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A TAXONOMIC REVISION OF *LACHNAEA* L. (THYMELAEACEAE)

by

JOSEPHINE BERTHA PAULINE BEYERS

Submitted in partial fulfilment of the requirements for the degree

PHILOSOPHIAE DOCTOR

in the Faculty of Natural-, Agricultural- and Information Sciences
(Department of Botany)
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Promoter: Prof. Dr A.E. van Wyk

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L. filamentosa


L. laniflora


L. macrantha


L. globulifera


L. filamentosa


L. grandiflora


L. pudens


L. eriocephala


L. pomposa


L. alpina


L. pomposa

ABSTRACT

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Lachnaea L., a genus endemic to the Cape Floristic Region, occurs almost exclusively in fynbos vegetation. In this revision a brief taxonomic history of *Lachnaea* is presented. Palynology and chromosome numbers were found to be taxonomically insignificant at specific level. Evidence from macromorphology, leaf anatomy, ecology and geographical distribution is used as the basis for species delimitation. Circumscription of the genus is extended to include the species of *Cryptadenia* Meisn. Previously proposed sections in *Lachnaea* are not upheld. Four species and all varieties are reduced to synonymy; 12 species and two subspecies are newly described and one new name is proposed. Forty species and two subspecies are now recognised. Geographically most species are concentrated in the 3319 (Worcester) grid. A phylogenetic hypothesis of *Lachnaea* resulting from two cladistic analyses is presented. The results of the analyses show that *Lachnaea* is monophyletic and that the sections are paraphyletic. The two analyses produced mixed resolution regarding the solitary-flowered species and gave conflicting results with regard to the evolutionary pathway of certain characters. Allopatric speciation appears to have been the dominant process in *Lachnaea*. Additional variables that may have governed diversification are altitudinal difference, allochory and post-fire regeneration strategies. The taxonomic treatment includes keys to the species and subspecies, detailed descriptions with notes on nomenclature, diagnostic features, relationships, distribution, ecology and conservation status. Line drawings and a distribution map are provided for each species.

KEYWORDS: anatomy — conservation — cytology — ecology — morphology — palynology — phylogeny — phytogeography — speciation — systematics.

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Accepted names in *Lachnaea* are in bold type, synonyms in italics and excluded taxa in ordinary type.

CHAPTER 1

INTRODUCTION

The genus *Lachnaea* L., the subject of this monograph, belongs to the family Thymelaeaceae which is a medium-sized family comprising about 50 genera and 700 species (Mabberley 1997; Takhtajan 1997). Although found in both temperate and tropical regions, the family is more diverse in the southern than in the northern Hemisphere, and is especially well represented in Australia and tropical Africa (Heywood 1979; Mabberley 1997; Takhtajan 1997). Many genera are found in the Pacific Islands (Heywood 1979).

Although relatively homogeneous, the Thymelaeaceae is usually divided into four subfamilies, namely Gonostyloideae, Aquilarioideae, Synandrodaphnoideae and Thymelaeoideae. The Gonostyloideae and Aquilarioideae have either been treated as separate families or have been included as subfamilies within the Thymelaeaceae (Domke 1934; Hutchinson 1969; Heywood 1979; Cronquist 1981; Mabberley 1997; Takhtajan 1997), thus drawing attention to a few genera which differ from the main bulk of members belonging to the subfamily Thymelaeoideae. The Gonostyloideae comprises three small genera from Southeast Asia and Borneo, the Aquilarioideae seven small genera from the Pacific area and Africa and the Synandrodaphnoideae one genus, *Synandrodaphne* Gilg, from tropical West Africa (Heywood 1979).

The taxonomic affinities of the Thymelaeaceae have been much debated. In the Bentham and Hooker system the Thymelaeaceae is placed in the Daphnales near the Proteaceae and Penaeaceae (Bentham & Hooker 1880). Hutchinson (1959) classified the family in the Thymelaeales with affinities to the Penaeaceae and Nyctaginaceae. He is however convinced that wherever the Thymelaeaceae is placed it should be followed by the Proteaceae (Hutchinson 1969). In the Engler system of Melchior (1964) it also resorts in the Thymelaeales but is placed next to the Dichapetalaceae and Elaeagnaceae. Affinities of the Thymelaeaceae with the Euphorbiaceae are proposed in the Young system (Brummitt 1992) where it is placed in the Euphorbiales and by Takhtajan (1969 & 1997) in the Thymelaeales, adjacent to the Euphorbiales. Dahlgren in his classification of 1975 follows Takhtajan (1969). The various placement of the Thymelaeaceae by Thorne (1968; 1976; 1981) illustrates the unclear affinities of the family. In the 1976 version of his classification he included Thymelaeaceae in the Myrtales, but in a subsequent treatment (1981) has returned Thymelaeaceae to the Euphorbiales where he had placed it earlier (1968). Cronquist (1981) includes Thymelaeaceae in the Myrtales adjacent to Crypteroniaceae and Trapaceae. Dahlgren & Thorne (1984) are of the opinion that Thymelaeaceae should be excluded from the Myrtales and that it should be classified near the Euphorbiaceae and that these two families are related to the Malvales. The Angiosperm Phylogeny Group (1998) have included Thymelaeaceae in the Malvales without indicating the families adjacent to it. In a combined cladistic analysis of angiosperms using *rbc*L and non-molecular data sets the Thymelaeaceae is nested within the Malvales *s. l.* clade (Nandi *et al.* 1998). From the above classification systems it is clear that the Euphorbiaceae, Elaeagnaceae, Flacourtiaceae, Proteaceae, and various families of the Myrtales and Malvales are among the groups that have been suggested as possible relatives.

The southern African members of the Thymelaeaceae all belong to the subfamily Thymelaeoideae. The four genera occurring in the Cape Floristic Region as defined by Bond & Goldblatt (1984), namely *Gnidia* L., *Lachnaea*, *Passerina* L. and *Struthiola* L., belong to the tribe Gnidieae (Domke 1934). Since Beyers & Van der Walt (1995) concluded that *Lachnaea* and *Cryptadenia* Meisn. are congeneric, the circumscription of *Lachnaea* has been extended to include all five species of *Cryptadenia*. *Lachnaea*, which now consists of 40 species, is endemic to the Cape Floristic Region. The generic name is derived from the Greek *lachneeis*, meaning woolly, which alludes to the woolly inflorescences of several members of the group. *Gnidia,* the largest genus in the Thymelaeaceae, with about 150 species is mainly an African group (Dyer 1975) with approximately one third of the species (47) in the Cape Floristic Region (Bond & Goldblatt 1984). Both *Struthiola* with about 40 species (Dyer 1975), and *Passerina* with about 17 species (Bredenkamp & Van Wyk 1996) occur mainly in the Cape Floristic Region.

Lachnaea is poorly known among the general public and flower enthusiasts because most species occur on mountain slopes and summits at high altitudes and usually in relatively small, localized populations. Sometimes these populations may be reduced to just a few plants. Numerous species, however, with their showy inflorescences and long blooming periods, have great potential for the horticultural industry. Already in the latter half of the eighteenth and beginning of the nineteeth century, four species were being cultivated in conservatories in England, recognising their potential. These introduced species were propagated by seed and cuttings, and growing best in a soil mixture of peat and loam. At present, however, no member of the genus is commercially available or cultivated in gardens. During this study, numerous attempts were made at propagating *Lachnaea* by means of cuttings, but with little success. The hope is expressed that the horticultural potential of these beautiful plants will be acknowledged and that the problems constraining propagation will be solved in the near future.

AIM AND SCOPE

The flora of southern Africa is estimated to contain 224 families, 2 228 genera and 21 087 species of flowering plants (Arnold & De Wet 1993). Southern Africa is here defined as including Botswana, Lesotho, Namibia, South Africa and Swaziland. Before a definitive "Flora" for the region can be published, each genus needs to be revised. The most recent taxonomic treatment of *Lachnaea* and *Cryptadenia* was done by Wright (1915) in Flora Capensis. Both the taxonomy and nomenclature are in need of revision on the species as well as the genus level. All existing taxonomic treatments of these two genera were solely based on a study of herbarium specimens. With the large number of herbarium specimens now available, compared to the small range of material on which earlier studies were made, and the opportunity to conduct extensive field work, a systematic revision of *Lachnaea*, following a multidisciplinary approach, would contribute to an improved understanding of the biodiversity of our rich flora.

The principle aims of this study are to:

- study the habit, the phylotaxis, the morphology of the leaves, inflorescences and flowers, the anatomy of the leaves, the pollen morphology and the cytology of *Lachnaea* to ascertain characters of taxonomic significance;
- study the phytogeography of the group;
- undertake an infrageneric phylogenetic analysis and;
- provide a monographic treatment of the genus.

Two papers emanating from Beyers (1992), in which the generic delimitation of *Lachnaea* and *Cryptadenia* was investigated, are added as Appendices (3 & 4). Frequent reference is made to these publications. Four papers, three on taxonomic and nomenclatural aspects of *Lachnaea* (Beyers 1997; Beyers & Van Wyk 1998a & 1998b) and one on the palynology of the Thymelaeaceae of the Cape Flora (Beyers & Marais 1998), with special emphasis on *Lachnaea* are presented here as Appendices (1, 2, 5 & 6).

Following this introduction, a brief historical review of *Lachnaea* and *Cryptadenia* is provided (Chapter 2), followed by materials and methods used (Chapter 3). Chapter 4 deals with the taxonomic significance of characters. Here comparative analyses of the morphology, anatomy, palynology and cytology are discussed. An account of the phytogeography of the genus (Chapter 5) is followed by a cladistic analysis and a discussion on speciation (Chapter 6). The taxonomic treatment of *Lachnaea* (Chapter 7) deals with the nomenclature, detailed description, distribution and ecological aspects of the various infrageneric taxa. This is followed by a general discussion (Chapter 8) and conclusions are offered in Chapter 9.

CHAPTER 2

HISTORICAL REVIEW

The genus *Lachnaea* was established by Linnaeus (1753) based on two species, *L. eriocephala* L. and *L. conglomerata* L. The identity of the last mentioned species, which in fact is today known as *Phylica stipularis* L. (Rhamnaceae), was questioned and excluded in most publications after 1792. *L. eriocephala* is the lectotype species of the genus (Domke 1934). Linnaeus in both his *Genera Plantarum* (1742) and *Species Plantarum* (1753) accredits *Lachnaea* to Adriaen van Royen but unfortunately I could not ascertain why he did. Linnaeus was in close contact with Van Royen, director of the Hortus Botanicus in Leiden during his residence in Holland between 1735 and 1738 (Wijnands 1983). Whether Van Royen suggested the generic name to Linnaeaus or whether Linnaeus saw a specimen of his, remains a mystery. No original material of *L. eriocephala* is known. Crantz (1766) included previously described *Passerina* species in his concept of *Lachnaea* and divided the genus into two groups, namely *Lachnaeae* L. consisting of the above two species, and *Passerinae* L. consisting of eight species.

Lamarck (1792) recognized *L. eriocephala* but excluded *L. conglomerata* in his concept of the genus, and described two new species, *L buxifolia* Lam. and *L. phylicoides* Lam. Subsequent publications, e.g. Salisbury (1808) and Sims (1813, 1814a & 1814b), appeared in which new species were described and illustrated from living material growing in conservatories in Britain.

In 1840 a detailed taxonomic account of the genus was published by Meisner in which some *Gnidia* and *Passerina* species were included, based on Drège's collections. Three sections were established, namely *Sphaeroclinium* Meisn., *Conoclinium* Meisn. and *Microclinium* Meisn., based on the infloresconse structure. Thirteen species and six infraspecific taxa were recognized (Meisner 1840). Meisner's earlier contribution on *Lachnaea*, with some alterations, was published in De Candolle's Prodromus in which 18 species and 13 infraspecific taxa were recognized (Meisner 1857).

Wright's revision of *Lachnaea* in Flora Capensis (1915) has been the standard work up to the present. In this treatment he reinstated *L. purpurea* Andr., which Meisner regarded as a variety of *L. eriocephala*, and included three newly described species namely, *L. funicaulis* Schinz (Schinz 1895), *L. micrantha* Schltr. (Schlechter 1898) and *L. passerinoides* N.E.Br. (Brown 1901) and regarded *L. dubia* Gand. (Gandoger 1913) as an imperfectly known species. Nineteen species and eight infraspecific taxa were recognized, but no mention was made of the sections established by Meisner. In a subsequent Addendum to the above volume (Wright 1915), Wright (1925) recognized a further two species and two infraspecific taxa which were already taken up in Meisner's treatment (1857). *Lachnaea marlothii* Schltr. (Schlechter 1896) and *Lachnaea gracilis* Meisn. (Meisner 1840) were both overlooked by Wright.

Between 1934 and 1953 four new species have been described, namely *L. elegans* Compton (Compton 1934a), *L. glomerata* Fourc. (Fourcade 1934), *L. naviculifolia* Compton (Compton 1934b) and *L. ruscifolia* Compton (Compton 1953). When Thoday (1924) published his revision of the genus *Passerina*, he noted that the type of *Passerina laniflora* C.H. Wright was not a *Passerina* but indeed a species of *Lachnaea*. Bond (1982) proposed the new combination, *Lachnaea laniflora* (C.H. Wright) Bond. Van Wyk (1993) recognised 29 species. Recently two new species have been described, namely *L. pudens* Beyers (Beyers & Van Wyk 1998a) and *L. sociorum* Beyers (Beyers & Van Wyk 1998b).

The genus *Cryptadenia*, with five species, was established by Meisner (1840). The generic name is derived from the Greek *kruptos* (concealed) and *aden* (a gland), and alludes to the fact that the floral scales are enclosed within the hypanthium. This treatment was also based on Drège's collections (Meisner 1840). Meisner (1840) regarded the glands (floral scales) positioned much lower down in the hypanthium just above the ovary, and the conspicuous filaments which are adnate to the hypanthium, the main distinguishing characters between *Cryptadenia* and its closely related counterpart *Lachnaea*. In De Candolle's Prodromus the same five species were recognized by Meisner (1857). The most recent taxonomic treatment of the genus was that of Wright (1915) in Flora Capensis. He upheld four of the species in Meisner's treatment, *C. ciliata* Meisn. was reduced to synonymy under *C. uniflora* (L.) Meisn. and a new species, *C. laxa* C.H. Wright was described. Wright (1915) regarded the flowers in *Cryptadenia* as axillary and solitary, whereas those of *Lachnaea* are terminal, capitate or rarely solitary. Contrary to the criterion used by Wright, he described the flowers of *C. laxa* as solitary and terminal! These five species were also recognized by Van Wyk (1993). Beyers & Van der Walt (1995) investigated the generic status of *Lachnaea* and *Cryptadenia* and proposed that *Cryptadenia* be combined with *Lachnaea*; necessary nomenclatural changes being provided by Beyers (1997). Four species were transfered to *Lachnaea* and *C. breviflora* Meisn. was placed in synonymy under *L. grandiflora* (L.f.) Baill.

CHAPTER 3

MATERIAL AND METHODS

MATERIAL

This study is based on an examination of herbarium material and observations made in the field. Live plants/material of 35 of the 41 taxa were studied. Attempts were made to propagate plants from cuttings collected in the wild for cytological investigation, but these were unsuccessful. Fresh material was preserved in formalin-acetic acid-alcohol (FAA) and a voucher herbarium specimen of each collection was made and is housed in the Compton Herbarium (NBG). Material from the following herbaria was studied (abbreviations according to Holmgren *et al.* 1990): BOL, G-DEL (photographs), GRA, K, LINN (microfiches, photographs and photocopies), LY, NBG, NY, P, P-LA (microfiches, photographs and photocopies), PRE, S, SAM, SBT (photocopies), UPS-THUNB (microfiches, photographs and photocopies) and Z.

METHODS

Descriptive terminology follows Stearn (1973) and Radford *et al.* (1974) unless otherwise stated.

Flowers of both fresh material and herbarium material were examined with the aid of a stereo-microscope. Flowers of herbarium specimens were first rehydrated in boiling water before being examined. Drawings were made with the aid of a drawing tube; these were used to take measurements of the different floral parts. The length of the hypanthium was measured from the base of the anterior sepal to the base of the hypanthium.

To ascertain whether the floral scales are nectariferous or functioning as osmophores, neutral red stain in distilled water (1:10 000) was used. The entire inflorescence was submerged in the solution for 2–3 hours and then examined under a microscope. The appearance of red spots on the surface of the scales was interpreted as a positive reaction (Kearns & Inouye 1993). Flowers preserved in formalin-acetic acid-alcohol (FAA) were dissected to expose the floral scales. The samples were critically point dried, thereafter mounted on stubs, coated with gold and studied with a Joel scanning electron microscope (SEM).

For the anatomical study of foliage leaves, both material preserved in FAA and herbarium specimens were used. Herbarium material was rehydrated by placing it in distilled water and heating it slowly to boiling point in a waterbath for approximately one hour, before allowing it to cool. These specimens were then fixed in FAA for at least 48 hours. The preserved material was dehydrated and embedded in wax according to the tertiary butyl-method (Johansen 1940). Transverse sections, 12 μm thick, were cut with a rotary microtome and stained with alcian green-safranin (Joel 1983). For the study of leaf surfaces portions of the leaf blade obtained from herbarium material were mounted on stubs, coated with gold and studied with a Joel scanning electron microscope (SEM). Epidermal cell patterns of the leaf blade were studied under a light microscope after the adaxial and abaxial epidermal layers were pealed off and then mounted in water.

For chromosome studies inflorescences were fixed in Carnoy's fixative (1886) in the field. After 24 hours, the fixative was replaced with 85% ethanol for 15 minutes and then finally replaced with 70% ethanol. Flower buds were stained in Snow's fluid (1963). The anthers were removed and squashed in 45% acetic acid.

The HENNIG86 package of programs for parsimony analysis (Farris 1988) was used for the cladistic analyses. Clados (Nixon 1993) was used to look at character distribution on the HENNIG trees.

The conservation status of each taxon was evaluated and the IUCN Red List Categories and critaria (Walter & Gillett 1998) were used.

LITERATURE, SPECIMEN AND AUTHOR CITATIONS

Titles of books are abbreviated as in Taxonomic literature, edn. 2 (Stafleu & Cowan 1976–1988). Author citations follow Brummit & Powell (1992).

Ecklon and Zeyher's collections are cited using the Drège (1847a) code system when definite collecting numbers are unavailable. These numbers are not collection numbers but refer to the numbering system for localities visited by Ecklon and Zeyher, together with the month during which the locality was visited. Ecklon and Zeyher numbers should therefore be interpreted as collections without numbers, for example "*Ecklon & Zeyher s.n. 52.2*".

TAXONOMIC CONCEPTS

Luckow (1995) and McDade (1995) highlighted the importance of explicitly stating the concepts and methods used for recognition of taxa in botanical monographs. In the treatment of the monophyletic genus *Lachnaea*, the species delimitation is mainly based on macromorphological, anatomical and geographical characters. The units recognized here should be referred to as "taxonomic species" (Cronquist 1978; Grant 1981) rather than biological species as defined by (Grant 1981). The species are not based on single characters but on a combination of characters unique to them. Subspecific entities have been used in only one species, *L. globulifera*, as the taxa are allopatric with the distinction between them based on a single character only.

CHAPTER 4

TAXONOMIC SIGNIFICANCE OF CHARACTERS

In existing taxonomic treatments of *Lachnaea* (Meisner 1840, 1857; Wright 1915) attention was given to macromorphological characters observed solely from herbarium specimens to delimit the species. To provide an empirical basis for a revised infrageneric classification of *Lachnaea* and to find new criteria for defining more natural groups an analysis of all the species was necessary. In the present study the growth habit, morphology of the leaves, inflorescences and flowers, anatomy of the leaves, pollen morphology and the chromosome numbers were examined. As Stace (1989) states: "Any data which show differences from species to species are of taxonomic significance, and thus constitute part of the information or evidence which may be used by taxonomists". In this chapter each potential source of taxonomic evidence will be dealt with by giving a short introduction, followed by the variation observed in *Lachnaea* and the taxonomic relevance of the particular aspect.

4.1 GROWTH HABIT

The Thymelaeaceae are shrublets, shrubs or small trees (Domke 1934; Dyer 1975). In past taxonomic treatments of *Lachnaea* (Meisner 1840, 1857; Wright 1915) not much emphasis was on habit. No information was for example, given on the regeneration of the species. Wright (1915), in the key to the species, used branch length (short or long), whether the branches were straight or flexuous and presence or absence of pubescence as diagnostic features.

Observations

All *Lachnaea* species are shrubs or shrublets varying in height from 0.3–2.0 m. The branching system is markedly sympodial in most species, but often rather irregular, especially in those with alternate leaves. There is considerable variation in appearance and size among and sometimes within the different species. The habit varies from erect, sparsely to moderately branched shrubs up to about 2.0 m tall, as in *L. capitata*, and *L.*

macrantha, erect or straggling, moderately branched shrublets of about 30 cm tall, as in *L. burchellii* and *L. laxa*, to a dense, much-branched, compact, round shrub attaining a height of 1.0 m as in *L. alpina*. Within some species the height can be very variable as in *L. filamentosa*, where it varies from 0.3–2.0 m. Individuals growing in moist places grew more luxurious than those on drier sandy habitats (Table 4.1).

Species are either reseeders, basally single-stemmed, as in *L. densiflora*, or resprouters, basally multistemmed, as in *L. axillaris*, or single- and multistemmed within a single species as in *L. filamentosa*, *L.burchelli* and *L. aurea*. When the same species may be either reseeders or resprouters, the general appearance of the plants is affected; resprouting individuals usually have a more rounded and compact form (Table 4.1).

The general appearance of some species may change considerably if grazed by livestock. In both *L. gracilis* and *L. elsieae* grazed individuals are very compact shrublets, differing considerably from ungrazed ones.

Some species have rigid, moderately stout branches as in *L. pomposa*, whereas others have lax or flexuous, slender branches as in *L. gracilis* and *L. burchellii*. The branches are at first leafy, glabrous or variously pubescent, either terete or ridged below the leaf bases. Older branches become defoliated, glabrous and in many species marked with more or less conspicuous leaf scars (Table 4.1). Trichomes, which may be present on many parts of the plant, are always unicellular and unbranched.

Discussion

Although there is considerable infraspecific variability in height and general appearance in some species, especially when individuals are both reseeders and resprouters, or when they have been grazed, other species do not show great variability. In the latter case the habit and size in combination with other characters can be of taxonomic value. Similarly, where the regeneration strategy is constant within a species it is of taxonomic value. Branch shape, here referring to whether the branches are terete or ridged below the leaf base, as well as the absence or presence of indumentum and the kind of indumentum have taxonomic significance.

TABLE 4.1—Regeneration, height of plant and selected branch characters of *Lachnaea* species. * = occasional occurrence; [X] = sparse indumentum; {X} = distal 1–6 internodes.

Species	Regeneration		Maximum height in m	Selected branch characters															
							indumentum												
	reseeder	resprouter		ridged below leaf base	terete	leaf scars prominent X; inconspicuous 0	glabrous	hirsute	sericeous-hirtellous	sericeous	sericeous-tomentose	villous-tomentose	tomentose	felted	adpressed hairy	straight hairs admixed crisped ones	short crisped hairs	short straight hairs	glabrescent
alpina	X		1	X		X	X	{X}											
aurea		X	1	X		X									X				
axillaris		X	0.75		X	X				X	X								
burchellii	X		0.3	X		X	X								[X]				
capitata	X		1.8	X		X	X			{X}									
densiflora	X		0.5	X		X				X	X								
diosmoides	X		1.5	X		X	X												
elsieae	X	X	0.6		X	0						X		X					
ericoides	X		0.5	X		X										X			
eriocephala	X		0.6		X	0			X										
filamentosa	X	X	2	X	X	X	X												
filicaulis		X	0.4	X		0				X									
funicaulis	X		0.45		X	0								X					
globulifera subsp. *globulifera*	X		0.6–0.9*		X	0											X		
globulifera subsp. incana		X	0.6–1*		X	0								X					
glomerata		X	0.45	X		X	X								[X]				
gracilis	X		2	X		0									[X]				
grandiflora		X	0.6–1*	X		X									X				X
greytonensis	X		0.45		X	0								X					
laniflora	X		1		X	X							X						
laxa	X		0.3	X		0				X									
leipoldtii	X		0.4		X	0							X						
macrantha	X		2	X		X	X												
marlothii	?	?	0.3		X	0							[X]	X					
montana	X		0.6		X	0											X	X	
naviculifolia		X	1.5		X	X	X			{X}					X				
nervosa	X	X	1	X		0				X [X]									
oliverorum	X		0.5		X	0								X					
pedicellata	X		0.6		X	0											X	X	
pendula	X		0.45		X	0								X		X			
penicillata	X	X	0.4		X	0								X					
pomposa	X	X	1.7	X		X	X								{X}				
pudens	X		0.6	X		X							X						
pusilla	X		0.4		X	0				X									
rupestris	X		0.2		X	0										X			
ruscifolia		X	0.8	X		X										X			
sociorum		X	0.6	X		X										X			
stokoei	?	?	?	X		X										X			
striata		X	0.6	X		X				X [X]									
uniflora	X	X	0.45	X		X	X			X*					[X]				
villosa	X		0.5		X	0								X					

4.2 LEAVES

In Thymelaeaceae the leaves are always simple, entire, exstipulate, sessile or subpetiolate, either alternate or opposite (Domke 1934). The phyllotaxis can be constant within a genus or a species but may sometimes differ within an individual Domke (1934). Meisner (1840 & 1857) in constituting his sections and subsections based mainly on the inflorescence morphology, used the phyllotaxis, arrangement and shape of the leaves as secondary characters. In section *Sphaeroclinium*, the first group, with capitula without an involucre (Meisner 1940), designated subsection *Exinvolucratae* (Meisner 1857), the leaves are alternate, close together, rather broad and flat, whereas in the second group, with an involucre (Meisner 1940), designated subsection *Involucratae* (Meisner 1957), the leaves are decussate rarely alternate, linear and dorsally convex or keeled. In section *Conoclinium* the leaves are alternate and semi-spreading (Meisner 1840 & 1857), whereas in section *Microclinium* the leaves are alternate or opposite, linear or almost needle-shaped (Meisner1840 &1857). Macromorphological leaf characters were used frequently in Wright's key (1915) to the species of *Lachnaea*.

Observations

In *Lachnaea* the leaves are either alternate or decussate, but in *L. burchellii* they are decussate or occasionally sub-opposite. The orientation and position of the leaves on the axis are variable among and within species. The leaves are imbricate to scattered, adpressed, subadpressed, ascending, patent, or only very occasionally reflexed (Table 4.2). The leaves are always entire and usually sessile, but may be sub-petiolate as in *L. ruscifolia*.

Leaf shape varies from linear to orbicular. Again the variability is not only interspecific but also infraspecific and even on the same individual. In *L. pomposa*, for example, leaves may vary from narrowly elliptic to elliptic, narrowly ovate to widely ovate and narrowly obovate to obovate on the same plant. Leaf size ranges from1.0–40.0 mm in length and 0.4–19 mm in width. The variation can be considerable within a species, as observed in *L. filamentosa*, with a range of 7.0–40 mm long and 2.0–13 mm wide and in *L. pomposa* from 7.0–38.0 mm long and 2.0–19.0 mm wide (Table 4.2).

TABLE 4.2—Diagnostic leaf characters (phyllotaxy, orientation, structure, shape, size) in *Lachnaea* species. * = occasional occurrence.

Species	Phyllotaxy			Orientation						Structure		Shape										Size	
	alternate	sub-opposite	decussate	adpressed	subadpressed	ascending	inclined	patent	reclined	amphistomatic	epistomatic	linear	lanceolate	narrowly elliptic	narrowly ovate	narrowly obovate	elliptic	ovate	obovate	widely ovate	orbicular	length (mm)	width (mm)
alpina	X					X					X			X			X		X			5–10	1.5–3
aurea	X			X	X	X		X*	X*		X			X			X		X			7.5–18	0.8–4
axillaris			X			X					X		X		X							2–4	0.8–1.2
burchellii		X*	X			X	X				X		X	X								6–13	1.0–3
capitata	X					X				X		X		X								5.2–21	0.7–1.8
densiflora	X					X	X			X		X		X								5–12–20*	0.7–2.5
diosmoides	X					X	X	X	X*		X	X		X								5–10	1.0–1.5
elsieae			X	X	X						X		X	X			X	X				1–4.5	0.4–1.1
ericoides	X				X	X					X			X			X		X			2–6–8*	0.8–1.5
eriocephala			X		X	X					X		X	X								5.2–15	1–2.5
filamentosa	X					X	X	X		X				X	X	X	X	X*	X			7–40	2–13
filicaulis			X			X	X	X			X		X									3.6–8–12*	0.6–1–1.5*
funicaulis			X	X							X		X	X		X						3.8–5	0.8–1.4
globulifera ssp. *globulifera*			X	X	X	X					X			X								5.4–12	0.7–1.7
globulifera ssp. *incana*			X	X	X	X					X		X	X								4.5–7.3	0.9–1.7
glomerata			X			X	X	X			X			X			X		X			4–10.5	1–2
gracilis			X	X	X	X					X			X		X	X		X			3.1*–3.5–8.3	0.8–1.5–3*
grandiflora			X		X	X					X			X	X	X	X	X				2.2–11.5	0.8–3
greytonensis			X	X							X			X								2.8–4.5	0.8–1.2
laniflora			X			X					X			X	X							2.5–7	0.9–1.3
laxa			X	X	X	X					X		X	X								3.8–7.6	0.6–1.3
leipoldtii			X	X							X			X			X	X				2.2–3.5	0.8–1.2
macrantha	X					X					X								X			7–23	2.9–11

TABLE 4.2—*continued.*

Species	Phyllotaxy			Orientation						Structure		Shape										Size	
	alternate	sub-opposite	decussate	adpressed	subadpressed	ascending	inclined	patent	reclined	amphistomatic	epistomatic	linear	lanceolate	narrowly elliptic	narrowly ovate	narrowly obovate	elliptic	ovate	obovate	widely ovate	orbicular	length (mm)	width (mm)
marlothii			X	X	X	X					X			X								2.5–4.2	0.6–1.0
montana			X	X	X	X					X		X	X								4.2–15	1–2.4
naviculifolia			X			X					X			X	X*		X	X*				1.5–16	1.5–5.5
nervosa	X					X	X	X			X			X		X*						4.7–14	0.7–1.5
oliverorum			X	X	X	X					X		X	X								3.8–5	0.8–1.4
pedicellata			X	X	X	X					X	X		X								4.5–12	0.8–1.5
pendula			X	X							X			X	X		X	X				1.8–2.4	0.6–0.8
penicillata			X	X							X		X	X								2–3.7	0.6–1
pomposa	X					X	X	X	X*	X				X	X	X	X	X	X	X		7–38	2–19
pudens			X			X					X						X					3.8–5	1–1.3
pusilla			X	X							X			X								2.8–3.2	0.6–0.7
rupestris			X		X	X					X		X	X								3–5.4	0.6–1
ruscifolia	X					X	X	X			X							X			X	5–10.5	2.6–5.5
sociorum	X					X	X*	X*			X		X	X			X*		X*			3.6–6	0.9–2.4
stokoei	X					X					X			X			X	X				2.5–4	1–1.5
striata	X					X					X			X			X	X				4.8–10	1.5–4.5
uniflora			X	X	X	X					X		X	X								3.4–6.7	0.6–1
villosa			X	X							X		X	X								2.8–5	0.6–1.2

The leaf-blade varies from more or less plane on either side to concave adaxially and convex abaxially. Abaxially they may be flat or subkeeled to keeled in the distal half, or enervate to longitudinally 1–9-ribbed (Table 4.3). Both surfaces are usually smooth but in *L. grandiflora* the abaxial surface may be transversely rugose towards the margins. Adaxial side is usually enervate, only occasionally midveined or subnervate as in *L. pomposa*. Abaxial surface is usually green, glossy and smooth, whereas the adaxial surface is usually pale green, dull and white-punctulate. Leaves are concolorous in *L. capitata*, *L. densiflora*, *L. filamentosa* and *L. pomposa*, and glaucous in *L. macrantha*, *L. pomposa*, and usually in *L. filamentosa*.

The leaves are coriaceous in most of the species, but occasionally semi-succulent in *L. densiflora* and *L. naviculifolia*. They are glabrous or pubescent at the margins, although the latter hairs are often deciduous (Table 4.3).

The bract-like leaves subtending the inflorescences are discussed under the inflorescences.

Discussion

Phyllotaxis and to a lesser degree the orientation, shape (in outline and cross section) of the leaves have taxonomic relevance. The abaxial surface being enervate or ribbed can be useful. The presence or absence and the type of indumentum at the leaf margins are relevant. Where the variation range of a character is infraspecifically wide the character becomes taxonomically less significant.

Some of the leaf shape types within *Lachnaea* are very similar to those found in unrelated groups as discussed by Dahlgren (1971) and Bremer (1976), illustrating the convergent evolution in leaf shape among genera of the Cape Flora. See also General Discussion.

4.3 ANATOMY OF THE LEAVES

Comparative plant anatomy is widely used for taxonomic purposes, although its usefulness has generally been in the classification of higher categories. While leaves

TABLE 4.3—Selected macromorphological leaf characters (shape of lamina as seen in cross section, surface of lamina, indumentum of the margin and apex) in *Lachnaea*. * = occasional occurrence; [X] = less pronounced.

Species	Shape (cross section)					Surface						Margin				Apex
	adaxial			abaxial		abaxial						indumentum				
	plane	concave	convex	plane	convex	enervate	faintly nervate	subkeeled	keeled	midribbed	mid- & laterally ribbed (quantity)	glabrous	ciliate	lanate	villous	tufted
alpina	X			X		X						X				
aurea	X			X		X						X				
axillaris	X	X			X	X						X				
burchellii		X		X						X	X(3)	X				
capitata	X				X	X		X*				X				
densiflora	X		X		X	X		X*				X	X*			X*
diosmoides	X				X					X		X				
elsieae		X			X			X	X			X				X
ericoides		X			X				X			X				X
eriocephala		X			X				X				X			
filamentosa	X			X		X	X					X				
filicaulis		X			X	X						X				
funicaulis		X			X	X		X						X		
globulifera subsp. globulifera		X			X			X				X	X*			
globulifera subsp. incana	X	X			X			X				X	X*			
glomerata		X			X	X		X				X				
gracilis	X	X		X	X	X						X				
grandiflora		X			X			X				X				
greytonensis		X			X	X		X							X	
laniflora		X			X			X				X				
laxa		X			X	X			X			X				
leipoldtii		X			X				X			X				
macrantha	X			X		X						X				
marlothii		X			X			X				X				
montana	X	X			X				X			X				
naviculifolia	X				X	X						X				
nervosa	X	X			X					X	X(3–5)	X				
oliverorum		X			X	X		X						X		
pedicellata		X			X				X			X				
pendula		X			X	X		X				X				X
penicillata		X			X			X	X					X		X
pomposa	X			X		X	X					X				
pudens		X			X				X			X				
pusilla		X			X			X				X				
rupestris		X			X			X				X				
ruscifolia		X			X						X(6–9)		X			
sociorum	X	X			X			X			[X](3)	X				
stokoei		X		X			X					X				X
striata	X			X						X	X(3–5)		X			
uniflora		X			X			X				X				
villosa		X			X			X	X					X		

respond readily to evolutionary pressures towards xeromorphy or other modifications, their endomorphic characters commonly retain the ground plan of the phylad to which they belong (Keating 1984). Metcalfe & Chalk (1950) give a general description of the leaf anatomy for the Thymelaeaceae. Thoday (1921) alluded to certain aspects of the leaf anatomy of two Cape species of *Passerina*, whereas Beyers & Van der Walt (1995), in their generic delimitation of *Lachnaea* and *Cryptadenia*, give an account of the leaf anatomy of 18 species. In an attempt to determine anatomical and morphological adaptations in the leaves of selected Fynbos species, Van der Merwe (1992) gives detailed descriptions of the anatomy of the leaves of two *Passerina* and two *Struthiola* species. Since no attention has been given to leaf anatomy in past taxonomic treatments of *Lachnaea* (Meisner 1840 & 1857; Wright 1915), the taxonomic value of these characters was hitherto unknown. The material used in the leaf anatomical study is tabulated in Table 4.4.

Observations

Based on structure, two leaf types can be distinguished in *Lachnaea*. Type A: those which are amphistomatic and isobilateral; Type B: those which are epistomatic and dorsiventral.

Type A: Amphistomatic, isobilateral leaves (Tables 4.5 & 4.6)

In transverse section the leaves are flattened ad- and abaxially, transverse elliptic or flattened adaxially and convex abaxially. The cuticle is well-developed, equally thick ad- and abaxially. The cuticular relief as observed with the SEM is adaxially undulate, reticulate or depressed reticulate whereas abaxially it is more or less smooth, reticulate or depressed reticulate (Figure 4.1). Epicuticular wax deposits (Figure 4.2) occur on both surfaces. On the adaxial surface the wax deposits are in the form of entire platelets [P] (terminology after Barthlott *et al.* 1998), whereas on the abaxial surface they are either in the form of entire platelets or a crust [C]. The epidermis is uniseriate. Epidermal cells are square to periclinally elongated, more or less the same size ad- and abaxialy, with the outer tangential cell walls slightly thicker than the inner tangential walls (before gelatinization). The inner tangential cell walls are ad- and abaxially either partly gelatinized as in

TABLE 4.4—Vouchers of material studied for leaf anatomy and chromosome numbers in *Lachnaea*.

Species	Voucher specimen	Herbarium	Transections	Surfaces: SEM	Chromosome No. (2n)
L. alpina	*Beyers 258*	NBG	X		
	Forsyth 508	NBG		X	
	Oliver 9299	NBG	X	X	18
L. aurea	*Beyers 135*	NBG	X	X	
L. axillaris	*Beyers 127*	NBG	X		
	Beyers 180	NBG	X	X	
	Schlechter 7702	BOL	X		
L. burchellii	*Oliver 9241*	NBG	X	X	
	Oliver 9251	NBG	X	X	
L. capitata	*Beyers 138*	NBG	X	X	
	Oliver 10519	NBG			18
L. densiflora	*Beyers 115*	NBG	X		
	Beyers 145	NBG	X	X	18
	Beyers 171	NBG	X		
	Beyers 177	NBG		X	
L. diosmoides	*Beyers 181*	NBG	X	X	18
	Spreeth 158	NBG		X	
L. elsieae	*Hanekom 3013*	NBG	X	X	
	Taylor 10751	NBG	X		
L. ericoides	*Beyers 172*	NBG	X	X	18
L. eriocephala	*Beyers 54*	NBG	X	X	18
	Esterhuysen 18794	NBG		X	
	Rugge s.n.	NBG			18
L. filamentosa	*Beyers 110*	NBG	X	X	
	Hansford 47	NBG	X		
	Low 1246	NBG		X	
	Taylor 10770	NBG		X	
L. filicaulis	*Boucher 5071*	NBG	X	X	
	McDonald 1989	NBG			18
	Oliver 9803	NBG	X		
L. funicaulis	*Bolus 5316*	NBG	X		
	Hugo 2332	NBG	X	X	
L. globulifera					
subsp. globulifera	*Beyers 240*	NBG	X	X	
subsp. incana	*Brown 575*	NBG	X	X	18
L. glomerata	*Beyers 129*	NBG	X	X	18
	Vlok 2378	NBG	X	X	18
L. gracilis	*Bean & Viviers 2613*	NBG		X	
	Beyers 126	NBG		X	
	Beyers 219	NBG	X		
	Marloth 3224	BOL		X	
	Oliver 10415	NBG	X	X	
	Oliver 10416	NBG			18
L. grandiflora	*Beyers 129*	NBG	X	X	
	Beyers 151	NBG	X		
	Beyers 155	NBG		X	
L. greytonensis	*Beyers 209*	NBG	X	X	
L. laniflora	*Forsyth 507*	NBG	X	X	18
	Hanekom 667	NBG	X	X	
	Oliver 9045	NBG	X	X	

TABLE 4.4—*continued.*

Species	Voucher specimen	Herbarium	Transections	Surfaces: SEM	Chromosome No. (2n)
L. laxa	*Bolus 7875*	BOL	X	X	
	Oliver, I 4	NBG	X		
L. leipoldtii	*Taylor 10871*	NBG	X	X	
L. macrantha	*Forsyth 527*	NBG	X	X	
	Oliver, I. 3	NBG	X	X	18
L. marlothii	*Kotze 124*	NBG	X		
	Phillips 2051	SAM	X	X	
L. montana	*Beyers 141*	NBG	X	X	18
	Beyers 276	NBG	X		
L. naviculifolia	*Beyers 114*	NBG	X	X	
	Forsyth 525	NBG		X	
L. nervosa	*Beyers 215*	NBG		X	
	De Kock 152	NBG	X	X	
	Esterhuysen 36180	NBG		X	
	Oliver 9259	NBG	X	X	18
L. oliverorum	*Oliver 10478*	NBG	X	X	
	Viviers & Vlok 430	NBG	X		
	Williams 1195	NBG		X	
L. pedicellata	*Oliver 9282*	NBG	X	X	
L. pendula	*Esterhuysen 29780*	BOL	X	X	
	Esterhuysen 30420	BOL		X	
L. penicillata	*Beyers 173*	NBG	X	X	
	Oliver & Fellingham 9145	NBG		X	
L. pomposa	*Beyers 122*	NBG	X	X	18
	Compton 21088	NBG		X	
L. pudens	*Beyers 161*	NBG	X	X	
	Beyers 166	NBG	X		
	Beyers 210	NBG	X	X	
L. pusilla	*Beyers 243*	NBG	X	X	
	De Villiers 45	NBG		X	
L. rupestris	*Oliver s. n.*	NBG	X	X	
L. ruscifolia	*Beyers 193*	NBG		X	
	Vlok 2084	NBG	X	X	
	Goldblatt & Manning 8870	NBG	X		
L. sociorum	*Beyers 176*	NBG	X	X	18
	McDonald 2059	NBG	X	X	
L. stokoei	*Stokoe NBG 103641*	NBG	X	X	
L. striata	*Esterhuysen 26861*	BOL		X	
	Leipoldt 3504	BOL	X		
	Stokoe BOL 22326	NBG	X		
L. uniflora	*Beyers 136*	NBG	X	X	18
L. villosa	*Beyers 125*	NBG	X	X	
	Du Toit s.n.	NBG			18
	Oliver 9808	NBG			18

TABLE 4.5—Selected leaf epidermal features of *Lachnaea* species with amphistomatic leaves. Explanation of abbreviations used – epicuticular wax: C, crust; P, platelets; outer: inner, refers to the thickness of the outer tangential cell walls with relation to the inner tangential cell walls of both epidermides.

Species	Cuticular relief						Epicuticular wax		Stomata	Epidermis	Adaxial epidermis		Abaxial epidermis		Tangential cell walls	Inner tangential walls gelatinized			
	adaxial			abaxial						cell size	cell shape		cell shape		outer: inner	adaxial		abaxial	
	undulate	reticulate	depressed reticulate	± smooth	reticulate	depressed reticulate	adaxial	abaxial	sunken	abaxial = adaxial	square	pericinally elongated	square	pericinally elongated	ad- & abaxial epid.: X >2x thicker, [X] slightly thicker, 0 even thickness	wholly	partly	wholly	partly
capitata		X			X		P	P	X	X	X	X	X	X	[X]		X		X
densiflora		X			X		P	P	X	X	X	X	X	X	[X]		X		X
filamentosa			X			X	P	C	X	X	X		X		0		X		X
pomposa	X		X	X		X	P	C	X	X	X	X	X	X	X	X		X	

TABLE 4.6—Selected histological features of leaf transections of *Lachnaea* species with amphistomatic leaves. Explanation of abreviations and symbols used – mid-vascular bundle: M = large; m = small; lateral vascular bundle: B = the same size as the mid-bundle; b = smaller than mid bundle; the number refers to the number of lateral bundles on either side of the mid-bundle; extraxyllary fibres capping mid-vascular bundle: MX = very well developed; mx = less well developed.

Species	Structure	Mesophyll	Vascular bundles			Extraxyllary fibres			Bundle sheath		Crystals					
		undifferentiated	mid	lateral							druse	diosmin				
	isobilateral	palisade-like chlorenchyma	size	number & size	intermediate	mid bundle cap	lateral bundle cap prominent	fibre strands along lateral margin	complete	incomplete	mesophyll	adax. epidermis	abax. epidermis	mesophyll	vascular bundle	Tanniniferous deposits
capitata	X	6–7	M	2 b	X	MX		0		X	X					0
densiflora	X	6–7	M	1–2 b	X	MX	X	0		X	X					0
filamentosa	X	6–8	M/m	2 b / 3 B	X	mx		0	X			X	X	X	X	0
pomposa	X	6–7	M	3 B	X	mx		0	X		X	X	X	X	X	0

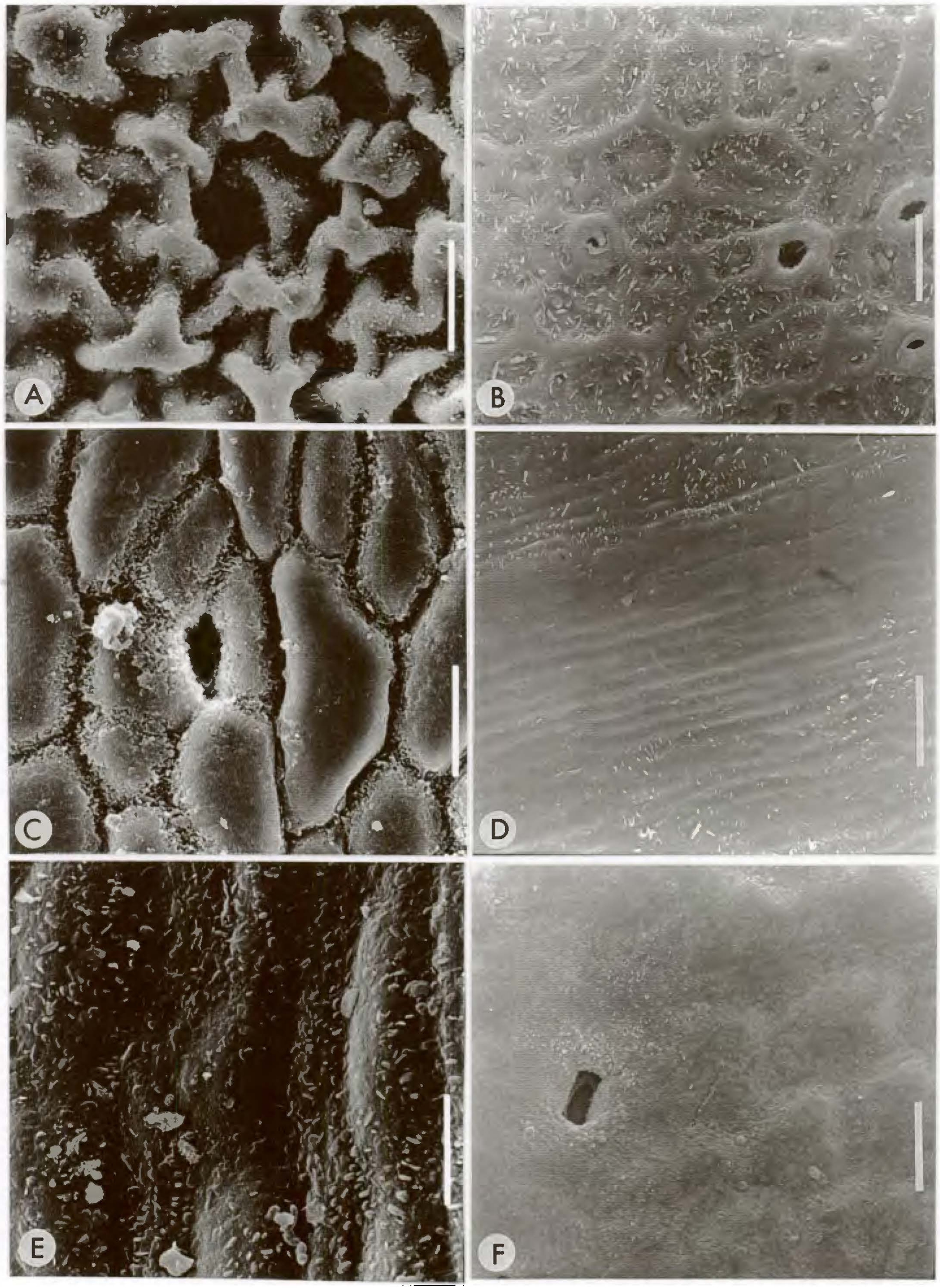

FIGURE 4.1—SEM micrographs of the cuticular relief in leaves of *Lachnaea* species. A. *L. alpina* (*Oliver 9299*), adaxial surface, epidermal cells irregularly papillate ('basket woven'); B. *L. capitata* (*Beyers 138*), abaxial surface, reticulate; C. *L. filamentosa* (*Taylor 10770*), abaxial surface, areas between epidermal cells depressed reticulate; D. *L. filicaulis* (*Boucher 5071*), abaxial surface, striate; E *L. glomerata* (Beyers 192), abaxial surface, undulate: F. *L. pomposa* (*Beyers 122*), abaxial surface, ± smooth. Scale bars: 37 µm.

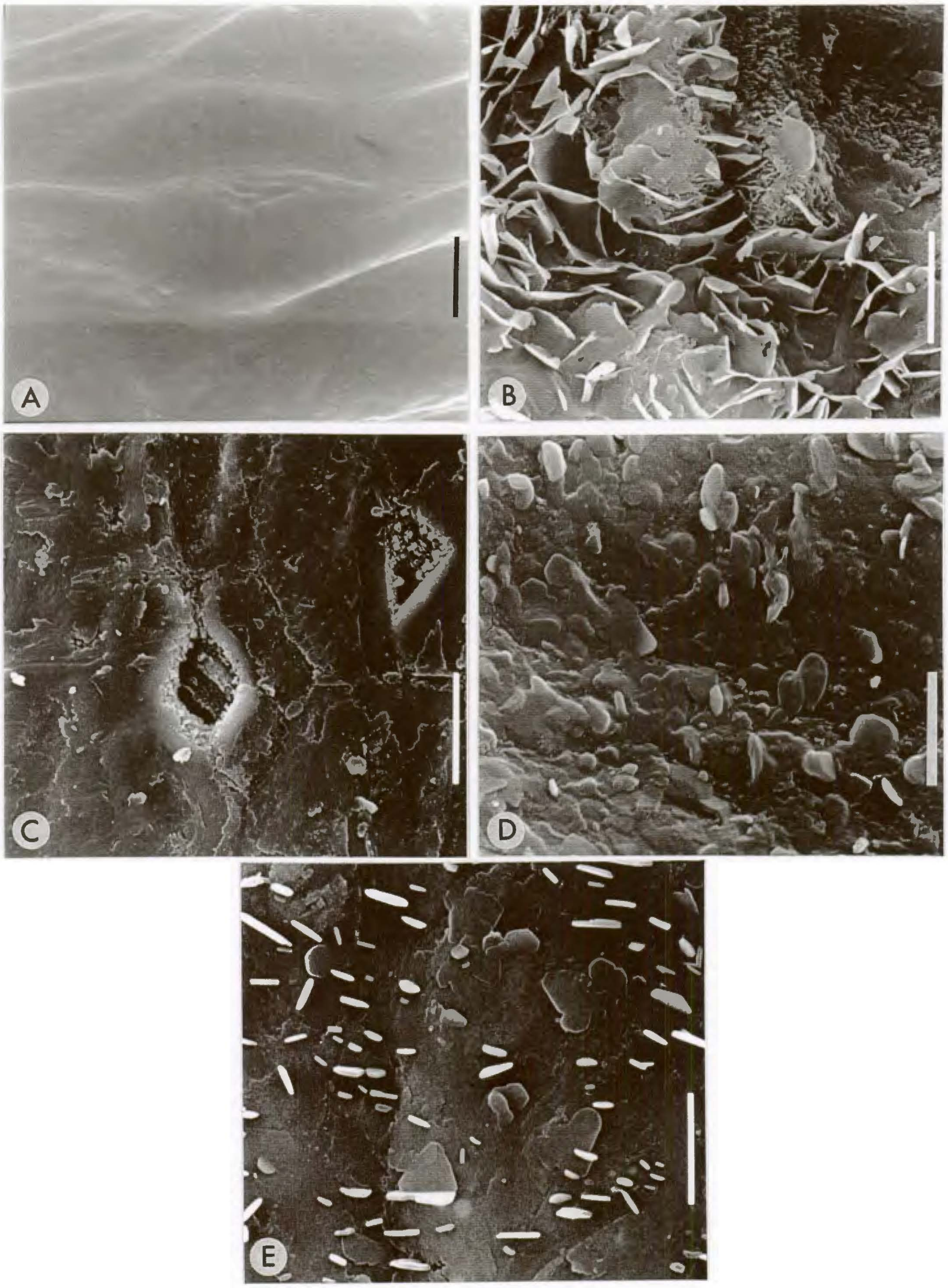

FIGURE 4.2—SEM micrographs of different types of epicuticular wax deposits on leaves of *Lachnaea* species. A. *L. ericoides* (*Beyers 172*), abaxial surface, smooth layer; B. *L. eriocephala* (*Esterhuysen 18794*), adaxial surface, platelets; C. *L. filamentosa* (*Low 1246*), abaxial surface, crust; D. *L. glomerata* (*Beyers 192*), abaxial surface, sparse platelets; E. *L. gracilis* (*Bean & Viviers 2613*), abaxial surface, smooth layer with sparse platelets. Scale bars: A, C, 37 µm; B, D, E, 9 µm.

L. densiflora (Figure 4.3 A) or wholly gelatinized as in *L. pomposa* (Figure 4.3 C). Stomata are anomocytic, more abundant adaxially and are sunken.

The mesophyll is not differentiated in palisade and spongy parenchyma but consists of 6 or 7 layers of palisade-like chlorenchyma. In *L. filamentosa*, however the chlorenchyma consists of palisade-like cells admixed with rounded cells. Numerous substomatal air chambers are present below the ad- and abaxial epidermis.

The vascular bundles are collateral, comprising usually of one large mid-bundle flanked by one or two smaller lateral bundles on either side with very small intermediate bundles occurring between these two types as in *L. densiflora* (Figure 4.3 A). Here the mid- and lateral bundles are capped abaxially by large extraxylary fibres, which are particularly well developed in the mid- and lateral bundles. A uniseriate, parenchymatous bundle sheath is present which may be complete as in *L. filamentosa* (Figure 4.3 B) or incomplete, interrupted by the extraxylary fibre cap, as in *L. densiflora*.

Crystals of diosmin (potasium hydroxide test: Jackson & Snowdon 1990) occurring as sphaerocrystalline to somewhat dendritic masses, pale yellow in colour, are present in the epidermis, mesophyll and vascular tissue in *L. filamentosa* and *L. pomposa* (Figure 4.3 B & C). Druse crystals (presumably calcium oxalate) are present in the mesophyll of *L. capitata*, *L. densiflora* and *L. pomposa*. Tanniniferous deposits are absent.

Type B: Epistomatic, dorsiventral leaves (Table 4.7, 4.8 & 4.9)

In transverse section the leaves are usually flattened to concave or occasionally transverse elliptic as in *L. laniflora* adaxially and shallowly to deeply convex abaxially, but in *L. macrantha* they are flattened ad- and abaxially. The cuticle is well-developed, equally thick ad- and abaxially or thinner adaxially. The cuticular relief as observed with the SEM is adaxially more or less smooth, subpapillate to papillate, striate-papillate, depressed reticulate, depressed reticulate-subpapillate or basket woven. Adaxially the cuticular relief is subpapillate to papillate, striate-papillate, undulate, reticulate, reticulate-subpapillate, striate, depressed reticulate or depressed reticulate-subpapillate (Figure 4.1 & 4.4). Epicuticular wax deposits occur on both surfaces. These deposits are adaxially usually in

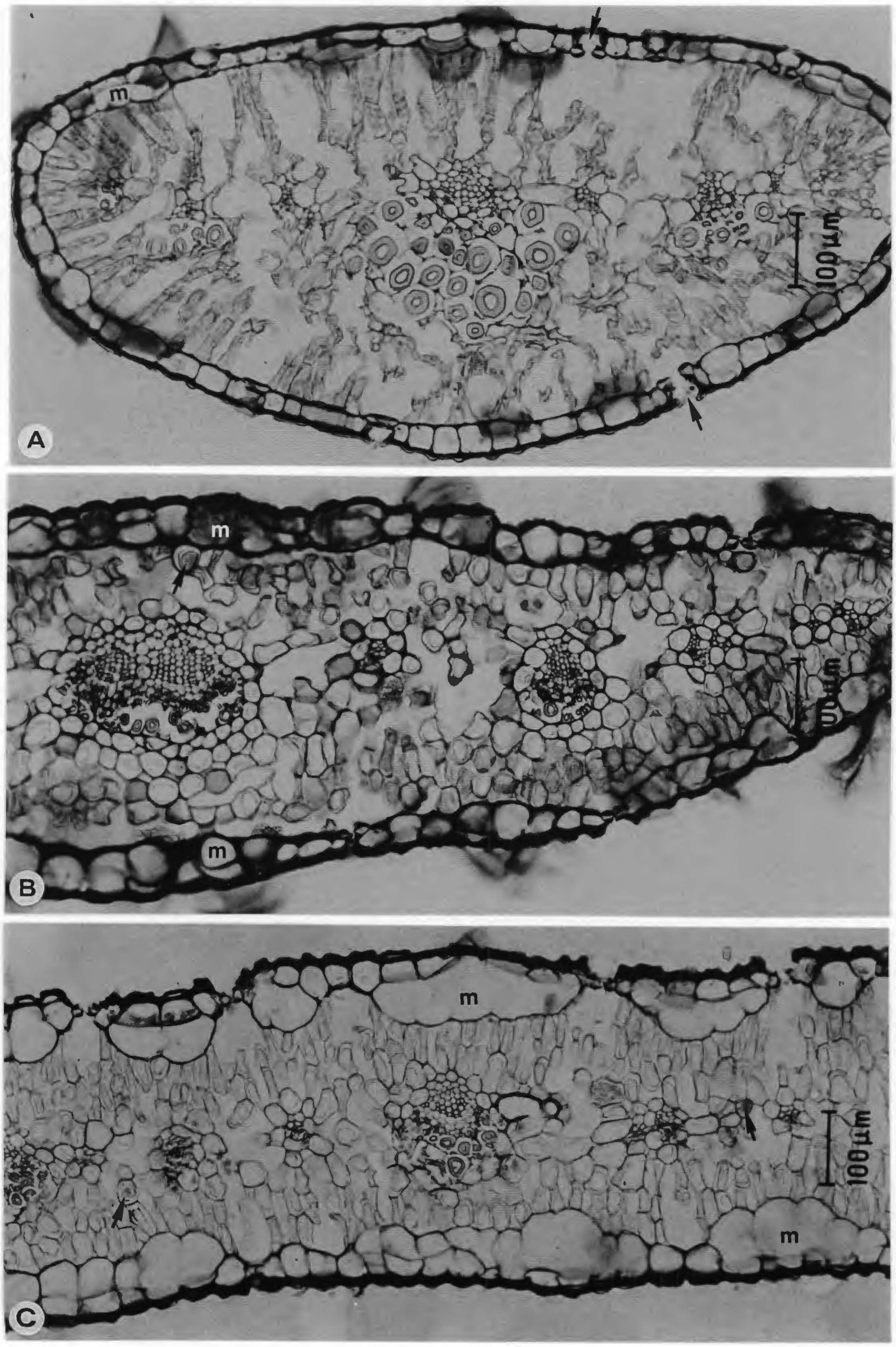

FIGURE 4.3—Leaf anatomy in *Lachnaea*. Transverse sections of amphistomatic, isobilateral leaves, adaxial face above. A. *L. densiflora*, *Beyers 145*, leaf lamina, note partly gelatinized epidermis with gelatinized (mucilaginous) inner tangential cell walls (m), sunken stomata (arrowed), mid- and lateral vascular bundles with prominent caps of extraxylary fibres. B & C. Transections through central portion of leaf: B. *L. filamentosa*, *Beyers 110*, note chlorenchyma consisting of palisade-like cells admixed with rounded cells, complete, uniseriate, parenchymatous bundle sheath and diosmin crystals (arrowed); C. *L. pomposa*, *Beyers 122*, note wholly gelatinized epidermis and the diosmin crystals (arrowed).

TABLE 4.7—Cuticular relief paterns and epicuticular wax in *Lachnaea* species with epistomatic leaves observed under SEM. Explanations of abreviations used – epicuticular wax: C, crust; P, platelets; (P), platelets less dense; SL, smooth layer.

Species	Cuticular relief																Epicuticular wax	
	adaxial epidermis							abaxial epidermis										
	± smooth	subpapillate	papillate	striate-papillate	depressed reticulate	depressed reticulate-subpapillate	basket woven	papillate	subpapillate	striate-papillate	undulate	reticulate	reticulate-subpapillate	striate	depressed reticulate	depressed reticulate-subpapillate	adaxial	abaxial
alpina					X		X								X		C	C
aurea			X									X					P	(P)
axillaris			X													X	P	SL+(P)
burchellii			X			X										X	P	SL+(P)
diosmoides			X									X					P	(P)
elsieae	X															X	C	SL+(P)
ericoides			X										X				P	SL
eriocephala			X							X			X				P	SL
filicaulis	X													X			P	SL+(P)
funicaulis	X												X				P	SL+(P)
globulifera subsp. globulifera			X											X			P	SL+(P)
globulifera subsp. incana			X										X				P	SL+(P)
glomerata			X								X		X				P	SL+(P)
gracilis			X		X										X	X	P	SL+(P) or P
grandiflora			X						X					X			P	SL
greytonensis			X							X							P	SL+(P)

TABLE 4.7—*continued.*

Species	Cuticular relief																Epicuticular wax	
	adaxial epidermis							abaxial epidermis										
	± smooth	subpapillate	papillate	striate-papillate	depressed reticulate	depressed reticulate-subpapillate	basket woven	papillate	subpapillate	striate-papillate	undulate	reticulate	reticulate-subpapillate	striate	depressed reticulate	depressed reticulate-subpapillate	adaxial	abaxial
laniflora		X	X										X	X			SL or P	SL or SL+(P)
laxa			X										X				P	SL
leipoldtii				X				X									SL	SL
macrantha			X													X	P	P
marlothii					X				X								P	SL+(P)
montana			X													X	P	SL+(P)
naviculifolia			X						X								P	SL or P
nervosa			X									X	X				P	SL+(P)
oliverorum			X		X								X			X	P	SL+(P)
pedicellata			X													X	P	SL+(P)
pendula					X				X						X		C	SL+(P)
penicillata					X											X	SL	SL+(P)
pudens			X						X								P	SL+(P)
pusilla			X			X										X	P	SL+(P) or (P)
rupestris			X						X								P	SL+(P)
ruscifolia			X			X			X	X							P	SL+(P) or SL
sociorum			X	X				X		X							P	SL+(P)
stokoei						X							X				P	SL
striata					X						X					X	P	SL+(P) or SL
uniflora			X													X	P	SL+(P)
villosa					X											X	SL	SL

TABLE 4.8—Selected leaf epidermal features of *Lachnaea* species with epistomatic leaves. "Outer: inner" refers to the thickness of the outer tangential cell walls with relation to the inner tangential cell walls of both epidermides.

Species	Stomata		Epidermis			Adaxial epidermis			Abaxial epidermis			Tangential cell walls		Inner tangential walls gelatinized					
			cell size			cell shape			cell shape			outer: inner		adaxial			abaxial		
	sunken	level	abaxial = adaxial	abaxial < adaxial	abaxial 2x > adaxial	square	pericinally elongated	radially elongated	square	pericinally elongated	radially elongated	ad- & abaxial epid.: X >2x thicker, [X] slightly thicker, 0 even thickness	only outer wall of adax. epid. thicker	wholly	partly	weakly	wholly	partly	weakly
alpina	X		X			X	X		X	X		X			X		X		
aurea	X		X			X	X		X	X		X				X	X		
axillaris	X				X	X			X		X	[X]				X		X	
burchellii	X			X		X	X		X			0				X		X	X
densiflora	X		X			X	X		X	X		[X]			X			X	
diosmoides	X			X			X		X	X		[X]			X			X	
elsieae	X				X		X				X		X		X	X	X		
ericoides	X				X	X	X		X		X	[X]				X		X	
eriocephala	X				X		X		X	X		X			X	X	X		
filicaulis	X		X			X	X		X		X	0			X		X		
funicaulis	X				X		X				X		X				X		
globulifera subsp. globulifera	X				X	X	X		X		X	X				X	X		
globulifera subsp. incana	X				X	X	X		X		X	X				X	X		
glomerata	X				X	X	X		X		X		X			X	X	X	
gracilis	X				X	X	X		X		X	X				X	X		
grandiflora	X				X	X					X	0				0/X		0/X	
greytonensis	X				X		X		X		X		X		X		X		

TABLE 4.8—*continued.*

Species	Stomata		Epidermis			Adaxial epidermis			Abaxial epidermis			Tangential cell walls		Inner tangential walls gelatinized					
			cell size			cell shape			cell shape			outer: inner		adaxial			abaxial		
	sunken	level	abaxial = adaxial	abaxial < adaxial	abaxial 2x > adaxial	square	pericinally elongated	radially elongated	square	pericinally elongated	radially elongated	ad- & abaxial epid.: X >2x thicker, [X] slightly thicker, 0 even thickness	only outer wall of adax. epid. thicker	wholly	partly	weakly	wholly	partly	weakly
laniflora	X				X	X	X	X			X	[X]	X			0/X	X	X	X
laxa	X			X			X			X		0			X		X		
leipoldtii		X			X		X				X	0				X		X	
macrantha	X			X		X	X		X	X		0				X			X
marlothii	X				X	X	X				X	0			X		X		
montana	X				X	X	X		X	X		[X]			X		X		
naviculifolia	X				X	X		X			X	0			X			X	
nervosa	X				X	X	X		X	X		0			X		X	X	
oliverorum	X				X	X	X		X		X		X		X		X		
pedicellata	X				X	X	X		X		X	[X]		X		X		X	X
pendula	X				X		X				X	X			X	X	X		
penicillata		X			X		X				X	0					X		
pudens		X			X	X	X		X	X		[X]			X		X		
pusilla	X		X				X			X		0				X	X		
rupestris	X				X	X	X				X	[X]				X	X		
ruscifolia	X		X			X	X		X	X		0			X			X	
sociorum	X				X		X		X		X		X			X		X	
stokoei	X				X		X		X	X		[X]		X			X		
striata	X		X	X		X	X		X	X		0			X	X		X	X
uniflora	X			X			X			X		[X]				X	X		
villosa		X			X		X		X		X	0					X		

TABLE 4.9—Selected histological features of leaf transections of *Lachnaea* species with epistomatic leaves. Explanation of abreviations and symbols used – mid-vascular bundle: M = large; m = small; lateral vascular bundle: B = the same size as the mid-bundle; b= smaller than mid bundle; b* = very small bundle; the number refers to the number of lateral bundles on either side of the mid-bundle; extraxyllary fibres capping mid-vascular bundle: MX = very well developed; mx = less well developed.

Species	Structure	Mesophyll		Vascular bundles			Extraxyllary fibres			Bundle sheath		Crystals							Tanniniferous deposits			
				mid	lateral							druse	diosmin									
	dorsiventral	palisade layers	spongy chlorenchyma	size	number & size	intermediate	mid bundle cap	lateral bundle cap prominent	fibre strands along lateral margin	complete	incomplete	mesophyll	adaxial epidermis	abaxial epidermis	mesophyll	vascular bundle	bundle sheath	extraxylary fibre cap	adaxial epidermis	abaxial epidermis	mesophyll	bundle sheath
alpina	X	1–2	X	M	2–3 b		mx			X			X	X	X	X	X					
aurea	X	1	X	M	1 B	X	MX	X	X		X	X										
axillaris	X	2	X	M	1 b	X	MX	X		X	X				X				X	X		
burchellii	X	1	X	M	2 b	X	MX	X			X											
diosmoides	X	1	X	M	1 b	X	MX	X			X	X							X	X		
elsieae	X	1	X	M	2b*		MX			X		X								X		
ericoides	X	1	X	M	1 b	X	MX				X		X				X		X	X		
eriocephala	X	1	X	M	3–4 b*		MX			X		X								X		
filicaulis	X	1	X	M	1 b	X	MX	X			X	X							X	X		
funicaulis	X	1	X	M	2–3b*		MX			X										X		
globulifera subsp. globulifera	X	1	X	M	2–3b*		MX			X		X								X		
globulifera subsp. incana	X	2	X	M	3–4 b*		MX			X		X							X	X		
glomerata	X	1	X	M	1–2 b	X	MX	X			X	X							X	X		
gracilis	X	1–2	X	M	1–2b	X	MX	X			X	X	X	X	X	X						
grandiflora	X	1	X	M	2–3 b	X/0	MX	X		X	X	X	X		X	X		X	X	X/0	X	
greytonensis	X	1	X	M	2 b*		MX			X									X	X		
laniflora	X	1–2	X	M	2 b*		MX			X		X							X	X		X
laxa	X	1	X	M	3–4 b	X	MX	X			X	X										

TABLE 4.9—*continued.*

Species	Structure	Mesophyll		Vascular bundles			Extraxyllary fibres			Bundle sheath		Crystals							Tanniniferous deposits			
				mid	lateral							druse	diosmin									
	dorsiventral	palisade layers	spongy chlorenchyma	size	number & size	intermediate	mid bundle cap	lateral bundle cap prominent	fibre strands along lateral margin	complete	incomplete	mesophyll	adaxial epidermis	abaxial epidermis	mesophyll	vascular bundle	bundle sheath	extraxylary fibre cap	adaxial epidermis	abaxial epidermis	mesophyll	bundle sheath
leipoldtii	X	1	X	M	2b*		MX				X	X								X		
macrantha	X	1	X	m	3 B	X	mx			X		X										
marlothii	X	1	X	M	2b*		MX				X	X								X		
montana	X	2	X	M	3 b*		MX			X		X							X	X		
naviculifolia	X	2	X	M	2–4 b*		MX			X		X	X						X	X		
nervosa	X	1–2	X	M	2–3 b	X	MX	X			X	X	X		X				X/0	X/0		
oliverorum	X	2	X	M	2–3b*		MX			X		X								X/0		X
pedicellata	X	1	X	M	3 b*		MX			X									X	X		
pendula	X	1	X	M	2b*		MX			X										X		
penicillata	X	1	X	M	2 b*		MX				X									X		X
pudens	X	1	X	M	2–3 b*		MX				X		X	X	X							
pusilla	X	1	X	M	3b*		MX				X											
rupestris	X	1	X	M	2b*		MX			X		X							X	X		X
ruscifolia	X	1	X	m	4–5 B	X	MX	X			X		X	X	X							
sociorum	X	1–2	X	M	2 b	X	MX	X			X		X		X				X	X		
stokoei	X	1	X	M	2 b		MX	X			X	X	X		X				X	X		
striata	X	1	X	M	2b	X	MX	X	X		X	X										
uniflora	X	1	X	M	2–3 b	X	MX	X			X	X										
villosa	X	2	X	M	2–4 b*		MX			X		X								X		X

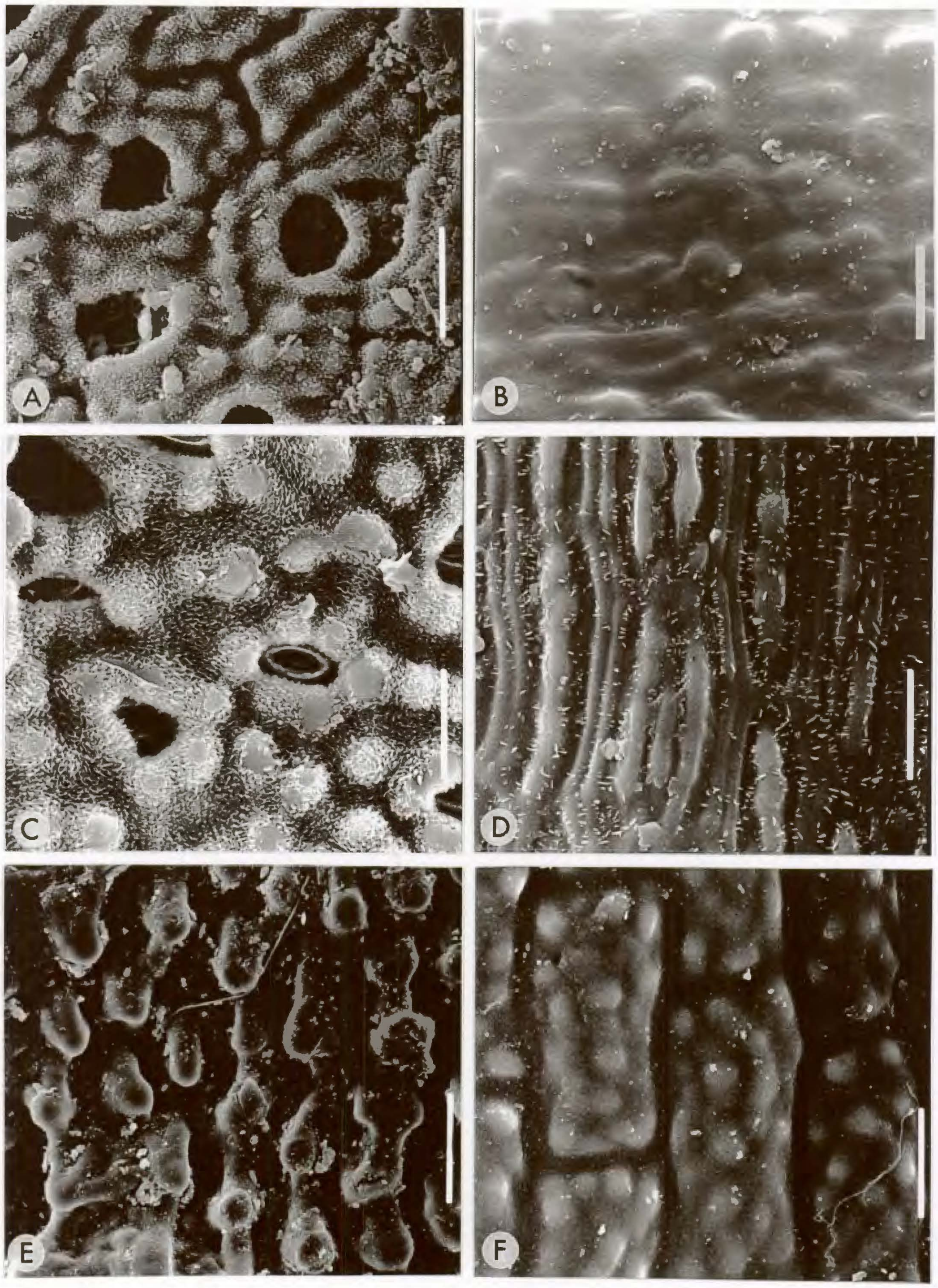

FIGURE 4.4—SEM micrographs of the cuticular relief in leaves of *Lachnaea* species. A. *L. burchellii* (*Oliver 9251*), adaxial surface, depressed reticulate-subpapillate; B. *L. grandiflora* (*Beyers 129*), abaxial surface, subpapillate; C. *L. naviculifolia* (*Beyers 114*), adaxial surface, papillate; D. *L. nervosa* (*Oliver 9259*), abaxial surface, reticulate-subpapillate; E., *L. sociorum* (*Beyers 176*), abaxial surface, striate-papillate; F. *L. striata* (*Esterhuysen 26861*), abaxial surface, depressed reticulate-subpapillate. Scale bars: A–D, F, 37 µm; E, 92 µm.

the form of platelets [P] but occasionally they are in the form of a crust [C] or smooth layer [SL]. On the abaxial surface they appear mostly as a smooth layer with sparse platelets dispersed over the smooth layer [SL+(P)], occasionally in the form of a crust, a smooth layer or as platelets, but then the platelets are usually less dense than those found adaxially [(P)] (Figure 4.2). Trichomes when present, are non-glandular and uniseriate. Epidermis is uniseriate. Adaxial epidermal cells are usually much smaller than the abaxial ones (Figure 4.5), but in a few species they are only slightly smaller or more or less the same size as abaxial ones. Epidermal cells are either square or periclinally or radially elongated. Before gelatinization of the epidermal walls the outer tangential cell walls of both epidermides are either thicker than the inner tangential cell walls, of even thickness, or in a few species, as in *L. glomerata* (Figure 4.6 A), the outer tangential cell walls of the adaxial epidemis are thicker than the inner walls of the adaxial epidermis and the tangential walls of the abaxial epidermis. Inner tangential cell walls of the adaxial epidermis are either partly to weakly gelatinized or occasionally wholly gelatinized. Inner tangential walls of abaxial epidermis are usually wholly to partly gelatinized and only occasionally weakly gelatinized. Stomata are anomocytic and usually sunken but in three species they occur on the same level as the adjacent epidermal cells.

Mesophyll is differentiated, palisade occurring abaxially and spongy parenchyma adaxially. Palisade is 1 or 2-seriate. Spongy parenchyma consists of palisade-like cells usually loosely arranged, often with large intercellular spaces.

Vascular bundles are collateral. In some species a large mid-bundle is flanked by one or two, occasionally three or four lateral bundles on either side with very small intermediate bundles occurring between these two types. Each bundle is capped abaxially by large extraxylary fibres, which are particularly well developed in the mid- and lateral bundles as in *L. glomerata* (Figure 4.6 A). In *L. ruscifolia* (Figure 4.6 C) and *L. striata* the extraxylary fibre strands of the mid- and larger lateral bundles extend to the abaxial epidermis. The uniseriate, parenchymatous bundle sheath is either complete or due to the interruption by the extraxylary fibre cap, incomplete. In *L. grandiflora* and *L. ericoides* both states occur. In other species, however, the large mid-bundle is flanked on either side by two to four small to very small lateral bundles without intermediate bundles as in *L. laniflora* (Figure 4.5 A), *L. naviculifolia* (Figure 4.5 B) and *L. pudens* (Appendix 5, Figure

2 A). Here only the mid-bundle has abaxially a particularly well-developed extraxylary fibre cap and the uniseriate, parenchymatous bundle sheath is either complete or incomplete. In *L. leipoldtii* the extraxylary fibre cap is exceptionally well developed and extends to the abaxial epidermis. Extraxylary fibres not associated with the vascular bundles, occur along the lateral margins immediately below the epidermis in *L. aurea* (Appendix 4, Figure 8 F) and *L. striata*. In *L. macrantha,* however, the mid vascular bundle is flanked on either side by three lateral bundles, more or less the same size as the mid bundle, with small intermediate bundles occuring between these two types. Here the extraxylary fibre caps are not well developed abaxially and the uniseriate, parenchymatous bundle sheath is complete.

Crystals of diosmin occurring as sphaerocrystalline to somewhat dendritic masses, pale yellow in colour, may be present either in the epidermis, mesophyll, vascular tissue, extraxylary fibres or in the bundle sheath, or occurring simultaneously in a combination of these tissues (Figure 4.6 B & C; Appendix 6, Figure 9 B). Druse crystals of presumably calcium oxalate (Figures 4.5 A & 4.6 B) are present in most species and may also occur in the mesophyll together with diosmin crystals as in *L. nervosa* (Figure 4.6 B) and *L. ruscifolia*. Visibly stained tanniniferous deposits are usually present except in *L. alpina*, *L. macrantha* and *L. pudens*, and may be absent in *L. nervosa*. These deposits are usually found in the epidermis but in *L. laniflora* (Figure 4.5 A), *L. penicillata* and *L. villosa* they also occur in the parenchymatous bundle sheath. Crystals and tanniniferous deposits are mutually exclusive and have never been observed in the same cell.

Discussion

Anatomical adaptations in the leaves of *Lachnaea* probably enable the plants to withstand the long dry summers of the mediterranean or semi-mediterranean climate of the Cape Floristic Region with a rainfall of 200–3000 mm per annum. Patterns in *Lachnaea* correlate with many of those found in selected fynbos species by Van der Merwe *et al.* (1994). Presence of a relatively thick cuticle and epicuticular waxes, and in some species, as in *L. alpina*, the thick periclinal walls of the epidermal cells, are characteristic of xeromorphic adaptations. A thick cuticle, together with waxes, probably prevents cuticular transpiration and reflects excessive sunlight (Van der Merwe *et al.* 1994). The gelatinized inner periclinal walls of the epidermis with large mucilage content have, according to

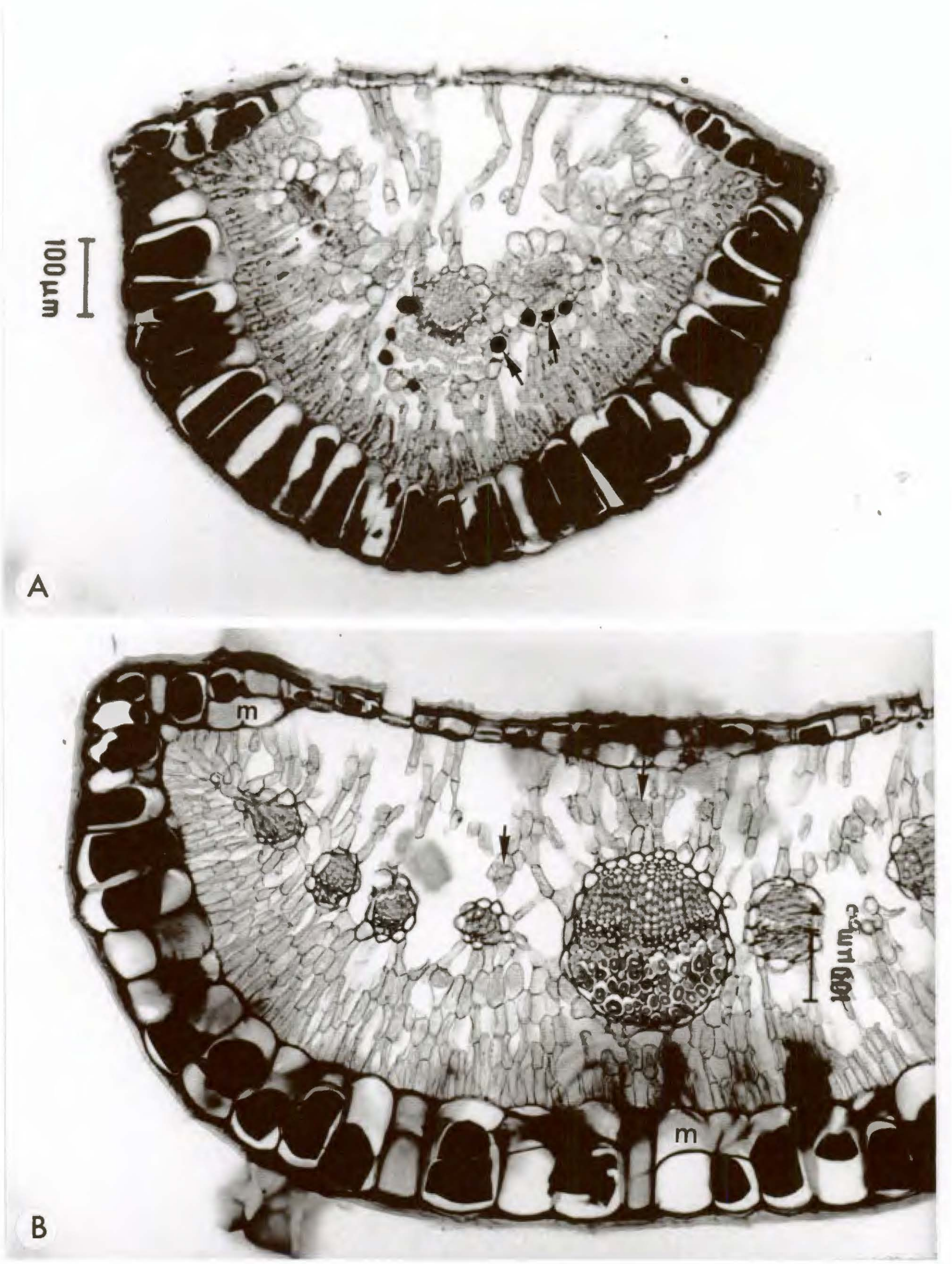

FIGURE 4.5—Leaf anatomy in *Lachnaea*. Transverse sections of epistomatic, dorsiventral leaves, adaxial face above. A, *L. laniflora* (*Forsyth 507*), leaf lamina, note tanniniferous epidermal cells (particularly abaxial) and tanniniferous bundle sheath cells (arrowed). B, *L. naviculifolia* (*Beyers 114*), portion of lamina showing mid and lateral vascular bundles, note gelatinized epidermis (m), tanniniferous epidermal cells, mid-vascular bundle with prominent cap of extraxylary fibres, complete bundle sheath, small lateral vascular bundles with poorly developed extraxylary fibre caps and druse crystals (arrowed) in mesophyll.

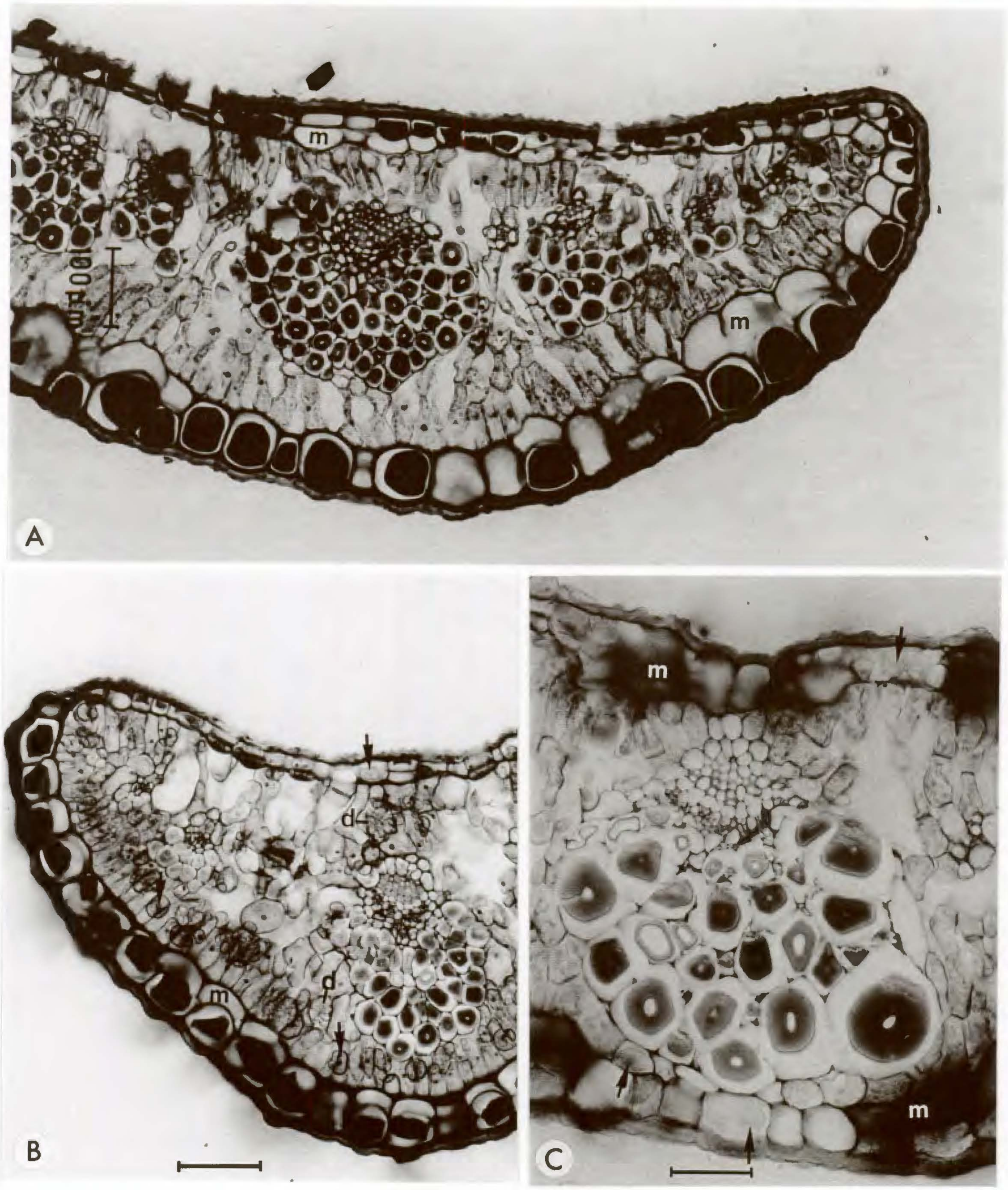

FIGURE 4.6— Leaf anatomy in *Lachnaea*. Transverse sections of epistomatic, dorsiventral leaves, adaxial face above. A & B, portion of lamina showing mid and lateral vascular bundles: A, *L. glomerata* (*Beyers 192*), note thick outer wall of adaxial epidermis, gelatinized epidermis (m), tanniniferous epidermal cells, vascular bundles with prominent caps of extraxylary fibres; B, *L. nervosa* (*Beyers 215*), note diosmin crystals (arrowed) in adaxial epidermis and mesophyll and druse crystals (d) in mesophyll. C. *L. ruscifolia*, (*Vlok 2084*), transverse section through mid-vascular bundle; note prominent cap of extraxylary fibres extending to the abaxial epidermis, masses of diosmin crystals (arrowed) in ad- and abaxial epidermis and mesophyll. Scale bars: B, 100 µm; C, 50 µm.

Bredenkamp & Van Wyk (1999), been erroneously interpreted as a mutiseriate epidermis in *Geissoloma* by Carlquist (1990) and in *Struthiola leptantha* Bolus among other fynbos species by Van der Merwe *et al.* (1994). Beyers & Van der Walt (1995) also regarded the epidermis with mucilaginous inner walls as a multiseriate epidermis in *Lachnaea*. The mucilaginous inner walls probably represent a waterstoring mechanism by undertaking the function, which in the typical epidermis is assigned to the cell sap (Haberlandt 1914). The mucilage may be involved in the water economy of the leaves of xerophytic plants (Lyshede 1977; Fahn 1990) and may also act as a light density filter protecting the palisade tissue from excessive radiation (Bredenkamp & Van Wyk 1999). The stomata are in all but four species sunken. In *L. leipoldtii*, *L. penicillate* and *L. villosa*, three of the four species with stomata on the same level as the adjacent epidermal cells, the leaves are adpressed, the branches are tomentose or felted and the leaf margins are densely ciliate. In these taxa the hairs probably decrease air movement over the adaxial epidermis. According to Metcalfe & Chalk (1983) a dense covering of hairs is usually associated with a thin cuticle and raised rather than sunken stomata, which is an example of an ‘anatomical compensation’. In *L. pudens*, the other species with stomata on the same level as the adjacent epidermal cells, the branches are tomentose but the leaves are imbricate, ascending and incurved. The thick adaxial cuticle surrounding the stomata, however, may compensate for the absence of hairs.

An increase of palisade parenchyma at the expense of the development of spongy parenchyma is apparent in *Lachnaea*. Additional palisade is also provided when the leaves become isobilateral. Furthermore, as in the leaves of some xerophytes the structure of the mesophyll is reversed with the palisade restricted to the abaxial side in dorsivental leaves (Metcalfe & Chalk 1983). Gibson (1998) found that the standard leaf of nonsucculent desert plants is amphistomatic and the mesophyll is isolateral, with chloroplast-rich palisade cells and little to no spongy mesophyll in the centre. Leaves with such high surface density of palisade cells experience a higher rate of photosynthesis (Gibson 1998).

The prominent extraxylary fibre strands capping the vascular bundles are thought to play a role in protecting the tissues against mechanical injury on desiccation (Esau 1965; Van der Merwe *et al.* 1994). Strands of schlerenchymatic fibres running parallel to the leaf margins in the mesophyll in *L. aurea* and *L. striata* were reported by Van der Merwe *et al.*

(1994) in *Cliffortia ruscifolia* L., *Passerina glomerata* Thunb., *P. vulgaris* Thoday and *Struthiola leptantha*. These fibre strands seem to offer mechanical support to the leaf margins and protection against tearing (Van der Merwe *et al.* 1994).

Phenolic deposits are present at least in the epidermis of most *Lachnaea* species, but are also present occasionally in the mesophyll and in the bundle sheath cells. According to Jordaan & Theunissen (1992) the concentration of tanniniferous substances increases when drought conditions intensify. They are of the opinion that these deposits may be part of an anti-herbivory defense mechanism or that an increase in phenolic substances may also be the result of a disrupted metabolism caused by high radiation levels of arid regions.

Two of the four leaf types proposed by Van der Merwe *et al.* (1994), namely the *Myrsine* and *Metalasia* types, can partially be ascribed to *Lachnaea*. The *Myrsine* type, when dorsiventral, differs from the epistomatic, dorsiventral group of *Lachnaea* by having stomata abaxially and the palisade adaxially. Within *Lachnaea* there is a gradual change from leaves being more or less flattened on both sides to those which are deeply concave adaxially and convex abaxially as well as a reduction in leaf width. Leaves in *L. ericoides* approach the *Metalasia* leaf type, but the adaxial groove is rather wide without unicellular hairs confined to the groove. The leaves of some *Lachnaea* species have in the past been referred to as ericoid (Dyer 1975), but if one connotes recurved margins forming one or two pockets on the lower side of the leaf to the term ‘ericoid’, leaves of *Lachnaea* cannot be considered ericoid.

In *Lachnaea* when the foliage leaves are epistomatic, the leaves are usually either adpressed, ascending or inclined, only occasionally patent or reclined. The divergence from the axis is therefore usually not greater than 75°. The abaxial leaf surface is thus exposed, whereas the adaxial leaf surface is more protected. Additionally the leaves are usually adaxially concave and abaxially convex.

One of the most fundamental of biological problems is the relative influences of heredity and environment on the life forms and structure displayed by the various taxa. Hence anatomical characters as indicators of taxonomic affinity should not be studied in isolation (Metcalfe & Chalk 1983). Although acknowledging the fact that leaves respond to ecological factors, the taxonomic value of certain anatomical characters have been found to be very useful within *Lachnaea*, especially presence of stomata on both surfaces or only adaxially, as well as the position in relation to the adjacent epidermal cells. In *Lachnaea* amphistomatic leaves are found in four species sharing the same inflorescence structure. Two other species, *L. alpina* and *L. macrantha*, both with the same inflorescence structure as the other four species, have epistomatic leaves. Leaves of *L. macrantha* have been included in the epistomatic, dorsiventral group, but can be regarded as a transitional type between the two types described above. Stomata are only adaxial, the adaxial epidermal cells are slightly smaller than those abaxially, and the palisade-like spongy tissue adaxially is similar to the palisade abaxially, differing only in having larger intercellular spaces below the stomata. No phenolic deposits were found in the species with a capitate inflorescence. If the presence of these deposits were entirely influenced by the environmental conditions, why should they be absent in these species? For example in *L. filamentosa*, which belongs to the group having capitate inflorescences, no phenolic deposits are present in the leaves, whereas in *L. naviculifolia*, with a bracteate umbel, and epistomatic, dorsiventral leaves, phenolic deposits are present in the leaves. Both these species occur together in the same habitat only a few meters apart.

Differences in cuticular pattern have been regarded useful at generic or specific level (Cutter 1978; Haron & Moore 1996). Haron & Moore (1996), however, emphasise that leaf surface features alone are not sufficient for the delimitation of various infrageneric groups and like all other taxonomic evidence, leaf micromorphological characters must be interpreted with great circumspection.

In *Lachnaea* cuticular relief patterns vary interspecifically and often infraspecifically, for example in *L. nervosa* and *L. gracilis*. It was also not always easy to assign a particular descriptive term to a pattern as there was also to some extent a continuum of variation. Wax deposits, when crusted could also possibly hide the substructure. According to Cutter (1978) wax patterns vary in different species, and to some extent within a single species under different conditions. Thus, conditions under which plants are grown, including altitude, may affect the form of the wax (Cutter 1978). Cuticular relief in *Lachnaea* is not taxonomically useful on the specific level.

Presence of prominent extraxylary fibre caps associated with the mid and lateral bundles as in *L. ruscifolia* and *L. striata* is expressed externally by the ribbed leaves, and is a useful taxonomic character. Schlerenchymatic fibres running parallel to the leaf margins in the mesophyll in *L. aurea* and *L. striata* are diagnostic for these two species.

Mucilaginous epidermal cell walls cannot be used as a taxonomic character at the species level as it is present to varying degrees in all members of the genus. At the family level, however, it has taxonomic relevance as the mucilaginous epidermal cell walls are regarded as a common feature in the Thymelaeaceae (Solereder 1908; Metcalfe &Chalk 1979).

As calcium oxalate crystals are among the most widespread ergastic substances in angiosperms (Metcalfe & Chalk 1983), their taxonomic value on the generic or specific level in the Thymelaeaceae is not really useful. Diosmin crystals have been recorded in certain Lamiaceae and Rutaceae (Metcalfe & Chalk 1983). These crystals occur in eleven *Lachnaea* species and may have taxonomic relevance within the family. Unfortunately no reference has been found to the presence of these crystals in other genera of the Thymelaeaceae.

4.4 INFLORESCENCE MORPHOLOGY

Meisner (1840) established three sections, *Sphaeroclinium*, *Conoclinium* and *Microclinium*, within *Lachnaea*, based on the inflorescence morphology. In a subsequent publication (Meisner 1857) he followed the same classification. He regarded the inflorescences to be a terminal, many-flowered capitulum, which was either involucrate or evolucrate (section *Sphaeroclinium*), a terminal or subterminal, few- to many-flowered, evolucrate capitulum (section *Conoclinium*), or a terminal, subcapitate or subsolitary inflorescence with sessile flowers (section *Microclinium*), or an axillary, one-flowered inflorescence (section *Microclinium*). In *Cryptadenia* Meisner (1840) regarded the flowers to be terminal, solitary or geminate, or occasionally as axillary and solitary, but in his publication of 1857 he regarded them to be terminal and subsolitary.

Gilg (1894) regarded the inflorescences of *Lachnaea* as usually terminal, many-flowered heads, but occasionally, when consisting of two flowers, as mostly axillary. He regarded the flowers in *Cryptadenia* to be solitary, axillary with two bracteoles.

Domke (1934) regarded the inflorescences to be usually terminal, involucrate capitula or congested capitula without an involucre. In his generic description no mention was made of the solitary-flowered inflorescences. In *Cryptadenia* he regarded the flowers as solitary or few, either terminal or axillary with two bracteoles.

According to Dyer (1975) the inflorescences in *Lachnaea* are either terminal, bracteate or ebracteate heads or a congested spike, or rarely one-flowered, whereas in *Cryptadenia* the flowers are axillary and solitary.

Weberling & Herkommer (1989) considered the inflorescences of *Lachnaea* as being capitate or spicate, or having solitary, axillary flowers borne on a proliferating spike. In *Cryptadenia* they considered the flowers as being solitary and terminal. They regarded the terminal single-flowered inflorescence found in *Cryptadenia* as a monotelic inflorescence and the ramification type of the polytelic synflorescences in the Thymelaeaceae to be thyrsic. These synflorescences have according to them, been reduced to racemes, spikes or umbels within certain genera, and in some taxa, as in *Lachnaea*, the umbel-like aggregation of flowers is combined with the formation of an involucrum.

Beyers & Van der Walt (1994; Appendix 3) investigated the inflorescence morphology of 14 *Lachnaea* species and four *Cryptadenia* species. They concluded that the flowers in *Lachnaea* are arranged in terminal, indeterminate, capitate or umbellate inflorescences, or that they are solitary and terminal. The capitula are multi-flowered and ebracteate, borne singly at the end of branches on sericeous peduncles. The indeterminate umbels are sessile and either ebracteate as in *L. burchellii*, *L ericoides* and *L. nervosa* and bracteate as in *L. eriocephala*. In both *L. axillaris* and *L. ruscifolia* they found the solitary flowers to be terminal contrary to the opinion of previous authors. Beyers & Van der Walt (1994) considered the flowers in *Cryptadenia* to be solitary and terminal.

Observations

The inflorescence morphology as interpreted by Beyers & Van der Walt (1994) is followed here although some aspects need commentary. Inflorescence characters are summarized in Table 4.10. The diameter of the inflorescences is measured from the extremities of the outermost flowers. In the capitulum and umbel flower development is sequential. The fruiting stage may be present while buds are still developing within. The number of flowers in an inflorescence is therefore not easily determined. Once all the flowers are shed, the floral scars remaining on the floral axis of the capitate inflorescences or the pedicels in the umbellate inflorescences, which remain for some time, are counted; in this way a more accurate count could be achieved. For comparative purposes however, the highest number of mature flowers, at a given time is rather given here.

Both indeterminate and determinate inflorescences occur in *Lachnaea*.

Indeterminate inflorescences

Within the indeterminate inflorescences the capitulum and umbel are represented.

CAPITULUM (Figure 4.7 E & F)

Six species have terminal, multi-flowered, ebracteate capitula. The diameter of the inflorescences varies from 5–100 mm. These capitula are borne singly at the end of the branches on peduncles, which vary in length from 1–20 mm long. The indumentum of the peduncles varies from being densely hairy to being puberulent only near the apex. The sessile flowers are arranged on a moderately thick convex floral axis, which elongates during the flowering period. In *L. filamentosa* more than a hundred mature flowers may be present, whereas in *L. capitata* not more than eight have been seen (Table 4.11).

UMBEL

Although Beyers & Van der Walt (1994) distinguish between the ebracteate and bracteate umbel, a further intermediate type is here proposed. Thus three groups are recognized, namely the (a) ebracteate, (b) pseudobracteate and (c) bracteate umbels.

(a) *Ebracteate umbel* (Figure 4.7 B–D)

Eight species have ebracteate umbels which vary between 3–20 mm in diameter having up to 3–20 mature flowers at a given time. These umbels are subtended by foliage leaves which do not usually differ from the leaves on the rest of the branches. In *L. nervosa*

TABLE 4.10—Inflorescence characters of *Lachnaea*. * = occasional occurrence.

Species	Determinate inflorescences with solitary flower	Indeterminate inflorescences							
		Capitulum	Umbellate						
			Ebracteate	Pseudobracteate	Bracteate	Diameter (mm)	Number of mature flowers at any one time	Number of involucral bracts	Number of bract-like leaves
axillaris	X								
filicaulis	X								
gracilis	X								
grandiflora	X								
laxa	X								
leipoldtii	X								
pudens	X								
pusilla	X								
ruscifolia	X								
uniflora	X								
alpina		X				15–25	up to 40		
capitata		X				5–16	up to 8		
densiflora		X				8–16	up to 22		
filamentosa		X				30–100	>100		
macrantha		X				35–60	> 50		
pomposa		X				25–55	> 50		
diosmoides			X			3–15	up to 20		
ericoides			X			3–8	up to 4		
sociorum			X			8–15	up to 9		
stokoei			X			4–6	up to 3		
striata			X			8–20	up to 12		
burchellii			X			4–10	up to 10		
glomerata			X			5–10	up to 8		
nervosa			X			6–15	up to 5		
elsieae				X		to 2	up to 4		4
eriocephala				X		25–55	up to 30		2–4
greytonensis				X		5–7	up to 5		4
laniflora				X		8–15	up to 14		4
marlothii				X		5–10	up to 4		4
naviculifolia				X		18–35	up to 15		4–6
rupestris				X		5–7	up to 5		4
villosa				X		2–4	up to 3–5*		4
aurea					X	20–55	up to 30	6–8	
funicaulis					X	4–8	up to 6	4	
globulifera					X	5–20–25*	up to 16	2	2
montana					X	10–30	up to 20	2	2
oliverorum					X	8–15	up to 6	4	
pedicellata					X	7–15	up to 8	2	2
pendula					X	3–5	up to 8	4	
penicillata					X	3–4	1	4	

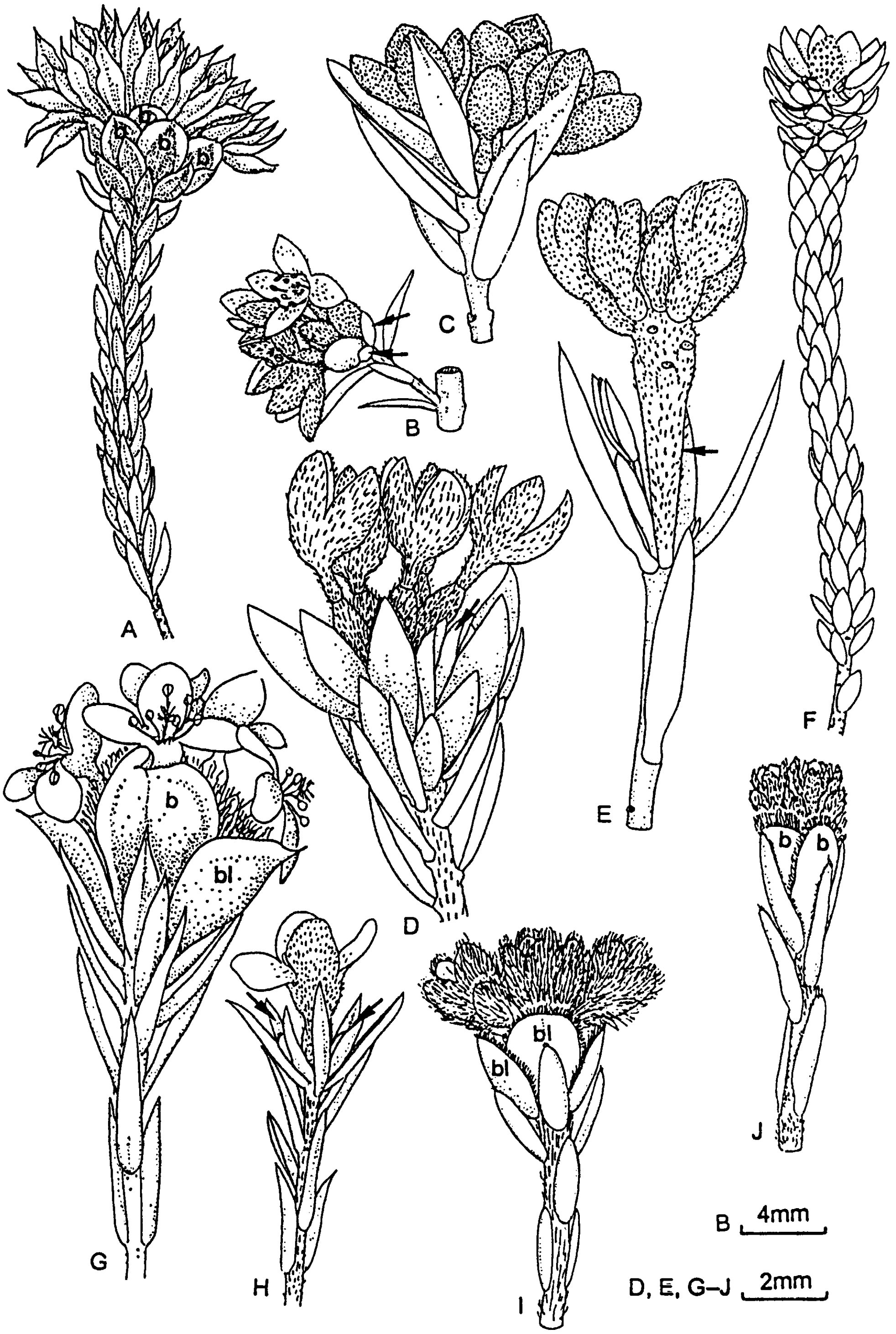

FIGURE 4.7—Inflorescences of *Lachnaea* species. A, G & J, bracteate umbels: A, *L. aurea* (*Oliver 10550*) (life size); G, *L. pedicellata* (*Beyers 260*); J, *L.funicaulis* (*Bolus 5316*); B–D, ebracteate umbel: B, *L. burchellii* (*Oliver 9251*), note bracteose leaves (arrowed) subtending flowers; C, *L. diosmoides* (*Beyers 181*); D, *L. nervosa* (*Oliver 9258*), note sharp differentiation between lower foliage leaves and those subtending inflorescence and lateral shoot (arrowed); E & F, ebracteate capitulum: E, *L. capitata* (*Beyers 138*), note peduncle (arrowed); F, *L. filamentosa* (*Beyers 110*) (life size), note convex floral axis and vegetative bud (arrowed) in axil of distal leaf; H, terminal, one-flowered inflorescence: *L. filicaulis* (*McDonald 1989*), note lateral shoot (arrowed) in axil of distal leaves; I, pseudobracteate umbel: *L. greytonensis* (*Beyers 209*), note superficial similarity of inflorescences between I & J. b = involucral bract; bl = bract-like leaf.

TABLE 4.11—Diagnostic inflorescence characters in *Lachnaea* species with a capitate inflorescence.

Species	Size	Number of mature flowers at any one time	Peduncle		Floral axis		
	diameter (mm)		length (mm)	indumentum	shape	size (mm)	indumentum
alpina	15–25	up to 40	3–20	sericeous-hirsute	subconical	2.0–3.2 × 2.2–3.5	sericeous
capitata	5–16	up to 8	3–6	sericeous	hemispherical to cylindrical-conical	0.9–20.2 × 1.5–6.0	sericeous
densiflora	8–16	up to 22	5–10	sericeous or tomentose-sericeous	hemispherical to conical to widely conical	2–8 × 3.4–7.5	sericeous
filamentosa	30–100	up to >100	1–15	sericeous	narrowly conical to conical	5–25 × 2–11	puberulent
macrantha	35–60	up to >50	2–3	puberulent near apex	oblong conical to ellipsoid	4.0–5.5 × 1.8–2.2	puberulent
pomposa	25–55	up to >50	1–10	sericeous-hirsute	subconical–conical	4–12 × 2.8–6.0	puberulent

(Figure 4.7 D) however, the inflorescences may be subtended by leaves differing from the rest of the leaves. Here a sharp differentiation between the lower foliage leaves and those close to the inflorescene was observed. The distal group of leaves are closely set with the lower leaves being noticeably shorter than the foliage leaves below. These leaves gradually become broader and longer, with the 4–8 distal ones up to three times broader than the foliage leaves lower down on the branches. Differentiation of the distal leaves may also occur in *L. burchellii* (Figure 4.7 B) and *L. conglomerata*. In both species these leaves differ in size and shape from the foliage leaves on the rest of the plant. These are particularly noticeable on the short, lateral flowering branches in the latter two species. Differentiation of the leaves on the main flowering branches may possibly be ascribed to unfavourable ecological conditions which cause the terminal growth to undergo a dormancy period. Under favourable conditions growth is stimulated and a relatively short shoot with a terminal inflorescence develops.

(b) *Pseudobracteate umbel* (Table 4.12; Figure 4.7 J)

Eight species have pseudobracteate umbels. These umbels are capitate-like, 2–55 mm in diameter with up to 3–30 mature flowers at a given time. The distal 2–6 leaves subtending the inflorescence are closely set and partially enclose the inflorescence. They differ in shape, size and often texture and indumentum from the rest of the foliage leaves. These subtending leaves are bract-like and similar to the involucral bracts of the bracteate umbel. Although the inflorescences appear to be similar to the bracteate umbels, they differ from the latter by the development of new vegetative growth in the axils of the bract-like leaves. These bract-like leaves also differ from those found in the ebracteate umbels in *L. nervosa*, *L. burchelli* and *L. glomerata* where the lower leaves of the distal group of leaves are noticeably shorter than the foliage leaves below. In the pseudobracteate umbels there is not a sharp transition between the foliage leaves and those subtending the inflorescence. Here a dormancy period is not inferred.

New growth in the axils of the bract-like leaves is not always easily detected, especially on herbarium sheets, and careful scrutiny is required. The inflorescence of *L. eriocephala*, which in previous publications (Weberling & Herkommer 1989; Beyers & Van der Walt 1994) have been regarded as being involucrate, actually belongs to the pseudobracteate type since vegetative shoots were observed in the axils of the distal 'bracts' [voucher: *Beyers 238* (NBG)].

(c) *Bracteate umbel* (Table 4.13; Figures 4.7 A, G & J)

Eight species have bracteate umbels. These umbels are capitate-like, 3–55 mm in diameter with 1–30 mature flowers at a given time. The flowers are partially enclosed by 2–8 closely set bracts. With the exception of *L. aurea* (Figure 4.7 A), which has 6–8 bracts, the other species in this group appear to have four each. On closer examination it was found that in three species, only the distal pair of bracts were true bracts and that in the axils of the subdistal pair vegetative growth was observed as in *L. pedicellata* (Figure 4.7 G). Thus these bracts are in fact bract-like leaves, similar to those found in the pseudobracteate umbels. The bracts and bract-like leaves differ in shape, size and often texture as well as indumentum from the normal foliage leaves.

Determinate inflorescences (Figure 4.7 H)

In ten species of *Lachnaea* the flowers are solitary and terminal. In some species, for example *L. axillaris* and *L. ruscifolia*, reduced lateral branches each terminated by a solitary flower develop at random on the main flowering branches within the same flowering period. Consequently the main flowering branch may have the appearance of a racemose or spicate inflorescence. In other species the main flowering branches are terminated by the solitary flower and the new proliferating shoots developing in the axils of the distal leaf pair immediately behind the flower may either be terminated by a solitary flower in the same flowering period or only in the following flowering period.

Discussion

Inflorescence morphology is of considerable taxonomic importance within *Lachnaea*. On the grounds of the inflorescence morphology three main groups can be distinguished namely, (1) the determinate, solitary-flowered inflorescence, (2) the indeterminate capitulum and (3) the indeterminate umbel. Within the umbellate inflorescence three groups, namely the ebracteate, the pseudobracteate and bracteate umbels are recognized. In the latter two groups the shape, texture and indumentum of the bracts or bract-like leaves have taxonomic relevance.

Following Weberling & Herkommer (1989) the terminal solitary-flowered inflorescence in *Lachnaea* can be regarded as monotelic, whereas the capitulum and umbel as polytelic. Weberling (1983) postulates that the polytelic type of inflorescence has probably been derived repeatedly from the monotelic type during the evolution of angiosperms by the reduction of the terminal flower and specialization of the paracladia of the monotelic system. Thus the floral axis, instead of terminating in a single flower, terminates in a multi-flowered polytelic inflorescence.

Within the Thymelaeaceae, Weberling & Herkommer (1989) found that *Gonostylus* Teijsm. & Binn. and *Amyxa* van Tiegh. of the Gonostyloideae, which is regarded as a relatively primitive group, have monotelic inflorescences. Similarly within the Thymelaeoideae they also found that certain taxa have monotelic inflorescences. Their conclusion was "regarding the various combinations of the other, more or less primitive characters and the different taxonomical evaluation of these combinations it appears to be impossible to draw any taxonomic conclusions exclusively from the existence of the monotelic inflorescence within these taxa".

TABLE 4.12—Diagnostic characters of the pseudobracteate umbel in *Lachnaea*. * = occasional occurrence.

Species	Diameter (mm)	No. mature flowers	No. bract-like leaves	Shape	Size	Abaxial surface	Margin	Apex
elsieae	1.5–2	up to 4	4	narrowly elliptic to obovate	1.6–4 × 0.9–2	glabrous	membranous to brown scarious, ciliate	subacute to obtuse or emarginate
eriocephala	25–55	up to 30	2–4	elliptic to widely obovate to oblate	5.2–17 × 3.6–14	glabrous or sparsely adpressed hairy	membranous, ciliate	acuminate to mucronate
greytonensis	5–7	up to 5	4	obovate	2.9–4.2 × 1.6–2.3	glabrous	villous-ciliate	acute to obtuse
laniflora	8–15	up to 14	4	elliptic to widely elliptic to obovate	2.9–5.1 × 2.1–3	glabrous	glabrous to ciliolate*	subacute
marlothii	5–10	up to 4	4	elliptic to obovate	2.9–4.1 × 1.2–2.7	glabrous	villous-ciliate	acute to obtuse
naviculifolia	18–35	up to 15	4–6	elliptic to very widely elliptic or obovate to very widely obovate	6–21 × 4–13	glabrous or adpressed hairy at apex	membranous (upper 1/2) ciliolate	cuspidate to mucronate
rupestris	5–7	up to 5	4	elliptic to widely elliptic obovate to widely obovate	3.2–5 × 1.6–2.9	glabrous	ciliate	mucronulate, acute to cuspidate
villosa	2–4	up to 3–5*	4	elliptic to widely elliptic or obovate	2.3–3.2 × 1.1–2.2	glabrous	brown lanate-ciliate	rounded to obtuse

TABLE 4.13. Diagnostic characters of the bracreate umbel in *Lachnaea*. * = occasional occurrence.

Species	Diameter (mm)	No. of mature flowers at any one time	No. of involucral bracts	Shape	Size	Abaxial surface	Margin	Apex	No. of bract-like leaves	Shape	Size	Abaxial surface	Margin	Apex
aurea	20–55	up to 30	6–8	narrowly elliptic to elliptic or obovate	11.5–19 × 4.5–11	glabrous or sericeous in middle	membranous yellow	mucronulate to acuminate						
funicaulis	4–8	up to 6	4	narrowly obovate to obvate	3.5–4.6 × 1.8–2.5	glabrous	tinged brown lanate-ciliate	obtuse truncate to subemarginate						
globulifera	5–15 (25*)	up to 16	2	ovate or widely elliptic to widely obovate	4.5–6.0 (10.0*) × 2.3–4.5 (7.0*)	glabrous	membranous ciliate	acute mucronate acuminate	2	narrowly elliptic to widely elliptic, ovate to obovate	3.5–6.8 (10*) × 1.7–3.5 (6*)	glabrous or adpressed pillose near margin	membranous ciliate	acute to acuminate
montana	10–30	up to 20	2	elliptic to widely ovate or obovate	7.5–12.0 × 4.0–6.0	glabrescent to tomentose	membranous (upper 1/2); yellow	mucronulate or cuspidate	2	elliptic to obovate	6.5–12.0 × 3.5–8.5	glabrescent to tomentose	membranous (upper 1/2); yellow	mucronate to cuspidate
oliverorum	8–15	up to 6	4	ovate to obovate	4.7–7.0 × 2.3–3.7	glabrous	lanate- ciliate	acute to rounded						
pedicellata	7–15	up to 8	2	elliptic to obovate to widely obovate	6.0–7.5 × 3.0–7.0	glabrous	membranous (upper 1/2); yellow	mucronulate or shortly cuspidate	2	obovate to widely obovate	5.5–7.2 × 3.2–5.0	glabrous	membranous (upper 1/2); yellow	apiculate to cuspidate
pendula	3–5	up to 8	4	elliptic to obovate to widely obovate	2.0–2.5 × 1.2–2.2	glabrous	tinged brown, white ciliate	rounded to obtuse						
penicillata	3–4	1	4	narrowly elliptic to obovate	3.0–4.0 × 1.0–2.0	glabrous	scarious brown; upper 1/2 ciliate, lower 1/2 lanate-ciliate	rounded to emarginate						

In postulating the evolutionary development of the multi-flowered inflorescence structure within *Lachnaea* one could argue that two pathways were followed from an hypothetical racemose inflorescence, namely the capitulum with the thickened floral axis and sessile flowers and the umbel, through the shortening of the floral axis. The umbellate inflorescence evolved further from the ebracteate through the pseudobracteate to the bracteate state.

Classen-Bockhoff (1990) found that pseudanthia occur in more than 40 angiosperm families. The cephalium is the type of indeterminate inflorescence from which pseudanthia have most frequently developed (Classen-Bockhoff 1990). Within the Thymelaeaceae she reported hyperfloral pseudanthia in *Pimelea* Banks & Sol. ex Gaertner. Similar pseudanthia occur in many *Lachnaea* species. Here are included those species which have either pseudobracteate or bracteate umbels. One could also interpret the capitate inflorescences in *Lachnaea* as pseudanthia. In *L. macrantha*, with strongly zygomorphic flowers, the inflorescence appears daisy-like. Here the pseudanthia are composed exclusively of flowers.

4.5 FLOWER MORPHOLOGY

Within the Magnoliophyta, flowers have traditionally been regarded as conservative organs and of great taxonomic importance. A literature survey of the Thymelaeaceae reveals the confusion, which exists with regard to the identity of the petaloid structures and the floral tube and whether the ovary of the unilocular Thymelaeoideae is composed of one or two carpels. Naturally the interpretation of the above will have a direct influence on the taxonomic position of the family.

Heads (1990), Heinig (1951), Saunders (1939) and Beyers & Van der Walt (1995) regard the floral tube in Thymelaeaceae as a hypanthium. The hypanthium in the Thymelaeaceae has been interpreted as being appendicular (foliar) by Meisner (1857), Wright (1915), Saunders (1939), Heinig (1951), Peterson (1959), Dyer (1975) and Beyers & Van der Walt (1995), or as being receptacular by Eichler (1878), Baillon (1880), Gilg (1894), Wettstein (1935), Rendle (1938) and Bunninger (1972).

In the different genera of the Thymelaeaceae organs comparable to the scales in *Lachnaea* have been interpreted by various authors as petals which might be reduced or greatly modified in form (Eichler 1878; Gilg 1894; Hutchinson 1959; Domke 1934, Wettstein 1935; Rendle 1938), as aborted stamens (Endlicher 1836–1840), as petaloid glands (Payer 1857 in Heinig 1951), as scales (Meisner 1857; Baillon 1880; Bentham & Hooker 1880; Heads 1990, Beyers & Van der Walt 1995), as mere outgrowths of the perigynum (Velenovsský 1910 in Heinig 1951), as squamellae which should be regarded either as new structures of uncertain origin or modified parts of the androecium (Moore 1919 in Hennig 1951), or as stipules (Heinig 1951). A brief account of these various interpretations by different authors (from their generic descriptions of *Lachnaea* and *Cryptadenia*) is presented in Table 4.14.

TABLE 4.14—Interpretation of the hypanthium, petals, scales and gynoecium within *Lachnaea* by various authors.

Author	Hypanthium (floral tube)	Petals	Scales	Gynoecium
Meisner 1840	appendicular	absent	scales	unilocular
Meisner 1857	appendicular	absent	scales	unilocular
Baillon 1880	receptacular	absent	scales	unilocular
Bentham & Hooker 1880	appendicular	absent	scales	unilocular
Gilg 1894a	receptacular	absent	receptacular effigurations	unilocular
Wright 1915	appendicular	absent	scales	unilocular
Domke 1934	appendicular	present	petaloid scales	unilocular
Saunders 1939	appendicular	absent	not specified	pseudomonomerous
Heinig 1951	appendicular	absent	stipular appendages of the sepals	pseudomonomerous
Dyer 1975	appendicular	absent	scales	unilocular
Beyers & Van der Walt 1995	appendicular	absent	scales	pseudomonomerous

Floral scales inserted on the floral tube also occur in various other families. In the monogeneric Olinaceae, Rao & Dahlgren (1969) concluded that the floral scales inserted above the stamens and alternating with the petals are most probably stipular appendages of the sepals, since there is evidence of rudimentary stipules in the leaves of *Olinia* Thunb. In the Apocynaceae, Periplocaceae and Asclepiadaceae the corolline coronas are homologous with colleters in the axil of vegetative leaves and sepals by reason of positional correspondence and ontogenetic similarity (Kunze 1990).

Earlier classification within the Thymelaeaceae has to a large extent been dependant on the floral morphology. Domke (1934) in his treatment of the family placed great emphasis on the floral morphology.

In the past treatments of *Lachnaea* (Meisner 1940, 1857; Baillon 1880; Gilg 1894; Wright 1915; Domke 1934; Dyer 1975) and *Cryptadenia* (Meisner 1840, 1857; Gilg 1894; Wright 1915; Domke 1934; Dyer 1975) the floral morphology was regarded to be of great taxonomic importance. The position of the scales deep down in the hypanthium was one of the major considerations by Meisner (1840) for establishing the genus *Cryptadenia*. In the generic delimitation of *Lachnaea* and *Cryptadenia* Beyers & Van der Walt (1995) dealt with the floral morphology in detail.

Observations

Flowers in *Lachnaea* are either sessile or pedicellate. A ring of trichomes occurs at the basal articulation of the sessile flowers of the solitary-flowered species. In the pedicellate flowers the pedicels are variable in length, shape and indumentum. They may be terete as in *L. diosmoides* or dorsiventrally flattened as in *L. naviculifolia*. The flowers may be terminally attached to the pedicels or the pedicels may be abaxially elongated beyond the insertion of the flower as in the latter species. In all the species with ebracreate umbels as well as *L. aurea* and *L. laniflora* the pedicels hardly elongate in the fruiting stage, whereas in the other species they may elongate considerably in the fruiting stage and remain within the inflorescence long after the fruits have been shed as in *L. eriocephala*.

Hypanthium

The floral tube is a hypanthium and interpreted as being appendicular in origin (Beyers & Van der Walt 1995). A circumscissile articulation is always present as in several other Thymelaeaceae, e.g. *Drapetes* Banks ex Lamarck (Heads 1990). The position of the articulation expressed as a fraction of the length of the base to the total length varies from one-fifth to four-fifths. The upper portion of the hypanthium abscises soon after seedset.

The length of the hypanthium varies from 1.2–20 mm in length. Within some species the variation in length can be considerable as in *L. eriocephala, L. filamentosa* and *L. grandiflora*.

The portion of the hypanthium above the circumscissile articulation is hereafter referred to as the upper portion of the hypanthium and that below the circumscissile articulation as the basal portion of the hypanthium.

The shape of the upper portion of the hypanthium varies from either being narrowly funnel-shaped to funnel-shaped or cup-shaped narrowing into a tube at base, or widely cup-shaped to cup-shaped with or without a basal invagination, or narrowly obconical to widely obconical with or without a basal invagination (Figure 4.8). The indumentum inside and outside is variable although all the trichomes when present, are acicular.

The shape of the basal portion of the hypanthium varies from narrowly ellipsoid to ellipsoid, narrowly ovoid to broadly ovoid, narrowly obovoid to widely obovoid, oblong or pyriform. The shape may be constant or vary within a species. In *L. gracilis* for example the shape of the basal portion of the hypanthium may vary from narrowly ellipsoid to ellipsoid or narrowly ovoid to ovoid, in *L. naviculifolia* from ellipsoid to obovoid and in *L. grandiflora* from narrowly ellipsoid to ellipsoid or occasionally widely obovoid. The basal portion of the hypanthium is but for five species, glabrous within. On the outside the basal portion can be glabrous or variously pubescent. The trichomes when present are usually acicular but in *L. burchellii*, *L. nervosa*, *L. pusilla* and *L. uniflora* they are either subacute to obtuse, thus differing from the acicular trichomes on the outside of the upper portion of the hypanthium.

Calyx

The calyx consists of four sepals fused to the rim of the hypanthium. The petaloid calyx is white, cream, cream with a pink to mauve or blue tinge, varying shades of pink, blue or mauve, or occasionally yellow or dark red. They vary in shape and size from being almost equal to distinctly unequal, but with a gradual transition from one state to the other. In the distinctly zygomorphic forms the anterior sepal is usually the longest and the posterior one the shortest as in *L. filamentosa*. In *L. macrantha* however, the lateral sepals

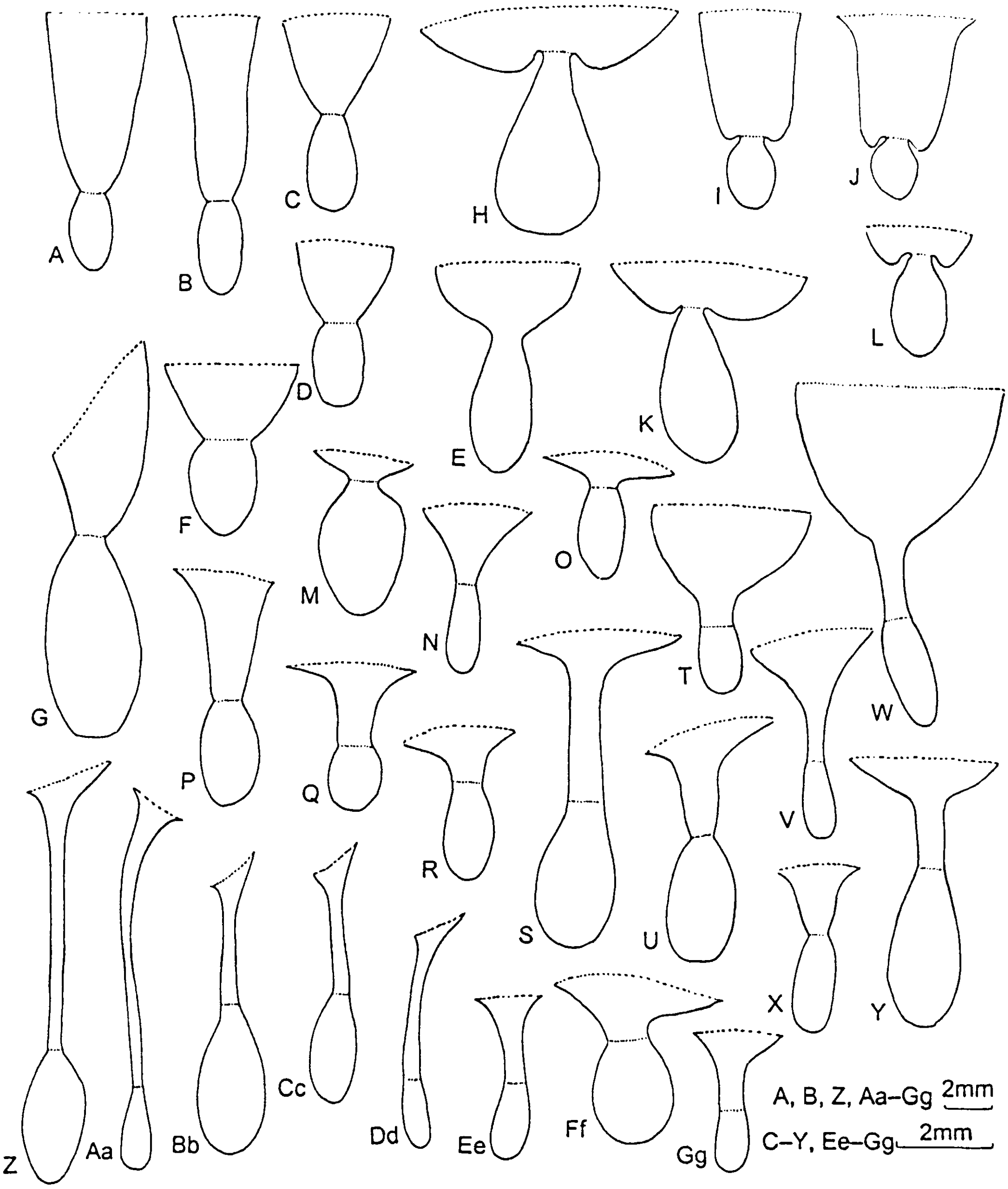

FIGURE 4.8—Diagrams of hypanthia illustrating the position of the circumscissile articulation (….) and the different shapes of the upper portion of the hypanthium in *Lachnaea*. A–L, upper portion not narrowing into a tube at base (not stalked): A, *L. grandiflora*; B, *L. uniflora*; C, *L. stokoei*; D, *L. filicaulis*; E, *L. gracilis*; F, *L. capitata*; G, *L. aurea*; H, *L. pudens*; I, *L. leipoldtii*; J, *L. pusilla*; K, *L. gracilis*; L, *L. axillaris*; I–L, upper portion with basal invagination; M–Gg, upper portion narrowing into a tube at base (stalked) although tube may be very short; M–S, U, V, X ,Y, Ee–Gg, upper portion funnel-shaped: M, *L. densiflora*; N, *L. funicaulis*; O, *L. ericoides*; P, *L. ruscifolia*; Q, *L. diosmoides*; R, *L. striata*; S, *L. alpina*; U, *L. burchellii*; V, *L. villosa*; X, *L. penicillata*; Y, *L. nervosa*; Ee, *L. globulifera*; Ff, *L. glomerata*; Gg, *L. marlothii*; T & W, upper portion cup-shaped narrowing into a tube at base: T, *L. greytonensis*; W, *L. oliverorum*; Z–Dd, upper portion narrowly funnel-shaped: Z, *L. pomposa*; Aa, *L. montana*; Bb, *L. macrantha*; Cc, *L. filamentosa*; Dd, *L. eriocephala*.

and posterior sepal are much reduced with the anterior sepal being three to four times longer than the other three. The shape and size of the sepals vary inter- and infra-specifically. The smallest sepals occur among others in *L. greytonensis* (0.8–1.3 mm long), *L. pendula* (0.9–1.7 mm long) and *L. stokoei* (1.1–1.8 mm long), whereas the largest sepals are the anterior ones in *L. macrantha* and *L. filamentosa*, which may attain a length of 16.3 mm and 30 mm respectively. The abaxial surfaces of the sepals are in all but one species, *L. axillaris*, pubescent. The indumentum is either sericeous, sericeous-tomentose, tomentose or villous-tomentose abaxially. The abaxial surface may be glabrous, glabrescent or variously pubescent, but usually the density of the indumentum is less than that of the abaxial surface. The aestivation of the sepals is decussate imbricate.

Androecium

Eight stamens in two whorls of four are present in all taxa. In some species, as in *L. aurea*, *L. laxa* and *L. villosa*, however, the two whorls are very close to each other, having the appearance of a single whorl. In the outer stamen whorl, the antisepalous stamens are episepalous or inserted on the hypanthium. When episepalous they may be inserted at the base of the sepals, close to the rim of the hypanthium, or up to a third way up the sepals. When inserted on the hypanthium their position may vary from being inserted on the rim to a third way down the upper portion of the hypanthium. The inner stamen whorl, the antipetalous stamens, are inserted on or very close to the rim to two-thirds way down the upper portion of the hypanthium. Filaments of the antisepalous stamens are usually longer than those of the antipetalous ones, although in some species they may be of equal length as in *L. alpina* or occasionally the antisepalous stamen, which are inserted on the anterior sepal as in *L. filamentosa* may be shorter than those of the antipetalous stamens. Conspicuous ridges formed by the adnation of the filaments to the inner wall of the upper portion of hypanthium are present in some species, e.g. in *L. gracilis*, *L. grandiflora* and *L. pudens*. The anthers are basifixed and introse, the shape varying from oblong to ellipsoid to spheroid to depressed spheriod. The size of the anthers varies from 0.2–2.6 mm long. Anthers with broad connective tissue are present in seven species. In all the species the antisepalous stamens are exserted, whereas in most species the antipetalous stamens are also exserted. In nine species, however, the anthers of the antipetalous stamens are either fully or partially exserted or enclosed.

Scales

Eight scales are inserted on the upper portion of the hypanthium below the attachment of the antipetalous stamens and alternating with the stamens. The position of the scales varies within the species from being inserted just below the rim to just above the circumscissile articulation. They are either exserted or enclosed. In most species the scales are basally attached to the inner wall of the hypanthium. These scales are usually terete, varying in shape from being linear, narrowly oblong, capitate, narrowly obovoid to obovoid, narrowly ovoid to ovoid or subspheroid. However, in *L. ruscifolia* the scales are laterally flattened. In *L. filicaulis* the scales are basally and partly abaxially attached to the hypanthium. In three species, *L. grandiflora*, *L. stokoei* and *L. uniflora* the scales are semi-terete, abaxially attached to the inner wall of the hypanthium. The shape of these scales varies from being oblong, narrowly elliptic to elliptic or circular in outline. The scales are either translucent white, white or yellow and usually glabrous. In *L. alpina*, *L. burchellii*, *L. filamentosa* and *L. pomosa* the scales are pubescent.

The scales of fifteen species were treated with neutral red solution to ascertain whether these scales are nectariferous or functioning as osmophores (Table 4.15). Some species tested positively, whereas in some species where more than one specimen was tested, both a positive and negative result was obtained. Other species tested negatively although tiny droplets of fluid were observed on the scales as in *L. gracilis* and *L. oliverorum*. In some species moisture was observed at the base of the scales. Unfortunately the amount of liquid collected from these flowers was miniscule and tests for sugars could not be carried out. SEM micrographs taken of the scales of selected species showed that no stomata are present (Figure 4.9).

According to Beyers & Van der Walt (1995) anatomical evidence obtained from transections of flowers from a number of species showed that no vascular tissue is present in or at the base of the scales, even when they are inserted in close juxtaposition to the sepal lateral bundles and the sepal midrib bundles where a rich vascular plexus is present. They found that in some species as in *L. capitata*, the scales appeared non-glandular. In other species as in *L. axillaris*, the scales appeared glandular since they are composed of compact thin-walled cells rich in cytoplasm with large nuclei. According to Heads (1990)

TABLE 4.15—Scales of selected species of *Lachnaea* studied with the scanning electron microscope (SEM) and tested with neutral red to assertain whether they are nectariferous (osmophores).

Species	Voucher specimens (Herbarium)	SEM	Tested with neutral red		Fluid on scales	Fluid at base of scales
			positive	negative		
aurea	Oliver 10550 (NBG)	X	X			X
capitata	Beyers 138 (NBG)	X				
	Oliver 10519 (NBG)			X		X
densiflora	Beyers 244 (NBG)			X		X
eriocephala	Beyers 237 (NBG)			X		X
	Beyers 238 (NBG)			X		X
	Rugge s.n. (NBG)	X	X			X
filamentosa	Beyers 110 (NBG)	X				
	Beyers 245 (NBG)		X			X
	Hansford 47 (NBG)			X		X
globulifera						
subsp. globulifera	Beyers 240 (NBG)		X			X
subsp. incana	Beyers 246 (NBG)		X			X
gracilis	Oliver 10415(NBG)	X		X	X	
grandiflora	Beyers 129 (NBG)	X				
	Beyers 241 (NBG)			X	X	
	Beyers 248 (NBG)		X		X	
	Beyers 250 (NBG)			X	X	
laniflora	Oliver 10679 (NBG)		X			X
montana	Beyers 267 (NBG)	X				
naviculifolia	Hansford, M. s.n. (NBG)		X			X
oliverorum	Oliver 10478 (NBG)	X		X	X	
pedicellata	Beyers 260 (NBG)		X			X
pomposa	Beyers 122 (NBG)		X			X
pusilla	Beyers 243 (NBG)			X	X	
uniflora	Beyers 136 (NBG)	X				
villosa	Beyers 125 (NBG)	X				
	Du Toit s.n. (NBG)					X

the gland scales in *Kelleria* (Thymelaeoideae) when in their fully developed state, are turgid, bright yellow and secrete liquid. In other flowers the glands are small, white, and non-secretory (Heads 1990). In *L. gracilis* the scales are translucent white or yellow and in *L. oliverorum* they are translucent white, yet droplets of fluid were observed on these scales. Thus the colour of the scales in *Lachnaea* is not an indicator whether they are nectariferous or not.

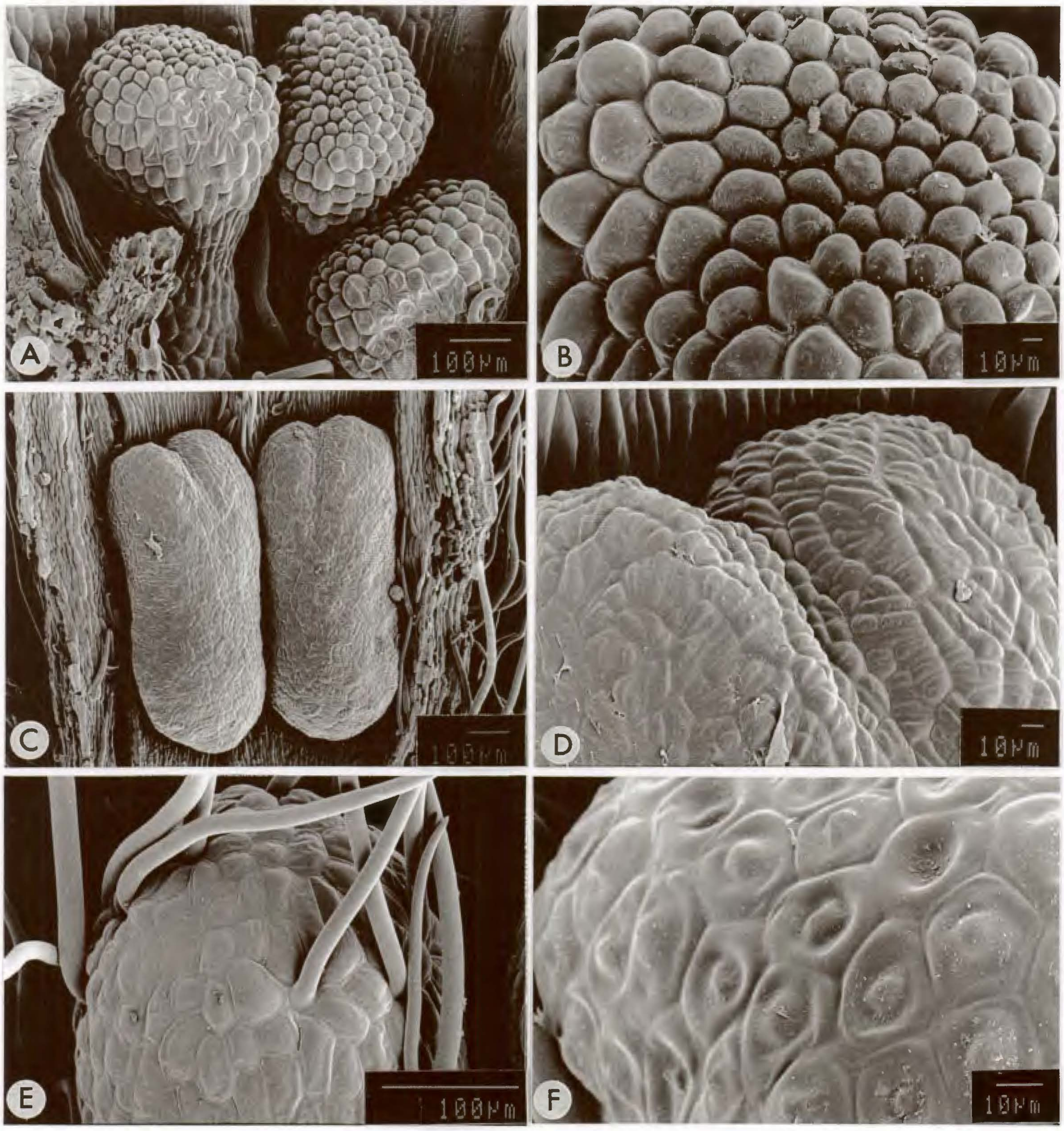

FIGURE 4.9—SEM micrographs of floral scales of *Lachnaea* species. A & B, *L. oliverorum* (*Oliver10478*): A, capitate scales attached basally to inner wall of hypanthium; B, apical portion of scale. C & D, *L. uniflora* (*Beyers 136*): C, scales abaxially attached to inner wall of hypanthium; D, apical portion of scale. E & F, apical portion of scales: E, *L.filamentosa* (*Beyers110*), note trichomes; F, *L. villosa* (*Beyers 125*).

Disc

A disc is absent in all species, a state taxonomically significant at the generic level.

Gynoecium

In *Lachnaea* the ovary is sessile, narrowly ellipsoid to ellipsoid, narrowly obovoid to obovoid or narrowly ovoid to ovoid, 0.5–5 mm long, glabrous or variously pubescent. The ovary is pseudomonomerous—consisting of one expanded or fertile carpel and one contracted or sterile carpel (Heinig 1951; Beyers & Van der Walt 1995), unilocular with a solitary anatropous ovule laterally attached near the top of the ovary, thus consistent with that of the Gnidieae (Domke 1934). The style is laterally attached to the ovary, linear to linear-obconical, glabrous or variously pubescent. The stigma is either brush-like, capitate with short or long papillae or conical with short papillae. Zygomorphy is expressed in all the species through the lateral placement of the style and the single locule.

Fruit

The fruit is an achene which is enclosed in the persistent basal portion of the hypanthium. The pericarp is dry and thin, whereas the seed coat is thick and crustaceous. According to Domke (1934) the achene is, without exception, characteristic of the Thymelaeoideae and thus at generic level the fruit type is not of taxonomic importance. In the South African thymelaeaceous genera the pericarp is usually dry, but in *Passerina* it may be dry or fleshy (Dyer 1975). Whereas the structure of the pericarp is taxonomically significant in P*asserina*, this is not the case in *Lachnaea*.

Discussion

According to Baillon (1880) members of the Thymelaeaceae have numerous constant characters. The principle are: the symplicity of the perianth and its imbricate prefloration; the definite number of parts of the androecium and their insertion on the hypanthium; the independence of the gynoecium and its insertion inferior to the stamens (Baillon 1880). Characters which vary most and which generally serve to mark generic divisions according to Baillon (1880) are: the number of the parts of the flower, the point of insertion of the stamens and the dimensions of the filaments which render them exserted or enclosed, the presence or absence of scales in the throat of the hypanthium, the presence of a disc at the foot of the gynoecium, the consistance of the pericarp, whether the basal portion of the hypanthium falls after floration or persists enveloping the ripe fruit, the relative proportions of the embryo and albumen which may be wanting, and the arrangement of the inflorescence.

According to Peterson (1959) the Thymelaeaceae is a family where it is difficult to find reliable characters for generic delimitation; these being few and of superficial significance. In *Gnidia* he found the number of sepals to be divergent within the same species as well as transitions between well developed or aborted petaloid scales often within a species.

Within *Lachnaea* the number of flower parts are constant contrary to Peterson's observation in *Gnidia*. Floral characters considered taxonomically useful in *Lachnaea* are:

- presence or absence of the pedicel;
- whether the pedicel elongates abaxially beyond the point of insertion of the flower or not;
- whether the pedicel is persistent and elongates in the fruiting stage;
- the shape of the upper portion of the hypanthium and whether it narrows into a tube towards the circumscissile articulation or whether it is basally invaginated;
- the distinctly zygomorphic calyx;
- the colour of the calyx, although there may be great variability within a species;
- the position of the stamen insertion and whether the antipetalous stamens are exserted or only the anthers of the antipetalous stamens are fully or partially exserted or enclosed;
- presence or absence of filament ridges on the hypanthium;
- anthers with or without broad connective tissue abaxially;
- the position of the scale insertion on the hypanthium and the shape of the scales;
- the shape of the stigma and the length of the papillae;
- indumentum of the flower.

4.6 **PALYNOLOGY** (Appendix 2)

The pollen of the Thymelaeaceae is remarkably uniform: spheroidal in shape, pantoporate, with a *Croton*-pattern or a derivative thereof (Nowicke *et al.* 1985). The *Croton*-pattern (named by Erdtman 1966) comprises triangular supratectal elements attached to a reticulum (semitectum: Punt *et al.* 1994) having short or irregular columellae

(Nowicke 1994). The triangular supratectal elements or subunits can be psilate, striate, furrowed or ridged, or pitted. The subunits can be closely spaced or arrayed in more open configurations (Nowicke 1994).

Discussion

In *Lachnaea* the pollen grains are shed as monads with the structure of the triangular supratectal subunits revealing a similar continuum of variation as described and illustrated for several genera of the Thymelaeaceae by Nowicke *et al.* (1985) and Nowicke (1994), for *Wikstroemia* Endl. by Mayer (1991) and for seven southern African genera of the Thymelaeaceae by Bredenkamp & Van Wyk (1996). The subunits are tetrahedral with a single central spinule or it can be flattened but then having four spinules. The majority of species of *Lachnaea* reveal a striation on the subunit and usually when the base-sides of these subunits are emarginate, horizontal intercostal striations also occur. These intercostal striations are usually associated with a single central spinule. A small number of species of *Lachnaea* shows a granular pattern on the subunit and these subunits are usually associated with four spinules, or instead of the spinules, wart-like structures or verrucae. A continuum of variation was found between the striate and granular surfaces as well as the number of spinules on the subunits. Variation was not only found amongst species but often within a species or even a specimen. Where several specimens per species were studied transitional forms of these characters degrade the taxonomic value of these characters.

In all the *Lachnaea* species studied pollen size ranged from 19–67 µm. The variation in size formed a gradient from small to medium-sized grains and from medium-sized to large grains. In three species, viz. *L. nervosa*, *L. greytonensis* and *L. oliverorum* the pollen size varied greatly within a specimen, with the smallest grains less than half or almost half the size of the largest ones. Within this range species of *Lachnaea* could not be grouped according to the size of the pollen grains. Although polyploidy may express itself directly in pollen size (Muller 1979), this is not the case in *Lachnaea*, since the known chromosome numbers of 18 *Lachnaea* species are all the same, with no polyploidy known. Pollen size in *Lachnaea* could rather be correlated to flower size (Muller 1979) since small flowers have small pollen grains and larger flowers have larger grains. Concerning the variation in pollen size within *L. nervosa*, *L. greytonensis* and *L. oliverorum*, Pozhidaev (1993) pointed out that in most palynological investigations deviated pollen forms are regarded as abnormal and thus left unregistered and that published data do not reveal the true occurrence of these deviations. Mathew & Valsaladevi (1989) described polymorphism of pollen grains as a state where two or more pollen morphs occur in the same species, or occasionally in a single plant or even the same anther. This polymorphism occurs naturally or due to various factors such as ecological conditions. Mathew & Valsaladevi (1989) and Pozhidaev (1993) also pointed out that deviated pollen forms were found in very different and distant angiosperm groups. As the variation in pollen size in the three *Lachnaea* species was not consistent within a species the phenomenon could be due to temporary ecological conditions or other factors, but could not be regarded as being well established within the species.

No correlation could be made between the inflorescence types or the flower morphology in *Lachnaea* and the structure of the supratectal subunits. As with the size of the pollen grains, the sculpture of the tectum revealed a continuum of variation. Although species could not be grouped according to pollen morphology, the pollen micromorphology can assist in some cases in the delimitation of species with similar inflorescences and floral structures. For example in two closely related species, viz. *L. pusilla* and *L. leipoldtii*, the sculpture of the supratectal subunits can be used as one of the distinguishing characters. In the former species the supratectal subunits are granular with wart-like spinules whereas in the latter the subunits are striate-granular with one or four spinules.

The ultrastructure of the pollen wall reveals a closer relationship between *Gnidia* and *Struthiola* because both have very thin footlayers and reduced columellae. *Passerina* shares the reduced columellae with *Gnidia* and *Struthiola*, but the presence of a more prominent footlayer with *Lachnaea* (Beyers & Marais 1998; Appendix 2). According to Nowicke *et al.* (1985) the well developed columellae of *Lachnaea* show a resemblance to those of *Thymelaea arvensis* Lam., *Linodendron cubanum* (A. Rich.) Urb. and *Daphne mezereum* L.

According to Beyers & Marais (1998; Appendix 2) the differences in the pollen morphology of *Gnidia* species, previously included in the genera *Arthrosolen* and *Lasiosiphon*, are insignificant and made no contribution to the subdivision of *Gnidia*. Similar to this is the insignificance of the variations in the structure of the tectum in

Gnidia, *Struthiola* and *Lachnaea*. This wider spectrum in the palynology of the Cape Flora genera of the Thymelaeaceae convinced the authors that palynology is not an important source of taxonomic evidence to apply in the delimitation of the different genera of the subtribe Gnidiinae and did not contribute anything in the decision to include *Cryptadenia* into *Lachnaea*. Neither did pollen analysis contribute much to the delimitation of species in *Lachnaea* or to the grouping of species within the genus (Beyers & Marais 1998). This conclusion corresponds with the results of Heads (1990) for *Kelleria* and *Drapetes* and for the Hawaiian species of *Wickstroemia* (Mayer 1991).

According to Beyers & Marais (1998) the sculpture of the tectum reveals a closer relationship between *Struthiola*, *Gnidia* and *Lachnaea* whereas *Passerina*, with the subunits lacking, stands apart. The closer relationship between *Gnidia*, *Lachnaea* and *Struthiola* supports the placement of these genera in the same subtribe, whereas the distinctly different pollen morphology of *Passerina* supports the classification by Domke (1934), where *Passerina* is placed in a separate subtribe or the newly instated tribe Passerineae (Domke) Bredenkamp & Van Wyk by Bredenkamp & Van Wyk (1996).

4.7 CHROMOSOME NUMBER

Most Thymelaeaceae have chromosome numbers of $n = 9$ and $2n = 18$ (Beyers & Van der Walt 1995; Bhat et al. 1974; Bjorkqvist *et al.* 1969; Gupta & Gillett 1969; Heads 1990; Kuzmanov 1973; Loeve & Kjellqvist 1974; Majovsky *et al.* 1970; Nevling & Woodbury 1966; Sharma & Sarkar 1967–1968). Polyploidy has been recorded in *Daphne* L. (Heads 1990), *Daphnopsis* C. Martius (Nevling & Woodbury 1966), *Edgeworthia* Meisn. (Heads 1990) and *Wikstroemia* (Gupta & Gillett 1969; Heads 1990).

Observations

Chromosome counts for 18 species of *Lachnaea* are now known (Table 4.4); in all cases $n = 9$. *Beyers 125* (NBG) referred to as *L. funicaulis* in Beyers & Van der Walt (1995) was misidentified. It is in fact a new species, *L. villosa* Beyers ined.

Discussion

Since the basic chromosome number of $x = 9$ was recorded for most genera of the Thymelaeaceae, the chromosome number is therefore taxonomically insignificant at the generic and specific levels.

CHAPTER 5

PHYTOGEOGRAPHY

The Cape Floristic Region (CFR) is a highly distinctive phytogeographical unit, which is recognized as one of the six floral kingdoms of the world (Good 1974; Goldblatt 1978; Takhatajan 1986). The CFR as defined by Goldblatt (1978) includes the territory west and south of a line extending from Nieuwoudtville in the north, following the eastern slopes of the Cederberg, and then east from Karoopoort along the north slope of the Witteberg, Swartberg, Baviaans Kloof, and Groot Winterhoek Mountains, ending at Port Elizabeth (Goldblatt 1978). The region has a relatively mild, temperate, mediterranean-type climate. Rainfall is predominantly or entirely in the winter, but the eastern part receives substantial summer rain. The rainfall pattern is orographic; precipitation increases with altitude and rain shadow effects are more than usually pronounced. The surface area of the CFR is small, ca. 90 000 km², less than 4% of the area of southern Africa. The species diversity, about 9000 species of vascular plants, constitutes about 44% of the total flora of southern Africa (Goldblatt & Manning in press). For equivalent-sized areas, this region has the highest recorded plant species diversity for any temperate region in the world (Cowling 1992). Taylor (1980) includes the Thymelaeaceae among those families that are richest in genera in the Cape Region but widely distributed in other parts of the world. Perhaps more remarkable than species diversity of the CFR is the degree of endemism, which is 68,2 % for species and 19,5 % for genera (Bond & Goldblatt 1984). Weimarck (1941) was the first to recognize centres of endemism in the CFR. He recognized five centres, which formed the basis for the analysis of distribution patterns for many subsequent monographs (e.g. Dahlgren 1963; Nordenstam 1969; Lundgren 1972; Strid 1972). These centres were also supported by the studies of Oliver *et al.* (1983). Weimarck failed to recognize a well-defined centre associated with the limestones of the southwestern and southeastern coastal region which Cowling (1992) calls the Bredasdorp-Riversdale Centre. Thus at present the CFR constitutes six centres of endemism, viz. Northwestern (NW), Southwestern (SW), Bredasdorp-Riversdale (BR), Karoo Mountain (KM), Langeberg (LB) and Southeastern (SE) Centres.

OBSERVATIONS

The genus *Lachnaea* is endemic to the CFR. *Lachnaea* species occur almost exclusively in fynbos vegetation on oligotrophic soils derived from the orthoquartzites of the Cape Supergroup. A few species, however, occur on shale or limestone. The number of species occurring per quarter degree and per degree square, coded according to the grid reference system of Edwards & Leistner (1971) is illustrated in Figures 5.1 and 5.2. The highest number of species (24) occur in the 3319 (Worcester) grid, with the highest diversity of species (12) in the Hex River Mountains (3319AD), followed by the Groot Winterhoek Mountains (3319AA) with 11 species. Species richness of the genus declines to the north, south, east and west of the above concentration of species.

On a regional basis there is a conspicuous concentration of species in the Northwestern Centre. Twenty-one of the 40 taxa recognized occur here of which 12 are endemic (Table 5.1). These 12 species are: *L.alpina*, *L. filamentosa*, *L. funicaulis*, *L. laniflora*, *L. leipoldtii*, *L. marlothii*, *L. montana*, *L. naviculifolia*, *L. pedicellata*, *L. pendula*, *L. striata* and *L. villosa*. Most of these species occur at altitudes from 1000 m upwards, with *L. marlothii* and *L. montana* occurring at altitudes as high as 2330 m in the Hex River Mountains. *L. filamentosa* has been recorded to occur from 600–1900 m, *L. striata* from 800–1160 m, *L. villosa* from 480–1500 m and *L. funicaulis* from 500–1000 m. These species are essentially montane species although some, as illustrated above, occur on the flats and lower mountain slopes.

Of the 18 species occurring in the Southwestern Centre, five are endemic, viz. *L. greytonensis*, *L. laxa*, *L. pudens*, *L. pusilla* and *L. rupestris*. These five species are found on sandstone slopes. *L. greytonensis* and *L. pudens* occur on the Riviersonderend Mountains at altitudes between 640–830 m and 330–1530 m respectively. *L. rupestris* is found on the Riviersonderend Mountains to Stetynsberg north of Villiersdorp growing amongs rocks at altitudes above 1500 m. *L. laxa* has been recorded from the Jonkershoek Mountains to Caledon Swartberg and Elim at altitudes between 600–2150 m. *L. pusilla* occurs in the Elandskloof Mountains at altitudes between 70–1000 m.

TABLE 5.1—Species of *Lachnaea* represented in the six centres of endemism of the Cape Floristic Region. X* = endemic species. NW = Northwestern; SW = Southwestern; BR = Bredasdorp-Riversdale; KM = Karoo Mountain; LB = Langeberg; SE = Southeastern.

Species	Centres of Endemism					
	NW	SW	B-R	KM	LB	SE
alpina	X*					
aurea		X	X			
axillaris		X	X		X	
burchellii					X	X
capitata	X	X				
densiflora		X	X			
diosmoides					X	X
elsieae	X			X		
ericoides					X*	
eriocephala	X	X				
filamentosa	X*					
filicaulis		X	X		X	
funicaulis	X*					
globulifera	X	X				
glomerata				X		X
gracilis	X	X		X		
grandiflora	X	X	X			
greytonensis		X*				
laniflora	X*					
laxa		X*				
leipoldtii	X*					
macrantha		X			X	
marlothii	X*					
montana	X*					
naviculifolia	X*					
nervosa	X	X			X	
oliverorum				X*		
pedicellata	X*					
pendula	X*					
penicillata					X*	
pomposa	X	X		X		
pudens		X*				
pusilla		X*				
rupestris		X*				
ruscifolia				X	X	
sociorum					X*	
stokoei					X*	
striata	X*					
uniflora	X	X				
villosa	X*					
TOTAL	21	18	5	6	11	3

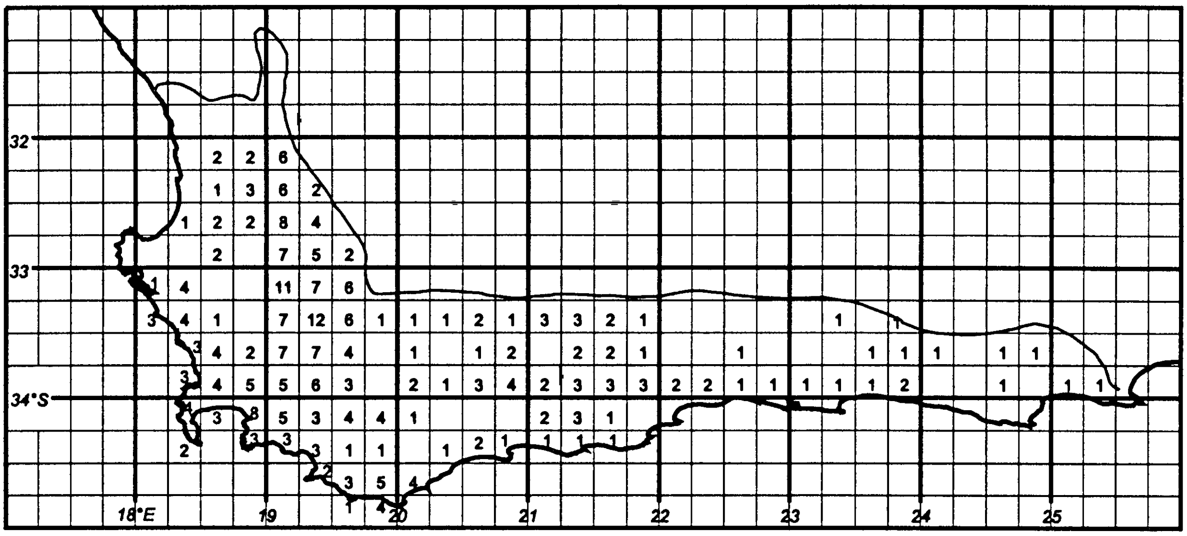

FIGURE 5.1. Distribution of the genus *Lachnaea* with the number of species per quarter degree grid square. Inland boundary of the Cape Floristic Region following Goldblatt (1978).

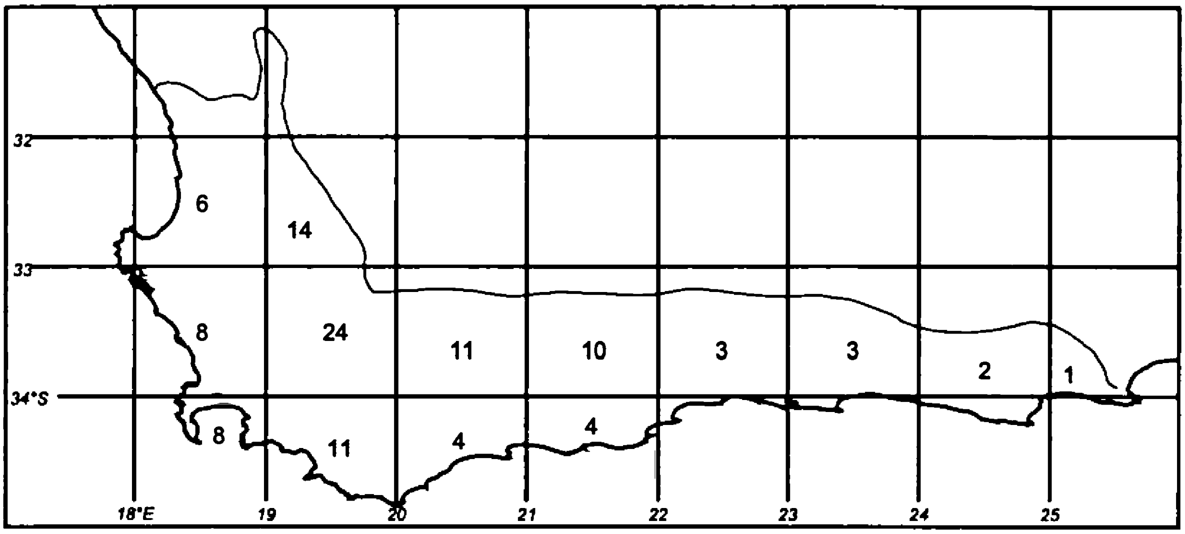

FIGURE 5.2. Distribution of the genus *Lachnaea* with the number of species per degree grid square. Inland boundary of the Cape Floristic Region following Goldblatt (1978).

Only one species, *L. oliverorum*, of the six species represented in the Karoo Mountain Centre is endemic. It is restricted to the Waboomsberg in the Montagu District growing on sandy soil at altitudes between 1280–1400 m.

Of the fourteen species represented in the Langeberg Centre, four species, *L. ericoides*, *L. penicillata*, *L. sociorum* and *L. stokoei*, are endemic. *L. stokoei* has only been recorded from Lemoenshoek and Strawberry Hill near Barrydale. It is only known from the two Stokoe collections dated December 1954 and January 1957. Unfortunately the localities given on the sheets are very vague and no other more recent information is available about this species. *L. ericoides* and *L. penicillata* occur west of the Gourits River at altitudes between 330–660 m and 300–1330 m respectively. *L. sociorum* occurs on the eastern end of the region on either side of the Gourits River at altitudes between 300–1000 m. All three these species occur on sandstone slopes.

There are no endemic species of *Lachnaea* in either the Bredasdorp-Riversdale or Southeastern Centre. However, five species occur in the Bredasdorp-Riversdale Centre and three in the Southeastern Centre.

The two allopatric subspecies of *L. globulifera* are each endemic to two adjacent centres, namely *L. globulifera* subsp. *globulifera* to the Southwestern Centre and *L. globulifera* subsp. *incana* to the Northwestern Centre.

Among the *Lachnaea* species diverse types of distributions occur. *L. greytonensis*, *L. funicaulis*, *L. leipoldtii*, *L. marlothii*, *L. pudens*, *L. pusilla*, *L. rupestris* and *L. stokoei* can be regarded as being narrowly endemic. These species are either found in a single locality or restricted to a small area of close-lying localities. *L. axillaris*, *L. macrantha*, *L. montana* and *L striata* each have a disjunct distribution. *L. axillaris* occurs on sandy flats in the vicinity of Hopefield and Darling, in the southwestern area, and reappears along the southern coast from Elim to the Gourits River mouth. *L. macrantha*, a species with a localized distribution, occurs in the mountains in the Southwestern Centre and then on the Langeberg in the Swellendam and Riversdale Districts. *L. montana* occurs on the Piketberg, Hex River Mountains and Keeromsberg, whereas. *L. striata* has been recorded from the Northern Cederberg and then again from the Groot Winterhoek and Witzenberg Mountains in the vicinity of Tulbagh. With the exception of *L. axillaris*, these species are all montane species. The distribution of a few *Lachnaea* species may be termed wide or fairly wide when stretching over three centres as in *L. filicaulis*, *L. grandiflora*, and *L. pomposa*.

CONCLUSION

Oliver *et al.* (1983) found that one of the major phytogeographical patterns in the Cape Flora is a concentration of species and diversity in the mountains of the southwestern Cape with the number of species per unit area decreasing from this centre. They found the quarter degree, 3418 BB centred on Sir Lowry's Pass and the Hottentots Holland Mountains to be the richest area in the CFR. The highest concentration of species in the genus *Metalasia* R.Br. is also nested in the western Caledon area (Karis 1989). In the genus *Pelargonium* L'Hérit. the 3319 (Worcester) and 3318 (Cape Town) grids were found to have the highest concentration of species (Van der Walt & Vorster 1983). In *Lachnaea* however, the quarter degree, 3319 AD and the 3319 (Worcester) grid was found to be the richest area.

Lachnaea demonstrates a high percentage of regional endemism with 55% of the species endemic to one of four of the centres in the CFR. Most of these species can be regarded as montane species. The relief and terrain diversity of the Cape Fold Mountains in combination with edaphic factors and the climate regime are part of the understanding why upland centres of species richness occur and have persisted in the Cape mountains (Cowling 1992).

CHAPTER 6

CLADISTIC ANALYSIS AND SPECIATION

6.1 CLADISTIC ANALYSIS

Cladistic analysis of the southern African Gnidieae as defined by Domke (1934) has not previously been attempted. At present molecular studies of the Thymelaeaceae are being undertaken (M. van der Bank, pers. comm.); results are likely to have a direct influence on Domke's (1934) classification of the Thymelaeaceae. Preliminary results from the sequencing of the plastid genes, *rbcL* and *trnL*, support the monophyletic status of *Lachnaea* (M. van der Bank, pers. comm.).

Choice of outgroup

In Domke's (1934) classification of the Thymelaeaceae, *Lachnaea*, *Gnidia s. str.* and *Struthiola* are placed in the same subseries within the subtribe Gnidiinae, thus reflecting his view of their close affinity. Recently preliminary cladistic analysis based on sequence data from the *rbcL* gene showed *Struthiola leptantha* Bolus to be basal to the clade including *Lachnaea filicaulis*, *Passerina filiformis* L., *Gnidia denudata* Lindl. and *G.* aff. *renniana* Hilliard & Burtt (Van der Bank, pers. comm.). According to Van der Bank the genus *Gnidia* appears to be polyphyletic. Nixon & Carpenter (1993) point out that if the outgroup is the sister group, the cladistic inference might be better founded and that if more outgroups are used the better founded the inference might be. Consequently *S. leptantha* and five *Gnidia* species, namely *G. galpinii* C.H.Wright, *G. linearifolia* (Wikstr.) Peterson, *G. oppositifolia* L., *G. pinifolia* L. and *G. squarrosa* (L.) Druce, were chosen as outgroups.

Choice of characters and data matrices

Morphological data for *Lachnaea* were assembled from the present study, whereas those for the *Gnidia* species and *S. leptantha* were obtained from literature and dried material at NBG. Leaf anatomical data for the *Gnidia* species were based on handsections made from rehydrated herbarium material at NGB and those for *S. leptantha* from Van der

Merwe (1992). Floral and inflorescence morphology for *Struthiola* were obtained from Mattatia (1965).

In selecting the morphological data consideration was given to continuous versus discrete and overlapping versus nonoverlapping characters (compare Stevens 1991; Thiele 1993; Wiens 1995). Since the HENNIG86 version 1.5 (Farris 1988) does not distinguish between polymorphic and unknown characters, it was decided to exclude the polymorphic ones following Thiele (1993). All assumptions regarding the direction of transformation series were considered inappropriate prior to analysis (Hauser & Presch 1991) and multistate characters were treated as unordered. Ultimately 33 discrete characters were selected (Table 6.1) which in itself is a small number compared to the number of taxa analyzed. Unfortunately *Lachnaea* is not blessed with a large number of diagnostic characters.

Analysis of data matrix

The mh* and bb* options of the HENNIG86 package were used. The data include considerable homoplasy with the result that in the first analysis (Analysis A) with only *S. leptantha* as outgroup, the strict consensus tree of 2282 (overflow) equally parsimonious trees resulting from unweighted computations shows little resolution [length 113, consistency index (CI) 0.31, retention index (RI) 0.71] (Figure 6.1). Similarly in the second analysis (Analysis B) with multiple taxa as the outgroup the strict consensus tree of 2044 (overflow) trees (length 135, CI 0.27, RI 0.69) also showed little resolution (Figure 6.2). Therefore successive weighting (xsteps w) as recommended by Farris (1969), was applied in both analyses. In Analysis A character 17 was excluded as it is an autapomorphy for *L. axillaris*, whereas in Analysis B all the characters in the matrix were included. Clados (Nixon 1993) was used to look at character distribution on the HENNIG86 trees. Two types of character transformations were plotted namely as unique occurrences (synapomorphies) in black and homoplasies (forward or reverse homoplasy) in grey. The bootstrap option in HENNIG86 was run on 1000 replicates using mh*and bb* options to establish a measure of confidence in the results of the cladistic analysis. The bootstrap values are presented on the initial two trees (Figures 6.1 & 6.2).

Results

Analysis A produced 2274 (overflow) equally parsimonious trees, 269 steps long, CI 0.68 and RI 0.91, whereas in Analysis B 2044 (overflow) equally parsimonious trees, 248 steps long, CI 0.58 and RI 0.88 were produced. The strict consensus tree of each analysis (Figure 6.3 and 6.4) shows that *Lachnaea* is monophyletic, characterised as a genus by the insertion of the floral scales below the stamen attachment [22(1)] in Analysis A and B and the presence of the antisepalous stamen whorl [19(0)] in Analysis A.

Analysis A (Figure 6.3)

Within *Lachnaea* the tree indicates a primary division into two basal clades. One basal clade comprises eight of the ten solitary-flowered species. These are supported by five homoplasious characters, namely, the upper portion of the hypanthium unstalked [15(0)], the floral scales included [21(1)], inserted below midway in upper portion of the hypanthium [22(1)], a linear-obconical style [25(1)] and a capitate stigma [27(1)]. However, within this group all the species do not share a capitate stigma. A conical stigma [27(2)] occurs in three species and a penicillate one [27(0)] in one species. The terminal group in this clade is held together by a synapomorphy, namely the upper portion of hypanthium with basal invagination [16(1)].

The other basal clade, supported by two homoplasies, namely, scales inserted above midway up hypanthium [23(1)] and pubescent style [26 (1)], includes the rest of the species. *L. laxa* and *L. ruscifolia*, the two other solitary-flowered species, are included in this clade and are basal. The rest of the species are held together by a synapomorphy (polytelic inflorescences [5(1)]). Here this subclade branches dichotomously with *L. alpina*, *L. macrantha*, *L. filamentosa*, *L. pomposa*, *L. capitata* and *L. densiflora* included in a subclade. This subclade is supported by pedunculate [7(1)] capitula [8(0)] and leaves abaxially plane [29(0)]—this character reverses further up the subclade [29(1)] in *L. capitata* and *L. densiflora*. The subclade with *L. filamentosa*, *L. pomposa*, *L. capitata* and *L. densiflora* are held together by a secondary derived character (also present in outgroup), namely, amphistomatic leaves [3(0)]. The second subclade in the dichotomy is supported by two homoplasies [8(1) and 25(1)] and a synapomorphy (pedicels present [13(1)]). All the species in this subclade have umbellate inflorescences. This subclade is polychotomous. Here a well defined subgroup can be distinguished by a synapomorphy (pedicels elongating in fruit [14(1)]. Within this subgroup a further group of species is distinguished by another synapomorphy (pedicels abaxially produced beyond flower attachment [13(2)]).

Analysis B (Figure 6.4)

The clade containing all the *Lachnaea* species is polychotomous. The well defined groups of species, however, are rather similar to those indicated by the previous analysis. One of the major differences is that all the solitary-flowered species are grouped together in one clade supported by monotelic [5(0)] solitary-flowered [8(4)] inflorescences.

Discussion

Meisner (1840) subdivided *Lachnaea* into three sections, *Sphaeroclinium*, *Conoclinium* and *Microclinium*, based mainly on the inflorescence morphology. In a subsequent publication the same three sections were recognised with a few alterations (Meisner 1857). The section *Sphaeroclinium* is defined by terminal capitula, flowers on a globose, sessile receptacle. Within this section he distinguished two subsections, *Exinvolucratae* and *Involucratae*. He placed *L. filamentosa*, *L. macrantha* and *L. pomposa* (= *L. buxifolia*), within the *Exinvolucratae*. The placement of these three species are supported by the cladistic analysis. In his *Involucratae* he included *L. aurea*, *L. burchellii*, *L. eriocephala*, *L. globulifera* and *L. nervosa* (= *L. ambigua*). These species, however, come out in different clades and thus their placement can not be supported.

Section *Conoclinium* was defined by Meisner (1857) as having terminal or subterminal, exinvolucrate capitula with few or many flowers borne on a slightly thick conical to hemisperical, tomentose, tuberculate receptical which later elongates and becomes cylindrical. Here he includes *L. alpina*, *L. capitata*, *L. densiflora* and *L. striata*. The first three species are contained in the same clade as those in his *Exinvolucratae* whereas *L. striata* comes out in a clade with *L. aurea*.

In section M*icroclinium* the flowers are sessile, terminal or subsolitary, rarely axillary and solitary, without an involucre and receptacle. Species included are *L. axillaris*, *L. diosmoides*, *L. ericoides*, *L. gracilis*, *L. nervosa* and *L. penicillata*. These species come out in different clades and thus *Microclinium* can not be regarded as a natural section.

TABLE 6.1—Matrix and character list for the cladistic analysis (Figures 6.1–6.4). The outgroups are five *Gnidia* species and *Stuthiola lepthantha*. No polarity is implied in the allocation of character states. Multistate characters were treated as unordered. G = *Gnidia*; L = *Lachnaea*; S = *Struthiola*; ? = unknown; – = inapplicable.

	Character numbers						
Taxon	1–5	6–10	11–15	16–20	21–25	26–30	31–33
G. galpinii	01101	10100	– 0100	00010	00000	00100	?00
G. linearifolia	00011	00100	– 0100	01010	00000	02110	100
G. oppositifolia	01001	00100	– 0100	01111	00000	00100	?00
G. pinifolia	00001	00303	00100	01011	00000	02010	?00
G. squarrosa	00011	10100|	– 0100	01111	00000	00100	?01
S. leptantha	01000	20400	– 00–1	01101	00000	00100	000
L. alpina	00101	01000	– 00–1	01110	01100	10100	100
L. aurea	00101	00303	01101	01110	01101	10100	010
L. axillaris	11100	10400	– 00–0	10011	11201	01010	100
L. burchellii	01101	10100	– 0101	01210	01101	10100	000
L. capitata	00001	01000	– 00–0	01110	11200	10110	000
L. densiflora	00001	01000	– 00–0	01110	01200	10110	000
L. diosmoides	00101	00100	– 0101	01110	01101	11010	000
L. elsieae	11121	10220	– 0111	01110	01101	01110	001
L. ericoides	00121	10100	– 0101	01010	01101	11110	100
L. eriocephala	11111	00220	– 1211	01110	01100	10110	001
L. filamentosa	00001	01000	– 10–1	01110	01100	10100	100
L. filicaulis	01100	10400	– 00–0	01111	11201	02010	000
L. funicaulis	11111	10302	10111	01110	11201	01010	001
L. globulifera	11101	10311	10211	01110	01100	10110	001
L. glomerata	01101	10100	– 0101	01110	01101	11110	000
L. gracilis	01100	10400	– 00–0	01111	11201	01000	100
L. grandiflora	01100	00400	– 00–0	01110	11211	01110	100
L. greytonensis	11111	10220	– 0111	01110	11201	01010	001
L. laniflora	11101	00220	– 0101	01110	01101	10110	001
L. laxa	01100	00400	– 00–1	01210	01100	10110	000
L. leipoldtii	11100	00400	– 00–0	11010	11201	02011	001
L. macrantha	00101	01000	– 10–1	01110	01100	10100	000
L. marlothii	11101	00220	– 0111	01010	01101	01110	001
L. montana	11101	10311	00211	01110	01100	10110	001
L. naviculifolia	11101	01220	– 0211	01111	01101	10110	100
L. nervosa	00101	10100	– 0101	01210	01100	10110	100
L. oliverorum	11111	10302	10111	01110	11201	01110	001
L. pedicellata	11101	10311	00211	01110	01101	10110	001
L. pendula	11121	00302	10111	01110	01101	11110	001
L. penicillata	11111	00302	10111	01110	01101	11111	001
L. pomposa	00001	01000	– 00–1	01110	01100	10100	100
L. pudens	01100	10400	– 00–0	11111	11201	00111	101
L. pusilla	11100	00400	– 00–0	11211	11201	02010	001
L. rupestris	11101	10220	– 0211	01110	01101	10110	001
L. ruscifolia	00110	20400	– 00–1	01110	01101	11110	100
L. sociorum	00101	00100	– 0101	01010	01101	10110	100
L. stokoei	00121	00100	– 0100	01110	11111	11100	100
L. striata	00111	00100	– 0101	01010	01100	10100	010
L. uniflora	01100	00400	– 00–0	01110	11211	02110	000
L. villosa	11111	10220	– 0111	01110	01101	01111	001

TABLE 6.1—*continued.*

CHARACTER LIST

1. Branches ridged below leaf base (0)—not ridged below leaf base (1)
2. Leaf arrangement: alternate (0)—opposite (1)
3. Leaves: amphistomatic (0)—epistomatic (1).
4. Leaf margin: eciliate (0)—ciliate (1)—tufted (2)
5. Inflorescence class: monotelic (0)—polytelic (1)
6. Inflorescence position: on main flowering branches (0)—on main flowering branches and on short lateral flowering branches (1)—only on reduced lateral branches (2)
7. Inflorescence: sessile (0)—pedunculate (1)
8. Type of inflorescence: capitulum (0)—ebracteate umbel (1)—pseudobracteate umbel (2)—bracteate umbel (3)—solitary flowered (4)
9. Distal leaves subtending inflorescence: leaf–like (0)—bract–like: 2 (1)—4–6 (2)
10. Involucral bracts: 0 (0)—2 (1)—4 (2)—6–8 (3)
11. Margin of involucral bracts: glabrous (0)—ciliate (1)
12. Flower symmetry: subactinomorphic (0)—zygomorphic (posterior sepal at least half length of anterior sepal) (1)
13. Pedicel: absent (0)—present, abaxially not produced beyond flower attachment (1)—present, abaxially produced beyond flower attachment (2)
14. Pedicel: not elongating in fruit (0)—elongating in fruit (1)
15. Upper portion of hypanthium: not stalked (0)—stalked (1)
16. Upper portion of hypanthium: without basal invagination (0)—with basal invagination (1)
17. Indumentum of upper portion of hypanthium outside: glabrous (0)—hairy, trichomes acicular (1)
18. Indumentum of basal portion of hypanthium outside: glabrous (0); hairy, trichomes acicular (1)—hairy, trichomes obtuse (2)
19. Antisepalous stamen whorl: present (0)—absent (1)
20. Anthers abaxially with broad connective tissue: absent (0)—present (1)
21. Floral scales: exserted (0)—included (1)
22. Floral scale insertion: above stamen attachment (0)—below stamen attachment (1)
23. Position of floral scales on upper hypanthium: rim (0)—above midway (1)—below midway (2)
24. Scale attachment to hypanthium wall: basally (0)—abaxially (1)
25. Style shape: linear (0)—linear-obconical (1)
26. Style indumentum: glabrous (0)—pubescent (1)
27. Stigma shape: penicillate (0)—capitate (1)—conical (2)
28. Stigmatic papillae: short (0)—long (1)
29. Leaf shape, abaxially: plane (0)—convex (1)

Leaf anatomy:

30. Stomata position relative to adjacent epidermal cells: sunken (0)—level (1)
31. Diosmin crystals: absent (0)—present (1)
32. Extraxylary fibres along lateral margin: absent (0)—present (1)
33. Extraxylary fibres capping lateral vascular bundles: well developed (0)—weakly developed (not more than two fibres present) (1)

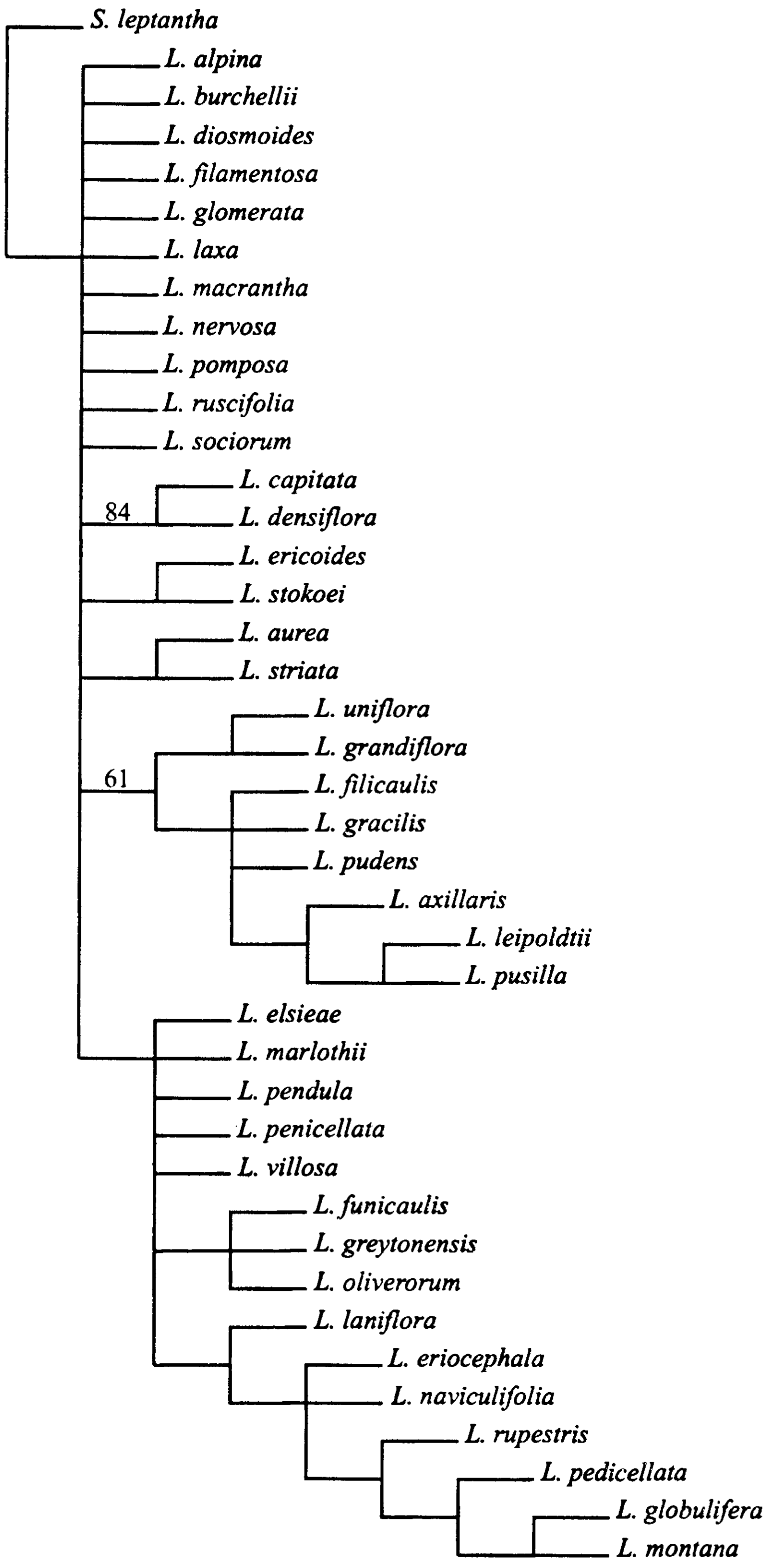

FIGURE 6.1—Strict consensus tree generated from the character matrix (Table 6.1) excluding character 17, with only *Struthiola leptantha* as outgroup and using the mh* and bb* options of HENNIG86. Bootstrap values drawn on the stict consensus tree generated using the mh* and bb* options of HENNIG86. L = *Lachnaea*; S = *Struthiola*.

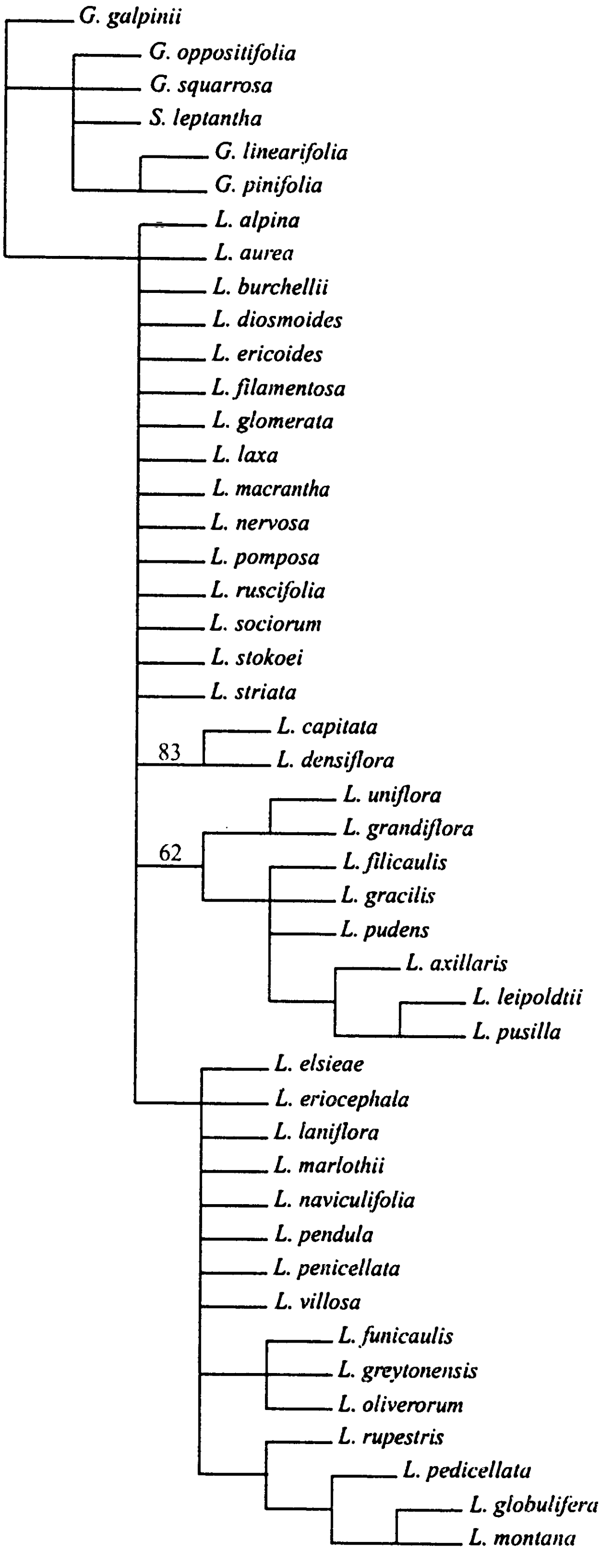

FIGURE 6.2— Strict consensus tree generated from the character matrix (Table 6.1) with multiple taxa as outgroup and using the mh* and bb* options of HENNIG86. Bootstrap values drawn on the stict consensus tree generated using the mh* and bb* options of HENNIG86. G = *Gnidia*; L = *Lachnaea*; S = *Struthiola*.

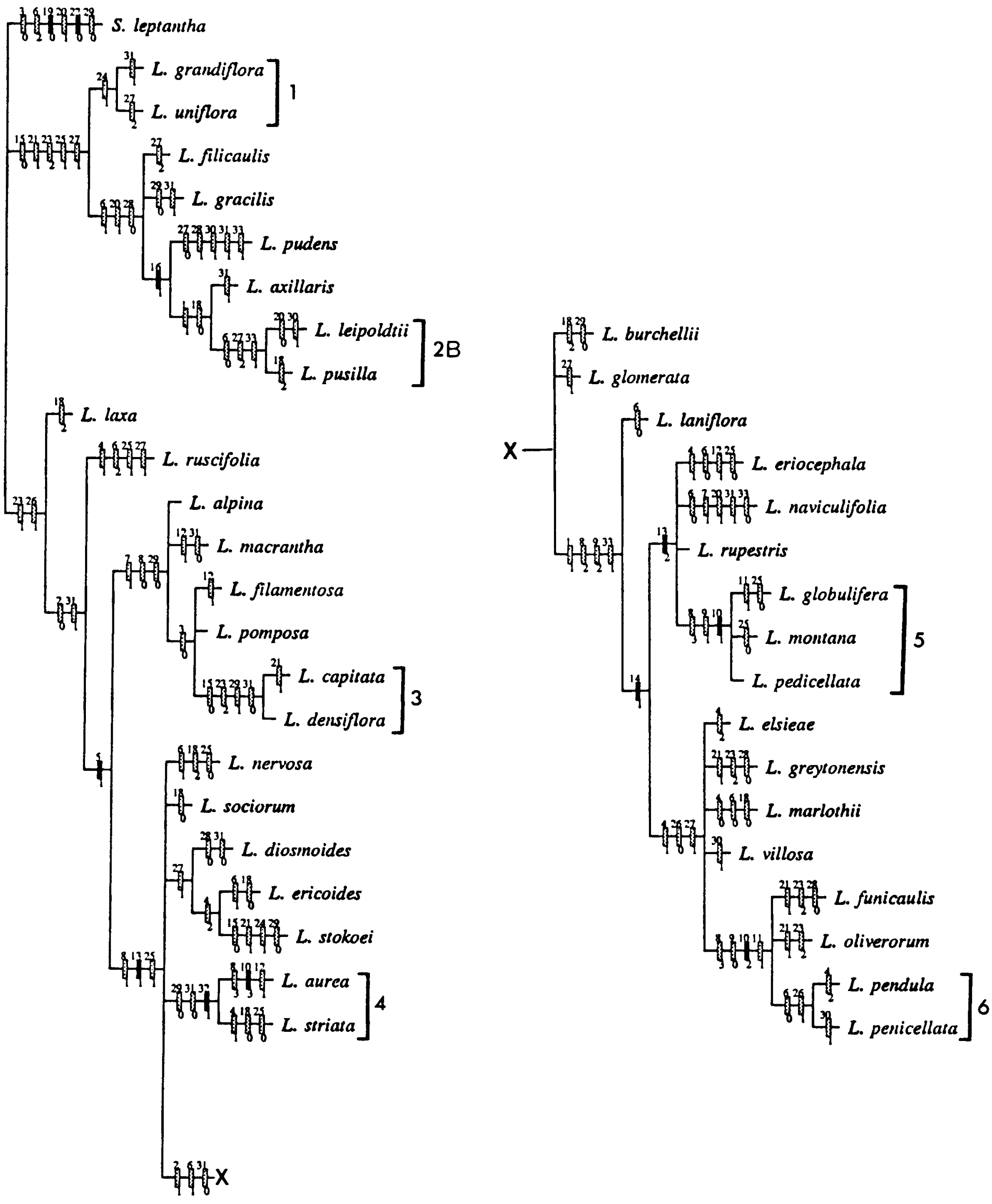

FIGURE 6.3—Strict consensus tree generated from the character matrix (Table 6.1) excluding character 17, with only *Struthiola leptantha* as outgroup and using the mh*, bb* and successive weighting (xsteps w) options of HENNIG86. Character bars mapped onto the tree are shaded as follows: black = synapomorphic character; gray = homoplasious character. Numbers above character bars refer to character numbers, those below the bars indicate the character state. L = *Lachnaea*; S = *Struthiola*.

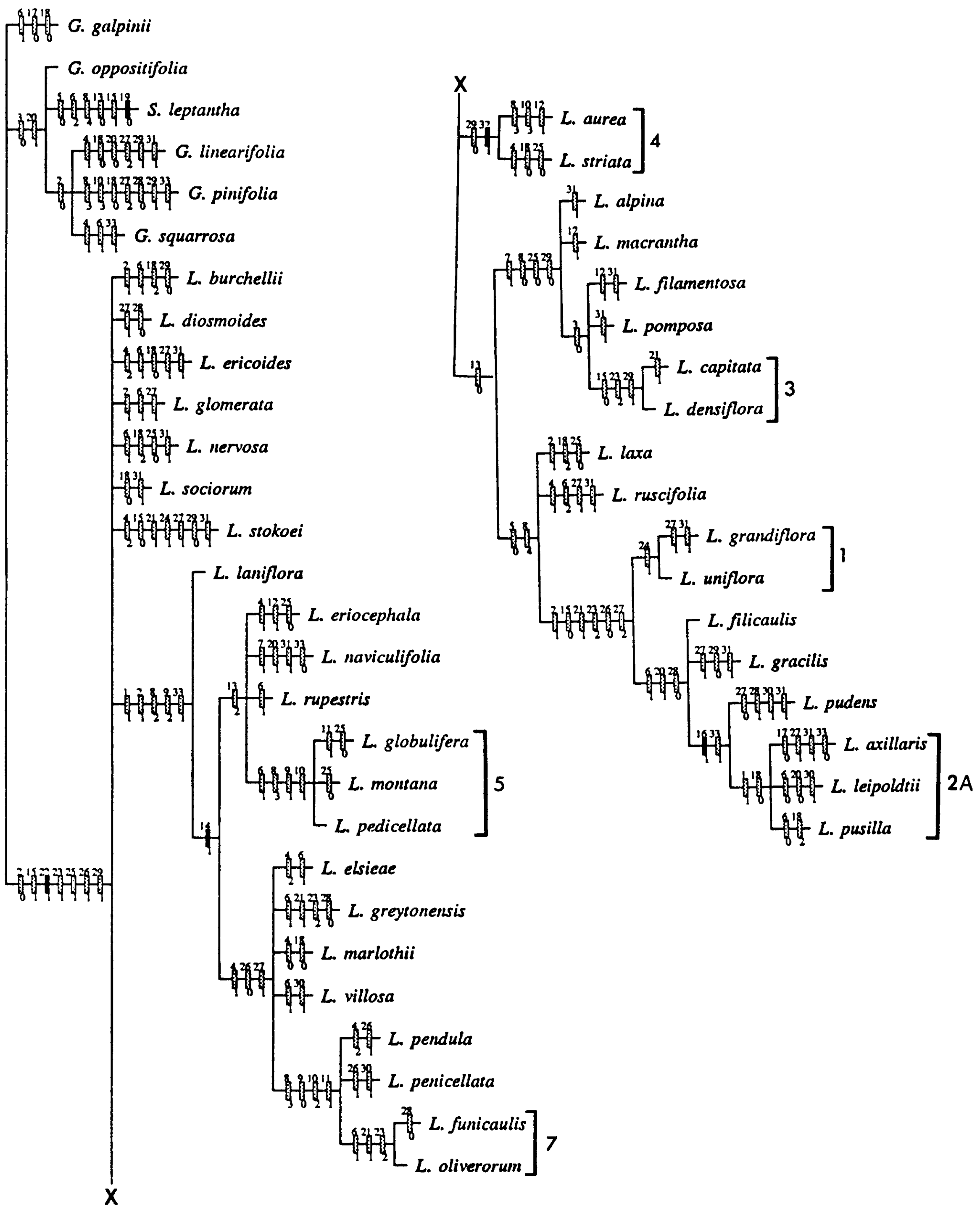

FIGURE 6.4—Strict consensus tree generated from the character matrix (Table 6.1) with multiple taxa as outgroup and using the mh*, bb*, and successive weighting (xsteps w) options of HENNIG86. Character bars mapped onto the tree are shaded as follows: black = synapomorphic character; gray = homoplasious character. Numbers above character bars refer to character numbers, those below the bars indicate the character state. G = *Gnidia*; L = *Lachnaea*; S = *Struthiola*.

Unfortunately Meisner (1840, 1857) misinterpreted the inflorescence morphology as he regarded all the flowers to be sessile. In both analyses the pedicel characteristics are significant. The solitary-flowered species, he regarded as having axillary inflorescences. Thus the criteria used to define his sections can not be accepted.

Conclusion

The two analyses produced conflicting resolution regarding the solitary-flowered species. In Analyses A, *L. laxa* and *L. ruscifolia* are embedded basally in one of the basal clades whereas in Analysis B they are included with the other solitary-flowered species in a distal subclade. All attempts to meaningfully resolve the polytomy in both analyses with the morphological data at hand, failed. A more meaningful analysis would be to run morpholgical data as well as evidence from other sources (e.g. molecular data). With the evidence at hand *Lachnaea* cannot be subdivided into sections and the three sections proposed by Meisner (1840, 1857) are not upheld.

With the cladograms containing so much homoplasy it is difficult to develop with any certainty a hypothesis on the evolution of many of the characters. Analyses A and B gave conflicting results with regard to the evolutionary pathway of certain characters.

In analysis A, there are some indications of the direction of evolution in inflorescence characters. The monotelic inflorescence is plesiomorphic and the polytelic inflorescence apomorphic. The umbellate inflorescence evolved from the ebracteate to the bracteate state. The number of bracts (2, 4, 4–6) have arisen independently in different lineages. In analysis B the polytelic inflorescence is plesiomorphic. The monotelic inflorescence is a parallelism, occurring in one of the outgroups (*S. leptantha*) as well as in the ingroup. The results from the two analyses support the conclusion of Weberling & Herkommer (1989). Although the polytelic inflorescence has probably been derived repeatedly from the monotelic type (Weberling 1983), the authors above found that within the Gnidioideae certain taxa have monotelic inflorescences, and that it was impossible to draw any taxonomic conclusion exclusively from the existence of the monotelic type within those taxa.

The multistate character [13]—pedicel absent (0), present, abaxially not produced beyond flower attachment (1), present, abaxially produced beyond flower attachment (2), is clearly an evolutionary advancement in analysis A. In analysis B pedicels present, abaxially not produced beyond flower attachment [13(1)] is plesiomorphic, and pedicels abaxially produced beyond flower attachment [13(2)] is apomorphic. Pedicel absent [13(0)] is a parallelism occurring in *S. lepthantha* and in the ingroup holding the capitate and solitary flowered species together in a clade. Pedicel elongating in fruit [14(1)] is a derived condition in both analyses.

Two other characters showing evolutionary advancement in both analyses are characters 16 and 32. The upper portion of the hypanthium with basal invagination [16(1)] is a synapomorphy for *L. pudens*, *L. axillaris*, *L. leipoldtii* and *L. pusilla*. Extraxylary fibres present along lateral margins of leaves [32(1)] supporting the clade with sister species, *L. aurea* and *L. striata*, is a derived condition.

The strongly zygomorphic flowers in *L. aurea*, *L. eriocephala*, *L. filamentosa* and *L. macrantha*, a derived condition occurring in different lineages, have probably been pollinator driven.

The cladistic analysis (Analysis A) forms the basis of the arrangement of species in the formal taxonomic treatment (Chapter 7). Since the cladogram represents the first cladistic analysis of *Lachnaea* based on morphological data, the hypothesis of relationships presented here should be seen as a starting point and by no means the final word.

6.2 SPECIATION

Speciation in the Cape flora is generally thought to be allopatric (Goldblatt 1978). However, Goldblatt (1981) notes that the geographical component, with its accompanying edaphic and micro-climatic variation is clearly the most significant factor in the evolution of the genus *Homeria*. According to Linder (1985) most of the species diversity is accounted for by species replacement along ecological gradients rather than by geographical replacement patterns.

The causative agents of speciation can be inferred only from comparison of the phylogeny of a group with their ecology. A comparison of the biological differences of the species at the terminal nodes should give an indication of the factors that lead to speciation of the species pairs/triplets. The lower nodes of the cladogram are not as informative as subsequent evolution may obscure the factors that led to speciation.

In *Lachnaea* seven species pairs/triplets on the cladogram of both analyses A (Figure 6.3) and B (Figure 6.4) were analyzed. The species pair, *L. ericoides* and *L. stokoei*, was not included, as the last mentioned species is only known from two herbarium collections with very little information. Ecological factors taken into account in this analysis are given in Table 6.2, and the differences between the sister species for each pair/triplet are tabulated in Table 6.3.

It appears that the most likely main causative agent for speciation in *Lachnaea* is geographic isolation. Six of the seven species pairs/triplets are allopatric. Additional ecological differences between sister species are also evident in two species pairs. In species pair 6 (*L. pendula* and *L. penicillata*) allopatry and altitudinal differences characterise the sister species, whereas in species pair 4 (*L. aurea* and *L. striata*) allopatry and allochrony characterise the sister species. The species in species pair 4 differ markedly in flower colour. It is unclear whether the shift in colour followed the speciation event or whether it preceded it. Different methods of surviving fire (e.g. reseeder vs. resprouter) add another variable along which diversification may have taken place (Linder 1985). In species pair 1 (*L. grandiflora* and *L. uniflora*) the regeneration strategy differs where these two species are sympatric. *L. grandiflora* is a resprouter and *L. uniflora* is a reseeder. It is thus possible that the regeneration strategy could have played a role in speciation. In species pair 3 (*L. capitata* and *L. densiflora*) the causative agent for speciation is unclear.

TABLE 6.2—Comparison of life history traits in terminal species pairs/triplets in *Lachnaea*.

Outgroup	multiple taxa		multiple taxa		
	Struthiola leptantha			*Struthiola leptantha*	
Species group	1		2A		
				2B	
Species	*L. grandiflora*	*L. uniflora*	*L. axillaris*	*L. leipoldtii*	*L. pusilla*
Soil	sandy	sandy, stony	sandy	sandy	sandy, stony
Distribution	Swartboskraal in Clanwilliam Dist south and southeast to Cape Peninsula, Bredasdorp, inland: Citrusdal to Worcester	Darling to Cape Peninsula and Somerset West and inland: Twenty-four River Mtns, Wolseley, Franschhoek	Hopefield, Darling; Elim to Gourits River mouth	Northern Cederberg (alt: 1000 m)	Nuwekloof southwest of Tulbagh, along Elandskloof to Bailey's Peak north of Wellington
Flowering time	all year except July	July–March	all year	December, February	October–March
Habitat	sandy flats, lower mountain slopes	a, sandy flats; b, mountain slopes	sandy flats, limestone ridges	moist, sandy flats	restioid, sandy flats
Flower colour	pink, pinkish mauve, white	pink, pinkish mauve, occ. white	cream, pink, dark pink	white	white, some tinged pink
Regeneration	resprouter	a, reseeder b, resprouter	resprouter	reseeder	reseeder

TABLE 6.2—*continued*.

Outgroup	multiple taxa *Struthiola leptantha*		multiple taxa *Struthiola leptantha*	
Species group	3		4	
Species	*L. capitata*	*L. densiflora*	*L. aurea*	*L. striata*
Soil	sandy	sandy	sandy	sandy
Distribution	Clanwilliam to Cape Peninsula, inland Franschhoek, Goudini	southern Cape Peninsula to Bredasdorp	Hermanus to Agulhas (alt: below 900 m)	Northern Cederberg , Grootwinterhoek, Witsenberg, Roodesand Mtns
Flowering time	June–March	August–March	March–September	September–January
Habitat	sandy flats, lower mountain slopes	sandy flats	flats and lower mountain slopes	mountain slopes, seasonally damp areas
Flower colour	cream	cream, pink, dark pink	golden yellow	cream, pale rose, purple
Regeneration	reseeder	reseeder	resprouter	resprouter

TABLE 6.2—*continued*.

Outgroup	multiple taxa *Struthiola leptantha*			*Struthiola leptantha*		multiple taxa	
Species group	5			6		7	
Species	*L. globulifera*	*L. montana*	*L. pedicellata*	*L. pendula*	*L. penicillata*	*L. funicaulis*	*L. oliverorum*
Soil	sandy; sandy stony	stony; sandy	sandy, loam probably on underlying shale	stony	sandy or stony, clay	sandy	sandy
Distribution	Pakhuis Mtn to Bainskloof, Du Toit's Kloof, Stettyn Mtn (alt.:200–1665 m)	Piketberg Mtn, Hex River Mtns, Keeromsberg Mtn (alt.:765–2330 m)	Koue Bokkeveld Mnts (alt.:1760–1830)	Skurweberg, Witsenberg, Hex River Mtns (alt.:1330–2000 m)	Langeberg Mtns: Montagu to Gouritz River (alt.:300–1330 m)	Mountains east and south of Ceres	Waboomsberg in Montagu District (alt.:1280–1400 m)
Flowering time	all year except June	September–February	October–January	September–December	all year	July–March	June–August
Habitat	lower mountain slopes, flats	mountain slopes	upper mountain slopes	stony or shaly mountain slopes	mountain slopes and sandy flats	summit and mountain valley	level sandy area on mountain
Flower colour	cream, cream tinged pink, pale mauve	cream, mauve, dirty violet	cream	cream, pale yellow	cream	cream	cream
Regeneration	reseeder or resprouter	reseeder	reseeder	reseeder	reseeder or resprouter	reseeder	reseeder

TABLE 6.3—Distribution of differences among species of terminal sister groups. 1 = *L. grandiflora* & *L. uniflora*; 2A = *L. axillaris*, *L. leipoldtii* & *L. pusilla*; 2B = *L. leipoldtii* & *L. pusilla*; 3 = *L. capitata* & *L. densiflora*; 4 = *L. aurea* & *L. striata*; 5 = *L. globulifera*, *L. montana* & *L. pedicellata*; 6 = *L. pendula* & *L. penicillata*; 7 = *L. funicaulis* & *L. oliverorum*.

Species group	1	2A	2B	3	4	5	6	7
Allopatry		*	*	? *	*	*	*	*
Altitude							*	
Allochrony					*			
Regeneration strategy	? *	? *						

INDEX TO THE SPECIES

(numbers in brackets refer to the taxon numbers)

CHAPTER 7

TAXONOMIC TREATMENT

7.1 CIRCUMSCRIPTION OF THE GENUS

Lachnaea [*Van Royen*] *L.*, Genera plantarum edn 2: 165, n. 382 (1742); L.: 169, n. 441 (1754); Crantz: 128 (1766); Juss.: 77 (1789); Lam.: 373 (1792); Willd.: 434 (1799); C.F.Gaertn.: 195 (1807); W.T.Aiton: 415 (1811); Meisn.: 408 (1840); Meisn.: 574 (1857); Baill.: 108 (1880); Bentham & Hooker: 196 (1880); Gilg: 240 (1894); C.H.Wright: 18 (1915); Domke: 136 (1934); R.A.Dyer: 395 (1975). Lectotype species: *L. eriocephala* L. vide Domke: 136 (1934).

Lachara (lapsu typogr.?) Van Royen ex L., Systema naturae, edn 2: 22 (1740)

Cryptadenia Meisn. in Linnaea 14: 404 (1840); Meisn. : 573 (1857); Bentham & Hooker: 195 (1880); Gilg: 239 (1894); C.H.Wright: 15 (1915); Domke: 136 (1934); R.A.Dyer: 395 (1975). Lectotype species: *C. grandiflora* (L.f.) Meisn. (= *Lachnaea grandiflora* (L.f.) Baill.) vide Domke: 137 (1934).

Radojitskya Turcz. in Bulletin de la Société Impériale des Naturalistes de Moscou 25:176 (1852); Turcz.: 742 (1853). Type species: *R. capensis* Turcz. (= *Lachnaea axillaris* Meisn.) selected here.

Gonophylla Eckl. & Zeyh. ex Meisn.—*nom. nud.* in De Candolle, Prodromus systematis naturalis regni vegetabilis 14: 574 (1857) in synonymy.

Calysericos Eckl. & Zeyh. ex Meisn.—*nom. nud.* in De Candolle, Prodromus systematis naturalis regni vegetabilis 14: 573 (1857) in synonymy.

Erect to decumbent, slender to compact shrubs or shrublets, single-stemmed or multistemmed at base. *Branches* terete or ridged below leaf bases, glabrous or variously pubescent. *Leaves* alternate or decussate, imbricate to scattered, adpressed to patent, sessile, epistomatic or amphistomatic, glabrous or occasionally margins ciliate or apex tufted, linear to ovate to obovate, occasionally orbicular, coriaceous, occasionally slightly fleshy, adaxially ± flat to concave, usually white-punctulate, abaxially ± flat to convex, enervate, subkeeled to keeled or ribbed. *Inflorescence* a terminal capitulum, bracteate or ebracteate umbel, or one-flowered. *Flowers* sessile or pedicellate, subactinomorphic to strongly zygomorphic. *Hypanthium* with circumscissile articulation above ovary, basal portion persistent, enclosing expanding fruit and not ruptured by it, narrowly ovoid to obovoid, usually glabrous within, glabrous or variously pubescent outside, upper portion cylindrical-obconical to widely obconical, narrowly funnel-shaped to funnel-shaped, cup-shaped, cup-shaped narrowing into a tube at base or occasionally cup-shaped with a basal invagination, glabrous or variously pubescent within and outside. *Petals* absent. *Sepals* four, ascending to patent, ± equal to unequal, narrowly elliptic to oblate, narrowly ovate to widely depressed ovate or obovate to widely obovate, adaxially and abaxially variously pubescent or glabrous. *Stamens* 4 + 4, all exserted, or outer whorl exserted and inner whorl semi-exserted or included; outer, antisepalous whorl inserted on sepals, usually near base, to a third-way down upper portion of hypanthium, inner, antipetalous whorl inserted at rim to two-thirds down upper portion of hypanthium, often shorter than outer whorl; anthers basifixed, introrse, ellipsoid to depressed spheroid, occasionally oblong, occasionally with broad connective tissue abaxially. *Scales* eight, exserted or included, inserted in a single whorl below stamens and alternating with them, at various levels in upper portion of hypanthium, usually basally but occasionally abaxially attached to hypanthium, linear to oblong, narrowly obovoid to widely obovoid, or narrowly ellipsoid to subglobose, usually glabrous, translucent and white to yellow in fresh state, sometimes secretory. *Ovary* superior, sessile, narrowly ellipsoid to ellipsoid, or ovoid to obovoid, glabrous to pubescent, unilocular with single, pendulous, anatropous ovule. *Style* lateral, linear to linear-obconical, glabrous to pubescent. *Stigma* brush-like, capitate and papillate or conical and papillate. *Fruit* an achene, enclosed in persistent basal portion of hypanthium; pericarp dry, thin; seedcoat thick, crustaceous.

A genus of 40 species endemic to the Cape Floristic Region.

7.2 KEY TO THE SPECIES

Note: Flower measurement given is hypanthium length plus sepal length.

1a. Flowers three to more than 50 in terminal capitula or umbels 11

1b. Flowers solitary, terminal (may appear axillary when much reduced lateral branches comprise one pair of leaves) 2

2a. Leaves alternate .... 10. *L. ruscifolia*

2b. Leaves opposite 3

3a. Upper portion of hypanthium funnel-shaped (stalked); floral scales exserted ....9. *L. laxa*

3b. Upper portion of hypanthium not stalked, obconical or cup-shaped; floral scales included...4

4a. Flowers more than 11 mm long; floral scales semiterete, abaxially attached to hypanthium wall 5

4b. Flowers less than 9 mm long; floral scales terete, basally attached to hypanthium wall...6

5a. Basal portion of hypanthium covered outside with blunt hairs ....1. *L. uniflora*

5b. Basal portion of hypanthium covered outside with acicular hairs.......2. *L. grandiflora*

6a. Hypanthium glabrous outside .... 6. *L. axillaris*

6b. Hypanthium pubescent outside...7

7a. Flowers dark red, borne on short branches and facing downwards........... 5. *L. pudens*

7b. Flowers cream or pink to dark pink, if borne on short branches then not facing downwards...8

8a. Upper portion of hypanthium cup-shaped, with or without basal invagination 9

8b. Upper portion of hypanthium narrowly obconical with basal invagination 10

9a. Stigma conical, papillate... 3. *L. filicaulis*

9b. Stigma capitate, papillate.. 4. *L. gracilis*

10a. Basal portion of hypanthium glabrous outside; stigma conical...............7. *L. leipoldtii*

10b. Upper half of basal portion of hypanthium pubescent outside, trichomes obtuse; stigma linear-conical...8. *L. pusilla*

11a. Inflorescence a capitulum—flowers sessile, borne on thickened floral axis 12

11b. Inflorescence an umbel—flowers pedicellate 17

12a. Upper portion of hypanthium not stalked, obconical 13

12b. Upper portion of hypanthium stalked, funnel-shaped 14

13a. Capitulum globose with many open flowers at a time; upper portion of hypanthium widely obconical; sepals patent, tomentose on outside; floral scales exserted .... 16. *L. densiflora*

13b. Capitulum with few open flowers at a time; upper portion of hypanthium obconical; sepals ascending, sericeous on outside; floral scales included .... 15. *L. capitata*

14a. Sepals unequal, anterior sepal at least twice the length of other three 15

14b. Sepals equal to slightly unequal, anterior sepal never much longer than other three 16

15a. Capitula pompom-like, leaves narrowly ovate to obovate, amphistomatic (± punctulate ad- and abaxially when dry) .... 13. *L. filamentosa*

15b. Capitula daisy-like, leaves obovate, epistomatic (± punctulate adaxially when dry) .... 12. *L. macrantha*

16a. Capitula 25–55 mm in diameter; hypanthium more than 15 mm long, narrowly funnel-shaped; sepals equal; leaves amphistomatic .... 14. *L. pomposa*

16b. Capitula 15–25 mm in diameter; hypanthium less than 10 mm long; sepals equal to unequal; leaves epistomatic .... 11. *L. alpina*

17a. Umbel ebracteate 18

17b. Umbel pseudobracteate or bracteate 25

18a. Leaves alternate 19

18b. Leaves opposite 24

19a. Leaf margin crisped-ciliate .... 22. *L. striata*

19b. Leaf margin glabrous or only apex tufted 20

20a. Upper portion of hypanthium funnel-shaped 21

20b. Upper portion of hypanthium obconical; floral scales semiterete, abaxially attached to hypanthium wall .... 21. *L. stokoei*

21a. Leaf apex tufted .... 20. *L. ericoides*

21b. Leaf apex glabrous 22

22a. Stigma capitate, papillate .... 19. *L diosmoides*

22b. Stigma brush-like 23

23a. Basal portion of hypanthium hairy on outside; trichomes obtuse or subacute .... 17. *L. nervosa*

23b. Basal portion of hypanthium usually glabrous on outside, if hairy then trichomes acicular .... 18. *L. sociorum*

24a. Trichomes on outside of basal portion of hypanthium obtuse, sepals dorsally (outside) sericeous .... 24. *L. burchellii*

24b. Trichomes on outside of basal portion of hypanthium acicular, sepals dorsally (outside) tomentose .... 25. *L. glomerata*

25a. Sepals unequal, anterior sepal at least twice the length of posterior sepal 26

25b. Sepals ± equal, if unequal then not as above 27

26a. Leaves alternate, flowers golden yellow .... 23. *L. aurea*

26b. Leaves opposite, flowers cream to mauve .... 35. *L. eriocephala*

27a. Inflorescence pendulous .... 33. *L. pendula*

27b. Inflorescence erect 28

28a. Pedicels not elongating in fruiting stage .... 26. *L. laniflora*

28b. Pedicels elongating in fruiting stage 29

29a. Pedicels dorso-ventrally flattened, abaxially elongating beyond point of flower attachment 36

29b. Pedicels terete, not abaxially elongating beyond flower attachment 30

30a. Scales inserted in mouth of hypanthium 33

30b. Scales inserted below midway in upper portion of hypanthium 31

31a. Upper portion of hypanthium funnel-shaped (Figure 4.7 N) .... 31. *L. funicaulis*

31b. Upper porton of hypanthium cup-shaped narrowing into a tube at base (Figure 4.7 T & W) 32

32a. Inflorescence pseudobracteate, flowers 3.3–5.5 mm long; outer stamen whorl exserted, inner whorl semi-exserted or included .... 30. *L. greytonensis*

32b. Inflorescence bracteate, flowers 7.0–9.5 mm long; both stamen whorls exserted ....32. *L. oliverorum*

33a. Antisepalous stamens arising in lower third of sepals..........................29. *L. marlothii*

33b. Antisepalous stamens arising at base of sepals...34

34a. Upper portion of hypanthium and sepals outside villous-tomentose.........28. *L. villosa*

34b. Upper portion of hypanthium and sepals outside sericeous 35

35a. Umbel pseudobracteate, with up to four open flowers at a time; style glabrous ....27. *L. elsieae*

35b. Umbel bracteate, with one open flowers at a time; style covered in upper half with silky ascending hairs.. 34. *L. penicillata*

36a. Leaves glaucous, naviculoid (boat-shaped)..................................... 36. *L naviculifolia*

36b. Leaves not as above...37

37a. Involucral bracts or bract-like leaves ciliate..38

37b. Involucral bracts or bract-like leaves eciliate 39

38a. Low straggling shrublet up to 0.2 m tall; umbel pseudobracteate, with 3–5 open flowers at a time.. 37. *L. rupestris*

38b. Slender, erect shrub up to 0.6(–0.9) m tall; umbel bracteate, with up to 14 open flowers at a time...38. *L. globulifera*

39a. Pedicels linear in outline, villous; flowers 4.2–25.0 mm long .... 39. *L. montana*

39b. Pedicels narrowly obovate to obovate in outline, adaxially sericeous, abaxially villous, apex usually emarginate; flowers 2.4–8.2 mm long ....40. *L. pedicellata*

7.3 SPECIES TREATMENT

1. **Lachnaea uniflora** *(L.) Crantz* in Institutiones rei herbariae 1: 130 (1766); Beyers: 45 (1997). *Passerina uniflora* L. Species plantarum edn 1: 560 (1753); P.J.Bergius: 128 (1767) pro parte; Thunb.: 75 (1794); Poir.: 42 (1804) pro parte; ? Poir: t. 291, f. 1 (1804) [illustration could be the narrow leafed-form of *L. grandiflora*]; Wikstr.: 344 (1818); Thunb.: 376 (1823); Speng.: 239 (1825). *Cryptadenia uniflora* (L.) Meisn., Linnaea 14: 406 (1840); Hooker: 71, t. 4143 (1845); Meisn.: 573 (1857); C.H.Wright: 22

(1915). Syntypes: Burm. Rariorum africanarum plantarum: 131, t. 48, f. 1 (1739), lecto.! here designated; Burm. Rariorum africanarum plantarum: 131 t. 48, f. 2 (1739).

Note: Two specimens, *herb. LINN 504.8* and *504.9* in LINN are not original material. *Herb. LINN 504.8* lacks the correct corresponding Species plantarum number (4 in this case) which is the requisite proof that it was in Linnaeus' possession in 1753. It therefore has to be considered a post 1753 addition to the Linnaean herbaria and is thus not eligible for lectotypification. Similarly *herb LINN 504.9* could not have formed the basis of the name as it is not even annotated by Linnaeus but by his son and is regarded as a 1772 specimen. The only original elements therefore are the two Burman plates. The plate, an illustration of the complete plant, is chosen as the lectotype since there can be no question of its identity. The other plate, t. 48, f. 2, is somewhat ambiguous, illustrating only a piece of the upper portion of the plant with broader leaves which appears to be better matched with the species concept of *L. grandiflora*. It is also the lectotype of *L. uniflora* var. *alba* P.J. Bergius which has been placed in synonymy under *L. grandiflora*.

Passerina uniflora var. *angustifolia* Burm.f., Flora indica: 12 (1768). Type: Burm. Rariorum africanarum plantarum: 131, t. 48, f. 1 (1739) (icono.!).

Passerina uniflora var. *purpurea* Bergius, Descriptiones plantarum ex Capite Bonae Spei: 128 (1767); Poir.: 42 (1804). Type: Burm. Rariorum africanarum plantarum: 131, t. 48, f. 1 (1739) (icono.!).

Thymelaea ramosa, linearibus foliis angustis, flore solitario Burm. Rariorum africanarum plantarum: 131, t. 48, f. 1 (1739).

Erect, lax, moderately branched shrub to 0.45 m tall, single-stemmed at base when a reseeder, or multistemmed at base when a resprouter. *Branches* ascending, slender, flexuose, ridged below the leaf bases, glabrous or sparsely adpressed hairy, occasionally sericeous, leafy, later becoming glabrous and naked with prominent leaf scars. *Leaves* decussate, adpressed to ascending, scattered, internodes half to as long as leaves, distal two pairs subverticillate, sessile, epistomatic, narrowly elliptic or lanceolate, 3.3–6.7(–12.0) × 0.6–1.0 mm, coriaceous, glabrous, adaxially concave, enervate, dull, ± white-punctate, abaxially convex, subkeeled or only subkeeled in upper half, glossy, smooth or faintly nervate, apex acute to acuminate, base obtuse or rounded, margin membranous, narrow. *Inflorescence* terminal, one-flowered, villous at floral articulation. *Flowers* sessile, subactinomorphic, pink to pinkish mauve, occasionally white, unscented. *Hypanthium* 6.8–12.0 mm long, circumscissile a quarter to a third from base, upper portion narrowly obconical to obconical, outside sericeous or sericeous-villose, trichomes acicular, within densely hairy to sparsely hairy below scales, hirtellous on prominent ridges formed by adnate filaments of antisepalous stamens, in vicinity of scales glabrous, basal portion narrowly ellipsoid to ellipsoid, narrowly oblong or obovoid, outside sericeous, trichomes broad, obtuse or acute, twice as broad as those above circumscission zone, within adpressed hairy to glabrescent. *Sepals* spreading, subequal (two inner ones slightly smaller than outer two), elliptic, ovate or occasionally narrowly ovate, 5.0–9.5 × 3.0–5.5 mm, apex subacute or rounded, abaxially sericeous, adaxially glabrous or occasionally sparsely adpressed hairy at apex. *Stamens* with outer, antisepalous whorl adnate to upper portion of hypanthium and becoming free at rim to one-sixth way down hypanthium, exserted or semi-exserted, inner, antipetalous whorl adnate to upper hypanthium and becoming free a fifth to a third-way down hypanthium, semi-exserted or included; filaments filiform, 0.3–1.5 mm long; anthers ellipsoid, 0.8–1.5 mm long, abaxially without broad connective tissue. *Scales* included, inserted a quarter to midway up from circumscission zone on upper portion of hypanthium, 0.2–0.8 mm long, semiterete, abaxially adnate to hypanthium, narrowly elliptic or oblong in outline, glabrous. *Ovary* narrowly ellipsoid to ellipsoid, 1.2–2.0 mm long, glabrous. *Style* linear-obconical, 4.5–9.8 mm long, glabrous. *Stigma* narrowly conical, narowlly ellipsoid to ellipsoid or occasionally subcapitate, elongate-papillate (Figure 7.1).

Distribution, ecology and variation

Lachnaea uniflora has been recorded from Darling southwards to the Peninsula and as far east as Somerset West, and inland from Twenty-four River Mountains southeast to Wolseley and the mountains around Franschhoek, at altitudes from sea level to 860 m (Figure 7.2).

Two distinct entities based on regeneration can be distinguished. Form A is a reseeder, growing in sandy flats from Darling to the Peninsula and eastwards to Somerset West at altitudes below 300 m. Form B, on the otherhand, is a resprouter occuring inland, at altitudes between 300 and 860 m, favouring sandy to sandy, stony soil. Numerous collections, old and recent, have been recorded from the Franschhoek area, whereas Drège's collection from Twenty-four Rivers Mountains and Schlechter's collection from Ceres Road (Wolseley) are single collections from the respective areas, collected in the nineteeth century. Flowering has been recorded from July to March.

Conservation status: Vulnerable (VU A1c). Most of the populations on the sandy flats north of the Cape Peninsula and on the Cape Peninsula in the vicinity of Wynberg and Constantia have disappeared.

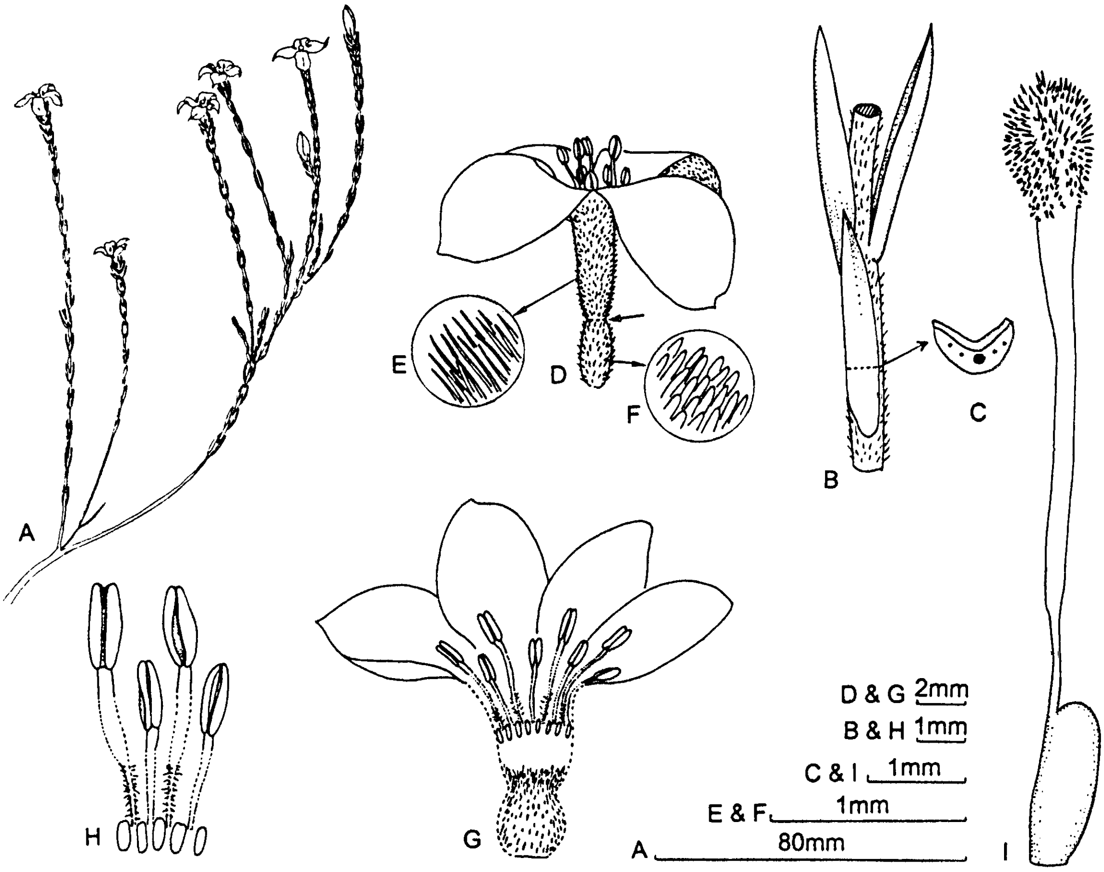

FIGURE 7.1—*Lachnaea uniflora*, *Beyers 136* (NBG). A, portion of plant; B, branch with leaves (enlarged); C, leaf (cross section); D, flower, note circumscission zone (arrowed); E, acicular trichomes on upper portion of hypanthium; F, obtuse trichomes on basal portion of hypanthium; G, flower split longitudinally with gynoecium removed; H, stamens and scales (enlarged); I, gynoecium.

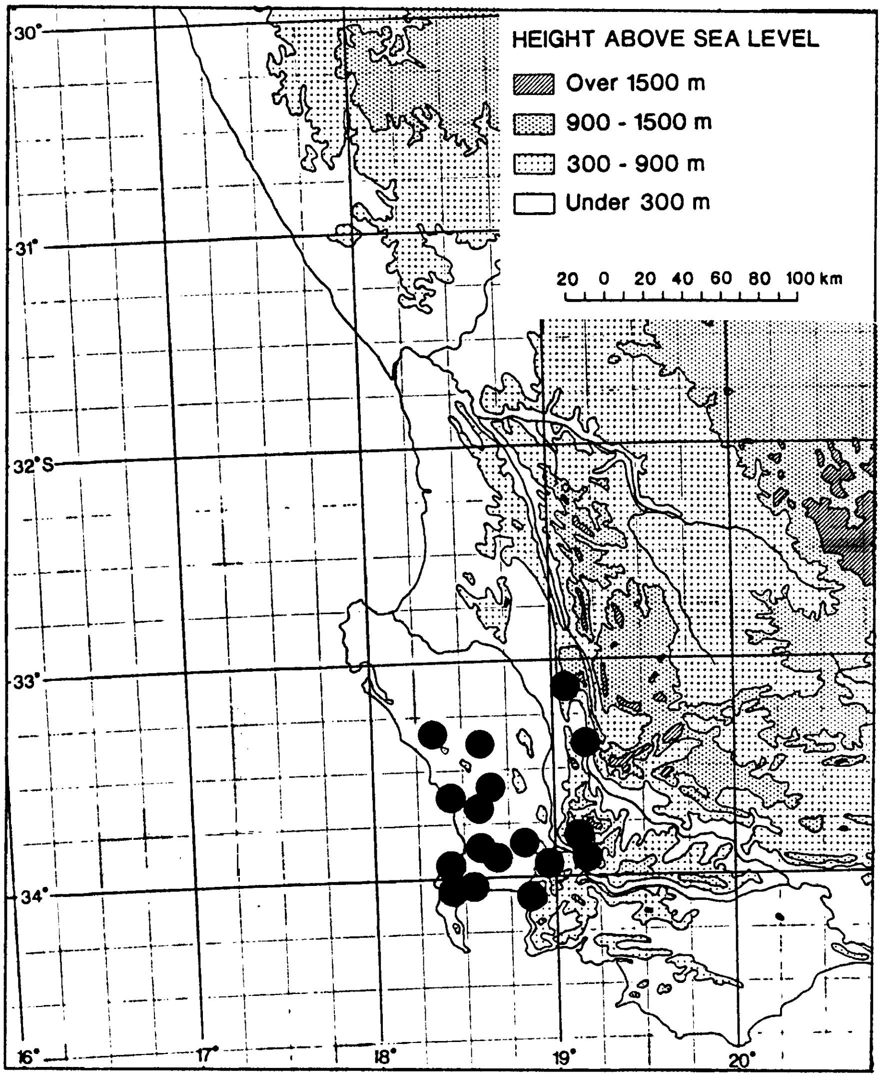

FIGURE 7.2—Known distribution of *Lachnaea uniflora*.

Diagnostic characters and relationships

Lachnaea uniflora is closely related to *L. grandiflora*, both having similar, large, solitary flowers, but it differs from the latter by the obtuse or acute trichomes being twice as broad as those above the circumscission zone on the outside of the hypanthium. In *L. grandiflora* the trichomes are acicular, not differing above and below the circumscission zone.The reseeding form of *L. uniflora* is sympatric with *L. grandiflora* but can easily be distinguished from the latter, which is a resprouter. The resprouting form of *L. uniflora* appears to be allopatric with *L. grandiflora.*

Specimens examined

WESTERN CAPE.—3319 (Worcester): Twenty-four Rivers Mtn, below 130 m, (–AA), 30-11-1828, *Drège* [*Cryptadenia uniflora* Meisn. b] (P, S); Ceres Road (Wolseley) 330 m, (–AC), 11-11-1896, *Schlechter 9089* (BOL, Z); Franschhoek Pass, sandy, rocky W slopes half-way up pass, (–CC), 11-12-1934, *Acocks 3832* (S); *ibid.*, 830m, 25-01-1942, *Compton 12965* (NBG); *ibid.*, 830m, 28-12-1946, *Dickson NBG 52536* (NBG); Franschhoek, (–CC), 06-10-1946, *Barker 4160* (NBG); *ibid.*, N slopes of Pass, 04-10-1931, *Levyns 3437* (BOL); *ibid.*, 330 m, 03-11-1913, *Phillips 1286* (SAM); *ibid.*, Oct. 1913, *Phillips 8486* (PRE); *ibid.*, 05-01-1948, *Rodin 3082* (BOL, S); Klein Drakenstein Mtns, W of Wemmershoek Dam, E slopes, 665 m, (–CC), 18-12-1997, *Beyers 269* (K, NBG, PRE); Zachariashoek Mtns, NW of Wemmershoek Dam on plateau, roadside ± 800 m, (–CC), 26-10-1972, *Boucher 1970* (NBG, PRE); Wemmershoek Mtns, lower slopes in Tierkloof, (–CC), 05-11-1950, *Esterhuysen* 17690 (BOL); *ibid.*, slope above plantations at forest station, 04-11-1965, *Esterhuysen 31371* (BOL, S); Wemmershoek, (–CC), 16-12-1940, *Esterhuysen 4069* (BOL); *ibid.*, dry slopes above dam, 500 m, 28-10-1958, *Levyns 10906* (BOL); Drakenstein Mtns above Franschhoek (–CC), 10-12-1933, *Galpin 12401* (PRE); Franschhoek, Zachariashoek Catchment Waterdivide, ± 865 m, (–CC), 08-12-1969, *Haynes 257* (NBG, PRE); Upper Zachariashoek, stony NE aspect, ± 450 m, (–CC), 12-11-1970, *Haynes 447* (NBG); *ibid.*, 14-11-1968, *Kruger 782* (NBG); Klein Drakenstein Mtns, Kasteelkloof Experimental Catchment, ± 330 m, (–CC), 08-10-1970, *Kruger 1063* (NBG); Zachariashoek Catchment Experiment, Zachariaskloof Catchment, ± 440 m, (–CC), 20-12-1979, *Le Maitre 37* (NBG); *ibid.*, Kasteelkloof Catchment, ± 600 m, 14-09-1072, *Smith 11* (NBG); *ibid.*, ± 530 m, 19-10-1972, *Smith 53* (NBG); *ibid.*, Kasteelkloof, 465m, 09-09-1982, *Viviers 544* (NBG); *ibid.*, 21-10-1982, *Viviers 657* (NBG); Drakenstein Mtns, 330m, (–CC), Dec. 1939, *Stokoe SAM 54530* (SAM); Franschhoek Peak, (–CC), Oct. 1946, *Stokoe SAM 59499* (SAM); Zachariashoek, 665 m, (–CC), 29-10-1963, *Van der Merwe 1603* (NBG, PRE); *ibid.*, 540 m, 03-11-1977, *Van Wilgen 179* (NBG).

—3318 (Cape Town): Paarl Dist., Hercules Pillar (exact locality unknown), 15-09-1942 *Barker 1649* (NBG); *Melkbosch* Strand Rd (exact locality unknown), 08-09-1940, *Bond 512* (NBG); *ibid.*, 15 m, 12-09-1931, *Levyns 3212* (BOL); Melkbosch Rd (exact locality unknown), 18-10-1941, *Compton 12030* (NBG); Malmesbury Dist., Cape Town–Malmesbury Rd (exact locality unknown), 11-09-1973, *Montgomery 545* (NBG); Darling Dist., (–AD), 25-09-1927, *Lewis Grant 3411* (PRE); Darling Flats, (–AD), 10-10-1949, *Malherbe s.n.* (NBG); Darling, (–AD), 20-09-1956, *Stokoe SAM 69982* (SAM); Between Mamre Rd and Malmesbury, sandy flats, 300 m, (–AD),13-09-1958, *Levyns 10861* (BOL); Malmesbury, Springfontein, off Mamre Rd, (–CB), 22-01-1971, *Axelson 380* (NBG); Cape Peninsula, Kenilworth Race Course, (–CD), 3-09-1946, *Barker 4112* (NBG); *ibid.*, in centre of course, 12-09-1989, *Beyers 136* (BOL, K, MO, NBG, PRE, S); *ibid.*, 02-11-1990 *Beyers 196a* (NBG); *ibid.*, in sandy flats near Claremont, Sept. 1877, *Bolus 2923* (BOL); *ibid.*, 1877, *Bolus 2923b* (BOL); *ibid.*, 26-01-1968, *Esterhuysen 31879a* (BOL); *ibid.*, Sept. 1947 *Lewis 2727* (SAM); Camps Bay, (–CD), *Marloth 13637* (PRE); sandy flats E of Mowbray, (–CD), 12-10-1913, *Pillans 2135* (BOL); Vygeskraal, (–CD), 25-12-1895, *Wolley Dod 482* (BOL); flats near Rondebosch,(–CD), 23-12-1895, *Wolley Dod 664* (BOL); between Koeberg Rd and Melkbosch Strand, (–DA), 06-10-1934, *Acocks 3314* (S); Malmesbury Dist., Morewag farm, W of Paardeberg, (–DA), 05-09-1978, *Boucher 4570* (NBG, PRE); Malmesbury Dist., Kalbaskraal (–DA), 05-11-1961, *Ihlenfeldt 1493* (PRE); *ibid.*, 120 m, 29-09-1958, *Werdermann & Oberdieck 310* (PRE); corner of Mamre and Melkbosch Rd (–DA), 06-09-1938, *Lewis SAM 53002* (SAM); Malmesbury Div., National Rd, Cape Town–Malmesbury, 15 miles from C.T., (–DA), 22-11-1965, *Mattatia 39* (BOL); Malmesbury Rd, near turnoff to Melkbosch Strand, 30 m, (–DA/DC), Nov. 1962, *Levyns 11385* (BOL); between Bottelary Rd and Main line, (–DC), Feb. 1932, *Acocks 94* (S); Kraaifontein, (–DC), 04-10-1947, *Barker 4820* (NBG); Brackenfel, (–DC), 14-12-1940, *Bond 716* (NBG); Cape, Doornhoogde, Cape Flats (–DC), Aug., *Ecklon & Zeyher 3744* (Z), as *Ecklon & Zeyher 78.8* (S, Z), as *Zeyher [78.8] PRE 49111* (PRE); Bosmansdam, in sand, (–DC), 27-10-1965, *Esterhuysen 31330a* (BOL); Wolwefontein S of Kraaifontein, dry sandy flats choked by Acacia, 115 m, (–DC), 22-03-1971, *Oliver 3303* (NBG); Pniel, sandy slopes at foot of Groot Drakenstein Mtns, (–DD), 29-12-1954, *Esterhuysen 24034* (BOL); Paarl Dist., Groot Drakenstein, (–DD), 28-11-1934, *Compton 4838* (NBG); *ibid.*, Devils Tooth, 330–500 m, 12-12-1943, *Wasserfall 746* (NBG); sandy flats near Joostenberg, between Durbanville and Paarl, (–DD), 11-10-1949, *Esterhuysen 16015* (BOL); N slopes of Joostenberg, (–DD), Aug. 1929, *Pillans BOL 49961* (BOL); Bellevue farm, Bottelary Rd, W of Koelenhof, ±115 m, (–DD), 30-09-1975, *Thompson 2625* (NBG).

—3418 (Simonstown): Cape Peninsula, on flats near Tokai, 30 m, (–AB), Aug. 1880, *Bolus 4592* (BOL, PRE, Z); Tokai Flats, (–AB), 01-09-1916, *Foley 8* (NBG, PRE); Wynberg (111, E, b), below 30 m, (–AB), 03-08-1926, *Drège s. n.* (P); flats NE. of Steenberg, (–AB), 30-07-1918, *Pillans 3613* (BOL); Wynberg, Sanddowns, (–AB), 07-08-1846, *Prior PRE 49116* (PRE); Constantia, Bergvliet Farm, flats near small Gethyllis camp, (–AB), 23-08-1917, *Purcell SAM 90784* (SAM); *ibid.*, flats near pump, 25-08-1917, *Purcell SAM 90785* (SAM); Wynberg, old Pollsmore race track, 30 m, (–AB), 09-02-1967, *Rourke 725* (NBG); Wynberg, (–AB), Nov. 1898, *Schimper s.n.* (Z); *ibid.*, Flats, 10-08-1883, *Wilms 3592* (Z); *ibid.*, September, *Zeyher 1485* (GRA); near Princess Vley, (–BA), Nov. 1892, *MacOwan 3061* (GRA); Princess Vley, 30 m, (–BA), Feb. 1896, *MacOwan HAA 1637* (SAM, Z); Hottentots Holland, (–BB), *Zeyher s.n.* (S). Grid ref. unknown: Cape Peninsula, *Bauer 96* (PRE); Cape, in sandy flat area, Dec., *Ecklon 362* (S); Cape Flats (exact locality unknown), *Ecklon s. n.* (S); *ibid.*, *Krauss 1835* (PRE); *ibid.*, 17-09-1918, *Moss 4005* (Z); *ibid.*, *MacOwan SAM 1459* (SAM); *ibid.*, Oct., *Zeyher 1485* (BOL, SAM, K); Cape, sandy flats, *Pappe STEU 14344* (NBG); near Cape Town, 1847, *Prior PRE 49128* (PRE); Cape Peninsula, Flats?, 1–166 m, 1886, *Thode STEU 9364* (NBG). Without locality: Oct., *Pappe SAM 19795* (SAM); 1847, *Prior PRE 49118* (PRE).

2. **Lachnaea grandiflora** *(L.f.) Baill.* in Natural history of plants 6: 109, t. 77 (1880); Beyers: 45 (1997). *Passerina grandiflora* L.f., Supplementum plantarum: 226 (1782); Curtis: t. 292 (1795); Willd.: 432 (1799), excluding synonym *P. linoides* Thunb.; Poir.: 44 (1804); Wikstr.: 345 (1818). *Cryptadenia grandiflora* (L.f.) Meisn. in Linnaea: 405 (1840); Meisn.: 552 (1843); Meisn.: 573 (1857); Gilg: 234, t. 83, f. e (1894); C.H.Wright: 16 (1915); Levyns: 601 (1950). Type: *herb. LINN 504.13* (LINN, lecto. here designated, —NBG, photocopy!).

Cryptadenia grandiflora (L.f.) Meisn. var. *latifolia* Meisn. in A. P. de Candolle, Prodromus systematis naturalis regni vegetabilis: 573 (1857); C.H.Wright: 16 (1915). Type: specimen without collector and locality in herb. DC [possibly in G-DC], fide Meisner – not seen.

Cryptadenia breviflora Meisn. Linnaea 14: 406 (1840); Meisn. 14: 573 (1857); C.H.Wright: 17 (1915). Syntypes: In single, sandy island in Berg River, alt 400 ft., (111. E. b), *Drège s.n.* (not yet located); *Passerina uniflora* Herb. Lam. ex parte fide Meisn. (not seen); icon. Burm. Rariorum africanarum plantarum:131, t. 48, f. 2 (1739); Table Mountain, *Ecklon 360* (S, lecto.! here designated; K!, NBG!, PRE!, isolecto.).

Note: Unfortunately the sheet from Meisner's Herbarium (NY) with notes written by him has two different collections of Ecklon without stating the collection number. The sheet from S is chosen as the lectotype as Meisner communicated with Sonder as stated on the sheet in NY and most likely this specimen is from Sonder's Herbarium, which is now incorporated in S.

Calysericos canaliculata Eckl. & Zeyh. ex Drège—*nom. nud.* Linnaea 20: 210 (1847b) in synonymy.

Calysericos grandiflora Eckl. & Zeyh. ex Meisn.—*nom. nud.* A.P. de Candolle, Prodromus systematis naturalis regni vegetabilis 14: 573 (1857) in synonymy.

Calysericos parviflora Eckl. & Zeyh. ex Meisn.—*nom. nud.* A.P. de Candolle, Prodromus systematis naturalis regni vegetabilis 14: 574 (1857) in synonymy.

Calysericos subulata Eckl. & Zeyh. ex Meisn.—*nom. nud.* A.P. de Candolle, Prodromus systematis naturalis regni vegetabilis 14: 574 (1857) in synonymy.

Calysericos tabularis Eckl. & Zeyh. ex Meisn.—*nom. nud.* A.P. de Candolle, Prodromus systematis naturalis regni vegetabilis 14: 574 (1857) in synonymy.

Passerina campanulata E.Mey. ex Meisn.—*nom. nud.* in Linnaea 14: 407 (1840) in synonymy.

Passerina uniflora L. var *alba* P.J. Bergius Descriptiones plantarum ex Capite Bonae Spei: 129 (1767); Poir.: 42 (1804). Type: Burm. Rariorum africanarum plantarum:12*3*, t. 46, f. 1 (1739) (lecto.! here designated).

Note: Bergius also refers to Herm. Afr. 23 in the protologue. This is only a literature reference as no specimen was found in Vol.4-1 (Burman 1737) which does contain some South African material, matching the Hermann polynomial as cited by Bergius (pers. comm. S. Cafferty). According to Cafferty: 'Herm. afr'. refers to an appendix by Paul Hermannn, Cat. Pl. Afr., in Burman's Thesaurus Zeylanica (1737), where the cited polynomial is listed on page 23.

Passerina uniflora var. *latifolia* Burm.f., Flora indica:12 (1768). Type: Burm. Rariorum africanarum plantarum:131, t. 48, f. 2 (1739) (icono.!).

Thymelaea foliis imbricatis oblongis, floribus serieis, ramosa Burm. Rariorum africanarum plantarum: 123, t.46, f. 1 (1739).

Thymelaea foliis imbricatis angustioribus, floribus serieis, spicata Burm. Rariorum africanarum plantarum: 123, t.46, f. 2 (1739).

Thymelaea foliis triquetris, angustis, cruciatim oppositis, flore sericeo Burm. Rariorum africanarum plantarum: 131, t. 48, f. 2 (1739).

Erect or occasionally straggling, moderately to much-branched shrub 0.2–0.6–(1.0) m tall, multistemmed at base; resprouter. *Branches* ascending to decumbent, slender to moderately thick, flexuose to semi-riged, ridged below the leaf bases, usually adpressed puberulent, occasionally sparsely hairy, leafy, later glabrescent and naked with prominent leaf scars. *Leaves* decussate, subadpressed to ascending, ± imbricate or scattered, internodes quarter to one and a half length of leaves, distal two pairs subverticillate, sessile, epistomatic, narrowly elliptic to elliptic, narrowly ovate or narrowly obovate, 2.2–11.5 × 0.8–3.0 mm, coriaceous, glabrous, adaxially obtusely concave or concave, enervate or faintly mid-veined, dull, ± white-punctate, abaxially convex, occasionally nervate, subkeeled or only subkeeled in upper half, glossy, smooth to rugose, sometimes upper leaves below inflorescence with a reddish brown tinge, apex acute, mucronulate or mucronate, base obtuse or rounded, margin membranous, narrow to broad, when broad usually conspicuously corrugated (with transverse folds). *Inflorescence* terminal, one-flowered. *Flowers* sessile, subactinomorphic, creamy white, white with a pink tinge, pinkish mauve or pink, unscented. *Hypanthium* 5.0–14.0 mm long, circumscissile a fifth to a third from base, upper portion narrowly obconical to obconical, basal portion narrowly ellipsoid to ellipsoid, occasionally widely obovoid, sericeous outside, trichomes of base and upper portion acicular, upper portion within adpressed hairy from the scales downwards, glabrous or sparsely hairy above, basal portion within adpressed hairy in upper third or upper half, glabrous below. *Sepals* ascending to spreading, subequal (two inner ones slightly smaller than outer two), elliptic, obovate or occasionally ovate, 5.2–14.5 × 3.0–8.0 mm, apex subacute to obtuse, abaxially sericeous, adaxially usually glabrous, occasionally glabrescent. *Stamens* of outer, antisepalous whorl exserted, adnate to upper portion of the hypanthium and becoming free at the base to a fifth-way up sepals, inner, antipetalous whorl semi-exserted or included, occasionally exserted, adnate to upper hypanthium and becoming free at rim to a third-way down the hypanthium; filaments filiform, 0.3–2.2 mm long; anthers narrowly ellipsoid to ellipsoid, 1.0–2.6 mm long, abaxially without broad connective tissue. *Scales* enclosed, inserted a sixth to a third-way, occasionally half-way up from circumscission zone on upper portion of hypanthium, semiterete, abaxially adnate to hypanthium, narrowly elliptic or oblong in outline, 0.4–1.2 mm long, glabrous, yellow in fresh state. *Ovary* ellipsoid, 1.0–2.2 mm long, glabrous. *Style* linear-obconical, 5.2–11.5 mm long, glabrous, occasionally glabrescent. *Stigma* capitate, elongate-papillate (Figure 7.3).

Distribution, ecology and variation

Lachnaea grandiflora occurs on sandy flats and sandy areas on lower mountain slopes from Swartboskraal in the Clanwilliam District south and southeast to the Cape Peninsula, Citrusdal, Tulbagh, Worcester and Bredasdorp, at altitudes between 15 and 1000 m (Figure 7.4). One isolated record from Buffelsberg in the Kammanassie Mountains in the Little Karoo, at altitude of 1660 m, (*Viviers & Vlok 30* NBG) appears out of place and needs to be investigated. This sheet could possibly have an incorrect label.

Two intergrading morphs, based on the leaves, can be discerned in this species. Form A with leaves narrowly elliptic to elliptic, narrowly ovate or narrowly obovate, abaxially usually rugose and with a broad membranous margin with transverse corrugations or at least the distal two pairs of leaves below the inflorescence with broad, membranous, corrugated margins. In form B the leaves are narrowly ovate to narrowly obovate, some times almost linear elliptic, with a very narrow, smooth membranous margin. Form A occurs predominantly from Malmesbury to the Cape Peninsula and eastwards to Houhoek.

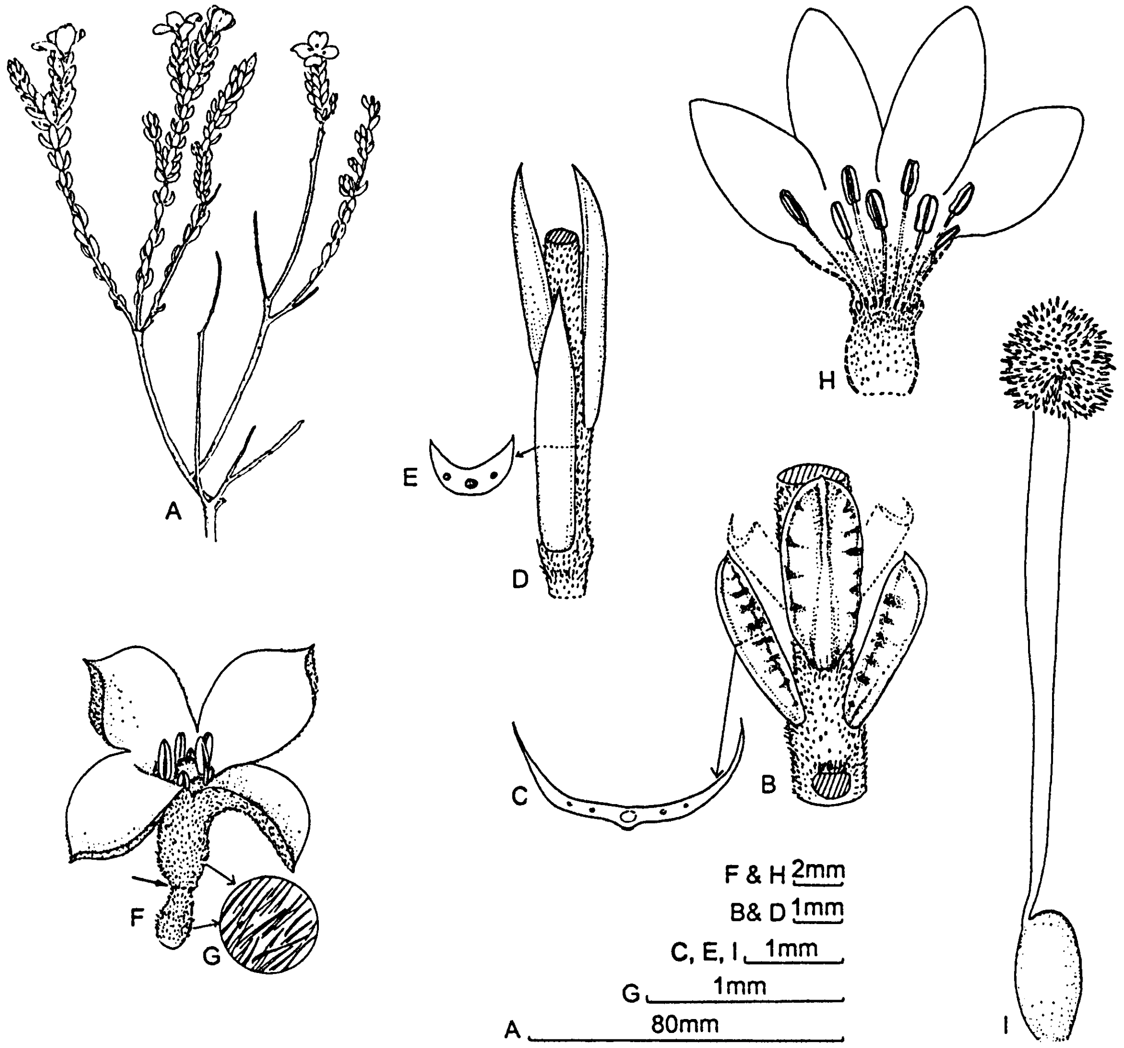

FIGURE 7.3—*Lachnaea grandiflora*. A, portion of plant; B & D, branches with leaves (enlarged); C & E, leaves (cross section); F, flower, note circumscission zone (arrowed); G, acicular trichomes on hypanthium; H, flower split longitudinally with gynoecium removed; I, gynoecium.A–C, F–I, *Beyers 129* (NBG); D,E, *Hansford 86* (NBG).

In the Bredasdorp area the leaves of at least the distal two leaf pairs below the inflorescence have broad membranous margins which are either smooth or faintly corrugated. Form B occurs from Swartboskraal in Clanwilliam District in the north, south-east through Citrusdal to Worcester. The narrow leaved-form appears to occur in drier conditions. Between these two forms there is a continuum of variation with regard to the width of the membranous margin and the surface of the leaves which makes a reliable subdivision of this species impossible. Flowering has been recorded in all the months except July.

Conservation status:Vulnerable (VU A1c). Most of the sandy flats populations have disappeared.

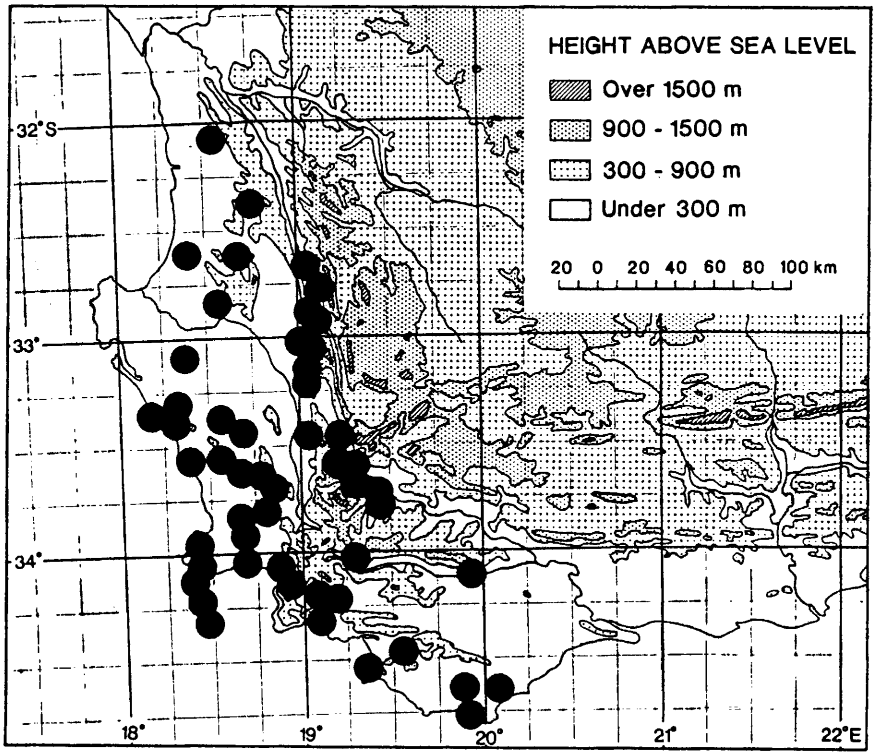

FIGURE 7.4—Known distribution of *Lachnaea grandiflora*.

Diagnostic characters and relationships

Lachnaea grandiflora is closely related to *L. uniflora*. Both have a similar inflorescence and floral structure. The narrow-leaved form of *L. grandiflora* has in the past been confused with *L. uniflora*. *L. grandiflora* is multi-stemmed at base, resprouting after a fire whereas in *L. uniflora* two distinct forms have been identified, namely a single-stemmed reseeder and a multistemmed resprouter. Although the hypanthium of both species is sericeous on the outside the trichomes of the basal portion of the hypanthium in *L. uniflora* are blunt (obtuse), whereas those in *L. grandiflora* are acicular, similar to those on the upper hypanthium.

Specimens examined

WESTERN CAPE.—3218 (Clanwilliam): mountain slopes Piquetberg (exact locality unknown), Oct. 1892, *Bolus PRE 49112* (PRE); Clanwilliam Div., mountain slopes above Olifants River Valley at Keerom, W aspect (exact locality unknown), 04-12-1950, *Esterhuysen 17924* (BOL, NBG); Klipfonteinkoppe, Pankop Flats near vlei, sandy ridge near pan, 430 m, (–BA), 09-02-1978, *Boucher 3622* (NBG); Piquetberg (III, E, a), 165 m, (–BC/DA), 17-11-1828, *Drège s. n.* (P); Clanwilliam Dist., Olifants River Mtns, Swartboskraal, deep sand, (–BD), 10-10-1984, *Bean & Viviers 1485* (BOL); Piquetberg Dist., Klein Klipfontein, Coastal Fynbos of white sand, ± 15 m, (–CB), 19 11-1970, *Acocks 24455* (NBG, PRE); Piquetberg Dist., Papkuil Valley, (–DA), 22-09-1940, *Compton 9508* (NBG); Piketberg, (–DA/DD) *Edwards BOL 49955* (BOL); in hills between Pretorskloof and Pikenierskloof, 665 m, (–DB), *Drège* [*uniflora e*] (K); Piketberg Div., 2–3 miles S of Sauer, (–DC),15-09-1953, *Lewis 3967* (SAM), *Lewis SAM 66773* (NBG).
—3219 (Wuppertal): Warm Baths, Olifants River Valley, (–CA), Oct. 1915, *Engcla PRE 49130* (PRE); Clanwilliam Div., Elandskloof, W end, (–CA), 20-12-1940, *Esterhuysen 4164* (BOL); Groot Winterhoek Mtn Catchment Area, Swartvlei, NW of Perdekop, (–CA), 14-10-1985, *Rheeder 141* (NBG); Olifants River Valley, foothills of Cold Bokkeveld Mtns, opposite Warm Baths, (–CA), 26-09-1911, *Stephens 7265* (BOL); Clanwilliam Dist., Cardouw Pass, 1000 m, (–CC), 04-11-1951, *Martin 910* (NBG); Clanwilliam Div., Grasruggens Moutains, middle E slopes, (–CC), 26-11-1938, *Pillans 8789* (BOL); Olifants River Valley, Grootfontein, SE of Grasruggens, sandy N slope 465 m, (–CC), 29-09-1972 *Thompson 1490* (NBG); Porterville, Olifants River Mtns, Grasruggens, ± 730 m, (–CC), 14-09-1982, *Van Zyl 3110* (NBG); Porterville Dist., Grootfontein, close to Ratel River, (–CC), 17-09-1983, *Van Zyl 3534* (NBG).
—3318 (Cape Town): Paarl Div., Belgravia, Paarl Rd (exact locality unknown), 04-12-1930, *De Villiers BOL 49949* (BOL); Cape Town-Malmesbury Road (exact locality unknown), 18-12-1972, *Montgomery 278* (NBG); Cape Town Dist., Melkbosch Road (exact locality unknown), 18-10-1941, *Olivier NBG 52528* (NBG); Paarl district (exact locality unknown), *Smith s.n.* (NBG); Malmesbury Div., vicinity of Hopefield, (–AB), Dec. 1885, *Bachmann 965* (Z); Malmesbury Dist., near Hopefield, (–AB), 10-12-1946, *Compton 18923* (NBG); *ibid.*, *Esterhuysen 2450* (BOL); *ibid.*, *Leighton 2450* (BOL); Hopefield, (–AB), Oct. 1912, *Pattison BOL 13394* (BOL); *ibid.*, in sand, Oct. 1930, *Van Ryswyk STEU 11627* (NBG); Malmesbury Dist., Ysterfontein, (–AC), 18-12-1938, *Wall s.n.* (S); Jakkalsfontein, sand, slight drainage line, 50 m, (–AD), 06-02-1978, *Boucher 3566* (NBG); about 7 miles from Darling on Yzerfontein Rd., (–AD), 23-09-1950, *Maguire 452* (NBG); Malmesbury Dist., Darling Flora Reserve, (–AD),13-11-1956, *Rycroft 2012* (NBG); Malmesbury Dist., Mamre Road, (–BC), 12-10-1940, *Compton 9809* (NBG); *ibid.*, 18-10-1941, *Olivier NBG 52527* (NBG); Malmesbury, opposite Abbotsdale, (–BC), 14-11-1979, *Goldblatt 5114* (PRE, S); Mamre,

1km from intersection of Mamre, Melkbosch Rd & Silwerstroom Rd, (–CB), 08-03-1989, *Beyers 129* (NBG); Malmesbury Dist., near Bok Point, (–CB),15-09-1940, *Compton 9403* (NBG); Malmesbury Div., near Bokbaai, (–CB), 15-09-1940, *Esterhuysen 5120* (BOL); Cape Peninsula, Kenilworth Race Course, (-CD), 01-11-1990, *Beyers 196* (NBG); *ibid*., 19-02-1970, *Esterhuysen 32392* (BOL); *ibid*., 06-11-1973, *Esterhuysen 33326* (BOL); Cape Peninsula, Camps Bay (–CD), Jan., *Ecklon & Zeyher 69.1* (S, Z); Cape Peninsula, Table Mtn, (–CD), Nov., *Ecklon 360* (K, NBG, S); *ibid*., 03-01-1898, *Froembling 603* (NBG, PRE); *ibid*., *Wahlberg s.n.* (S); Cape Peninsula, Devil's Peak, (–CD), 1875–1880, *Rehmann 1149* (Z); Cape Peninsula, flats near Claremont, (–CD), 16-12-1891, *Schlechter 98* (Z); Malmesbury Dist., near Pella, Burgers Post Farm, 210 m, (–DA), 27-03-1979, *Boucher & Shepherd 4282* (NBG, PRE); *ibid*., ± 65 m, 14-11-1979, *Boucher & Shepherd 4902* (NBG, PRE); 1km N of Pella Mission Station near Mamre, ± 330 m, (-DA), 03-06-1975, *Boucher 2755 (NBG);* 21 st mile-stone to Mamre, (–DA), 26-01-1951, *Middlemost 1659* (NBG); *ibid*., *Middlemost 1660* (NBG); Malmesbury Dist., Kalbaskraal; (–DA), 14-11-1963, *Van der Merwe 1618* (NBG, PRE); *ibid*., 120 m, 29-09-1958, *Werdermann & Oberdieck 307* (PRE); Paarl Dist., Modderkloof, W side of Paardeberg, 500m, (–DB), 14-04-1981, *Fellingham 4* (NBG); in hills near Paarl, 100 m, (–DB), 16-11-1896, *Schlechter 9209* (PRE); Agter Paarl, Bulelwa, slight S slope, (–DB), 24-11-1983, *Van Zyl 3584* (NBG); Bellville, Joostenberg Farm, sandy flats, (–DC), 18-10-1961, *Barker 9606* (NBG, S); Penhill, Eersterivier, 45 m, (–DC), 20-11-1989, *Beyers 168* (K, NBG, PRE); *ibid*., 19-05-1979, *Raitt 372* (NBG); Brackenfel, (–DC), 14-12-1940, *Compton 10121* (NBG); Bosmansdam, (–DC), 27-10-1956, *Esterhuysen 31322a* (BOL); Cape Flats, Kraaifontein, North Pine Development Area, (–DC), 05-01-1979, *Low 792* (NBG); 0,5 mile along Kraaifontein Road from Bottelary Road, 100 m, (–DC), 22-03-1971, *Oliver 3308* (NBG, PRE); Annandale, (–DC), 24-04-1903, *Rautanen s.n.* (Z); *ibid*., 18-04-1903, *Rautanen s.n.* (Z); Bellville, (–DC), 30-10-1929, *Rogers 17700* (Z); Stellenbosch Dist., between Kraaifontein and Bottelary Hills, 66 m, (–DC), 01-02-1968, *Rourke 1026* (NBG); Beecroft Farm near Kraaifontein, (–DC), 09-11-1949, *Wilman 958* (BOL); Cape, Doornhoogte, Cape Flats, (–DC), Oct., *Zeyher 3744* (S); Ysterplaat, (–DC), Oct., *Zeyher 4803* (BOL); Stellenbosch, (–DD), 05-11-1943, *Compton 15274* (BOL, NBG); Agter Paarl Rd near Klapmuts, (–DD), 24-09-1951, *Esterhuysen 20430* (BOL); Klapmuts, (–DD), 1875–1880, *Rehmann s.n.*(Z). —3319 (Worcester): near Worcester (exact locality unknown), 16-10-1929, *Bolus L. BOL 49958* (BOL); Worcester Dist., between Worcester and Villiersdorp (exact locality unknown), 01-10-1951, *Compton 22916* (NBG); Worcester Div., between Franschhoek and Villiersdorp (exact locality unknown), Oct. 1951, *Lewis 3966* (SAM); Tulbagh Dist., Roodezandsberg, lower E slopes just S of Platberg; 460 m, (–AA), 22-10-1994, *Beyers 250* (BOL, K, NBG, PRE); Porterville, near farm De Tronk, flats between Twenty-four Rivers Mtn and Groot Kliphuis River, 830 m, (–AA), 10-10-1969, *Boucher & Kruger 7* (NBG); Piquetberg Dist., 3 km E of Porterville, W slope of mountain range, (–AA), 05-11-1956, *Dahlgren & Peterson 1060* (NBG); Piketberg Dist., Twenty-four Rivers Mtn, slopes overlooking Porterville, ± 665 m, (–AA), 17-12-1962, *Esterhuysen 29955* (BOL, NBG); Saron, (–AA), 22-09-1936, *Lewis 22020* (BOL); slopes of Great Winterhoek Mtns near Saron, (–AA), Nov. 1941, *Stokoe 8227* (BOL); Tulbagh Div., De Hoek Estate near Saron, (–AA), Nov. 1941, *Stokoe SAM 58624* (SAM); Wellington Dist; Elandsberg Private Nature Reserve, (–AC), 29-09-1994, *Beyers 241* (NBG); *ibid*., restioid flats between Elandsberg and fields, tortoise reseve, 70 m, 04-10-1994, *Beyers 242* (BOL, K, MO, NBG, NY, PRE, S, Z); Wolseley, Romansrivier, geometric tortoise reserve; (–AC), 21-10-1996, *Hansford 86* (NBG); *ibid*., 250 m, 07-11-1996, *Hansford s.n.* (BOL, K, NBG, PRE); Romansrivier, (–

AC), 09-11-1946, *Leighton 2178* (BOL, NY); Breede River Valley, near Bain's Kloof, 65 m, (–CA), Oct. 1873, *Bolus 2923 sub BOL 49956* (BOL); Worcester Dist, Botha, (–CA), 09-11-1846, *Compton 18706* (NBG); Worcester, Bothashalt, in sand along main road to Ceres, (–CB), 04-10-1960, *Van Breda 1002* (PRE); Worcester Dist, Brandvlei Co-op Winery, (–CB), 28-10-1960, *Van Rensburg 448* (K, NBG, PRE, Z); Goudini, farm Wyzersdrift, (–CB), 26-10-1979, *Walters 1890* (NBG); Worcester area, Moordkuil, roadside near greater Brandvlei dam wall, (–CD), 24-10-1976, *Boucher 3242* (K, NBG): Villiersdorp, road to High Noon, Elandskloof, sandy slope next to road, (–CD), 19-10-1977, *Osrin 22* (NBG); Worcester Div., flats near Sandhills, (–DA), 17-05-1896, *Wolley Dod 1078* (BOL).

—3322 (Oudtshoorn): Kammanassie Mtns, Buffelsberg 1665m, (–DB), 29-01-1983, *Viviers & Vlok 30* (NBG) (dubious locality).

—3418 (Simonstown): Cape Peninsula, flats (exact locality unknown), Oct. 1832, *Zeyher SAM 19794* (SAM); Cape Peninsula, Fish Hoek Mtns, (–AB), 01-11-1944, *Barker 3250* (NBG); *ibid.*, Klawer Valley, Klawersvlei, 320 m, 13-11-1989, *Beyers 151* (NBG, PRE); *ibid.*, Cape of Good Hope Nature Reserve, Klaasjagers, 40 m, 13-11-1989, *Beyers 155* (NBG); *ibid.*, Muizenberg, 330 m, Jan. 1881, *Bolus 4635* (BOL, Z); *ibid.*, Modderdam, 10-10-1945, *Compton 17458* (NBG); *ibid.*, E-side of Table Mtn at Constantia, Aug., *Zeyher PRE 49123* (PRE), *Ecklon & Zeyher 85.8* (S, Z;); *ibid.*, Kommetjie near Simonstown, ± 30 m, 21-11-1897, *Galpin 4494* (K, PRE); *ibid.*, Red Hill above Simonstown, 10-02-1929, *Gillett 3461* (NBG); *ibid.*, between Noordhoek Berg and Plateau above Retreat, 03-03-1929, *Gillett 3571* (NBG); *ibid.*, Kalk Bay Mtn, plateau, on top, 13-04-1974, *Goldblatt 1528* (NBG); *ibid.*, ridge between Fish Hoek and Glencairn, 300 m, 28-10-1956, *Levyns 10619* (BOL); *ibid.*, flats west of Klaasjagersberg, (–AB), Oct. 1945, *Lewis 1573* (SAM); *ibid.*, Modderdam, Dec. 1950, *Martin 7931* (GRA); *ibid.*, Silvermine Forest Reserve, 19-11-1965, *Mattatia 35* (BOL); *ibid.*, Fishhoek, Nov. 1916, *Page PRE 49121* (PRE); *ibid.*, Simonstown Mtn, 13-06-1903, *Pearson 127* (NBG); *ibid.*, sand flats near Kommetjie, 30-11-1924, *Phillips PRE 49122* (PRE), 30-12-1924, *Phillips PRE 59080* (PRE); *ibid.*, Kalk Bay, Jan. 1915, *Rogers 16096* (Z); *ibid.*, Clovelly, Dec. 1924, *Rogers 29853* (Z); *ibid.*, Wynberg, Nov. 1898, *Schimper 660* (Z); Smitswinkel, (–AD), 09-12-1939, *Compton 8108* (NBG, S); near entrance to Cape Point Reserve above Retreat, (–AD), 10-11-1964, *Lavranos 3745* (NBG); Smitswinkels Bay, Cape Point, (–AD), *MacOwan SAM 19796 (*SAM); Miller's Point–Cape Point, sandy heathy places,165–330 m (–AD), Nov. 1886, *Thode STEU 9365* (NBG); Cape Peninsula, near Cape Point turn off in marsh, (–AD), 3-12-1960, *Whellan 1712* (PRE); Faure-Kramat Road, alongside new flyover on farm Zandvliet, ± 5 m, (–BA), 20-11-1970, *Boucher 1426* (NBG); Cape Flats, (–BA), Dec., *Ecklon 361* (K, NY, Z); *ibid.*, 1875–1880, *Rehmann 2218* (Z); Somerset West, Westridge, on public open ground; (–BB), 15-10-1994, *Beyers 248* (NBG); *ibid.*, 25-10-1994, *Beyers 252* (NBG); upper Harmony Flats between Lwandle township and Strand Foam Factory, 30 m, (–BB), 05-01-1978, *Boucher 3446* (NBG); bottom of Sir Lowry's Pass, near Somerset West, (–BB), 10-01-1946, *Clarkson 219* (PRE); Sir Lowry's Pass, foot of pass, (–BB), Nov. 1944, *Lewis 1572* (SAM); *ibid.*, 27-09-1958 *Werdermann & Oberdieck 240* (PRE); Hottentots Holland Mtns, at foot of mountains, (–BB), Feb. 1897, *MacOwan 3182* (SAM); Caledon Dist., Kogelberg Forest Reserve, (–BB), 28-12-1965, *Mattatia 58* (BOL); Somerset West, common on clay, 28-04-1940, *Parker 3495* (BOL, NBG); Strand to Gordons Bay, (–BB), 21-10-1946, *Parker 4133* (BOL. NBG).

—3419 (Caledon): Elim (exact locality unknown), Dec. 1915, *Frowein 1025* (PRE); in hills between Houhoek and Palmiet River, (–AA), Nov. 1879, *Bolus BOL 49944* (BOL); Houhoek, Haasvlakte, sandy flats on crest of ridge, 465 m, (–AA), 23-10-1987, *Boucher 5201* (NBG); *ibid.*, SW corner on boundary with farm De Hoop, 300 m, 28-10-1991, *Boucher s.n.* (NBG); *ibid.*, 19-11-1935, *Hubbard Forest Dept. Herb. 177* (NBG); Kogelberg State Forest, Remhoogte, 200 m, (–AA), 25-10-1984, *Brits 9* (NBG); Houhoek Mtns, ± 330 m, (–AA), 08-11-1897, *Galpin 4493* (PRE); Houhoek, in mountains, 500 m, (–AA), 24-11-1896, *Schlechter 9375* (PRE, S, Z); Riviersonderend Valley, Zeekoeikraal, W. base of Donkerhoekberg, 330 m, (–AB), 23-11-74, *Oliver 5479* (NBG, PRE); Caledon Dist., Highlands, (–AC), 07-11-1942, *Compton 14089* (NBG); Bredasdorp Div., Appelskraal, (–BB), Oct. 1947, *Stokoe 9386* (BOL); Sandy Glen Farm (Koueberg), ± 330 m, (–BC), 22-12-1985, *Forsyth 389* (NBG); Gansbaai, (–CB), Oct. 1947, *Stokoe SAM 62644* (SAM); Bredasdorp Div., vlei on road between The Poort and Vogelvlei, (–DB), *Leighton BOL 21142* (BOL); between Bredasdorp and Elim, sandy flats, 30 m, (–DB), Sept. 1932, *Levyns 4516* (BOL); Bredasdorp, on hill S of farm Bo-Vogelvlei, 70 m, (–DB), 27-09-1989, *Vlok 2179* (K, NBG, PRE, S); Brandfontein, sand dunes along coast, (–DD), 13-10-1951, *Esterhuysen 18990* (BOL).

—3420 (Bredasdorp): Bredasdorp, damp margin of salt pan NW of The Poort, (–CA), 25-09-1933, *Acocks 1757* (S); Bredasdorp, The Poort, (–CA), *Compton 4390* (NBG); *ibid.*, Jan. 1948, *Lewis 3285* (SAM). Grid ref. unknown: Liefde, on hills, below 330 m, Oct., *Drège s.n.* [*uniflora g*], (S); Cape Peninsula, *Harvey 12407* (PRE); Cape of Good Hope, *Grubb* (S); Cape of Good Hope, *Grubb & Thunberg* (SBT); about 20 miles from Malmesbury on the new road, 65 m, Nov. 1962, *Levyns 11390* (BOL); from Cape Town Flower Show, Oct. 1924, *Marloth 6232* (PRE); in ericoid Flats, Oct., *Pappe SAM 19807* (SAM); Cape Town, Sept. 1846, *Prior s.n.* (PRE, Z); Cape, 1773, *Thunberg Herb. Montin* (S). Without locality: *Burchell 163* (K); *Burchell 194* (K); *Ecklon 397* (S).

3. **Lachnaea filicaulis** *(Meisn.) Beyers* in Bothalia 27,1: 45 (1997). *Cryptadenia filicaulis* Meisn. in Linnaea 14: 407 (1840); Drège: 210 (1847b); Meisn.: 574 (1857); C.H.Wright: 17 (1915). Type: Cape, locality unknown, *Drège 7367* (NY, holo.!—fragment in capsule on *Burchell 7540*; P!, iso.).

Gnidia genistaefolia Eckl. & Zeyh. ex Meisn.—*nom. nud.* in A.P.de Candolle, Prodromus systematis naturalis regni vegetabilis 14: 574 (1857) in synonymy.

Erect, moderately branched shrub to 0.4 m tall, multistemmed at base; resprouter. *Branches* erect to flexuous, slender, ridged below the leaf bases, sericeous, leafy, becoming sparsely hairy and naked without prominent leaf scars. *Leaves* decussate, ascending to patent, imbricate to distant, distal two pairs of leaves usually subverticillate, sessile, epistomatic, lanceolate, 3.6–8.0(–12) × 0.6–1.0(–1.5) mm, coriaceous, glabrous, adaxially concave to obtusely concave, smooth, dull, ± white-punctate, abaxially convex, glossy, smooth, apex mucronate or acuminate, base obtuse. *Inflorescence* terminal, one-flowered, but appearing to be axillary when much-reduced, lateral branches comprise only one pair of leaves and a single flower, densely sericeous at floral articulation. *Flowers* sessile, subactinomorphic, cream or pink. *Hypanthium* 3.0–4.5 mm long, circumscissile a third to two-thirds from base, upper portion cup-shaped, basal portion narrowly ellipsoid to ellipsoid or narrowly ovoid to ovoid, sericeous outside, upper portion adpressed puberulent within but barbate above circumscission zone in vicinity of scales, basal portion glabrous within. *Sepals* ascending, subequal, elliptic, ovate, obovate to subrotund, 1.3–3.0 × 1.2–2.0 mm, obtuse, abaxially sericeous, adaxially puberulent to glabrescent. *Stamens* exserted or only outer, antisepalous whorl exserted and inner, antipetalous whorl semi-exserted; antisepalous whorl inserted usually at rim but occasionally a third-way down upper portion of hypanthium, inner, antipetalous whorl inserted third to midway down upper portion of hypanthium; filaments filiform, 0.3–0.9 mm long; anthers widely oblong to widely ellipsoid, 0.5–1.0 mm long, abaxially with broad connective tissue. *Scales* inserted just above circumscission zone immediately below antipetalous stamens, subrotund, 0.3–0.5 mm long, glabrous. *Ovary* ellipsoid, ovoid or obovoid, 1.0–1.6 mm long, usually glabrous but occasionally adpressed hairy near apex. *Style* linear-obconical, 1.4–2.8 mm long, glabrous. *Stigma* conical and papillate (Figure 7.5).

Distribution and ecology

Lachnaea filicaulis occurs on the flats and lower mountain slopes in the southwestern and southern part of the Western Cape from the Palmiet River in the Caledon District eastwards to Riversdale at altitudes below 365 m (Figure 7.6). Flowering has been recorded from August to June.

Conservation status: Vulnerable (VU A1ce). The habitat of this species has been restricted through the effects of human activities and invasion by alien invader plants.

Diagnostic characters and relatonships

Lachnaea filicaulis is distinguished from *L. axillaris* by the upper portion of the hypanthium being cup-shaped without a basal invagination, the hypanthium and sepals being sericeous on the outside and the conical, papillate stigma.

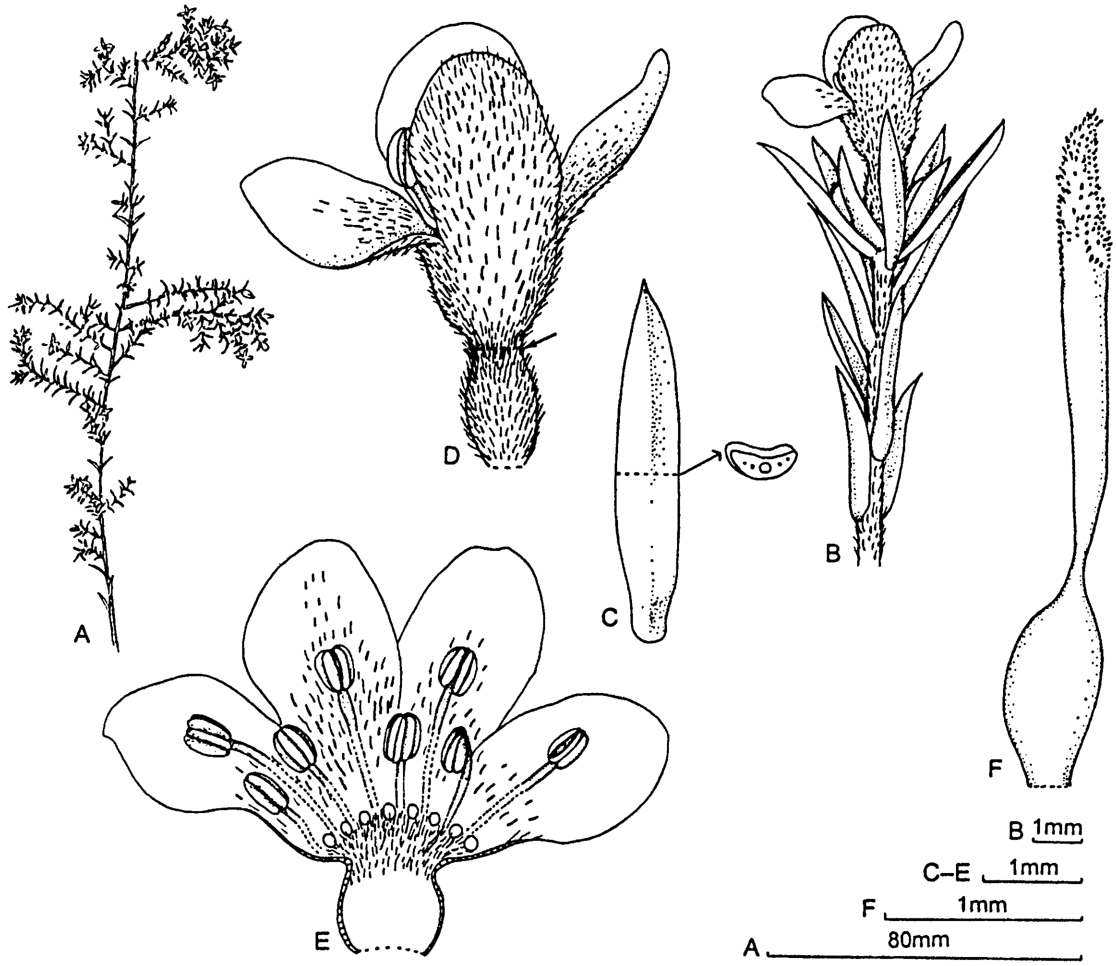

FIGURE 7.5—*Lachnaea filicaulis*, *McDonald 1988* (NBG). A, portion of plant; B, flowering branch; C, leaf (abaxial view and cross section); D, flower, note circumscission zone (arrowed); E, flower split longitudinally with gynoecium removed; F, gynoecium.

Specimens examined

WESTERN CAPE.—3418 (Simonstown): Caledon Dist., Palmiet River, valley near Elgin, (–BB), May 1943, *Stokoe 8982* (BOL); Betty's Bay, across Palmiet River towards Betty's Bay, on right side od road, (–BD), Jan. 1994, *Oakes s.n.* (NBG); Palmiet River mouth, (–BD), May 1943, *Stokoe SAM 58625* (SAM). —3419 (Caledon): Swartberg, (–AB), *Zeyher 3747* (GRA, SAM, NY – capsule); between Hermanus River and Ysterklip, close to road, (–AC), 30-09-1956, *Dahlgren & Peterson 487* (NBG); Palmiet vlakte below mountain, (–AC), Dec. 1948, *De Vos 1120* (NBG); Kleinmond flats on road to Heuningklip, foot of mountain W of Heuningklip, (–AC), 20-02-1949, *De Vos 1230* (NBG); Head of Bot River Lagoon, (–AC), 19-09-1949, *MacNae 1095* (SAM); Kleinmond, near Palmiet River, (–AC), Dec. 1950, *Stokoe SAM 64619* (SAM); Bredasdorp Dist., Stanford, (–AD), 30-12-1940, *Compton 10208* (NBG); beyond Mossel River, slopes above lagoon 10 m, (–AD), 06-01-1954, *Levyns 10051* (BOL); in sandy flats near Vogelgat, 30 m, (–AD), 02-12-

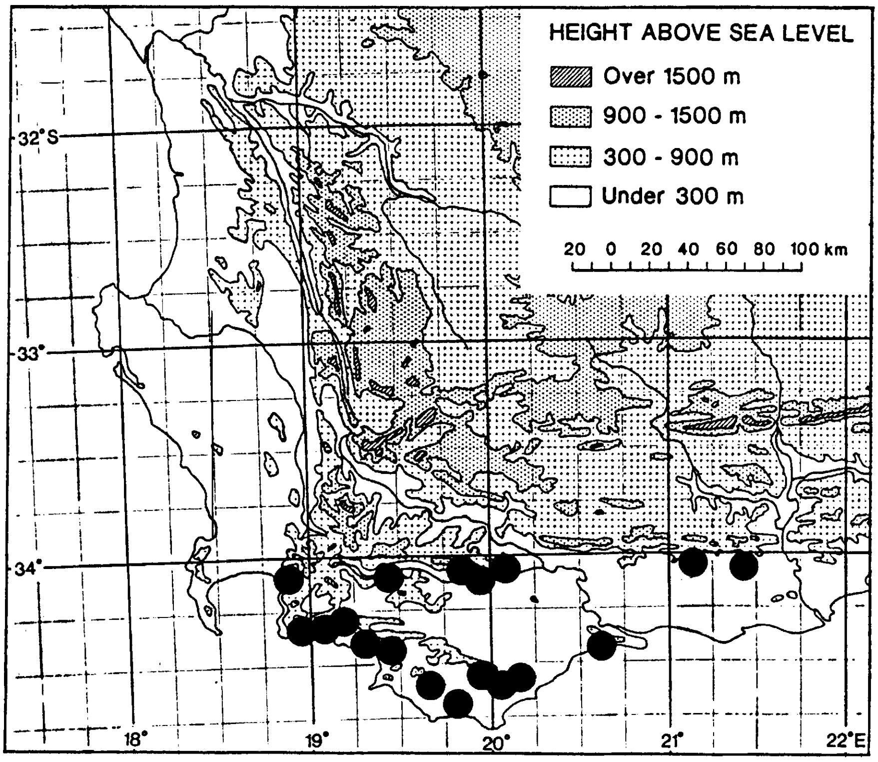

FIGURE 7.6—Known distribution of *Lachnaea filicaulis*.

1896, *Schlechter 9579* (BOL, Z); Hermanus, Coppall Farm, road to Stanford, 6 m, (–AD), 24-09-1991, *Williams 1315* (NBG); Caledon, Kleinriviersberg, 330–1000 m, (–AD/BC), Aug., *Ecklon & Zeyher 58.8.* (K, NY – capsule, S); Riviersonderend Mtns, lower slopes near village, (–BB), 20-11-1955, *Esterhuysen 25079* (BOL); *ibid.*, Olifantskloof, entrance to kloof, dry flats, *Goldblatt 8482* (PRE); *ibid.*, lower slopes N of town, 170 m, 26-01-1991, *Oliver 9803* (K, NBG, PRE); Langeberg, Riviersonderend, Appelskraal, (–BB), Nov. 1848, *Zeyher 3748* (BOL, SAM); Bredasdorp Dist., Pheasantshoek near Viljoenshof, (–DA), 15-09-1976, *Esterhuysen 34370* (BOL, PRE, S); Rietfontein Private Nature Reserve, Melkbosvlei environs, (–DB), 04-02-1981, *Boucher 5071* (NBG); Uitvlugt, S slopes of Bredasdorp Mountain, 115 m, (–DB), 16-03-1978, *Thompson 3789* (NBG, PRE).

—3420 (Bredasdorp): Riviersonderend Mtns, Dasberg near Stormsvlei, (–AA), Oct. 1947, *Stokoe SAM 64618* (SAM); Potberg, 165–660 m, (–BC), 13-11-1962, *Taylor 4356* (NBG); Elias Kraal (Kleinheuwel farm) S of Bredasdorp, (–CA), 19-04-1983, *Albertyn 658* (NBG); National Bontebok Park, (–CA), 25-06-1953, *Brynard 229* (PRE); *ibid.*, 16-04-1950, *Compton 21922* (NBG); *ibid.*, 17-02-1951, *Johnson 11* (NBG); Stomp Bay, (–CA), Oct. 1940, *Esterhuysen 5122* (BOL).

—3421 (Riversdale): Langeberg Mtns, slopes near Riversdale 330 m, (–AA), 30-11-1992, *Schlechter 1904* (BOL); Langeberg Mtns, slopes W of Riversdale, 300 m, (–AB), 30-11-1892, *Schlechter 1906* (BOL, GRA, Z); Langeberg Mtns, De Berg, NE of Riversdale, footslopes of mountain, 365 m, (–AB), 30-10-1989, *McDonald 1989* (K, NBG, PRE). Grid ref. unknown: Riviersonderend Mtns, May 1950, *Stokoe SAM 64617* (NBG, SAM). Without locality: *Burchell 7540* (K, NY); *Drège 7367* (P, NY – capsule).

4. **Lachnaea gracilis** *Meisn.* in Linnaea 14: 421 (1840); Drège: 114 (1843); Meisn.: 579 (1857). Type: Hexrivier, alt. 1000–1500 ft. (IV. A), *Drège s.n.* [*583*] (NY, holo.!; P!, iso.).

Erect, lax, moderately branched shrub to 2 m tall, single-stemmed and branching at base, when grazed tends to have low, compact, decumbent habit; reseeder. *Branches* erect to flexuous, slender, subridged or ridged below the leaf bases, sparsely adpressed hairy, leafy, becoming glabrous and naked without prominent leaf scars. *Leaves* decussate, adpressed to ascending, distant, internodes half to three-quarters as long as leaves, distal two pairs usually subverticillate, sessile, epistomatic, narrowly elliptic to elliptic or narrowly obovate to obovate, (3.1–)3.5–8.3 × 0.8–1.5(–3.0) mm, coriaceous, glabrous, adaxially flat or obtusely concave, smooth, dull, ± white-punctate, abaxially flat or obtusely convex, occasionally subkeeled at apex, glossy or glaucous, smooth, apex acute, acuminate or obtuse, base obtuse. *Inflorescence* terminal, one-flowered, but may appear axillary when much-reduced, lateral branches comprise only one pair of leaves and a solitary flower, sericeous at floral articulation. *Flowers* sessile, subactinomorphic, cream usually turning pink with age. *Hypanthium* 2.4–5.0 mm long, circumscissile midway to three-quarters from base, upper portion cup-shaped occasionally with a basal invagination, basal portion narrowly ellipsoid to ellipsoid or narrowly ovoid to ovoid, sericeous outside, upper portion adpressed puberulent or glabrous within but barbate above circumscission zone in vicinity of scales, basal portion glabrous within, but sometimes adpressed puberulent towards circumscission zone. *Sepals* patent, subequal, ovate to widely ovate, or orbicular to oblate, 1.5–3.0 × 1.5–2.6 mm, obtuse or rounded, abaxially sericeous, adaxially adpressed puberulent or glabrous. *Stamens* exserted or outer, antisepalous whorl exserted and inner, antipetalous whorl subexserted or included, antisepalous whorl inserted at base of sepals, at rim of hypanthium or occasionally third-way down upper portion of hypanthium, antipetalous whorl inserted a third to two-thirds down upper portion of hypanthium; filaments filiform, 0.3–0.9 mm long; anthers widely ellipsoid to depressed spheroid, 0.6–0.9 mm long, abaxially with broad connective tissue. *Scales* inserted just above circumscission zone immediately below antipetalous stamens, subrotund, 0.3–0.6 mm long, glabrous, yellow in fresh state. *Ovary* narrowly ellipsoid, ovoid or obovoid, 0.9–2.8 mm long, glabrous. *Style* linear-obconical, 1.3–2.8 mm long, glabrous. *Stigma* capitate and papillate (Figure 7.7).

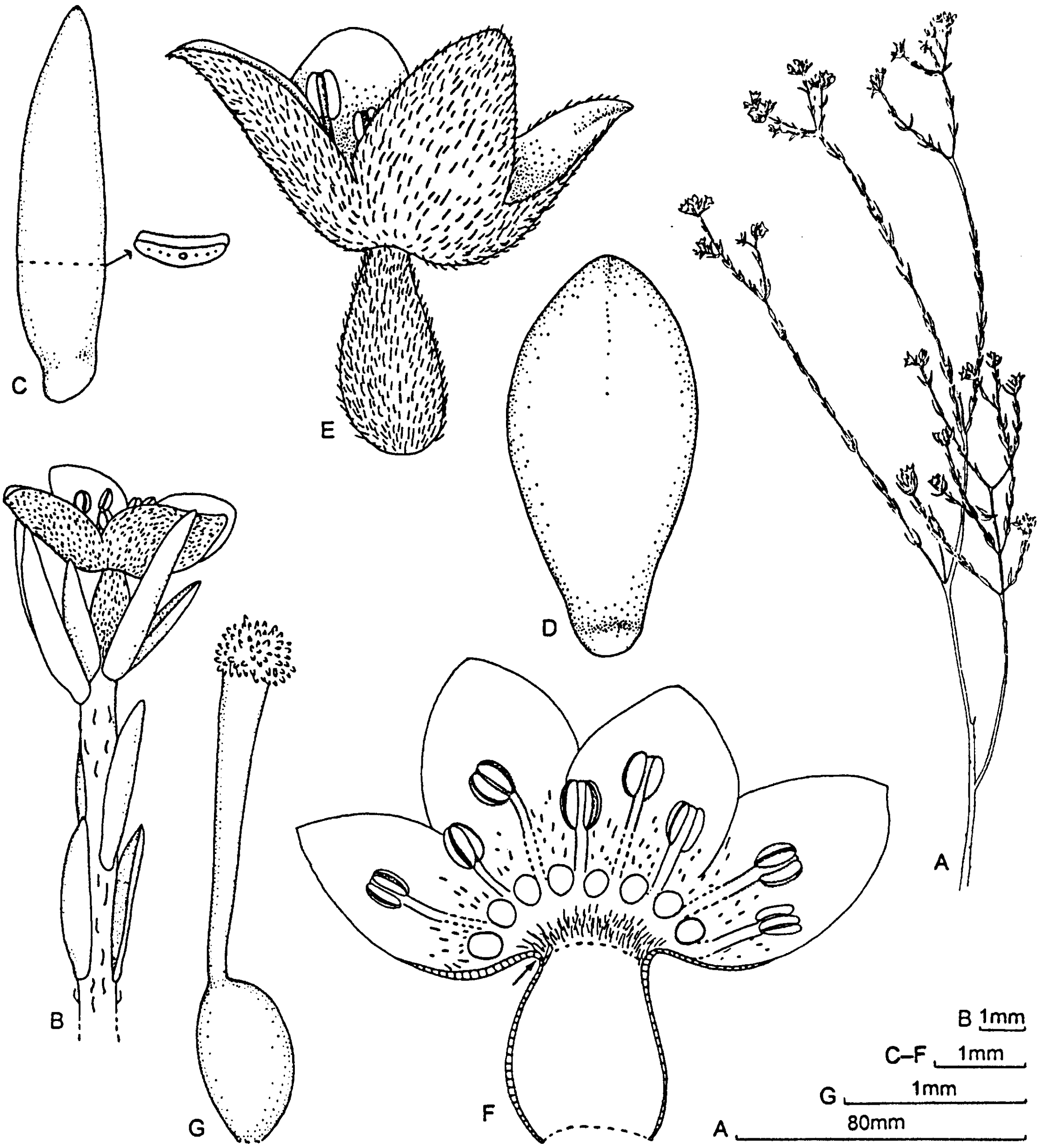

FIGURE 7.7—*Lachnaea gracilis*. A, portion of plant; B, flowering branch; C & D leaves: C, abaxial view and cross section; D, abaxial view; E, flower; F, flower split longitudinally with gynoecium removed, note circumscission zone (arrowed); G, gynoecium. B,C,E–G, *Beyers 254* (NBG); D, *Bean & Viviers 2613* (NBG).

Distribution and ecology

Occurs on sandy flats and mountain slopes in the Ceres, Tulbagh and Worcester Districts at altitudes between 330 and 1660 m (Figure 7.8). Flowering has been recorded in May and from July to January.

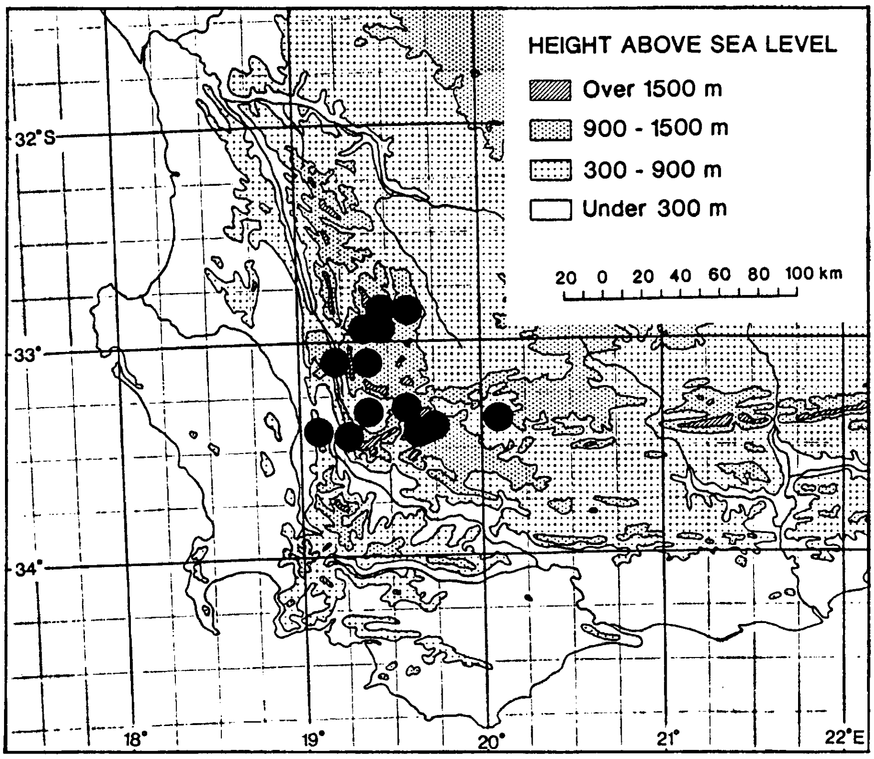

FIGURE 7.8—Known distribution of *Lachnaea gracilis*.

The leaf width of this taxon is variable. There is a gradation from narrowly elliptic or narrowly obovate to elliptic or obovate leaves.The leaves of those from the Katbakkies area are the broadest. With only one such variable, subspecific delimitation has not been considered.

Conservation status: Lower Risk Least Concern (LRlc). Since this species is a reseeder, it could in future through frequent mountain fires become threatened.

Diagnostic characters and relationships

Lachnaea gracilis is distinguished from *L. axillaris* by the hypanthium and sepals being sericeous on the outside and from *L. filicaulis* by the capitate, papillate stigma.

Specimens examined

WESTERN CAPE.—3219 (Wuppertal): Zuurvlakte, E of pass up from Ceres-Clanwilliam Road near turnoff to God's Acre, (–CD), 06-10-1990, *Bean & Viviers 2612* (NBG); Ceres Dist., Katbakkies area, Zuurvlakte, E of summit of pass, in sand, (–CD), 06-10-1990, *Bean & Viviers 2613* (NBG); Rosendal, valley NE of farmstead, N of large dam, sandy flats, 1050 m, (–CD), 10-10-1975, *Oliver 6099* (NBG, PRE); Zwartruggens, Groenfontein, near Stompiesfontein on open sandy flats, 1300 m, (–DC), 02-10-1991, *Bean & Trinder-Smith 2689* (BOL, NBG); Rietrivier on road to Zuurvlak in river valley, in deep sand, (–DC), 08-11-1987, *Bean & Viviers 1973* (NBG); Swartruggens, between Winkelhaaks River and Stompiesfontein, in sand, (–DC), 18-11-1961, *Esterhuysen 29307* (BOL, S); Swartruggens, Stompiesfontein, (–DC), 18-11-1961, *Esterhuysen 29328* (BOL), *Esterhuysen 29328a* (BOL, S); Winkelhaaks River in Swartruggens, near river, 1130 m, (–DC), 28-09-1926, *Levyns 1913* (BOL); Katbakkies Pass, Ceres, 1160 m, (–DC), 15-09-1964, *Taylor 5858* (NBG).

—3319 (Worcester): Visgat, between Schurfteberg and Groot Winterhoek Mtns, (–AA), Oct. 1953, *Stokoe SAM 63185* (SAM); Between Witzenberg and Skurfdeberg, 660–1660 m, (–AA/AB), Dec., *Zeyher 1486* (GRA, K, NY [capsule on *Burchell 7540*], PRE, SAM, Z); Cold Bokkeveld, Wadrif area, junction of 3 main roads near Kleinvlei 960 m, (–AB), 14-11-1993, *Beyers 219* (NBG); *ibid.*, 13-02-1992, *Oliver 10043* (NBG); Cold Bokkeveld, Hartbeeskloof, E end of Sandberg, 1020 m, (–AB), 13-11-1993, *Oliver 10405* (NBG); *ibid.*, S of Bokberg, 970 m, 13-11-1993, *Oliver 10415* (NBG), *Oliver 10416* (NBG); Cold Bokkeveld in sand near Kleinvlei, 1300 m, (–AB), 20-01-1897, *Schlechter 10067* (BOL, PRE, Z); Ceres Dist., Elandskloof, 1160 m, (–AC), 19-12-1944, *Compton 16780* (NBG); Ceres, Schoonvlei (–AD), 24-01-1989, *Beyers 126* (NBG); *ibid.*, 13-10-1989, *Beyers 140a* (NBG); *ibid.*, October 1988, *Cillie s. n.* (NBG); in plain near Ceres, 500 m, (–AD), Jan., *Bolus 9207* (BOL, PRE); *ibid.*, Dec. 1891, *Bolus HNAA 1356* (BOL, SAM, Z); Hex River [between Hex River Mtns and Bokkeveld on mountain flats on stony hills (Drège 1843)], 330–500 m, –AD/BC, *Drège 583* (NY, P); Ceres Div., Baviaansberg, (–BA), 10-12-1956, *Stokoe PRE 49144* (PRE); *ibid.*, 10-01-1956, *Stokoe SAM 69996* (SAM); Hex River near De Doorns, ± 560 m, (–BC), Jan. 1908, *Bolus 13181* (BOL, S); Ceres Div., Valsch Gat Kloof, (–BC), May 1940, *Esterhuysen 1567* (BOL); Hex River valley, near Buffelshoek Kloof, in sand, (–BC), 10-12-1947, *Esterhuysen 14275* (BOL, PRE); Ceres, Matroosberg, near Lakenvlei, 1160 m, (–BC), Jan. 1917, *Phillips 2052* (SAM); Ceres, Bokkerivier, flats, in sand, 930 m, (–BC/BD), Sept. 1924, *Levyns 923* (BOL); Bokkerivier Farms, flats SE of camping site, (–BC/BD), 09-11-1963, *Middlemost 2252* (NBG); *ibid.*, 19-03-1964, *Thompson 3* (NBG).

—3320 (Montagu): Touws River, in sand, 660 m, (–AC), 13-05-1935, *Compton 5140* (BOL, NBG); *ibid.*, opposite railway station, 800 m, Jul. 1903, *Marloth 3224* (BOL, NBG).

5. **Lachnaea pudens** *Beyers* in South African Journal of Botany 64,1:66 (1998a).

Type: Western Cape, 3319 (Worcester): Riviersonderend Mountains, Jonaskop, upper north slopes, –DC, *Beyers 161* (NBG, holo.!; BOL!, K!, NY!, PRE!, iso.).

Erect to decumbent, much branched shrub to 0.6 m tall, single-stemmed at base, branching close to ground; reseeder. *Branches* flexuous, intertwined, moderately thick, ridged below leaf bases, tomentose or tomentose-sericeous, leafy, becoming sparsely hairy and naked with prominent leaf scars; flowering branches declinate. *Leaves* decussate, ascending incurved, imbricate, distal two pairs of leaves inclined, erect or slightly recurved, subverticillate, sessile, elliptic, 3.8–5.7 × 1.0–1.3 mm, subfleshy, glabrous, adaxially flat to obtusely concave, smooth, dull, ± white-punctate, abaxially convex, keeled, glossy, smooth, sometimes with a reddish brown tinge, apex apiculate, base obtuse. *Inflorescence* terminal, one-flowered, but appearing to be axillary when much-reduced, lateral branches comprise only one pair of leaves and a solitary flower. *Flowers* sessile, subactinomorphic, dark red. *Hypanthium* 3.0–4.5 mm long, circumscissile four-fifths from base, upper portion widely cup-shaped with a basal invagination, basal portion pyriform, sericeous outside, upper portion glabrous within but villous above circumscission zone in vicinity of scales, basal portion sparsely hairy within. *Sepals* patent, subequal, widely ovate or widely depressed ovate, 2.0–3.9 × 2.6–3.6 mm, acute or obtuse, abaxially sericeous, adaxially glabrous. *Stamens* exserted, outer, antisepalous whorl adnate to upper portion of hypanthium and becoming free just above base of sepals, inner antipetalous whorl adnate to upper hypanthium and becoming free two-thirds up hypanthium; filaments filiform, 0.3–0.5 mm long; anthers depressed-spheroid, 0.5–0.6 mm long, abaxially with broad connective tissue. *Scales* inserted midway on upper portion of hypanthium below antipetalous stamens, subrotund, 0.3–0.4 mm long, glabrous. *Ovary* ovoid, 1.0–1.3 mm long, glabrous. *Style* linear-obconical, 2.2–2.6 mm long, glabrous. *Stigma* brush-like (Figure 7.9).

Distribution and ecology

Lachnaea pudens occurs on the mountain slopes of Jonaskop near Villiersdorp and on the Riviersonderend Mountains above Greyton and Genadendal, at altitudes between 330 and 1530 m, growing in sandy, stony soils overlying sandstones (Figure 7.10). Flowering has been recorded in February, May, August and from October to December.

Conservation status: Vulnerable (VU D2). This species has a restricted distribution and being a reseeder, is vulnerable to frequent mountain fires.

Diagnostic characters and relationships

Lachnaea pudens is easily distinguished by the terminal, solitary, dark red flowers borne on short branches facing downwards. The floral structure is similar to that of *L. axillaris* Meisn., with the upper portion of the hypanthium cup-shaped and basely invaginated, but the flowers are sericeous on the outside whereas in *L. axillaris* they are glabrous and cream to dark pink.

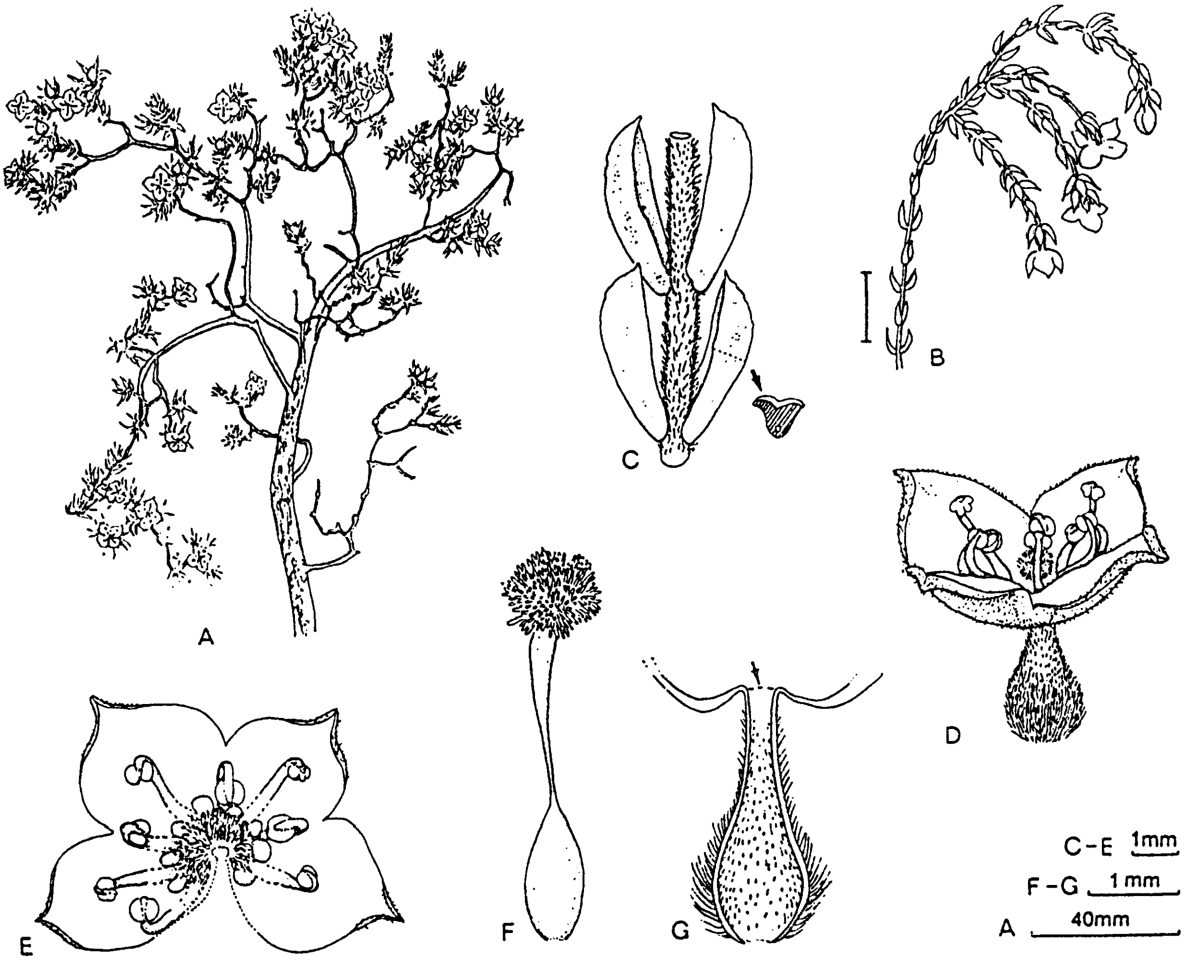

FIGURE 7.9—*Lachnaea pudens*, *Beyers 161* (NBG). A, portion of plant; B, flowering branch; C, branch with leaves and cross section of leaf; D, flower; E, upper portion of flower above circumscission zone; F, gynoecium; G, portion of hypanthium (longitudinal section), illustrating basal invagination of upper portion of hypanthium just above circumscission zone (arrowed). Scale bar: B,

Specimens examined

WESTERN CAPE.—3319 (Worcester): Villiersdorp, Paulsgat area above Kleinfontein, NE slopes SW of Vetkop, 680 m, (–CD), 4-10-1997, *Oliver 10730* (K, PRE, NBG); Riviersonderend Mtns, lower N slopes on Boesmans Pass road, E-facing slopes E of Koenieskloof, 660 m, (–DC), 14-10-1991, *Bean & Viviers 2737* (BOL, K, NBG, PRE); Riviersonderend Mtns, Jonaskop, N slopes, 660 m, (–DC), 19-11-1989,

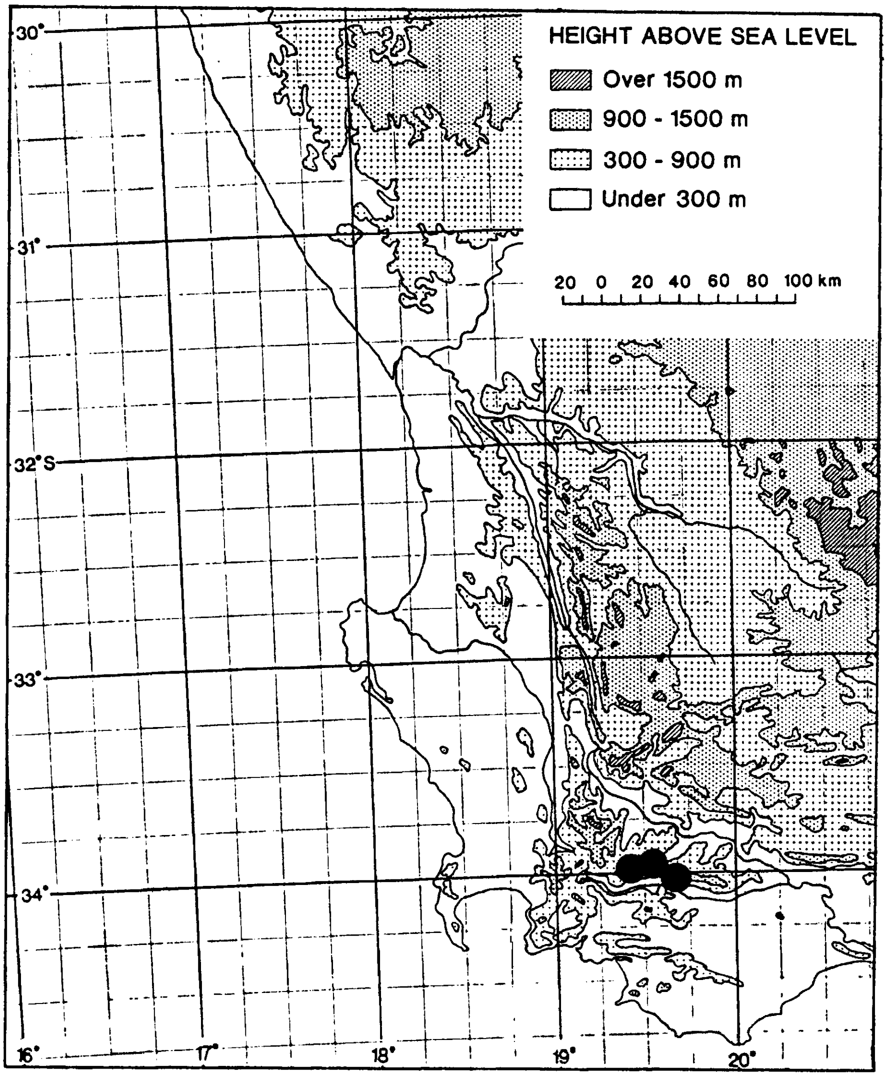

FIGURE 7.10—Known distribution of *Lachnaea pudens*.

Beyers 166 (BOL, K, NBG, PRE); *ibid.*, S side near summit to W of SABC tower, ± 1530 m, 16-12-1975, *Boucher 3038* (NBG); *ibid.*, N slope, roadside quarry above 2nd gate, ± 700 m, 25-05-1985, *Boucher 5094* (NBG); *ibid.*, Oct. 1977, *Hugo 958* (NBG); *ibid.*, upper NE slopes, 1200 m, 08-08-1986, *Oliver 8980* (NBG); Genadendal Mtns top of Baviaanskloof, 1500 m, (–DC), Oct., *Stokoe 2524* (NBG, PRE); Boschjeveld Mtns, Worcester side, (–DC), 01-10-1955, *Stokoe SAM 69967* (NBG, SAM); *ibid.*, Villiersdorp side, 1500 m, Feb. 1940, *Stokoe SAM 58590* (SAM).

—3419 (Caledon): Riviersonderend Mtns, Greyton, Boesmanskloof, jeeptrack to Die Galg, 640 m, (–BA), 12-11-1992, *Beyers 210* (BOL, K, NBG, NY, PRE); Wildepaardeberg, (–BA), 00-10-1933, *Stokoe 2762* (BOL, PRE); Genadendal Mtns, (–BA), 00-11-1930, *Stokoe 6759* (BOL, PRE); Genadendal, plateau W of The Trail, 700 m, (–BA), 24-05-1996, *Volk 249* (NBG). Grid ref. unknown: Riviersonderend, 330 m, 20-10-1894, *Schlechter 5643* (BOL, Z).

6. **Lachnaea axillaris** *Meisn.* in Linnaea 14: 142 (1840); Meisn.: 552 (1843); Meisn.: 578 (1857); C.H.Wright: 26 (1915). Type: Cape, locality unknown, *Drège 7371* (NY, holo.!—fragment in capsule on *Krauss 1265*; P!, iso.).

Lachnaea micrantha Schltr. in Botanische Jahrbücher für Systematik, Pflanzeschichte und Pflanzengeographie 24: 451 (1898); C.H.Wright: 26 (1915). Type: Western Cape, on sandy hill at Elim, 300 ft, 24 April 1896, *Schlechter 7702* (Z, holo.!; BOL!, iso.).

Radojitskya capensis Turcz. in Bulletin de la Société Impériale des Naturalistes de Moscou 25: 176 (1852); Turcz.: 743 (1853). Type: Cape of Good Hope, *Zeyher 2163* (S, holo.!; K!, NBG!, iso.);

Erect, much-branched, compact shrub to 0.75 m tall, multistemmed at base; resprouter. *Branches* erect to flexuous and interlacing, filiform, ± terete, sericeous or sericeous-tomentose, leafy, becoming puberulent and naked without prominent leaf-scars. *Leaves* decussate, ascending, distant, internodes ± as long as leaves, distal two pairs of leaves sometimes subverticillate, sessile, epistomatic, narrowly ovate to lanceolate, 2.0–4.0 × 0.8–1.2 mm, fleshy, glabrous, adaxially flat, smooth, dull, ± white-punctate, abaxially convex, subkeeled towards apex, glossy, apex mucronate, base obtuse. *Inflorescence* terminal, one-flowered, but may appear axillary when much-reduced, lateral branches comprise only one pair of leaves and a single flower, sericeous to sericeous-tomentose at floral articulation. *Flowers* sessile, subactinomorphic, cream, pink or dark pink. *Hypanthium* 1.4–2.2 mm long, circumscissile midway to two-thirds from base, upper portion cup-shaped with a basal invagination, basal portion ovoid to broadly ovoid, glabrous outside, glabrous within but barbate above circumscission zone in vicinity of scales. *Sepals* erect-spreading, subequal, two outer ones elliptic, ovate to broadly ovate, 1.6–2.6 × 0.8–1.5 mm, acute, adaxially glabrous or near apex puberulent or ciliolate, abaxially glabrous, two inner ones elliptic, obovate to broadly obovate, acute to obtuse, 1.4–2.3 × 1.0–1.8 mm, adaxially glabrous becoming puberulent near apex, abaxially glabrous. *Stamens* exserted, outer, antisepalous whorl inserted at base of sepals, inner, antipetalous whorl inserted at mouth of hypanthium; filaments filiform, 0.4–0.8 mm long, inner whorl shorter or as long as outer whorl; anthers widely ellipsoid to spheroid, 0.4–0.5 mm long, dorsally with broad connective tissue. *Scales* inserted just above the circumscission zone immediately below the antipetalous stamens, partially concealed by stiff hairs in throat of hypanthium, subrotund, 0.2–0.4 mm long, glabrous. *Ovary* narrowly ellipsoid to ellipsoid, 1.0–1.3 mm long, glabrous. *Style* linear-obconical, 0.8–1.6 mm long, glabrous. *Stigma* capitate and papillate (Figure 7.11).

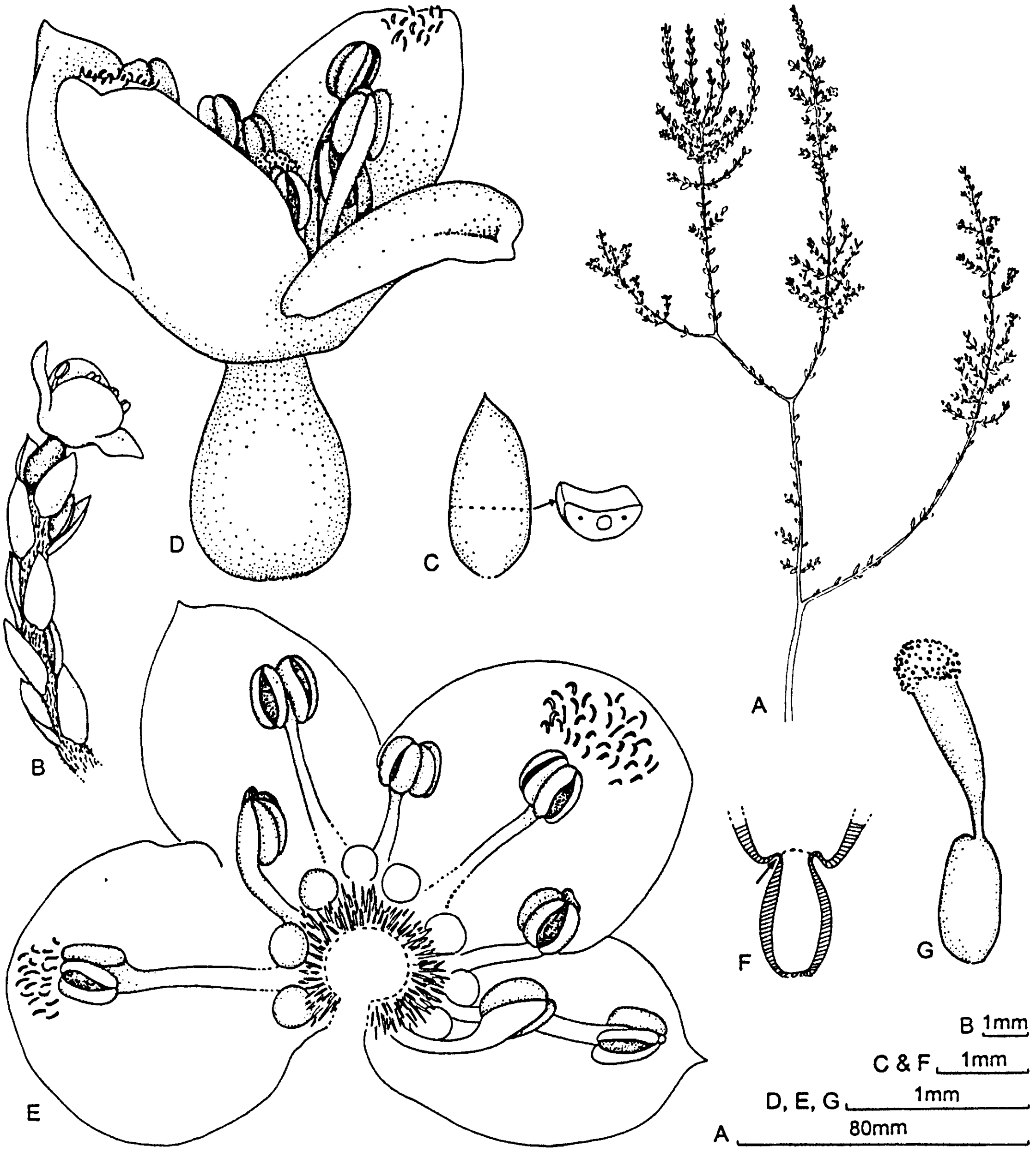

FIGURE 7.11—*Lachnaea axillaris*, *Beyers 180* (NBG). A, portion of plant; B, flowering branch (enlarged); C, leaf (abaxial view and cross section); D, flower; E, upper portion flower above circumscission zone split longitudinally; F, hypanthium (longitudinal section), note circumscission zone (arrowed); G, gynoecium.

Distribution and ecology

Confined to the Western Cape and with a disjunct distribution. Occurs on sandy flats in the Hopefield and Darling Districts in the southwestern area and reappears along the southern coast from Elim to the Gourits River mouth (Figure 7.12). The distribution of *L. axillaris* requires some explanation. The southern coastal flats are separated from the western coastal flats by a formidable ecological barrier, namely the Hottentots Holland Mountains. At the present time there are no low lying coastal sandy areas which could link the two areas of distribution. Rourke (1972) hypothesized that due to coastline regression during the Middle Pleistocene, a lowland link, now inundated, provided a migration route between the Bredasdorp coastal flats and the Cape Flats. Flowering has been recorded throughout the year.

Conservation status: Vulnerable (VU A1ce). The habitat of this species has been restricted through the effects of human activities and invasion by alien invader plants.

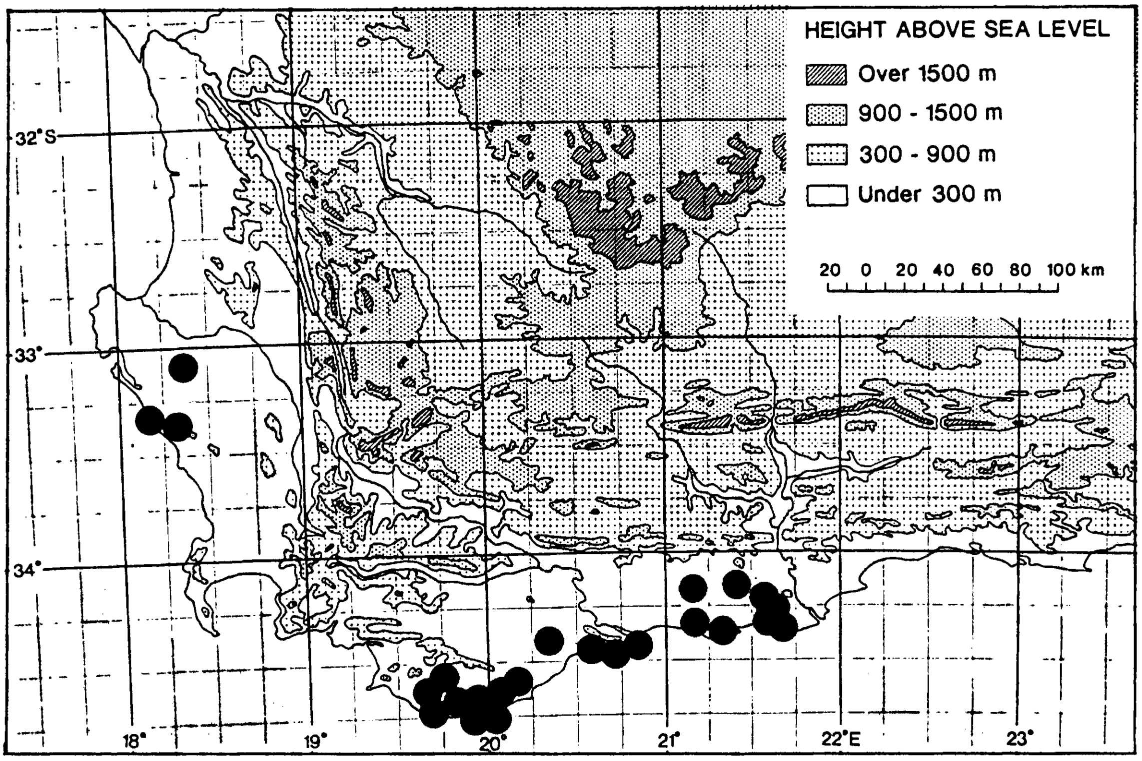

FIGURE 7.12—Known distribution of *Lachnaea axillaris*.

Diagnostic characters and relationships

Lachnaea axillaris is closely related to *L. pudens*, *L. leipoltii* and *L. pusilla*. The upper portion of the hypanthium in these species are basally invaginated. *L. axillaris* is easily distinguished from *L. pudens* by the hypanthium being glabrous on the outside. In *L. axillaris* the upper portion of the hypanthium is cup-shaped and the stigma is capitate, papillate, whereas in *L. leipoldtii* and *L. pusilla* it is narrowly obconical and the stigma is conical, papillate and linear-conical, papillate respectively

Specimens examined

WESTERN CAPE.—3318 (Cape Town): Hopefield, (–AB), Nov. 1919, *Bolus L. BOL 16741* (BOL); road between Darling and Ysterfontein, 1 km before Langebaan turnoff, (–AC), 08-03-1989, *Beyers 127* (NBG); Jakkalsfontein, sandy flats, ± 150 m, (–AD), 06-02-1978, *Thompson 3596* (NBG).
—3419 (Caledon): Swellendam, Rietkuil, (–BB), Oct., *Zeyher 2163* (K, NBG, S); Buffelsjagtsberg, NW-foothills, ± 130 m, (–DA), 11-03-1979, *Hugo 1613* (NBG); Bredasdorp Dist., Ratel River, in sandy plain, (–DA/DC), 11-08-1983, *Esterhuysen 36028* (BOL); *ibid.*, 12-01-1956, *Rycroft 1853* (NBG); Elim, Jul. 1895, (–DA/DB), *Bolus Herb. Guthrie 3831* (NBG); Rietfontein Poort near Elim, 65 m, (–DB), 10-12-1896, *Bolus 8596* (BOL, NBG, Z); Soetanysberg NW-end on farm Suur en Soet, ± 152 m, (–DB), 01-06-1973, *Boucher 2167* (NBG, S); Caledon, Soetendalsvlei, in sandy flats, (–DB), Dec. 1838, *Krauss 1265* (NY); Bredasdorp Dist., Brandfontein, limestone ridge, (–DC), *Esterhuysen 19092* (BOL); Springfield Estates on road to Hooiklip S of Soetendalsvlei, 15 m, (–DD), 29-07-1982, *Albertyn 299* (NBG).
—3420 (Bredasdorp): off Bredasdorp-Skipkop Road, 1 km on farm road next to fence of farm Melkkamer, 60 m, (–AD), 15-05-1984, *Fellingham 537* (NBG, PRE); De Hoop, Oulande, 16 m, (–AD), 20-09-1984, *Morley 174* (NBG); *ibid.*, 1 km from farm house, beside farm road, 20 m, 15-05-54, *Van Wyk 1524* (NBG); Pottberg Estates, near Cape Infanta, limestone hills, 160 m, (–BC), 16-06-1974, *Bayliss 6608* (GRA, K, NBG, NY, S, Z); most E-outlier of Potberg range, (–BC), *Burgers 409* (NBG); Potberg Nature Reserve, De Hoop, 70m, (–BC), 08-09-1978, *Burgers 1180* (NBG); *ibid.*, 135 m, 18-10-1978, *Burgers 1435* (NBG); Potberg, sandy, stony flats, (–BC), 19-09-1954, *Esterhuysen 23265* (BOL); S of Potberg, Lekkerwater Farm, (–BC), 08-09-1973, *Powrie 271* (NBG); Potberg, S slopes of Hamerkop, 160-500 m, (–BC), 21-09-1962, *Taylor 4025* (NBG); *ibid.*, 65 m, 65m, 01-01-1971, *Thompson 1105* (NBG); Hamerkop Farm, 80–160 m, (–BC), 19-06-1984, *Van Wyk 1609* (NBG); *ibid.*, calcrete crevices, 65 m, 19-09-1984, *Van Wyk 1886* (NBG); Frans Rietfontein, near Cape Infanta, (–BD), 26-11-1961, *Esterhuysen 29392* (BOL, S); Cape Infanta, (–BD), 15-07-1966, *Thomas s.n. NBG 84653* (NBG); on Witwaters-Elandspad Road, 1 km from Witwater towards sea, 500 m, (–BD), 18-06-1984, *Van Wyk 1555* (NBG); De Hoop, Witwater, 100 m, (–BD), 06-08-1984, *Van Wyk 1709* (NBG); on stony hills near Bredasdorp, 65 m, (–CA), 00-07-1895, *Bolus 6973* (BOL); *ibid.*, 24-08-1940, *Bond 462* (NBG); Paapekuikfontein 281, 1.5 km W of Struisbaai, 40 m, (–CA), 13-04-1998, *Helme 1419* (NBG); Bredasdorp, (–CA), Aug. 1940, *Walgate 74* (BOL); 1 km along entrance road to Zoetendals Vallei farmstead off Bredasdorp/L'Agullas Rd., below 20 m, (CA/CC), *Paterson-Jones 418* (NBG).

—3421 (Riversdale): S of Riversdale, SE of Swartheuwel, ± 100 m, (–AA), 13-03-1978, *Boucher 3697* (NBG); *ibid.*, 130m, 24-11-1972, *Oliver 4157* (NBG); W of Albertinia, flats W of Dekriet siding, 180 m, (–AB), 16-03-1990, *Beyers 180* (NBG); *ibid.*, 05-01-1991, *Beyers 197* (NBG); *ibid.*, 180 m, 19-03-1975, *Oliver 5698* (NBG); Riversdale Dist., between Riversdale and Albertinia, (–AB), 24-11-1950, *Maguire 466* (NBG, S); Riversdale, (–AB), Aug. 1915, *Rogers 16731* (K, Z); Dekriet Station, roadside on E-side of station, (–AB), 27-11-1979, *Spreeth 160* (NBG); between Albertinia and Riversdale, (–AB/BA), 07-12-1951, *Compton 23173* (NBG); Vermaaklikheid, 34 km W of Still Bay, 210 m, (–AC), 15-03-1978, *Boucher 3737* (NBG); farm Ystervarkfontein near Stillbay, (–AD), 25-04-1990, *Barnard 313* (NBG); Takkiesfontein, ± 160 m, (–AD), 25-09-1978, *Hugo 1242* (NBG); Still Bay Hills, (–AD), 9-08-1949, *Steyn 331* (NBG, S); Albertinia Dist., Gouriqua, Ystervarkpunt, (–AD), 20-01-1987, *Willemse 13* (NBG); *ibid.*, 20-01-1987, *Willemse 32* (NBG); near Albertinia – to West, 230 m, (–BA), 22-09-1949, *Acocks 15409* (BOL); Ystervarkfontein Road from Albertinia, 330 m, (–BA), 20-03-1978, *Bayliss 8599* (GRA, NBG, NY); Schoemanshoek on Albertinia-The Fisheries Road, 100 m, (–BA), 14-03-1978, *Boucher 3714* (NBG); near Albertinia, (–BA), 30-01-1951, *Compton 22595* (NBG); Albertinia, (–BA), 15-04-1952, *Compton 23527* (NBG); *ibid.*, 15-04-1952, *Compton 23528* (NBG); *ibid.*, 16-04-1956, *Winkler 54* (NBG); National Road near Albertinia, in sand, (–BA), 07-12-1951, *Esterhuysen 19509* (BOL); roadside near Albertinia, (–BA), 27-07-1953, *Leighton 3036* (BOL); Albertinia, (–BA), 03-05-1955, *Lewis 4689* (SAM); S-facing slopes of Olifantsberg along road from Albertinia to Gourits, 200 m, (–BA), 21-10-1987, *McDonald 1395* (NBG); Albertinia dunes, (–BA), Oct. 1912, *Muir 1823* (BOL); farm Platbos on road to Gourits River mouth, S facing, 130 m, (–BA), 20-09-1973, *Thompson 2012* (NBG); Akkordskop, S of Albertinia, 200 m, (–BC), 21-03-1975, *Oliver 5746* (NBG); Gourits mouth, 2 km W of entrance gate to Gourikwa, on new road, 200 m, (–BC), 20-07-1990, *Bohnen 9093* (NBG); Gouriqua, Ystervarkpunt, 120 m, (–BC), 16-06-1987, *Willemse 210* (NBG). Without locality: *Mundt s.n.* [42. *Passerina brunioides* Eckl. & Zeyh., 91] (S).

7. **Lachnaea leipoldtii** *Beyers*, sp. nov. *L. axillaris* parte superiore hypanthii basaliter invaginata affinis, sed parte superiore hypanthii obconica (non cyathiformi) stigmate conico (non capitato).

TYPE.—Western Cape, 3219 (Wuppertal): North Cederberg, between Heuningvlei and Boontjieskloof in moist, sandy flats between Heuningvlei and Koupoort, ± 950 m, (–AA), 28-12-1983, *Taylor 10871* (NBG, holo.!; PRE!, iso).

Erect to decumbent, much-branched, shrub to 0.4 m tall, single-stemmed at base, branching close to the ground; reseeder. *Branches* ascending to patent, flexuous, slender, terete, tomentose, leafy, becoming sparsely hairy and naked without prominent leaf scars. *Leaves* decussate, adpressed, scattered, internodes three-quarters to one and a half times as long as leaves, distal two pairs of leaves subverticillate, sessile, epistomatic, narrowly elliptic to ovate, 2.2–3.5 × 0.8–1.2 mm, coriaceous, glabrous, adaxially concave, enervate, dull, ± white-punctate, abaxially convex, keeled, glossy, enervate, apex acute, base rounded. *Inflorescence* terminal, one-flowered, sericeous-villous at floral articulation. *Flowers* sessile, subactinomorphic, white. *Hypanthium* 2.6–3.6 mm long, circumscissile one-third from base, upper portion narrowly obconical with basal invagination, sericeous outside, but at basal invagination hairs retrose, glabrous within but barbate at circumscission zone, basal portion ellipsoid or obovoid, glabrous outside and within. *Sepals* ascending, subequal, very widely ovate to oblate, 1.5–2.0 × 1.5–1.9 mm, apex rounded to obtuse, sericeous abaxially, glabrous adaxially. *Stamens* outer, antisepalous whorl exserted or half exserted, inserted a sixth to a quarter-way down upper portion of hypanthium, inner, antipetalous whorl enclosed, inserted two-thirds way down upper portion of hypanthium; filaments usually shorter than anthers, 0.3–0.7 mm long, inner whorl usually as long as outer whorl; anthers ellipsoid to widely ellipsoid, 0.5–0.8 mm long, dorsally with broad connective tissue. *Scales* enclosed, inserted just above circumscission zone partially concealed by stiff hairs at base, subglobose, ± 0.2 mm long, glabrous. *Ovary* ellipsoid, 0.5–1.0 mm long, glabrous. *Style* linear-obconical, 0.9–2.4 mm long, glabrous. *Stigma* conical and papillate (Figure 7.13).

Distribution and ecology

Lachnaea leipoldtii is endemic to the Northern Cederberg. It favours moist, sandy areas at an altitude of aproximately 1000 m (Figure 7.14). Flowering has been recorded in December and February.

Conservation status: Vulnerable (VU D2). This species has a restricted distribution and being a reseeder would be vulnerable to frequent mountain fires.

Diagnostic characters and relationships

Lachnaea leipoldtii is allied to *L. axillaris* with the upper portion of the hypanthium basally invaginated but differs in that the upper portion of the hypanthium is narrowly obconical and not cup-shaped and the stigma is conical-papillate and not capitate-papillate. *L. leipoldtii* is sister to *L. pusilla* but differs in that the basal portion of the hypanthium is glabrous outside and the stigma is conical and papillate.

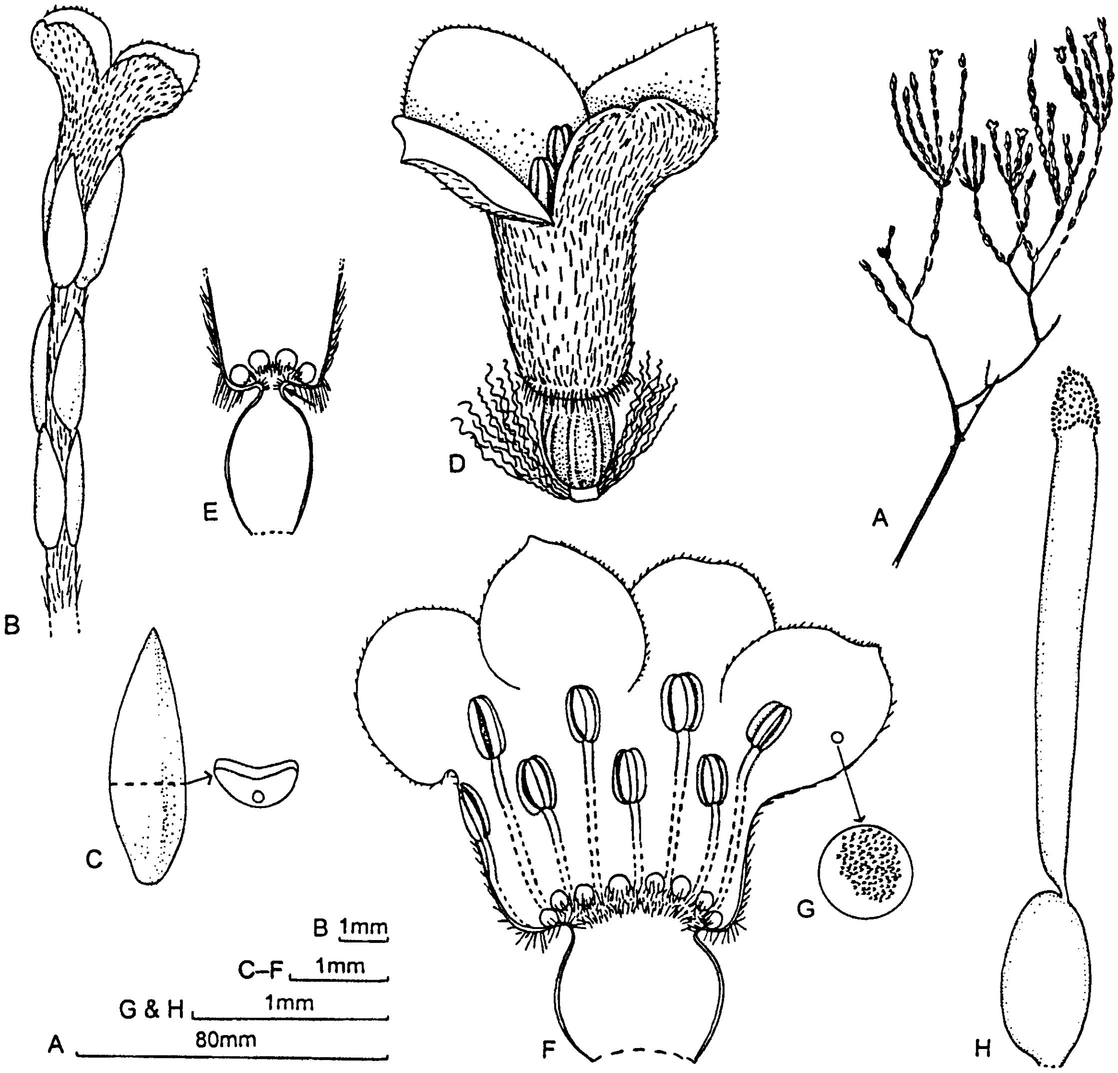

FIGURE 7.13—*Lachnaea leipoldtii*, *Taylor 10871* (NBG). A, portion of plant; B, flowering branch; C, leaf (abaxial view and cross section); D, flower, E, hypanthium (longitudinal section), note circumscission zone (arrowed); F, flower split longitudinally with gynoecium removed; G, inner surface of sepal papillate; I, gynoecium.

Eponymy

This species was first collected in 1889 by Dr. C. L. Leipoldt, a renowned Afrikaans poet and keen amateur botanist. Since the first collection, three other collections have been made close to his grave, thus prompting the choice of the specific epithet.

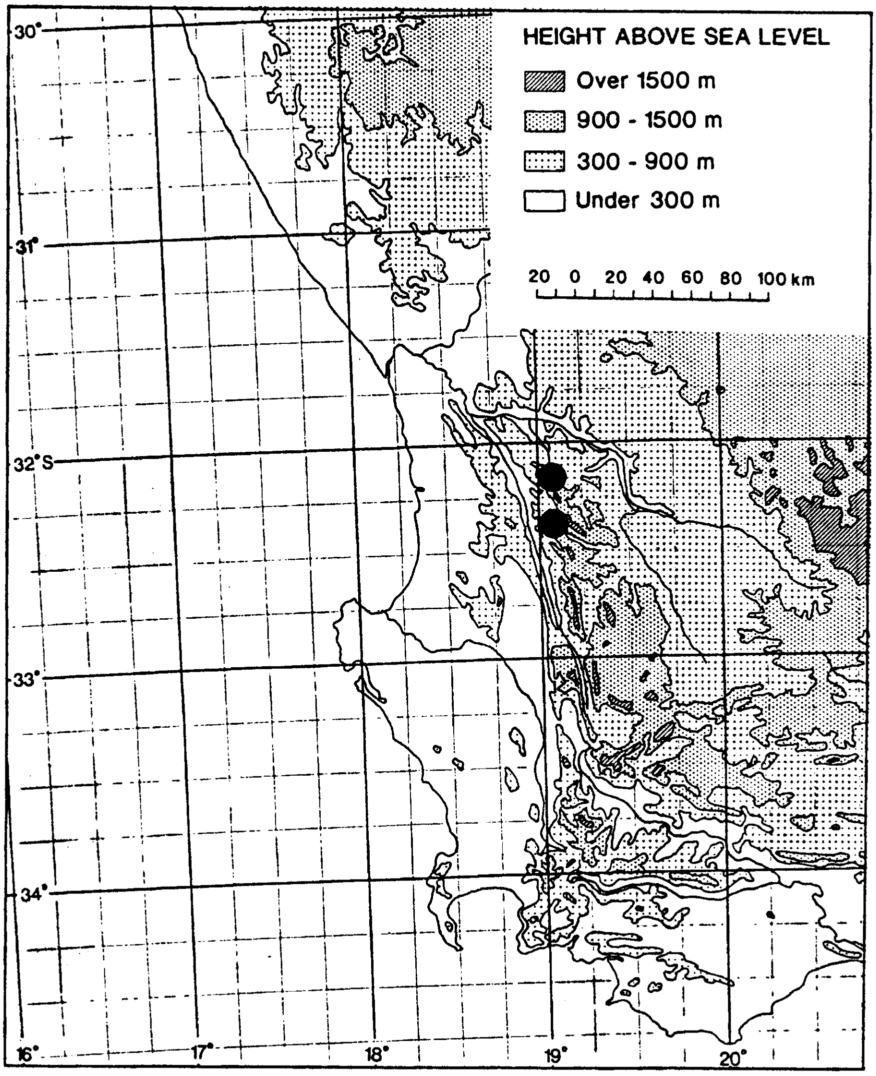

FIGURE 7.14—Known distribution of *Lachnaea leipoldtii*.

Specimens examined

WESTERN CAPE.—3219 (Wuppertal): North Cederberg, between Heuningvlei and Boontjieskloof, (–AA), 18-12-1977, *Esterhuysen 34831* (BOL); *ibid.*, 31-12-1941, *Esterhuysen 7523* (BOL); *ibid.*, moist, sandy flats between Koupoort and Heuningvlei, ± 950 m, 28-12-1983, *Taylor 10871* (NBG, PRE); Grootberg, Clanwilliam, 1000 m, (–AC), Feb. 1898, *Leipoldt 1047* (BOL).

8. **Lachnaea pusilla** *Beyers*, sp. nov. *L. leipoldtii* proxime affinis, sed differt parte basali hypanthii extra pilis obtusis in parte superiore (non omnino glabra) stigmate lineari-conico (non conico).

TYPE.—Western Cape, 3319 (Worcester): Wellington District, Elandsberg Private Nature Reserve, in restioid flats between Elandskloof Mountains and fields in Tortoise

Reserve, 70 m, (–AC), 4-10-1994, *Beyers 243* (NBG, holo.!: BOL!, KEW!, NY!, PRE!, Z!, iso.)

Straggling, erect, much branched, shrub to 0.4 m tall, single-stemmed at base; reseeder. *Branches* ascending to patent, flexuous, filiform, terete, sericeous, leafy, becoming glabrous and naked without prominent leaf scars. *Leaves* decussate, adpressed, internodes three-quarters to as long as the leaves, distal two pairs of leaves subverticillate, sessile, epistomatic, narrowly elliptic, 2.8–3.2 × 0.6–0.7 mm, coriaceous, glabrous, adaxially concave, enervate, dull, ± white-punctate, abaxially convex, subkeeled, glossy, apex subacute, base rounded. *Inflorescence* terminal, one-flowered, villous at floral articulation. *Flowers* sessile, subactinomorphic, white, some tinged pale pink. *Hypanthium* 2.3–3.2 mm long, circumscissile quarter to one-third from base, upper portion narrowly obconical with basal invagination, sericeous outside, but at basal invagination hairs retrose, inside sericeous at mouth, glabrescent towards base and barbate at base of scales, basal portion ellipsoid or obovoid, outside puberulent in upper and lower third, middel portion covered with ascending, obtuse hairs, inside adpressed hairy at plane of circumscission, glabrous below. *Sepals* erect-patent, subequal, elliptic to widely elliptic, 1.4–2.5 × 1.2–1.7 mm, rounded to obtuse, sericeous on both sides. *Stamens* outer, antisepalous whorl exserted, inserted at mouth of hypanthium, inner, antipetalous whorl enclosed, inserted two-fifths way down upper portion of hypanthium; filaments as long or shorter than anthers, 0.2–0.5 mm long, inner whorl shorter or as long as outer whorl; anthers ellipsoid to ovoid, 0.5–0.7 mm long, dorsally with broad connective tissue. *Scales* enclosed, inserted just above circumscission zone partially concealed by stiff hairs at base, subglobose, 0.2–0.3 mm long, glabrous, yellow in fresh state. *Ovary* ellipsoid, 0.8–0.9 mm long, glabrous. *Style* linear-obconical, 0.7–1.0 mm long, glabrous. *Stigma* linear-conical, papillate, 1.6–2.0 mm long (Figure 7.15).

Distribution and ecology

Recorded from Nuwekloof southwest of Tulbagh southwards along Elandskloof Mountains to the western foot of Bailey's Peak north of Wellington, occuring in stony sand between 70 and 1000 m above sea level (Figure 7.16). Flowering has been recorded from October to March.

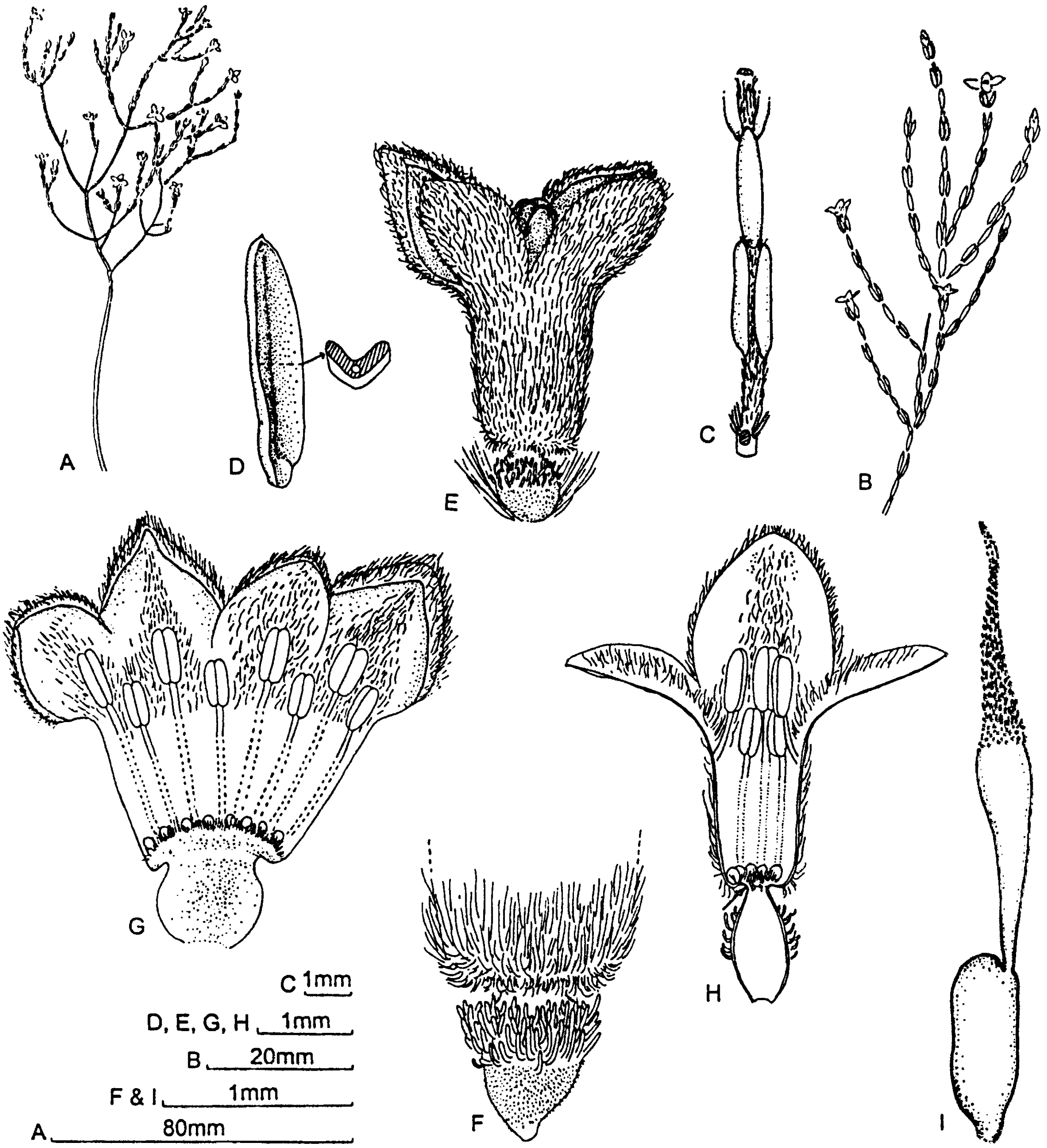

FIGURE 7.15—*Lachnaea pusilla*, *Beyers 243* (NBG). A, portion of plant; B, portion of plant (enlarged); C, branch with leaves; D leaf (lateral view and cross section): E, flower; F, hypanthium (enlarged); G, flower split longitudinally with gynoecium removed; H, longitudinal section of flower, note circumscission zone (arrowed); I, gynoecium.

Conservation status: Vulnerable (VU D2). This species has a restricted distribution and although also occuring in a private nature reserve, would be vulnerable to frequent fires as it is a reseeder.

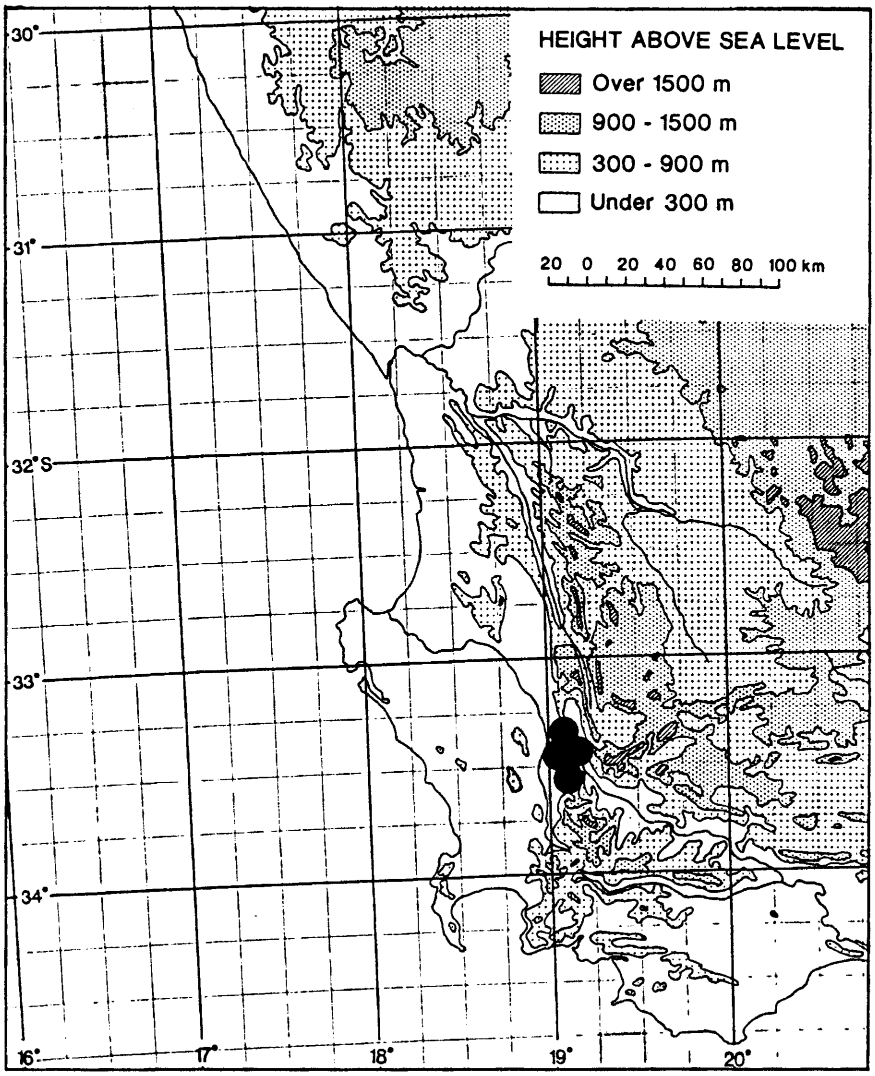

FIGURE 7.16—Known distribution of *Lachnaea pusilla*.

Diagnostic characters and relationships

Lachnaea pusilla is closely allied to *L. leipoldtii* but differs in that the basal portion of the hypanthium outside is covered with obtuse hairs in the upper half and the stigma is linear-conical, papillate.

Etymology

The specific epithet, means very small, and refers to the tiny flowers.

Specimens examined

WESTERN CAPE.—3319 (Worcester): Wellington Dist., Elandsberg Private Nature Reserve, restioid flats between Elandskloof Mtns and fields in Tortoise Reserve, 70 m, (–AC), 04-10-1994, *Beyers 243* (BOL, K, NBG, NY, PRE, Z); *ibid.*, 13-11-1986, *De Villiers 45* (NBG); Nieuwekloof, 1000 m, (–AC), 17-02-1896, *Schlechter 1195* (PRE); *ibid.* 1000 m, 17-02-1896, *Schlechter 7503* (BOL, GRA, K, S, Z); Paarl Div., W. foot of Bailey's Peak, (–CA), 22-11-1953, *Esterhuysen 22341* (PRE, BOL).

9. **Lachnaea laxa** (*C.H.Wright*) *Beyers* in Bothalia 27,1: 45 (1997). *Crytadenia laxa* C.H.Wright Flora capensis 5,2: 17 (1915). Syntypes: Caledon Div., Swartberg, near Caledon, 3200 ft., *Bolus 7875* (BOL!); near Houw Hoek, 2000 ft., *Bolus 9208* (BOL!); Bredasdorp Div., near Elim, *Bolus 7876* (BOL!. PRE!); without locality *Harvey s.n.* (K, lecto.! here designated; K!, isolecto.).

Note: Wright cites the locality of *Bolus 9208* as “near Houw Hoek, 2000 ft”. Only the sheet in BOL has the collecting no 9208, but the locality is questioned and there is no date. Sheets of *Bolus HNAA 1353* (BOL, K, NBG, SAM, Z) correspond to the locality and altitude given by Wright [sheet in BOL determined by Wright] for *Bolus 9208*. Unfortunately one cannot assume that they were referred to as types. *Harvey s.n.* sub. *herb. Hooker* (K) is selected as the lectotype, as it is the only one determined by Wright. The isolectotype is mounted on the same sheet as *Bolus HNAA 1353* (K).

Erect to decumbent, sparsely to moderately branched shrub to 0.3 m tall, single-stemmed at base, branching close to the ground; reseeder. *Branches* slender, lax to straggling, ridged below the leaf bases, at first sericeous, leafy, later glabrescent and naked with inconspicuous leaf scars. Leaves decussate, adpressed to ascending, scattered, internodes three-quarters to one and a third as long as leaves, distal two pairs of leaves subverticillate, sessile, narrowly elliptic to lanceolate, 3.8–7.6 × 0.6–1.3 mm, coriaceous, glabrous, adaxially concave, smooth, dull, ± white-punctate, abaxially convex, smooth or keeled, glossy, apex acute, base obtuse. *Inflorescence* terminal, one-flowered, sericeous at floral articulation. *Flowers* sessile, subactinomorphic, cream to pink. *Hypanthium* 3.8–8.0 mm long, circumscissile ± a third from base, upper portion funnel-shaped, basal portion narrowly ovoid, sericeous outside, upper portion adpressed hairy within, basal portion glabrous within. *Sepals* erect-patent, subequal, narrowly elliptic to elliptic, 2.8–8.5 × 1.3–4.2 mm, acute to subacute, abaxially sericeous, adaxially sparsely sericeous or sericeous only in upper quarter, lower three-quarters glabrous. *Stamens* exserted, the outer, antisepalous whorl inserted at base to lower fifth of sepals, inner, antipetalous whorl inserted at rim of hypanthium; filaments filiform, 0.4–2.0 mm long, inner shorter than outer whorl; anthers ellipsoid, 0.6–1.2 mm long, abaxially without broad connective tissue. *Scales* exserted, inserted at mouth of hypanthium just below the antipetalous stamens, narrowly ellipsoid, 0.5–1.3 mm long, glabrous, translucent-white in fresh state. *Ovary* narrowly ellipsoid to ellipsoid or obovoid, 0.8–1.2 mm long, glabrous. *Style* linear, 2.8–6.0 mm long, covered with soft, ascending hairs in upper half. *Stigma* brush-like (Figure 7.17).

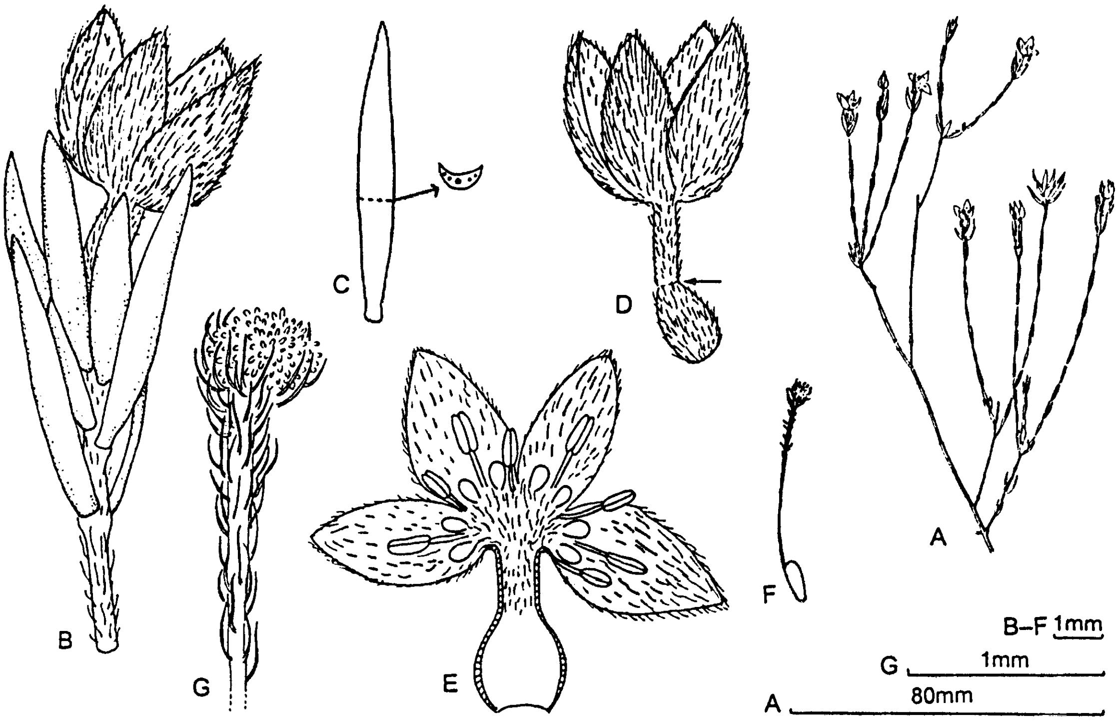

FIGURE 7.17—***Lachnaea laxa*, *I, Oliver 4* (NBG). A, portion of plant; B, flowering branch; C, leaf (abaxial view and cross section); D, flower, note circumscission zone (arrowed); E, flower split longitudinally with gynoecium removed; F, gynoecium; G, stigma and upper portion of style (enlarged).**

Distribution and ecology

Recorded from the Jonkershoek and Hottentots Holland Mountains eastwards to Genadendal and southeast to the Houhoek Mountains and Swartberg, above Caledon. It has also been recorded from Elim but no precise locality is given. It occurs on mid to upper slopes, at altitudes between 400 and 2150 m, favouring damp, sandy areas (Figure 7.18). Flowering has been recorded in October to December.

Conservation status: Vulnerable (VU D2). Although only known from a few collections, most of which are old, it occurs in a restricted area on high mountains. From the available collections it appears to be a reseeder and would therefore be vulnerable to frequent fires.

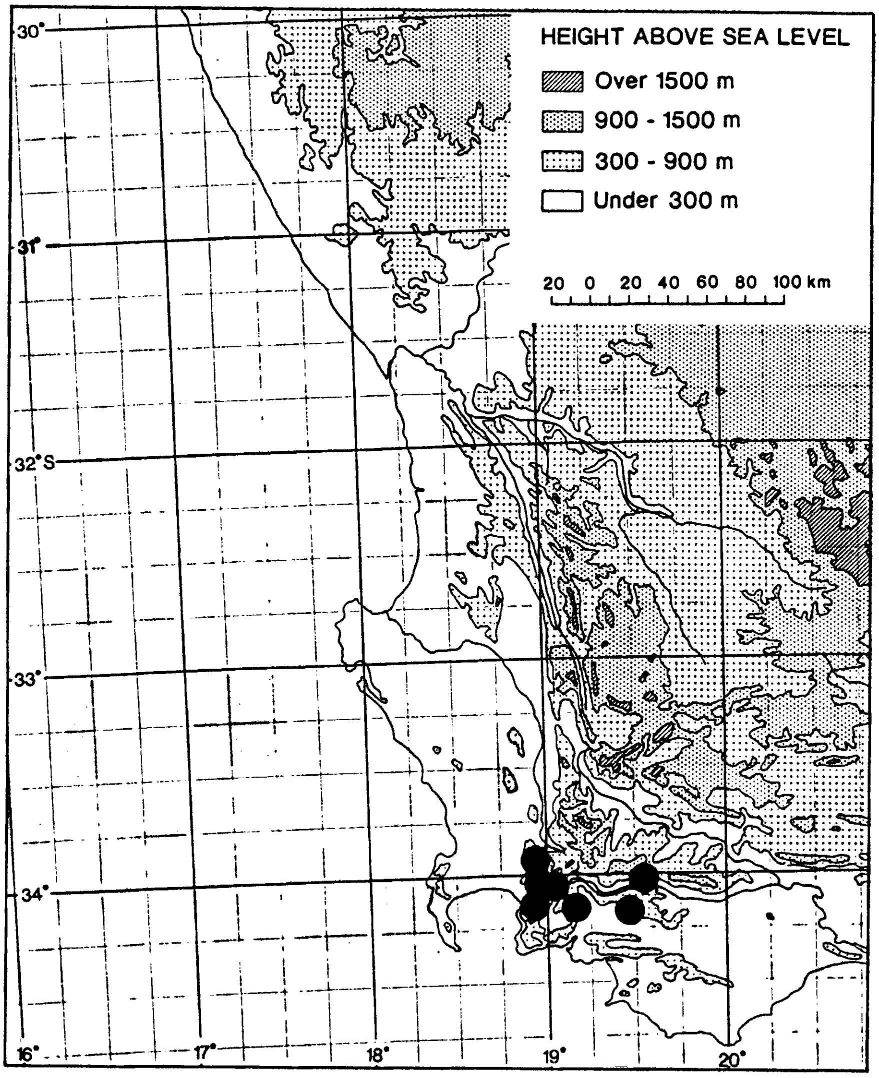

FIGURE 7.18—Known distribution of *Lachnaea laxa*.

Diagnostic characters

Lachnaea laxa is easily distinguished from the other solitary-flowered species with a decussate leaf arrangement and cream to pink flowers by the upper portion of the hypanthium being funnel-shaped and the scales being inserted at the mouth of the hypanthium.

Specimens examined

WESTERN CAPE.—3318 (Cape Town): Stellenbosch, Jonkershoek Valley, S slopes beyond head of valley, en route to Victoria Peak, 1000 m, (–DD), 15-10-1950, *Esterhuysen 17598* (BOL, NBG). —3418 (Simonstown): Hottentots Holland Mountains, Sugarloaf [Verkykerskop], summit, coarse sand, ± 2150 m, (–BB), 10-11-1974, *Boucher 2637* (NBG); Kogelberg Nature Reserve, 2 km NE of Rockview Dam, 400 m, (–BB), *Johns A 5* (NBG). —3419 (Caledon): near Elim (precise locality unknown), Oct.1894, *Bolus 7876* (BOL, PRE); near Houhoek, mountain slopes, 665 m, (–AA), Oct.1885, *Bolus HNAA 1353* (BOL, K, NBG, SAM, Z); Lebanon Slopes, in marsh on slopes towards Houhoek, ± 500–665 m, (–AA), 28-09-1975, *Esterhuysen 33988* (BOL); valley between Dwarsberg and Victoria Peak, (–AA), 10-10-1990, *Oliver I. 4* (NBG, PRE); Houhoek Mountain, summit, 1200 m, (–AA), 14-10-1894, *Schlechter 5444* (GRA, Z); Swartberg, near Caledon, 1065 m, (–AB), Dec.1894, *Bolus 7875* (BOL); Genadendal, 1000 m, (–BA), 28-12-1895, *Bodkin sub Herb. Guthrie 3585* (NBG). Grid ref. unknown: near Houhoek ? (locality uncertain), *Bolus 9208* (BOL). Without locality: *Harvey s.n.* (K).

10. **Lachnaea ruscifolia** *Compton*, Journal of South African Botany 19: 132 (1953). Type: Western Cape, 3321 (Ladismith): Klein Swartberg Range, Elandsberg, 2000 ft, (–AD), July/August 1953, *Wurts 1036* (NBG, holo.!; K!, PRE!, iso.).

Erect, moderately branched shrub up to 0.8 m tall, multistemmed at base; resprouter. *Branches* erect, slender to moderately thick, ridged below leaf bases, covered with long, straight, adpressed hairs admixed with crooked ones, densely leafy, later glabrescent and naked with prominent leaf scars. *Leaves* alternate, ascending to patent, imbricate, sessile to subsessile, epistomatic, ovate to orbicular, 5.0–10.5 × 2.6–5.5 mm, coriaceous, green, glabrous, adaxially obtusely concave, smooth, dull, ± white-punctate, abaxially convex, glossy, with 6–9 ridges converging to base and apex, apex acute to subacute, base cuneate, margin indurated, at first pilose, later deciduous, becoming naked, petiole up to 0.6 mm long. *Inflorescence* terminal, one-flowered, but appearing to be axillary as apical meristem of main branches seems to abort and flowers borne only on much reduced, lateral flowering shoots, comprising usually one pair of small, scarious, bracteose leaves and a solitary flower, which develop at random in axils of foliage leaves on main flowering branches thus appearing spicate-like. *Flowers* sessile, subactinomorphic, creamy white. *Hypanthium* 2.7–4.7 mm long, circumscissile one-third from base, upper portion narrowly funnel-shaped, tomentose outside, adpressed villous within, basal portion ellipsoid, tomentose outside, glabrous within. *Sepals* ascending, subequal, elliptic to narrowly ovate, 2.8–4.5 × 1.5–2.2 mm, subacute to obtuse, both surfaces tomentose. *Stamens* exserted, outer, antisepalous whorl inserted at base of sepals, 0.9–1.3 mm long, inner, antipetalous whorl inserted at rim of hypanthium, 0.9–1.1 mm long; anthers spheroid, 0.3–0.5 mm long, abaxially without broad connective tissue. *Scales* exserted, inserted at mouth of hypanthium, immediately below antipetalous stamens, ovate to obovate in outline, laterally flattened, 0.6–1.0 mm long, glabrous, yellow in fresh state. *Ovary* ovoid, 0.8–1.1 mm long, usually glabrous but occasionally with tuft of hair at base of style. *Style* linear-obconical, 2.7–4.5 mm long, with incurled hairs in upper half, rest glabrous. *Stigma* capitate, elongate-papillate (Figure 7.19).

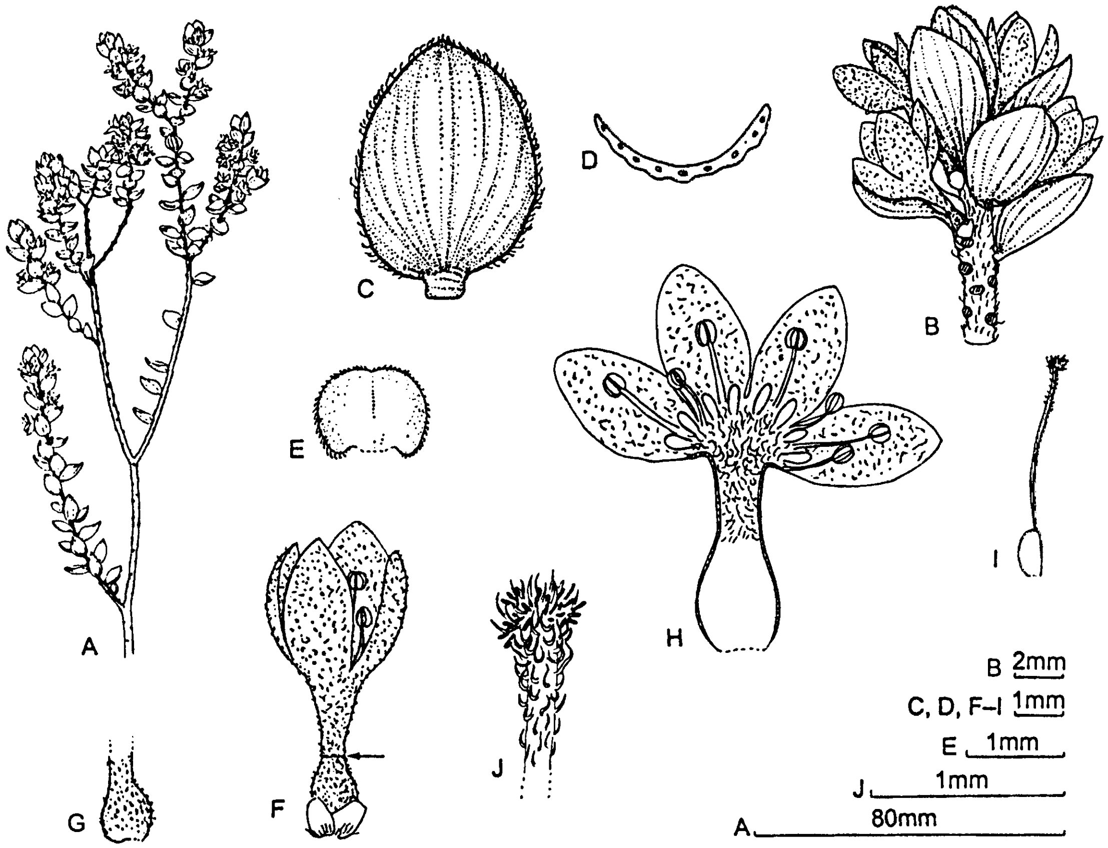

FIGURE 7.19—*Lachnaea ruscifolia*, *Vlok 2084* (NBG). A, portion of plant; B, flowering branch; C & D, leaves: C, abaxial view; D, cross section; E, scarious, bracteose leaf; F, flower with bracteose leaves at base, note circumscission zone (arrowed); G, basal portion of hypanthium; H, flower split longitudinally with gynoecium removed; I, gynoecium; J, stigma and upper portion of style (enlarged).

Distribution and ecology

Confined to the mountains of the Little Karoo, from the Klein Swartberg and Rooiberg in the west to the Groot Swartberg and Gamka Mountain in the east, at altitudes between 650 and 1150 m, growing in rocky, sandy loam soils (Figure 7.20). Flowering has been recorded in December to September.

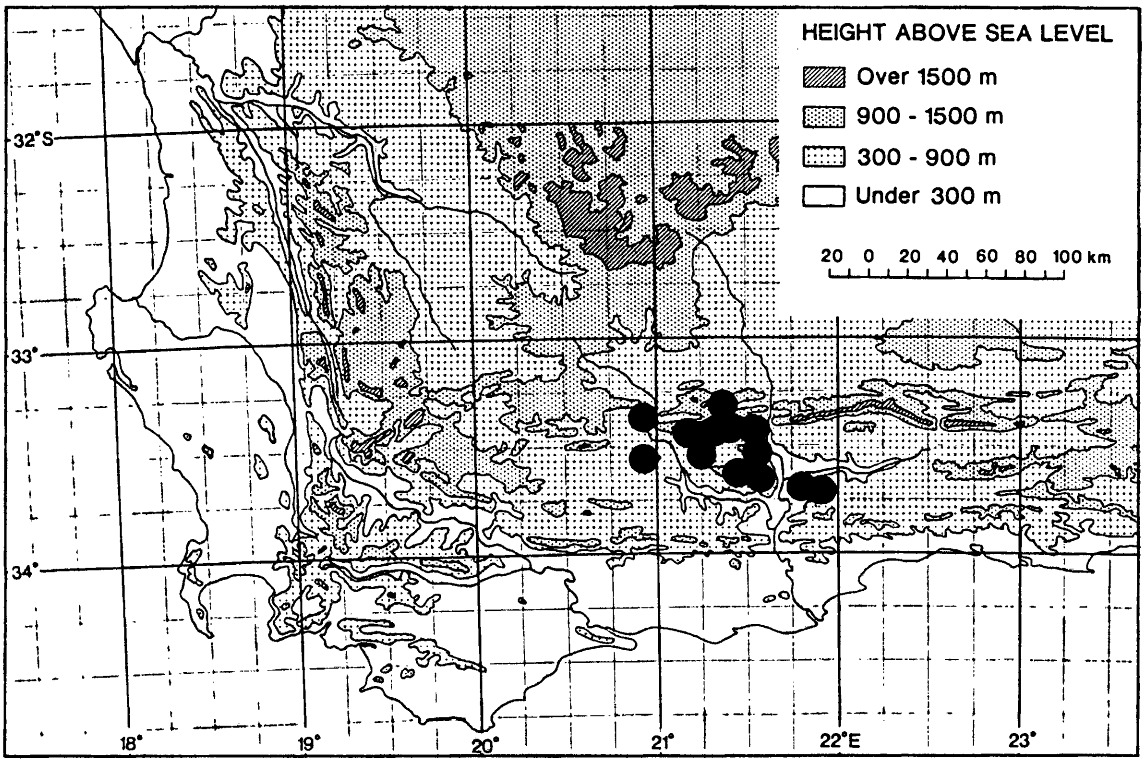

FIGURE 7.20—Known distribution of *Lachnaea ruscifolia*.

Conservation status: Lower Risk Least Concern (LRlc).

Diagnostic characters

Lachnaea ruscifolia is easily distinguished from the other one-flowered species by the alternate, ovate to orbicular leaves with six to nine prominent ridges below.

Specimens examined

WESTERN CAPE.—3320 (Montagu): Klein Swartberg, above Buffelsrivierpoort 1000-1330 m, (–BD) 31-03-1988, *Goldblatt & Manning 8870* (NBG); *ibid.*, above Aasvoëlkrans, 1000 m, 03-01-1981, *Vlok*

166 (NBG); *ibid.*, next to forestry track at Buffelsrivierpoort 760 m, 07-05-1985, *Vlok 993* (NBG); Touwsberg, Ladismith, rocky S slopes, 1155–1330 m, (–DB), 01-06-1956, *Esterhuysen 25893* (BOL). —3321 (Ladismith): Brandewynskuil, Bobuffelskloof at base of Swartberg, (–AC), 17-08-1975, *Esterhuysen 33905* (BOL, S); lower slopes of Swartberg, Ladismith, 760 m, (–AC/AD), Jul. 1929, *Levyns 2734* (BOL); Seweweekspoort near Ladismith, 660 m, (–AD), 04-05-1965, *Bayliss 2821* (NBG, Z); Korrelland (Waterkloof), N of Ladismith, 650 m, (–AD), 31-07-1956, *Dahlgren & Peterson 39* (K, NBG); koppie at foot of Swartberg, Ladismith, 730 m, (–AD), 02-09-1941, *Levyns 7399* (BOL); koppie N of Ladismith, 830 m, (–AD), 16-08-1948, *Levyns 9045* (BOL); Klein Swartberg, Steenslang, 1305 m, (–AD), 15-06-1983, *Marshall 39* (NBG); *ibid.*, Elandsberg, Ladismith, 660 m, 12-08-1953 *Wurts 1036* (NBG); *ibid.*, S slopes Ladismith 1330 m, 04-05-1955, *Wurts 1342* (NBG); Paardeberg at head of Huis R. Pass, Ladismith, (–BC), 23-05-1950, *Esterhuysen 17108* (BOL, NBG); Groot Swartberg, N lopes of Kangoberg, 1830 m,(–BD), 17-01-1954, *Taylor 1100* (NBG, SAM); koppie near Ladismith, 660 m, (–CA/CB), Jul.1927, *Levyns 2126* (BOL), Levyns 2127 (BOL); *ibid.*, 800 m, 09-07-1937, *Levyns 6101* (BOL); Rooiberg, S lopes, Mount Ararat, along jeep track, NW aspect, 1330 m, (–CB), 08-08-1990, *Beyers 193* (NBG); *ibid.*, 20-01-1989 *Vlok 2084* (NBG); Roodeberg, S slopes, Ladismith, (–CB/DA), 24-05-1950, *Esterhuysen 17193* (BOL); *ibid.*, 1300 m, 06-07-1937, *Levyns 6073* (BOL); along Rooiberg, road to Pass, Ladismith, ± 960 m, (–DA), 18-04-1977, *Taylor 9601* (NBG); Calitzdorp Dist., Opsoek, E of Amalienstein, 970 m, (–DA), 01-08-1956, *Dahlgren & Peterson 64* (NBG); Gamka Mountain Reserve, S slope, (–DB), 16-01-1977, *Boshoff 358* (NBG); *ibid.*, 22-05-1975, *Boshoff P75* (NBG); *ibid.*, Bakenskop, 1200 m, 24-01-1983, *Cattell & Cattell 230* (NBG); *ibid.*, near Calitzdorp, 23-05-1975, *Esterhuysen 33848* (BOL); *ibid.*, between Syferwater and Paddafluitjies Kloof, 900 m, 13-04-1988, *Erasmus 155* (NBG); *ibid.*, Calitzdorp, on crest of mountain, 1060 m, 07-12-1987, *Vlok 1898* (NBG).

11. **Lachnaea alpina** *Meisn.* in A.P. de Candolle, Prodromus systematis naturalis regni vegetabilis 14: 578 (1857); C.H.Wright: 583 (1925). Type: In mountain Winterhoeksberg, near Tulbagh, alt. 6000 ft, *Ecklon s.n.* (NY, holo.!, S!, SAM!, iso.).

Gonophylla alpina Eckl. & Zeyh. ex Meisn.—*nom. nud.* in A.P. de Candolle, Prodromus systematis naturalis regni vegetabilis 14: 578 (1857) in synonymy.

Erect, much-branched shrub up to 1 m tall, single-stemmed at base with capacity to sprout from base of old branches; reseeder. *Branches* ascending, slender, later becoming woody, ridged below leaf bases, glabrous or at first hirsute below inflorescence becoming glabrous, densely leafy, becoming naked with prominent leaf scars. *Leaves* alternate, ascending, imbricate, subsessile, epistomatic, glabrous, narrowly elliptic to obovate, 5.0–10.0 × 1.5–3.0 mm, coriaceous, green, faintly midveined, adaxially flat or obtusely concave, dull, white-punctate, abaxially flat or obtusely convex, glossy, smooth, apex rounded to acute, straight or slightly incurved, base attenuate. *Inflorescence* a terminal, ebracteate capitulum, 1.5–2.5 cm in diameter, ± 12–40-flowered, pedunculate; peduncle 3–20 mm long, sericeous-hirsute. *Receptacle* subconical, 2.0–3.2 × 2.2–3.5 mm, sericeous. *Flowers* sessile, subactinomorphic to zygomorphic, pale blue, mauve or cream, strongly honey-scented. *Hypanthium* 4.3–6.8 mm long, circumscissile third to midway from base, upper portion funnel-shaped, basal portion ellipsoid, sericeous-villosulus outside, adpressed hairy inside above plane of circumscission, glabrous below. *Sepals* patent, unequal, abaxially sericeous-villosulus, adaxially sericeous, elliptic, ovate or obovate, apex acute to rounded, anterior and lateral sepals ± equal, 2.9–5.4 × 1.4–3.0, posterior one smallest, 2.1–3.8 × 1.3–3.0 mm. *Stamens* exserted, outer, antisepalous whorl inserted near base of sepals, inner, antipetalous whorl inserted at rim of hypanthium; filaments filiform, 0.7–2.0 mm long, inner whorl as long as or slightly shorter than outer whorl; anthers depressed spheroid, 0.4–0.5 mm long, abaxially without broad connective tissue. *Scales* exserted, inserted at mouth of hypanthium immediately below antipetalous stamens, obovoid, 0.4–0.6 mm long, hirsute, yellow in fresh state. *Ovary* obovoid, 0.9–1.5 mm long, apex sericeous, glabrous below. *Style* filiform, covered with silky, ascending hairs. *Stigma* brush-like (Figure 7.21).

Distribution and ecology

Lachnaea alpina is known only from the mountains in the Tulbagh and Ceres Districts, occurring at altitudes between 1600 and 2100 m (Figure 7.22). Flowering has been recorded from November to January.

Conservation status: Vulnerable (VU D2). This species has a restricted distribution and being a reseeder would be vulnerable to frequent mountain fires.

Diagnostic characters and relationships

Lachnaea alpina belongs to the group of species with capitate inflorescences. It is easily distinguished from *L. macrantha*, the only other species in this group which also has epistomatic leaves, by its honey-scented, subactinomorphic to slightly zygomorphic flowers, with the posterior sepal either equal to or slightly shorter than the other sepals.

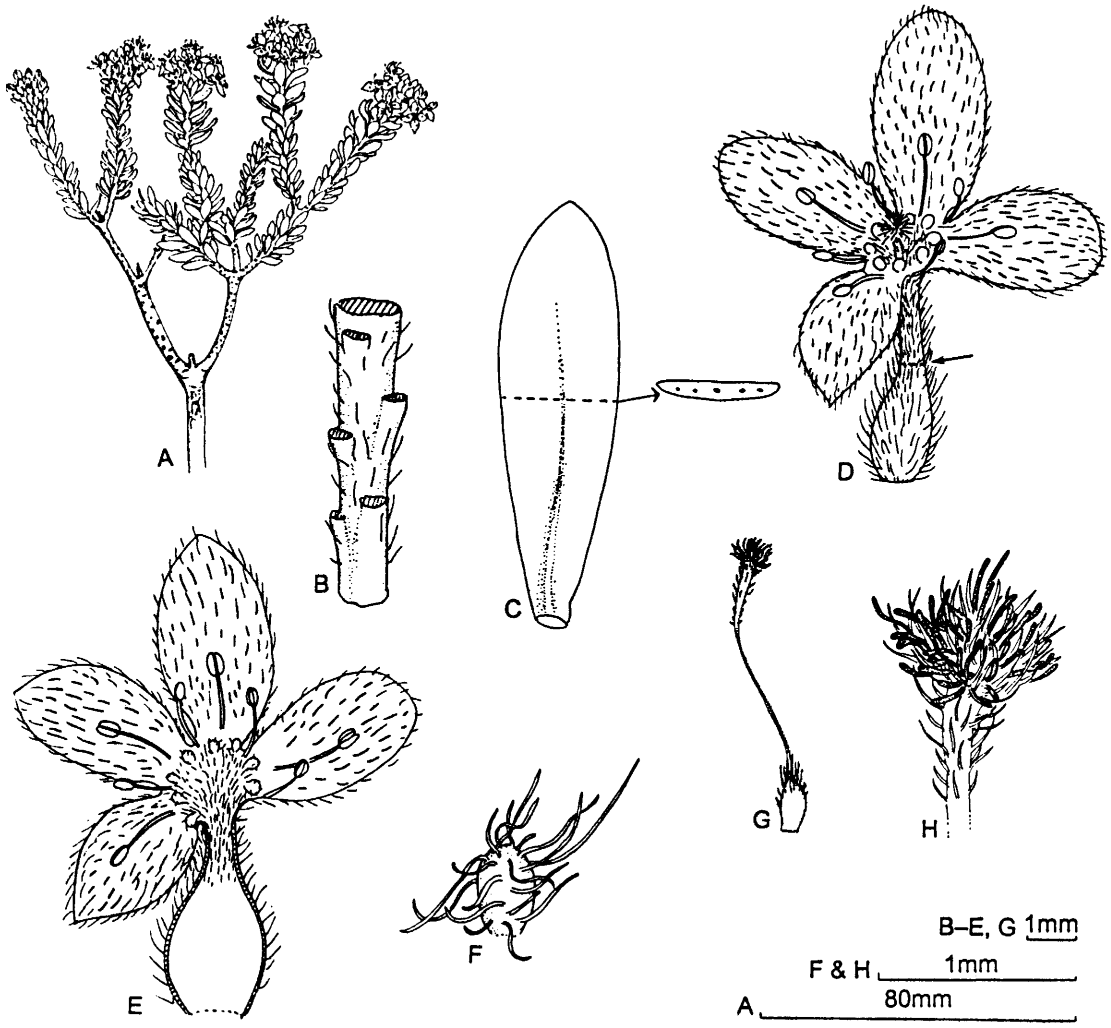

FIGURE 7.21—*Lachnaea alpina*, *Beyers 258* (NBG). A, portion of plant; B, branch with leaves removed; C, leaf (abaxial view and cross section); D, flower, note circumscission zone (arrowed); E, flower split longitudinally with gynoecium removed; F, scale; G, gynoecium; H, stigma and upper portion of style (enlarged).

Specimens examined

WESTERN CAPE.—3319 (Worcester): Tulbagh, Winterhoek Mtns, 1800 m, (–AA), Nov. 1879, *Bolus 5441* (BOL); Winterhoeksberg [Winterhoek Mtn] near Tulbagh, 2000 m, (–AA), November, *Ecklon s.n.* (NY), *Ecklon 71* (S), *Ecklon & Zeyher 71* (SAM!); Groot Winterhoek Mtns, 2000 m, (–AA), 2-01-1927, *Andreae 1133* (NBG); *ibid.*, 2000 m, 31-12-1951, *Esterhuysen 19799* (BOL); Ceres Dist., Waboomsberg, summit ridge W of beacon, 1720 m, (–AD), 24-11-1995, *Beyers 258* (NBG); *ibid.*, 1700 m, 12-11-1989, *Oliver 9299* (BOL, K, NBG, PRE); Ceres Dist., Baviaansberg, 2000 m, (–BA), 2-01-1942, *Bond 1454* (BOL); *ibid.*, 2100 m, 4-11-1962, *Esterhuysen 29830* (BOL); *ibid.*, 1900 m, 5-11-1989, *Forsyth 508* (NBG);

ibid., 2100 m, Jan. 1937, *Stokoe 4502* (BOL), *Stokoe SAM 52720* (SAM); *ibid.*, 1800–2000 m, 10-01-1956, *Stokoe SAM 68239* (BOL, NBG, SAM). Without locality: *Stokoe 6474* (BOL).

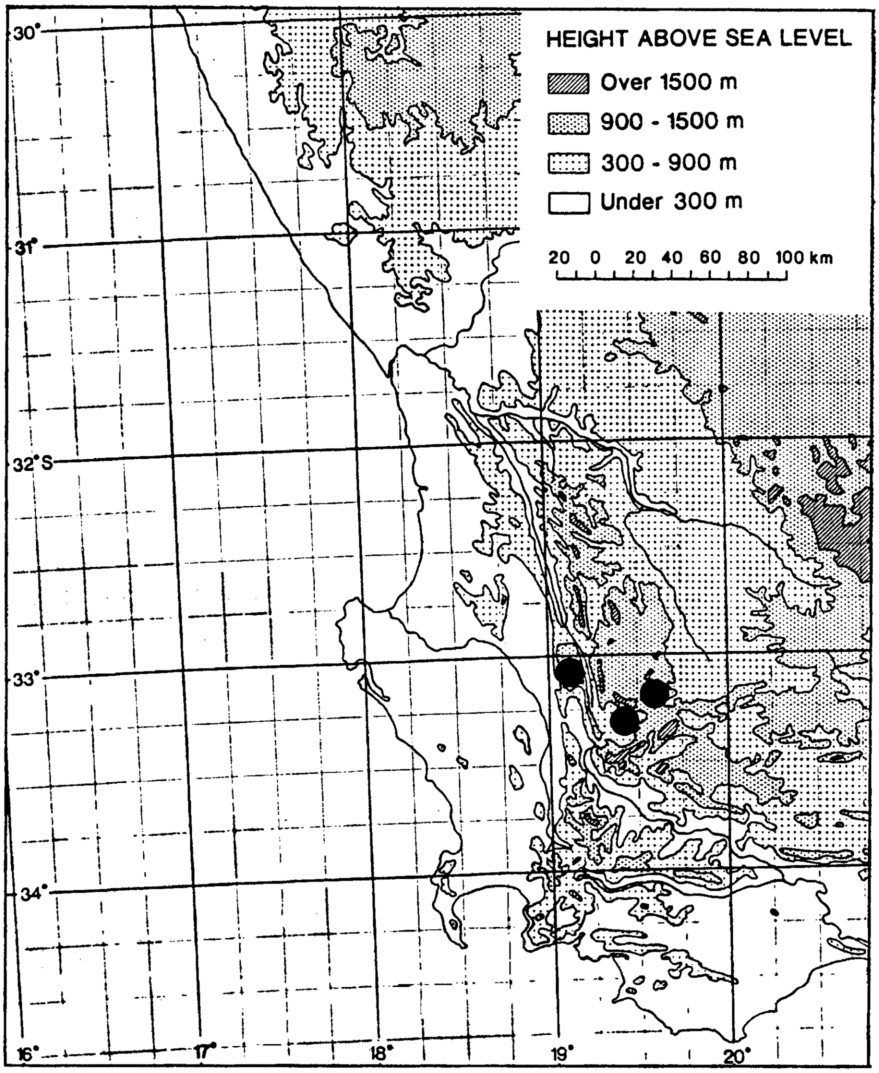

FIGURE 7.22—Known distribution of *Lachnaea alpina*.

12. **Lachnaea macrantha** *Meisn.* in A.P. de Candolle, Prodromus systematis naturalis regni vegetabilis 14: 575 (1857); C.H.Wright: 19 (1915). Type: Cape, without locality, *Ecklon & Zeyher s.n.* ["28. *Lachnaea buxifolia." Eckl. & Z. L. macrantha nob.*—script Meisner] (S, holo.!).

Lachnaea buxifolia Eckl. & Zeyh. ex Meisn.—*nom. nud.* in A.P. de Candolle, Prodromus systematis naturalis regni vegetabilis 14: 575 (1857) in synonymy.

Erect to semi-erect, sparsely to much branched shrub up to 2 m tall, single-stemmed at base; reseeder. *Branches* ascending, woody, ridged below leaf bases, glabrous, leafy, becoming naked with prominent leaf-scars. *Leaves* alternate, ascending, those lower down on stem sometimes patent, imbricate, subsessile, epistomatic, obovate, 7.0–23.0 × 2.9–11.0 mm, coriaceous, glabrous, faintly nerved, adaxially ± flat or obtusely concave, glaucous, white-punctulate, abaxially ± flat or obtusely convex, glossy, smooth, apex rounded or mucronulate, base cuneate. *Inflorescence* a terminal, more than 50-flowered, ebracteate capitulum, 35–60 mm in diameter, basally enclosed by foliage leaves, pedunculate; peduncle 2–3 mm long, puberulent towards apex, glabrous below. *Receptacle* oblong conical to ellipsoid, 4.0–5.5 × 1.8–2.2 mm, puberulent. *Flowers* sessile, zygomorphic, cream, occasionally with pink or purplish tint, fragrantly scented. *Hypanthium* 6.6–10.6 mm long, circumscissile ± midway, upper portion narrowly funnel-shaped, silky-hirsute outside, sericeous inside, basal portion narrowly ellipsoid, ellipsoid or ovoid, sericeous outside, glabrous within. *Sepals* patent, unequal, sericeous on both sides, anterior one at least three times length of other three, obovate, 8.3–16.3 × 2.3–6.5 mm, apex acute to rounded, lateral ones narrowly elliptic to narrowly obovate, 2.0–5.5 × 0.4–1.3 mm, apex acute to rounded, posterior one narrowly elliptic to elliptic or narrowly ovate, 2.0–4.0 × 0.5–1.3 mm, apex acute to rounded. *Stamens* exserted, outer, antisepalous whorl inserted near base to one-fifth way up sepal, inner, antipetalous whorl inserted at rim of hypanthium; filaments filiform, outer 0.6–2.5 mm long, inner 0.7–2.0 mm long; anthers ellipsoid to subrotund, 0.4–0.8 mm long, abaxially without broad connective tisssue. *Scales* exserted, inserted in mouth of hypanthium immediately below antipetalous stamens, obovoid, 0.4–0.7 mm long, glabrous, yellow in fresh state. *Ovary* narrowly obovoid to ovoid,1.8–3.0 mm long, attenuate at base, sericeous throughout or only near apex. *Style* filiform, upper third to upper half covered with ascending hairs, glabrous below. *Stigma* brush-like (Figure 7.23).

Distribution and ecology

Lachnaea macrantha has been recorded from the Slanghoek to Riviersonderend Mountains in the southwestern part of the Western Cape and from the Langeberg Mountains in the Swellendam and Riversdale Districts. It is a montane species with a localised distribution, occuring amongst rocks and on rock crevices on the southern,

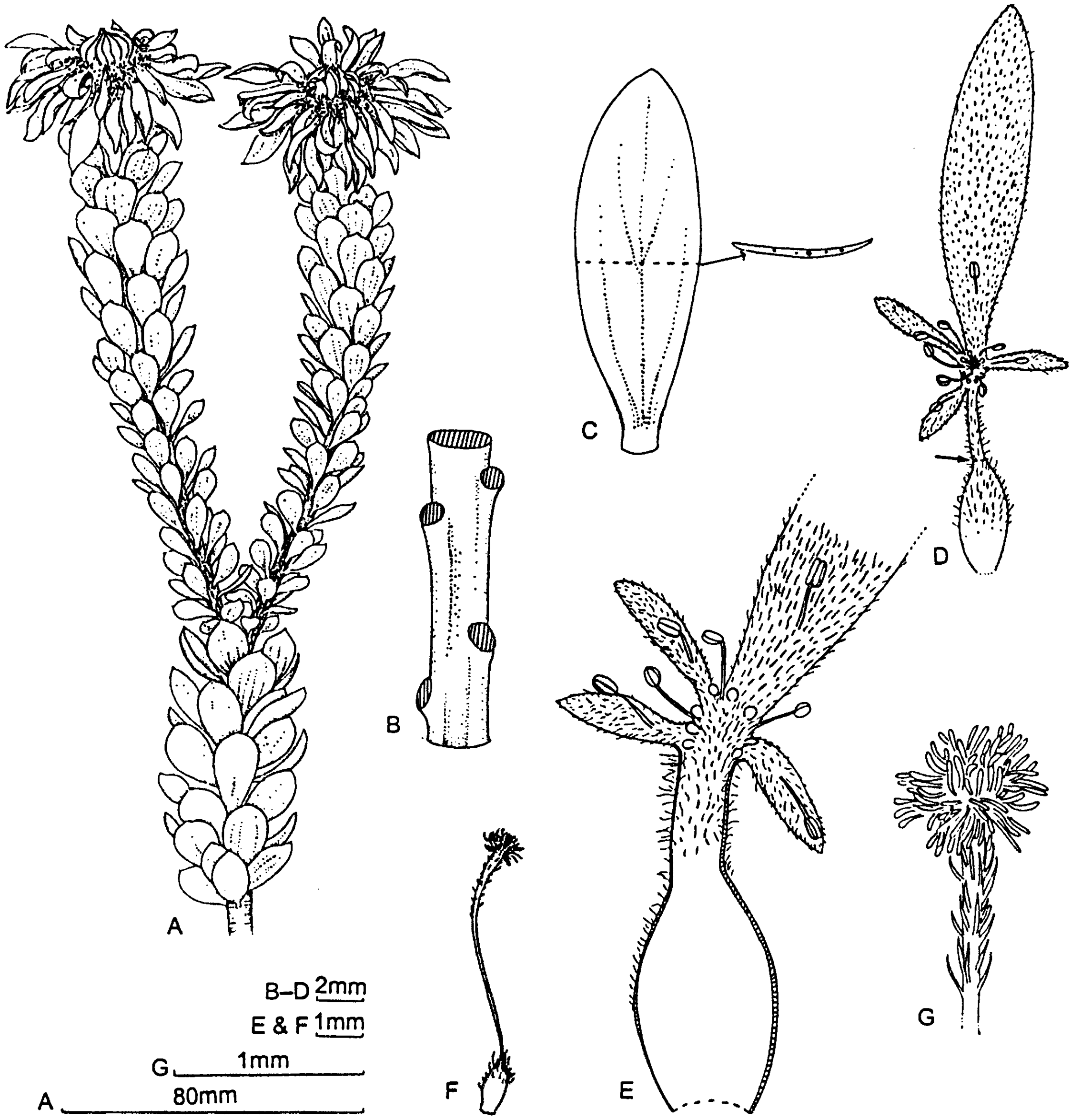

FIGURE 7.23—*Lachnaea macrantha*, *I. Oliver 3* (NBG). A, portion of plant; B, branch with leaves removed; C, leaf (abaxial view and cross section); D, flower, note circumscission zone (arrowed); E, flower split longitudinally with gynoecium removed; F, gynoecium; G, stigma and upper portion of style (enlarged).

southeastern or western mountain slopes at altitudes between 1330 and 2255 m (Figure 7.24). Flowering has been recorded from September to January and in April.

Conservation status: Lower Risk Least Concern (LRlc). Although this species has a wide distribution, it is vulnerable to frequent fires. Due to frequent fires it has disappeared locally from the southern slopes of Jonaskop, where it was last collected in 1970.

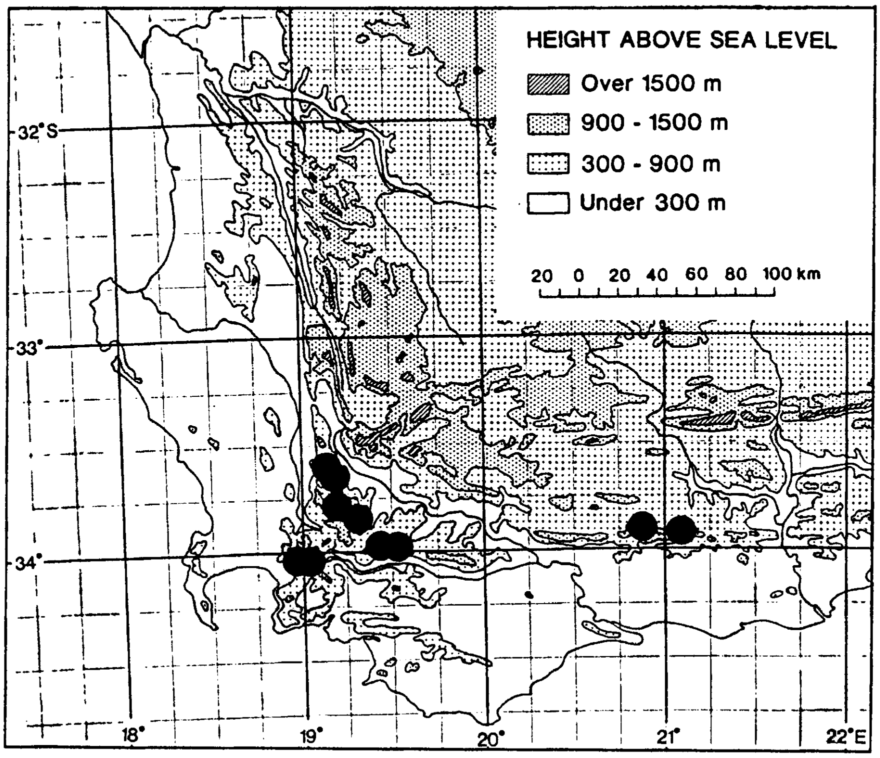

FIGURE 7.24—Known distribution of *Lachnaea macrantha*.

Diagnostic characters and relationships

Lachnaea macrantha and *L. pomposa* both have capitate, pedunculate inflorescences. *L. macrantha* is distinguished from *L. pomposa* by being a reseeder, the inflorescences are daisy-like not pompom-like, the large anterior sepal is at least three times the length of the other three and the leaves are epistomatic.

Specimens examined

WESTERN CAPE.—3319 (Worcester): Wellington, Sneeukop Mtns, 1330 m, (–CA), 07-11-1925, *Adamson SAM 36859* (SAM); Slanghoek Mtns, Witteberg, W slope, between boulders and on ledges, 1830–2000 m, (–CA), 13-11-1944, *Esterhuysen 16539* (BOL); *ibid.*, summit amongst rocks, 2000 m, 21-11-1943, *Esterhuysen 9468* (BOL); *ibid.*, 2000 m, 21-11-1943, *Wasserfall 638* (NBG); Slanghoek Mtns, Upper Wellington Sneeukop, S aspect, on shale band, 1665–1830 m, (–CA), 11-11-1956, *Esterhuysen 26484* (BOL); Worcester Dist., Du Toitskloof, (–CA), Dec. 1954, *Taylor SAM 69948* (SAM); Du Toit's Mtns, Du Toit's Peak, amongst rocks, 2165 m, (–CC), 26-01-1943, *Esterhuysen 8578* (BOL); *ibid.*, near summit, S side, 2165 m, 01-01-1966, *Esterhuysen 31452* (BOL); *ibid.*, summit, 2200–2255 m, (–CC), 13-12-1954, *Taylor s.n. sub Saasveld Herb.* (NBG); Paarl Div., Wemmershoek Peak, rocky gulley on W side, 1665 m, (–CC), 31-12-1944, *Esterhuysen 11259* (BOL); *ibid.*, 1665 m, Dec. 1944, *Stokoe SAM 58633* (SAM); Wemmershoek Mtns, Tafelberg, from rock crevices at rocky summit, 1900 m, (–CC), 05-11-1950, *Esterhuysen 17723* (BOL, PRE); Hawequas State Forest, Wemmershoek Mtns, SE-facing slope, rocky habit, 1580 m, (–CC), 04-11-1990, *Forsyth 527* (K, NBG, NY, PRE); Caledon Div., Stettynsberg, S side, below summit, 1830–1930 m, (–CD), 16-12-1944, *Esterhuysen 11163* (BOL, NBG); Caledon Dist., Riviersonderend Mtn Range, Olifantsberg, above farm Elandskloof, E slope, ± 1600 m, (–CD), *Steyn s.n.* (NBG); Riviersonderend Mtns, Jonaskop, S-facing slopes, 1665 m, (–DC), 15-12-1970, *Oliver 3195* (NBG); *ibid.*, head of Baviaanskloof, S slopes, 1600 m, 02-09-1983, *Oliver 8029* (NBG); *ibid.*, cliffs on S side, 1665 m, 09-11-1965, *Oliver s.n.* (NBG, PRE); *ibid.*, Wilde Paardeberg, 1665 m, (–DC), Jan. 1925, *Stokoe SAM 28652* (SAM).

—3320 (Montagu): Grootvadersbos State Forest, Boosmansbos Wilderness Area, S-facing slopes, 1370 m, (–DD), 02-12-1987, *McDonald 1552* (NBG).

—3321 (Ladismith): without locality [Riversdale Div., summit of Kampsche Berg; fide Wright: 19 (1915), (–CD)], *Burchell 7120* (PRE, NY).

—3418 (Simonstown): Hottentots Holland Mtns, Somerset Sneeukop, summit SE side among rocks, (–BB), Dec. 1939, *Esterhuysen 3639* (BOL); *ibid.*, Nov. 1938, *Stokoe 8039* (BOL); Somerset West, Lourensford Estate, (–BB), Jan. 1946, *Stokoe SAM 59500* (SAM); Hottentots Holland Mtns, Emerald Dome, ledges S side below shale band, 1330 m, (–BB), 09-04-1944, *Esterhuysen 10089* (BOL).

—3419 (Caledon): Jonkershoek Forest Reserve, Victoria Peak, S aspect, 1500–1600 m, (–AA), 19-01-1975, *Esterhuysen 33742* (BOL); Dwarsberg, SE face of Victoria Peak, 1600 m, (–AA), 02-01-1968, *Kerfoot 6252* (NBG); *ibid.*, moist slopes usually amongst rocks, ± 1500 m, 06-09-1973, *Kerfoot 6800* (NBG); *ibid.*, summit, amongst boulders, 10-10-1990, *Oliver I. 3* (NBG); Caledon Dist., Landdroskop, 1330 m, (–AA), Nov. 1939, *Stokoe SAM 58634* (SAM). Grid ref. unknown: Swellendam Mtns, 1630 m , Oct. 1925, *Barnard SAM 28908* (SAM); Swellendam, Puspasvalei (3319DC), Voormansbosch (3320DC), Duivelsbosch, Keurboomrivier (3320CD), 1000–4000 ft., Oct., *Ecklon & Zeyher 28* (S); summit Zuurbraak Mtn, 1630 m, 12-10-1897, *Galpin 4503* (PRE).

13. **Lachnaea filamentosa** *Meisn.* in Linnaea 14: 410 (1840); Meisn.: 575 (1857); C.H.Wright: 20 (1915). Type: Cederberg near Honigvalei [Heuningvlei], alt. 3000–3500 ft (111. A. d.), *Drège s.n.* (NY, holo.!—two collections on sheet; one *Burchell 7120* [= *L. macrantha*] and the other specimen on the right with a capsule, annotated by Meisner as "*Gnidia filamentosa* Th." *Drège. 12.*; K!, P!, S!, iso.).

Gnidia filamentosa Thunb., Prodromus plantarum capensium: 76 (1794)?—description insufficient, could also be refering to *L. pomposa* Beyers as in Thunberg Herb. specimens of both these species are annotated as *G. filamentosa*. *G. filamentosa* Thunb., Flora capensis, ed. 2: 378 (1823), non L.f.

Note: In herb. Thunberg there are two specimens annotated by Thunberg, one as *Gnidia filamentosa 1* and the other as *Gnidia filamentosa 2*. He assumed that these two specimens were conspecific with *G. filamentosa* L.f. However, in his description of the species he mentions that the sepals are unequal, which distinguishes it from *G. filamentosa* L.f. *G. filamentosa 1* is in fact *L. filamentosa Meisn.* and *G. filamentosa 2*, with its regular sepals, is *L. pomposa*.

Lachnaea filamentosa Meisn. var. *major* Meisn. in A.P. de Candolle, Prodromus systematis naturalis regni vegetabilis: 575 (1857); C.H.Wright: 20 (1915). Type: Winterhoeksberg near Tulbagh, mountain slopes, alt. 5, *Ecklon & Zeyher 72* (S, holo.!—without coll. no. but annotated by Meisner; NBG!, Z!, iso.).

Erect, sparsely to moderately branched shrub to 2 m tall, single-stemmed or multistemmed at base; reseeder or resprouter. *Branches* ascending, semi-rigid to rigid, terete or ridged below leaf bases, glabrous, leafy, becoming naked with prominent leaf scars. *Leaves* alternate, ascending, imbricate or patent with tips turned upward, closely set, sessile, amphistomatic, glabrous, 7–40 × 2–13 mm, narrowly elliptic to elliptic, narrowly obovate to obovate, narrowly ovate or occasionally ovate, coriaceous, flat, glaucous or dull green, sometimes those below inflorescence tinged blue, adaxially enervate, dull, ± white-punctulate, abaxially enervate or faintly nerved, glossy, occasionally ± white-punctulate, apex subacute, acute or mucronulate, base cuneate, occasionally attenuate. *Inflorescence* a terminal, ebracteate capitulum, usually more than 50-flowered with 10 to more than 50 open flowers at a time, 30–100 mm in diameter, basally enclosed by foliage leaves, pedunculate; peduncle 1–15 mm long, sericeous. *Receptacle* narrowly conical to conical, 5–25 × 2–11 mm, puberulent. *Flowers* sessile, zygomorphic, blue, lilac-blue, cream or cream with a lilac or blue flush, fragrantly scented. *Hypanthium* 6.3–17.5 mm long, circumscissle ± one-fifth to one-third from base, upper portion narrowly funnel-shaped, covered with long, ascending to patent, silky hairs admixed with shorter adpressed, crooked hairs on outside, within densely adpressed hairy, glabrescent towards circumscission zone, basal portion ellipsoid to ovoid, sericeous outside, glabrous within. *Sepals* patent, sericeous on both sides, unequal, anterior one almost twice to three times size of other three, narrowly elliptic to elliptic or narrowly obovate, 6.5–30.0 × 2.0–10.6 mm, apex acute to rounded, lateral ones narrowly elliptic to elliptic or narrowly obovate, 3.5–10.5 × 1.0–2.8 mm, apex acute to rounded, posterior one narrowly ovate to narrowly obovate or ovate to elliptic, 3.3–8.0 × 1.0–2.5 mm, apex acute to rounded. *Stamens* exserted, outer, antisepalous whorl inserted on sepals [anterior one inserted at base to a third-way up, other three inserted near base], inner, antipetalous whorl inserted at rim of hypanthium; filaments filiform, 1.0–5.3 mm long; anthers ellipsoid to broadly oblong, 0.6–1.5 mm long. *Scales* exserted, inserted at mouth of hypanthium immediately below antipetalous stamens, narrowly obovoid to obovoid or narrowly ovoid, 0.3–1.0 mm long, with stiff hairs at apex, yellow in fresh state. *Ovary* ellipsoid to obovoid, 1.4–5.0 mm long, tufted at apex, also occasionally adpressed hairy along side below style attachment. *Style* linear, 6.2–15.6 mm long, silky pubescent in upper third to midway, lower portion glabrous. *Stigma* brush-like (Figure 7.25).

Distribution and ecology

Lachnaea filamentosa is restricted to the Western Cape, ranging from the Pakhuis Mountains in the Clanwilliam District in the north along the Cederberg range southwards through the Groot Winterhoek and Roodesand Mountains near Tulbagh to Mostertshoek Mountain near Ceres (Figure 7.26). It occurs on stony, rocky soil or rocky outcrops, sandy areas along streamsides or in seasonally damp areas at altitudes between 665 and 1900 m.

There is considerable variation in size of the plant as well as in leaf, inflorescence and flower size. Those from the Groot Winterhoek and Roodesand Mountains, growing in seepage areas at altitudes between 1000 and 1665 m are the most robust. Throughout the range individuals growing in moist areas seem to be more luxuriant than those on open, sandy, drier areas. One collection (*Levyns 2205*) from Grootlands Peak in the Cederberg has exceptionally narrow leaves and sepals. Flowering has been recorded from July to February, with a peak from August to December.

Conservation status: Lower Risk Least Concern (LRlc).

Diagnostic characters and relationships

Lachnaea filamentosa, *L. macrantha* and *L. pomposa* belong to the group of species with capitate, pedunculate inflorescenses. *L. filamentosa* is easily distinguished from *L. pomposa* by the unequal sepals and from *L. macrantha* by the amphistomatic leaves.

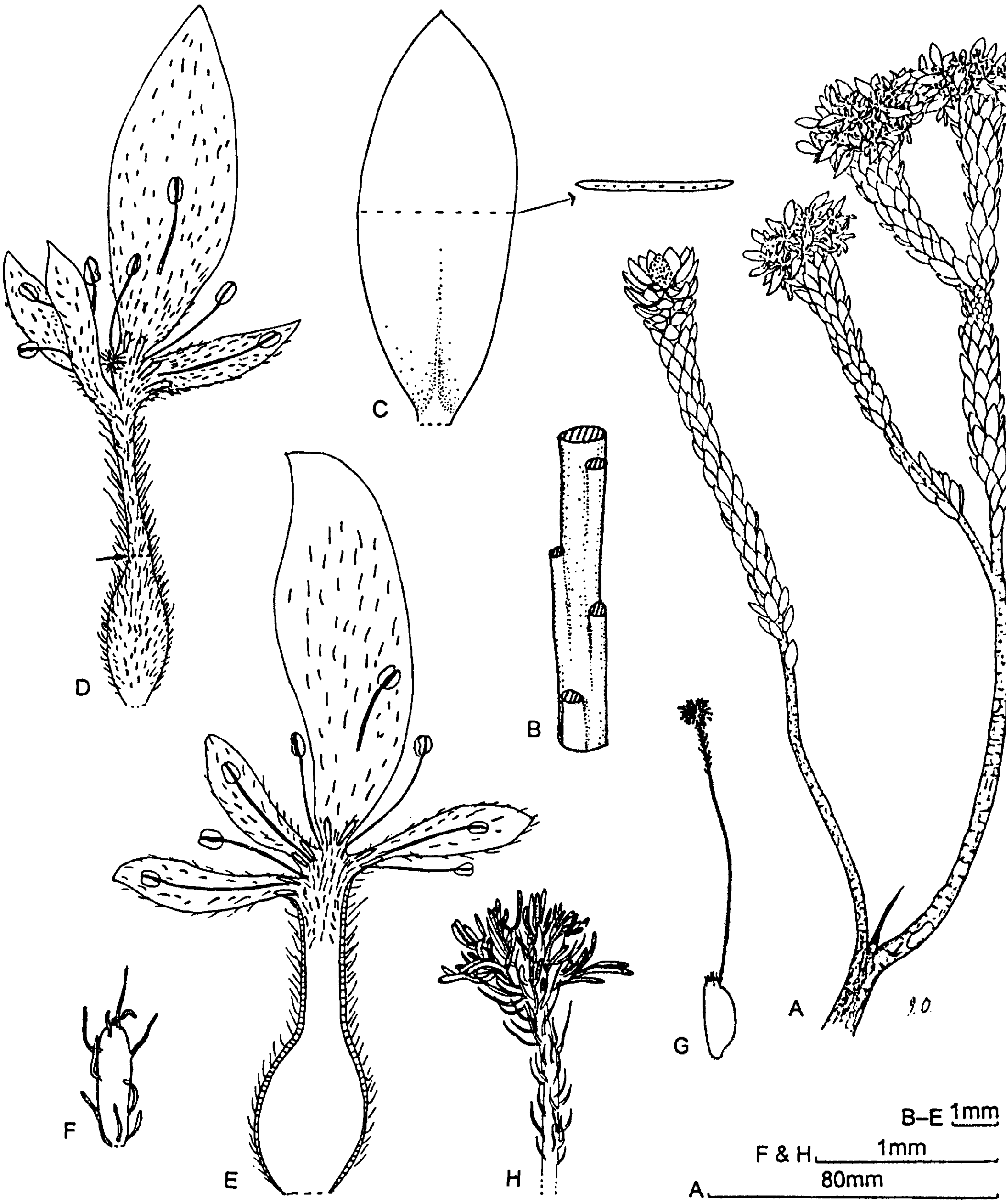

FIGURE 7.25—*Lachnaea filamentosa*, *Beyers 110* (NBG). A, portion of plant; B, branch with leaves removed; C, leaf (abaxial view and cross section); D, flower, note circumscission zone (arrowed); E, flower split longitudinally with gynoecium removed; F, scale; G, gynoecium; H, stigma and upper portion of style (enlarged).

Specimens examined

WESTERN CAPE.—3218 (Clanwilliam): Clanwilliam Dist., Steenrug farms, Varkfontein, next to small seasonal stream, (–BB), 14-08-1980, *Le Roux 2608A* (NBG).

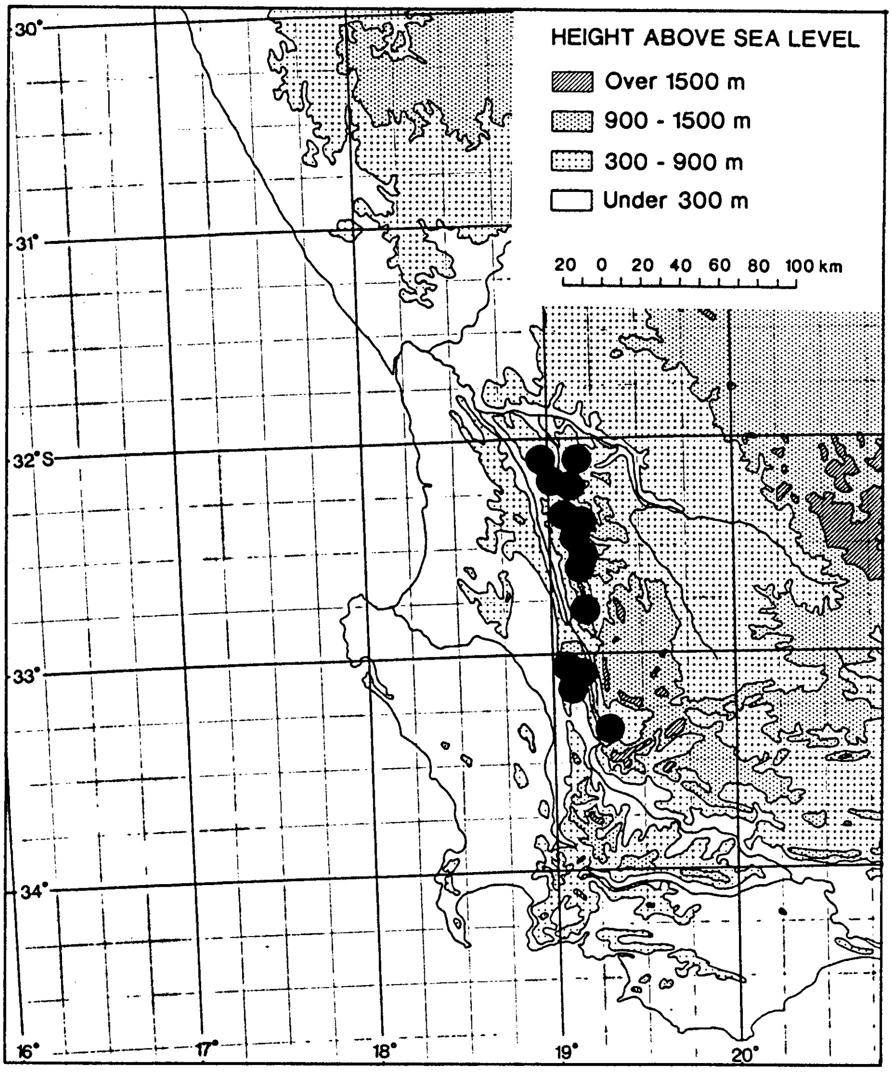

FIGURE 7.26—Known distribution of *Lachnaea filamentosa.*

—3219 (Wuppertal): Clanwilliam [precise locality unknown], 28-09-1915, *Resident Magistrate* (BOL); Clanwilliam Dist., Cederberg [precise locality unknown], Aug. 1896, *Mann sub Marloth 11382* (NBG); ibid., Oct. 1929, *Thode A2055* (K); Cederberg, Heuningvlei, marshy, sandy soil, (–AA), 03-09-1972, *Andrag 128* (NBG); *ibid.*, 1000–1165 m, 11-12-1830, *Drège 2972* (P), as *Drège* 12 (NY), as *Drège s. n. sub. Herb Bentham* (K), as *Drège SAM 19790* (SAM); *ibid.*, 29-12-1941, *Esterhuysen 7482* (BOL); *ibid.*, rocky, slight N slope near stream, ± 1165 m, 14-09-1976, *Hugo 528* (NBG); *ibid.*, 665 m, 1896, *Leipoldt 364* (BOL, SAM, Z); *ibid.*, streamside, 22-11-1955, *Middlemost 1892* (NBG); *ibid.*, scattered on water courses, ex hort. Kirstenbosch, 16-07-91, 17-07-1991, *Powrie 196* (NBG); *ibid.*, Jan. 1942, *Stokoe SAM 58635* (SAM); *ibid.*, E aspect, 23-11-1996, *Van Rooyen, Steyn & De Villiers 338* (NBG); Pakhuis Pass, along jeeptrack to Heuningvlei; (–AA), 22-10-1988, *Beyers 109* (NBG); *ibid.*, streamside near grassy flats, ± 950 m, 06-11-1983, *Taylor 10770* (NBG); Pakhuis Pass, 1000 m, (–AA), 30-09-1940, *Bond 604* (NBG); *ibid.*, 19-09-1937,*Compton 6935* (NBG); *ibid.*, 09-09-1958, *Hayes NBG 52593* (NBG); *ibid.*, Oct. 1929, *Leipoldt BOL 46862* (BOL), as *Leipoldt STEU 25887* (NBG); *ibid.*, top of pass, 26-08-1951, *Martin 795* (NBG); *ibid.*, along forestry track, seasonally damp sandy soil, 15-11-1976, *Spreeth 139* (NBG); *ibid.*, plateau at top of pass, moist places, 28-11-1955, *Taylor 1613* (SAM); *ibid.*, S of top of pass, 1100 m, 02-08-1966, *Williams 848* (NBG); plateau S of Pakhuis Pass, 640 m, (–AA), 28-10-1956, *Dahlgren & Peterson 895* (NBG); North Cederberg, Krakadouw Peak, rocky summit, 1900 m, (–AA), 20-10-1945, *Esterhuysen 12090* (BOL); *ibid.*, 1000–1900m, Sept. 1936, *Thorne SAM 52499* (SAM); Clanwilliam Dist., near Boontjieskloof, streambank, 665–1000 m, (–AA), 24-10-1945, *Esterhuysen 12202* (BOL, NBG); North Cederberg, Pakhuis, on plateau amongst rocks, 1000 m, (–AA), 07-09-1953, *Esterhuysen 21763* (BOL); *ibid.*, above 1165 m, Dec. 1940, *Leipoldt 3505* (BOL); *ibid.*, E end of forestry road, 24-08-1966, *Pamphlett 114* (NBG); Cederberg Forest Reserve, SE of Heuningvlei, sandy banks of stream, ± 1030 m, (–AA), 03-12-1969, *Kruger 986* (NBG); Pakhuisvlakte beyond Stoor, near stream crossing at *Roridula* site, 970 m, (–AA), 07-11-1988, *Taylor 12001* (NBG); Clanwilliam, Rheboksberg, 1165–1200 m, Sept. 1936, *Thorne SAM 52675* (SAM); Cederberg, shale band east of Sneeukop, marshy ground, 1665 m, (–AC), 15-08-1973, *Andrag 226* (NBG); Cederberg, between Middelberg Hut and Crystal Pool, 1330–1665m, (–AC), 22-09-1930, *Barnes BOL 19301* (BOL); near Middleberg Hut and Crystal Pool, (–AC), Sept. 1930, *Barnes s. n.* (NY); Cederberg Mtns, Sneeuberg, along jeeptrack near hut, (–AC), 23-10-1988, *Beyers 110* (NBG); *ibid.*, shale belt, 1400 m, 18-10-1923, *Pocock 402* (NBG); *ibid.*, along jeep track near hut, 16-11-1976, *Spreeth 146* (NBG); *ibid.*, W aspect, 16-11-1996, *Van Rooyen, Steyn & De Villiers 209* (NBG); Cederberg, Sneeukop, 1665 m, (–AC), 04-10-1897, *Bodkin BOL 9085* (BOL, NBG); Cederberg, Sneeuberg Hut, ± 1500 m, (–AC), 03-09-1963, *Bos 584* (NBG); *ibid.*, approximately 1 km E of hut, on plateau, 1300 m, 14-10-1995, *Hanekom 2814* (NBG); *ibid.*, near hut, in rock outcrop on sand flats, ± 1400–2000 m, 09-09-1971, *Kruger 1397* (NBG); *ibid.*, hut vlakte, deep sand, moist near rock outcrop, ± 1300 m, 24-09-1983, *Taylor 10675* (NBG); Cederberg, Juriesberg, (–AC), 24-09-1937, *Compton 7025* (NBG); South Cederberg, Duiwelsgat, Sneeuberg area, streamside, 1000 m, (–AC), 11-10-1946, *Esterhuysen 13115* (BOL); *ibid.*, near Duiwelsgat, 1000–1330 m, Oct. 1898, *Thode 5268* (NBG); Cederberg Forest Reserve, shale band SE of Langberg on stream banks, ± 1530 m, (–AC), 02-12-1969, *Kruger 977* (NBG); Cederberg, Middelberg Plateau, growing with 2206, 1530 m, (–AC), Sept., 1927, *Levyns 2205* (BOL); *ibid.*, 1530 m, Sept. 1927, *Levyns 2206* (BOL); *ibid.*, vlaktes on plateau, 1665 m, 12-10-1923, *Pocock 153* (NBG); Cederberg State Forest, Sneeuberg summit, rocky (TMS) summit ridge, 2000–2200 m, (–AC), 04-12-1964, *Taylor 6154* (NBG); Cederberg, between Tafelberg and Corridor Peak, 165 m above jeeptrack, (–AC), 05-09-1965, *Reinecke s.n. sub Mattatia 29* (BOL); Cederberg, Hoogvertoon, along jeep track to Sneeuberg hut, (–AC), 16-11-1976, *Spreeth 147* (NBG); Southern Cederberg, Suurvlakte, S of Apex Peak, flats S of dam. 1265 m, (–CA), 13-10-1994, *Beyers 245* (NBG); Kunje, Middelberg between Ceres and Citrusdal, (–CA), 10-10-1987, *Cillie 4* (NBG); Cederberg Forest Station, summit of Heksberg, in deep sand with restioids, (–CA), 03-12-1983, *Viviers 1236* (NBG); Koue-Bokkeveld Mtns, above farm Wydekloof, in sand amongst boulders, (–CC), 14-10-1975, *Hanekom 2468* (Z).

—3319 (Worcester): Winterhoek Mtns near Tulbagh, on plain, 830 m, (–AA), Nov. 1877, *Bolus 5260* (BOL, Z); Worcester, Winterhoeksberg, 330–1665 m, (–AA), Nov., *Ecklon & Zeyher 72.11* (NBG, PRE, Z) as *Ecklon & Zeyher s.n.* (S); Groot Winterhoek Mtns, 1665 m, (–AA), 06-12-1896, *Bolus A. sub Guthrie 4192* (BOL, NBG, PRE); *ibid.*, The Shoot SE of Sneeugat alongside perennial river running down from Sneeugat Peak, 1350 m, 18-11-1995, *Hansford 47* (NBG); *ibid.*, N-E of De Tronk, E edge of shale band, rocky slab in stream bed, 1000 m, 02-10-1981, *Low 1246* (NBG); *ibid.*, 1665 m, Oct. 1896, *Marloth 1952* (GRA, SAM), as *Marloth 1852* (Z); *ibid.*, 1500 m, Nov. 1896, *Marloth 2327* (NBG); *ibid.*, Sneeugat valley, bank of stream, 1330 m, 18-11-1916, *Phillips 1861* (SAM); *ibid.*, Sneeugat, NE of Tulbagh, very stony soil, Nov., 1976, *Spreeth 144* (NBG); Roodesandberg, Tulbagh Wild Flower Show, (–AA), 13-09-1950, *Comm. Esterhuysen 17446* (BOL); Groot Winterhoek Forest Reserve, above Klein Kliphuis on bare slope above side stream, (–AA), 15-08-1982, *Esterhuysen 35790* (BOL); *ibid.*, between De Tronk and Perdevlei farms, NE aspect, 1000 m, 01-09-1980, *Forsyth 89* (NBG); *ibid.*, Driebosch, in sandy soil on shale band, ± 930 m, 28-08-1973, *Haynes 810* (NBG); *ibid.*, Driebosch, Porteville Plateau, on gentle sandy slopes, ± 965 m, 09-09-1971, *Kruger 1389* (NBG); Tulbagh Dist., Klein Winterhoek, half-way between Kleinpoort to Klein Winterhoek, 1400 m, (–AA), 12-11-1995, *Hansford 46* (NBG); *ibid.*, 1330 m, Feb. 1922, *Stokoe BOL 15405* (BOL); Tulbagh, Sneeugat Valley, 1165–1330 m, (–AA), Nov. 1932, *Thorne SAM 50391* (SAM); Mostertsberg [Mostertshoek] near Ceres, ± 830 m, (–AD), 31-01-1892, *Schlechter 936* (Z). Grid ref. unknown: Ceres Wild Flower Show, 01-10-1934, *Compton 4891* (BOL, NBG); Tulbagh Flower Show, 13-09-1969, *Van der Merwe s. n.* (NBG).

14. **Lachnaea pomposa** *Beyers*, nom. nov.

Gnidia filamentosa L.f., Supplementum plantarum: 224. (1782), non *Lachnaea filamentosa* Meisn.: 410 (1840); Thunb.: 76 (1794); Willd. 2: 425 (1799); Wikstr.: 311 (1818); Thunb.: 328 (1823) [but not the description which correlates with *L. filamentosa* Meisn.], Spreng.: 239 (1825). Type: Cape of Good Hope, herb. LINN 502.13 (LINN, lecto. here designated, —PRE, micofiche!, —NBG, photocopy!). *Lachnaea filamentosa* (L.f.) Gilg, in Engler & Prantl Natürlichen Pflanzenfamilien. 3, 6a: 240 (1894)—*nom. illeg.*

Lachnaea buxifolia Lam., Encyclopédie méthodique 3, 2: 373, t. 292, fig. 1 (1792)—*nom. superfl.*; Andrews: 8, t.524 (1808); Meisn.: 410 (1840), 575 (1857); C.H.Wright: 19 (1915). Type: as for *Gnidia filamentosa* L.f.

Lachnaea buxifolia var. *virens* Sims in Curtis's Botanical Magazine 39: t. 1657 (1814a)—*nom. superfl.*; *Gnidia filamentosa* var. *virens* Wikstr.: 311 (1818). Type: as for *Gnidia filamentosa* L.f.

Lachnaea glauca Salisb., Paradisus Londinensis 2: t. 109 (1808)—*nom. superfl.*; W.T.Aiton: 415 (1811); *L. buxifolia* var. *glauca* Sims in Curtis's Botanical Magazine 39: t.1658 (1814b); *Gnidia filamentosa* var. *glauca* Wikstr. in Kongl. Vetenskaps Academiens Handlingar 1818: 311 (1818). Type: as for *Gnidia filamentosa* L.f.

Gnidia grandis hort., Sims in Curtis's Botanical Magazine 39: t. 1658 (1814b).

Linnaeus filius was the first to describe this species as *Gnidia filamentosa*. Lamarck (1792) transferred *G. filamentosa* to *Lachnaea* but unfortunately did not take up Linnaeus' epithet. Subsequent authors followed suit and as a result all the names for this species are illegitimate. Meisner (1840) decided that what Thunberg (1823) had described as *Gnidia filamentosa* was not the same as *G. filamentosa* L.f.. He cites *L. buxifolia* Lam. with *G. filamentosa* L.f. non Thunberg in synonymy and describes a new plant *L. filamentosa* nob. with *G. filamentosa* Thunb. in synonymy. With the epithet, *filamentosa,* thus occupied in *Lachnaea* the new combination by Gilg, *L. filamentosa* (L.f.) Gilg is illegitimate. As all the available names for this species are illegitimate, a new name, *L. pomposa*, is proposed.

Erect, moderately branched shrub to 1.7 m tall, single-stemmed or multistemmed at base; reseeder or resprouter. *Branches* ascending, stout, rigid, ridged below leaf bases, usually glabrous but occasionally sparsely adpressed hairy towards the apex [specimens from Touwsberg], leafy, becoming naked with prominent leaf scars. *Leaves* alternate, ascending to patent, occasionally reclined, those below inflorescences patent to reclined with their tips turned upwards, imbricate, sessile, amphistomatic, glabrous, narrowly elliptic to elliptic, narrowly ovate to widely ovate or narrowly obovate to obovate, 7–38 × 2–19 mm, coriaceous, glaucous, adaxially flat, midveined or subnervate, abaxially flat, faintly nervate, apex mucronulate, obtuse, rounded or acute, base rounded, cuneate or attenuate. *Inflorescence* a terminal, more than 50-flowered, ebracteate capitulum, 25–55 mm in diameter, basally enclosed by the foliage leaves, pedunculate; peduncle 1–10 mm long, shortly sericeous. *Receptacle* subconical to conical, 4.0–12.0 × 2.8–6.0 mm, puberulent. *Flowers* sessile, subactinomorphic, cream, occasionally with blueish tint, sweet-scented. *Hypanthium* 9–20 mm long, circumscissile one-fifth to one-third from base, upper portion narrowly funnel-shaped, silky hirsute or hirsute-tomentose outside, within densely hairy at mouth, rest adpressed hairy, basal portion ellipsoid, ovoid or obovoid, sericeous or silky hirsute outside, glabrous within. *Sepals* patent, ± equal, adaxially and abaxially sericeous, ovate or elliptic, 3.5–9.0 × 1.6–5.3 mm, apex acute. *Stamens* exserted, outer, antisepalous whorl inserted at base of sepals, usually the longest, inner, antipetalous whorl inserted at rim of hypanthium; filaments filiform, 1.3–5.0 mm long; anthers ellipsoid to spheroid, 0.4–1.5 mm long. *Scales* exserted, inserted at mouth of hypanthium immediately below antipetalous stamens, obscured by dense hairs in mouth, narrowly obovoid to obovoid or ellipsoid, 0.4–0.9 mm long, hirsute at apex, occasionally glabrous [specimens from Matroosberg], at first yellow later translucent in fresh state. *Ovary* ellipsoid, 1.4–3.0–(5.0) mm long, tufted at apex, occasionally sericeous in upper half. *Style* filiform, 8.3–18.2 mm long, midway to upper quarter adpressed hairy, lower portion glabrous. *Stigma* brush-like (Figure 7.27).

Distribution and ecology

Lachnaea pomposa is endemic to the Western Cape, occuring on the mountain slopes from the Olifants River Mountains in the north through to the Du Toits Mountains in the south, and to the Witteberg and the mountains of the western end of the Little Karoo as far east as the Klein Swartberg at altitudes between 500 and 2330 m (Figure 7.28). Flowering has been recorded from August to January.

Conservation status: Lower Risk Least Concern (LRlc).

Etymology

The specific epithet, derived from *pomposus* meaning showy or splendid, refers to the showy, pompom-like inflorescences.

Diagnostic characters and relationships

This species, with its more or less regular sepals, can easily be distinguished from *Lachnaea filamentosa* and *L. macrantha* with similar, large, showy, ebracteate capitula and strongly zygomorphic flowers.

Specimens examined

CAPE.—3219 (Wuppertal): Ceres Div., Olifants River Mtns, 1500 m, (–CC), 28-12-1946, *Esterhuysen 13459* (BOL).

—3319 (Worcester): Groot Winterhoek State Forest, Kliphuisvlakte, rocky sandy soil on top of ridge, (–AA), 15-11-1977, *Durand 289* (NBG); Schurfdeberg, Tulbagh, (–AA/AB), Nov., *Pappe s.n.* (Z); *ibid.*, Nov., *Pappe SAM 1477* (SAM); *ibid.*, *Zeyher 1477* (K, PRE,); Ceres, Agter Witzenberg, farm Slagboom, NW slope, 1130 m, (–AB), 22-11-1988, *Beyers 122* (NBG); Ceres, Schurfdeberg Pass, (–AB), 30-10-1950, *Hall 184* (NBG, NBG); Modderrivierskloof, (–AB), Dec. 1976, *Hugo 788a* (NBG); Worcester, slopes at head of sandy vlakte, ± 1465 m, (–AB), 06-11-1973, *Taylor 8648* (NBG); Ceres Dist., Ceres Nature Reserve,

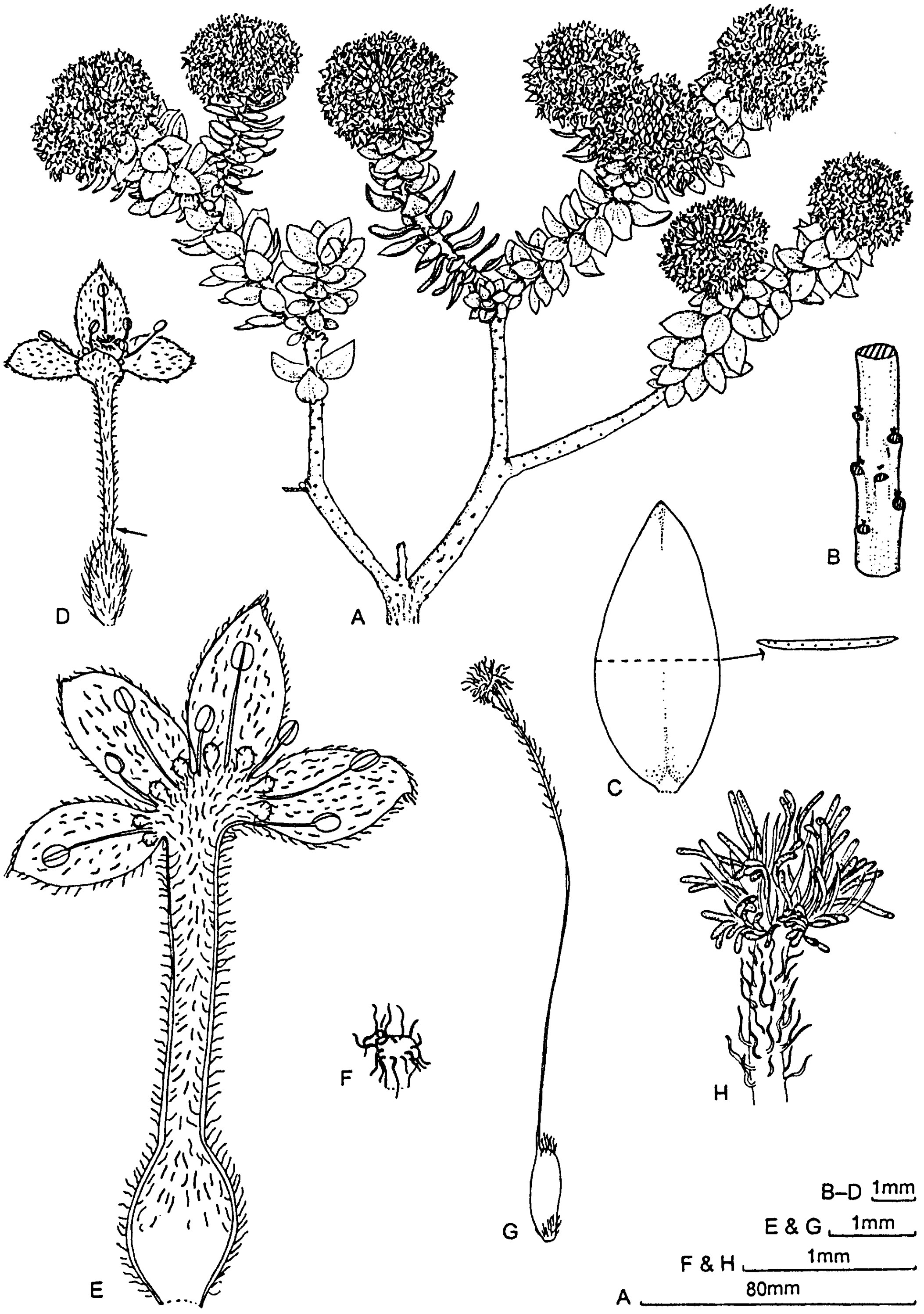

FIGURE 7.27—*Lachnaea pomposa*, *Beyers 118* (NBG). A, portion of plant; B, branch with leaves removed; C, leaf (abaxial view and cross section); D, flower, note circumscission zone (arrowed); E, flower split longitudinally with gynoecium removed; F, scale; G, gynoecium; H, stigma and upper portion of style (enlarged).

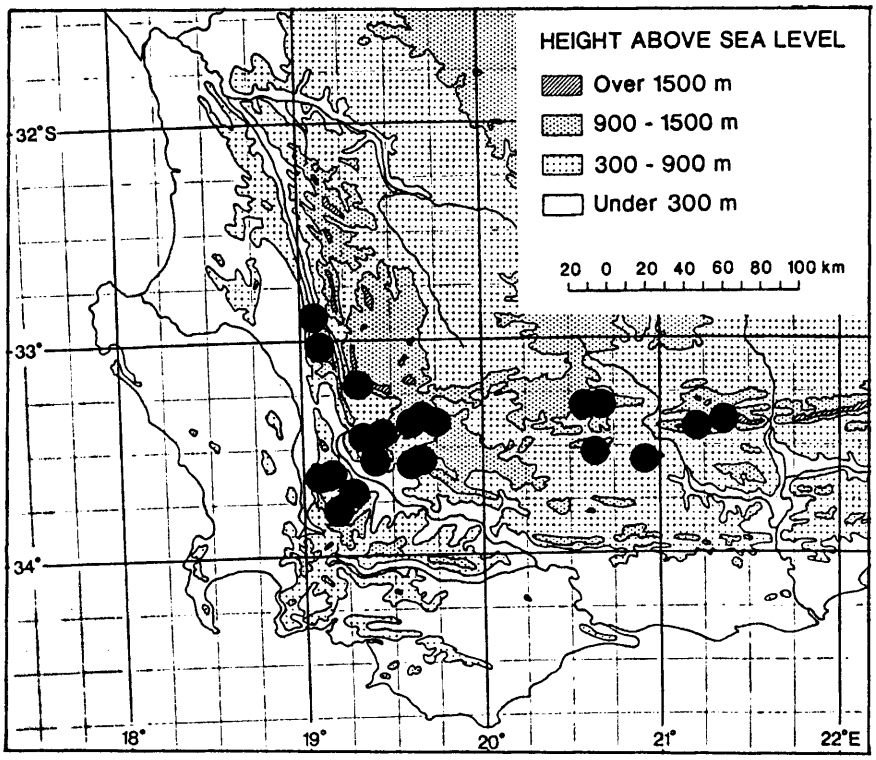

FIGURE 7.28—Known distribution of *Lachnaea pomposa*.

cultivated from seed, (–AD), 22-11-1988, *Beyers 123* (NBG); Ceres, Mitchell's Pass, 500 m, (–AD), Sept. 1903, *Bolus 445* (NBG); *ibid.*, Slab Peak, 665 m, 05-10-1941, *Compton 11962* (NBG); *ibid.*, 05-10-1941, *Esterhuysen BOL 46772* (BOL); *ibid.*, Ceres side, 03-10-1934, *Thorne SAM 51240* (SAM); Skurfdeberg near Ceres, 600 m, (–AD), Oct. 1899, *Bolus 7349* (BOL); *ibid.*, 900 m, Oct. 1889, *Bolus HNAA 1091* (Z); Worcester Div., Milner Peak, S side, shale band, 1665 m, (–AD), 07-12-1947, *Esterhuysen 14265* (BOL); *ibid.*, 1665 m, 18-12-1948, *Esterhuysen 14928* (BOL); Ceres Div., Castle Rocks, S slopes, (–AD), 05-12-1948, *Esterhuysen 14696* (BOL); Ceres, (–AD), Oct. 1940, *Leslie NBG 52580* (NBG); *ibid.*, 1831, *Stokoe 6475* (BOL); Matroosberg, 2330 m, (–BC), Dec. 1895, *Bolus sub Guthrie* (NBG); *ibid.*, shale band on W slope, in swamp, 02-12-1947, *Esterhuysen 14193* (BOL); *ibid.*, 1665 m, Sept. 1924, *Levyns 959* (BOL); *ibid.*, upper slopes, 2065 m, Sept. 1924, *Giffen sub Levyns 960* (BOL); *ibid.*, 2000 m, Dec. 1895, *Marloth 2256* (NBG); *ibid.*, near Lakenvlei, 2000–2330m, Jan. 1917 *Phillips 2048* (SAM); mouth of Els Kloof, Hex River, (–BC), 15-08-1897, *Wolley Dod 2758* (BOL. K); Ceres, Bokkerivier Farms, SE of camping site, (–BC/BD), 09-11-1963, *Horrocks 109* (NBG); Hawakwa Mtn, Du Toits Kloof, on farm De Poort, S slope, 1000 m, (–CA), 09-11-1988, *Beyers 118* (NBG); *ibid.*, 04-11-1980, *Walters 2353* (NBG); Paarl Dist., Du Toit's Kloof, (–CA), 27-11-1962, *D'Ewes s.n.* (NBG); Du Toitskloof Mtn, in rocks (III, A, e), [a,], 1000–1165 m, (–CA), 30-11-1827, *Drège 1197* (P); Du Toitskloof (III, A, e), 665 m, (–CA), 28-12-1827, *Drège s.n.* (P); *ibid.*, *Drège s.n. Herb. Hooker* (K); Paarl Div., Lower Wellington Sneeukop, S slopes, 1130–1330 m, (–CA), 23-12-1945, *Esterhuysen 12451* (BOL); Paarl Div., Bailey's Peak to Pic Blanc, 1330 m, (–CA), 22-11-1953, *Esterhuysen 22367* (BOL); Paarl Div., Seven Sisters Mountain, on cliffs, 1330 m, (–CA), 14-11-1954, *Esterhuysen 23940* (BOL); Worcester Dist., Slanghoek Mtns, Farm Witelsrivier, (–CA), 12-10-1997, *Le Roux s.n.* (NBG); Bainskloof, in kloof below Sneeukop, (–CA), 11-10-1946, *Rehm STE 26824* (NBG); Bainskloof, (–CA), Nov. 1949, *Stokoe SAM 62665* (SAM); Worcester Dist, Steenboksberg, ± 500 m, (–CA), 29-08-1965, *Taylor 6435* (NBG); Wellington, slopes of Sneeukop, (–CA), Nov. 1922, *Thorne SAM 46524* (SAM); Worcester Div., plateau on Fonteintjiesberg, (–CB), 00-09-1925, *Stokoe BOL 18423* (BOL); Worcester Div., Du Toit's Peak, steep S slopes, 1000-1330 m, (–CC), 27-12-1949, *Esterhuysen 16641* (BOL); Worcester Div., Keeromsberg, 1000–1330 m, (–DA), 22-11-1956, *Esterhuysen 26594* (BOL); *ibid.*, W side, shale band, 1000–1330 m, 01-11-1943, *Esterhuysen 9243* (BOL); Kwadouwsberg, Saw-Edge Peak on farm Keeromsberg, along jeeptrack on lower slopes, 1120 m, (–DA), 29-10-1988, *McDonald 1687* (NBG); Saw Edge Peak, N slopes above Tierkloof, 1000 m, (–DA), 24-08-1972, *Oliver 3791* (NBG); Saw Edge Peak, N slope, 1000 m, (–DA), 24-08-1972, *Rourke 1356* (NBG).

—3320 (Montagu): Witteberg (Bantams), 1665 m, (–BC), 27-10-1941, *Compton 12227* (NBG); Laingsburg, Witteberg (Whitehill), 1300 m, (–BC), 21-10-1942, *Compton 13946* (BOL, NBG); Laingsburg, Fisantekraal, S aspect, 1330 m, (–BC), 07-11-1948, *Compton 21088* (NBG); summit of Witteberg, 1665 m, (–BC), Oct. 1924, *Compton 2723* (BOL); Witteberg, S of Bantams, S slopes, 1330-1500 m, (–BC), 04-11-1936, *Esterhuysen 30482* (BOL); *ibid.*, Bantamskop, 20-10-1989, *Marais s.n.* (NBG); *ibid.*, Bantams SABC tower, 1565 m, 20-10-1989, *Van Zyl 3974* (NBG); Ladismith, Anysberg, next to forestry track, 1665 m, (–DA), 16-09-1982, *Vlok 453* (NBG); Ladismith Dist., Touwsberg, W end summit ridge, steep S-facing slope, 1160 m, (–DB), 05-10-1993, *Oliver 10301* (K, MO, PRE, NBG).

—3321 (Ladismith): Ladismith, Swartberg, Towerkop, S aspect, 2165 m, (–AC), 15-12-1956, *Esterhuysen 26811* (BOL); Klein Zwartberg, W of Towerkop on Bleshoek, SW aspect below summit, ± 1930 m, (–AC), 09-11-1991, *Forsyth 530* (NBG); Seweweekspoort, mountain slopes, 1330 m, (–AD), 26-09-1928, *Adamson BOL 46870* (BOL); Klein Swartberg, N of Seweweekspoort, 1666 m, (–AD), 03-01-1981, *Vlok 117* (NBG); Klein Swartberg, ESE of Seweweekspoort, Gysmanskop, Blouberg, 1665 m, (–BC), 13-11-1972, *Rycroft 3143* (NBG). Doubtful locality: Constantiaberg, in stony places, ± 500 m, (3418AB), 29-05-1892, *Schlechter 880* (Z). Without locality, *Foster Herb.* (K); 1882, *Sickenberger s.n.* (Z); *Thunberg in herb. Thunb. 9551* (UPS).

15. **Lachnaea capitata** *(L.) Crantz* in Institutiones rei herbariae 1: 129 (1766); Meisn.: 414 (1840) [as var. *pauciflora*]; Meisn.: 552 (1843); Meisn.: 577 (1857) [as var. *pauciflora*]; C.H.Wright: 22 (1915); Levyns: 601 (1950); Mason: 150, t. 64, f. 7 (1972). *Passerina capitata* L. Amoenitates academicae 6: 88 (1760); L.: 513 (1762); Burm.f.: 12 (1768); Thunb.: 75 (1794); Wendl.: 18, t. 2, f. 17 (1798); Poir.: 41, t. 291, f. 3 (1804); Wikstr.: 329 (1818); Thunb.: 376 (1823); Spreng.: 240 (1825). Type: Africa australis: Caput bonae Spei, *herb. Burman s.n.* (G.-DEL, lecto. here designated, —NBG, photo!). The specimen chosen here, selected from six original elements, most closely matches the illustration in Burm. Rar. afr. pl. 133. t. 48, fig. 3 (1739).

Lachnaea capitata var. *multiflora* Meisn. in Linnaea 14: 414 (1840); Meisn.: 578 (1857). Type: near Dieprivier, alt. below 100 ft *Drège s.n.* (NY ["Pas. capitata. L. c." Drège], holo.!; P!, iso.).

Lachnaea phylicoides Lam. Encyclopédie méthodique 3, 2: 374, non t. 392, f. 3 (1792); Meisn.: 414 (1840). Type: Herb. Lamarck 19.3-1 (P-LA, lecto. here designated, — NBG, photo!).

Gonophylla acuminata Eckl. & Zeyh. ex Meisn.—*nom. nud.* in A.P. de Candolle, Prodromus systematis naturalis regni vegetabilis 14: 578 (1857) in synonymy.

Gonophylla capitata Eckl. & Zeyh. ex Meisn.—*nom. nud.* in A.P. de Candolle, Prodromus systematis naturalis regni vegetabilis 14: 578 (1857) in synonymy.

Gonophylla conglomerata Eckl. & Zeyh. (pro parte) ex Meisn.—*nom. nud.* in A.P. de Candolle, Prodromus systematis naturalis regni vegetabilis 14: 578 (1857) in synonymy.

Thymelaea foliis linearibus, etc., Burman Rariorum africanarum. plantarum 133, t. 48, fig. 3 (1739). Type: as for *Passerina capitata*.

Erect, sparsely to moderately branched shrub up to 1,8 m tall, single-stemmed at base; reseeder. *Branches* ascending, slender, lax, occasionally rigid [few individuals from Cape Peninsula], ridged below leaf-bases, glabrous or distal 1–4 internodes below inflorescence sericeous, leafy, becoming nude and marked with leaf-scars. *Leaves* alternate, ascending, crowded to distant, internodes one-fifth to twice leaf length, sessile, amphistomatic, glabrous, linear to narrowly elliptic, 5.2–21.0 × 0.7–1.8 mm, coriaceous, green, concolourous, enervate, glossy, white-punctulate, adaxially ± flat to concave, abaxially flat to convex, sometimes subkeeled, apex acute to acuminate, base cuneate to attenuate. *Inflorescence* a terminal, ebracteate capitulum, 5–16 mm in diameter, up to 20-flowered with 1–8 open flowers, pedunculate; peduncle 3–6 mm long, sericeous. *Receptacle* at first hemispherical, later after elongating, cylindrical-conical, 0.9–20.2 × 1.5–6.0 mm, sericeous. *Flowers* sessile, subactinomorphic, cream. *Hypanthium* 2.5–4.6 mm long, circumscissle two-fifths to three-fifths from base, upper portion obconical, basal portion ovoid, ellipsoid or obovoid, sericeous outside, inside between plane of circumscission and base of scales adpressed hirsute, rest glabrous. *Sepals* ascending, subequal, elliptic to oblate or ovate to widely depressed ovate, 1.2–2.8–(5.0) × 1.2–3.2 mm, adaxially densely to sparsely covered with short, silky, adpressed hairs, abaxially sericeous, apex rounded to obtuse. *Stamens* exserted or inner, antipetalous whorl only anthers exserted, outer, antisepalous whorl inserted at base of sepals, inner, antipetalous whorl inserted a quarter to midway down upper portion of hypanthium; filaments filiform, 0.3–1.7 mm long, inner whorl shorter than outer whorl; anthers ellipsoid to spheroid, 0.4–0.7 mm long, abaxially without broad connective tissue. *Scales* included, inserted two-thirds to three-quarters way down upper portion of hypanthium, narrowly oblong, 0.4–0.9 mm long, glabrous, translucent or yellow-translucent. *Ovary* ellipsoid to obovoid, 0.7–1.6 mm long, glabrous. *Style* filiform, 1.7–4.7 mm long, adpressed hairy to sparsely adpressed hairy. *Stigma* brush-like (Figure 7.29).

Distribution and ecology

Lachnaea capitata is restricted to the Western Cape, where it occurs on sandy flats and lower mountain slopes from Clanwilliam in the north, southwards to the Cape Peninsula and inland to Franschhoek and Goudini (Figure 7.30). Flowering has been recorded from June to March.

Conservation status: Vulnerable (VU A1c). *L. capitata* may have disappeared from the Cape Peninsula as a result of urban development as no recent collections have been made. Very few recent collections are known from the sandy flats up the west coast and in the Tygerberg area.

Diagnostic characters and relationships

Lachnaea capitata is a sister species of *L. densiflora* based on the shared characters—leaves abaxially convex, upper portion of the hypanthium not stalked and floral scales inserted below midway on the upper portion of the hypanthium.It can, however, be distinguished from *L. densiflora* by the usually glabrous branches [sericeous or sericeous-tomentose branches], the inflorescence with 1–8 open flowers [up to 20 open flowers] and the ascending sepals with sericeous indument [patent sepals with tomentose indument].

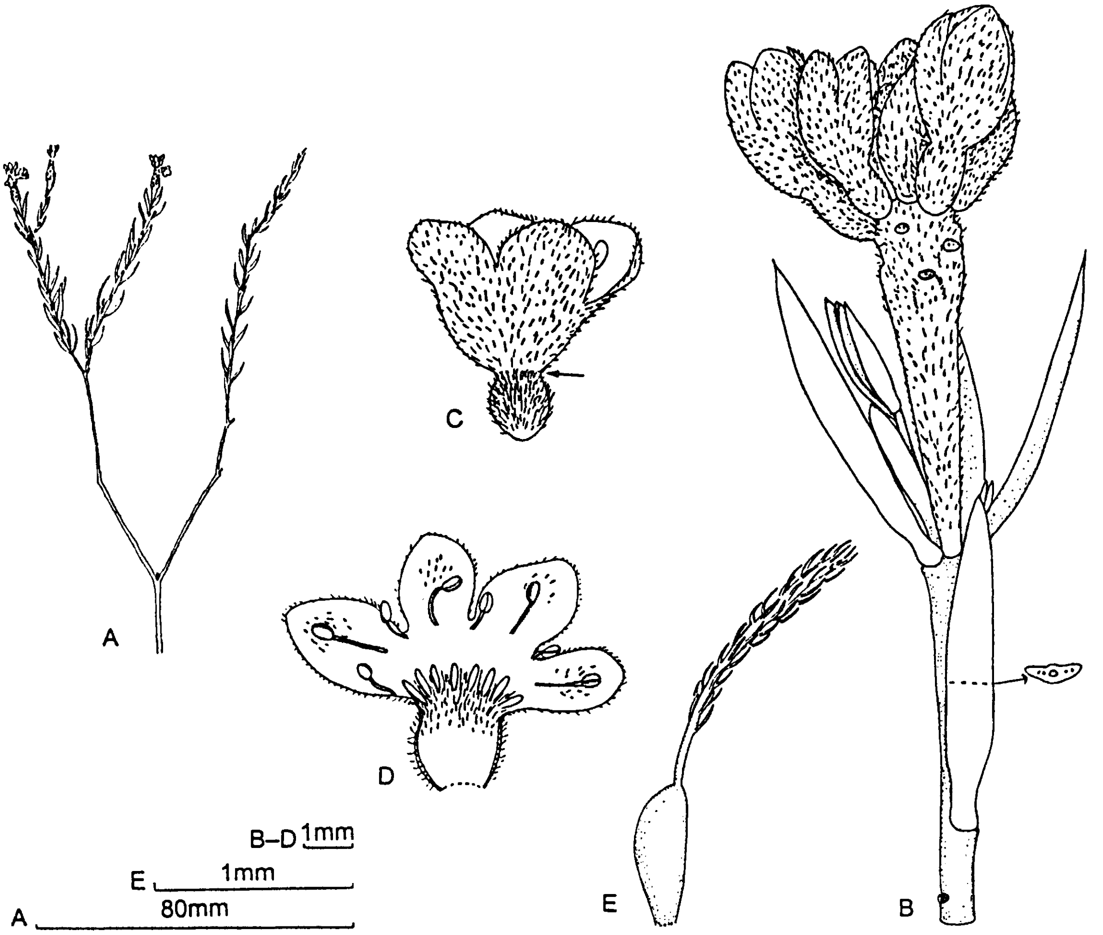

FIGURE 7.29—*Lachnaea capitata*, *Beyers 138* (NBG). A, portion of plant; B, flowering branch with leaves and cross section of leaf; C, flower, note circumscission zone (arrowed); D, flower split longitudinally with gynoecium removed; E, gynoecium.

Specimens examined

WESTERN CAPE.—3218 (Clanwilliam): Zeekoeivlei W of Clanwilliam, flats E of Elandsberg, 530 m, (–BA), 06-09-1972, *Oliver 3866* (NBG); Zeekoeivlei, 260 m, (–BA), 13-08-1896, *Schlechter 8508* (BOL, GRA, K, S, Z); between Paleisheuwel and Leipoldtville, 150 m, (–BC), 07-10-1958, *Werdermann & Oberdieck 472* (PRE); Kleinvlei, near Swartboskraal, N of Paleisheuwel, (–BC), 04-10-1990, *Bean 2603* (NBG); Clanwilliam Dist., hills between Witelskloof and Lambertshoekberg, (–BD), 11-10-1939, *Pillans 9073* (BOL); W slopes of Olifants River Mtns N of Paleisheuwel, farm Swartberg, (–BD), 08-09-1988, *Bean & Viviers 2054* (BOL, NBG, PRE); Goergap-Aurora Road, 64 km from Piketberg, (–DA), 13-08-1969, *Marsh 1257* (NBG); N-base Engelsman se Baken between Weltevrede & Barkatsfontein, (–DA), 23-11-

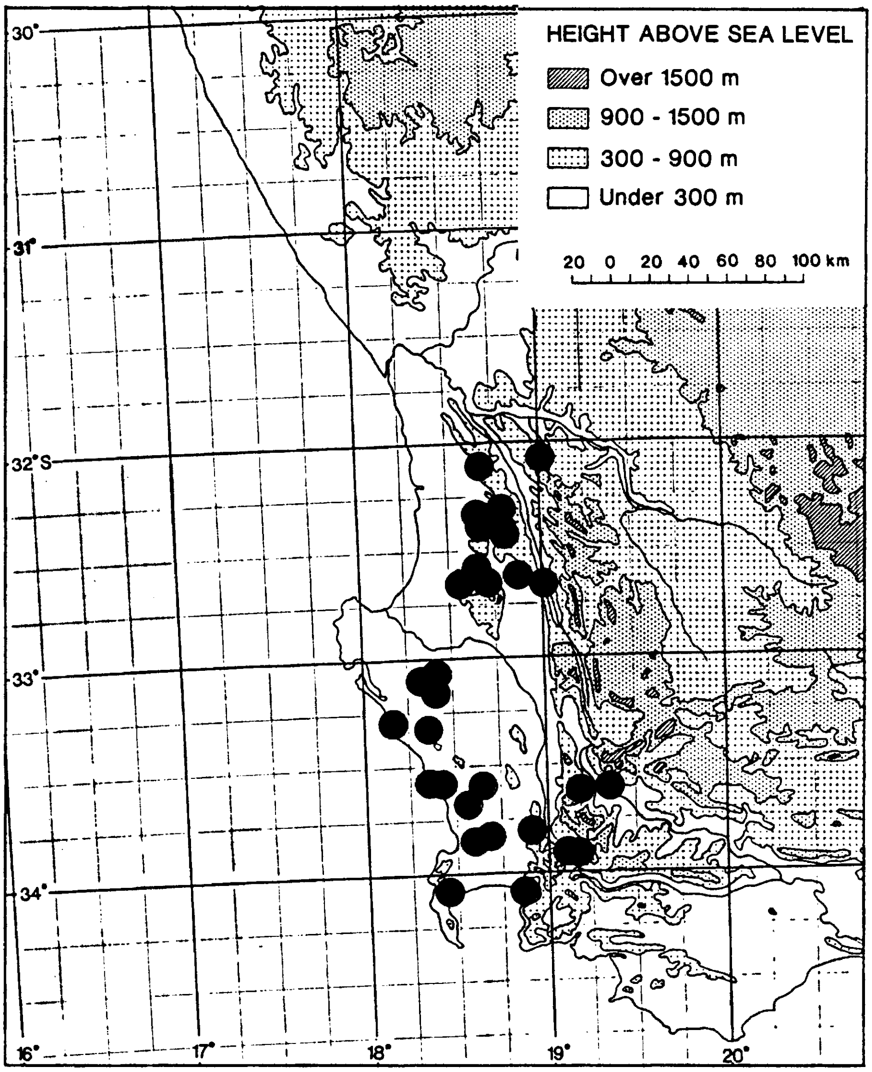

FIGURE 7.30—Known distribution of *Lachnaea capitata*.

1982, *Bean 1043* (BOL, NBG); Riviera farm, W side of Piketberg Mtn, (–DA), 10-09-1969, *Barker 10660* (NBG); Olifants River Mtns, 200 m, (–DB), 01-09-1894, *Schlechter 5113* (BOL, GRA, S, Z); Pikenierskloof, Piketberg Mnts, (–DB), Jun., *Zeyher 1484* (BOL, SAM); Piketberg, 330–1330 m, (–DC/DD), Jun., *Ecklon & Zeyher 1484b* (Z).

—3219 (Wuppertal): Pakhuis Pass, (–AA), Oct. 1925, *Leipoldt STEU 25886* (NBG); Clanwilliam Dist., Modderfontein, 230 m, (–CA), 06-09-1933, *Compton 4332* (BOL, NBG); road between Warmbaths and Modderfontein, Olifants River Valley, (–CA), 27-09-1911, *Stephens 7262* (BOL).

—3318 (Cape Town): Between Tygerberg and Simonsberg, Stellenbosch [precise loc. unknown], *Drège s.n.* (K [sub herb Bentham]), NY; near road to Melkbosch Strand [precise loc. unknown], 04-08-1946, *Leighton 1757* (NY); Malmesbury Dist., Cape Town to Malmesbury, roadside [precise loc. unknown], 11-09-1973, *Montgomery 543* (NBG); Paarl [precise loc. unknown], *Rogers 10505* (BOL, K); Malmesbury Dist., Geelbek, (–AA), 23-08-1947, *Compton 19901* (NBG); Hopefield Dist., Geelbek Road, (–AA), 28-09-1953, *Compton 24380* (NBG, S); around Hopefield, (–AB), *Bachmann 1295* (Z); around Hopefield on way to Saldanha Bay, (–AB), Oct. 1885, *Bachmann 1280* (Z); around Hopefield, Theefontein, (–AB), Mar. 1887, *Bachmann 1294* (Z); near Hopefield, in sand, 30 m, (–AB), Sept. 1905, *Bolus 12820* (BOL, GRA, Z); Darling area, Theefontein farm, about 8 km SW of farmhouse, 109 m, (–AB), 18-07-1978, *Boucher 3868* (NBG); Hopefield, Waterboerskraal, (–AB), 15-06-1975, *Hugo 231* (NBG); *ibid*., 03-10-1974, *Hugo STEU 5460/10* (STE); Yzerfontein, gravel road between Yzerfontein and Geelbek, (–AC), 08-03-1989, *Beyers 128* (NBG, PRE); *ibid*., 2km. from turn, 17-09-1989, *Beyers 138* (K, NBG, PRE); near Yzerfontein, (–AC), Jul. 1938, *Esterhuysen 1459* (BOL); veld between Yzerfontein and Darling, (–AC), 30-09-1926, *Lewis Grant 2599* (PRE); along West Coast Highway near Yzerfontein turnoff ± 90 m, (–AC), 30-08-1989, *Taylor 12074* (NBG); between Yzerfontein and Darling, (–AC/AD), 01-08-1938, *Barker 393* (NBG); Darling, sand, 130 m, (–AD), 13-09-1931, *Levyns 3253* (BOL); Mamre, (–CB), *Baur sub Marloth 8679* (PRE); Malmesbury, near Bok Point, (–CB), 15-09-1940, *Compton 9404* (NBG); Melkbosch Road, (–CB), 18-10-1941, *Compton 12027* (NBG); Malmesbury Dist., Mamre flats, (–CB), 28-09-1953, *Compton 24375* (NBG); *ibid*., 03-03-1940, *Penfold 242* (NBG); 6 km SE of Mamre, (–CB), 21-09-1956, *Dahlgren & Peterson 374* (NBG); just outside Mamre next to tarred road, (–CB), 31-08-1977, *Emdon 34* (NBG); Malmesbury Dist., near Bokbaai, (–CB), *Esterhuysen 5170* (BOL); *ibid*., ± 15 m, 15-08-1963, *Taylor 5010* (NBG); Melkpost, Atlantis, ± 165 m, (–CB), 05-10-1977, *Thompson 3546* (NBG); Bokke River, beside new national road, dune ridge, 65 m, (–CB), 06-02-1978, *Thompson 3581* (NBG); Malmesbury, near Manresa Holiday Farm, N of Atlantis, (–DA), 06-03-1991, *Koekemoer 578* (NBG); National Rd from Cape Town to Malmesbury, 24 km from Cape Town, (–DA), 22-11-1965, *Mattatia 38* (BOL); W slopes of Koeberg on Baasariesfontein, sandy slopes, 180 m, (–DA), 21-06-1972, *Oliver 3757* (NBG); Malmesbury, Kalbaskraal, (–DA), 22-02-1962, *Van der Merwe 69* (NBG); Brackenfell, (–DC), 14-12-1940, *Bond 722* (NBG), *ibid*., *Compton 10112* (NBG); Kraaifontein, (–DC), Mar. 1931, *Bolus L. BOL 46792* (BOL); *ibid*., 17-10-1956, *Dahlgren & Peterson 682* (NBG); *ibid*., Aug. 1908, *Dummer NBG 96308* (NBG); *ibid*., 08-02-1950, *Middlemost 1578* (NBG); Cape, Doornhoogde, Cape Flats, (–DC), Oct., *Ecklon & Zeyher 1484a* (S, Z); Bosmansdam, (–DC), 27-10-1965, *Esterhuysen 31326* (BOL, S); Durbanville near Cape Town, (–DC), Oct. 1903, *Marloth 3255* (PRE); Flats near Doornhoogde, (–DC), 23-12-1895, *Wolley Dod 653* (BOL, K); between Tygerberg and Zandhoogte, 65 m, (–DC/DD), 07-10-1827, *Drège s.n* [(III, E, b) aa] (P); Between Tygerberg and Zandhoogte, 65 m, (–DC/DD), 18-12-1827, *Drège 266* [(III, E, b), (a)] (P); Rhodes Fruit Farm, Languedoc portion, foot of Groot Drakenstein Mnts, 220 m, (–DD), 26-09-1986, *Forsyth 407* (NBG); Kliprug Farm, S of Paarl, (–DD), 10-10-1998, *Low 3928* (NBG); Paarl Div., Muldersvlei, (–DD), Jan. 1951, *Pillans 10399* (NY).

—3319 (Worcester): Rawsonville, Witelsrivier Farm, Slanghoek, (–CA), 18-08-1975, *Walters 229* (NBG); *ibid*., 300 m, 19-09-1975, *Walters 970* (NBG); Goudini Road, (–CB), Oct. 1921, *Levyns 4431* (BOL); Drakenstein, (–CC), Oct. 1925, *Leipoldt BOL 46791* (BOL); Franschhoek, Keerweder, 330 m, (–CC), Oct. *Bolus BOL 46796* (BOL, NBG), *Bolus BOL 46797* (BOL); Franschhoek, (–CC), 12-10-1932, *Keet STEU 17229* (NBG); *ibid*., on flats, 29-12-1938, *Louw 181* (NBG); *ibid*., Oct. 1913, *Phillips 1293* (SAM); Franschhoek flats near Groot Drakenstein alongside Paarl Rd, ± 800 m, (–CC), 26-10-1972, *Boucher 1972* (NBG, S); Roberts Vlei, Franschhoek, (–CC), 19-09-1946, *Compton 18303* (NBG); Paarl Dist., 1km SE of Groot Drakenstein, 175 m, (–CC), 24-10-1956, *Dahlgren & Peterson 794* (NBG); Wemmershoek Vlei, opposite sawmill on R303, (–CC), 18-07-1993, *Johns s.n.* (NBG);Berg River Hoek, (–CC), 19-09-1946, *Leighton 2058* (BOL, NY); Wemmershoek; ENE of station and N of railway (Forest Reserve), 185 m, (–CC), 26-08-1994, *Oliver 10519* (K, NBG, PRE); Franschhoek Pass, (–CC), Oct. 1946, *Stokoe SAM 59496* (SAM).

—3418 (Simonstown): sandy flats near Cape Town [precise locality unknown], 30 m, October 1877, *Bolus 3776* (BOL, NBG, Z); Kalk Bay Mtns, 500 m, (–AB), 17-10-1946, *Compton 18607* (NBG); Cape Peninsula, Polsmoor, (–AB), 12-06-1947, *Cross 29* (NBG); Dieprivier, sandy flats (III, E, b) c, below 30 m, (–AB), 15-06-1827, *Drège s.n.* (NY, P!); Tokai Flats, (–AB), 01-09-1916, *Foley 13* (NBG, PRE); *ibid.*, 30-05-1897, *Wolley Dod 2565* (BOL, K); near Princess Vley 30 m, (–AB), Oct. 1896, *MacOwan HNAA 1786* (K, SAM, Z), *MacOwan 3134* (Z); Old Polsmoor Race Track, Wynberg, 30 m, (–AB), 09-02-1967, *Rourke 729* (NBG); between Steenberg and Retreat, (–AB), 16-08-1931, *Salter 1293* (K); Cape Peninsula (Kalk Bay?), (–AB), May 1887, *Thode STEU 7740* (NBG); Cape Flats, (–BA), November 1886, *Purcell s.n.* (Z); near Grabouw towards Palmiet River, on hills, (–BB), December 1877, *Bolus 4195* (BOL). Grid ref. unknown: Bergrivier, Oct., *Ecklon & Zeyher SAM 19785* (SAM); Cape of Good Hope, *Thunberg s.n.* (S). Without locality: *Drège PRE 49229* (PRE), *Drège s.n.* (K [sub Herb Hooker]), *Harvey 553* (NY), *Harvey 665* (NY), Aug., *Pappe SAM 19784* (SAM).

16. **Lachnaea densiflora** *Meisn.* in A.P. de Candolle, Prodromus systematis naturis regni vegetabilis 14: 578 (1857); C.H.Wright: 22 (1915); Levyns: 601 (1950). Syntypes: “In planitie Capensi et distr. Caledon”, *Ecklon s.n.* (NY [capsule annotated as “*L. capitata* a E. & Z.”, marked #, on Meisner Herbarium sheet with different collections of *L. densiflora*]!, lecto. here designated; S![locality on sheet in Meisner’s handwriting, but unfortunately he did not write the species name on the sheet], isolecto.), *Ludwig* (not seen), *Niven* (not seen), *Zeyher 1483* (BOL! K! PRE! S!, SAM!, Z!).

Note: The capsule, annotated as “*L.capitata a* E. & Z.” and marked # in Meisner’s script, on Meisner’s Herbarium sheet with different collections, annotated as *L. densiflora* corresponds with the locality (marked #) on the sheet also in his handwriting. *Zeyher 1483*, which is well represented in the different herbaria, could not be chosen as there was no indication whether Meisner had seen any of the sheets.

Erect, corymbosely, moderate to much branched shrub up to 0.5 m tall, single-stemmed at base; reseeder. *Branches* ascending, semi-rigid, ridged below the leaf-bases, sericeous or sericeo-tomentose, densely leafy, the older sparsely hairy or glabrous and naked with prominent leaf scars. *Leaves* alternate, ascending to inclined, below inflorescence often patent with apex turned upward, crowded to distant, internodes one-fifth to as long as leaf length, sessile, amphistomatic, glabrous or occasionally margins ciliate or apex tufted, later becoming glabrous, linear to narrowly elliptic, 5.0–12.0(–20.0) × 0.7–2.5 mm, coriaceous or slightly fleshy, green, concolorous, enervate, glossy or dull, white-punctulate, in dried state longitudinally wrinkled, adaxially ± flat to concave, abaxially convex, sometimes subkeeled, apex acuminate, occasionally acute, base cuneate to attenuate. *Inflorescence* a terminal, ebracteate capitulum, globose, 8–16 mm in diameter, ± 40-flowered with up to 22 open flowers, pedunculate; peduncle 5–10 mm long, sericeous or tomentose-sericeous. *Receptacle* at first hemispherical later after elongating, conical to widely conical, 2.0–8.0 × 3.4–7.5 mm, sericeous. *Flowers* sessile, subactinomorphic, cream, cream with a pink flush, or pale to dark pink. *Hypanthium* 1.7–3.9 mm long, circumscissile three-fifths to three-quarters from base, upper portion widely obconical, basal portion ovoid or ellipsoid, sericeous to villosulous outside, inside adpressed hirsute between base of scales and plane of circumscission, rest glabrous. *Sepals* patent, subequal, ovate to widely depressed ovate, 1.7–3.5 × 1.2–3.1 mm, adaxially tomentose, abaxially tomentose or occasionally sericeo-tomentose, apex rounded to obtuse. *Stamens* exserted, outer, antisepalous whorl inserted at base of sepals, inner, antipetalous whorl inserted quarter to third-way down upper portion of hypanthium; filaments filiform, 0.5–1.8 mm long, inner whorl shorter than outer whorl; anthers ellipsoid to depressed spheroid, 0.3–0.4 mm long, abaxially without broad connective tissue. *Scales* exserted, inserted midway to two-thirds down upper portion of hypanthium, linear, 0.5–1.0 mm long, glabrous, yellow in fresh state. *Ovary* ellipsoid to obovoid, 0.7–1.5 mm long, glabrous. *Style* filiform, 1.8–3.1 mm long, adpressed hairy in upper half to two-thirds. *Stigma* brush-like (Figure 7.31).

Distribution and ecology

Lachnaea densiflora is restricted to the Western Cape, extending from the southern parts of the Cape Peninsula eastwards to Bredasdorp. It is predominantly a coastal species but has been recorded to occur on sandy flats at low elevations on the Peninsula and along the Palmiet River and in the Klein River Mountains (Figure 7.32). The explanation regarding the distribution of *L. axillaris* is applicable to that of *L. densiflora*. Flowering has been recorded from August to March.

Conservation status: Vulnerable (VU A1c). The populations occuring between Rooi Els and Bredasdorp are threatened by the development of residential erven of the coastal towns in the area.

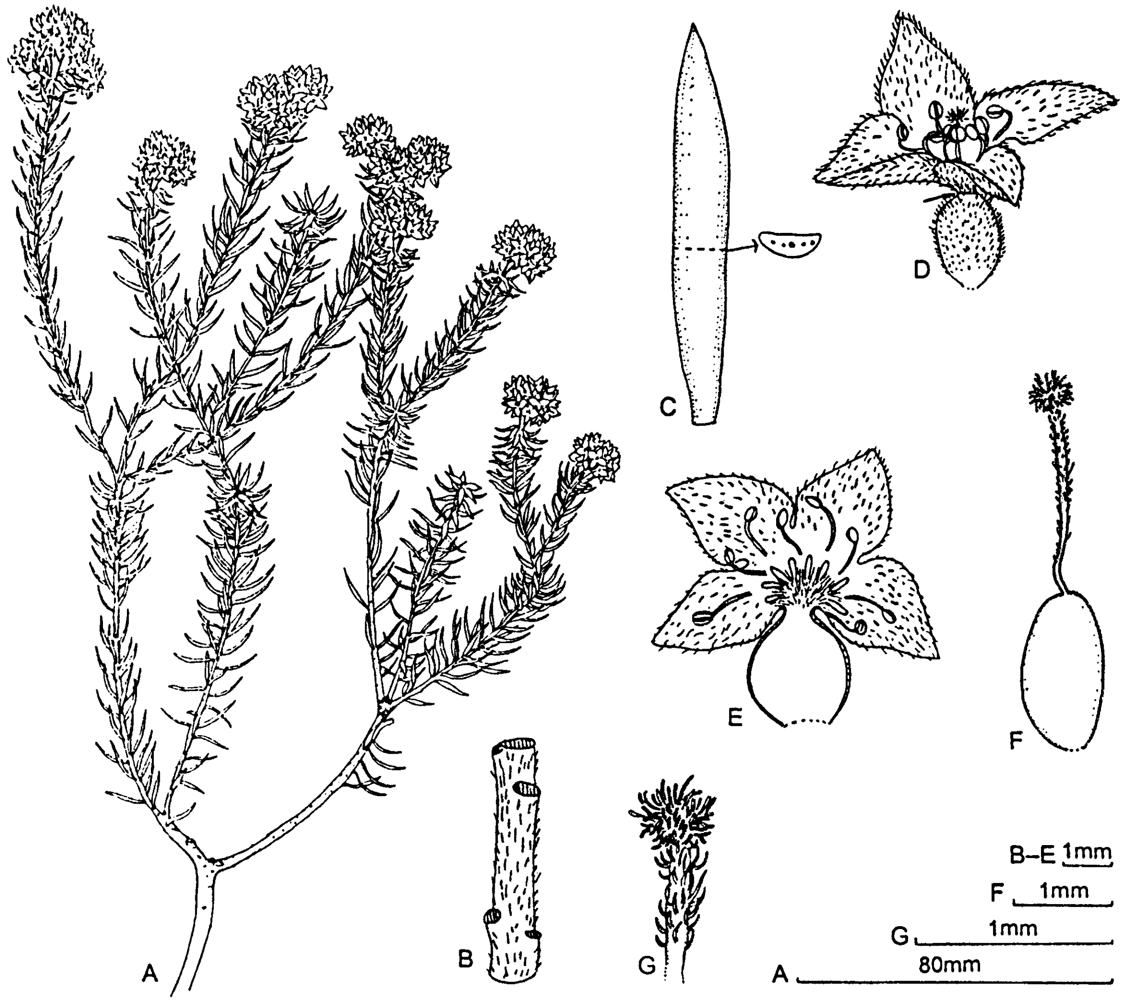

FIGURE 7.31—*Lachnaea densiflora*, *Oliver 9129* (NBG). A, portion of plant; B, branch with leaves removed; C, leaf (abaxial view and cross section); D, flower, note circumscission zone (arrowed); E, flower split longitudinally with gynoecium removed; F, gynoecium; G, stigma and upper portion of style (enlarged).

Diagnostic characters and relationships

Lachnaea densiflora is distinguished from *L. capitata*, its sister species, by the sericeous or sericeous-tomentose branches [usually glabrous branches], the inflorescence with up to 20 open flowers at a time [with 1–8 open flowers] and the patent, tomentose sepals [ascending, sericeous sepals].

Specimens examined

WESTERN CAPE—3319 (Worcester): Bain's Kloof [doubtful locality], (–CA), Dec.1924, *Rogers 29268* (NBG).

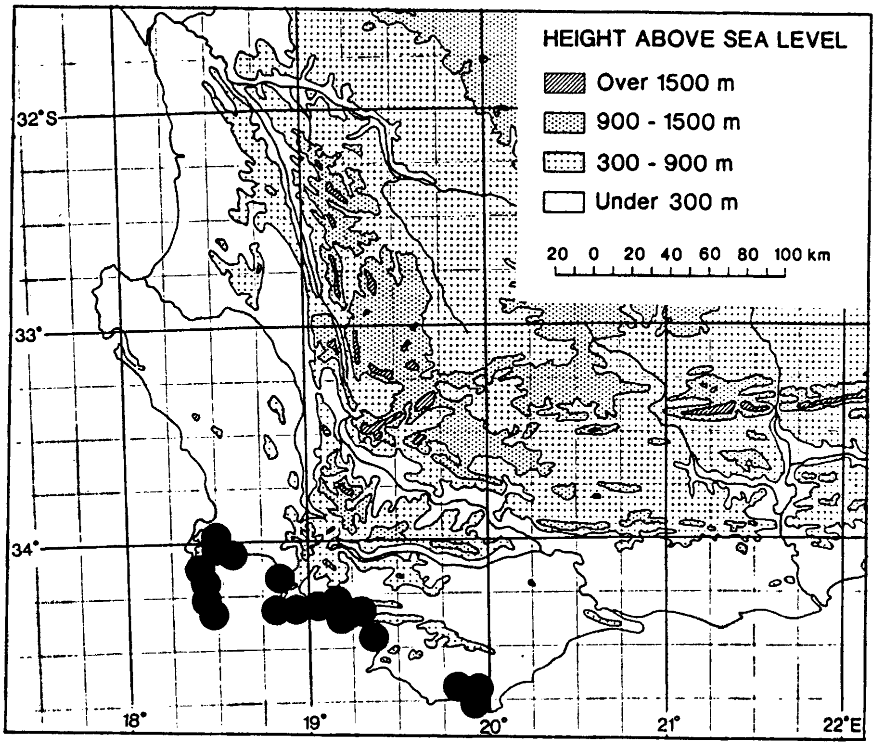

FIGURE 7.32—Known distribution of *Lachnaea densiflora*.

—3318 (Cape Town): Cape Peninsula, Kenilworth Race Course, centre of course, (–CD), 23-10-1989, *Beyers 148* (BOL, K, NBG, PRE); *ibid.*, NE corner, 08-10-1956, *Dahlgren & Peterson 601* (NBG); *ibid.*, 14-11-1956, *Dahlgren & Peterson 1889* (NBG); *ibid.*, 24-10-1964, *Esterhuysen 30817* (BOL); Kenilworth, 40 m, (–CD), 15-01-1894, *Kuntze s.n.* (NY); Claremont flats near Cape Town, 26 m, (–CD), 12-12-1891, *Schlechter 5* (Z); Cape, E-side of Tafelberg [Table Mtn] at Konstantia [Constantia], (–DC), *Ecklon 74* (S); Doornhoogde, (–DC), July, *Ecklon s.n.* (S).

—3418 (Simonstown): Cape Peninsula, Klawer Valley, Klawersvlei, 320 m, (–AB), 13-11-1989, *Beyers 150* (K, NBG, PRE); Cape of Good Hope Nature Reserve, Klaas Jagers, 40 m, (–AB), 13-11-1989, *Beyers 154* (K, NBG, PRE); *ibid.*, between Modderdam and Perdekloof, ± 80 m, 14-05-1965, *Taylor 6270* (NBG); *ibid.*, Taylor plot 17, ± 30 m, 19-01-1988, *Taylor 12023* (NBG); Kommetjie flats, (–AB), Oct. 1954, *Barker 484* (NBG); Cape Peninsula, Bonteberg, (–AB), 09-03-1941, *Compton 10625* (NBG); Simonstown, W of Rooihoogte near Krom River, ± 90 m, (–AB), 18-11-1956, *Dahlgren & Peterson 1230* (K, NBG); Redhill, (–AB), Aug. 1938, *Esterhuysen 1460* (BOL); *ibid.*, Isoetes Vlei overlooking Simonstown, ± 230 m, 21-11-1965, *Taylor 6606* (NBG); near Wynberg on moist plain, 30 m, (–AB), Nov. 1886, *MacOwan HNAA 763* (BOL, SAM, Z); Constantia, Bergfliet Farm, Albertyn's camp, (–AB), 29-10-1916, *Purcell s.n. a* (SAM), *Purcell SAM 90787* (SAM); *ibid.*, flats near Louws, 17-10-1915, *Purcell s.n. b* (SAM); Cape Point, (–AD), 06-11-1941, *Compton 12313* (NBG); *ibid.*, 250 m, Nov. 1884, *Marloth 480* (BOL); Cape Peninsula, marsh near Smith's Farm, (–AD), Nov. 1939, *Esterhuysen 1424* (BOL); *ibid.*, near Cirkels Vlei, 14-11-1945, *Leighton 1505* (BOL, NY); *ibid.*, Smitswinkel, 01-02-1951, *Middlemost 1672* (NBG); *ibid.*, Patrys Vlei, 16-

08-1896, *Wolley Dod 1498* (BOL. K); Cape of Good Hope Nature Reserve, Olifant's Point, (–AD), 14-03-1965, *Mattatia 6* (BOL); *ibid.*, shack track near Rheboksdam, ± 50 m, *Taylor 6556* (NBG); Cape Flats, in sand dunes, (–BA), Oct. 1877, *Pillans BOL 3776* (BOL); Cape Flats, (–BA), Nov. 1884, *Purcell s.n* (Z); Steenbrasmond, (–BB), 23-09-1959, *Van Rensburg 440* (NBG); Betty's Bay, vacant plot just off Albertyn's Drive, (–BD), 22-10-1989, *Beyers 145* (BOL, K, NBG, PRE); *ibid.*, 16-10-1949, *Martin 416* (NBG); *ibid.*, coastal flats at Sunny Seas, 10 m, 16-10-1988, *Oliver 9129* (NBG, PRE); *ibid.*, Cascades, *Taylor L. 4386* (NBG); Pringle Bay, just south of Die Punt, 16 m, (–BD), 10-12-1989, *Beyers 171* (K, NBG, PRE); *ibid.*, open erf in Bell Road South, 18 m, 09-10-1994, *Beyers 244* (NBG, PRE); *ibid.*, dry stony places, probably damp in winter, 20 m, 05-02-1958, *Levyns 10843* (BOL); SW of Klein Hangklip Flats, rocky sandy, 20 m, (–BD), 10-09-1969, *Boucher 567* (NBG); Skilpadsvlei Flats, 10 m, (–BD), 29-10-1969, *Boucher 846* (NBG); *ibid.*, W of Hangklip, 29-01-1936, *Pillans 8245* (BOL); W of Klein Hangklip range near Roman Rock, 16 m, (–BD), 03-09-1970, *Boucher 1368* (NBG); Elephant Rock Estate, flats W of Palmiet River mouth, ± 10 m, (–BD), 08-01-1972, *Boucher 1767* (NBG); *ibid.*, near beach N of river, 30-09-1956, *Dahlgren & Peterson 1872* (NBG); *ibid.*, marshy slopes, 23-01-1946, *Esterhuysen 12589* (BOL); *ibid.*, 01-02-1947, *Levyns 8695* (BOL); Hangklip, 30 m, (–BD), 26-01-1936, *Compton 6117* (NBG); *ibid.*, 28-01-1936, *Compton 6129* (NBG); *ibid.*, 09-10-1950, *Compton 22149* (NBG); *ibid.*, SW slope, 25-10-1956, *Dahlgren & Peterson 1881* (NBG); *ibid.*, Oct. 1957, *Loubser 1036* (NBG); Palmiet vlakte, (–BD), 05-10-1948, *De Vos 1047* (NBG); Paardeberg, (–BD), Jan. 1933, *Jordaan s.n.* (NBG); Palmiet River, (–BD), Sept. 1930, *Nieuwoudt STEU 11258* (NBG); *ibid.*, near Kleinmond, Sept. 1930, *Rossouw STEU 11241* (NBG); Rooi Els, swampy ground, 33 m, (–BD), 02-10-1955, *Levyns 10349* (BOL); near Cape Hangklip, (–BD), 27-12-1945, *Parker 4025* (BOL, K, NBG).

—3419 (Caledon): Palmiet River Mountains, (–AA), Jan. 1944, *Stokoe SAM 58599* (SAM); Onrust, (–AC), 12-10-1929, *Adamson sub Levyns 2620* (BOL); Flats between Palmiet and Botrivier, in swamp, 60 m, (–AC), 19-10-1924, *Andreae 588* (NBG); Kleinmond, just past houses on way to Bot River, damp sandy flats, (–AC), 30-10-1988, *Beyers 115* (K, NBG, PRE), *Beyers 116* (NBG), *Beyers 117* (NBG); *ibid.*, 21-01-1990, *Beyers 177* (NBG); *ibid.*, near coast, 31-10-1854, *Cloete SAM 67545* (SAM); *ibid.*, 09-11-1941, *Compton 12381* (NBG, BOL); *ibid.*, dorpserwe W van Kerksaal, , 14-09-1946, *De Vos 38* (NBG); *ibid.*, vlakte N of vlei, 14-09-1946, *De Vos 79* (BOL, NBG); *ibid.*, dorpserwe W van hotel, , 01-10-1946, *De Vos 163* (NBG); *ibid.*, 03-10-1946, *De Vos 191* (NBG); *ibid.*, 01-09-1958, *Loubser 1060* (NBG); *ibid.*, opposite Heuningklip, between Main Rd. and Akasia Ave., 23-08-1985, *Simpson 56* (NBG); Kleinmond Nature Reserve, (–AC), 25-09-1982, *Burman 974* (BOL); Hawston, (–AC), 08-12-1951, *Compton 23214* (NBG); *ibid.*, 28-11-1896, *Schlechter 9461* (K, S, Z); 7 km SE-junction Kleinmond-Hawston-Botrivier, road to Kleinmond, 200 m NW, (–AC), 30-09-1956, *Dahlgren & Peterson 489* (NBG); 5 km NE Kleinmond near Bot River Vlei, (–AC), 30-09-1956, *Dahlgren & Peterson 1871* (NBG); E Kleinmond, near beach Sandown Bay, (–AC), 27-11-1956, *Dahlgren & Peterson 1895* (NBG), *ibid.*, *Dahlgren & Peterson 1896* (NBG); Bot River Vlei, sandy area W of vlei, 10 m, (–AC), 16-08-1982, *O'Callaghan 269* (NBG); Hermanus, Sandbaai, in black sandy soil, (–AC), 12-10-1975, *Walters 1393* (NBG); near Hermanus, next to the sea shore, ± 30 m, (–AC/AD), 1893, *Bolus 9894* (BOL); Hermanus, (–AC/AD), 13-01-1952, *Compton 23221* (NBG); *ibid.*, 6 m, 23-10-1897, *Galpin 4499* (BOL); *ibid.*, E cliffs, 06-12-1937, *Hubbard 499* (NBG); *ibid.*, Nov. 1921, *Rogers 26587* (Z); *ibid.*, 08-12-1935, *Taylor L. 1709* (NY); Hermanus, Vogelklip, (–AD), 29-09-1942, *Barker 1708* (NBG); *ibid.*, Mossel

River, *Guthrie PRE 59858* (PRE); *ibid.* Fernkloof Nature Reserve, 50 m, 04-09-1974, *Orchard 224* (NBG); *ibid.*, 110 m, 14-10-1976, *Woodvine 24* (NBG); *ibid.*, Mossel River, Jan. 1913, *Potts SAM 28324* (SAM); *ibid.*, N of Riviera Hotel, 05-10-1916, *Purcell SAM 98112* (SAM), *Purcell SAM 98113* (SAM); *ibid.*, Riviera Hotel, 02-10-1918, *Purcell SAM 98114* (SAM); Caledon Div., Klein River Mtns, (–AD), 13-10-1975, *Orchard 308* (NBG); *ibid.*, Sept. 1940, *Stokoe 8035* (BOL); *ibid.*, Sept. 1940, *Stokoe SAM 58600* (SAM); Kleinmond, Ysterklip, (–AD), 25-09-1984, *Van der Walt 456* (NBG), *Van der Walt 458* (NBG); Caledon, Kleinriviersberg, 330–1000 m, (–AD/BC) Aug., *Ecklon 58.8* [as *"Gonophylla conglomerata E. Z."*] (S); Caledon, Kleinriviersberg, 330–1000 m, (–AD/BC) Aug., *Zeyher 1483* (BOL, K, PRE, S, SAM, Z); Bredasdorp Div., Springfield Estate, (–DB), 00-09-1949, *Stokoe SAM 64620* (SAM); Elim–Napier, Rietfontein Private Nature Reserve, (–DB), 19-09-1984, *Van der Walt 427* (NBG, PRE); Bredasdorp Div., Brandfontein, (–DD), 13-10-1951, *Esterhuysen 19025* (BOL); *ibid.*, 10-08-1983, *Esterhuysen 35985* (S). Grid ref. unknown: sandy flats near Cape Town, 30 m, Oct. 1877, *Bolus 3776 a* (SAM, Z); Bredasdorp Dist., Ratel River, 03-09-1943, *Compton 14774* (NBG); *ibid.*, sandy brak soil, 12-01-1956, *Rycroft 1841* (NBG); Caledon Div. Oct. 1929, *Pont 1115* (Z); Cape of Good Hope, *Thunberg sub Herb Swartsii* (S), *Sparrman sub Herb Montinii* (S). Without locality, *Burchell s.n.* (K), *Ecklon & Zeyher Herb. Schinz* [as "*L. globulifera* Msn. (Eckl.)"] (Z); *Harvey 550* (NY), *Perdonnet 167* (Z), *Wright s.n.* (NY).

17. **Lachnaea nervosa** *(Thunb.) Meisn.*, Linnaea 14: 417 (1840); Meisn.: 579 (1857); C.H.Wright: 20 (1915). *Passerina nervosa* Thunb. Prodromus plantarum capensium: 75 (1794); Wikstr.:328 (1818); Thunb.: 375 (1823). Type: *Thunberg 9588* (UPS, holo.—NBG, photo!, —PRE, microfiche!).

Lachnaea ambigua Meisn. in Linnaea 14: 417 (1840) [as var. *major*]; Meisn.: 576 (1857) [as var. *major*]; C.H.Wright: 23 (1915). Type: Dutoitskloofbergen, alt. 2500–3000 ft., *Drège 7368a* (NY [capsule on *Drège 7378b*], holo.!; P!, iso.!).

Lachnaea ambigua var. *minor* Meisn. in Linnaea 14: 418 (1840); Meisn.: 577 (1857); C.H.Wright: 24 (1915). Type: Dutoitskloofbergen, in rocky area, alt. 4000 ft., *Drège 7368b* (NY, holo.!; P!—*Drège s.n. b*, iso.).

Gonophylla stricta Eckl. & Zeyh. ex Meisn.—*nom. nud.* A.P. de Candolle, Prodromus systematis naturalis regni vegetabilis 14: 579 (1857) in synonymy.

Erect, moderately to much branched shrub up to 0.3 m, rarely up to 1 m tall, single- or multistemmed at base; reseeder or resprouter. *Branches* ascending, occasionally patent, slender to semi-rigid, ridged below leaf bases, sericeous or sparsely sericeous later glabrescent, leafy, becoming naked with prominent leaf scars. *Leaves* alternate, ascending or patent, close set to scattered, internodes up to half as long as leaves, sessile, epistomatic, narrowly elliptic or rarely narrowly obovate, 4.7–14.0 × 0.7–1.5 mm, coriaceous, glabrous, adaxially concave, enervate, dull, faintly white-punctulate, abaxially convex, midribbed or 3–5-ribbed, glossy, apex mucronate or acuminate, base cuneate; distal leaves below inflorescence crowded, green or tinged maroon, may appear bract-like, size variable, those immediately below inflorescence largest, narrowly ovate to obovate, 1.8–9.0 × 1.0–4.2 mm, acuminate or cuspidate, margin glabrous or ciliate. *Inflorescence* a terminal, sessile, ebracteate, 2–14-flowered umbel with 2–5 open flowers at a time, on main and also on short lateral flowering branches below main inflorescence, appearing racemose-like. *Flowers* subactinomorphic, cream or pink, or cream with mauve tinge. *Pedicel* 0.3–2.5 mm long, sericeous. *Hypanthium* 3.5–6.8(–10.0) mm long, circumscissile a third to two-thirds from base, upper portion funnel-shaped, sericeous on both sides, trichomes acicular, basal portion ovoid or ellipsoid, sericeous outside, trichomes blunt or subacute, glabrous within. *Sepals* patent, subequal, narrowly ovate to widely elliptic, 2.3–5.2(–8.2) × 1.1–3.0 mm, apex acute to obtuse, adaxially sparsely sericeous or glabrous, abaxially sericeous. *Stamens* exserted, outer, antisepalous whorl inserted at base of sepal, inner, antipetalous whorl inserted at rim of hypanthium, shorter than outer whorl; filaments filiform, outer 1.0–2.4(–4.0) mm long, inner 0.6–1.5(–2.0) mm long; anthers ellipsoid to widely ellipsoid, 0.5–0.9(–1.2) mm long, abaxially without broad connective tissue. *Scales* exserted, inserted at mouth of hypanthium immediately below antipetalous stamens, linear or narrowly ellipsoid, 0.7–1.7(–2.4) mm long, glabrous, translucent white in fresh state. *Ovary* ellipsoid or rarely obovoid, 0.9–1.9 mm long, glabrous, usually with tuft of hair at style attachment. *Style* linear, 3.0–6.0(–10.5) mm long, covered with straight, silky, ascending hairs throughout or only in upper half. *Stigma* brush-like (Figure 7.33).

Distribution and ecology

Lachnaea nervosa has been recorded along the mountains from Elandskloof south of Citrusdal in the north to the Jonkershoek mountains in the Stellenbosch District and eastwards through the Riviersonderend Mountains to the Langeberg near Swellendam (Figure 7.34). Apart from the Zeyher collection, no other herbarium specimens of this species are known from the Langeberg. It occurs on the upper slopes and summit ridges at altitudes between 830 and 2000 m. Flowering has been recorded from July to December.

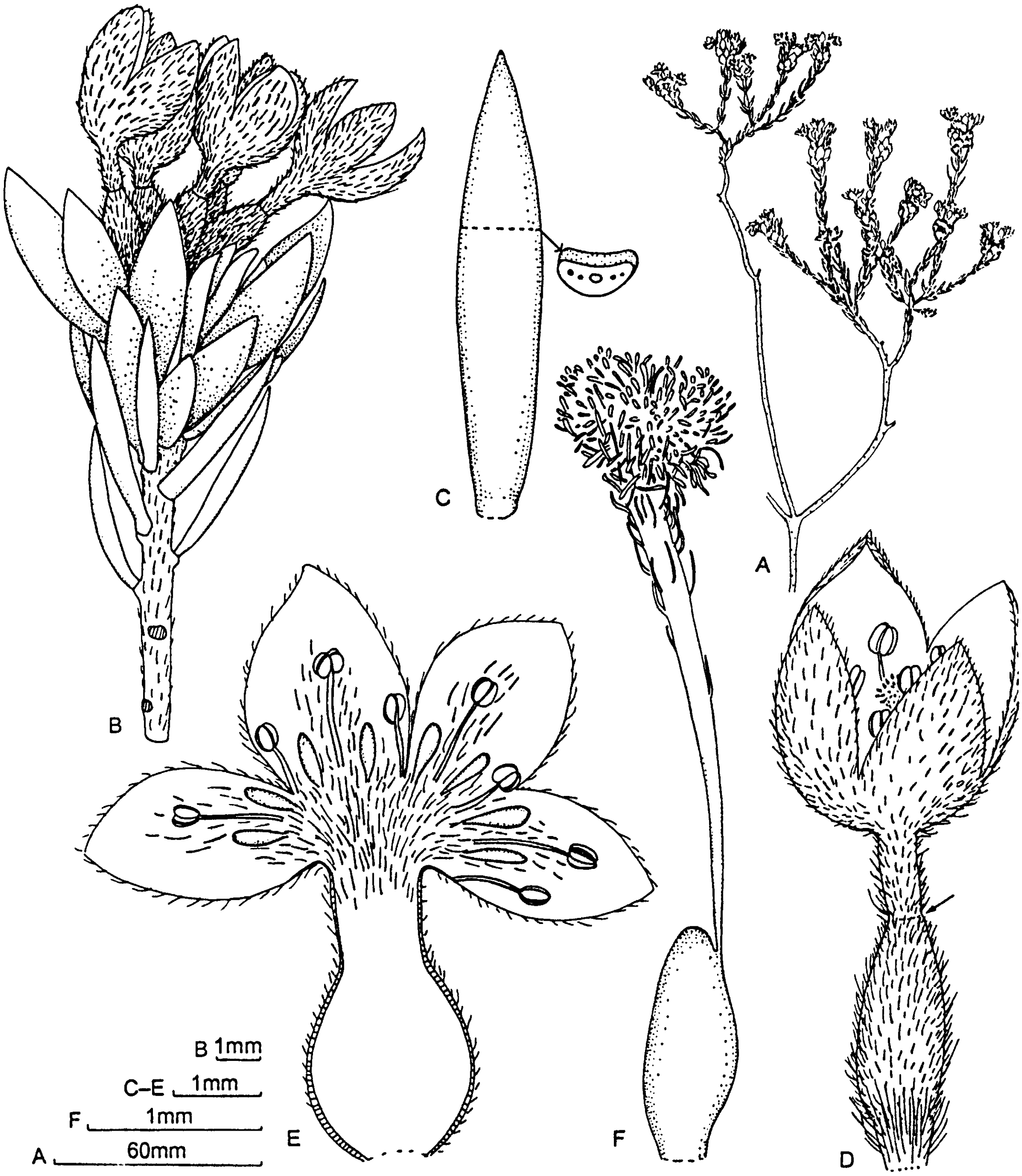

FIGURE 7.33—*Lachnaea nervosa*, *Oliver 9259* (NBG). A, portion of plant; B, flowering branch; C, leaf (abaxial view and cross section); D, flower, note circumscission zone (arrowed); E, flower split longitudinally with gynoecium removed; F, gynoecium.

Meisner regarded *Lachnaea ambigua* to be very similar to *L. nervosa* from which it is distinguished mainly by the shorter branches and the leaves being two to four times shorter. Over its distribution range variation in growth form and leaf length could be correlated with variation in habitat. On the open slopes in the drier regions the plants are more compact and usually not more than 0.4 m tall. The length of the leaves, however, varies from 4.7 to 12 mm. Plants growing on steep rocky slopes in wetter areas, as in the Du Toit's Kloof and Stellenbosch Mountains, are more slender, upright, and up to 1.0 m tall with the leaf length varying from 5.0 to 14.0 mm. The variation exhibited includes Meisner's concepts of the two species and therefore *L. ambigua*, the more recent name, must be regarded as a synonym of *L. nervosa*.

Conservation status: Lower Risk Least Concern (LRlc).

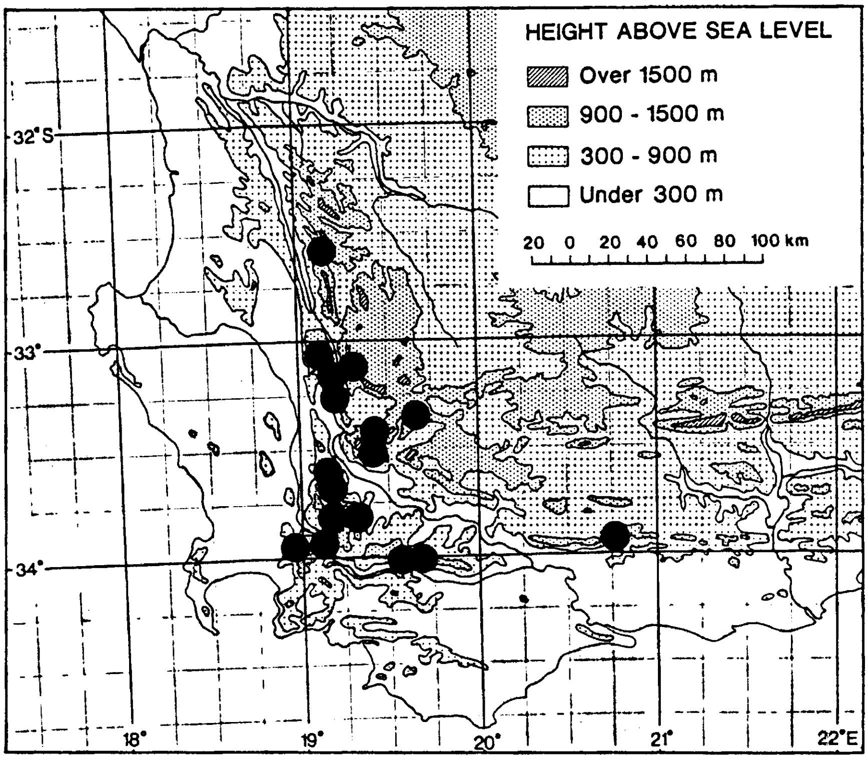

FIGURE 7.34—Known distribution of *Lachnaea nervosa*.

Diagnostic characters and relationships

Lachnaea nervosa can be distinguished from *L. striata*, a species also having ebracteate umbels, alternately arranged leaves and leaves abaxially 1–5-ribbed with crisped ciliate margins by the eciliate leaves, the basal portion of the hypanthium covered on the outside by silky, blunt to subacute trichomes and the long, linear or narrowly elliptic scales which may be almost as long or longer than the antisepalous stamens.

Specimens examined

WESTERN CAPE.—3219 (Wuppertal): Between Citrusdal and Elandskloof, W of the waterfalls, (–CA), Aug. 1940, *Stokoe 8038* (BOL); Elandskloof, (–CA), Aug. 1940, *Stokoe SAM 58638* (SAM);

—3318 (Cape Town): Jonkershoek State Forest, Third Ridge Peak, (–DD), 29-11-1987, *De Kock 152* (NBG, PRE); Jonkershoek, Second Ridge Peak, 1400 m, (–DD), 01-06-1980, *Esterhuysen 35444* (BOL); *ibid*., on steep rocky slope, 02-09-1984, *Esterhuysen 36180* (BOL, NBG); Jonkershoek Valley, 1000–1165 m, (–DD), 28-08-1963, *Taylor 5050* (NBG, PRE).

—3319 (Worcester): Ceres Mtns [exact locality unknown], Sept. 1924, *Marloth 6253* (NBG); Witzenberg, Inkruip, (–AA), 01-10-1954, *Esterhuysen 23395* (BOL); *ibid*., Swartgat Peak, upper slopes, 1665–2000 m, 02-11-1958, *Esterhuysen 27931* (BOL); Groot Winterhoek State Forest, Kliphuisvlakte, ± 1465 m, (–AA), 20-09-1973, *Haynes 827* (NBG); Great Winterhoek, Sneeugat Valley, 1500 m, (–AA), 17-11-1916, *Phillips 1669* (NBG, SAM); *ibid*., 1165–1330 m, Nov. 1932, *Thorne SAM 50405* (SAM); top of Tulbagh Valley, 1330 m, (–AA), 21-11-1916, *Phillips 1669a* (SAM); Ceres Dist., road to Agter Witzenberg, near Gydo Pass, (–AB), 09-11-1956, *Dahlgren & Peterson 1138* (K, NBG, S); Gydo Pass, (–AB), Aug. 1939, *Leipoldt 22470* (BOL, NBG, PRE); *ibid*., *Leipoldt 22471* (BOL, NBG, PRE); *ibid*., 1065 m, 18-08-1934, *Salter 4699* (BOL, K, PRE, SAM); *ibid*., Jul. 1943, *Newton BOL 46746* (BOL); Ceres Dist., Hansiesberg, E slopes, 1400 m, (–AB), 09-10-1975, *Oliver 6049* (NBG); *ibid*., SE slopes below summit, 1600 m, 05-11-1989, *Oliver 9259* (K, NBG, PRE); *ibid*., 1700 m, 06-12-1975, *Winter 56* (NBG); Witzenberg near Steendahl, 665–1000 m, (–AC), Oct. 1884, *Bolus 5475* (BOL); Tulbagh, Nuwekloof S-side, (–AC), 15-11-1928, *Gillett 364* (NBG); Hex River Mtns, nek below Sentinel Peak, 1830 m, (–AD), 13-12-1948, *Esterhuysen 14836* (BOL); Ezelsfontein slopes, (–AD), 01-09-1951, *Esterhuysen 20380* (BOL); Mount Brodie, Hex River Mtns, 1830 m, (–AD), 01-11-1953, *Esterhuysen 22211* (BOL); Matroosberg, (–BC), 13-11-1960, *Esterhuysen BOL 46745* (BOL); *ibid*., 1900 m, Dec. 1895, *Marloth 2232* (NBG); Ceres, Roodeberg, (–BC), Jan. 1841, *Stokoe SAM 58630* (SAM); Du Toit's Kloof Mtns, 1300 m, (–CA), 19-09-1833, *Drège 7368b* (NY), as *Drège s.n.* (P); *ibid*., 830–1000 m, (–CA), *Drège 7368a* (NY, P); *ibid*., 1000–1330 m, (–CA), Oct., *Drège s.n.* [*L. ambigua* Msn. a] (S); *ibid*., Molenaarsberg, 1000–1330 m, 29-09-1963, *Esterhuysen 30349* (BOL); Du Toit's Kloof, slopes above, S aspect, 830–1000 m, (–CA), 11-11-1951, *Esterhuysen 19230* (NBG BOL); Paarl Div., Haalhoek Sneeukop, S aspect, 1300 m, (–CA), 05-12-1965, *Mattatia 48* (BOL); Fonteintjiesberg area, S slope of Meirings Plateau, 1330–1665 m, (–CB), 20-10-1963, *Esterhuysen 30419* (BOL, S); Franschhoek Pass, Middagkransberg, summit ridge, ± 830 m, (–CC), 11-10-1973, *Boucher 2402* (NBG); Wemmershoek Mtns, 1000–1330 m, (–CC), 19-10-1943, *Esterhuysen 9083* (BOL); Wemmershoek Peak, 2000 m, (–CC), 31-12-1944, *Esterhuysen 11245* (BOL); *ibid*., S slopes, 1665 m, 03-11-1951, *Esterhuysen 19198* (NBG, BOL); Du Toit's Peak, W ridge, 1330–1665 m, (–CC), 11-12-1945, *Esterhuysen 12377* (BOL); *ibid*., stony slopes, 1500 m, 16-10-1949, *Esterhuysen 16057* (BOL); *ibid*., 1665–1830 m, 19-10-1954, *Esterhuysen 23776* (BOL); Franschhoek, Mont Rochelle Nature Reserve, near path on ascent to observation point, 700 m, (–CC), 4-10-1997, *Hansford, M 3* (NBG); Franschhoek, 1000 m, (–CC), 27-10-1913, *Phillips 1288* (SAM); Worcester Dist., Goudini Sneeukop, SE-side, 1830–2000 m, (–CD), 30-10-1960, *Esterhuysen 28548* (BOL, S); Louwshoek Mtns, 1833 m, (–CD), Nov. 1946, *Stokoe SAM 59497* (NBG, SAM).

—3320 (Montagu): mountains near Swellendam [precise locality unknown], Oct. 1826, *Ecklon s.n.* (NY); Langeberg, NW of Swellendam, Voormansbosch, Duiwelsbosch, 330–1330 m, (–DC), Oct., *Ecklon & Zeyher s.n. [70.10]* (NY, PRE, S, Z); Grootvadersbosch, Swellendam, (–DC/DD), Oct., *Ecklon 3767* [*126.10*] (NY, Z), *Zeyher 3767* (BOL, PRE, S, SAM).
—3419 (Caledon): Riviersonderend Mtn, Wa en Osse (Nooienskop on Map, 2nd edn.) S slopes, 1200 m, (–BA), 29-11-1992, *Beyers 215* (BOL, K, PRE, NBG); mountains Genadendal, ± 1330 m, (–BA), 27-10-1897, *Galpin 4498* (PRE); Caledon Div., Riviersonderend Mtns, (–BA/BB), Oct. 1950, *Stokoe SAM 64621* (PRE, SAM); Caledon Dist., Riviersonderend Peak, 1665 m, (–BB), 17-10-1945, *Stokoe NBG 52671* (NBG), as *Stokoe SAM 58629* (SAM). Grid ref. unknown: Ceres Wild Flower Show, Oct. 1931, *Comm. Compton BOL 46751* (BOL); *ibid.*, 04-10-1939, *Compton 7071* (NBG). Without locality: *Drège 7365* (NY [capsule], P); *Drège s.n.* [*L. ambigua* Msn. a] (K).

18. **Lachnaea sociorum** *Beyers* in Bothalia 28,1: 49 (1998b). Type: Western Cape, 3321 (Ladismith): Langeberg, Bergfontein, S-facing midslopes of Koksposberg, 379 m, (–DC), 18-01-1991, *McDonald 2059* (NBG, holo.!; BOL!, K!, NY!, PRE!, iso.).

Lachnaea diosmoides var. *major* Meisn. in A.P. de Candolle, Prodromus systematis naturalis regni vegetabilis 14: 579 (1857). Type: *Zeyher s.n.* (S, holo.!). Meisner, however, expressed his doubt regarding the status of this variety.

Lachnaea crassifolia Meisn.—*nom. nud.* in A.P. de Candolle, Prodromus systematis naturalis regni vegetabilis 14: 579 (1857).

Calysericos parviflora Eckl & Zeyh. (ex parte) ex Meisn.—*nom. nud.* in A.P. de Candolle, Prodromus systematis naturalis regni vegetabilis 14: 579 (1857).

Erect, compact, moderately branched, shrub up to 0.6 m tall, multistemmed at base; resprouting after fire. *Branches* erect, slender, ridged below leaf bases, covered with long, straight, adpressed hairs admixed with crooked ones, densely leafy, becoming naked with prominent leaf scars. *Leaves* alternate, ascending or occasionally inclined to patent, with apex curled inward, imbricate, sessile, lanceolate to narrowly elliptic or occasionally elliptic to obovate, 3.6–6.0 × 0.9–2.4 mm, coriaceous, green, those below inflorescence sometimes tinged maroon, glabrous, adaxially concave, smooth, dull, ± white-punctulate, abaxially convex, faintly 3-ribbed or towards apex subkeeled, glossy, subpapillate, apex acute, base cuneate. *Inflorescence* a terminal, sessile, ebracteate, 6–14-flowered umbel with up to 9 open flowers at a time, on main flowering branches. *Flowers* subactinomorphic, white, skunk-scented. *Pedicel* 0.3–0.7 mm long, sericeous. *Hypanthium* 2.5–3.7 mm long, circumscissile, three-fifths to three-quarters from base, upper portion funnel-shaped, tomentose outside, adpressed hirsute within, basal portion oblong, glabrous, rarely tomentose outside, glabrous within. *Sepals* patent, subequal, widely ovate or subrotund, 1.7–3.0 × 1.7–3.2 mm, apex rounded or obtuse, adaxially and abaxially tomentose. *Stamens* exserted, outer, antisepalous whorl inserted at base of sepals, 0.7–1.5 mm long, inner, antipetalous whorl inserted at rim of hypanthium, 0.5–1.2 mm long (inner stamens the shortest or equal to the shortest of outer stamens); anthers widely ellipsoid, 0.4–0.6 mm long, abaxially without broad connective tissue. *Scales* exserted, inserted at mouth of hypanthium immediately below antipetalous stamens, obovoid or subglobose, 0.3–0.5 mm long, glabrous, translucent-white when fresh. *Ovary* ellipsoid or obovoid, 0.9–1.4 mm long, glabrous. *Style* linear-obconical, 2.0–2.9 mm long, with straight, adpressed or incurled hairs in upper half to two-thirds. *Stigma* brush-like (Figure 7.35).

Distribution, ecology and variation

Recorded from the eastern end of the Langeberg Mountains, from Perdeberg in the west eastwards to Gavelsbos and the southern slopes of the Attakwa Mountains below Perdekop. Plants occur in stony soil on the southern and northern slopes, at altitudes between 300 and 1 100 m (Figure 7.36). Flowering has been recorded from August to January.

The population on the northern side of the Langeberg at Tygerberg, west of Huisrivier, is very localised and reasonably old. These plants are single-stemmed at the base, branching close to the ground and are open at the crown with decumbent branches. Whether they would resprout after a fire remains to be seen. Two collections were made from this area, viz. *Beyers 176* and *McDonald 1780*. In all the material collected by McDonald, the basal portion of the hypanthium is glabrous as in all collections from other localities. However, in the material collected by Beyers the basal portion of the hypanthium on the outside is tomentose like the rest of the flower. This variation in hairiness needs further investigation before it can perhaps be formally expressed taxonomically.

Conservation status: Lower Risk Least Concern (LRlc).

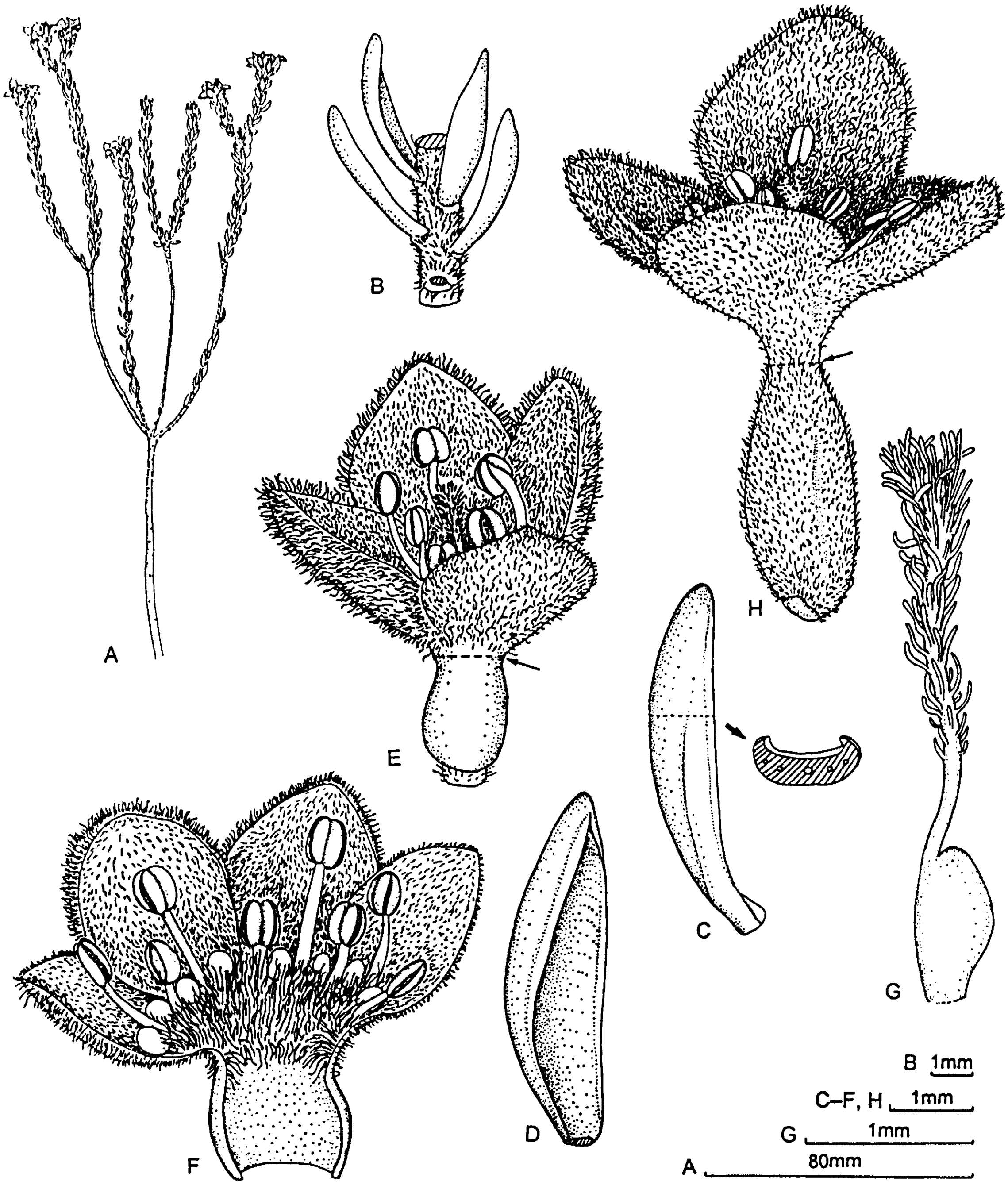

FIGURE 7.35—*Lachnaea sociorum*. **A**, portion of plant; B, branch with leaves; C & D leaves: C, abaxial view and cross section; D, lateral view; E, flower, note circumscission zone (arrowed); F, flower split longitudinally with gynoecium removed; F, gynoecium; H, flower (atypical pubescent form). A–G, *McDonald 2059* (NBG); H. *Beyers 176* (NBG)

Diagnostic characters and relationships

Lachnaea sociorum is closely related to *L. ericoides* Meisn.; both have a similar inflorescence and floral structure. In both species the lower portion of the hypanthium is glabrous (except for the one collection of *L. sociorum*, *Beyers 176*, where it is tomentose). In *L. sociorum* the leaves are usually lanceolate to narrowly elliptic, abaxially faintly 3-ribbed, with an acute, glabrous apex, the sepals adaxially tomentose and the stigma penicillate. In *L. ericoides*, on the other hand, the leaves are narrowly elliptic to obovate, abaxially keeled, with a rounded, tufted apex, the sepals adaxially sericeous-tomentose and the stigma capitate with elongated papillae.

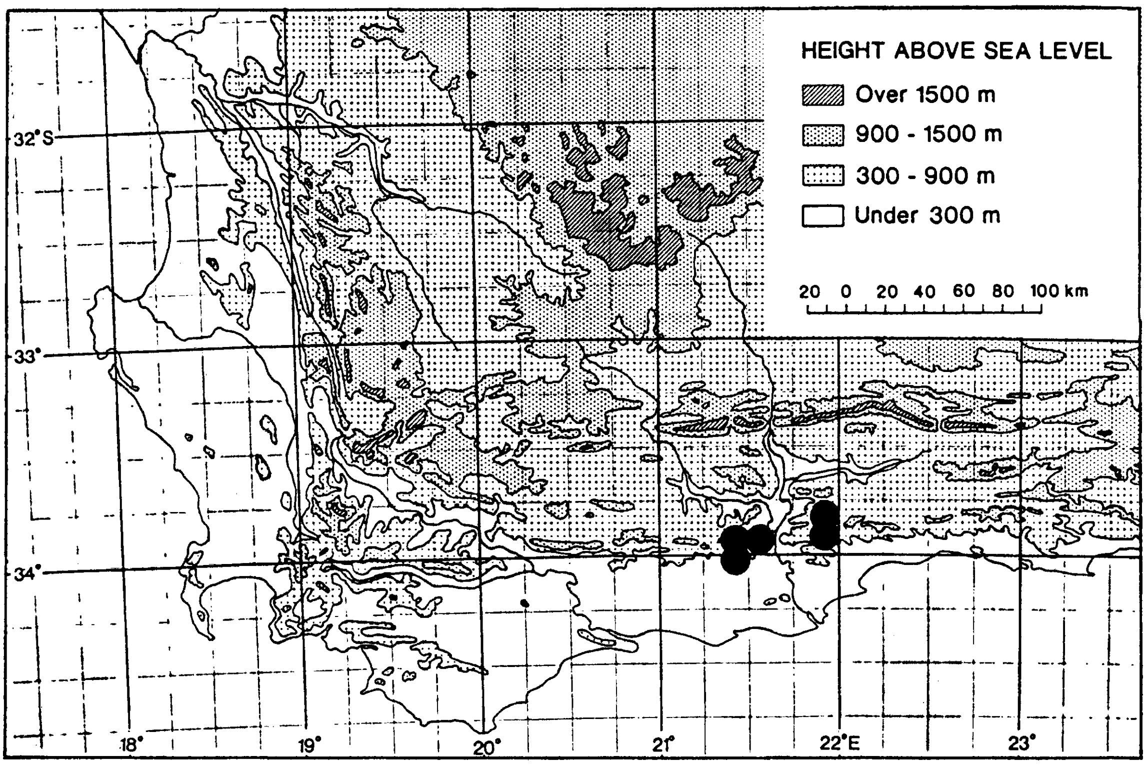

FIGURE 7.36—Known distribution of *Lachnaea sociorum*.

Specimens examined

WESTERN CAPE.—3321 (Ladismith): Langeberg, Paardeberg, 1 100 m, (–CD), 11-08-1977, *Haynes 1401* (NBG); E of Garcias Pass on northern side of Langeberg, Tygerberg, west of Huisrivier, 300 m, (–DC), 15-12-1989, *Beyers 176* (BOL, K, NBG, NY, PRE, Z); *ibid.*, 17-12-1988, *McDonald 1780* (BOL, NBG, PRE); Langeberg, Bergfontein area, lower slopes of Koksposberg, 425 m, (–DC), 30-10-1990, *McDonald 1963* (PRE, NBG); *ibid.*, S-facing midslopes of Koksposberg, 379 m, 18-01-1991, *McDonald 2059* (BOL, K, NBG, NY, PRE); Riversdale Dist., Langeberg, W of Witelsberg, upper Witelsrivierkloof, 610 m, (–DC), 01-09-1994, *Oliver 10524* (BOL, NBG, PRE); Langeberg, lower SW slopes of Witelsberg, N of Koksposberg, 485 m, (–DC), 01-09-1994, *Oliver 10536* (BOL, K, NBG, PRE, Z); Mossel Bay Road to Perdekop before forest plantation, 600 m, (–DD), 17-10-1978, *Bond 1578* (NBG); Outeniqua Mtns, ridge E of Elandsberg NW of Voortrekkergedenkplaat on Attaquaskloof Nature Reserve boundary, S slopes, 900 m, (–DD), 24-06-1997, *Oliver 10829* (BOL, K, NBG, PRE, S).

—3421 (Riversdale): Riversdale, Farm Gavelsbos, mountain slope, SW aspect, stony soil, 307 m, (–AB), 08-09-1984, *Bohnen 8479* (NBG, PRE). Grid ref. unknown: Riversdale Flower Show, 01-09-1994, *comm. Oliver* (NBG); Riversdale Div., Langeberg, 01-10-1923, *Muir 2824* (BOL), *Muir 3053* (PRE).

19. **Lachnaea diosmoides** *Meisn.* in Linnaea 14: 418 (1840) [as var. *elatior* on p. 419; see below]; Meisn.: 552 (1843); Meisn.: 578 (1857); C.H.Wright: 23 (1915); Batten & Bokelmann: ill. t. 88, fig. 9 (1966). Syntypes: mountain near Hoogekraalsrivier, below 1000–2000 ft, [19-09-1831], *Drège a* [*Lachnaea phylicoides* Lam. *a*] (K!, P!, PRE!); at margin of mountain forest near George, 1000–1500 ft, [29-08-1831], *Drège b* [*Lachnaea phylicoides* Lam. *b*] (NY!, lecto., here designated; P!, SAM!).

Lachnaea diosmoides var. *elatior* Meisn., Linnaea 14: 419 (1840), Meisn.:578 (1857). Syntypes: mountains near Hoogekraalsrivier, below 1000–2000 ft, [19-09-1831], *Drège* a [*Lachnaea phylicoides* Lam. *a*] (K!, P!); at margin of mountain forest near George, 1000–1500 ft, [29-08-1831], *Drège* b [*Lachnaea phylicoides* Lam. *b*] (NY!, lecto. here designated; P!, SAM!, isolecto.).

Lachnaea diosmoides var. *tenella* Meisn., Linnaea 14: 419 (1840); Meisn.: 579 (1857); C.H.Wright: 23 (1915). Type: Damp flats near Ataquaskloof, 1000 ft, [25-01-1830], *Drège s.n.* [*7366* on specimen] (NY, holo.!; K!, P!, iso.).

Lachnaea phylicoides Lam. Encyclopédie méthodique: t 292, fig. 3, non dict. Encyclopédie méthodique 3: 374 (1792), nec Herb.; Drège: 117 & 124 (1843).

Erect, moderately branched shrub to 1,5 m tall, single-stemmed at base; reseeder. *Branches* erect to flexuous, slender, ridged below the leaf bases, glabrous, leafy, becoming naked with prominent leaf scars. *Leaves* alternate, ascending to patent, occasionally reclined, imbricate but towards inflorescence crowded, sessile, epistomatic, linear-elliptic to narrowly elliptic, 5.0–10.0 × 1.0–1.5 mm, coriaceous, glabrous, adaxially flat to obtusely concave, smooth, dull, ± white-punctulate, abaxially obtusely convex, subkeeled in distal third, prominently midribbed, glossy, apex acuminate, base cuneate. *Inflorescence* a terminal, sessile, ebracteate, 6–20-flowered umbel on main and short lateral flowering branches immediately below main inflorescence, which may overtop umbel on main flowering branch, forming a dense cluster of umbels. *Flowers* subactinomorphic to zygomorphic, cream. *Pedicel* 0.2–0.5 mm long, adpressed hirsute. *Hypanthium* 2.0–2.8 mm long, circumscissile third to two-thirds from base, upper portion funnel-shaped, tomentose outside, within adpressed hirsute between base of scales and plane of circumscission, rest tomentose, basal portion oblong, ellipsoid or ovoid, sericeous outside, glabrous within. *Sepals* ascending, subequal to unequal, then posterior the smallest and anterior the largest, ovate, elliptic to widely elliptic, obovate or subrotund, 1.4–3.0 × 1.3–2.6 mm, apex rounded or obtuse, both sides tomentose. *Stamens* exserted, outer, antisepalous whorl inserted usually at base of sepals, occasionally at rim of hypanthium, inner, antipetalous whorl inserted usually at rim of hypanthium, occasionally in mouth of hypanthium; filaments filiform, 0.3–1.2 mm long; anthers widely ellipsoid to suborbicular, 0.4–0.8 mm long, abaxially without broad connective tissue. *Scales* exserted, inserted at mouth of hypanthium immediately below antipetalous stamens, clavate, ovoid or ellipsoid, 0.2–0.7 mm long, glabrous. *Ovary* ellipsoid or ovoid, 0.7–1.0 mm long, glabrous. *Style* linear to linear-obconical, 1.6–2.4 mm long, with straight, adpressed or incurled hairs in upper third to two-thirds. *Stigma* capitate and papillate (Figure 7.37).

Distribution and ecology

Lachnaea diosmoides occurs on the slopes of the Attakwas Mountains southwest of Oudtshoorn, across the Outeniqua and Tsitsikamma Mountains, as far east as the Storms River Forest Reserve, at altitudes between 250 and 1665 m (Figure 7.38). Flowering has been recorded throughout the year.

Conservation status: Lower Risk Least Concern (LRlc). Being a reseeder, frequent fires could impact negatively on this species, moving it into a threatened category very quickly.

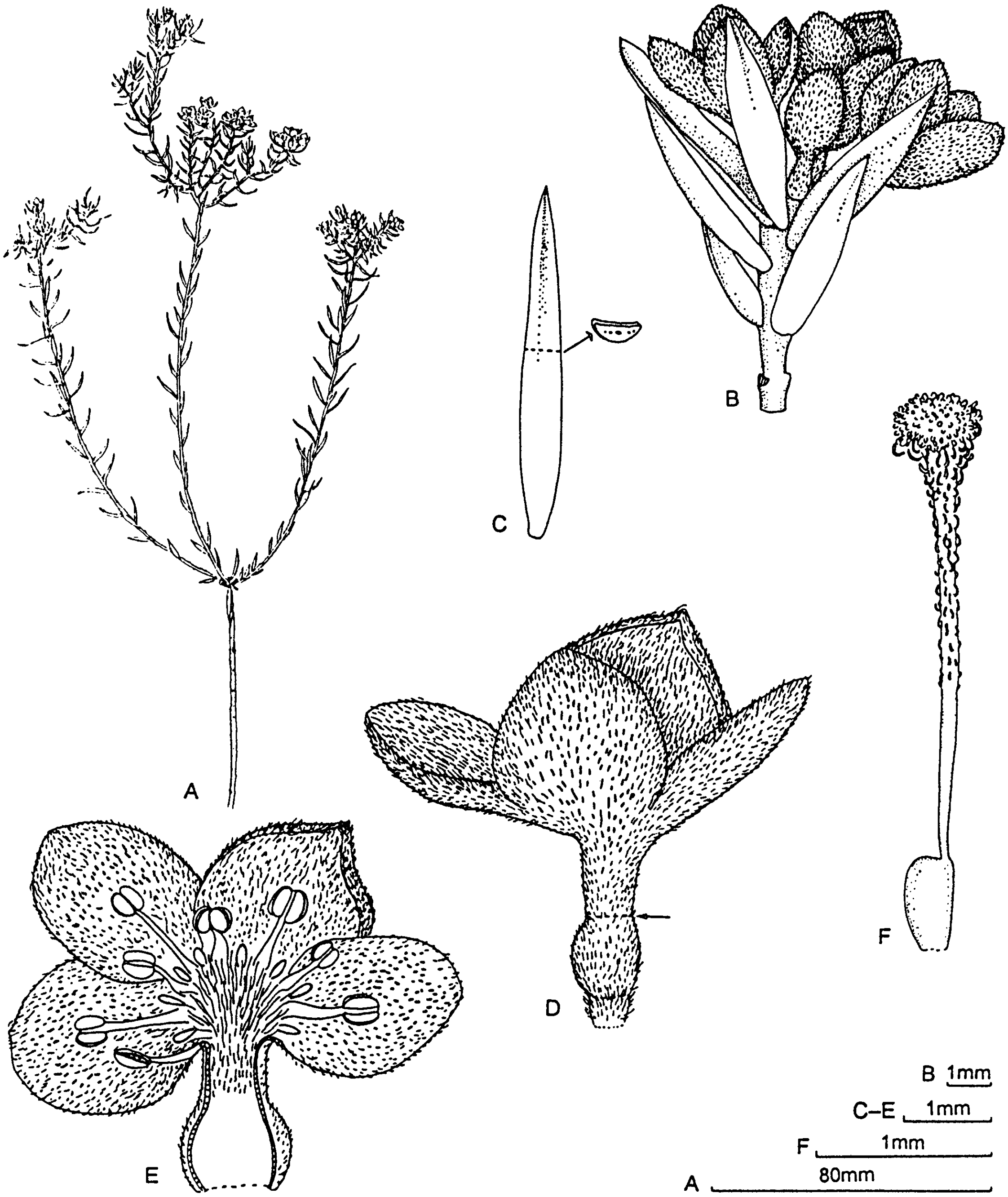

FIGURE 7.37—*Lachnaea diosmoides*, *Beyers 181* (NBG). A, portion of plant; B, flowering branch; C, leaf (abaxial view and cross section); D, flower, note circumscission zone (arrowed); E, flower split longitudinally with gynoecium removed; F, gynoecium.

Diagnostic characters and relationships

Lachnaea diosmoides is allied to *L. ericoides* and *L. stokoei*. Its erect habit (up to 1.5 m), glabrous leaves and basal portion of hypanthium being sericeous on the outside,

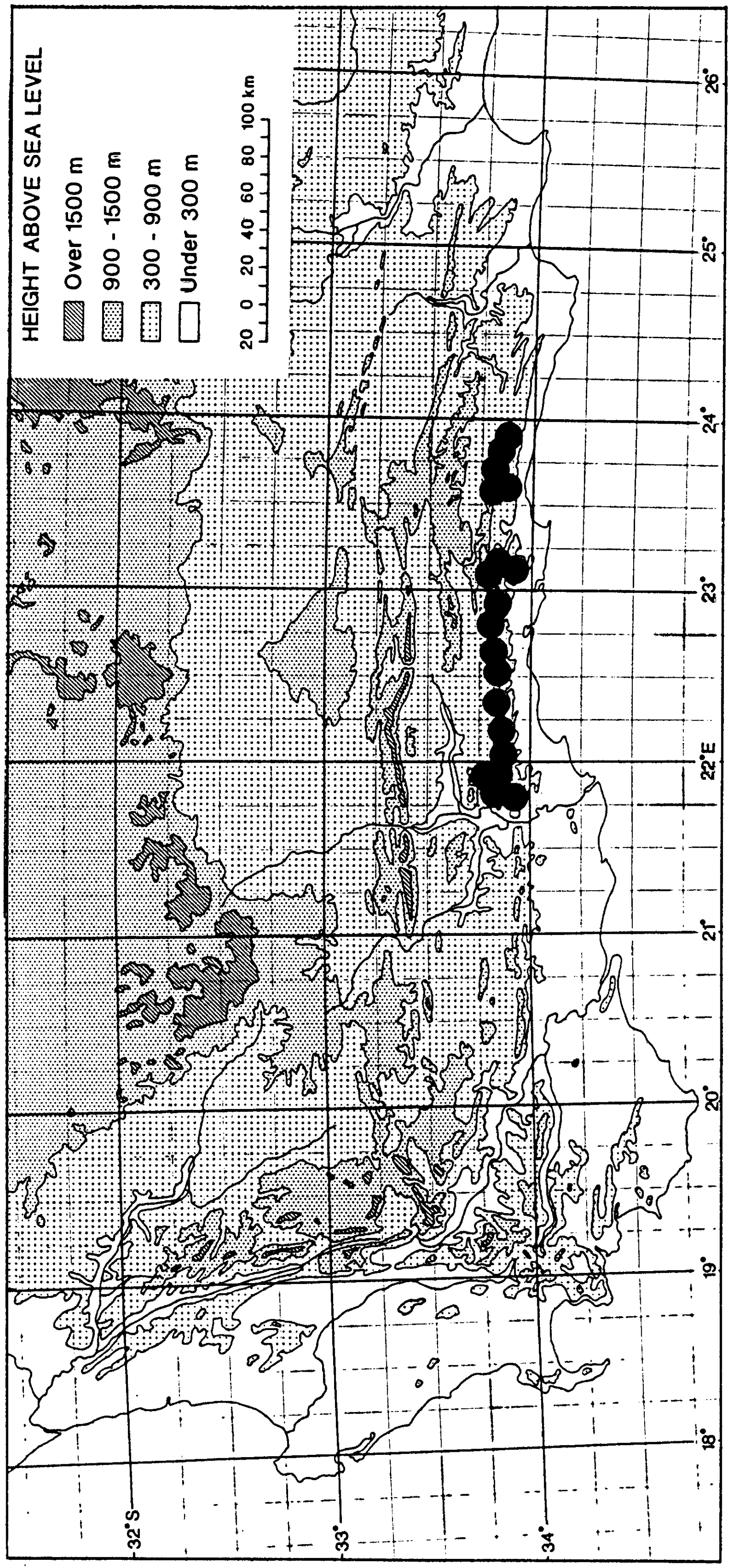

FIGURE 7.38—Known distribution of *Lachnaea diosmoides*.

distinguishes it from *L. ericoides* which has a more rounded to straggling habit (up to 0.5 m) and tufted leaves, with the basal portion of the hypanthium glabrous on the outside. It is also easily distinguished from *L. stokoei* which has the scales abaxially attached to the hypanthium.

Specimens examined

WESTERN CAPE.—3321 (Ladismith): Rooielsrivier Farm between Groot-Goliatsberg & Spitskop, NW aspect, 425 m, (–DD), 08-03-1980, *Burgers 2315* (NBG); damp flats near Ataquaskloof, (–DD), 330 m, 25-01-1830, *Drège 7366* (NY, P, K [Herb.Hook], K [Herb. Benth.]); Attakwas Mtns, Ruitersbos, en route to Perdekop, (–DD), 27-11-1979, *Spreeth 159* (NBG); Attakwaskloof near Voortrekker memorial plaque, 800 m, (–DD), 21-11-1972, *Thompson 1605* (NBG); Cloetes Pass, Herbertsdale, (–DD), 20-01-1940, *Zinn SAM 54770* (SAM).

—3322 (Oudtshoorn): George (precise locality unknown), Oct., *Pappe SAM 19787a* (SAM); *ibid.*, Jan., *Zeyher 1475* (PRE, SAM); Mossel Bay Dist, Ruytersbosch, (–CC), 05-12-1951, *Barker 7685* (NBG); *ibid.*, 19-09-1951, *Van Niekerk 92* (BOL); Outeniqua Mtns, near Krom River, ± 500 m, (–CC), 07-04-1979, *Campbell 13551* (NBG); Mossel Bay-Oudtshoorn Dist, Robinson Pass, (–CC), 30-06-1947, *Compton 19590* (NBG); *ibid.*, 415 m, 20-05-1956, *Heginbothnam 304* (NBG); *ibid.*, 500 m, 27-07-1957, *Levyns 10550* (BOL); *ibid.*, Langeberg to W of top of pass, moist S facing slopes, 1000 m, (–CC), 12-12-1979, *Oliver 7491* (NBG); top contour of Jonkersberg Plantation; 665 m, (–CC), Sept. 1932, *Fourcade 4782* (BOL, NBG); *ibid.*, 19-09-1936, *Salter 6347a* (BOL); Ruitersbos Forest Station, beyond old station, (–CC), 27-11-1979, *Spreeth 157* (NBG); *ibid.*, at forester's house, 27-11-1979, *Spreeth 158* (NBG); George Dist., Jonkersberg, (–CC), 21-12-1935, *Taylor 1647* (NY); back road near Ruytersbosch, (–CC), 14-19-1951, *Van Niekerk 53* (BOL); George, in mountains near the town, 330 m, (–CD), 11-01-1897, *Bolus 8690* (BOL); George Dist, Cradock Mtn, 665 m, (–CD), 29-01-1943, *Compton 14387* (NBG); *ibid.*, rocky N slopes, 1000 m, 14-04-1963, *Esterhuysen 30149* (BOL); George Dist, Montagu Pass, 330 m, (–CD), 15-10-1938, *Compton 7423* (NBG); *ibid.*, 250 m, 29-09-1939, *Compton 7580* (NBG, S); 25-08-1956, *Dahlgren & Peterson 233* (K, NBG, S); *ibid.*, 730 m, Oct. 1921, *Fourcade 1601* (BOL, GRA, NBG); *ibid.*, between Toll House and bridge, 1165 m, 13-06-1944, *Fourcade 6405* (BOL); *ibid.*, S side, ± 330 m, 04-11-1928, *Gillett 2034* (NBG); *ibid.*, 3-10-1974, *Goldblatt 2915* (S); *ibid.*, bushy slopes, 300 m, 25-07-1956, *Levyns 10505* (BOL); *ibid.*, 500 m, 02-11-1894, *Schlechter 5785* (BOL, K, S, Z); *ibid.*, 830 m, Aug. 1931, *Thorne SAM 51675* (SAM); *ibid.*, 400 m, Sept. 1880, *Young BOL 5532* (BOL); *ibid.*, Cradock Peak slopes, Jan. 1940, *Zinn SAM 54815* (SAM); Outeniqua Pass, 665 m, (–CD), 19-10-1953, *Compton 24398* (NBG); *ibid.*, near top of Pass, S slopes, 750 m, 21-08-1956, *Dahlgren & Peterson 177* (K, NBG); *ibid.*, top of Pass, ± 1000 m, 19-10-1953, *ibid.*, *Lewis 3975* (SAM); *ibid.*, summit, 800 m, 25-11-1979, *Spreeth 152* (NBG); Saasveld Forest Station, upper S slopes, 600 m, (–CD), 17-03-1970, *Dahlstrand 1405* (NBG); at margin of mountain forest near George, (IV, A), (–CD), 330–500 m, 29-08-1831, *Drège b* (P, NY, SAM); George, (–CD), Aug. 1931, *Gie STEU 11600* (NBG); *ibid.*, Jul./Aug. 1962, *Tennant 14* (NBG); mtns N of George, 500 m, (–CD), 12-01-1897, *Guthrie 4372* (NBG); George, New Montagu Pass, 665 m, (–CD), 01-08-1952, *Levyns 9874* (BOL); George Dist, Geelhoutboomberg, (–CD), 22-07-1962, *Taylor 3442* (NBG); Saasveld Forest Station, next to track en route to Tierkop, 1000 m, (–DC), 16-03-1990, *Beyers 181* (NBG); George Dist, S foothills of Outeniqua Mtns, Tierkop, S slope, 400 m, (–DC), 08-04-1983, *Bean 1122* (NBG); at mountain near Hoogekraals River, (IV, A), 330–665 m, (–DC), 19-09-1831, *Drège a* (P, K [Herb.Hook.], K [Herb. Benth.]); Berg Plaats, hills near settlement, 430 m, (–DC), Sept., 1936, *Fourcade 5255* (BOL, NBG); George Dist., Saasveld Block A, S slope of mountain, (–DC), 30-08-1966, *Le Roux 7* (NBG); Millwood, above old mining village, Nols se Kop, ± 700 m, (–DD), 03-12-1988, *Taylor 12013* (NBG); Knysna Dist, Mtns near Millwood, (–DD), 0ct./Nov. 1889, *Tyson 3128* (K, SAM); Knysna, Millwood, (–DD), 0ct./Nov. 1889, *Tyson 3128 sub Beck Herb*, (BOL); Outeniqua Mtns near George, 1000 m, (–DD), 15-03-1893, *Schlechter 2337* (BOL, GRA, K, NBG, Z). —3323 (Willowmore): Knysna Dist, Buffelsnek, 500 m, (–CC), 30-12-1933, *Compton 4498* (BOL, NBG); *ibid*., 730 m, May 1921, *Fourcade 1255* (BOL, NBG, S); *ibid*., 665 m, Nov. 1919, *Keet 442* (GRA, NBG); Knysna Dist, Deepwalls Reserve, Spitskop, (–CC), 21-11-1963, *Bos 869* (NBG); *ibid*., Rabbit's Island, 565 m, July 1925, *Phillips FH 1413* (NBG); Buffelsnek, near Deepwalls boundary, 830 m, (–CC), 29-03-1956, *Donald Forestry Herb. 37* (NBG); Knysna Dist, Gouna, along roadside, (–CC), 10-08-1956, *Donald Forestry Herb. 100* (NBG); Knysna Dist, Spitskop Fynbos Reserve, 830 m, (–CC), 17-09-1970, *Geldenhuys 132* (NBG); Buffelsnek Forest Station, ± 1665 m, (–CC), 26-09-1978, *Hugo 1299* (NBG); Prince Alfred's Pass, slopes, 830 m, (–CC), 03-07-1931, *Levyns 3808* (BOL); Knysna Div., Gouna Reserve, 600–665 m, (–CC), 04-08-1954, *Taylor 1337* (SAM); *ibid*., 22-07-1954, *Taylor 1297* (SAM); Knysna Dist, Spitskop Hill, 1000 m, (–CC), 04-09-1968, *Wurts 2239* (NBG); Uniondale Dist, Many Waterskloof, W of Louterwater, 1000 m, (–DC), 30-04-1935, *Compton 5180* (NBG, BOL); Bloukrans, (–DC), 03-05-1938, *Compton 7176* (NBG); Many Waters Kloof, 1000 m, (–DC), 05-05-1938, *Compton 7178* (NBG); Knysna Dist, Groot River, (–DC), 13-11-1949, *Compton 21714* (NBG, S); Knysa Div., E top of Groot River Pass, 250 m, (–DC), May 1921, *Fourcade 1230* (BOL); top of Bloukrans Pass between Humansdorp and Storms River, (–DC), 03-10-1974, *Goldblatt 2909* (NBG, S); Uniondale Div., Louterwater, (–DC), Jan. 1940, *Stokoe SAM 58631* (SAM, NBG); Bloukrans State Forest, path to Kleinheuningbos, lower N slope, ± 400 m, (–DC), 13-07-1978, *Taylor 9844* (NBG); Humansdorp Dist, near Groot Rivier Pass, 300 m, (–DC), 31-10-1962, *Wurts 2158* (NBG). —3422 (Mossel Bay): Mossel Bay (precise locality unknown), Aug., *Rogers 4164* (SAM). Grid. ref. unknown: George, Postberg, in descent down W ridge, 12-09-1814, *Burchell 5953* (BOL, NY, S); George Dist, Paddawatersbos, E slope, alongside road, 31-07-1970, *Geldenhuys 91* (NBG): Robertson Dist, Langeberge, Sept. 1934, *Kuun STEU 25998* (NBG); Knysna Dist, Ysternek, 600 m, 24-05-1936, *Laughton Forestry Herb. 1524A* (NBG); Swellendam, in mountains, Aug., *Pappe SAM 19787* (SAM); Knysa Dist., Houtboschberg, 660 m, 00-10-1925, *Phillips Forestry Herb. 1030* (NBG).

EASTERN CAPE.—3323 (Willowmore): Uniondale Dist, Formosa stream valley, 1000 m, (–DC), 04-05-1933, *Compton 4255* (NBG, BOL); Humansdorp Dist, Coldstream, (–DC), 06-04-1952, *Compton 23337* (NBG); Die Hoek, N foot of Outeniquas near Joubertinia, 15-01-1947, *Esterhuysen 13614* (BOL); Zitzikamma, Ratelsbosch (Lottering), flats under mountain, 265 m, (–DC), Jul. 1908, *Fourcade 293* (BOL); Humansdorp Dist, Lottering, (–DC), 08-11-1935, *Laughton Forestry Herb. 1524* (NBG); Uniondale Div., Formosa Peak, (–DC), Jan. 1940, *Stokoe 8036* (BOL); Storms River Forest Reserve, off National Rd, on Tsitsikama Mtn. S slope, 100–200 m, (–DD), 30-12-1968, *Dahlstrand 1678* (NBG); Camel Pile, Zitzikamma

Mtns near Joubertinia, 1165 m, (–DD), Mar. 1955, *Esterhuysen 27322* (BOL, NBG); Tsitsikama, top of pass above Storms River, (–DD), 06-04-1952, *Lewis 3974* (SAM). Without locality: *Lehmann s. n.(*NY).

20. **Lachnaea ericoides** *Meisn.* in A.P. de Candolle, Prodromus systematis naturalis regni vegetabilis 14: 579 (1857); C.H.Wright: 24 (1915). Syntypes: Swellendam District, in mountains around Grootvadersbosch and Voormansbosch, altitude 3–5, October, *Ludwig s.n.* (not seen) & *Zeyher 3776* (S, det. Meisner, lecto.!, here designated; PRE!, SAM!, Z!, isolecto.).

Gonophylla ericoides Eckl. & Zeyh. ex. Meisn.—*nom. nud.* in A.P. de Candolle, Prodromus systematis naturalis regni vegetabilis: 579 (1857) in synonymy.

Erect, round to straggling, corymbosely or fastigiately branched, shrub up to 0,5 m tall, single-stemmed at base; reseeder. *Branches* ascending to inclined, slender, ridged below the leaf bases, densely covered with long ascending or adpressed hairs admixed with crooked hairs later glabrescent, densely leafy, becoming naked with prominent leaf scars. *Leaves* alternate, subadpressed or ascending, usually falcate [apex curled inward], occasionally lower leaves of young plants straight, imbricate, sessile, epistomatic, narrowly-elliptic to obovate, 2.0–6.0(–8.0) × 0.8–1.5 mm, coriaceous, green, glabrous with tufted apex which may become naked later, adaxially concave, smooth, dull, ± white-punctulate, abaxially convex, keeled, glossy, subpapillate, apex rounded or acute in straight leaves, base cuneate. *Inflorescence* a terminal, sessile, ebracteate, 2–8-flowered umbel with up to 4 open flowers at a time, on main flowering branches or also on lateral flowering branches restricted to area immediately below main inflorescence. *Flowers* subactinomorphic, cream. *Pedicel* 0.3–0.6 mm long, sericeous. *Hypanthium* 1.8–2.4 mm long, circumscissile midway to two-thirds from base, upper portion funnel-shaped, covered on outside with silky, straight adpressed or crooked hairs, adpressed hirsute within, basal portion oblong or narrowly ovoid to ovoid, glabrous outside and within. *Sepals* erect-patent, subequal, narrowly elliptic to obovate, ovate to subrotund, 1.4–2.2 × 1.0–1.8 mm, apex rounded or obtuse, adaxially shortly tomentose to sparsely hairy, abaxially covered with crooked hairs admixed with long silky adpressed hairs. *Stamens* exserted, outer, antisepalous whorl inserted at base of sepals, 0.8–1.2 mm long, inner, antipetalous whorl inserted at rim of hypanthium, 0.5–0.9 mm long (inner stamens the shortest); anthers, spheroid, 0.3–0.6 mm long, abaxially without broad connective tissue. *Scales* exserted, inserted at mouth of hypanthium immediately below antipetalous stamens, obovoid or subspheroid, 0.2–0.5 mm long, glabrous, translucent-white in fresh state. *Ovary* narrowly ellipsoid to obovoid, 0.7–0.8 mm long, glabrous. *Style* linear-obconical, 1.4–2.1 mm long, with ascending incurled hairs in the upper half. *Stigma* capitate and elongate-papillate with a few sparse hairs (Figure 7.39).

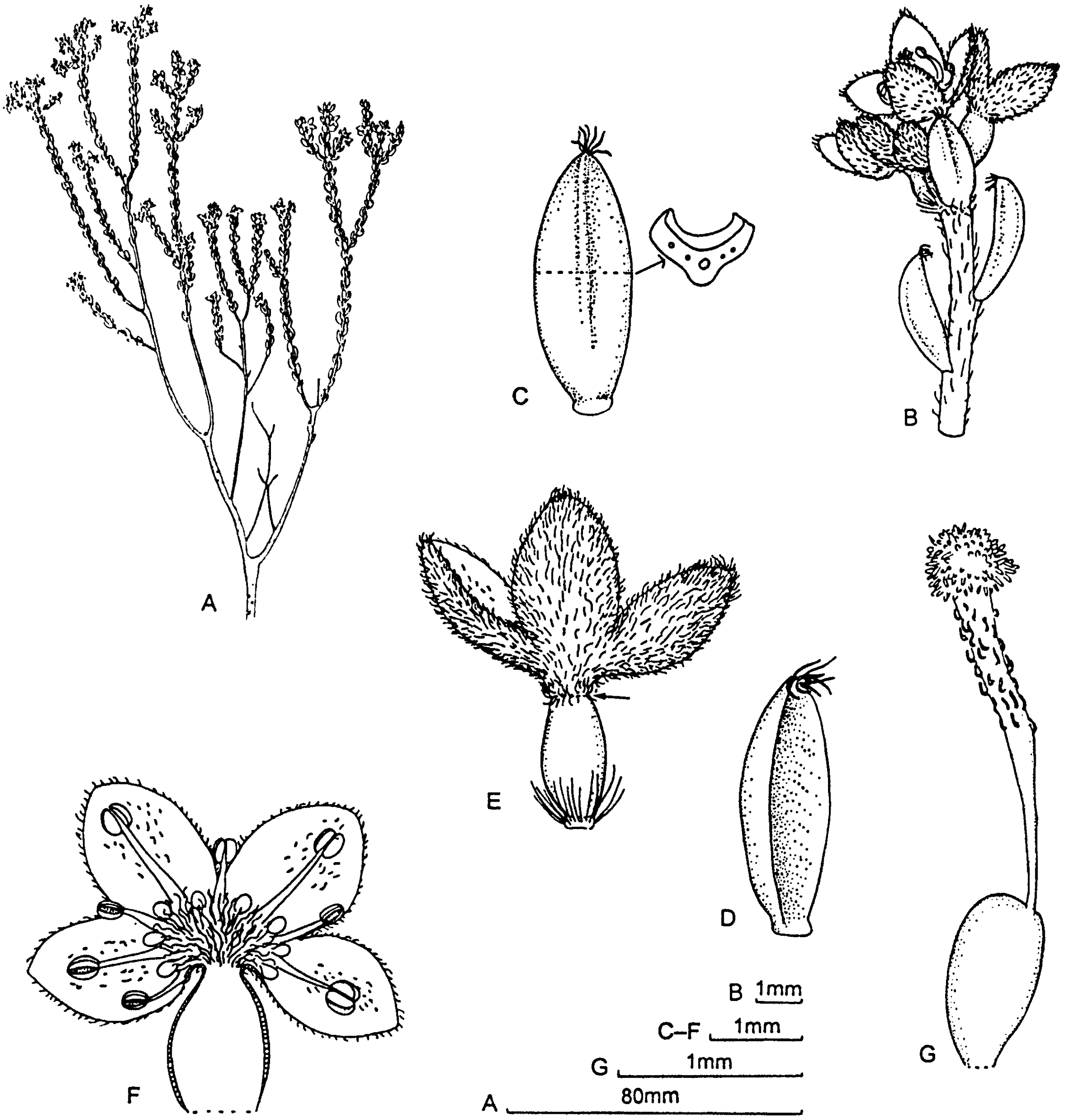

FIGURE 7.39—*Lachnaea ericoides*, *Beyers 172* (NBG). A, portion of plant; B, flowering branch; C & D, leaves: C abaxial view and cross section; D, lateral view; E, flower, note circumscission zone (arrowed); F, flower split longitudinally with gynoecium removed; G, gynoecium.

Distribution and ecology

Lachnaea ericoides, a Langeberg endemic, occurs on the lower slopes from Clock Peaks in the Swellendam District to Garcia Forest Reserve in the Riversdale Distict at altitudes between 330 and 665 m (Figure 7.40). Flowering has been recorded in July and from September to December.

Conservation status: Lower Risk Least Concern (LRlc). Frequent fires could result in this species rapidly moving into a threatened category.

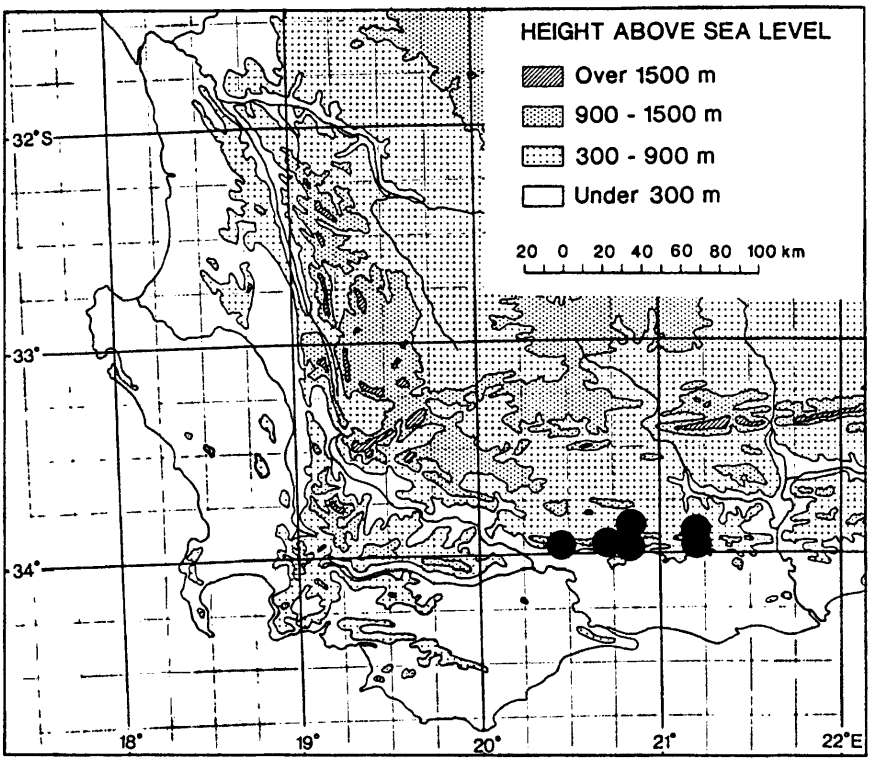

FIGURE 7.40—Known distribution of *Lachnaea ericoides*.

Diagnostic characters and relationships

Lachnaea ericoides is closely related to *L. sociorum* but is distinguished by being a reseeder, the leaves being narrowly elliptic to obovate, adaxially keeled, with a rounded, tufted apex, the sepals being sericeous-tomentose adaxially and the capitate stigma with elongated papillae.

Specimens examined

WESTERN CAPE.—3320 (Montagu): Swellendam Mtns, hiking trail, (–CD), 24-12-1979, *Esterhuysen BOL 46844* (BOL); Swellendam Dist., base of Langeberg Range, Clock Peaks, 330 m, (–CD), 16-06-1952, *Wurts 186* (NBG): *ibid.*, 27-10-1952, *Wurts 186a* (NBG); Swellendam Div., Tradouw Pass, (–DC), 07-09-1924, *Compton 3396* (BOL); *ibid.*, 530 m, 27-07-1954, *Levyns 10106* (BOL); *ibid.*, S entry, 450 m, Oct. 1923, *Levyns 672* (BOL), as *Levyns & Levyns 672* (NBG); *ibid.*, on SW-facing slope along jeep track to Gatboskloof, 360 m, 08-10-1988, *McDonald 1621* (NBG, PRE); *ibid.*, N-end, 24-09-1998, *Oliver 11124* (NBG); *ibid.*, 17-09-1936, *Salter 6313* (K); Zuurbraak (near Swellendam), 330 m, (–DC), 12-10-1897, *Galpin 4496* (BOL); Swellendam, above Voormansbosch, in grassy area on mountain, (–DC), Oct., *Zeyher 3776* (S, SAM, PRE, Z); Grootvadersbosch State Forest, (–DD), 03-12-1958, *Barker 8821* (NBG); *ibid.*, edge of plantation near reservoir, 455 m, 14-12-1989, *Beyers 172* (K, MO, NBG, NY, PRE); *ibid.*, E of Kleinberg, 430 m, 05-09-1984, *McDonald 901* (NBG); *ibid.*, 395 m, 12-09-1986, *McDonald 1188* (NBG); *ibid.*, slopes of Kleinberg, 480 m, 28-06-1988, *McDonald 1562* (NBG); *ibid.*, edge of plantation near reservoir, 455 m, 10-11-1989, *McDonald 1842* (NBG, PRE); *ibid.*, along Barend Koen Road, 300 m, 17-09-1985, *McDonald & Morley 976* (NBG); *ibid.*, 500 m, 11-07-1986, *Van der Merwe 118* (NBG); *ibid.*, E borderline, forest fringe, 483 m, 21-05-1983, *Van Wyk 1237* (NBG); *ibid.*, 600-1000 m, 18-10-1826, *Zeyher BOL 46846* (BOL); Swellendam Div., Langeberg, Lemoenshoek Peak, lower S slopes, (–DD), 27-03-1948, *Esterhuysen 14402* (BOL); *ibid.*, 27-10-1955, *Esterhuysen 25034* (BOL); Lemoenshoek Mtns near Heidelberg, (–DD), Mar. 1948, *Stokoe SAM 64624* (SAM); Swellendam, Voormansbosch and Grootvadersbosch, (–DC/DD), Oct., *Zeyher s.n.* (Z).

—3321 (Ladismith): Garcias Pass, Riversdale, 370 m, (–CC), *Bohnen 8374* (NBG); Garcia Pass Forest Station, above plantation, (–CC), 24-09-1985, *Dryfhout 4101* (NBG); *ibid.*, S. slopes near Rooiwaterspruit Huts, 545 m, 17-10-1990, *McDonald 1945* (K, NBG, PRE); *ibid.*, S-facing slopes on plateau S of Rooiwaterspruit, 515 m, 10-12-1990, *McDonald 2027* (K, NBG, PRE); Riversdale Dist., Kleinberg, (–CC), Aug. 1909, *Muir 497* (BOL); Riversdale, mountain slopes N of Garcias Pass, 500–665 m, (–CC), Oct. 1926, *Thorne SAM 38927* (SAM); slopes of Langeberg near Riversdale, 330 m, (–CC/CD), 06-11-1892, *Schlechter 1730* (BOL, S, Z). Grid ref unknown: Riversdale, 500 m, Sept. 1923, *Muir BOL 46848* (BOL); Langeberg, 665 m, 23-10-1894, *Schlechter 5693* (Z).

21. **Lachnaea stokoei** Beyers, sp.nov., *L. ericoidis* in facie similis foliis alternatis anguste ellipticis ad ovatis marginibus involutis apicibus caespitosis inflorescentia umbellata ebracteata floribus tribus apertis simul, sed differt squamis inclusis, stigmate conico.

TYPE.—Western Cape, 3320 (Montagu): Swellendam Div., Langeberg Range, between Lemoenshoek and Noukrans Farm, Strawberry Hill, (–DD), 11-01-1957, *Stokoe s.n.* (NBG 103641, holo.!; K!, PRE 49147!, iso.).

Low shrublet, ? height. *Branches* ascending to inclined, slender, ridged below the leaf bases, densely covered with long stiff adpressed hairs admixed with crooked hairs later glabrescent, densely leafy, becoming naked with prominent leaf scars. *Leaves* alternate, ascending, scattered, internodes a quarter to as long as leaves, distal 4–5 leaves below inflorescence crowded, sessile, epistomatic, narrowly-elliptic to ovate, 2.5–4.0 × 1.0–1.5 mm, coriaceous, green, glabrous with tufted apex which may become naked later, adaxially widely concave, smooth, dull, ± white-punctulate, abaxially ± flat, faintly nervate, glossy, margin involute, apex subacute, base cuneate. *Inflorescence* a terminal, sessile, ebracteate, 4–8-flowered umbel with up to 3 open flowers at a time, on main flowering branches. *Flowers* subactinomorphic, ? cream. *Pedicel* 0.4–0.8 mm long, sericeous. *Hypanthium* 3.2–4.2 mm long, circumscissile midway to two-fifths from base, upper portion obconical, sericeous outside, adpressed hairy within, basal portion ellipsoid, sericeous outside, glabrous within. *Sepals* ascending, subequal, elliptic to very widely ovate, 1.1–1.8 × 1.2–1.8 mm, apex rounded, sericeous on both sides. *Stamens* partly exserted, outer, antisepalous whorl exserted and inner, antipetalous whorl semi-exserted; antisepalous whorl inserted at base of sepals to quarter-way down upper portion of hypanthium, inner, antipetalous whorl inserted quarter to third-way down upper portion of hypanthium (inner stamens the shortest); filaments filiform, outer 0.7–1.0 mm long, inner 0.2–0.6 mm long; anthers, ellipsoid, 0.4–0.6 mm long, abaxially without broad connective tissue. *Scales* enclosed, inserted ± third-way down upper portion of hypanthium immediately below antipetalous stamens, semi-terete, elliptic in outline, abaxially attached to hypanthium, 0.3–0.4 mm long, glabrous. *Ovary* ellipsoid, 0.8–1.0 mm long, glabrous. *Style* linear-obconical, 2.2–3.0 mm long, with ascending incurled hairs throughout or only in upper three-quarters. *Stigma* conical and elongate-papillate (Figure 7.41).

Distribution and ecology

Lachnaea stokoei is a Langeberg endemic found in the Heidelberg District at Lemoenshoek [Grootberg] and Strawberry Hill, according to Stokoe's collections, dated December 1954 and January 1957. The localities given are very vague and no other more recent information is available about this species (Figure 7.42). Flowering has been recorded in December and January.

Conservation status: More than 40 years have elapsed since the last collection of this species. This portion of the Langeberg has been fairly well surveyed by McDonald (1993) and specific searches for this species have been unsuccessful. This species is therefore considered to be Extinct (Ex).

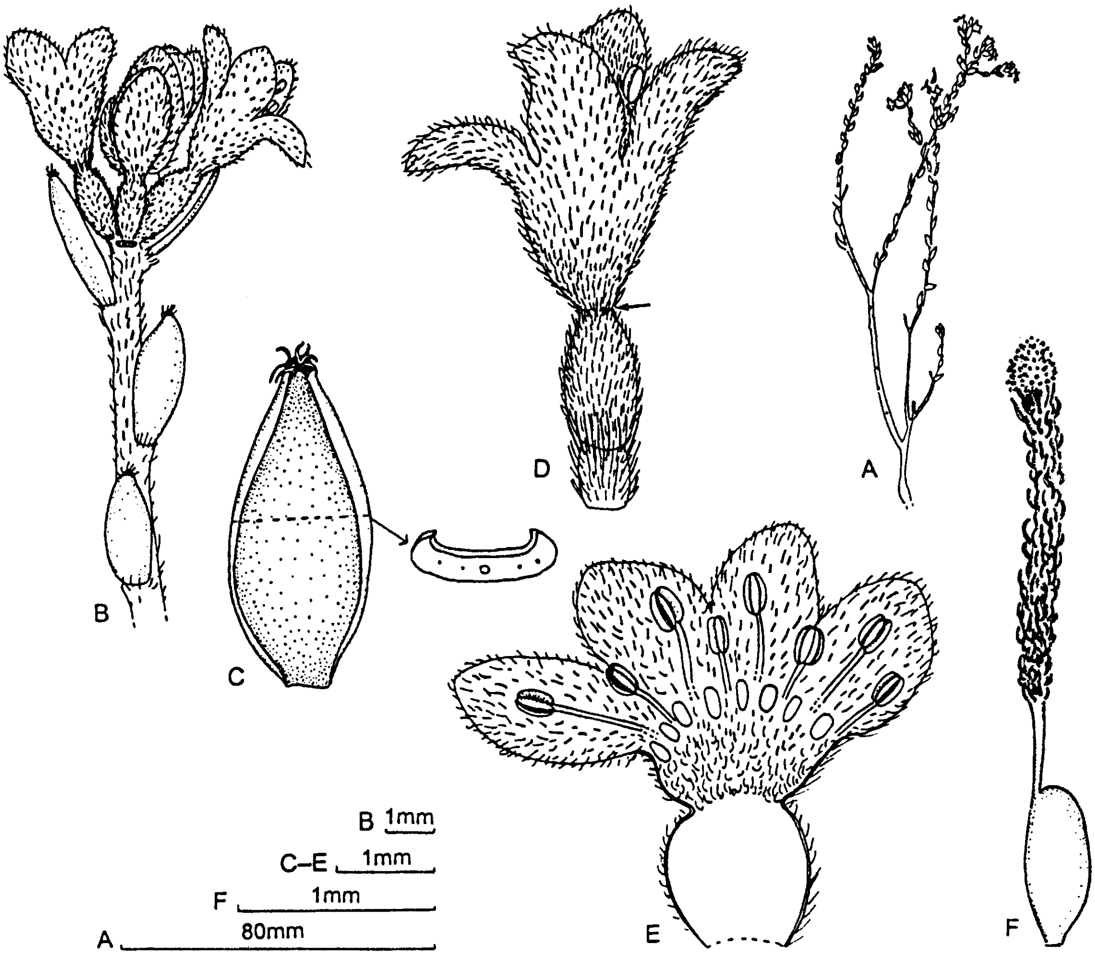

FIGURE 7.41—*Lachnaea stokoei, Stokoe s.n. sub NBG103641* (NBG). A, portion of plant; B, flowering branch; C, leaf (adaxial view and cross section); D, flower, note circumscission zone (arrowed); E, flower split longitudinally with gynoecium removed; F, gynoecium.

Diagnostic characters and relationships

Lachnaea stokoei resembles *L. ericoides* in general facies in that it has alternate, narrowly elliptic to ovate leaves with involute margins and tufted at the apices and the inflorescence which is an ebracteate umbel with up to three open flowers at a time, but the flower structure differs. The antisepalous stamen whorl is exserted, the antipetalous one semi-exserted, scales abaxially attached ± a third-way down upper portion of hypanthium and the stigma is conical and elongate-papillate.

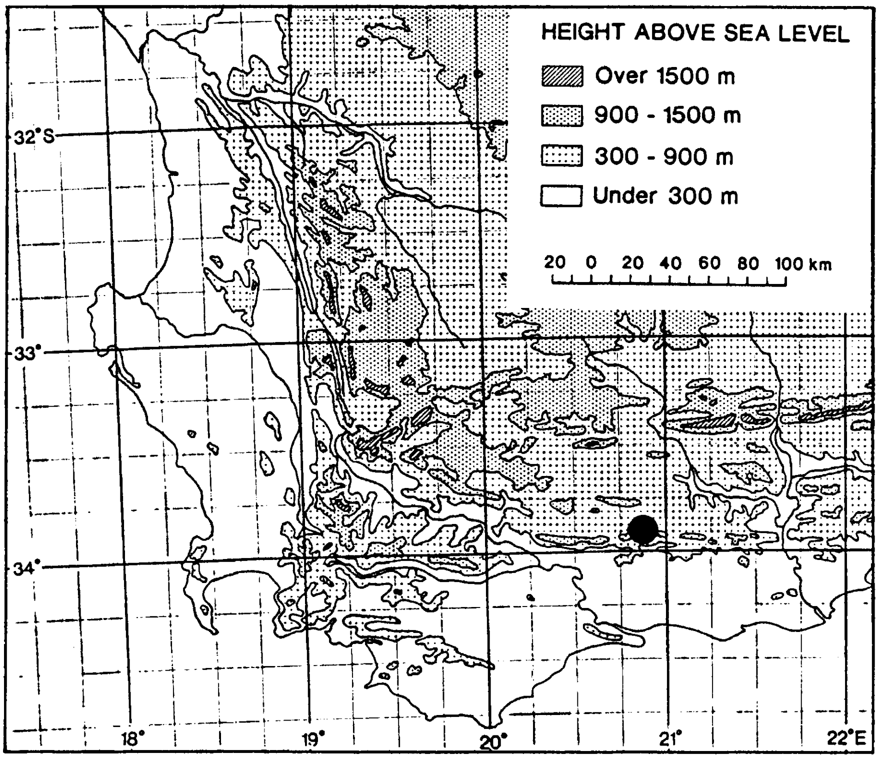

FIGURE 7.42—Known distribution of *Lachnaea stokoei*.

Eponymy

This species is dedicated to T.P. Stokoe (1868–1959) who, as a member of the Mountain Club between 1913 and 1959, climbed extensively in the mountains of the Western Cape where he collected many plant species new to science (Gunn & Codd 1981).

Specimens examined

WESTERN CAPE.—3320 (Montagu): Swellendam Div., Strawberry Hill, Heidelberg, (–DD), Dec. 1954, *Stokoe SAM 69968* (SAM), as *Stokoe PRE 49286* (PRE); Swellendam Div., Langeberg Range, between Lemoenshoek and Noukrans Farm, Strawberry Hill, (–DD), 11-01-1957, *Stokoe NBG 103641* (NBG), as *PRE 49147* (PRE), as *Stokoe s.n.* (K).

22. **Lachnaea striata** *(Poir.) Meisn.*, Linnaea 14: 415—416 (1840); Meisn. 577 (1857); C.H.Wright: 22 (1915). *Passerina striata* Poir. in Encyclopédie méthodique 5: 44,

t. 291, f. 2 (1804); non Spreng.: 240 (1825). Type: *Passerina striata herb. Lam.* (P-LA,—NBG, photocopy!).

Lachnaea elegans Compton, Journal of Botany, British and Foreign 72: 20 (1934a). Type: Cape Province; Ceres Div., exact locality unknown. Exhibited at Ceres Wild flower Show, October 1932, *Compton 4157* (BOL, holo.!),

Gonophylla nervosa Eckl.& Zeyh. ex Meisn.—*nom. nud.* in A.P. de Candolle, Prodromus systematis naturalis regni vegetabilis: 577 (1857) in synonymy.

Erect, corymbosely branched shrublet to 0.6 m tall, multistemmed at base; resprouter. *Branches* ascending, slender, slightly ridged below leaf bases, sericeous to sparsely sericeous, later glabrescent, densely leafy, becoming naked with prominent leaf scars. *Leaves* alternate, ascending, subimbricate to scattered, sessile, epistomatic, 4.8–10.0 × 1.5–4.5 mm, narrowly-elliptic to elliptic or ovate, coriaceous, adaxially flat with margin slightly incurved, glabrous, smooth, dull, ± white-punctulate, abaxially flat, venation conspicuous, prominently 1–5-ribbed, glabrous, glossy, apex acute, base cuneate to attenuate, margin crisped ciliate, trichomes bulbous at base, base often tinged red; with age trichomes disappear, then margins papillate. *Inflorescence* a terminal, sessile, ebracteate, more than 12-flowered umbel, 8.0–20.0 mm in diameter, on main flowering branches. *Flowers* subactinomorphic, cream, purple or pale rose, pedicellate. *Pedicel* 0.4–0.9 mm long, sericeous. *Hypanthium* 2.6–4.2 mm long, circumscissile half to two-thirds from base, upper portion shortly funnel-shaped, sericeous to sparsely hairy outside, within pubescent with stiff hairs at mouth, basal portion ellipsoid, glabrous outside and within. *Sepals* patent, subequal, elliptic to ovate, 2.2–5.3 × 1.0–1.3 mm, apex rounded, adaxially sericeous or posterior and anterior ones sparsely hairy with apex sericeous, lateral ones glabrous, or all four glabrous and only sericeous at apex, abaxially sericeous. *Stamens* exserted, outer, antisepalous whorl inserted at base of sepals, inner, antipetalous whorl inserted at rim of hypanthium, shorter than outer whorl, filaments filiform, outer 1–1.6 mm long, inner 0.7–1.1 mm long; anthers widely ellipsoid to depressed spheriod, 0.5–0.7 mm long, abaxially without broad connective tissue. *Scales* exserted, inserted at mouth of hypanthium immediately below antipetalous stamens, linear to clavate, 0.5–0.8 mm long, glabrous. *Ovary* ellipsoid, ovoid or obovoid, 1.0–2.2 mm long, glabrous. *Style* linear, 1.9–

3.7 mm long, upper half covered with straight, adpressed or incurled hairs, lower half glabrous. *Stigma* brush-like (Figure 7.43).

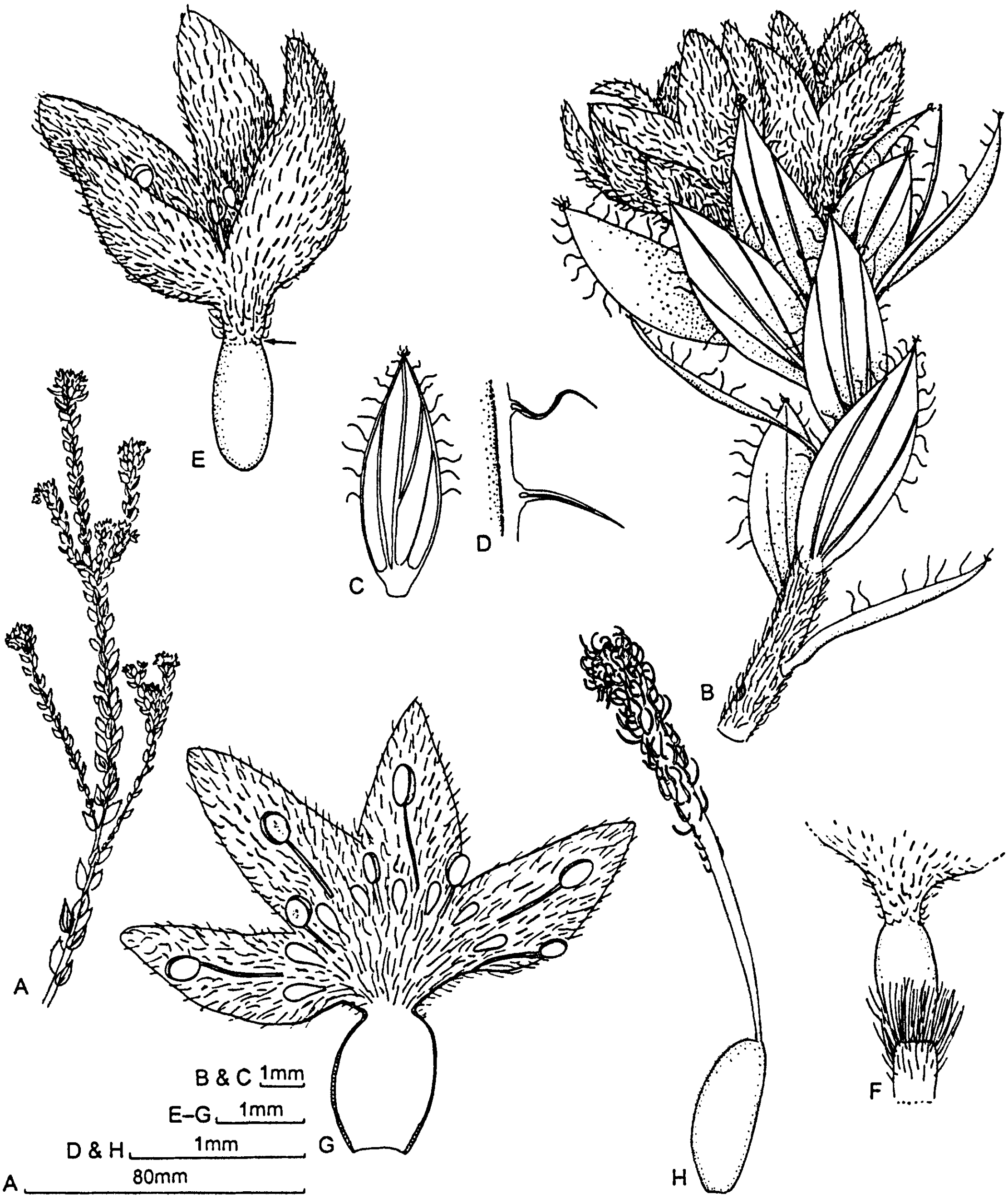

FIGURE 7.43—*Lachnaea striata*, *Compton 6933* (NBG). A, portion of plant; B, flowering branch; C, leaf (abaxial view) D, leaf margin with trichomes (enlarged); E, flower, note circumscission zone (arrowed); F, basal portion of flower with pedicel; G, flower split longitudinally with gynoecium removed; H, gynoecium.

Distribution and ecology

Lachnaea striata is known from the Northern Cederberg around Pakhuis and Heuningvlei areas and south in the Groot Winterhoek, Witsenberg and Roodesand Mountains near Tulbagh, favouring seasonally damp areas at altitudes between 800 and 1160 m (Figure 7.44). Flowering has been recorded from September to January.

Conservation status: Lower Risk Near Threatened (LRnt). The last known collection was made in 1971. It appears to be very scarce and further searches are required to check the status of this species.

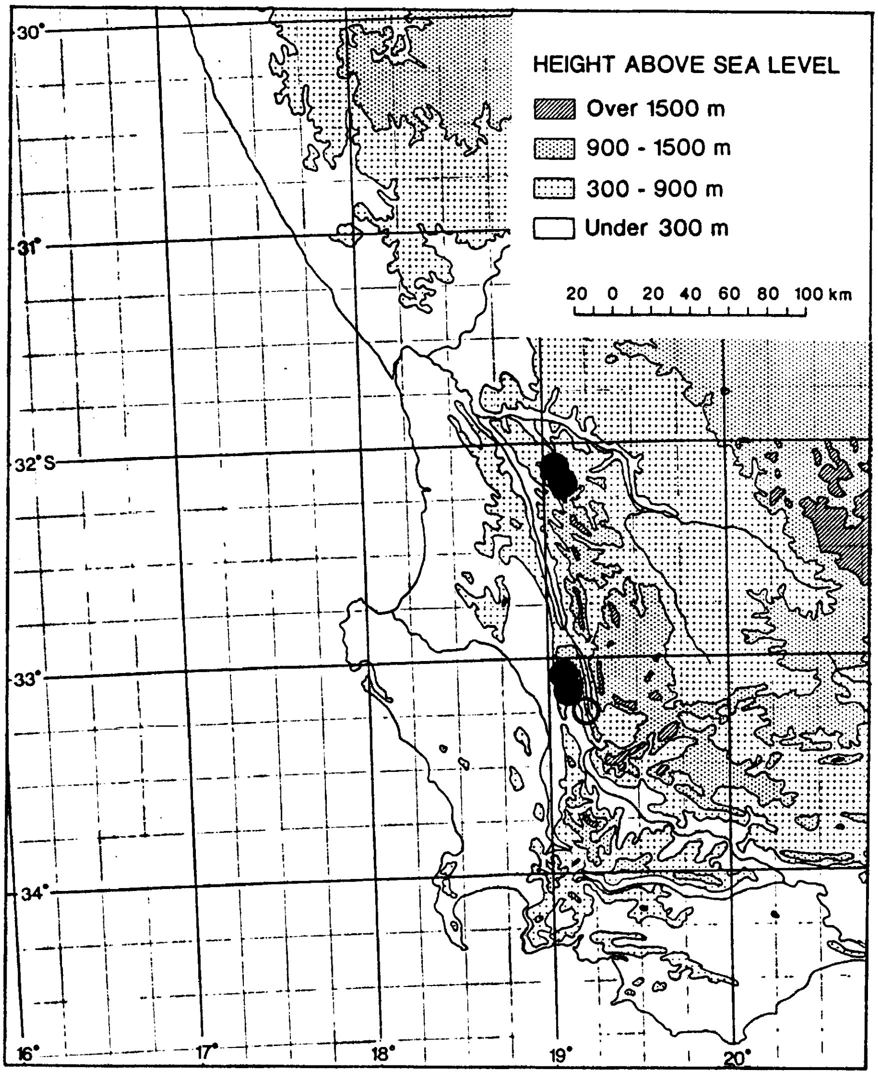

FIGURE 7.44—Known distribution of *Lachnaea striata*.

Diagnostic characters and relationships

Lachnaea striata is easily distinguished from the other species with alternate leaves and ebracteate inflorescences by its narrowly elliptic to ovate leaves with one to five prominent ribs abaxially and the crisped-ciliate margins.

Specimens examined

WESTERN CAPE.–3219 (Wuppertal): Cederberg Mtns, Pakhuis Pass, 1000 m, (–AA), 07-10-1897, *Bolus 9087* (BOL, NBG); *ibid.*, 19-09-1937, *Compton 6933* (NBG); *ibid.*, Sept. 1942, *Stokoe* SAM *58157* (SAM); *ibid.*, Nov. 1929, *Thode A2136* (K); N Cederberg, Pakhuis, stream bank on plateau. 800 m, (–AA), 16-01-1953, *Esterhuysen 21152* (BOL, S); *ibid.*, swampy plateau, 1000 m, 27-12-1956, *Esterhuysen 26861* (BOL); Pakhuis Mtns, 1160 m, (–AA), Dec. 1940, *Leipoldt 3504* (BOL); Cederberg, Heuningvlei, (–AA), Dec. 1941, *Stokoe SAM 58158* (SAM).
—3319 (Worcester): Winterhoek Mtns, Tulbagh, (–AA), Nov., *Ecklon & Zeyher 77.11* (GRA, SAM, S, Z); Winterhoeksberg, (III, A, e), 830–1000 m, (–AA), 02-01-1829, *Drège 1979* (K, NY, P, PRE); *ibid.*, Jan., *Drège s.n.* (S); Winterhoek State Forest, Driebosch, ± 930 m, (–AA), 18-09-1073, *Haynes 818* (NBG); Roodesand Mtns near Tulbagh, (–AA), 28-09-1931, *Stokoe BOL 22326* (BOL, NBG);Witsenberg, Tulbagh, (–AA/AC), Nov., *Ecklon & Zeyher SAM 1476b* (SAM). Grid ref. unknown: Ceres Wild Flower Show, October 1932, *Compton 4157* (BOL); *ibid.*, 2 10 1933, *Compton 4412* (BOL); *ibid.*, 1-10-1934, *Compton 4890* (BOL); *ibid.*, Oct. 1931, *Comm. Compton BOL 46842* (BOL); Porterville [precise locality unknown], 25-01-1971, *Keet NBG 92.338* (NBG); Clanwilliam [precise locality unknown], *Mader Herb. MacOwen 2210* (BOL, SAM); Worcester [precise locality unknown], *Zeyher Herb. Hooker* (K). Without locality: *Zeyher PRE 49208* (PRE).

23. **Lachnaea aurea** *Meisn.* in A.P. de Candolle, Prodromus systematis naturalis regni vegetabilis 14: 576 (1857); C.H.Wright: 21 (1915). Type: In mountains Klynriviersbergen [Klein River Mountains] near Hemel en Aarde, alt. 5, dist. Caledon, *Ecklon s.n.* [30 or 58.8] (NY [Meisner Herb.], holo.!; BOL!, GRA!, K!, NY [Torrey Herb.]!, PRE, SAM!, S!, Z!, iso.).

Lachnaea aurea Eckl. & Zeyh. ex Meisn.—*nom. nud.* in A.P. de Candolle, Prodromus systematis naturalis regni vegetabilis 14: 576 (1857) in synonymy.

Erect, sparsely branched shrub up to 1 m tall, single- or few-stemmed at base; resprouter. *Branches* erect to flexuous, slender, ridged below leaf-bases, adpressed puberulent, leafy, becoming glabrous and naked with prominent leaf scars. *Leaves* alternate, adpressed or ascending, occasionally patent to reflexed, imbricate, sessile, epistomatic, narrowly elliptic or narrowly obovate, 7.5–18.0 × 0.8–4.0 mm, coriaceous, glabrous, adaxially flat or obtusely concave, smooth, dull, ± white-punctulate, abaxially obtusely convex, sometimes subkeeled just below apex, smooth, glossy, margin membranous, yellow in fresh state, apex acuminate, base cuneate; leaves below inflorescence broader with a wider membranous margin resembling involucral bracts, narrowly elliptic to elliptic or narrowly obovate to obovate 11.5–19.0 × 3.5–11.0 mm. *Inflorescence* a terminal, sessile, bracteate, more than 50-flowered, capitate-like umbel with up to 30 open flowers at a time, 20–55 mm in diameter, on main flowering branches. *Involucral bracts* 6–8, narrowly elliptic to elliptic or obovate, 11.5–19.0 × 4.5–11.0 mm, innermost the widest, glabrous or abaxially sericeous along middle portion, ± flat or abaxially slightly keeled behind apex, middle portion coriaceous, 1- to 3-nervate, green, margin membranous, broad, yellow sometimes at apex tinged reddish-purple, apex mucronulate to mucronate or acuminate. *Flowers* zygomorphic, golden yellow, unscented, pedicellate. *Pedicel* 0.5–2.0 mm long, clothed with long, ascending, silky hairs. *Hypanthium* 3.8–7.8 mm long, circumscissile midway to two-thirds from base, upper portion narrowly funnel-shaped, clothed with long, ascending, silky hairs outside, within adpressed hirsute, basal portion ellipsoid or ovoid, clothed with short, ascending, silky hairs outside and glabrous within. *Sepals* patent, adaxially glabrous, abaxially sericeous, unequal, posterior one the smallest, ovate, acute to rounded, 2.6–4.5 × 1.6–3.0 mm, lateral ones narrowly elliptic, 7.5–14.0 × 2.0–3.5 mm, acute, anterior one usually the largest, narrowly elliptic, 9.3–15.5 × 3.0–4.5 mm, acute. *Stamens* exserted, outer, antisepalous whorl inserted at base of sepals, inner, antipetalous whorl inserted at rim of hypanthium; filaments filiform, 2.0–6.5 mm long; anthers ellipsoid, 0.8–1.5 mm long, abaxially without broad connective tissue. *Scales* exserted, inserted at mouth of hypanthium immediately below antipetalous stamens, narrowly obovoid or ellipsoid, 0.8–1.4 mm long, apex occasionally irregularly lobed, glabrous, yellow in fresh state. *Ovary* ellipsoid or obovoid, 1.2–2.5 mm long, glabrous. *Style* linear-obconical, 4.0–6.5 mm long, adpressed hairy only in upper three-quarters. *Stigma* brush-like (Figure 7.45).

Distribution and ecology

Lachnaea aurea occurs from Hermanus to Bredasdorp and southwards to Agulhas on coastal flats and lower slopes, in acid sands and ferricrete at altitudes below 900 m (Figure

7.46). Flowering has been recorded mostly in July to September, but occasionally in March, April and June.

Conservation status: Vulnerable (VU A1ce). The habitat of this species has been restricted through the effects of human activities and invasion by alien plants.

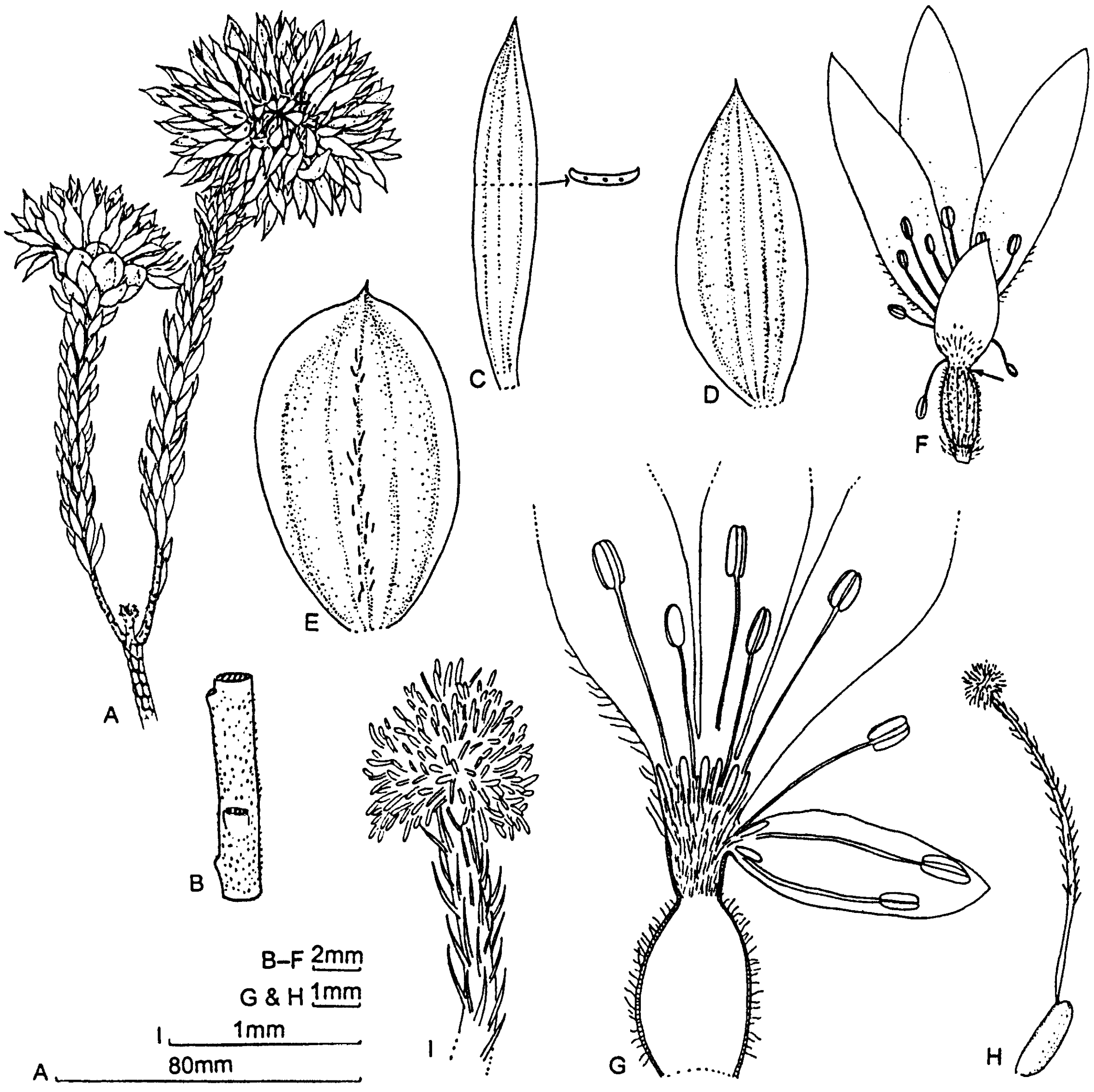

FIGURE 7.45—*Lachnaea aurea*, *Oliver 10550* (NBG). A, portion of plant; B, branch with leaves removed; C, leaf (abaxial view and cross section); D & E, involucral bracts: D, from subdistal pair; E, from distal pair; F, flower, note circumscission zone (arrowed); G, flower split longitudinally with gynoecium removed; H, gynoecium; I, stigma and upper portion of style (enlarged).

Diagnostic characters and relationships

Easily distinguished from the other umbellate species with alternate leaves by the showy, bracteate inflorescences with their strongly zygomorphic, golden yellow flowers, which at a glance appear asteraceous. *L. aurea* is a sister species of *L. striata*, both sharing the presence of marginal fibres not associated with the vascular bundles in the leaf.

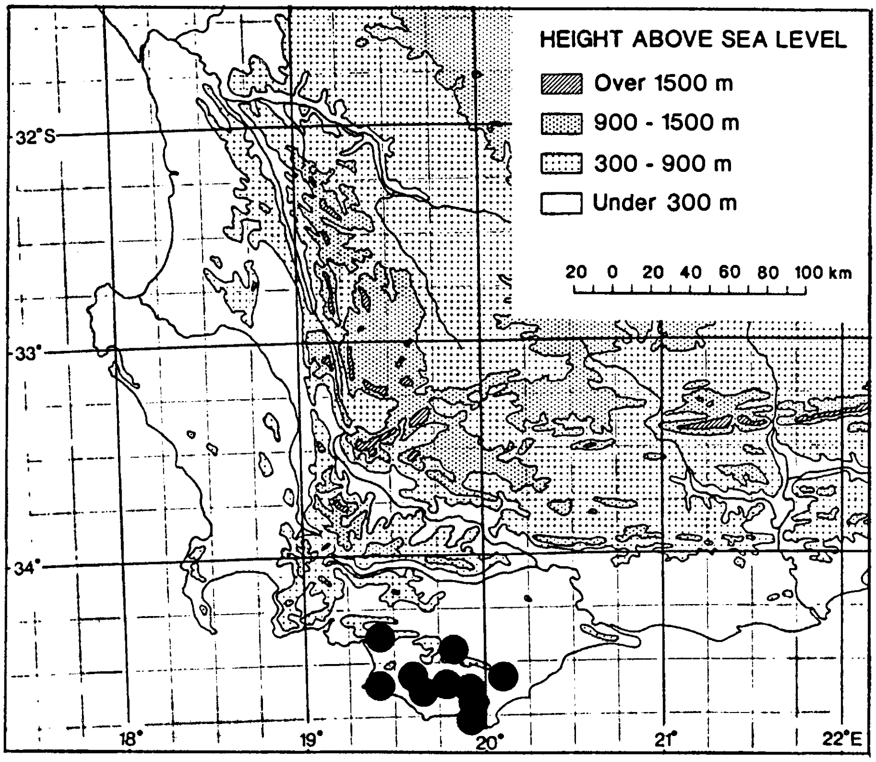

FIGURE 7.46—Known distribution of *Lachnaea aurea*.

Specimens examined

WESTERN CAPE.—3419 (Caledon): Caledon, Klein River Mountains near Hemel en Aarde, 333–1000 m, (–AD), August, *Ecklon & Zeyher 30* or *58.8* (BOL, K, NY [Meisner Herbarium], NY [Torrey Herbarium], SAM, S, Z); Klein River Mtns, near Hermanus, (–AD), Sept. 1920, *Stokoe BOL 16889* (BOL); Elandsberg, 18 miles from Stanford on road to Elim, (–BD), 22-09-1938, *Gillett 4343* (BOL, K); Elandskloof Mtns, east of Papiesvlei, (–BD), 03-09-1965, *Mattatia 26* (BOL); hills above Pearly Beach, (–CB), Jun. 1950, *Lewis 3531* (SAM); Papiesvlei valley, between Papiesvlei and Baardskeerdersbos, on farm Bruinklip, (–DA), 06-09-1993, *Aggenbach s.n.* (NBG); Bredasdorp Dist., Viljoenshof, (–DA), 14-06-1963, *Baker 2004* (NBG); *ibid.*, between Fisantekraal and Groenkloof, near Haelkraal River, 200 m, 13-08-1989, *Beyers 135* (NBG); Bleskloof near Viljoenshof, 100 m, (–DA), 17-03-1978, *Boucher 3788* (NBG); Bredasdorp Dist., Ratel River, (–DA), 03-09-1943, *Compton 14777* (BOL, NBG); Pheasantshoek near Viljoenshof, (–DA), 26-08-1976, *Esterhuysen 34351* (BOL, S); between Blomhuis and Bleskloof, NE of Pearly Beach, S aspect, (–

DA), 13-09-1981, *Hugo 2667* (NBG); Kouerivier Mtn near Elim, (–DA), 17-09-1932, *Nel STEU 17423* (NBG); Groenkloof at Klein Hagelkraal above Pearly Beach, 65 m, (–DA), 22-08-1968, *Rourke 1081* (NBG); Elim, (–DA/DB), 00-09-1924, *Compton 3397* (BOL); *ibid.*, Jul. 1937, *Gill SAM 52370* (SAM); *ibid.*, 130 m, Sept. 1927, *Levyns 2158* (BOL); *ibid.*, 19-04-1896, *Schlechter 7610* (GRA, K, Z); *ibid.*, *Tyson SAM 19797* (SAM); Elim, in sand near Missionary Station ± 65 m, (–DA/DB), Oct. 1894, *Bolus 9186* (BOL, Z); Elim hills (–DA/DB), 05-08-1940, *Compton 9110* (NBG); Hills about Elim, 65–200 m, (–DA/DB), Jul. 1895, *Guthrie 3809* (NBG); Springfield Estates, (–DB), Sept. 1949, *Stokoe SAM 64623* (SAM); Bredasdorp Dist., Bo-Vogelvlei, flats SSW of the farm, 50 m, (–DB), 02-09-1994, *Oliver 10550* (K, MO, NBG, NY, P, PRE, Z); Vogel Vlei near Elim, 65–100 m, (–DB), Dec. 1898, *Thode STEU 5269* (NBG); Bredasdorp, Brandfontein Mtn slopes, (–DD), 14-10-1951, *Esterhuysen 19020* (BOL).

—3420 (Bredasdorp): upper slopes of mountain above Bredasdorp, 300 m, (–CA), 03-06-1981, *Burgers 2711* (NBG); Bredasdorp, (–CA), July 1933, *Jordaan STEU 18726* (NBG). Grid ref. unknown: Groot Houwhoek, Dec., *Zeyher SAM 19798* (SAM).

24. **Lachnaea burchellii** *Meisn.*, Linnaea 14: 420–421 (1840); Meisn.: 577 (1857); C.H.Wright: 583 (1925). Type: Locality unknown, *Drège 7370* (P, holo.!; NY, capsule on *Ecklon 78*, iso.!).

Lachnaea burchellii var. *angustifolia* Meisn. in A.P. de Candolle, Prodromus systematis naturalis regni vegetabilis 14: 577 (1857). Syntypes: locality unknown, *Drège 7370*, (P!, NY, capsule on *Ecklon 78*!); in mountains, dist. George, alt. 5, *Ecklon & Zeyher s. n.* (not seen).

Lachnaea burchellii var. *latifolia* Meisn. in A.P. de Candolle, Prodromus systematis naturalis regni vegetabilis 14: 577 (1857); C.H.Wright: 583 (1925). Syntypes: In mountains, at river Vanstadensrivier [Van Stadens River], alt 2–4, dist. Uitenhage, *Ecklon 78* (NY [Meisner Herb.]!, lecto., here designated; GRA!, NY [Torrey Herb]!, PRE!, S!, Z!); *Zeyher 3757* (K!, PRE!, SAM!, Z!).

Lachnaea phylicoides Lam. var. *oppositifolia* Meisn.—*nom. nud.* in Linnaea 14: 420 (1840) in synonymy.

Gonophylla nana Eckl. & Zeyh. ex Meisn.—*nom. nud.* in A.P. de Candolle, Prodromus systematis naturalis regni vegetabilis 14: 577 (1857) in synonymy.

Gnidia tenuiflora Eckl. & Zeyh. ex Meisn.—*nom. nud.* in A.P. de Candolle, Prodromus systematis naturalis regni vegetabilis 14: 577 (1857) in synonymy.

Erect to decumbent, sparsely branched shrub to 0.3 m tall, single-stemmed at base; reseeder. *Branches* erect to straggling, slender, ridged below leaf-bases, sparsely adpressed hairy or glabrous, leafy, becoming naked with prominent leaf scars. *Leaves* decussate or occasionally subopposite, ascending to inclined, distal pair below inflorescence patent, imbricate to scattered, internodes half to twice as long as leaves, sessile, epistomatic, lanceolate to narrowly elliptic, 6–13 × 1–3 mm, coriaceous, glabrous, ± flat, adaxially smooth, dull, ± white-punctulate, abaxially, 1–3-ribbed, glossy, apex acuminate, base cuneate; leaves on reduced lateral flowering branches bract-like, elliptic, obovate to widely obovate or suborbicular, 1.3–4.9 × 1.1–4.5 mm, coriaceous, green, often with reddish tinge, adaxially concave, smooth, dull, abaxially convex, glossy, obtuse or mucronate, glabrous or abaxially sparsely hairy, margin ciliate. *Inflorescence* a terminal, sessile, ebracteate, 4–10-flowered umbel on main and short lateral flowering branches, those on the latter appearing bracteate. *Flowers* subactinomorphic, cream or pale pink. *Pedicel* 0.3–1.1 mm long, adpressed hirsute. *Hypanthium* 2.3–4.6 mm long, circumscissile midway to two-thirds from base, upper portion funnel-shaped, sericeous outside, adpressed hirsute within, basal portion ellipsoid or ovoid, clothed with obtuse hairs outside, glabrous within. *Sepals* patent, subequal, posterior sepal smallest, anterior one largest, elliptic or ovate, 2.0–4.6 × 1.1–3.2 mm, apex rounded or obtuse, adaxially sparsely sericeous or glabrous, abaxially sericeous. *Stamens* exserted, outer, antisepalous whorl inserted at base of sepals, inner, antipetalous whorl inserted at rim of hypanthium; filaments filiform, 0.7–1.4 mm long; anthers ellipsoid to suborbicular, 0.5–0.7 mm long, abaxially without broad connective tissue. *Scales* exserted, inserted at mouth of hypanthium immediately below antipetalous stamens, capitate, 0.4–0.5 mm long, lower half with declinate trichomes, upper half glabrous, white in fresh state. *Ovary* ellipsoid, 0.8–1.4 mm long, glabrous. *Style* linear-obconical, 2.1–3.7 mm long, clothed with stiff ascending hairs in upper half. *Stigma* brush-like (Figure 7.47).

Distribution and ecology

Lachnaea burchellii occurs on mountain slopes from Albertinia in the Western Cape eastwards to Port Elizabeth in the Eastern Cape, at altitudes between 330 and 1660 m (Figure 7.48). Flowering has been recorded from June to March.

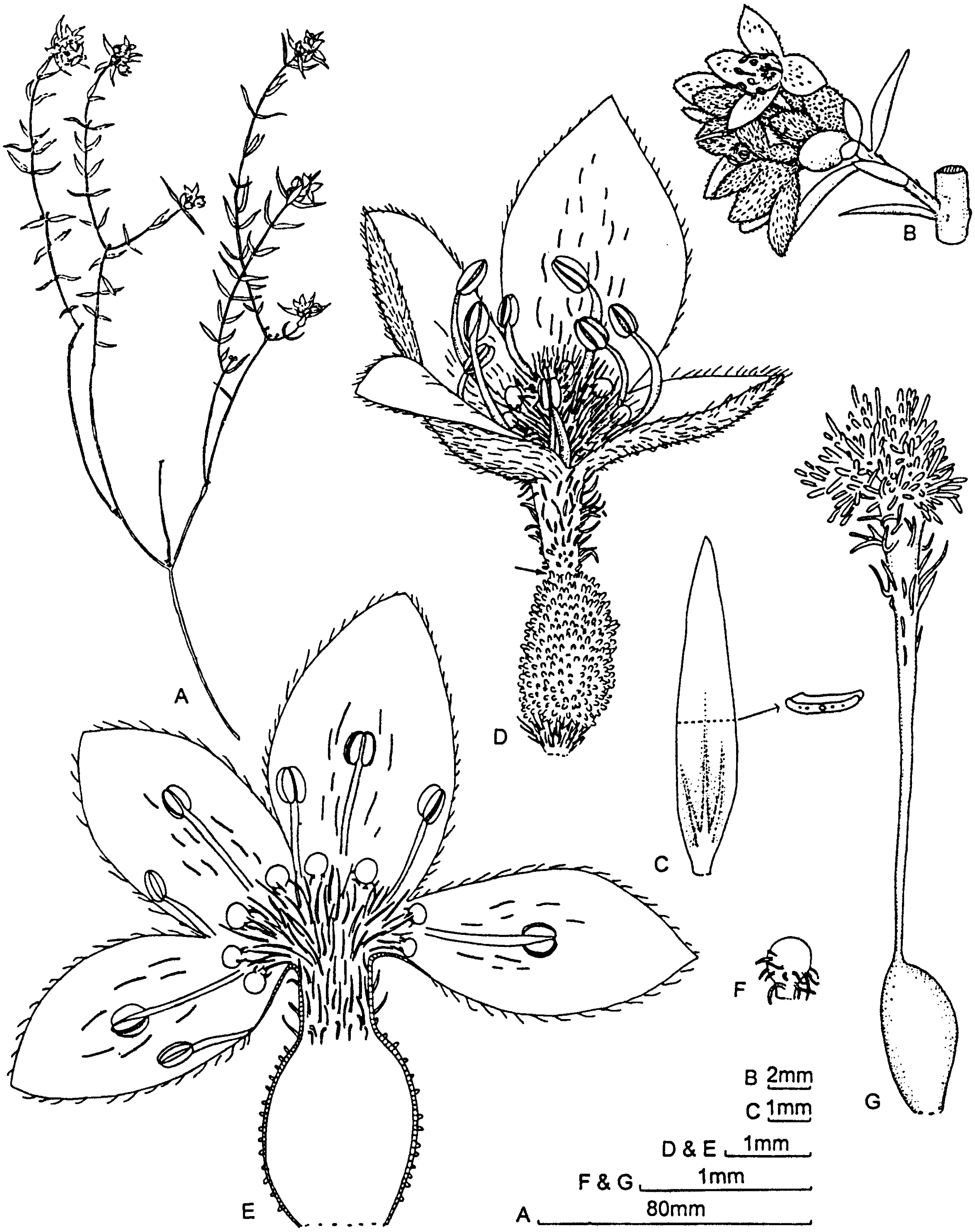

FIGURE 7.47—*Lachnaea burchelli*, *Oliver 9251* (NBG). **A**, portion of plant; **B**, frowering branch; **C**, leaf (abaxial view and cross section); **D**, flower, note circumscission zone (arrowed); **E**, flower split longitudinally with gynoecium removed; **F**, scale; **G**, gynoecium.

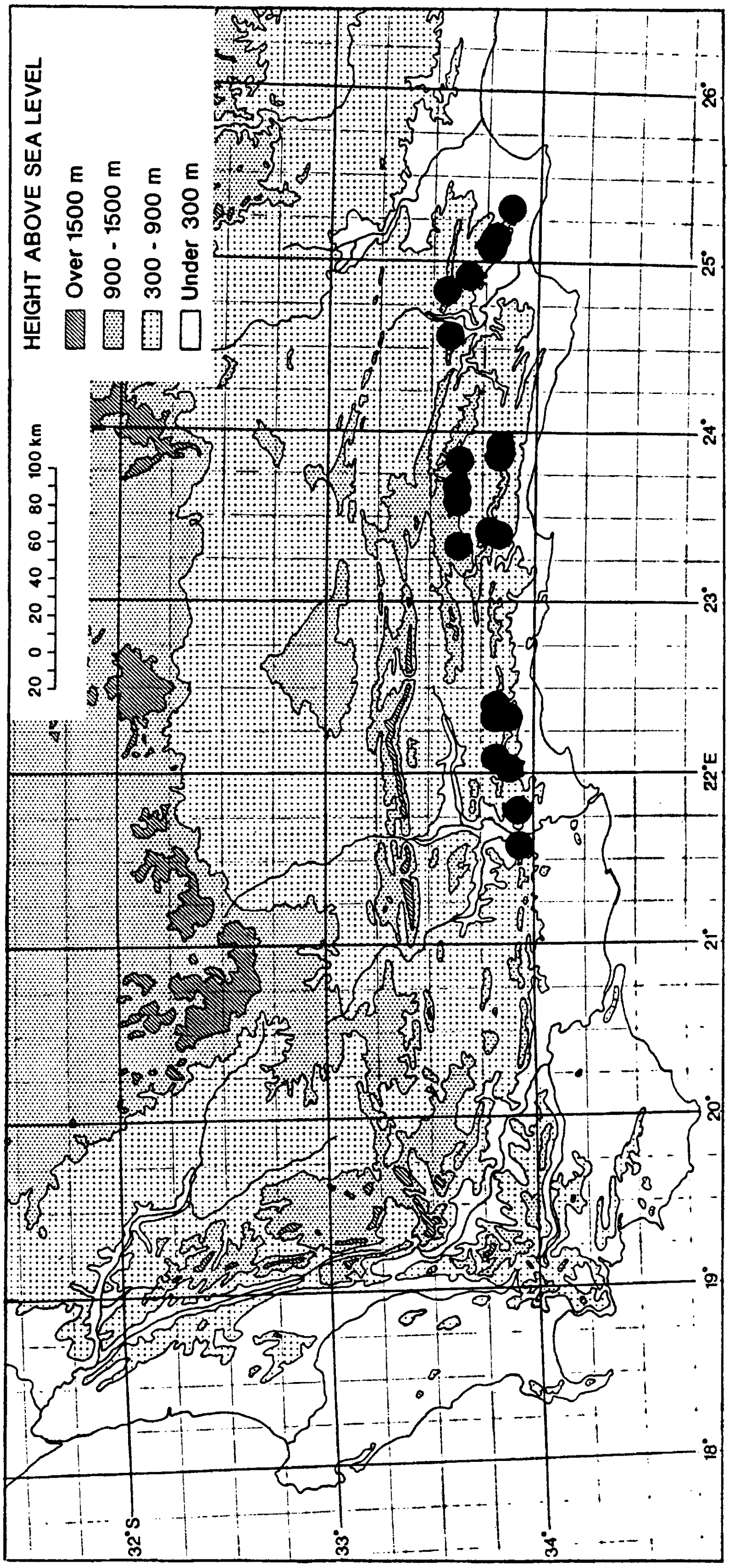

FIGURE 7.48—Known distribution of *Lachnaea burchellii*.

Conservation status: Lower Risk Least Concern (LRlc).

Diagnostic characters

Lachnaea burchellii is distinguished from *L. glomerata*, by being a reseeder, and in having the outside of the upper portion of the hypanthium and sepals sericeous, clavate trichomes on the outside of the basal portion of the hypanthium and a brush-like stigma.

Specimens examined

WESTERN CAPE.—3321 (Ladismith): Attakwasberge, Vreysberg, Vreysrant west of Cloete's Pass, E slope, 1075 m, (–DC), 16-12-1988, *McDonald 1761* (NBG); Mossel Bay Div., hills above Langfontein, 400 m, (–DD), 26-08-1915, *Muir 2364* (BOL); Cloete's Pass, ESE of Vreysberg, SE facing slope, 530 m, (–DD), 21-06-1997, *Oliver 10805* (NBG, PRE).

—3322 (Oudtshoorn): Mossel Bay Div., Outeniqua Mtns, Klein Moeras R. Catchment, N slopes, (–CC), 10-06-1983, *Bean 1153* (BOL); W of Robinson Pass, 500 m, (–CC), 29-08-1978, *Bond 1471* (NBG); Outeniqua Mtns, Robinson Pass, (–CC), *Hops 70* (BOL); Robinson Pass, S slopes; 500 m, (–CC), 27-07-1956, *Levyns 10542* (BOL); Robinson Pass, (–CC), 19-09-1936, *Salter 6347b* (BOL); Outeniqua Mountains, Montagu Pass, summit, (–CD), 07-12-1982, *Bean 1069* (NBG); George Dist., summit Montagu Pass, above road; (–CD), 805 m, 06-10-1978, *Bean 155* (BOL);); *ibid*., upper N slopes, 800 m, 16-09-1969, *Dahlstrand 1255* (NBG); *ibid*., 830 m, Oct. 1921, *Fourcade 1608* (BOL, K, NBG, Z); *ibid*., N part, 15-10-1928, *Gillett 1624* (NBG); *ibid*., 04-11-1928, *Gillett 2061* (NBG); *ibid*., 730 m, 25-07-1956, *Levyns 10490* (BOL); *ibid*., 28-12-1949, *Martin 92* (NBG); *ibid*., above Topping Siding, NW slopes, 800 m, 27-08-1989, *Oliver 9241* (NBG); *ibid*., 1165 m, 03-11-1894, *Schlechter 5810* (BOL, GRA, K, S, Z); *ibid*., summit, 26-11-1979, *Spreeth 155* (NBG); Outeniqua Pass, 1000 m, (–CD), 03-12-1951, *Compton 23081* (NBG, S); *ibid*., top, 1000 m, 19-10-1953, *Compton 24411* (NBG); *ibid*., near top, S slopes, 750 m, 21-08-1956, *Dahlgren & Peterson 179* (NBG, S); *ibid*., 19-10-1953, *Lewis 3976* (BOL); *ibid*., 11.9 miles from George, 26-09-1967, *Marsh 566* (NBG); Outeniqua Mtns, N side in Groot Doring R. valley, W of Waboomskraal, 700 m, (–CD), 27-08-1989, *Oliver 9251* (NBG); Cradock Peak, Montagu Pass, (–CD), Jan. 1940, *Stokoe SAM 54880* (SAM); George Dist., slopes of Cradock Berg, 830–900 m, (–CD), Aug. 1931, *Thorne SAM 51674* (SAM).

—3323 (Willowmore): Uniondale Div., Hoopsberg, summit, 1530 m, (–CD), 06-11-1941, *Esterhuysen 6554* (BOL); Donkerhoek Nek, Prince Alfred's Pass, ± 500 m, (–CD), 27-09-1978, *Hugo 1330* (NBG); Niekerksberg Forest Reserve, 1000 m, (–CD), 16-07-1974, *Bayliss 6430* (NBG); *ibid*., 29-10-1975 *Bayliss 7169* (NBG); Kouga Mtns, Saptoukop, ridge up from Withoogte, 1340 m, (–DA), 16-12-1991, *Oliver 9941* (NBG); Kouga Mtns, 1000 m, (–DA/DB), 14-11-1944, *Esterhuysen 10824* (BOL).

—3421 (Riversdale): Near Albertinia (precise locality not known), 30 m, August 1913, *Muir 1431* (SAM).

Grid ref. unknown: Eastern Cape, Baviaanskloof, 330 m, 18-11-1977, *Bayliss 8149* (Z), Drège 7370 (NY [cap. on *Ecklon 78*], P); *Zeyher 3757* (K, SAM); *Ecklon & Zeyher 3757* (Z).

EASTERN CAPE.—3323 (Willowmore): Kouga Mtns near Smutsberg, 1330–1665 m, (–DB), 12-11-1944, *Esterhuysen 10778* (BOL, NBG); Kromrivier, N side of Tsitsikamma, 805 m, (–DD), 18-05-1977, *Bond 1024* (NBG); Uniondale Div., Joubertinia, (–DD), 34-11-1941, *Esterhuysen 6877* (BOL); Wagenbooms River, headwaters, 630 m, (–DD), Sept. 1922, *Fourcade 2334* (BOL, K, NBG).
—3324 (Steytlerville): Great Winterhoek Mtns, Mac Peak, lower S slopes, 1000 m, (–DA), 22-09-1953, *Taylor 917* (BOL, NBG); Baviaanskloof Mtns above Coutie Kraal NW of Cambria, 1165 m, (–DA), 12-09-1973 *Thompson 1911* (NBG); Great Winterhoek Mtns, Cockscomb, 17-09-1950, (–DB), *Archibald 3464* (BOL); Otterford Forest Reserve, Elandsrivierberg area, 865 m, (–DB), 09-09-1973, *Thompson 1842* (NBG).
—3325 (Port Elizabeth): Longmore Forest reserve, Loerie, (–CC), 11-07-1968, *Dahlstrand 707* (GRA); Humansdorp Div., Blueberg, Loerie Plantation, (–CC), 22-09-1934, *Dix 44* (BOL); Uitenhage, Van Stadensberg, 1–100 m, (–CC), Jul., *Ecklon 78* (GRA, NY, S), *Ecklon s.n.* (S), *Ecklon & Zeyher 4.7* (NY, PRE, Z); Van Stadensberg, summit, 330 m, (–CC), Jan./Dec., *MacOwan 1051* (NY, Z); Van Stadens, Port Elizabeth, (-CC/CD), 31-5-1932, *Long 596* (K); *ibid.*, Nov. 1909, *Patterson 885* (GRA, K); Uitenhage Dist., Van Stadensberg, 330 m, (–CD), January 1867, *Bolus 1556* (BOL, NY); Uitenhage, Witteklip, (–CD), 1899, *Bolus 9130* (BOL); Van Stadensberg Trig. Beacon, Lady's Slipper on Wild Flower Reserve, Witteklip Mtn, 607 m, (–CD), 7-08-1994, *Dold 1038* (GRA). Doubtful locality: Annes Villa, near Kommadagga, 400 m, (3325BB), 02-03-1976, *Bayliss 7513* (NBG).

25. **Lachnaea glomerata** *Fourc.* in Transactions of the Royal Society of South Africa 21: 101–102 (1934). Type: Div. Humansdorp: Klein Hoek, 1000 ft., Sept. 1909, *Fourcade 445* (BOL 46910, holo.!; BOL 46906!, iso.).

Erect, moderately branched shrub up to 0,45 m tall, multi-stemmed at base; resprouter. *Branches* erect, slender, ridged below leaf bases, sparsely adpressed hairy or glabrous, leafy, becoming naked with prominent leaf scars. *Leaves* decussate, ascending to patent, scattered with internodes half to two-thirds as long as leaves, sessile, epistomatic, linear-elliptic to elliptic or obovate, 4.0–10.5 × 1.0–2.0 mm, coriaceous, glabrous, adaxially concave, smooth, dull, ± white-punctulate, abaxially convex, smooth or subkeeled, glossy, apex mucronate or acuminate, base cuneate; distal 2 or 3 or occasionally 4 or 5 leaf pairs immediately below inflorescence bract-like, elliptic, ovate, obovate or suborbicular, 1.3–3.0 × 1.3–2.4 mm, coriaceous, adaxially concave, abaxially convex, keeled to subkeeled, mucronate, margin ciliate. *Inflorescence* a terminal, sessile, ebracteate, 6–8-flowered umbel, 5.0–10.0 mm in diameter, on main and also on short lateral flowering branches below main inflorescence thus appearing racemose-like. *Flowers* subactinomorphic, cream or pale pink, sweetly skunk-scented. *Pedicel* 0.3–0.5 mm long, adpressed hirsute. *Hypanthium* 1.5–1.9 mm long, circumscissile ± midway, upper portion funnel-shaped, tomentose outside, adpressed hirsute within, basal portion ellipsoid, tomentose outside, glabrous within. *Sepals* patent, subequal, elliptic to widely elliptic, 1.4–3.0 × 1.0–2.0 mm, apex rounded or obtuse, adaxially sparsely tomentose to glabrescent, abaxially tomentose. *Stamens* exserted, outer, antisepalous whorl inserted at rim of hypanthium, inner, antipetalous whorl inserted at mouth of hypanthium; filaments filiform, 0.4–1.0 mm long; anthers ellipsoid to suborbicular, 0.2–0.4 mm long, abaxially without broad connective tissue. *Scales* exserted, inserted at mouth of hypanthium immediately below antipetalous stamens, clavate, 0.3–0.5 mm long, glabrous, yellow in fresh state. *Ovary* ellipsoid, 0.8–0.9 mm long, glabrous. *Style* linear-obconical, 1.3–1.9 mm long, with straight, adpressed or incurled hairs in upper half. *Stigma* capitate, elongate-papillate (Figure 7.49).

Distribution and ecology

Lachnaea glomerata has been recorded from the mountains in the Little Karoo, Antoniesberg in the Willowmore District and Kleinhoek in the Humansdorp District growing in stony soil on Table Mountain Sandstone at altitudes between 330 and 1130 m (Figure 7.50). Flowering has been recorded from August to October.

Conservation status: Lower Risk Least Concern (LRlc).

Diagnostic characters

Lachnaea glomerata is distinguished from *L. burchellii* by being a resprouter, and in having the outside of the hypanthium and sepals tomentose, acicular trichomes on the outside of the upper and lower portion of the hypanthium and a capitate, elongate-papillate stigma.

Specimens examined

WESTERN CAPE.—3321 (Ladismith): Rooiberg, S slopes, along jeep track to Mount Ararat, 865–1130 m, (–CB), 07-08-1990, *Beyers 192* (BOL, K, MO, NBG, NY, PRE, WU, Z); W of Rooiberg Pass, on ridge of Rooiberg, 1100 m, (–DA), 01-10-1958, *Wurts 1638* (NBG).
—3322 (Oudtshoorn): Kammanassie Mtns, Kleinberg Forest Reserve, Kleinplaas R. valley, (–DA), 1130 m, 11-08-1983, *Matthews 1209* (NBG).

—3323 (Willowmore): Antoniesberg, (–AD), 19-10-1955, *Esterhuysen 24977* (BOL); lower S slopes of Antoniesberg, on farm Misgund, (–AD), 1300 m, 24-09-1990, *Vlok 2378* (K, NBG, PRE).

EASTERN CAPE.—3323 (Willowmore): Baviaanskloof Mtns, W-end of range. above farm Verlorenrivier, 1350 m, (–BD), 2-05-1995, *Euston-Brown s.n* (NBG); *ibid.*, above farm Vaalkrans, 1400 m, 26-05-1995, *Euston-Brown 551* (K, NBG, PRE).

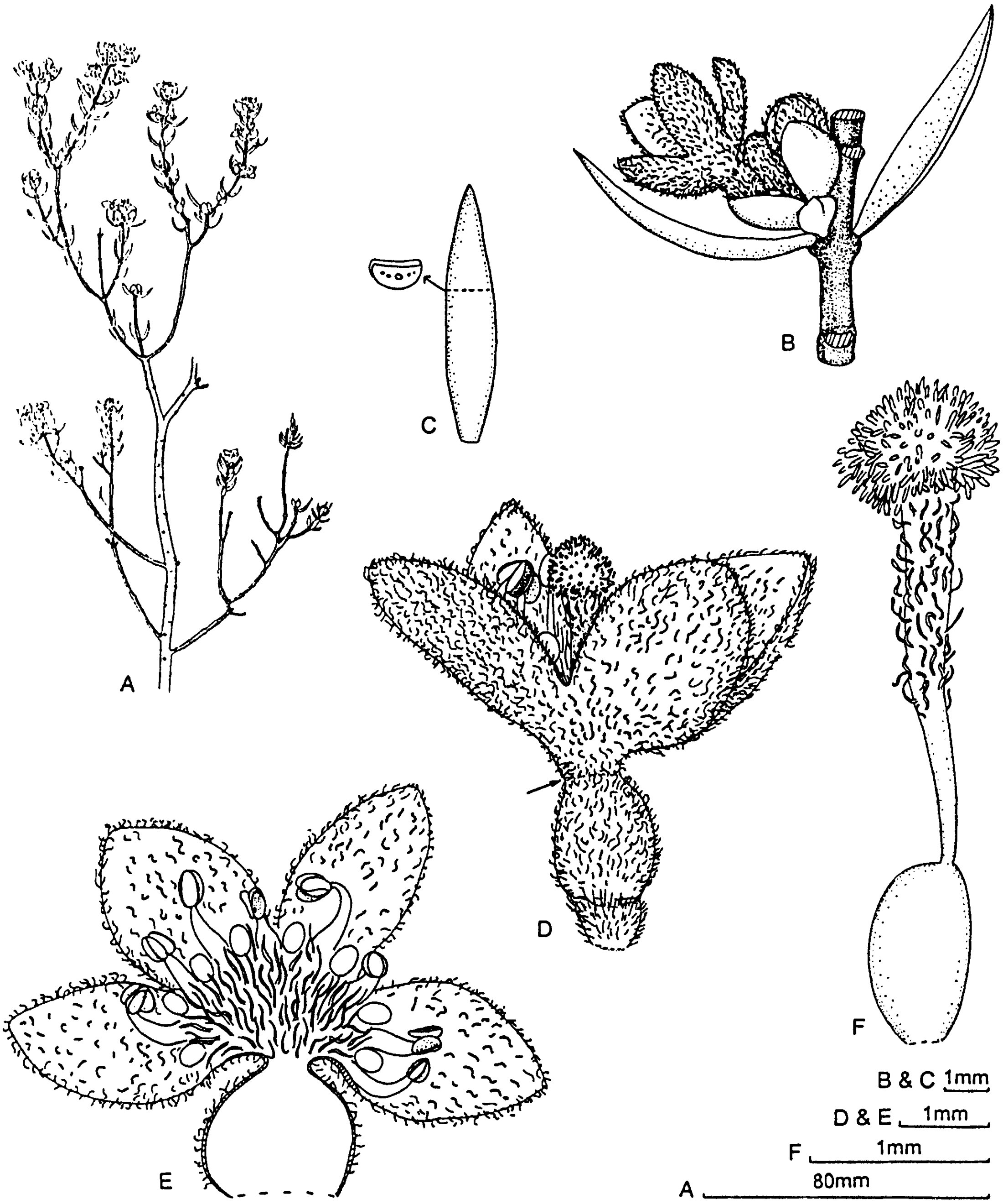

FIGURE 7.49—*Lachnaea glomerata*, *Beyers 192* (NBG). A, portion of plant; B, frowering branch; C, leaf (abaxial view and cross section); D, flower, note circumscission zone (arrowed); E, flower split longitudinally with gynoecium removed; F, gynoecium.

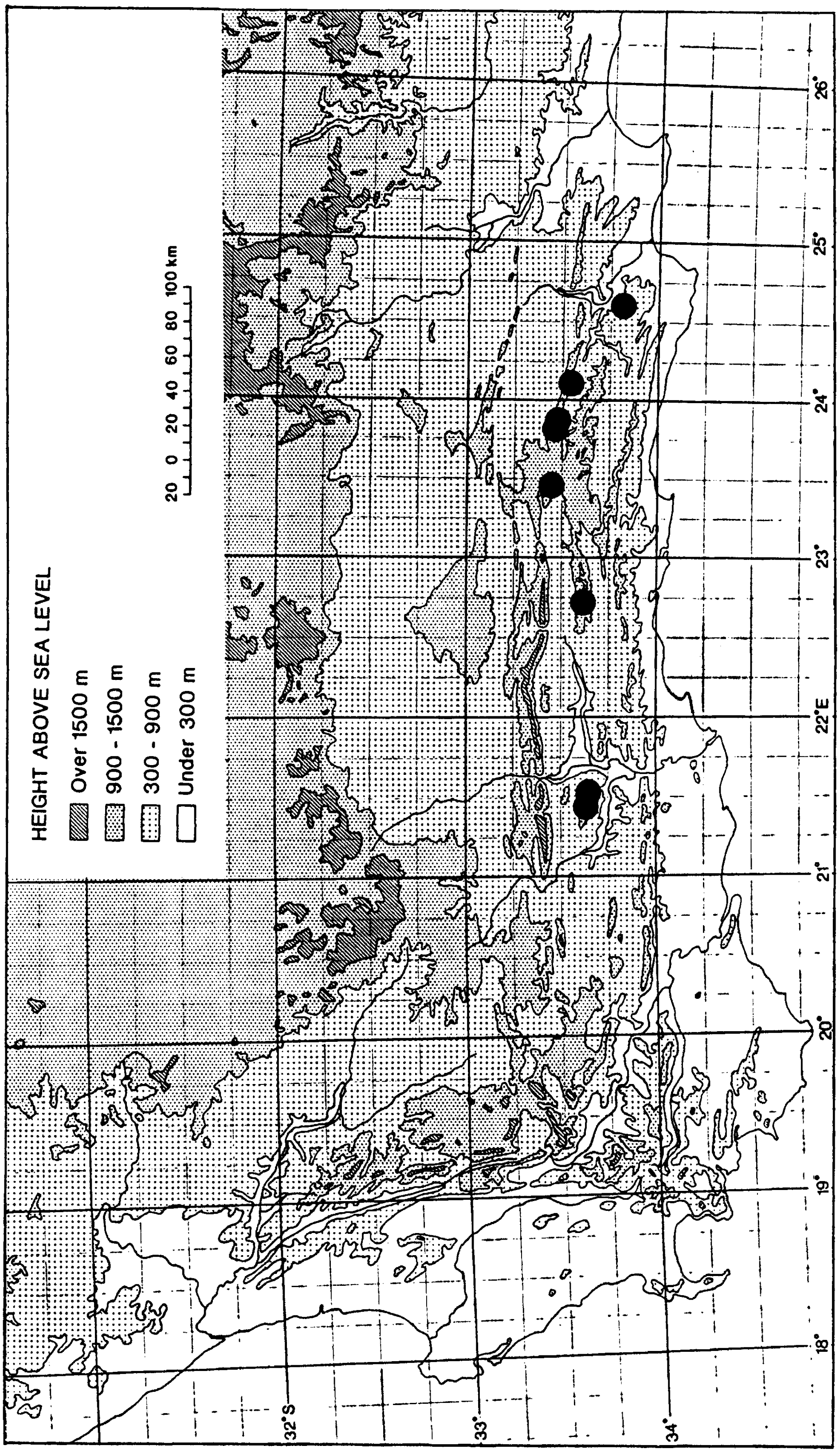

FIGURE 7.50—Known distribution of *Lachnaea glomerata*.

—3324 (Steytlerville): Baviaanskloof Mtns, Bosrug Track, N slopes, 1185 m, (–CA), 21-08-1993, *Euston-Brown 116* (NBG); *ibid.*, Bosrug, S slopes, 1215 m, 21-06-1993, *Euston-Brown 117* (BOL, NBG); *ibid.*, Bosrug, on top, 1200 m, 6-05-1995, *Euston-Brown 476* (GRA, NBG), *Euston-Brown 477* (GRA, NBG), *Euston-Brown 478* (GRA, NBG); *ibid.*, S of Bosrug Track, 1430 m, 7-06-1995, *Euston-Brown 485* (GRA, NBG); Humansdorp Div., Kleinhoek, 330 m, (–DC), Sept. 1909, *Fourcade 445* (BOL).

26. **Lachnaea laniflora** *(C. H.Wright) Bond*, Journal of South African Botany 48, 4: 527 (1982). *Passerina laniflora* C.H.Wright in Flora capensis 5,2: 11 (1915). Type: Clanwilliam Div., Cederberg Range, Sneeukop, 4500 ft., *Bodkin in Herb. Bolus 9086* (BOL, holo.!; NBG!, iso.).

Rounded, compact, much branched shrub up to 1 m tall and up to 2 m in diameter, single-stemmed at base, branching close to the ground; reseeder. *Branches* ascending to patent, subrigid to flexuose, terete, at first tomentose, later glabrescent, leafy, becoming naked with prominent leaf scars. *Leaves* decussate, usually strictly four-ranked, ascending, slightly incurved, imbricate, internodes one-fifth to half length of leaves, sessile, epistomatic, coriaceous, narrowly ovate to narrowly elliptic, 2.5–7.0 × 0.9–1.3 mm, glabrous, adaxially obtusely concave or concave, enervate, white-punctulate, dull, abaxially convex, keeled, usually more so towards apex, glossy, apex rounded or occasionally mucronulate, base rounded or obtuse; two distal leaf pairs subtending inflorescence bract-like, elliptic to widely elliptic or obovate, 2.9–5.1 × 2.1–3.0 mm, coriaceous, glabrous, green or green tinged reddish-brown, adaxially concave, abaxially convex, keeled towards apex, margin glabrous or occasionally ciliolate, apex subacute, base cuneate or rounded. *Inflorescence* a terminal, sessile, pseudobracteate, ± 15-flowered, capitate-like umbel with up to 14 open flowers at a time, 5–15 mm in diameter, on main flowering branches; umbel appears to be enclosed at base by 2 pairs of involucral bracts but vegetative shoots were observed to develop in axils of bract-like leaves. *Flowers* ± actinomorphic, pink, white, white tinged violet-blue, white turning pink with age or occasionally dark red to reddish brown, pedicellate. *Pedicel* 0.2–0.7 mm long, not noticeably elongating in fruit, sericeous. *Hypanthium* 2.3–4.0 mm long, circumscissile ± third to midway from base, circumscission zone not clearly defined, upper portion funnelshaped, sericeous or sericeous-tomentose outside, sericeous within, basal portion ellipsoid, outside puberulent to sericeous in upper half, rest glabrous, within glabrous. *Sepals* patent, ± equal, elliptic to widely elliptc, 1.6–4.2 × 1.0–2.3 mm, adaxially sericeous to sparsely adpressed hairy, occasionally glabrous, abaxially sericeous, apex rounded. *Stamens* exserted, outer, antisepalous whorl inserted at base of sepals, inner, antipetalous whorl inserted at rim of hypanthium, shorter than outer whorl; filaments filiform, outer 0.9–1.7 mm long, inner 0.6–1.3 mm long; anthers widely ellipsoid to spheroid, 0.2–0.5 mm long, abaxially without broad connective tissue. *Scales* exserted, inserted at mouth of hypanthium immediately below antipetalous stamens, narrowly ellipsoid or narrowly obovoid, 0.4–1.0 mm long, glabrous, yellow or white in fresh state. *Ovary* ellipsoid, 0.7–1.0 mm long, glabrous. *Style* linear-obconical, 2.1–3.4 mm long, sericeous in upper half. *Stigma* brush-like (Figure 7.51).

Distribution and ecology

Lachnaea laniflora is known from Pilaarsberg in the northern Cederberg southwards along the Skurweberge and the Groot Winterhoek Mountains to Brandwag Peak northwest of Worcester and eastwards to the western end of the Langeberg near Montagu, usually growing amongst rocks or in rock crevices, at altitudes between 1000 and 2200 m (Figure 7.52). Flowering has been recorded from July to March.

Conservation status: Lower Risk Least Concern (LRlc).

Diagnostic characters and relationships

Lachnaea laniflora is easily distinguished by the imbricate, usually four-ranked leaves which are slightly incurved and keeled abaxially, the pseudobracteate capitulum-like umbels with ± actinomorphic flowers and terete pedicels which hardly elongate in the fruiting stage. Its taxonomic affinities are unclear.

Specimens examined

WESTERN CAPE.—3218 (Clanwilliam): Clanwilliam Dist., Pilaarsberg N of Pakhuis Pass, 1000 m, (–BB), Sept, 1967, *Kerfoot 5913* (NBG).
—3219 (Wuppertal): Cederberg Mtns [precise locality not known], Nov. 1939, *Stokoe 8029* (BOL); Cederberg Mtns, Krakadouwsberg, in rock crevices, 2000 m, (–AA), 22-09-2942, *Esterhuysen 8053* (BOL); Krakadouws Peak, in rock crevices,1830 m, (–AA), 20-10-1945, *Esterhuysen 12104* (BOL); North Cederberg, Peak at Koupoort, in rock crevices, 1665 m, (–AA), 23-10-1945, *Esterhuysen 12177* (BOL);

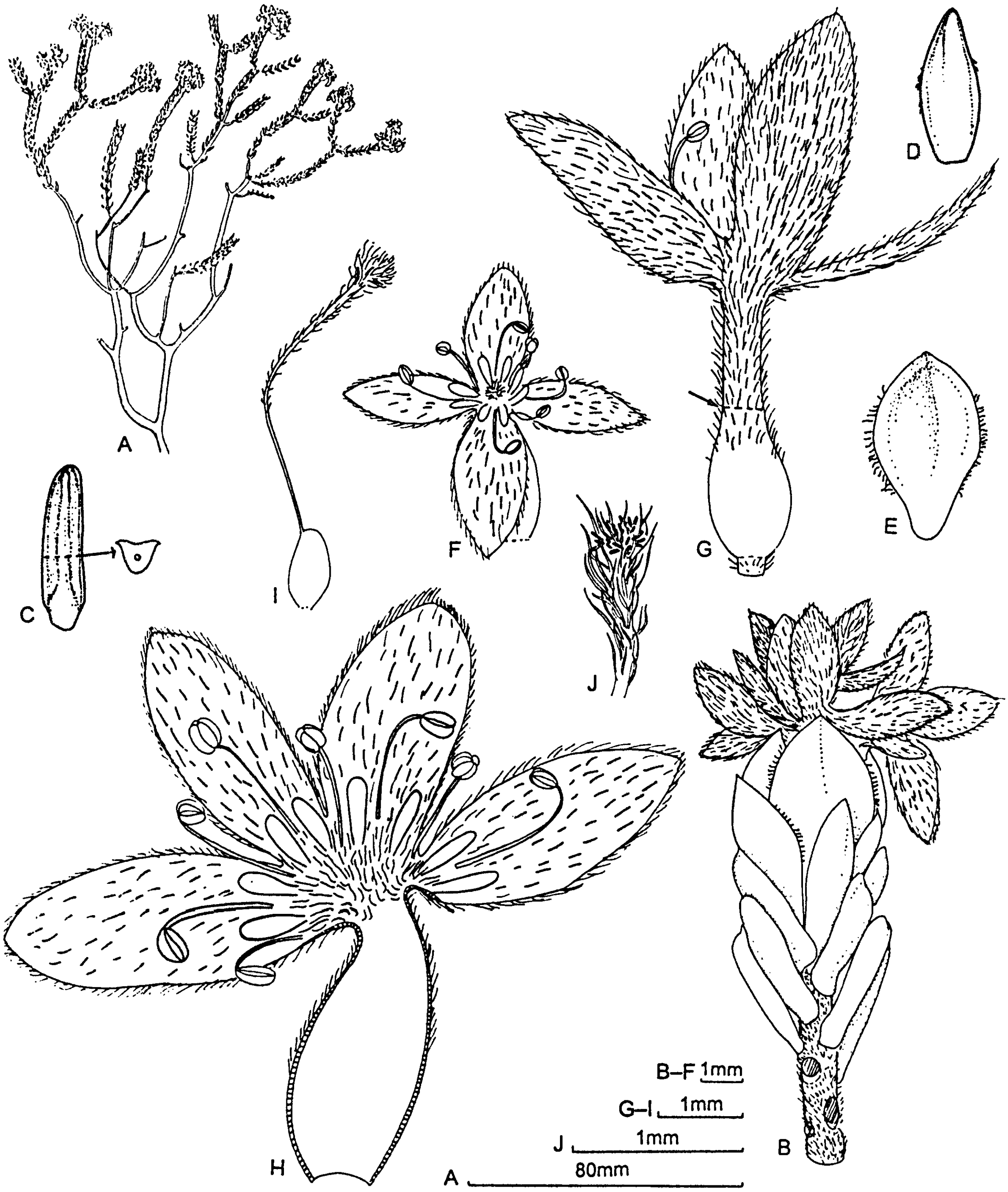

FIGURE 7.51—*Lachnaea laniflora, Oliver 10679* (NBG). A, portion of plant; B, flowering branch; C, leaf (abaxial view and cross section); D & E, bract-like leaves subtending inflorescence: D, from subdistal pair; E, from distal pair; F & G, flowers: F, view from above; G, side view, note circumscission zone (arrowed); H, flower split longitudinally with gynoecium removed; I, gynoecium; J, stigma and upper portion of style (enlarged).

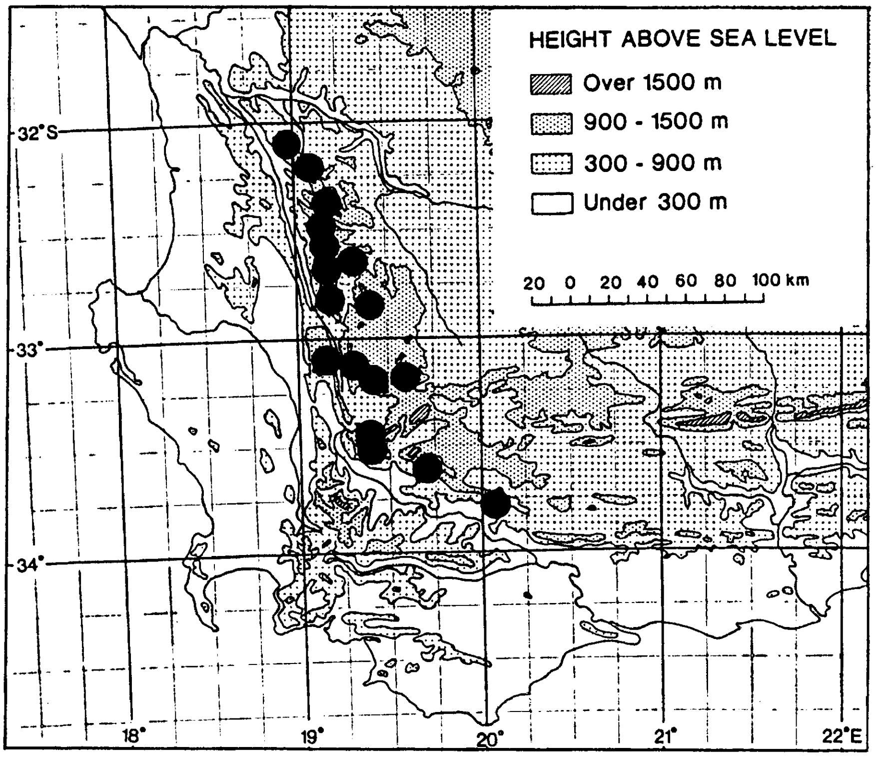

FIGURE 7.52—Known distribution of *Lachnaea laniflora*.

Cederberg, Sneeukop, ± 1300 m, (–AC), 04-10-1897, *Bodkin BOL 9086* (BOL, NBG); Cederberg, Sneeuberg, summit 1665 m (–CA), 22-07-1972, *Andrag 106* (NBG); *ibid.*, slopes, 22-07-1972, *Andrag 108* (NBG); *ibid.*, 1420 m, 05-09-1985, *Brown 500* (NBG); *ibid.*, mountain slopes, 1730 m, 18-10-1923, *Pocock 395* (NBG); *ibid.*, hut area, koppie SE of hut, steep NE slope, ± 1500 m, 24-09-1983, *Taylor 10686* (NBG); *ibid.*, rocky (TMS) summit ridge, 2000–2200 m, 01-09-1963, *Taylor 5089* (NBG); *ibid.*, summit, 2000–2200m, 04-12-1964, *Taylor 6146* (NBG); *ibid.*, E aspect, steep slope, 19-11-1996, *Van Rooyen, Steyn & De Villiers 227* (NBG); *ibid.*, summit, 2020 m, 01-03-1983, *Viviers 1052* (NBG); Cederberg, Langberg, 2065 m, (–AC), 15-12-1941, *Compton 12745* (NBG); *ibid.*, rock crevices, 2000 m, 15-12-1941, *Esterhuysen 7324* (BOL); *ibid.*, ridge running SE, 1700 m, (AC), 7-12-1995, *Oliver 10679* (BOL, K, MO, NBG, PRE); *ibid.*, *Oliver 10679a* (NBG, PRE); Clanwilliam Dist., Elandskloof, S slope, crevices in cliffs, ± 1500 m, (–CA), 03-10-1940, *Esterhuysen 3304* (BOL, NBG); Cederberg, Middelberg, mountain slopes, 1330 m (–CA), 15-10-1923, *Pocock 270* (NBG); Cederberg, Donkerkloofkop, (–CA), Jan. 1945, *Stokoe SAM 58583* (SAM); South Cederberg, Apex-Breekrock of Breekkrans-Hondverbrand area, ± 1580 m, (–CA), 17-12-1983, *Taylor 10843* (NBG); Cederberg Forest Reserve, top of Heksberg, between rocks in deep sand, (–CA), 03-12-1983, *Viviers 1220* (NBG); Gideonskop, Rietkloof, SE aspect, ± 1600 m,(–CB), 27-11-1979, *Forsyth 51* (NBG); Gideonskop, 1600 m, (–CB), 31-10-1987, *Oliver 9045* (NBG); *ibid.*, 03-11-1986, *Winter s.n. NBG 140939* (NBG); NW border of Ceres Div., near Gideonskop, (–CB), *Stokoe SAM 54497* (SAM); Ceres, Cold Bokkeveld Mts, Skoongesig, (–CC), 9-09-1966, Hanekom 667 (NBG); Skurweberg, N of Bokkeveld Tafelberg, rock crevices, 2000 m, (–CD), 11-10-1952, *Esterhuysen 20642* (BOL).

—3319 (Worcester): Groot Winterhoek Mtns, Sneeugat Peak, rocky summit, 2000 m, (–AA), 30-12-1951, *Esterhuysen 19752* (BOL); Groot Winterhoek, on cliffs, S aspect, 1665 m, (–AA), 12-12-1965, *Esterhuysen 31443* (BOL); *ibid*., ± 2000 m, (–AA), 27-11-1916, *Phillips 1668* (SAM); *ibid*., *Phillips s.n.* (NBG); Groot Winterhoek Peak, rocky ridge leading NW, rock crevices facing E, ±1900 m, (–AA), 16-11-1977, *Taylor 9737* (NBG); Ceres Dist., Hansiesberg, 2000 m, (–AB), 17-12-1944, *Compton 16706* (NBG, S); *ibid*., 2000 m (–AB), Dec. 1944, *Lewis 1567* (SAM); Cold Bokkeveld, Gydoberg, 2000 m, (–AB), 19-01-1897, *Schlechter 10220* (BOL, GRA); Schurfdeberg near Ceres, on slopes [precise locality not known], 1600 m, (–AB/AD), Dec. 1891, *Bolus HNAA 1355* (BOL, SAM); Hex River Mtns, Buffelshoek Twins, rock crevices, 2000 m, (–AD), 25-12-1942, *Esterhuysen 8393* (BOL); Worcester Div., Hex River Mtns, Mount Brodie, 2000 m, (–AD/BC), 25-12-1942, *Esterhuysen 8543* (BOL); Ceres Dist., Baviaansberg, amongst rocks or in rock crevices, 1830–2100 m, (–BA), 04-11-1962, *Esterhuysen 29824* (BOL, S); *ibid*., in cracks on rocky summit, 1800 m, 05-11-1989, *Forsyth 507* (NBG); *ibid*., 1930 m, Oct. 1937, *Stokoe 5010* (BOL); Worcester Dist., Brandwacht Peak, S side of summit, at base of rock, 1965 m, (–CB), 08-11-1959, *Esterhuysen 28358* (BOL); Naudesberg, Worcester side, (–DA), Aug. 1932, *Thorne SAM 50384* (SAM).
—3320 (Montagu): Robertson Div., Langeberg, near Montagu Ridge, (–CA/CC), 27-10-1954, *Esterhuysen 23813* (BOL).

27. **Lachnaea elsieae** *Beyers*, sp. nov. *L. penicillatae* structura florae affinis, sed differt umbello pseudobracteato floribus apertis usque ad quarternis simul, stylo glabro.

TYPE.—Western Cape, 3219 (Wuppertal): Cold Bokkeveld, Tafelberg at Boplaas, S–SE of Tafelberg, slopes, 1350 m, (–CD), 4-04-1998, *Hanekom 3013* (NBG, holo.!; BOL!, K!, MO!, NY!, P!, PRE!, S!, Z!, iso.).

Compact, rounded or diffuse spreading, much branched, shrub to 0.6 m tall, single-stemmed at base branching near the ground, or multistemmed at base; reseeder or resprouter. *Branches* ascending to patent, slender, terete, felted, tomentose or villous-tomentose, leafy, later glabrescent and naked without prominent leaf scars. *Leaves* decussate, adpressed or subadpressed, scattered, internodes half to as long as leaves, those below inflorescence crowded, sessile, epistomatic, narrowly ovate to ovate or narrowly elliptic to elliptic, 1.0–4.5 × 0.4–1.1 mm, coriaceous, adaxially concave, enervate, dull, abaxially convex, subkeeled or keeled, glossy, glabrous, margin of distal leaves below inflorescence sparsely villous-ciliate, apex rounded, villous-tufted, base rounded; distal two leaf pairs subverticillate, bract-like, partially enclosing inflorescence, coriaceous, green or occasionally tinged maroon, glabrous, adaxially concave, abaxially convex, subkeeled or keeled in upper half; distal pair elliptic or obovate to widely obovate, 1.6–3.3

× 0.9–2.0 mm, margin membranous or brown scarious, ciliate, apex subacute to obtuse or emarginate; subdistal pair narrowly elliptic to elliptic, ovate or obovate, 1.8–4.0 × 0.9–1.5, margin membranous or brown scarious, villous-ciliate, apex acute to rounded. *Inflorescence* a terminal, sessile, 3–13-flowered, pseudobracteate umbel with 1–4 open flowers at a time, up to 2 mm in diameter, on main flowering branches or also on short lateral flowering branches just below main inflorescence or for some distance down the main flowering branch, thus either forming a cluster of inflorescences at apex of main flowering branches or appearing racemose-like on main flowering branches. *Flowers* subactinomorphic, cream, pale pink or cream turning pink or pale, dull red with age, pedicellate. *Pedicel* 0.3–1.4 mm long, covered with long silky, ascending hairs becoming villous with age, elongating in fruiting stage. *Hypanthium* 1.2–2.3 mm long, circumscissile ± midway, upper portion shortly funnel-shaped, sericeous outside, adpressed hirsute within, basal portion ellipsoid or oblong, outside puberulent in upper half to upper third, glabrous below, within glabrous. *Sepals* erect-patent to patent, subequal, ovate to widely ovate or elliptic to widely ovate, 1.0–1.9 × 0.5–1.4 mm, apex subacute or rounded, adaxially glabrous or sparsely adpressed hairy in upper half, abaxially sericeous. *Stamens* exserted, outer, antisepalous whorl inserted at base of sepals, inner, antipetalous whorl inserted at rim of hypanthium; filaments filiform, outer 0.4–1.0 mm long, inner 0.3–0.8 mm long; anthers ellipsoid to spheroid, 0.2–0.4 mm long, abaxially without broad connective tissue. *Scales* exserted, inserted in mouth of hypanthium immediately below antipetalous stamens, obovoid, 0.2–0.6 mm long, glabrous, translucent white or pale yellow in fresh state. *Ovary* narrowly ellipsoid to obovoid, 0.6–1.1 mm long, glabrous. *Style* linear-obconical, 1.1–2.2 mm long, glabrous. *Stigma* capitate, elongate-papillate (Figure 7.53).

Distribution and ecology

Lachnaea elsieae ranges from Sneeukop in the Cederberg southwards to the Northeast Cold Bokkeveld and eastwards along the mountains of the Little Karoo as far east as Seweweekspoort in the Ladismith District. It seems to occur on shale bands and adjacent sandstone-derived soil at altitudes between 1250 and 2300 m (Figure 7.54).

Heavily grazed individuals have a dense, compact and rounded habit, appearing quite different from the ungrazed ones which have a loose, slender, almost decumbent habit. Flowering has been recorded throughout the year.

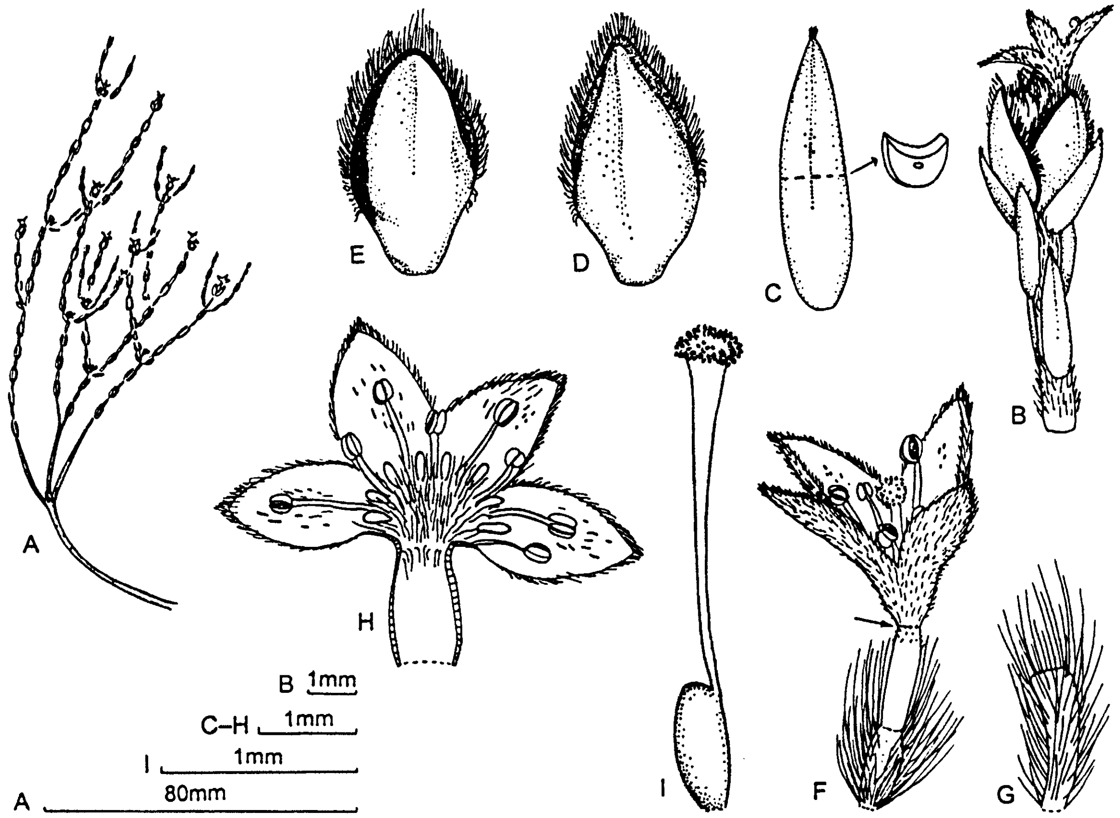

FIGURE 7.53—*Lachnaea elsieae*. A, portion of plant; B, flowering branch; C, leaf (cross section); D & E, bract-like leaves subtending inflorescence: D, from subdistal pair; E, from distal pair; F, flower, note circumscission zone (arrowed); G, elongated pedicel in fruiting stage; H, flower split longitudinally with gynoecium removed; I, gynoecium. A, *Boucher 5077* (NBG); B–I, *Hanekom 3013* (NBG).

Conservation status: Lower Risk Least Concern (LRlc).

Diagnostic characters and relationships

Lachnaea elsieae superficially resembles *L. penicillata*, a distantly relatated species, but differs in having a pseudobracteate umbel, with up to four open flowers at a time, and a glabrous style.

Eponymy

This species is dedicated to Ms Elsie Esterhuysen, one of southern Africa's most eminent plant collectors of the 20th Century. Her collections of especially the montane species of *Lachnaea* have been invaluable in the classification of the group.

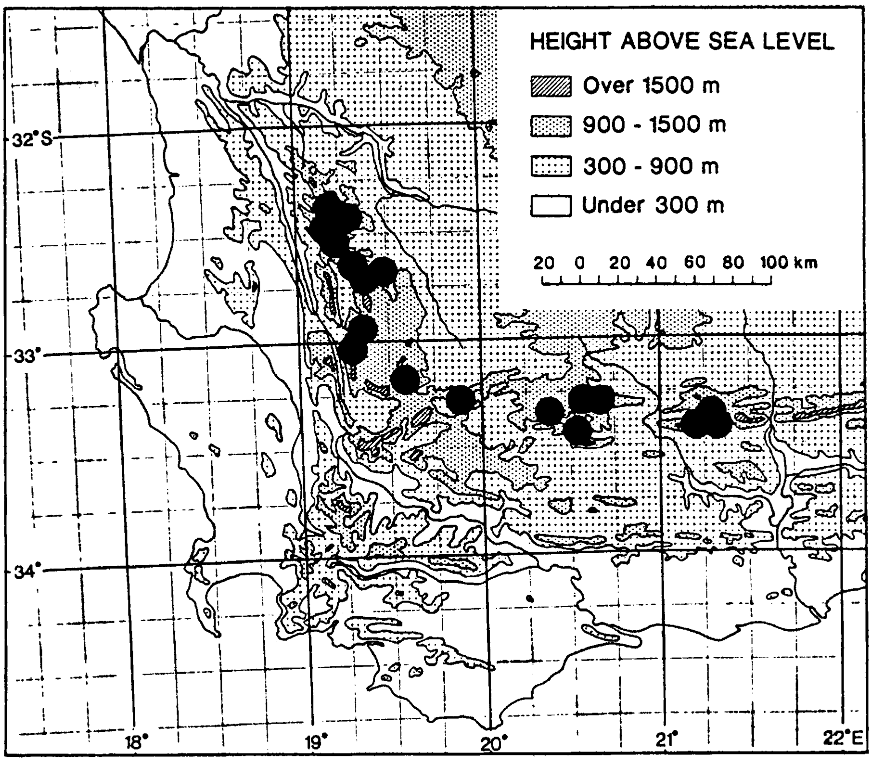

FIGURE 7.54—Known distribution of *Lachnaea elsieae*.

Specimens examined

WESTERN CAPE.—3219 (Wuppertal): Cederberg, near Bushman's Cave, (precise locality unknown), ± 1930 m, 23-09-1930, *Barnes BOL 19425* (BOL); Cederberg, shale band, (precise locality unknown), 1665 m, Sept. 1930, *Levyns 2965* (BOL); *ibid.*, Nov. 1939, *Stokoe 8032* (BOL); *ibid.*, Sept. 1942, *Stokoe SAM 58591* (SAM); Cederberg Mtns, Langberg, 1665–2000 m, (–AC), 15-12-1941, *Esterhuysen 7322* (BOL); *ibid.*, Sneeukop, shale band, 1665 m, 02-01-1942, *Esterhuysen 7541* (BOL); *ibid.*, S of Tafelberg, shale band, 1330–1665 m, 24-06-1942, *Esterhuysen 7882* (BOL); *ibid.*, Tafelberg, shale band, 1665 m, 25-09-1942, *Esterhuysen 8081* (BOL, PRE); *ibid.*, foot of Tafelberg, 1330 m, 08-10-1946, *Esterhuysen 13055* (BOL, PRE); Cederberg State Forest, Sneeukop Hut vicinity, 1700 m, (–AC), 06-09-1979, *Forsyth 35* (NBG); Cederberg State Forest, Sneeuberg, W slopes, ± 1400 m, (–AC), 02-12-1969, *Kruger 972* (NBG); *ibid.*, upper shale band around higher slope, 1830 m, 02-09-1963, *Taylor 5103* (NBG); *ibid.*, shale band, 1830 m, 16-05-1966, *Taylor 6821* (NBG, PRE); *ibid.*,1300 m, 01-03-1983, *Viviers 1051* (NBG); Cederberg, kloof W of Sneeukop, 1830 m, (–AC), 13-10-1923, *Pocock 221* (NBG); Cederberg, Sederhoutkop, deep shale soil of shale band, ± 1440 m, (–AC), 07-08-1987, *Taylor 11775* (NBG, PRE, S); Cederberg, near Wolfberg Arch, 1630 m, (–AD), 10-09-1978, *Campbell 11275* (NBG); Cederberg, Wolfberg, 1330 m, (–AD), 26-12-1953, *Esterhuysen 22454* (BOL); S Cederberg, Apollo peak, 1330 m, (–CA), 13-12-1950, *Esterhuysen 18055* (BOL); Donkerkloof Peak, (–CA), Jan. 1945, *Stokoe 9217* (BOL, PRE); Cederberg, Donkerkloofkop, 1665 m, (–CA), Jan. 1945, *Stokoe SAM 58592* (SAM); NE Cold Bokkeveld, Blinkberg summit, near Grootrivier crossing, 1500 m, (–CB), 01-11-1983, *Boucher 5077* (NBG); *ibid.*, near summit, ± 1400 m, 01-11-1983, *Taylor 10751* (NBG); Ceres Div., Blaauwkop, Cold Bokkeveld Plateau, E slopes, ± 1665 m, (–CB), 01-10-1958, *Esterhuysen 27906* (BOL); NW border of Ceres Div., Gideonskop, (–CB), Nov. 1939, *Stokoe SAM 54496* (SAM); Ceres Div., Bokkeveld Tafelberg, S slopes, (–CD), 14-08-1955, *Esterhuysen 24387* (BOL); *ibid.*, at Boplaas, S–SE of Tafelberg, slopes, 1350 m, 4-04-1998, *Hanekom 3013*. (BOL, K, MO, NBG, NY, P, PRE, S, Z); *ibid.*, lower S slopes, 17-11-1966, *Thompson 246* (NBG); Ceres Dist., Bokkeveld Sneeukop, ± 1665 m, (–CD), 31-03-1963, *Esterhuysen 30116* (BOL).

—3319 (Worcester): Cold Bokkeveld, Wagedrift, 1665 m, (–AB), 21-01-1897, *Schlechter 10072* (BOL, K, NBG, S, Z); Ceres Div., Baviaansberg, (–BA), Jan. 1937, *Stokoe 4504* (BOL); Worcester Dist., Bonteberg, 1330 m, (–BD), 03-11-1940, *Compton 10173* (NBG, NBG); *ibid.*, Eikenbosch Hoek, summit of ridge, 1330 m, 03-11-1940, *Esterhuysen 3705* (BOL, PRE).

—3320 (Montagu): SE Touwsrivier, Koegaberge, S of Witteberge, Pramkop, 1250m, (–AD), 25-10-1998, *Helme 1611* (NBG); Laingsburg, Witteberg, 1665 m, (–BC), 31-10-1924, *Compton 2692* (BOL); *ibid*,, 1500 m, 11-05-1941, *Compton 10810* (NBG); *ibid.*, 1000–1330 m, 11-05-1941, *Esterhuysen 5143* (BOL, PRE); *ibid.*, near summit of ridge, S side, 1630-1665 m, 31-01-1961, *Esterhuysen 28866* (BOL); Witteberg, Matjiesfontein, 1500 m, (–BC), 14-10-1928, *Compton 3334* (NBG); Laingsburg, Witteberg (Bantams), 1665 m, (–BC), 27-10-1941, *Compton 12217* (BOL, NBG, S); Laingsburg, Witteberg (Whitehill), 1665 m, (–BC), 10-10-1944, *Compton 16295* (NBG); Anysberg Nature Reserve, on Skerpkrans mountain, NW of farm Vrede, 1265 m, (–BC), 24-07-1990, *Vlok 2343* (NBG).

—3321 (Ladismith): Ladismith Div., Swartberg, Towerkop, rocky slopes of shale band, S aspect , (–AC), 15-12-1956, *Esterhuysen 26771* (BOL); Klein Swartberg, Toorkop, S summit slopes, 2300 m, (–AC), 16-12-1991, *Forsyth 532* (NBG); Prince Albert Dist., Klein Swartberg W of Ridge Peak, 2100 m, (–AC/AD), 27-12-1928, *Andreae 1240* (PRE); *ibid.*, 2330 m, 27-12-1928, *Stokoe 1850* (NBG); Ladismith Div., Seweweekspoortberg, 1665–2330 m, (–AD), 00-12-1928, *Barnard SAM 46302* (SAM); Klein Swartberg, Radio Tower track E of Seweweekspoort, ± 1930 m, (–AD), 14-10-1980, *Bond 1780* (NBG); Seweweekspoortberg Plateau, 1830 m, (–AD), 13-10-1955, *Esterhuysen 24822* (BOL); Elandskloof between Vleiland and Seweweekspoort, 1460 m, (–AD), 21-02-1986, *Moffett & Steensma* 3863 (NBG, PRE); Ladismith Dist., Klein Swartberg at Besemfontein, mountains E of Seweweekspoort, 1890 m, (–AD), 22-09-1990, *Oliver 9689* (BOL, K, NBG, NY, P, PRE); top of Klein Swartberg Mtns, at end of Besemfontein track, 2166 m, (–AD), 03-02-1986, *Vlok 1402* (NBG).

28. **Lachnaea villosa** *Beyers*, sp. nov. primo adspectu *L. funicaulis* similis, sed differt inflorescentia pseudobracteata (non bracteata), parte superiore hypanthii

sepalorumque extra villosa-tomentosa (non tomentosa-sericea), squamis exsertis et in ore hypanthii insertis (non inclusis).

TYPE.—Western Cape, 3319AD (Worcester): Ceres Dist., Schoonvlei, 480 m, 24-01-1989, *Beyers 125* (NBG, holo.!; BOL!, K!, MO!, NY!, P!, PRE!, iso.).

Compact or sparsely branched, erect to sprawling shrub up to 0,5 m tall, single-stemmed at base or branching at base appearing multistemmed; reseeder. *Branches* ascending to inclined, slender, terete, felted, leafy, later glabrescent and naked without prominent leaf-scars. *Leaves* decussate, adpressed, scattered, internodes two-thirds to one and a half times as long as leaves, those below inflorescence crowded, sessile, epistomatic, lanceolate or narrowly elliptic, 2.8–5.0 × 0.6–1.2 mm, coriaceous, glabrous with lanate-ciliate margin, terminal hairs simulating a mucro, later margins glabrescent, adaxially concave, smooth, dull, abaxially convex, keeled or subkeeled, glossy, apex rounded or acute, base rounded; distal two leaf pairs subverticillate, bract-like, broader and thinner than other leaves, margin brown, lanate-ciliate; distal pair obovate or widely elliptic, 2.3–3.1 × 1.6–2.2 mm, apex rounded or obtuse; subdistal pair elliptic or obovate, 2.7–3.2 × 1.1–1.4 mm, apex rounded. *Inflorescence* a terminal, sessile, 12–20-flowered, capitate-like, pseudobracteate umbel with 1–3, occasionally 5 open flowers at a time, 3–6 mm in diameter, on main and sometimes on short lateral flowering branches just below main inflorescence forming a cluster of inflorescences at apex; umbel appears to be enclosed at base by two pairs of involucral bracts but vegetative shoots were observed to develop in axils of distal bract-like leaf pair. *Flowers* ± actinomorphic, cream, sweetly scented, pedicellate. *Pedicel* 0.7–2.8 mm long, covered with ascending, crisped hairs in fresh state, villous in dry state, elongating in fruiting stage. *Hypanthium* 2–3 mm long, circumscissile third to two-thirds from base, upper portion funnel-shaped, villous-tomentose outside, villous-hirsute within, basal portion ellipsoid, outside towards circumscission zone puberulent, below glabrous, glabrous within. *Sepals* erect-patent, subequal, elliptic to widely elliptic or ovate to widely ovate, 1.2–1.7 × 0.8–1.1 mm, apex rounded or obtuse, adaxially glabrous or distal third villous-tomentose, abaxially villous-tomentose. *Stamens* exserted, outer, antisepalous whorl inserted at base of sepals usually close to rim of hypanthium, inner, antipetalous whorl inserted at rim of hypanthium; filaments filiform, outer 0.5–0.9 mm long, inner 0.4–0.6 mm long; anthers spheroid, 0.2–0.3 mm long, abaxially without broad connective tissue. *Scales* exserted, inserted at mouth of hypanthium just below antipetalous stamens, capitate, 0.2–0.4 mm long, glabrous, yellow in fresh state. *Ovary* narrowly obovoid, ovoid or ellipsoid, 0.4–1.0 mm long, glabrous. *Style* linear-obconical, 1.0–2.3 mm long, glabrous. *Stigma* capitate, papillate (Figure 7.55).

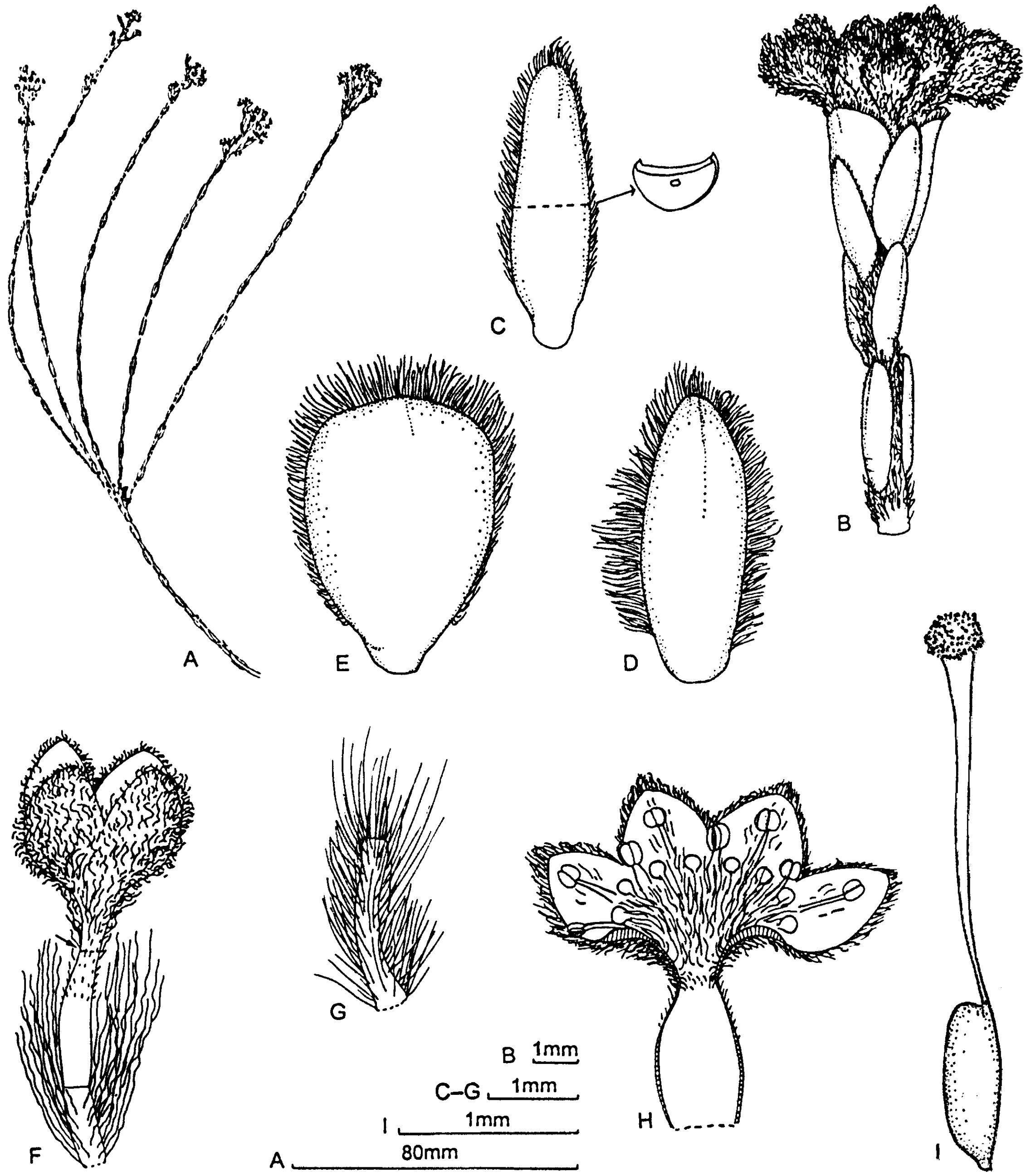

FIGURE 7.55—*Lachnaea villosa*, *Beyers 125* (NBG). A, portion of plant; B, flowering branch; C, leaf (abaxial view and cross section); D & E, bract-like leaves subtending inflorescence: D, from subdistal pair; E, from distal pair; F, flower, note circumscission zone (arrowed); G, elongated pedicel in fruiting stage; H, flower split longitudinally with gynoecium removed; I, gynoecium.

Distribution and ecology

Lachnaea villosa has been recorded from the Northern Bokkeveld in the Citrusdal District southwards to Schoonvlei north of Ceres in sandy or stony soil on the lower slopes and flats at altitudes between 480 and 1500 m (Figure 7.56). Flowering has been recorded throughout the year.

Conservation status: Lower Risk Least Concern (LRlc).

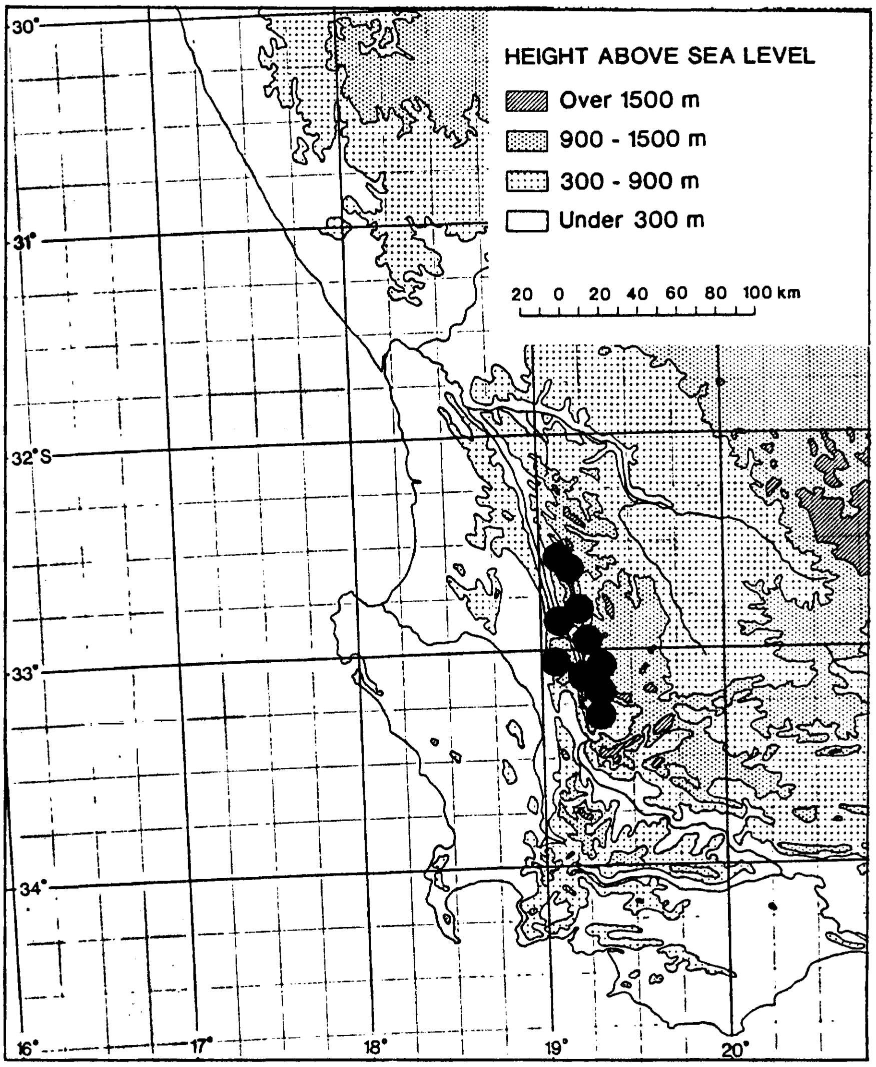

FIGURE 7.56—Known distribution of *Lachnaea villosa*.

Diagnostic characters and relationships

Lachnaea villosa superficially resembles *L. funicaulis* but differs in its inflorescence and floral structure. In *L. villosa* the inflorescence is pseudobracteate [bracteate], the upper portion of the hypanthium and sepals are villous-tomentose [tomentose-sericeous on the outside] and the scales are exserted [enclosed], inserted in the mouth of the hypanthium, [inserted midway to four-fifths way down the upper portion of the hypanthium]. It is allied to *L. elsieae* but can be distinguished from it by being a reseeder, having lanate-ciliate leaves, the upper portion of the hypanthium and sepals being villous-tomentose and the capitate scales.

Etymology

The specific epithet, *villosa*, refers to the long, soft crooked trichomes in the indumentum on the sepals.

Specimens examined

WESTERN CAPE.—3219 (Wuppertal): Ceres Dist., Elandskloof, (–CA), 25-03-1951, *Barker 7282* (NBG); *ibid.*, 700 m, 02-09-1956, *Dahlgren & Peterson 270* (K, NBG); *ibid.*, 26-09-1936, *Lewis BOL 22023* (BOL); Citrusdal, Middelberg, 1100 m, (–CA), 3-11-1997, *Hanekom 2952* (BOL, K, MO, NBG, PRE); *ibid.*, SSE of Witberg (Beacon 92), 820 m, 13-10-1994, *Oliver 10581* (NBG); *ibid.*, between Grootberg and Witberg, SE slopes, 1000 m, 18-08-1998, *Oliver 11109* (NBG); Citrusdal, Kleinplaas-East, approximately 3 km N from peak of Middelberg Pass along hiking trail, 1100 m, (–CA), 6-11-1997, *Hanekom 2952* (NBG, K, MO, PRE, WU); Cold Bokkeveld, New Pass to Citrusdal, 1500 m, (–CA), 04-10-1948, *Levyns 9266* (BOL); 48 km from Ceres to Citrusdal, farm Boboskloof, (–CA), 11-09-1968, *Marsh 758* (NBG); Cederberg, Citrusdal, (–CA), 14-01-1998, *Van Rooyen, Steyn & De Villiers 770* (NBG); Clanwilliam Dist., Cardouw Pass, E side, (–CC), 15-09-1953, *Barker 8120* (NBG, NBG); Porterville Mtns, Grootfontein farm, ± 440 m, (–CC), 27-10-1972, *Boucher 1973* (NBG, S); Cold Bokkeveld, Farm Appelfontein, three-quarters up mountain, (–CC), 09-10-1990, *Du Toit s.n.* (NBG); sandy mountain plateau above Monte Cristo near Porterville, 666 m, (–CC), May 1912, *Edwards 59* (BOL); Keerom, near stream in sandy rocky hills, W bank of Olifants River, (–CC), 03-12-1950, *Esterhuysen 17892* (BOL); Ceres Dist., Vredelus, Cold Bokkeveld, slopes in valley at E-base Olifants River, (–CC), 02-09-1962, *Esterhuysen 29671* (BOL); Ceres, Donkerkloof, Middeltuin, (–CC), 13-05-1970, *Hanekom 1369* (NBG); Piketberg Div., E slopes of Cardouw Pass, (–CC), 15-09-1953, *Lewis 3977* (SAM); *ibid.*, *Lewis SAM 66792* (PRE, NBG); Porterville Mtns, Berghof, near Ratelrivier, sandy slopes, 866 m, (–CC), 27-09-1972, *Oliver 3922* (NBG); E slope of Grasruggens Mtns, (–CC), 26-11-1938, *Pillans 8710* (BOL); Grasruggens, Olifantsrivier Mtns, Porterville, ± 730 m, (–CC), 14-09-1982, *Van Zyl 3092* (NBG); Ceres Dist., De Keur, (–CD), 11-11-1946, *Compton 18788* (NBG); *ibid.*, *Leighton 2284* (BOL).
—3319 (Worcester): Agter Witzenberg, Koue Bokkeveld, Rosendaal Farm, low rocky ridge near sandflats at potential dam site, ± 550 m, (–AA), 05-02-1991, *Boucher 5674* (NBG); Visgat, upper Olifants River valley, (–AA), 28-12-1946, *Esterhuysen 13419* (BOL); Twentyfour Rivers Mtns above Porterville, (–AA), 22-10-1949, *Esterhuysen 16155* (BOL); *ibid.*, 10-10-1953, *Esterhuysen 21900* (BOL); Groot Winterhoek State

Forest, between forest station and Groot Kliphuis (–AA), 14-09-1991, *Hansford 20* (NBG);Groot Winterhoek State Forest, Drieboschfontein, 680 m, (–AA), 19-01-1974, *Haynes 910* (NBG); Groot Winterhoek, along path to Die Hel, (–AA), 26-05-1979, *Low 859* (NBG, PRE); *ibid.*, 680 m, 07-04-1980, *Low 915* (NBG); Groot Winterhoek, 1500 m, (–AA), Nov. 1896, *Marloth 2346* (PRE); Visgat between Schurfteberg and Groot Winterhoek Mtns, (–AA), Oct. 1953, *Stokoe SAM 63187* (SAM);Ceres Dist., Witzenberg Vlakte, (–AA/AB), 11-01-1960, *Esterhuysen 28403* (BOL); Cold Bokkeveld, stony slopes in rocks, (–AB), 25-09-1936, *Adamson 1063* (BOL); Ceres Dist., Agter Witzenberg, Slagboom, (–AB), Sept. 1989, *Cillie s.n.* (NBG); Cold Bokkeveld, Hartebeeskloof, lower SE slopes of Vaalbokskloofberg, 1060 m, (–AB), 27-02-1991, *Oliver 9808* (NBG); *ibid.*, 1080 m, 13-11-1993, *Oliver 10400* (NBG); Cold Bokkeveld, Kleinvlei at base of Skurfteberg, 980 m, (–AB), 13-02-1992, *Oliver 10039* (NBG); pass over S end of Schurfteberg near Gydouw Pass, (–AB), 28-11-1941, *Pillans 9702* (BOL); Cold Bokkeveld, Kleinvlei, sandy area, 1500 m, (–AB), 20-01-1897, *Schlechter 10066* (BOL, S, Z); Gydo Pass, top of pass, (–AB), Mar. 1951, *Stokoe SAM 66793* (SAM); Skurfteberg, N section, ± 1230 m, (–AB), 09-11-1973, *Taylor 8668* (NBG, S); Cold Bokkeveld, slopes NW of Op Die Berg Village, sandy flats and slopes, 980 m, (–AB), 28-07-1973, *Thompson 1752* (NBG);Rocklands farm, about 30 km N of Ceres, ± 1200 m, (–AB), 10-03-1981, *Van Wyk 465* (NBG); Ceres, Schoonvlei, 480 m, (–AD), 24-01-1989, *Beyers 125* (BOL, K, MO, NBG, NY, P, PRE); *ibid.*, *Cillie s.n.* (NBG); *ibid.*, 480 m, Feb. 1989, *Cillie 50* (NBG); Schoonvlei Industrial area 4 km outside Ceres, 480 m, (–AD), 06-07-1987, *Cloete & Cillie 15* (NBG). Grid ref. unknown: Ceres Dist., brought to Ceres Flower Show [precise locality unknown], 13-10-1994, *Comm. Beyers s.n.* (NBG); Ceres Div., Koekoedouw Kloof, sandy pleateau, 03-01-1954, *Esterhuysen 22552* (BOL); mountains W of Porterville, Nov. 1912, *Edwards BOL 16153* (BOL).

29. **Lachnaea marlothii** *Schltr.* in Journal of Botany, British and Foreign 34: 503 (1896). Syntypes: In south-western region: Matroosberg, in grassy mountain slopes, alt. 6000–6500 ft., Dec. 1895, *R. Marloth, 2218* (NBG, lecto.! here designated; BOL!, PRE!, isolecto.); *Marloth 2276* (PRE!).

Note: Schlechter did not annotate any of the above sheets, but he most probably saw the material during his two visits to South Africa between 1891 and 1898 (Gunn & Codd 1981). *Marloth 2218* consisting of three sheets, one in each of the main South African herbaria, is chosen as the lectotype.

Slender, spreading or cushioned, moderately branched, shrub up to 0.3 m tall, appearing multistemmed at base; regeneration unknown. *Branches* ascending to patent, slender, terete, felted or thinly tomentose, leafy, later becoming glabrous and naked without prominent leaf scars. *Leaves* decussate, adpressed or ascending, scattered, internodes quarter to three-quarters as long as leaves, those below inflorescence crowded, sessile, epistomatic, narrowly elliptic, 2.5–4.2 × 0.6–1.0 mm, coriaceous, adaxially concave, enervate, dull, abaxially convex, subkeeled in upper half, glossy, glabrous, apex rounded, at first villous-tufted, later naked, base rounded; distal two leaf pairs subverticillate, partially enclosing inflorescence, broader than other leaves, bract-like, coriaceous, green or green with maroon tinge, glabrous, adaxially concave, abaxially convex keeled in upper half; elliptic or obovate, 2.9–4.1 × 1.2–2.7 mm, margin villous-cilliate, apex acute to obtuse. *Inflorescence* a terminal, sessile, 5–8-flowered, pseudobracteate umbel with 2–4 open flowers at a time, 5–10 mm in diameter, on main flowering branches. *Flowers* subactinomorphic, cream or cream with pink tinge, pedicellate. *Pedicel* 0.5–0.7 mm long, villous, elongating in fruiting stage. *Hypanthium* 1.8–3.2 mm long, circumscissile midway to two-thirds from base, upper portion funnel-shaped, sericeous-pilose outside, adpressed hirsute within, basal portion ellipsoid, glabrous on both sides. *Sepals* erect-patent, subequal, elliptic, 2.0–2.4 × 0.8–1.3 mm, apex rounded or obtuse, adaxially glabrous or adpressed hairy in upper quarter, abaxially sericeous-pilose. *Stamens* exserted, outer, antisepalous whorl inserted a third-way up on sepals, inner, antipetalous whorl inserted on rim of hypanthium; filaments filiform, outer 0.7–1.0 mm long, inner 0.6–1.0 mm long; anthers ellipsoid to spheroid, 0.3–0.5 mm long, abaxially without broad connective tissue. *Scales* exserted, inserted immediately below antipetalous stamens in mouth of hypanthium, capitate or obovoid, 0.2–0.4 mm long, glabrous, yellow in fresh state. *Ovary* ellipsoid, 0.8–1.0 mm long, glabrous. *Style* linear-obconical, 1.8–2.5 mm long, glabrous. *Stigma* capitate, elongate-papillate (Figure 7.57).

Distribution and ecology

Lachnaea marlothii is confined to the Hex River Mountains at altitudes between 1800 and 2330 m (Figure 7.58). Flowering has been recorded in August and December.

I have not been able to study this species in the live state and unfortunately very little information could be obtained from the herbarium labels.

Conservation status: This species has a restricted, localised distribution and although its mode of regeneration is not known, the status of Vulnerable (VU D2) seems appropriate.

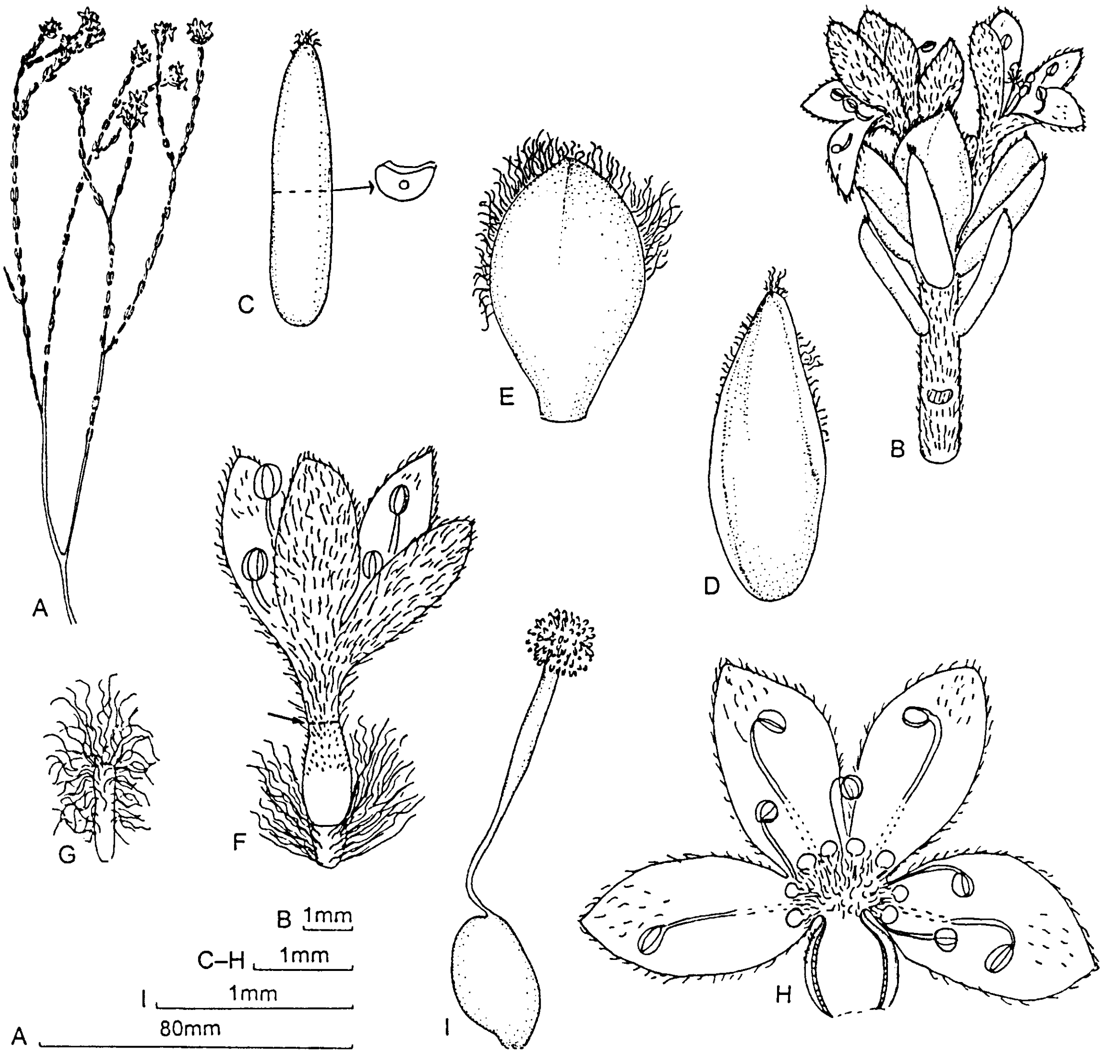

FIGURE 7.57—*Lachnaea marlothii*, *Kotze 124* (NBG). A, portion of plant; B, flowering branch; C, leaf (abaxial view and cross section); D & E, bract-like leaves subtending inflorescence: D, from subdistal pair; E, from distal pair; F, flower, note circumscission zone (arrowed); G, elongated pedicel in fruiting stage; H, flower split longitudinally with gynoecium removed; I, gynoecium.

Diagnostic characters and relationships

Lachnaea marlothii can easily be confused with *L. elsieae*, a distant relative. Both belong to the group of species having pedicels that elongate in the fruiting stage. *L. marlothii*, however, is distinguished from *L. elsieae* by the upper portion of the hypanthium and the sepals being villous-pilose on the outside, the capitate or obovate scales and the antisepalous stamens inserted a third-way up the sepals.

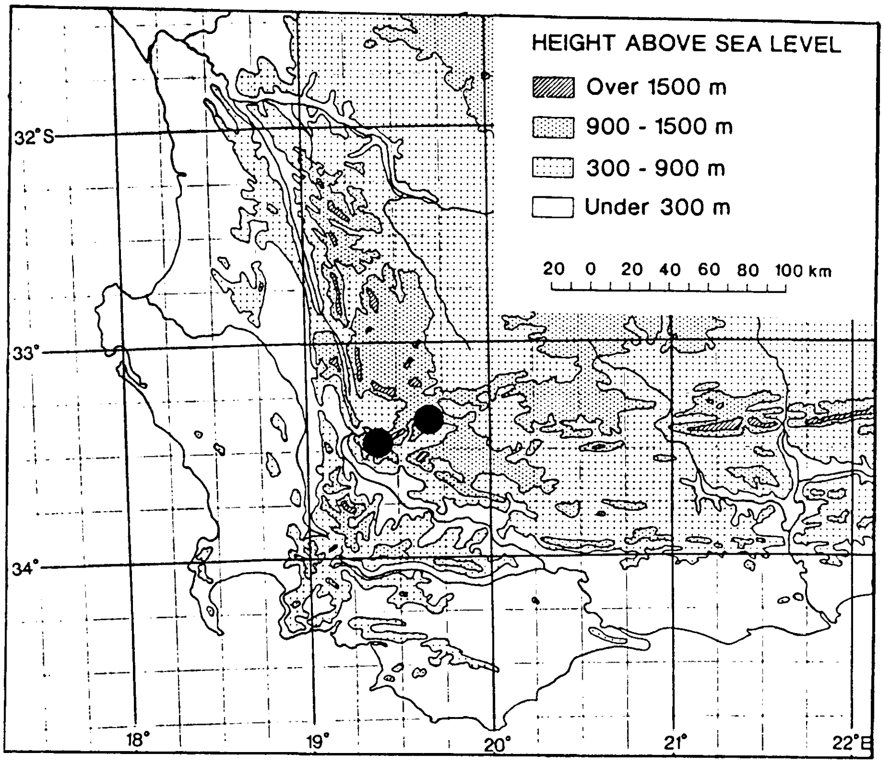

FIGURE 7.58—Known distribution of *Lachnaea marlothii.*

Specimens examined

WESTERN CAPE.—3319 (Worcester): Hex River Mtns, Buffelshoek Peak, 2000 m, (–AD), 16-12-1957, *Esterhuysen 27443* (BOL); Matroosberg, 2000 m, (-BC), Dec. 1895, *Bolus A. sub Guthrie 3939* (BOL); *ibid.*, Spekrivierkloof, 1800 m, 10-12-1981, *Kotze 124* (NBG); *ibid.*, 2000 m, Dec. 1895, *Marloth 2276* (PRE); *ibid.*, slopes of mountains, 2000 m, Dec. 1895, *Marloth 2218* (BOL, NBG, PRE); *ibid.*, ridge N of main peak, minor peaklet in rocky flat area, 2000 m, 19-08-1999, *E.G.H. & I.M. Oliver 11304* (NBG); *ibid.*, near Laken Vlei, ± 2330 m, Dec. 1917, *Phillips 2051* (SAM).

30. **Lachnaea greytonensis** *Beyers* sp. nov. *L. funicaulis* structura floris simili arte affinis, sed inflorescentia pseudobracteata, parte superiore hypanthii cyathiformi basi in tubo perangusto angustata, extra villoso-tomentosa, intra villoso-hirsuta, sepalis extra villoso-tomentosa.

TYPE.—Western Cape, 3419 (Caledon): Riviersonderend Mountains, Greyton, Boesmanskloof, jeeptrack to Die Galg, 640 m, (–BA), 12-11-1992, *Beyers 209* (NBG, holo.!; BOL!, K!, MO!, NY!, PRE!, S!, Z!, iso.).

Sparsely to much-branched, erect shrub up to 0.45 m tall, single-stemmed at base, corymbosely branched near the ground; reseeder. *Branches* ascending to inclined, slender, terete, felted, leafy, later becoming glabrous and naked without prominent leaf scars. *Leaves* decussate, adpressed, scattered, internodes three-quarters to one and a half times as long as leaves but those below inflorescence crowded, sessile, epistomatic, narrowly elliptic, 2.8–4.5 × 0.8–1.2 mm, coriaceous, glabrous with villous-ciliate margin, later margins glabrous, adaxially obtusely concave or concave, dull, faintly white-punctulate, abaxially convex, smooth or subkeeled, glossy, apex rounded, base rounded; distal two leaf pairs subverticillate, broader than other leaves, bract-like, margin villous-ciliate; distal pair obovate, 2.9–3.5 × 1.9–2.3 mm, abaxially subkeeled, apex rounded or obtuse; subdistal pair obovate, 3.4–4.2 × 1.6–2.0 mm, abaxially keeled, apex acute or rounded. *Inflorescence* a terminal, sessile, 12–30-flowered, capitate-like, pseudobracteate umbel with 1–5 open flowers at a time, 5.0–7.0 mm in diameter, on main and sometimes also on short lateral flowering branches just below main inflorescence forming a cluster of inflorescences at apex of main flowering branches; umbel appears to be enclosed at base by 2 pairs of involucral bracts but vegetative shoots were observed to develop in axils of distal bract-like leaf pair. *Flowers* ± actinomorphic, cream, pedicellate. *Pedicel* 0.5–2.7 mm long, villous, elongating in fruiting stage. *Hypanthium* 2.5–4.2 mm long, circumscissile midway to one-fifth from base, upper portion cup-shaped narrowing into a very short tube at base, villous-tomentose outside, within villous-hirsute below scales, glabrous above, basal portion ellipsoid, outside distal third tomentose, rest glabrous, within glabrous. *Sepals* erect-patent, subequal, widely to very widely ovate, 0.8–1.3 × 0.8–1.3 mm, apex rounded or obtuse, adaxially glabrous or distal half villous-tomentose, abaxially villous-tomentose. *Stamens* outer, antisepalous whorl exserted, inserted at base of sepals or rim of hypanthium, inner, antipetalous whorl enclosed or semi-exserted, inserted a quarter to third-way down upper portion of hyanthium; filaments filiform, outer 0.3–0.7 mm long, inner 0.2–0.7 mm long; anthers widely ellipsoid or spheroid, 0.3–0.4 mm long, abaxially without broad connective tissue. *Scales* enclosed, inserted midway to three-quarters way down upper portion of hypanthium, widely obovoid, 0.2–0.3 mm long, glabrous, white later turning yellow in fresh state. *Ovary* narrowly obovoid or obovoid, 0.6–0.8 mm long, glabrous. *Style* linear-obconical, 0.8–2.2 mm long, glabrous. *Stigma* capitate or subcapitate, papillate (Figure 7.59).

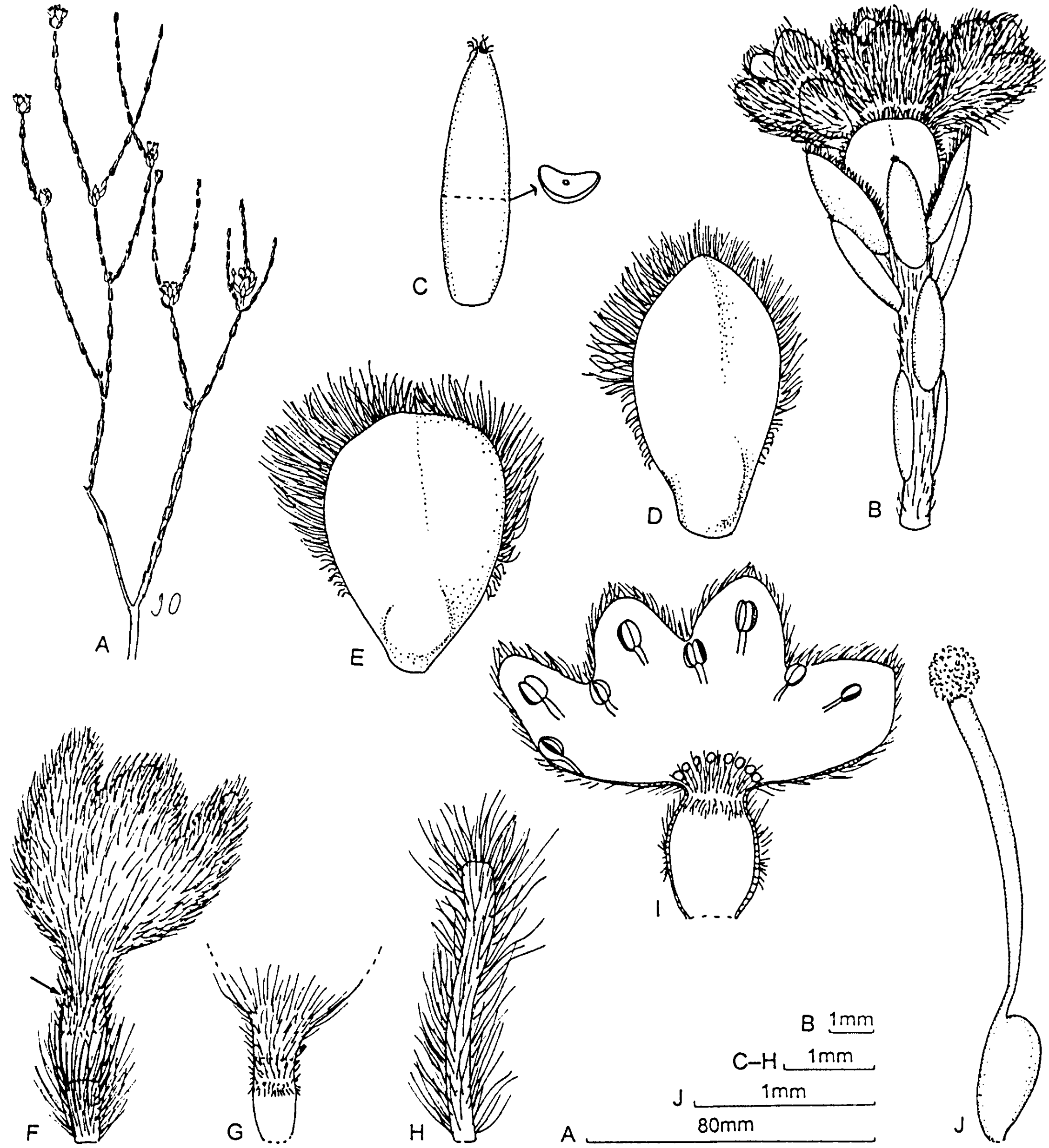

FIGURE 7.59—*Lachnaea greytonensis*, *Beyers 209* (NBG). A, portion of plant; B, flowering branch; C, leaf (abaxial view and cross section); D & E, bract-like leaves subtending inflorescence: D, from subdistal pair; E, from distal pair; F, flower, note circumscission zone (arrowed); G, hypanthium; H, elongated pedicel in fruiting stage; I, flower split longitudinally with gynoecium removed; J, gynoecium.

Distribution and ecology

Only known from the Riviersonderend Mountains above Genadendal and Greyton in sandy soil at altitudes between 640 and 830 m (Figure 7.60). Flowering has been recorded from September to January.

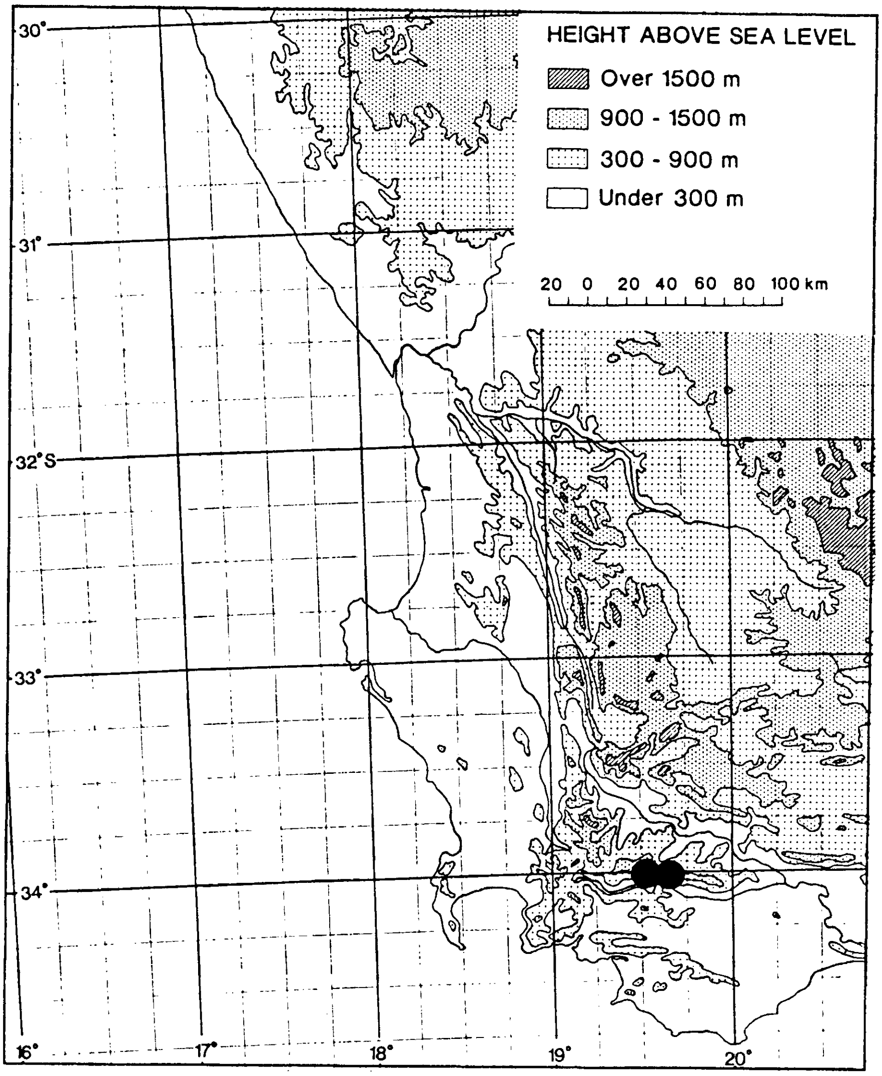

FIGURE 7.60—Known distribution of *Lachnaea greytonensis*.

Conservation status: Vulnerable (VU D2). This species has a restricted, localised distribution and being a reseeder, would be vulnerable to frequent fires.

Diagnostic characters and relationships

This species is allied to *Lachnaea funicaulis* which has a similar flower structure but also differs in several respects. *L. greytonensis* has a pseudobracteate umbel, the upper portion of the hypanthium is cup-shaped narrowing into a very short tube at base, which is villous-tomentose outside and villous-hirsute within and the sepals are abaxially villous-tomentose. In *L. funicaulis* the umbel is bracteate, the upper portion of the hypanthium funnel-shaped, tomentose-sericeous outside and adpressed hairy within and the sepals abaxially tomentose-sericeous.

Etymology

The picturesque town of Greyton, which lies at the foot of the Riviersonderend Mountains, has prompted the specific epithet.

Specimens examined

WESTERN CAPE.—3419 (Caledon): Riviersonderend Mtns, Greyton, Boesmanskloof, jeeptrack to Die Galg, 640 m, (–BA), 12-11-1992, *Beyers 209* (BOL, K, MO, NBG, NY, PRE, S, Z); *ibid.*, 24-09-1992, *Hansford 21* (NBG); *ibid.*, S slopes, ± 730 m, 21-04-1971, *Kruger 1215* (NBG); Riviersonderend Mtns, Paardekop, (–BA), Oct. 1940, *Stokoe 8031* (BOL); Greyton, Paardekop Peak, 830 m, (–BA), Jan. 1940, *Stokoe 9464* (BOL, PRE), *Stokoe SAM 58594* (SAM).

31. **Lachnaea funicaulis** *Schinz* in Bulletin de l'herbier Boissier 3: 112 (1895); C.H.Wright: 25 (1915). Type: South Africa: In valley only in sand [Mostertshoek], 3000 ft. alt., 31-01-92, *Schlechter 401* (Z, holo.!; NY, iso.!).

Sparsely to moderately branched, erect shrub up to 0.45 m tall, single-stemmed at base, corymbosely branched near the ground or higher up the stem; reseeder. *Branches* erect, slender, terete, felted, leafy, later glabrescent and naked without prominent leaf-scars. *Leaves* decussate, adpressed, scattered, internodes as long as to one and a half times as long as the leaves, sessile, epistomatic lanceolate, narrowly elliptic or narrowly obovate, 3.8–5.0 × 0.8–1.4 mm, coriaceous, glabrous with lanate-ciliate margin, adaxially concave, smooth, dull, abaxially convex, smooth or subkeeled, glossy, apex obtuse, base rounded. *Inflorescence* a terminal, sessile, bracteate, 8–12-flowered umbel with 3–6 open flowers at a time, 4.0–8.0 mm in diameter, on main and sometimes on short lateral flowering branches just below main inflorescence forming a cluster of inflorescences at apex. *Involucral* bracts 4, coriaceous, green, glabrous, margin brown, lanate-ciliate; inner pair obovate, 3.0–4.0 × 2.2–2.5 mm, apex truncate or sub-emarginate; outer pair narrowly obovate or obovate, 3.5–4.6 × 1.8–2.5 mm, apex obtuse or truncate. *Flowers* subactinomorphic, cream, pedicellate. *Pedicel* 0.6–2.4 mm long, covered with long silky, ascending hairs, elongating in fruiting stage. *Hypanthium* 2.7–3.5 mm long, circumscissile ± midway to a third from base, upper portion funnel-shaped, outside tomentose-sericeous but around circumscission zone puberulent, within adpressed hairy, basal portion ellipsoid, outside glabrous except near circumscission zone puberulent, within glabrous. *Sepals* erect-patent, subequal, shape variable, ovate to widely ovate, elliptic or obovate to widely obovate, 1.0–1.6 × 0.8–1.5 mm, apex rounded or obtuse, adaxially glabrous or at apex adpressed hairy, abaxially tomentose-sericeous. *Stamens* exserted, or only outer, antisepalous whorl exserted and inner, antipetalous whorl semi-exserted, outer whorl inserted at base of sepals or rim of hypanthium, inner whorl inserted a quarter to two-thirds way down upper portion of hypanthium; filaments filiform, outer 0.5–0.9 mm long, inner 0.4–0.6 mm long; anthers ellipsoid, 0.3–0.4 mm long, abaxially without broad connective tissue. *Scales* enclosed, inserted midway to four-fifths way down upper portion of hypanthium, narrowly ellipsoid or clavate, 0.2–0.3 mm long, glabrous. *Ovary* narrowly ellipsoid or narrowly ovoid, 0.6–1.6 mm long, glabrous. *Style* linear-obconical, 1.9–2.5 mm long, glabrous. *Stigma* sub-capitate, elongate-papillate or capitate, papillate (Figure 7.61).

Distribution and ecology

Recorded from the mountains east and south of Ceres in sandy or stony soil at altitudes between 500 and 1000 m (Figure 6.62). Flowering has been recorded from July to March.

Conservation status: Vulnerable (VU D2). Only known from a few collections, most of which are old. This species has a restricted distribution and being a reseeder, would be vulnerable to frequent fires.

Diagnostic characters and relationships

Lachnaea funicaulis can easily be confused with *L. villosa* as the habit and inflorescence structure appear somewhat similar. However, the inflorescence, flower structure and indumentum of the two species are quite different. In *L. funicaulis* the inflorescence is bracteate, the upper portion of the hypanthium and sepals are tomentose-sericeous on the outside, and the scales are enclosed, inserted midway to four-fifths way down the upper portion of the hypanthium. *L. villosa*, on the other hand, has a pseudobracteate inflorescence, the upper portion of the hypanthium and the sepals are villous-tomentose on the outside and the scales, which are inserted in the mouth of the hypanthium, are exserted. From its sister species, *L. oliverorum* it can be distinguished by having an 8–12-flowered umbel, smaller flowers (up to 5 mm long), a funnel-shaped hypanthium and the sepals being tomentose-sericeous on the outside.

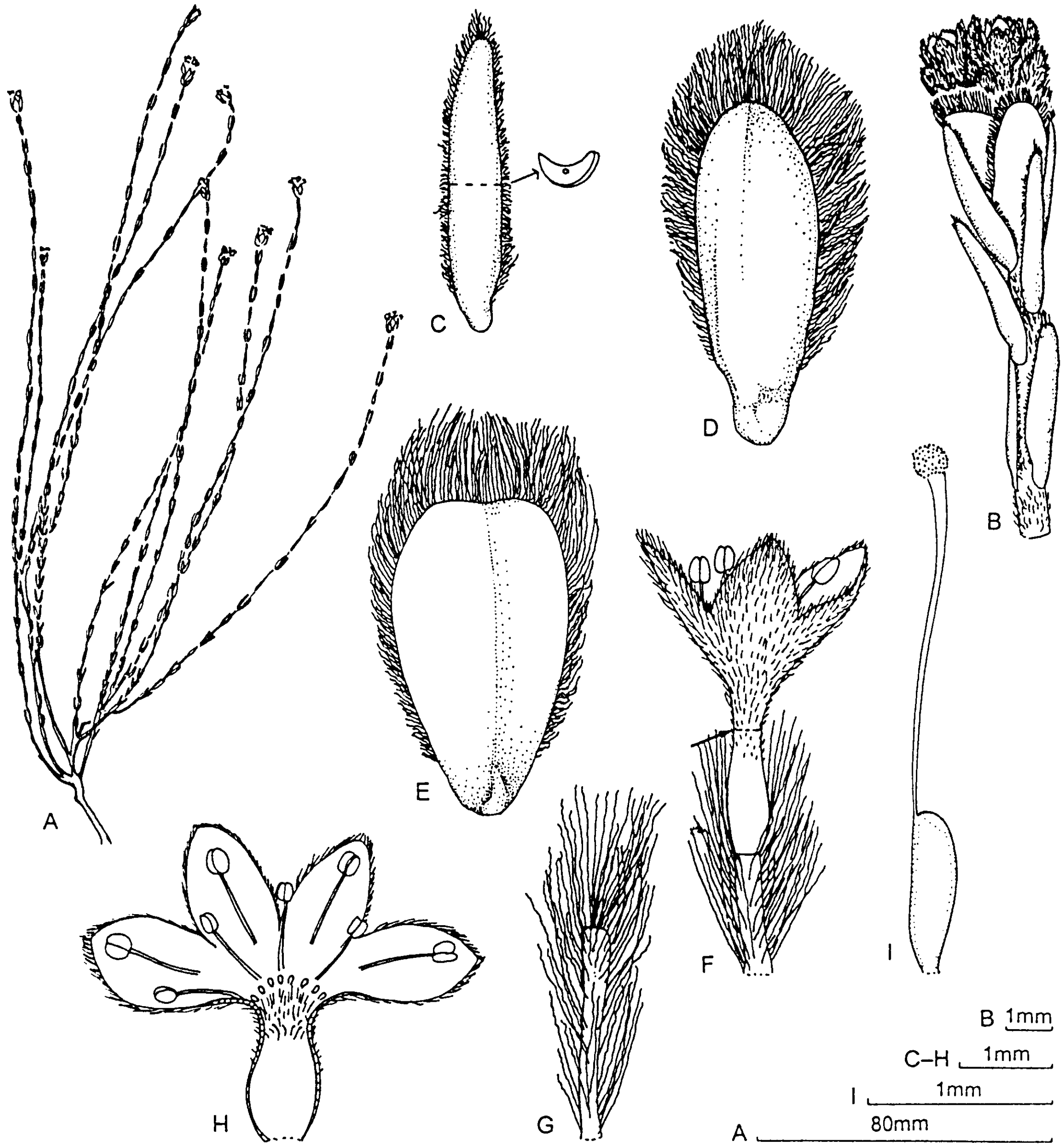

FIGURE 7.61—*Lachnaea funicaulis*, *Bolus 53169* (NBG). A, portion of plant; B, flowering branch; C, leaf (abaxial view and cross section); D & E, involucral bracts: D, from subdistal pair; E, from distal pair; F, flower, note circumscission zone (arrowed); G, elongated pedicel in fruiting stage; H, flower split longitudinally with gynoecium removed; I, gynoecium.

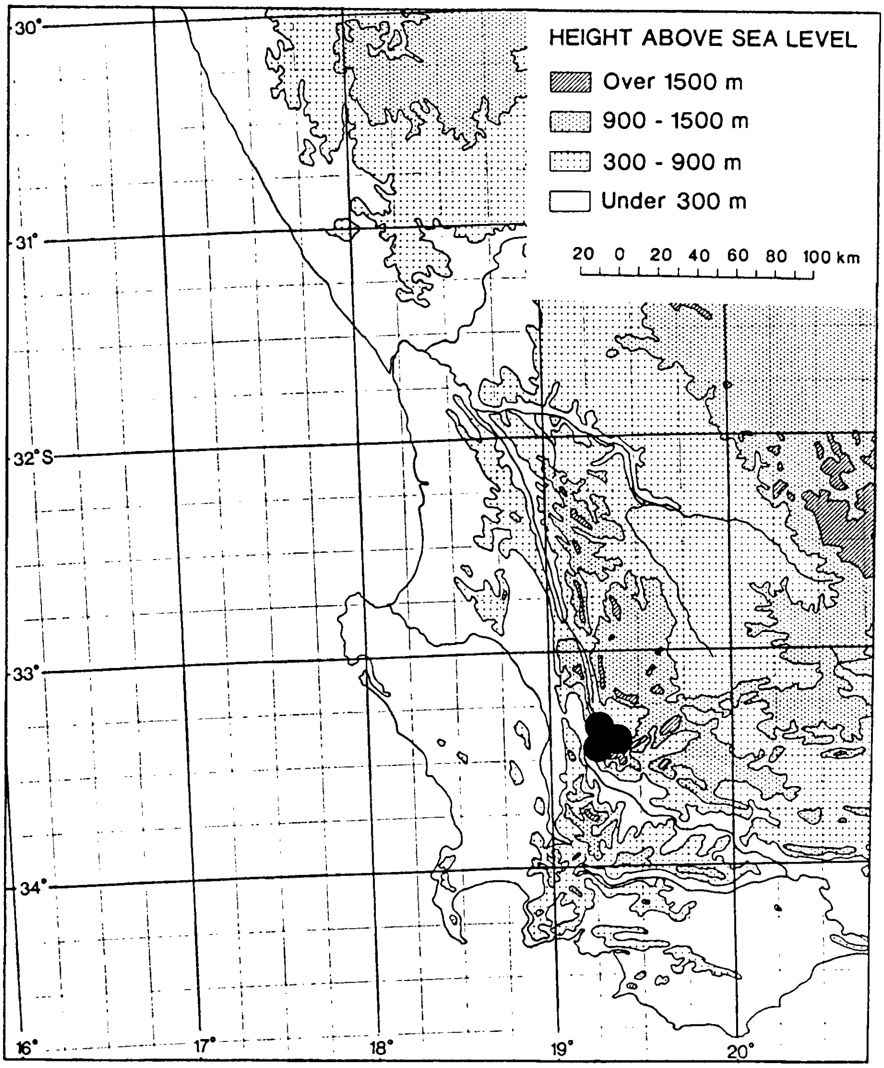

FIGURE 7.62—Known distribution of *Lachnaea funicaulis*.

Specimens examined

WESTERN CAPE.—3319 (Worcester): Ceres [precise locality unknown], 565 m, Dec. 1891, *Bolus 1357* (BOL), *Bolus HNAA 1357* (BOL, NBG, S, Z), *MacOwan & Bolus 1357* (NBG); *ibid.*, 630 m, Mar. 1882, *Bolus 5316* (GRA, NBG, SAM); *ibid.*, Jul. 1941, *Dreyer STEU 26078* (NBG); *ibid.*, 510 m, Jan. 1892, *Guthrie 2197* (NBG); *ibid.*, 500 m, Feb. 1918, *Rogers 17637* (GRA, Z); *ibid.*, Dec.–Jan. !929–30, *Thode A2280* (K); Ceres Div., Waaihoek Mtns, peak E of Tarantula Peak, 1000 m, (–AD), 07-10-1953, *Esterhuysen 21813* (BOL); Ceres Div., Skurfberg range between Bertsberg and Buffelshoek Peak, (–AD), 10-10-1956, *Esterhuysen 26402* (BOL); kloof to Ceres, Dorpsdam, 600 m, (–AD), 05-02-1980, *Hugo 2332* (NBG); Mostertshoek, in mountain valley growing in sand, 1000 m, (–AD), 31-01-1892, *Schlechter 401* (NY, Z); Mitchells Pass, 665 m, (–AD), 15-01-1897, *Schlechter 9961* (BOL, S, Z); *ibid.*, summit, 1-08-1932, *Salter 2662* (K). Without locality: *Bolus SAM 1488* (SAM).

32. **Lachnaea oliverorum** *Beyers,* sp. nov. *L. greytonensis* similis, sed differt inflorescentia bracteata, floribus duplo longioribus, parte superiore hypanthii cyathiformi basi in tubo partem cyathiformem aequanti et verticillis ambobus staminum exsertis.

TYPE.—Western Cape, 3320 (Montagu): Montagu District, Waboomsberg, east of Pypsteelfontein, on level, sandy area, 1280 m, (–CA), 13-07-1994, *Oliver 10478* (NBG, holo.!; BOL!, K!, MO!, PRE, S!, iso.).

Sparsely to much-branched, erect shrub up to 0.5 m tall, single-stemmed at base; reseeder. *Branches* ascending to inclined, slender, terete, felted, leafy, later glabrescent and naked without prominent leaf-scars. *Leaves* decussate, adpressed or ascending, scattered, internodes a third to twice as long as leaves, sessile, narrowly elliptic or lanceolate, 3.0–5.0 × 0.8–1.5 mm, those below inflorescence crowded, ovate or elliptic, 3.2–5.4 × 1.8–2.2, coriaceous, glabrous with lanate-ciliate margin, later margins glabrous, adaxially obtusely concave or concave, dull, faintly white-punctulate, abaxially convex, smooth or subkeeled, glossy, apex rounded, base rounded. *Inflorescence* a terminal, sessile, 18–22-flowered, capitate-like, bracteate umbel with 2–6 open flowers at a time, 8.0–15.0 mm in diameter, on main and also on short lateral flowering branches just below main inflorescence forming a cluster of inflorescences at apex of main flowering branches. *Involucral* bracts 4, coriaceous, green or green with a maroon tinge, glabrous, margin lanate-ciliate; distal pair ovate or obovate, 5.3–7.0 × 3.3–3.9 mm, adaxially concave, abaxially convex, subkeeled in upper half, apex rounded; subdistal pair elliptic or obovate, 4.7–6.3 × 2.3–3.7 mm, adaxially concave, abaxially convex, subkeeled in upper half, apex acute or rounded. *Flowers* ± actinomorphic, cream, pedicellate. *Pedicel* 0.7–4.6 mm long, at first covered with long, ascending, silky hairs later becoming villous, elongating in fruiting stage. *Hypanthium* 5.0–6.2 mm long, circumscissile a quarter to one third from base, upper portion cup-shaped narrowing into a tube at base, villous outside, cup-shaped portion glabrous within, tubular portion adpressed hairy; basal portion of hypanthium narrowly ellipsoid or narrowly obovoid, outside distal two-thirds puberulent, rest glabrous, within glabrous. *Sepals* erect-patent, subequal, ovate to widely ovate, 2.1–3.3 × 1.4–2.2 mm, apex rounded, adaxially glabrous in lower half, pilose in upper half, abaxially villous-tomentose. *Stamens* exserted, outer, antisepalous whorl inserted near base of sepals or on rim of hypanthium, inner, antipetalous whorl inserted midway to two-thirds way down cup-shaped portion of upper portion of hypanthium; filaments filiform, outer 0.9–1.6 mm long, inner 0.8–1.7 mm long; anthers ellipsoid, 0.5–0.6 mm long, abaxially without broad connective tissue. S*cales* enclosed, inserted two-thirds to three-quarters way down cup-shaped portion of upper portion of hypanthium, widely obovoid or capitate, 0.4–0.6 mm long, glabrous, translucent white in fresh state. *Ovary* narrowly ellipsoid or ellipsoid, 0.9–1.4 mm long, glabrous. *Style* linear-obconical, 3.8–4.3 mm long, glabrous. *Stigma* subcapitate, elongate-papillate (Figure 7.63).

Distribution and ecology

Only known from Waboomsberg in the Montagu District where it grows in sandy soil at altitudes between 1280 and 1400 m (Figure 7.64). Flowering has been recorded in June to August.

Conservation status: Vulnerable (VU D2). This is a localised species with a restricted distribution and being a reseeder would be vulnerable to frequent fires.

Diagnostic characters and relationships

Lachnaea oliverorum can be distinguished from its sister species, *L. funicaulis* by having 18–22-flowered umbels, larger flowers (up to 9 mm long), a villous-tomentose indumentum on the flowers and the cup-shaped upper portion of the hypanthium. It superficially resembles *L. greytonensis*, a distant relative, which has a similar floral structure but differs in having bracteate inflorescences, larger flowers, the hypanthium above the circumscission zone which is cup-shaped in the upper half and narrowing into a well developed tube below, and the exserted stamens.

Eponymy

This species is named after Ted and Inge Oliver, two of my colleagues, who have been a constant source of inspiration. They have always been on the look out for material of *Lachnaea* on their plant collecting trips.

Specimens examined

WESTERN CAPE.—3320 (Montagu): Montagu Dist., Waboomsberg, E of Pypsteelfontein; level area, sandy, 1280 m, (–CA), 13-07-1994, *Oliver 10478* (BOL, K, MO, NBG, S); *ibid.*, on farm

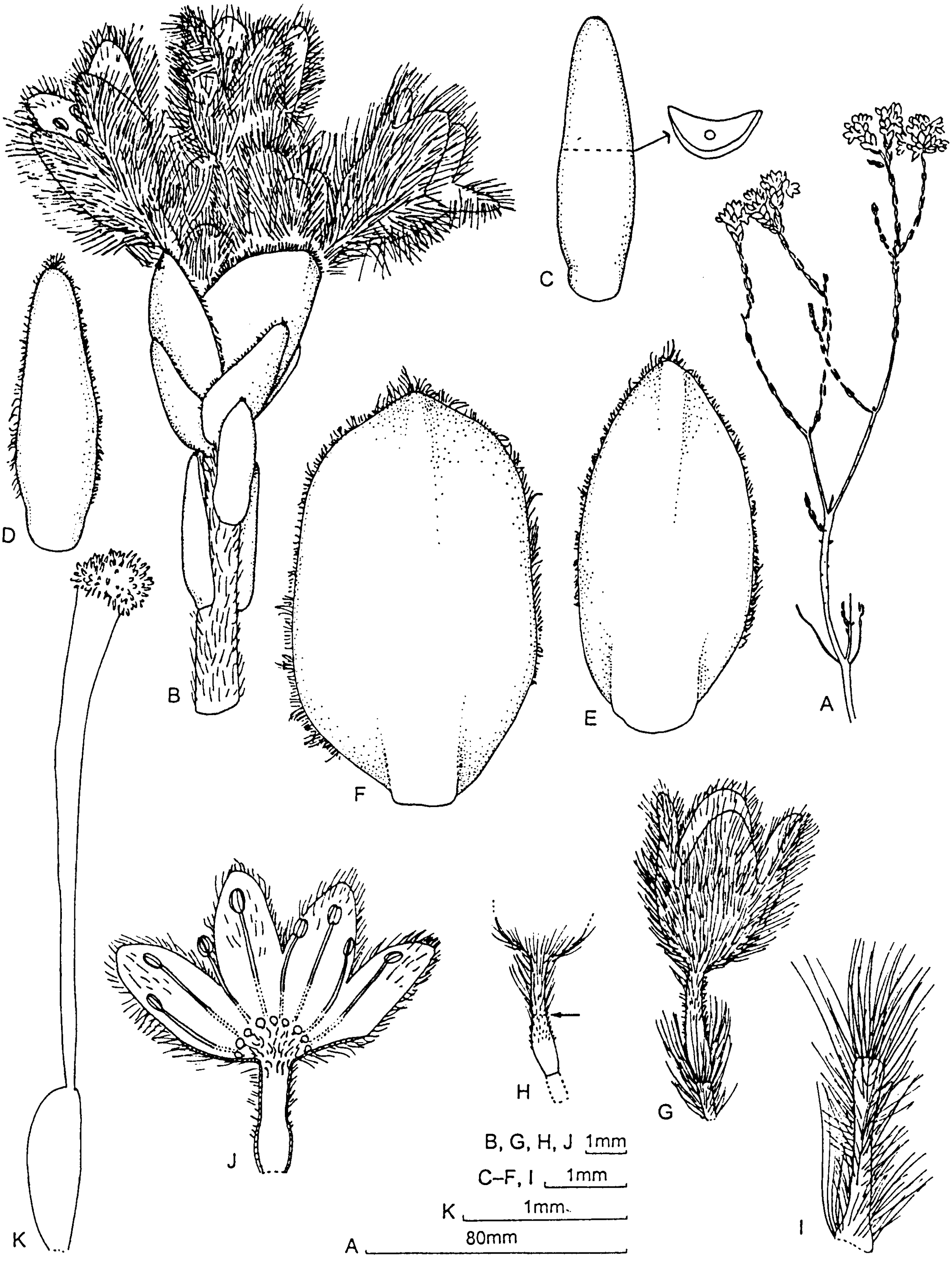

FIGURE 7.63—*Lachnaea oliverorum*, *Oliver 10478* (NBG). A, portion of plant; B, flowering branch; C & D, leaves: C, abaxial view and cross section; D, leaf subtending inflorescence (abaxial view); E & F, involucral bracts: E, from subdistal pair; F, from distal pair; G, flower; H, hypanthium, note circumscission zone (arrowed); I, elongated pedicel in fruiting stage; J, flower split longitudinally with gynoecium removed, K, gynoecium.

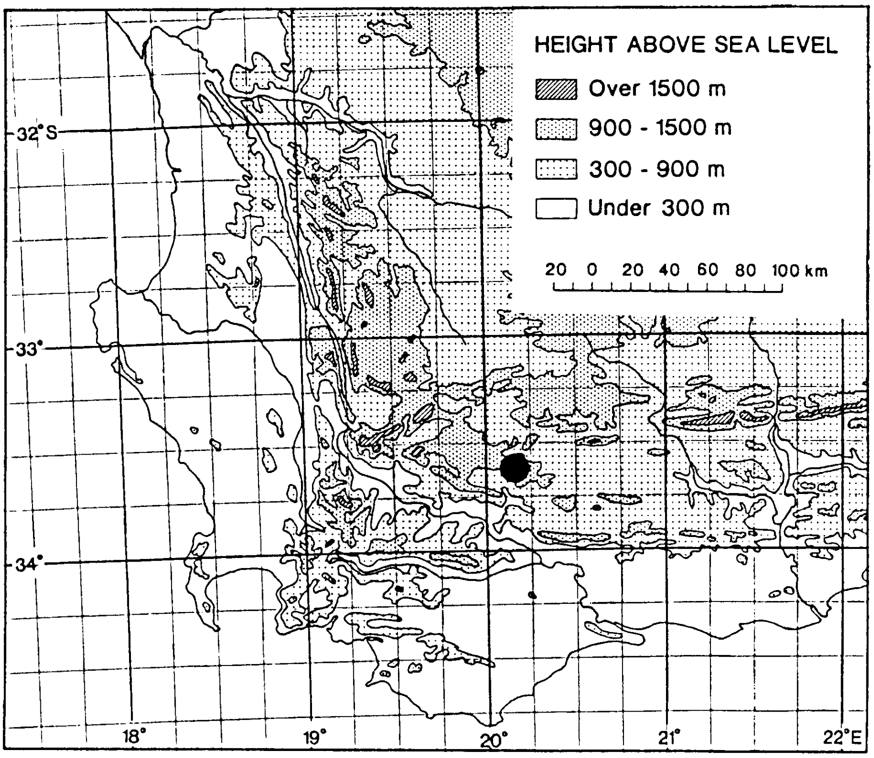

FIGURE 7.64—Known distribution of *Lachnaea oliverorum*.

Pypsteelfontein, 1365 m, (–CA), 05-08-1989, *Viviers & Vlok 430* (NBG); *ibid.*, N of Montagu, 1400 m, (–CA), 03-06-1968 *Williams 1195* (NBG, PRE).

33. **Lachnaea pendula** *Beyers*, sp. nov. distincta, inflorescentia parva pendula bracteata in ramis principalibus et pubescentia pallide aurea in pagina abaxiali sepalorum facile dignoscenda.

TYPE.—Western Cape, 3319 (Worcester): Worcester Dist., Fonteintjiesberg, Meiring's Plateau, on shaly slopes, 1330–1665 m, (–AD), 20-10-1963, *Esterhuysen 30420* (BOL, holo.!; S!, iso.).

Sparsely to moderately branched, erect to decumbent shrub to 0.45 m tall, single-stemmed at base, branching near the ground; reseeder. *Branches* ascending to patent, slender, terete, felted or covered with adpressed long silky hairs admixed with crisped hairs, leafy, later glabrescent and naked without prominent leaf scars. *Leaves* decussate, adpressed, scattered, internodes two-thirds to as long as leaves, sessile, narrowly elliptic to elliptic or narrowly ovate to ovate, 1.8–2.4 × 0.6–0.8 mm, coriaceous, glabrous, adaxially concave, enervate, dull, abaxially convex enervate or subkeeled, glossy, apex rounded, villous-tufted, base rounded. *Inflorescence* a terminal, sessile, pendulous, bracteate, up to ± 35-flowered umbel with 5–8 open flowers at a time, 3–5 mm in diameter, on main flowering branches. *Involucral* b*racts* 4, elliptic or obovate to widely obovate, 2.0–2.5 × 1.2–2.2 mm [distal pair always wider], coriaceous, green, glabrous, adaxially concave, abaxially convex, keeled in upper half, margin tinged brown in upper half, white-ciliate, apex rounded or obtuse. *Flowers* subactinomorphic, cream or pale yellow, pedicellate. *Pedicel* 0.5–1.5 mm long, villous, elongating in fruiting stage. *Hypanthium* 1.5–2.2 mm long, circumscissile two-thirds to four-fifths from base, upper portion shortly funnel-shaped, sericeous outside, adpressed hirsute within, basal portion ellipsoid or obovoid, outside pubescent in upper third to upper half, glabrous below, within glabrous. *Sepals* patent, subequal, ovate or elliptic, 0.9–1.7 × 0.6–0.9 mm, apex subacute or rounded, adaxially glabrous, abaxially sericeous, pale gold-coloured. *Stamens* exserted, outer, antisepalous whorl inserted at base of sepals, inner, antipetalous whorl inserted at rim of hypanthium; filaments filiform, outer 0.6–0.9 mm long, inner 0.3–0.8 mm long; anthers widely ellipsoid or depressed spheroid, 0.2–0.3 mm long, abaxially without broad connective tissue. *Scales* exserted, inserted in mouth of hypanthium near rim just below antipetalous stamens, narrowly obovoid or obovoid, 0.3–0.6 mm long, glabrous. *Ovary* ellipsoid or obovoid, 0.6–0.9 mm long, glabrous. *Style* linear-obconical, 1.1–1.3 mm long, sericeous in upper half, glabrous below. *Stigma* capitate, elongate-papillate (Figure 7.65).

Distribution and ecology

Lachnaea pendula has been recorded from the Skurweberg and Witsenberg northwest of Ceres and from the Hex River Mountains southeast of Ceres, on stony slopes at altitudes between 1330 and 2000 m (Figure 7.66). Flowering has been recorded from September to December.

Conservation status: Data Deficient (DD). Only known from a few herbarium collections of which the most recent was collected in 1963.

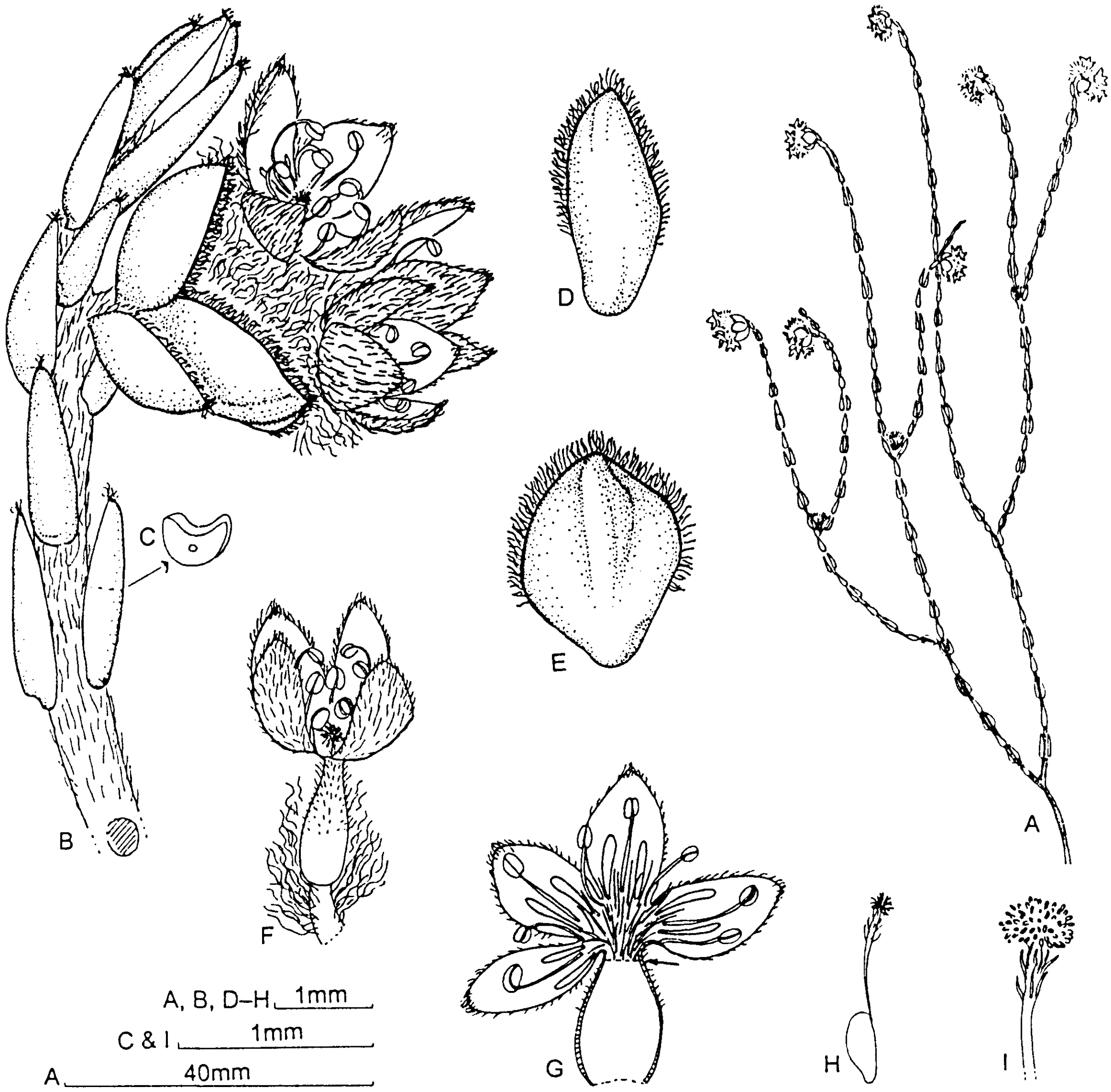

FIGURE 7.65—*Lachnaea pendula*, *Esterhuysen 30420* (BOL). A, portion of plant; B, flowering branch; C, leaf (cross section); D & E, involucral bracts: D, from subdistal pair; E, from distal pair; F, flower; G, flower split longitudinally with gynoecium removed, note circumscission zone (arrowed); H, gynoecium; I, stigma and upper portion of style.

Diagnostic characters and relationships

Lachnaea pendula is a sister species of *L. penicillata* based on the shared characters—inflorescence borne on the main flowering branches and a pubescent style. *L. pendula* can easily be distinguised by its small, pendulous, bracteate inflorescences and the pale gold-coloured pubescence on the abaxial side of the sepals.

Etymology

The specific epithet refers to the inflorescences facing downwards.

Specimens examined

WESTERN CAPE.—3319 (Worcester): Tulbagh Div., slopes of Witsenberg [precise locality not known], 1330 m, (–AA/AC), Sept. 1939, *Esterhuysen s.n.* (BOL); Ceres Div., Schurfteberg [precise locality not known], (–AB/AD), 08-10-1953, *Esterhuysen 21858* (BOL); Hex River Mtns, Roode-elsberg, NE aspect, stony slopes, 2000 m, (–BC), 02-10-1927, *Andreae* 1144 (NBG, PRE); *ibid.*, Outer Sanddrift Peaks, E aspect, on stony slopes, 1330 m, 28-10-1962, *Esterhuysen 29780* (BOL, S); Ceres Div., Conical Peak, (–BC), Dec. 1940, *Stokoe SAM 58632* (SAM); Worcester Dist., Meirings Plateau, Fonteintjiesberg area, shaly slopes, 1330–1665 m, (–CB), 20-10-1963, *Esterhuysen 30420* (BOL, S).

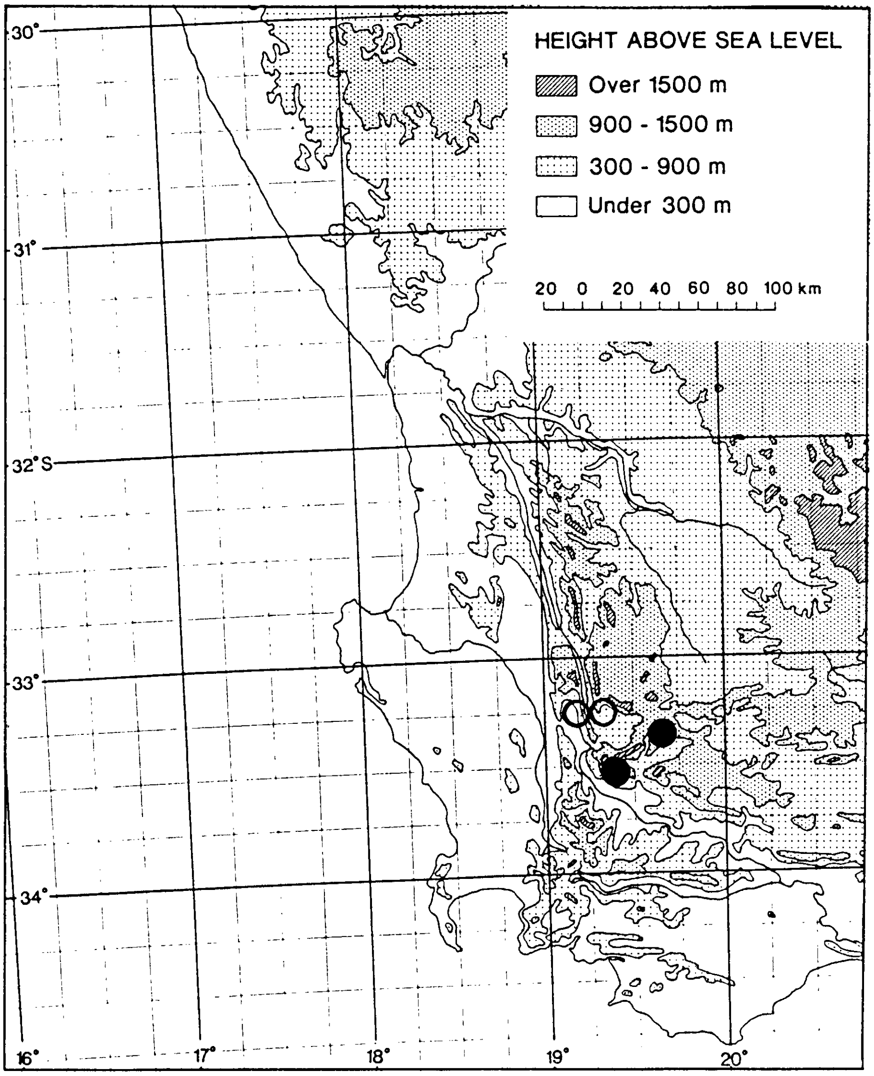

FIGURE 7.66—Known distribution of *Lachnaea pendula*. White dots are inexact localities.

34. **Lachnaea penicillata** *Meisn.* in Linnaea 14: 421 (1840); Meisn.: 579 (1857); C.H.Wright: 25 (1915). Type: between Sparrbosch and Tradouw, in rocky area, 2000–2500 ft. (IV. A.), *Drège s.n.* (NY, holo.!; P!, S!, SAM!, iso.).

Lachnaea passerinoides N.E.Br. in Kew Bulletin 1901: 132 (1901); C.H.Wright: 25 (1915). Type: Cape Colony. Riversdale Division: on the mountains of Garcias Pass, alt. 1200 ft., *Galpin 4497* (K, holo.!; BOL!, iso.).

Passerina filiformis L. var. *depauperata* E.Mey. ex Meisn.—*nom. nud.* in Linnaea 14: 422 (1840) in synonymy.

Passerina brunioides Eckl. & Zeyh. (ex parte) ex Meisn.—*nom. nud.* in A.P. de Candolle, Prodromus systematis naturalis regni vegetabilis. 14: 579 (1857) in synonymy.

Passerina bruniades Eckl. & Zeyh. (ex parte) ex Meisn.—*nom. nud.* in A.P. de Candolle, Prodromus systematis naturalis regni vegetabilis 14: 579 (1857) in synonymy.

Compact, round, much branched, shrub to 0.4 m tall, single-stemmed at base, corymbosely branched near the ground, or multi-stemmed at base; reseeder or resprouter. *Branches* ascending or inclined, slender, lax, terete, felted, leafy, later glabrescent and naked without prominent leaf scars. *Leaves* decussate, adpressed, scattered, internodes two-thirds to three-quarters as long as leaves, sessile, epistomatic, lanceolate or narrowly elliptic, 2.0–3.7 × 0.6–1.0 mm, coriaceous, adaxially concave, enervate, dull, abaxially convex, subkeeled or keeled, glossy, glabrous, margin lanate-ciliate, later glabrescent, apex obtuse, tufted, base rounded. *Inflorescence* a terminal, sessile, 3–12-flowered, bracteate umbel with a single open flower at a time, 3–4 mm in diameter, on main flowering branches. *Involucral bracts* 4, coriaceous, green; distal pair narrowly obovate or obovate, 3–4 × 1–2 mm, adaxially concave, abaxially convex, enervate or keeled, glabrous, margin scarious, brown, ciliate in upper half, lanate-ciliate in lower half, apex emarginate; subdistal pair narrowly elliptic or elliptic, 3.0–4.0 × 1.0–1.3 mm, adaxially concave, abaxially convex, keeled, glabrous, margin scarious, brown, lanate-ciliate or ciliate in upper half and lanate-ciliate in lower half, apex rounded. *Flowers* subactinomorphic, cream, pedicellate. *Pedicel* 0.5–2.0 mm long, covered with long silky, ascending hairs, elongating in fruiting stage. *Hypanthium* 2.2–3.0 mm long, circumscissile ± midway from base, upper portion funnel-shaped, sericeous outside, adpressed hirsute within, basal portion narrowly ellipsoid to elliptic or narrowly oblong to oblong, puberulent outside, glabrous within. *Sepals* inclined, subequal, ovate, elliptic or obovate, 1.4–2.3 × 0.8–1.6 mm, apex rounded or obtuse, adaxially sparsely adpressed hairy, abaxially sericeous. *Stamens* exserted, outer, antisepalous whorl inserted near base of sepals, inner, antipetalous whorl inserted at rim of hypanthium; filaments filiform, outer 0.5–0.8 mm long, inner 0.4–0.7 mm long; anthers widely ellipsoid or spheroid, 0.3–0.4 mm long, abaxially without broad connective tissue. *Scales* exserted, inserted immediately below antipetalous stamens in mouth of hypanthium, narrowly ellipsoid or narrowly obovoid, 0.5–0.7 mm long, glabrous, translucent white in fresh state. *Ovary* narrowly ellipsoid or ellipsoid, 0.6–1.0 mm long, glabrous. *Style* linear-obconical, 2.1–2.9 mm long, upper half covered with silky, ascending hairs, lower half glabrous. *Stigma* capitate, elongate-papillate (Figure 7.67).

Distribution and ecology

Lachnaea penicillata ranges from the Langeberg Mountains near Montagu in the west, eastwards to the Gourits River. It grows in sandy or stony, clay soils at altitudes between 300 and 1330 m (Figure 7.68). Flowering has been recorded throughout the year.

Conservation status: Lower Risk Least Concern (LRlc).

Diagnostic characters and relationships

Lachnaea penicillata superficially resembles *L. funicaulis*, but its inflorescence and flower structure differ. In *L. penicillata* the bracteate umbel, which has been interpreted as a single-flowered inflorescence in the past, produces one mature flower at a time; it protrudes beyond the involucral bracts. The immature flowers, fruits and pedicels remain tightly enclosed within the involucral bracts. In *L. funicaulis* the bracteate umbel has 3–6 mature (open) flowers at a time and the scales are enclosed, inserted midway to four-fifths way down the upper portion of the hypanthium, whereas in *L. penicillata* they are inserted at the mouth of the hypanthium and exserted.

Lachnaea penicillata is a sister species of *L. pendula* based on the shared characters—inflorescence borne on the main flowering branches and a pubescent style. It can easily be distinguished from *L. pendula* by the erect inflorescences and the leaf margins which are lanate-ciliate, later glabrescent.

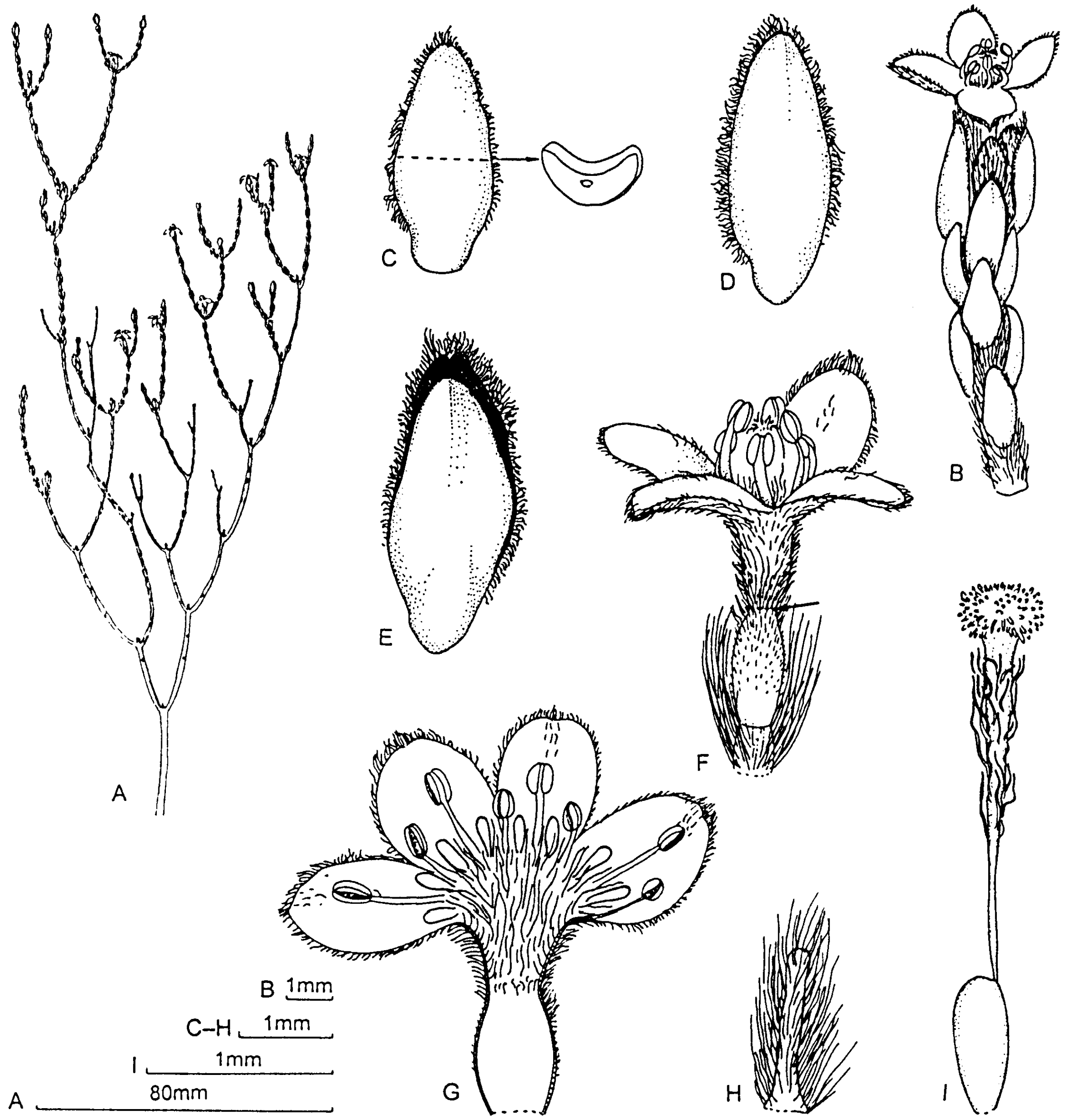

FIGURE 7.67—*Lachnaea penicillata*, *Beyers 173* (NBG). A, portion of plant; B, flowering branch; C, leaf (abaxial view and cross section); D & E, involucral bracts: D, from subdistal pair; E, from distal pair; F, flower, note circumscission zone (arrowed); G, flower split longitudinally with gynoecium removed; H, elongated pedicel in fruiting stage; I, gynoecium.

Specimens examined

WESTERN CAPE.—3320 (Montagu): Montagu, farm Rietfontein, (–CC), 29-09-1979, *Bohnen 6723* (NBG); Langeberg, S of Barrydale, 330–500 m, (–DC), *Barnard SAM 28787* (SAM); between Sparrbosch and Tradouw, in rocks on mountain (IV, A), 665-830 m, (–DC), 28-07-1831, *Drège 3542* (NY, P); *ibid.*, Jul., *Drège SAM 19776* (SAM); Tradouw Pass, (–DC), 29-05-1954, *Esterhuysen 22919* (BOL); *ibid.*, Oct. 1897,

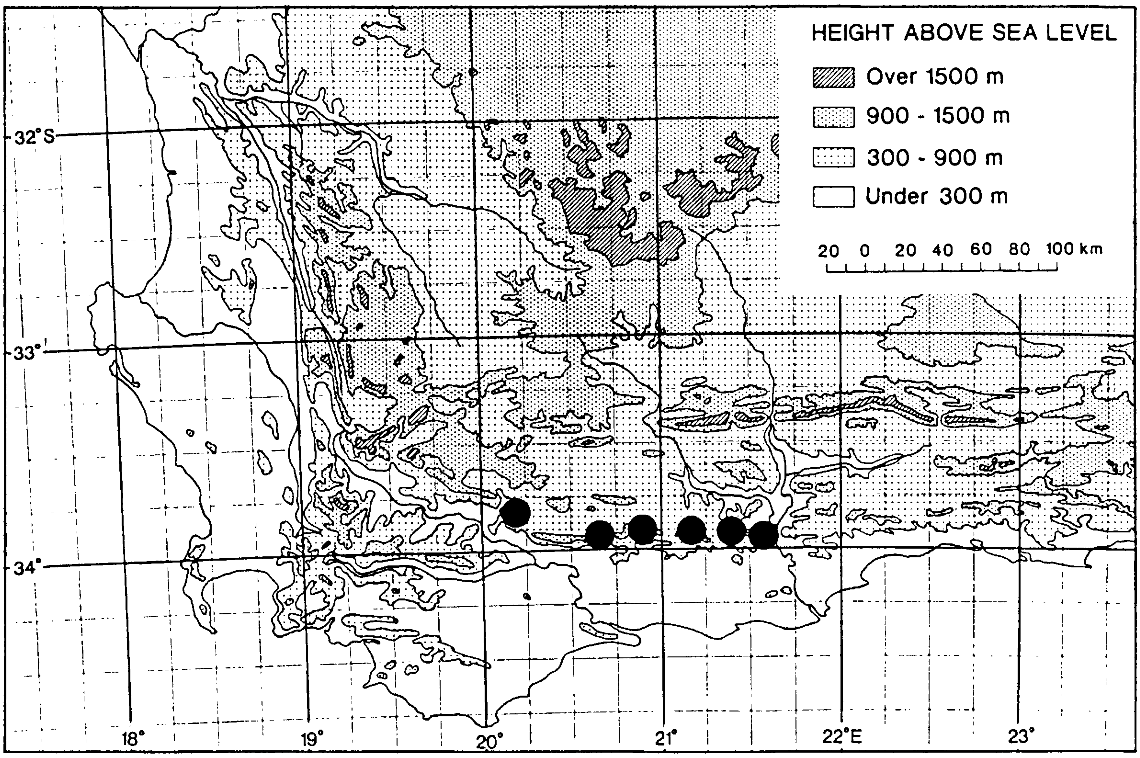

FIGURE 7.68—Known distribution of *Lachnaea penicillata*.

Galpin 4495 (GRA); *ibid.*, ridge, 730 m, Oct. 1923, *Levyns 620* (BOL, NBG); *ibid.*, Jun. 1939, *Walgate BOL 46938* (BOL); Zuurbraakberg, dry hot N slopes, ± 400 m, (–DC), 21-11-1950, *Taylor 233* (BOL, NBG); Langeberg, Swellendam Div., Lemoenshoek Peak, S slopes, 1330 m, (–DD), 15-09-1944, *Esterhuysen 10448* (BOL); Grootvadersbosch, Helderfontein, SE aspect, 1330 m, (–DD), 26-06-1987, *Forsyth 442* (NBG); Langeberg, Boosmansbos Wilderness Area, sandstone ridges E of Grootberg, 700 m, (–DD), 05-12-1986, *McDonald 1251* (NBG); *ibid.*, S of farm `Lifford', 600 m, 04-08-1987, *Van der Merwe 199* (NBG); Muurrivier between Doornrivier and Lemoenshoek on N facing slopes of Langeberg, 630 m, (–DD), 04-08-1987, *McDonald 1353* (NBG).

—3321 (Ladismith): Riversdale, between Muiskraal and Cloetes Pass, (precise locality unknown), 04-04-1959, *Barker 8900* (NBG); *ibid.*, left side of Langeberg, 04-04-1959, *Lewis 5391* (NBG, S); Riversdale, N-end of Garcias Pass, 665 m, (–CC), 23-09-1949, *Acocks 15436* (BOL); *ibid.*, 20-05-1950, *Esterhuysen 17036* (BOL); Riversdale, W side of Garcias Pass, (–CC), 05-08-1951, *Barker 7366* (NBG); Langeberg, N entrace to Garcias Pass, above road cutting, 440 m, (–CC), 15-12-1989, *Beyers 173* (NBG); *ibid.*, 530 m, 15-09-1981, *Fellingham 117* (NBG); *ibid.*, 440 m, 09-10-1988, *McDonald 1631* (NBG); Muiskraal, foothills of Langeberg, 370 m, (–CC), 17-05-1990, *Bohnen 9075* (NBG); *ibid.*, 370 m, 10-08-1983, *Bohnen 8251* (NBG); *ibid.*, 600 m, 19-07-1927, *Levyns 2119* (BOL); *ibid.*, slopes, 665 m, 16-07-1957, *Levyns 10743* (BOL); *ibid.*, S of farmstead and below dam, clay slope, 420 m, 07-06-1989, *Oliver & Fellingham 9145* (NBG); between Garcias Pass and Muiskraal, ± 600 m, (–CC), Oct. 1904, *Bolus 11372* (BOL, PRE); Garcias Pass, 400 m, (–CC), 30-09-1897, *Galpin 4497* (BOL, K); *ibid.*, slopes, 700 m, 12-10-1927, *Levyns 2298* (BOL); *ibid.*, Sept. 1908, *Phillips 407* (SAM); *ibid.*, 09-08-1949 *Steyn 301* (NBG); *ibid.*, 665–1000 m, *Thorne SAM 38928* (SAM); N slopes of Langeberg, Garcia's Pass, ± 565 m, (–CC), 13-05-1971, *Kruger 1269* (NBG); 37 miles from Barrydale to Garcia's Pass, foothills near pass, W slope, ± 500 m, (–CC), 29-01-1969, *Marsh 1157* (NBG); Langeberg, road to Langkloof, ± 3 km from turnoff, sandy flats, 630 m, (–CD), 13-03-1987, *Boucher 3694* (NBG); Riversdale, Waterval on Muiskraal-Gourits Road, 600 m, (–CD), 21-07-1962, *Levyns 11284* (BOL); Riversdale, Langeberg above Kampsch Berg, 600 m, (–CD), 30-08-1923, *Muir 2710* (BOL); mountains on side of Gourits River, (–CD/DC), Nov., *Ecklon & Zeyher 42* (SAM); Swellendam, in Kannaland, near Gourits River, (–CD/DC), Nov., *Ecklon & Zeyher 95.11* (S); Langeberg, E of Garcias Pass, Tygerberg, N slopes, W of Huisrivier, 300 m, (–DC), 15-12-1989, *Beyers 175* (NBG); Langeberg, Tygerberg, on vlakte below Witelsberg on N side, deep sand, 455 m, (–DC), 30-10-1990, *McDonald 1980* (NBG). Grid ref. unknown: Riversdale Div. Forestry Div., Nov. 1949, *Stokoe SAM 64625* (NBG, SAM).

35. **Lachnaea eriocephala** L., Species plantarum, edn 1, 1: 560 (1753); L.: 514 (1762); Crantz: 128 (1766); Burm.f.: 12 (1768); Lam.: 374 (1792); Willd.: 434 (1799); Andrews: t. 104 (1800); C.F.Gaertn.: 195, t. 215 (1807); Sims: t. 1295 (1810); W.T.Aiton: 415 (1811); Loisel.: t. 234 (1820); Meisn.: 411 (1840); Meisn.: 575 (1857); C.H.Wright: 20 (1915). *Passerina eriocephala* (L.) Spreng.: 240 (1825); non Thunb. 75 (1794); non Thunb.: 375 (1823). Type: Hottentots Holland Mtns, Sir Lowry's Pass, foot of pass, (–BB), *Beyers 270* (NBG, neo.!, BM!; BOL!; K!; MO!; NY!; P!; PRE!, S!; Z!; isoneo.). *Note*: No original material used by Linnaeus as basis for the name is available.

Lachnaea purpurea Andrews in The botanists repository 5: t. 293 (1803); W.T.Aiton: 415 (1811); Sims: t. 1594 (1813); Wikstr.: 323 (1818); Lodd.: t. 273 (1818); C.H.Wright: 21 (1915); *L. eriocephala* L. var. *purpurea* (Andrews) Meisn.: 576 (1857). Type: Andrews, The botanist repository: t. 293 (icono.!)

Lachnaea rosea Baill., Natural history of plants 6:108 (1880). Type: Baill. Natural history of plants 6, illustration [figs 74, 75 & 76] on page 108 (icono.!).

Passerina cephalophora Thunb., Prodomus plantarum capensium, part 1:75 (1794); Wikstr.: 321 (1818); Thunb.: 375 (1823). Type: *Thunberg* (as 9571 UPS, holo.—NBG, photo!; S [Herb. Montinii]!, iso.).

Erect, sparsely to moderately branched shrub up to 0.6 m tall, single-stemmed at base; reseeder. *Branches* ascending, subrigid, terete, at first sericeous-hirtellous, later glabrescent, leafy, becoming naked with leaf scars. *Leaves* decussate, ascending or subadpressed, imbricate, sessile, epistomatic, coriaceous, lanceolate or narrowly elliptic, 5.2–15.0 × 1.0–2.5 mm, glabrous, adaxially flat to concave, enervate, white-punctulate, dull, abaxially convex and keeled, usually more so towards apex, glossy, margin at first ciliate later glabrous, apex rounded or acute, base rounded; distal 2 or 3 leaf pairs subtending inflorescence bract-like, elliptic to widely elliptic, oblate, or obovate to very widely obovate, 5.2–17.0 × 3.6–14.0 mm (distal pair the broadest), coriaceous, green or green tinged maroon, adaxially concave, glabrous, abaxially convex, keeled in upper half, glabrous to sparsely adpressed hairy, margin membranous, ciliate, apex acuminate to mucronulate, base cuneate or obtuse. *Inflorescence* a terminal, sessile, pseudobracteate, more than 40-flowered, capitate-like umbel with up to 30 open flowers at a time, 25–55 mm in diameter, on main flowering branches; umbel appears to be enclosed at base by 2 or 3 pairs of involucral bracts but vegetative shoots develop in axils of distal bract-like leaves, although branching usually occurs below subdistal pair of bract-like leaves. *Flowers* zygomorphic, cream or mauve, pedicillate. *Pedicel* linear, abaxially elongated beyond insertion of flower, 2–6 mm long, elongating in fruiting stage, villous, responsible for woolly appearance of old inflorescence. *Hypanthium* 5.8–15.0 mm long, circumscissile ± one-fifth from base, circumscission zone not clearly defined, upper portion narrowly funnel-shaped, sericeous-hirsute outside, sericeous within, basal portion narrowly ovoid, puberulent or glabrescent outside, glabrous within. *Sepals* patent, unequal, anterior and lateral ones directed outwards, anterior one elliptic, 6.2–10.3 × 2.5–4.8 mm, lateral ones elliptic, 4.5–9.5 × 1.7–3.5 mm, posterior one ovate, 2.3–5.5 × 1.2–3.0 mm, always shorter than other three, adaxially sparsely sericeous, abaxially sericeous, apex rounded. *Stamens* exserted, outer, antisepalous whorl inserted at or near base of sepals, inner, antipetalous whorl inserted at rim of hypanthium, shorter than outer whorl; filaments filiform, outer 1.2–4.5 mm long, inner 1.0–3.0 mm long; anthers ellipsoid, 0.7–1.2 mm long, abaxially without broad connective tissue. *Scales* exserted, inserted at mouth of hypanthium immediately below antipetalous stamens, obscured by hairs in mouth, linear, 0.6–1.0 mm long, glabrous, translucent white in fresh state. *Ovary* narrowly ovoid or ellipsoid, 1.0–2.0 mm long, glabrous. *Style* linear, 5.2–10.5 mm long, sericeous in upper half to three-quarters. *Stigma* brush-like (Figure 7.69).

Distribution and ecology

Lachnaea eriocephala has been recorded from the Roodezand, Obiekwa and Voëlvlei Mountains near Tulbagh, as far west as Dassenberg near Malmesbury and

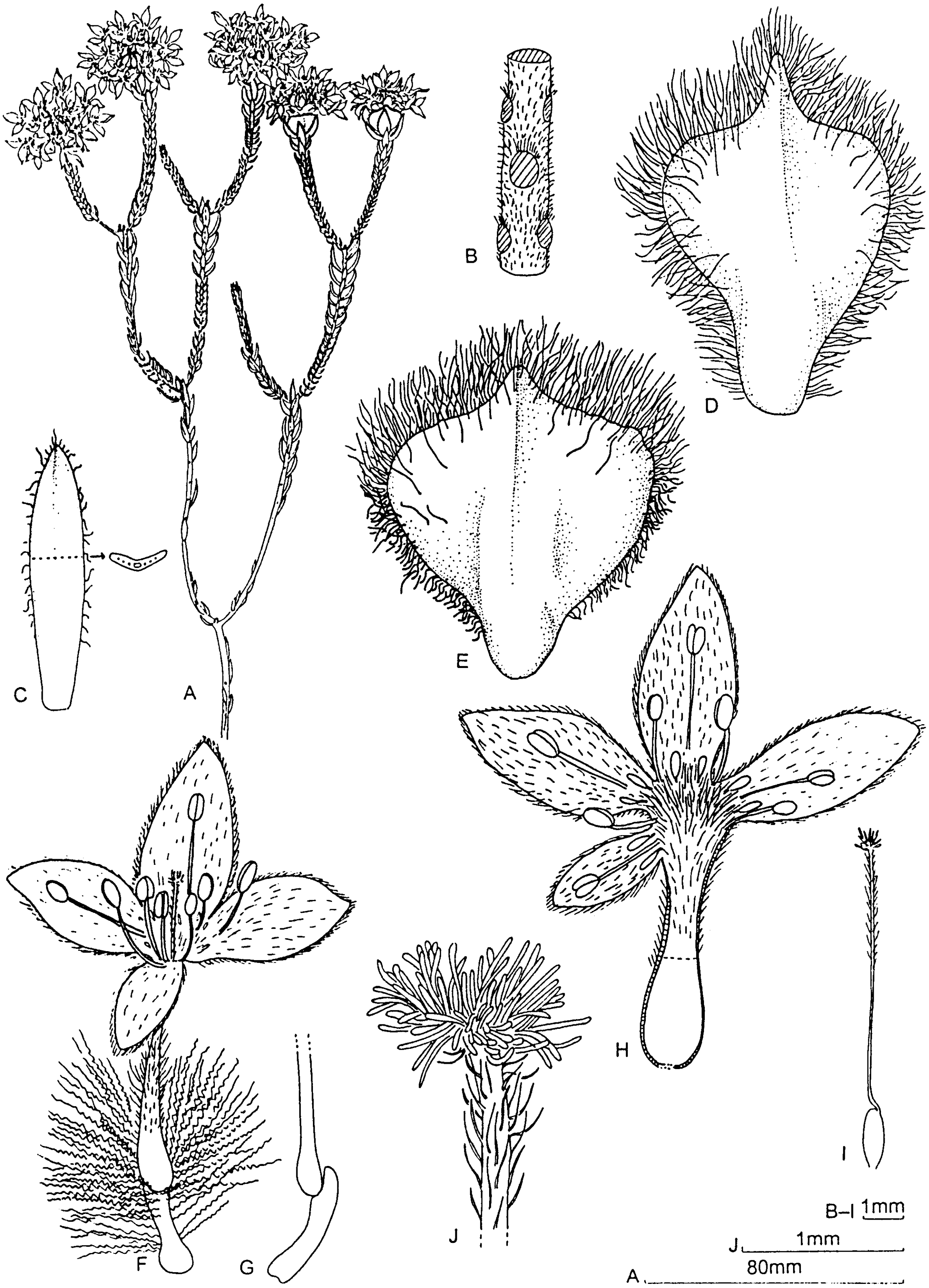

FIGURE 7.69—*Lachnaea eriocephala*, *Beyers 54* (NBG). A, portion of plant; B, branch with leaves removed; C, leaf (abaxial view and cross section); D & E, bract-like leaves subtending inflorescence: D, from subdistal pair; E, from distal pair; F, flower; G, pedicel abaxially produced beyond point of attachment of flower (lateral view); H, flower split longitudinally with gynoecium removed, note circumscission zone (arrowed); I, gynoecium; J, stigma and upper portion of style.

southwards to Betty's Bay at altitudes between 100 and 500 m (Figure 7.70). The collection by Thunberg from the hot water springs in the Swartberg at Caledon is probably incorrect. No other collections have been made from this area. In the vicinity of Tulbagh the plants are predominently mauve-flowered, rarely cream-flowered, whereas southwards all the plants have cream flowers. Flowering has been recorded from July to November.

Conservation status: Lower Risk Least Concern (LRlc).

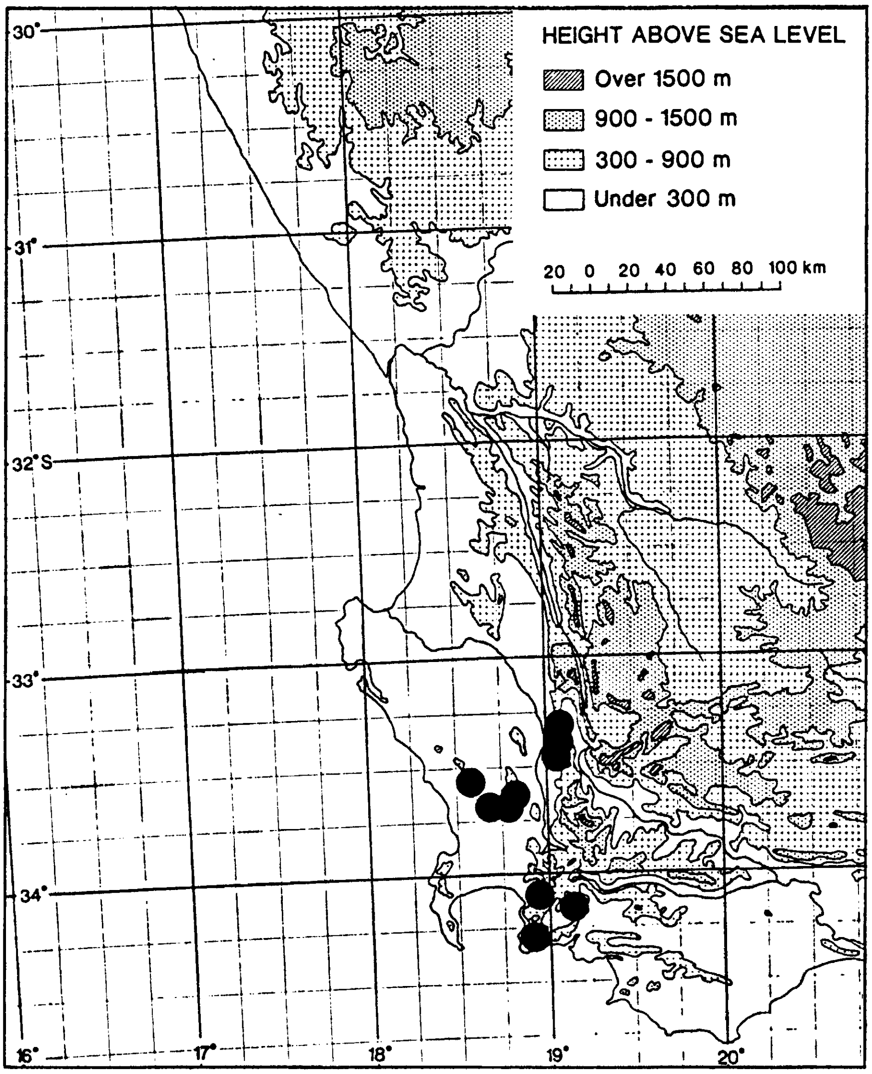

FIGURE 7.70—Known distribution of *Lachnaea eriocephala*.

Diagnostic characters and relationships

Lachnaea eriocephala is distinguished from the other species with large, showy inflorescences with zygomorphic flowers by the decussate, imbricate, lanceolate to narrowly elliptic leaves, which are abaxially keeled and the pedicels which elongate abaxially beyond the point of the flower attachment. It is easily distinguished from the species with the latter type of pedicels by the strongly zygomorphic flowers.

Specimens examined

WESTERN CAPE.—3318 (Cape Town): Darling Wild Flower Show [exact locality unknown], 17-09-1981, *Bean 676* (BOL); Malmesbury Dist., Paardeberg, SE slopes above Hoornbosch, (–AB) , 29-09-1974, *Esterhuysen 33634* (BOL); Malmesbury Div., NE base of southern prolongation of Dassenberg, (–AB), 03-09-1933, *Pillans 6880* (BOL); Dassenberg, E slope, sandy soil, 165 m, (–AB), 07-08-1966, *Rourke 498* (NBG); between Paardeberg and Dassenberg, below 130 m, (-BC/DB), 18-09-1927, *Drège s.n.* [(III, D, a) (a)] (P); Dassenberg, between Paardeberg and Groenkloof, below 160 m, (–DA), Sept., *Drège s.n.* [*L. eriocephala* Lam. a] (K, S); Klipheuwel, 18 km from N1 on R304, at radio masts, 100 m, (–DA), 09-09-1994, *Rugge s.n.* (K, NBG, PRE); between Paardeberg and Grootfontein, below 130 m (–DB), 30-07-1828, *Drège s.n.* [(III, D, a) (a)] (P).
—3319 (Worcester): Tulbagh Wild Flower Show [exact locality unknown], 13-09-1950, *Esterhuysen 17458* (BOL); *ibid.*, 13-09-1969, *Van der merwe s.n. sub STE* (NBG); Worcester, Tulbagskloof (Nieuwekloof), Tulbaghstahl, foot of Winterhoeksberg, (–AA/AC), Sept., *Eckon & Zeyher* 77.9 (NY); *ibid.*, Witsenberg, Sept, *Zeyher NBG 52647* (NBG), as *Zeyher PRE 49152* (PRE); Worcester, Nuwekloof, foot of Winterhoeksberg, Witsenberg, (AA/AC), Sept., *Ecklon & Zeyher 77.9* (S, NY, Z); Tulbagh Dist., Obiekwa Mtns, farm Oudekloof, W slopes S of Oukloof Pass, 500 m, (–AC) 29-09-1994, *Beyers 237* (NBG); Tulbagh Dist., Oukloofberg, SW slopes above Oukloof Pass, 300 m (–AC) 29-09-1994, *Beyers 238* (BOL, K, MO, NBG, PRE); near Tulbaghkloof, in mountains, (–AC), Oct. 1895, *Bolus 13641* (BOL); Wellington area, Welbedagt farm, shallow sand over rocky clay, 160 m, (–AC) 12-07-1978, *Boucher 3831* (NBG); Nuwekloof, 330 m, (–AC), 18-10-1828, *Drège 1202* (P); *ibid.*, *Drege s.n.* [*L. eriocephala* Lam. b] (K); *ibid.*, near Tulbagh, in mountains,400 m, Oct, 1885, *MacOwan HNAA 541* (BOL, SAM, Z); mountains, Tulbagh, (–AC), Sept., *Ecklon & Zeyher 31* (SAM); W slopes of Vogelvlei Mtns near Gouda, (–AC), 09-09-1951, *Esterhuysen 18794* (BOL, NBG); Roodezand, Oukloof, (–AC), *Niven s.n.* (K).
—3418 (Simonstown): Sir Lowry's Pass, 400 m, (–BB), 14-10-1928, *Adamson BOL 46855* (BOL); *ibid.*, 28-09-1942, *Barker 1729* (BOL); *ibid.*, foot of pass, 03-09-1988, *Beyers 54* (NBG, PRE); *ibid.*, 200 m, Oct. 1880, *Bolus 5553* (BOL, GRA, SAM, Z); *ibid.*, 200 m, 22-09-1972, *Boucher 1885* (NBG); *ibid.*, 140 m, 22-10-1984, *Brits 45* (NBG); *ibid.*, 23-07-1955, *Clemitson s.n.* (NBG); *ibid.*, 09-11-1941, *Compton 12328* (BOL); *ibid.*, 03-09-1942, *Compton 13485* (BOL); *ibid.*, 01-09-1943, *Compton 14714* (BOL); *ibid.*, foot of Hottentots Holland Mtns, 06-08-1950, *Esterhuysen 17405* (BOL); *ibid.*, 11-07-1890, *Guthrie & Guthrie 2003* (BOL); *ibid.*, *Hoekstra BOL 46856* (BOL); *ibid.*, Oct. 1943, *Levyns 8557* (BOL); *ibid.*, Nov. 1944, *Lewis 1574* (SAM); *ibid.*, 18-08-1958, *Loubser 1056* (NBG); *ibid.*, ±160 m, *MacOwan 3178* (GRA); *ibid.*, lower N slopes, 200 m, 07-09-1975, *Oliver 6033* (NBG); *ibid.*, 150 m, 31-10-1946, *Parker 4143* (BOL, K, NBG); *ibid.*, 260 m, 17-09-1983, *Richardson 15* (NBG); *ibid.*, NW slopes, 15-09-1976, *Spreeth 141* (NBG); *ibid.*, 100 m, 15-07-1892, *Schlechter 1128* (GRA, SAM, Z); *ibid.*, Aug. 1951, *Stokoe s.n.* (NBG); *ibid.*, 23-09-1959, *Van Rensburg 441* (NBG); below Sir Lowry's Pass, foot of Hottentots Holland Mtns, S of Nat. Rd, (–

BB), 19-09-1956, *Dahlgren & Peterson 366* (NBG); Somerset West Dist., W lower slopes of Hottentots Holland Mtns, NE Nat. Rd, 500 m, (–BB) 27-11-1956, *Dahlgren & Peterson 1296* (K, NBG); Hottentots Holland, (-BB), 09-09-1928, *Hutchinson 312* (BOL, K); *ibid.*, *Pappe SAM 19789a* (SAM); Sir Lowry's Pass Fort, (–BB), 03-08-1951, *Martin 786* (BOL); Hottentots Holland Mtns, (–BB), Oct., *Pappe SAM 43747* (SAM); *ibid.*, 22-09-1846, *Prior s.n.* (Z); Sir Lowry's Pass Village, SW slope of Sir Lowry's Pass Road,(–BB), 29-09-1974, *Schabort 1* (NBG); Betty's Bay, (–BD), 20-08-1952, *Brunt BOL 46854* (BOL). —3419 (Caledon): Houhoek, (–AA), Sept., *Pappe SAM 19789* (SAM); *ibid.*, 28-09-1826, *Von Ludwig* (NY). Grid ref. unknown: *Drège s.n. SAM 19788* (SAM); mountains between Hottentots Holland and Caledon, Oct.–Nov., *Ecklon & Zeyher 101* (S, Z); Cape of Good Hope, 1775, *Thunberg* [*P. cephalophora*] (S). Without locality: Oct. 1820, *Ecklon s.n.* (S).

36. **Lachnaea naviculifolia** *Compton* in Journal of Botany 72: 21 (1934b). Type: Cape Province; Ceres Div., precise locality unknown. Exhibited at Ceres Wild Flower Show, October 1932, *Compton 4158* (BOL, holo.!; K, iso.!).

Erect, sparsely to moderately branched shrub up to 1.5 m tall, multistemmed at base; resprouter. *Branches* ascending, slender, terete, puberulent to sericeous below inflorescence [± 6 pairs of distal leaves], below glabrous or occasionally covered with short adpressed hairs, leafy, becoming naked with prominent leaf scars. *Leaves* decussate, ascending, erect or with apex turned inward, scattered, internodes quarter to two-thirds as long as leaves, those below inflorescence crowded, sessile, epistomatic, glaucous, narrowly elliptic to elliptic, occasionally narrowly ovate to ovate, 7.5–16.0 × 1.5–5.5 mm, coriaceous or subfleshy, glabrous, adaxially obtusely concave, enervate, white-punctulate, dull, abaxially obtusely convex, enervate, glossy or dull, margin inflexed, apex rounded, base rounded; distal 3 pairs below inflorescence becoming gradually larger upward and bract-like, winged, elliptic to very widely elliptic or obovate to very widely obovate, 6.0–21.5 × 4.0–13.0 mm, coriaceous, glaucous or green tinged red, greeny yellow tinged red or reddish, adaxially concave, abaxially convex, subkeeled towards the apex, glabrous or adpressed hairy at apex, margin membranous, ciliolate, more so in upper half, apex cuspidate or mucronate, base rounded or cuneate. *Inflorescence* a terminal, sessile, more than 20-flowered, pseudobracteate, capitate-like umbel with 8–15 open flowers at a time, 18–35 mm in diameter, usually only on main flowering branches; ebracteate umbel appears to be enclosed at base by 2 or 3 pairs of involucral bracts but vegetative shoots develop in axils of these bract-like leaves, although generally branching occurs below subdistal pair of bract-like leaves. *Flowers* subactinomorphic, white or white tinged pink or mauve, or cream, pale pink, pale blue, pale yellow or yellowish green, scented. *Pedicel* dorso-ventrally flattened, abaxially produced beyond point of attachment of flower, rectangular, 2.0–4.5 mm long, elongating in fruiting stage, adaxially villous, abaxially sericeous. *Hypanthium* 7–13 mm long, circumscissile fifth to two-fifths from base, upper portion narrowly funnel-shaped, sericeous on both sides, basal portion ellipsoid or obovoid, outside puberulent in upper third, rest glabrous, within glabrous. *Sepals* patent, ± equal or occasionally subequal, adaxially glabrous or occasionally sparsely sericeous along midvein, abaxially sericeous, elliptic, rounded to obtuse, anterior one 4.0–8.0 × 2.2–4.0 mm, lateral ones 3.4–6.2 × 2.0–4.0 mm, posterior one 3.6–6.5 × 1.6–3.8. *Stamens* exserted, outer, antisepalous whorl inserted at base of sepals, inner, antipetalous whorl inserted at rim of hypanthium, shorter than outer whorl; filaments filiform, outer 3.0–5.5 mm long, inner 1.4–3.5 mm long; anthers oblong or ellipsoid to widely ellipsoid, 0.6–1.3 mm long, abaxially with broad connective tissue. *Scales* exserted, inserted at mouth of hypanthium immediately below antipetalous stamens, linear, 0.8–2.0 mm long, glabrous, translucent white in fresh state. *Ovary* ellipsoid or obovoid, 1.6–2.4 mm long, glabrous. *Style* linear-obconical, 8.0–14.5 mm long, sericeous in upper half. *Stigma* brush-like (Figure 7.71).

Distribution and ecology

Lachnaea naviculifolia ranges from the central Cederberg in the north, along the eastern side of the Cold Bokkeveld to as far south as Watervalsberg at altitudes between 1000 and 1865 m, occuring in sandy, flat areas and steep, rocky slopes (Figure 7.72).

Both narrow and broad leaved-forms occur. Those with usually narrow leaves occur in the central Cederberg. Around Sneeuberg and Kromrivier both leaf forms occur, whereas southwards the leaves are broader and slightly succulent. Flowering has been recorded from August to November.

Conservation status: Lower Risk Least Concern (LRlc).

Diagnostic characters and relationships

Lachnaea naviculifolia is allied to *L. eriocephala*. Both have the derived character state of pedicels abaxially produced beyond the flower attachment. It is easily

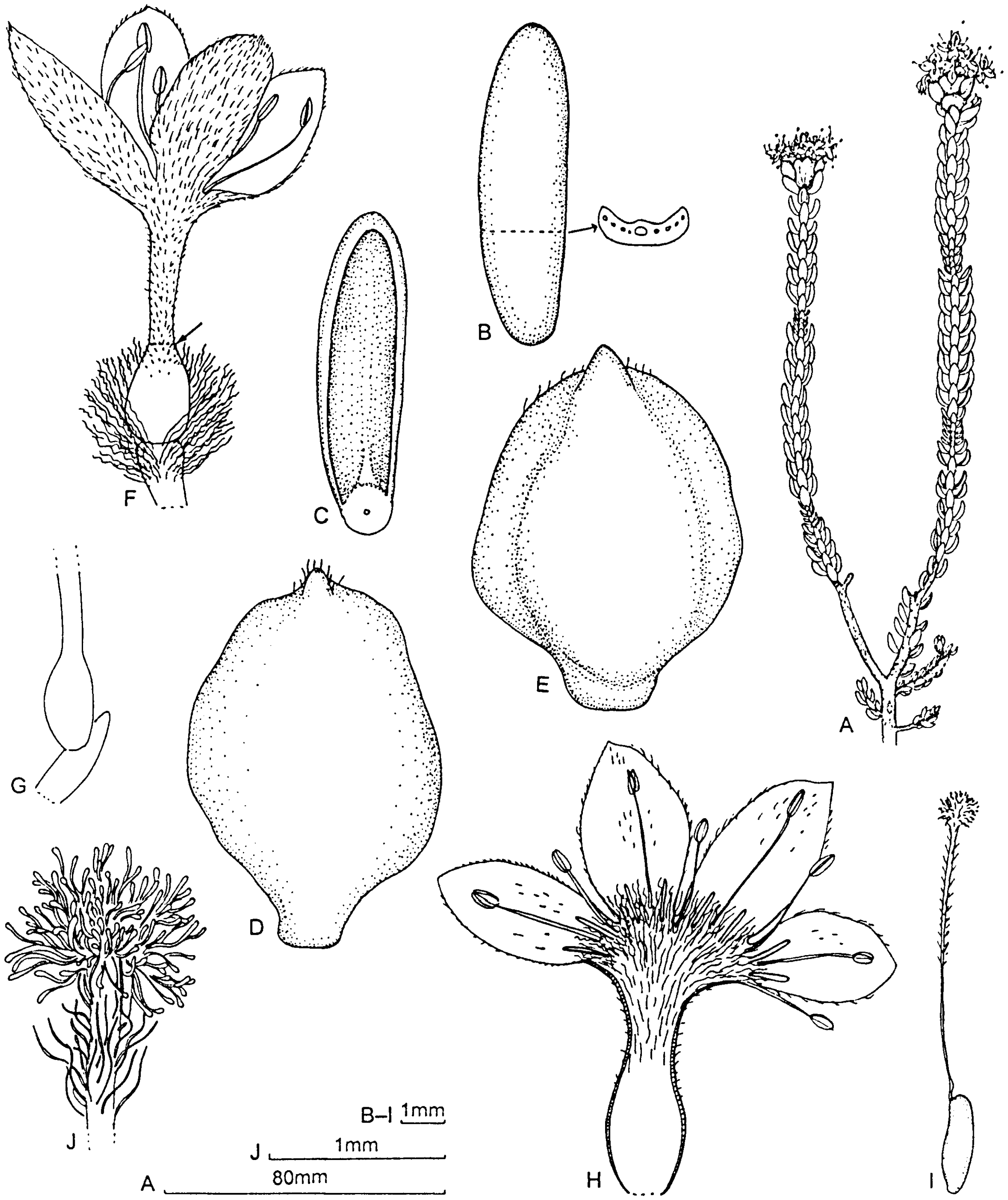

FIGURE 7.71—*Lachnaea naviculifolia*, *Forsyth 525* (NBG). A, portion of plant; B & C, leaves: B, abaxial view and cross section; C, adaxial view; D & E, bract-like leaves subtending inflorescence: D, from subdistal pair; E, from distal pair; F, flower, note circumscission zone (arrowed); G, pedicel abaxially produced beyond point of attachment of flower (lateral view); H, flower split longitudinally with gynoecium removed; I, gynoecium; J, stigma and upper portion of style.

distinguished from *L. eriocephala* by the glaucous, naviculoid (boat-shaped) leaves, more or less regular flowers, rectangular pedicels which are dorso-ventrally flattened and the linear scales which are not obscured by hairs in the mouth of the hypanthium.

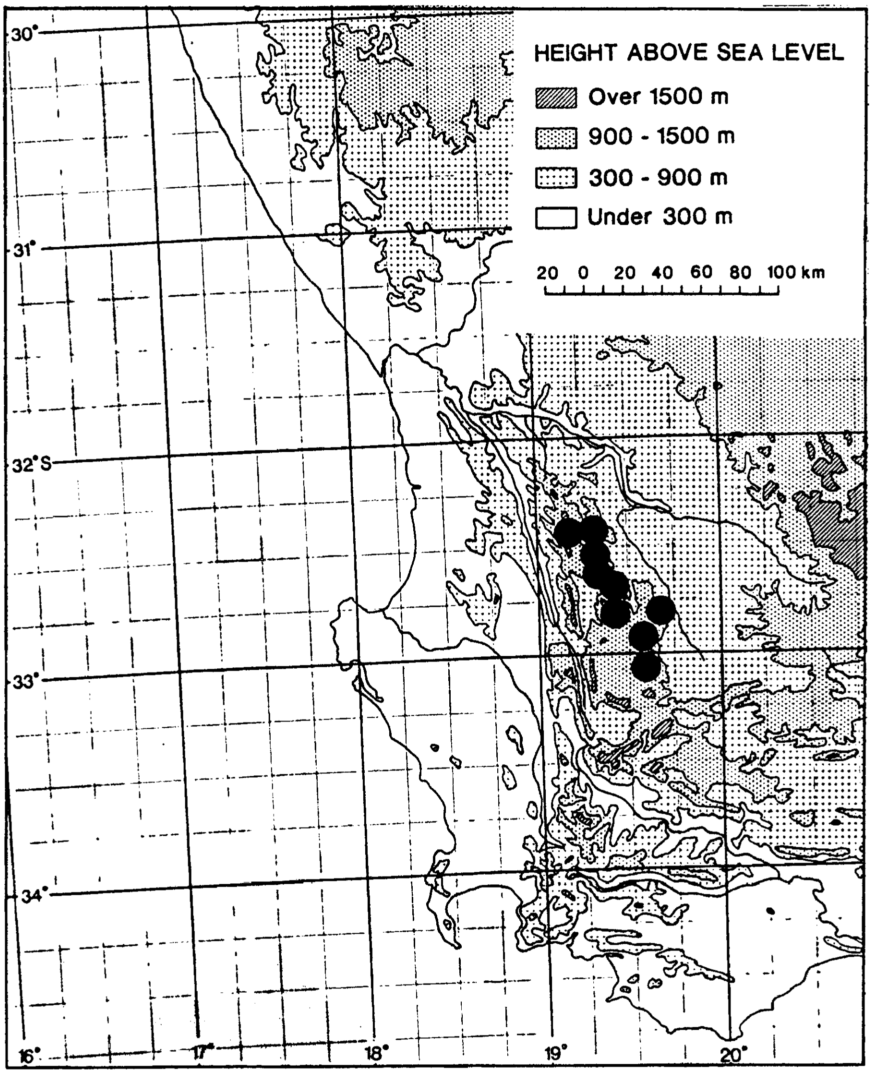

FIGURE 7.72—Known distribution of *Lachnaea naviculifolia.*

Specimens examined

WESTERN CAPE.—3219 (Wuppertal): Clanwilliam Dist., Cederberg [precise locality unknown], 24-09-1964, *Dose s.n.* (NBG); Clanwilliam Dist., Cederberg Mtns, Waterkloof [locality unknown], 1165–1330 m, 26-09-1942, *Esterhuysen 8109* (BOL, NBG); Cederberg Mtns [precise locality unknown], Nov. 1939, *Stokoe 8033* (BOL); Cederberg, Sneeuberg hut, near water, (–AC), 22-07-1972, *Andrag 105* (NBG); *ibid.*, NW aspect, ± 1450 m, 24-09-1983, *Taylor 10676* (NBG); *ibid.*, moist seepage below sandflats, 1350 m, 18-09-1984, *Taylor 11058* (NBG); *ibid.*, rocky places, 06-07-1964, *Venter NBG 77433* (NBG); Cederberg, Welbedachtkloof, 1066 m, (-AC), 03-09-1973, *Andrag 233* (NBG); *ibid.*, near Tafelberg, 1865 m, 23-09-

1930, *Barnes BOL 19295* (BOL); *ibid*., 1500 m, Sept. 1930, *Barnes BOL 46927* (BOL); Cederberg Mtns, Sneeuberg, along path from hut to Maltese Cross, (–AC), 23-10-1988, *Beyers 114* (NBG); Cederberg, near Sneeuberg hut, rocky slopes and small kloofs, (–AC), 04-09-1975, *Durand 55* (NBG); *ibid*., 1400 m, 03-09-1971, *Haynes 583* (NBG); South Cederberg, Sneeuberg, shale band on E side, 1330 m, (–AC), 11-10-1946, *Esterhuysen 13087* (BOL); *ibid*., sandy, rocky slopes, 1330 m, 01-09-1963, *Esterhuysen 30299* (BOL, S); Cederberg State Forest, Hoogvertoon, W aspect, ± 1400 m, (–AC), 30-08-1973, *Haynes 816* (NBG); *ibid*., in sand, 1300 m, 17-08-1982, *Viviers 522* (NBG); Cederberg, Wolfberg, Gabriel's Pass, stony slopes, (–AC), 12-09-1995, *Hansford, M s.n.* (NBG); Cederberg, Hoogvertoon near Sneeuberg, moist sandy areas between rocks, 1300 m, (–AC), 07-09-1982, *Le Maitre 328* (NBG); Cederberg, along path to Welbedacht Cave, (–AC), 05-09-1965, *Reinecke s.n. sub Mattatia 30* (BOL); Cederberg, rocky pass beyond hut en route to Maltese Cross, E slope, 1300 m, (–AC), 09-12-1982, *Taylor 10510* (NBG); Cederberg below Wolfberg cracks, burnt slopes, (–AC), 26-09-1970, *Wicomb s.n.* (NBG); Cederberg, Wolfberg, rocky SE slopes, (–AD), 03-10-1952, *Esterhuysen 20577* (BOL, S); Cederberg, Kromrivier, 830 m, (–CB), 27-09-1934, *Compton 4896* (BOL, NBG); *ibid*., amongst rocks, 04-10-1952, *Esterhuysen 20484* (BOL); *ibid*., Aug. 1949, *Stokoe SAM 62666* (SAM), *Stokoe SAM 62667* (SAM); Ceres Dist., Zandfontein Peak, 1330 m, (–CB), 05-04-1947, *Compton 19441* (NBG); Cold Bokkeveld, Bloukop, rocky slopes, 1330–1665 m, (–CB), 01-10-1958, *Esterhuysen 27910* (BOL); Southern Cedarberg, Bloukop, E-facing slope, rocky soils, 1200 m, (–CB), 13-10-1990, *Forsyth 525* (NBG); NE Cold Bokkeveld, Blinkberg, E-facing upper rocky slopes, 1500 m, (–CB), 01-11-1983, *Oliver 8062* (NBG); South Cederberg, Gideonskop, rocky dry N slopes, 1600 m, (–CB), 31-10-1987, *Oliver 9038* (NBG); *ibid*., 1500 m, 25-10-1966, *Rourke 663* (NBG); between Kleinveld and Sonderwater, rocky, sandy fynbos, (–CD), 28-10-1977, *Emdon 215* (NBG); Zuurvlakte, N of Rozendal Farm, 1080 m, (–CD), 04-02-1990, *Hugo 2266* (NBG); Ceres Dist., Skurweberg, top of pass on flat area in sand, (–CD), 21-09-1985, *Viviers 1504* (BOL); Ceres Karoo, Kaggakamma, outcrops before gate, (–DA), 18-09-1994, *Hansford 40* (NBG); Swartruggens, Katbakkies, 1330 m, (–DC), 27-09-1926, *Adamson 1902* (BOL); Swartruggens; Zuurvlakte, on road to Katbakkies Pass, near turnoff Lord's Acre, 1020 m, (–DC), 14-11-1993, *Beyers 221* (NBG).

—3319 (Worcester): Worcester, Watervalsberg, in dry sand, (–BA), 29-11-1990, *Powrie 352* (NBG). Grid ref. unknown: Ceres Show, 03-10-1932, *Compton 4158* (BOL); Ceres Wild Flower Show, Oct. 1931, *Compton 3986* (BOL, NBG); *ibid*., 01-10-1934, *Compton 4894* (BOL, NBG); Cold Bokkeveld, Dwarsberg,1000 m, 29-09-1926, *Levyns 1943* (BOL); Ceres mountains, Sept. 1824, *Marloth 6250* (NBG); Clanwilliam, July 1967, *Meyer s.n.* (NBG).

37. **Lachnaea rupestris** *Beyers*, sp.nov. a *L. marlothii* pubescentia exili ramorum, foliis glabris, pedicellis ventraliter complanatis et abaxialiter trans flores elongatis, staminibus antisepalis in base sepalorum insertis, squamis anguste ellipsoideis vel angusta obovoideis dignoscenda.

TYPE.—Western Cape, Stettynsberg, south-western slopes, 3319CD, *Esterhuysen 11102* (BOL, holo.!; PRE!, iso.).

Low straggling, moderately branched, shrub up to 0.2 m tall, single-stemmed at base branching near the ground; reseeder. *Branches* ascending to patent, slender, terete, clothed with short crisped hairs admixed with short, retrose ones, leafy, later glabrescent and naked without prominent leaf scars. *Leaves* decussate, subadpressed or ascending, scattered, internodes one-third to as long as leaves, sessile, epistomatic, lanceolate or narrowly elliptic, 3.0–5.4 × 0.6–1.0 mm, coriaceous, adaxially concave, enervate, dull, abaxially convex, often subkeeled in upper half, glossy, glabrous, apex rounded or subacute, base rounded; distal two leaf pairs subverticillate, partially enclosing inflorescence, broader than other leaves, bract-like, coriaceous, green or green with maroon tinge, glabrous, adaxially concave, abaxially convex keeled in upper half; elliptic to widely elliptic or obovate to widely obovate, 3.2–5.0 × 1.6–2.9 mm, margin ciliate, apex mucronulate or acute. *Inflorescence* a terminal, sessile, 12–22-flowered, pseudobracteate umbel with 3–5 open flowers at a time, 5–7 mm in diameter, on main flowering branches or also on a few, short, lateral branches immediately below main inflorescence forming a compact glomerule at apex of main flowering branch; umbel appears to be enclosed by two pairs of involucral bracts but vegetative shoots develop in axils of these bract-like leaves, although new shoots mostly arise from axils of subdistal pair of bract-like leaves. *Flowers* subactinomorphic, mauve or cream with mauve tinge, pedicellate. *Pedicel* dorso-ventrally flattened, abaxially produced beyond point of attachment of flower (more noticeable in fruiting stage), oblong, 0.4–1.2 mm long, slightly elongating in fruiting stage, villous. *Hypanthium* 2.0–2.5 mm long, circumscissile two-thirds to midway from base, upper portion funnel-shaped, sericeous outside, adpressed hirsute within, basal portion ellipsoid, outside for most part glabrous but in vicinity of circumscission zone puberulous, within glabrous. *Sepals* patent, subequal, ovate to elliptic, 1.6–1.9 × 0.8–1.4 mm, apex subacute or rounded, adaxially spasely adpressed hairy or glabrous, abaxially sericeous. *Stamens* exserted, outer, antisepalous whorl inserted at base of sepals, inner, antipetalous whorl inserted on rim of hypanthium, shorter than outer whorl; filaments filiform, outer 1.0–1.2 mm long, inner 0.7–0.9 mm long; anthers widely ellipsoid to spheroid, 0.3–0.4 mm long, abaxially without broad connective tissue. *Scales* exserted, inserted immediately below antipetalous stamens in mouth of hypanthium, narrowly obovoid or narrowly ellipsoid, 0.4–0.6 mm long, glabrous. *Ovary* ellipsoid, ± 1.0 mm long, glabrous. *Style* linear-obconical, 1.9–2.2 mm long, covered with silky ascending hairs in upper half. *Stigma* brush-like (Figure 7.73).

Distribution and ecology

Lachnaea rupestris is known from the Stettynsberg north of Villiersdorp to Riviersonderend Mountains above Genadendal, where it grows in rocky places at altitudes above 1500 m (Figure 7.74). Flowering has been recorded in October to December.

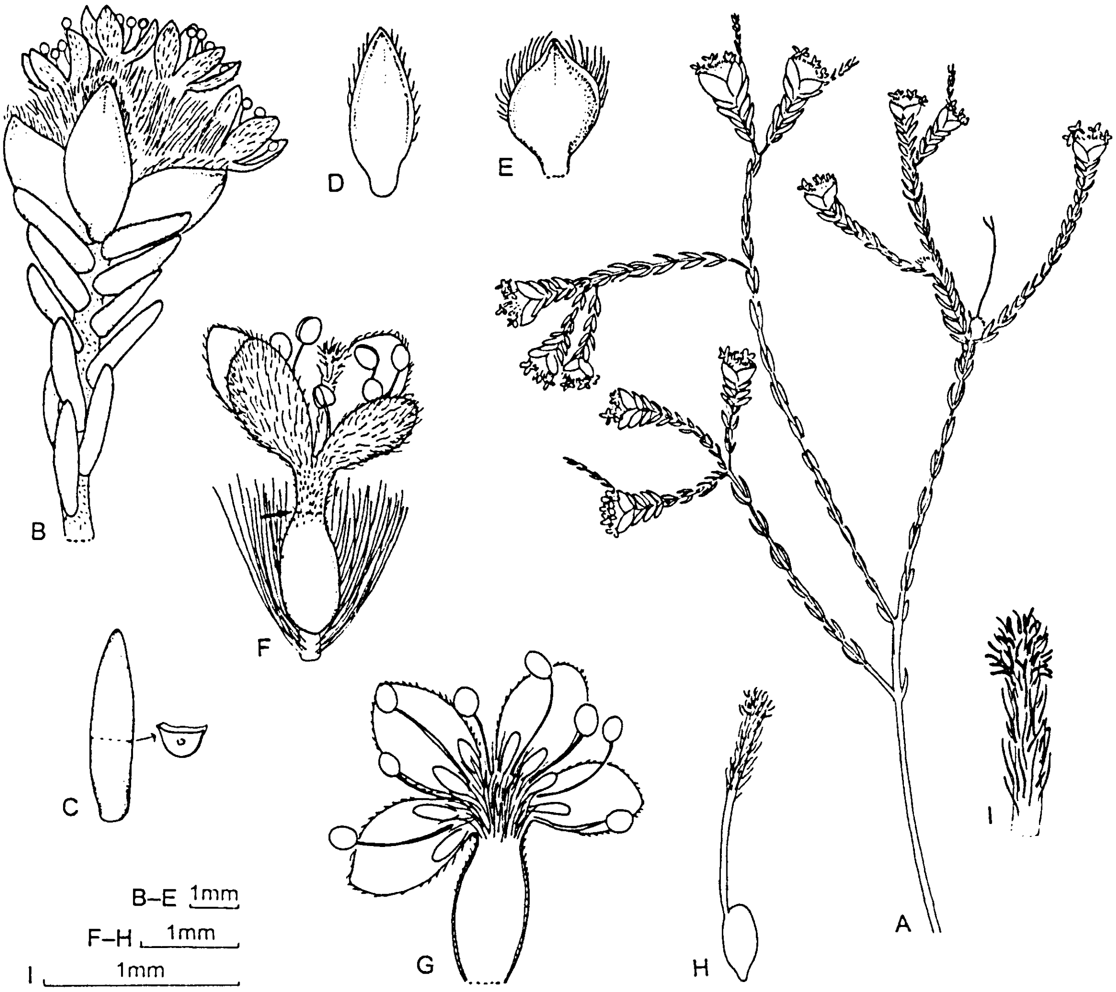

FIGURE 7.73—*Lachnaea rupestris*, *Esterhuysen 11102* (BOL). A, portion of plant (life size); B, flowering branch; C, leaf (abaxial view and cross section); D & E, bract-like leaves subtending inflorescence; D, from subdistal pair; E, from distal pair; F, flower, note circumscission zone (arrowed); G, flower split longitudinally with gynoecium removed; H, gynoecium; I, stigma and upper portion of style.

As I have not seen this species in the wild, the descriptions are based solely on herbarium specimens.

Conservation status: Vulnerable (VU D2). Only known from a few localities and being a reseeder, it would be vunerable to frequent fires.

Diagnostic characters and relationships

Lachnaea rupestris is allied to *L. eriocephala* and *L. naviculifolia*, but is easily distinguished by its low straggling habit. It is superficially very similar to *L. marlothii* from which it can be distinguished by the thin pubescence of the branches, glabrous leaves, dorso-ventrally flattened pedicels which are abaxially produced beyond the point of attachment of the flower, antisepalous stamens inserted at the base of the sepals and the narrowly ellipsoid or narrowly obovoid scales.

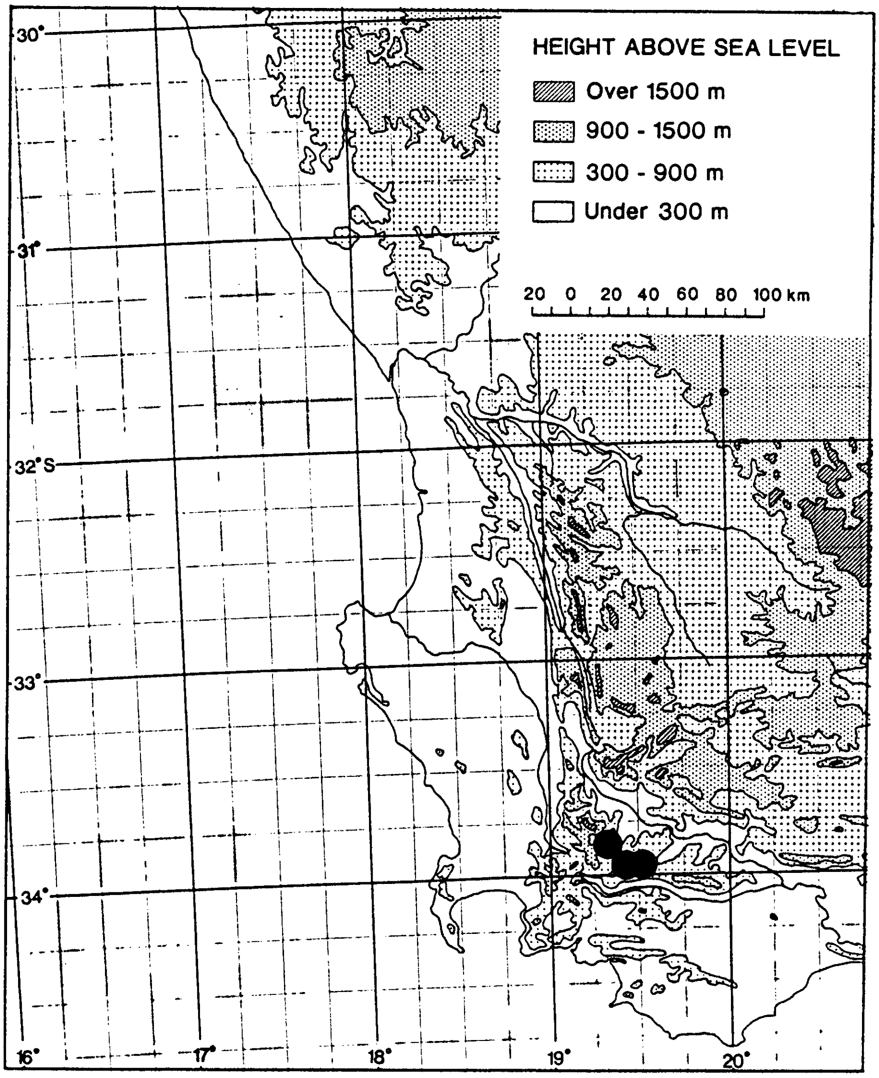

FIGURE 7.74—Known distribution of *Lachnaea rupestris*.

Etymology

The rocky habitat favoured by this species has promted the specific epithet, which means rock-dwelling.

Specimens examined

WESTERN CAPE.—3319 (Worcester): Stettynsberg, SW slopes, 1665 m, (–CD), 16-12-1944, *Esterhuysen 11102* (BOL, PRE); Caledon/Worcester Dist., Langberg, 1665 m (–CD), Oct. 1965, *Oliver s.n.* (NBG).
—3419 (Caledon): Genadendal Mtns, top of Baviaanskloof, 1500 m, (–BA), Nov. 1930, *Stokoe 2524* (BOL); *ibid.*, 1500 m, 1930, *Stokoe 2533* (PRE).

38. **Lachnaea globulifera** *Meisn.*, Linnaea 14: 412 (1840); Meisn.: 576 (1857); C.H.Wright: 24 (1915). Type: In sandflats near Goudini, alt. 800–1200 ft (IV. B. b.), *Drège s.n.* (NY, holo!; K!, P!, S!, SAM!, iso.).

Gonophylla setosa Eckl. & Zeyh. ex Meisn.—*nom. nud.* in A.P. de Candolle, Prodromus systematis naturalis regni vegetabilis 14: 576 (1857) in synonymy.

Two subspecies are recognized on the basis of regeneration strategy, indumentum of the branches and geographic separation.

38a. subsp. **globulifera**.

Slender, erect, sparsely to moderately branched shrub up to 0.6–(0.9) m tall, single-stemmed at base; reseeder. *Branches* ascending, slender, wiry or semi-rigid, terete, at first covered with short, crisped hairs, later glabrescent, leafy, becoming naked without prominent leaf-scars. *Leaves* (excluding bract-like leaf pair subtending inflorescence) decussate, adpressed or ascending, scattered with internodes a quarter to one and a half as long as leaves, sessile, epistomatic, narrowly elliptic or lanceolate, 5.4–12.0 × 0.7–1.7 mm, coriaceous, glabrous, adaxially obtusely concave to concave, enervate, ± white punctulate, dull, abaxially convex, subkeeled, glossy, apex acute to mucronate, sometimes tinged red, base rounded; those below inflorescence gradually wider to 2.5 mm wide, apex acuminate, margin occasionally ciliate; bract-like leaf pair subtending inflorescence narrowly elliptic to widely elliptic, ovate or obovate, 3.5–6.8(–10.0) × 1.7–3.5(–6.0) mm, coriaceous, green with maroon tinge, glabrous, margin membranous, ciliate, apex acute to acuminate, base attenuate. *Inflorescence* a terminal, sessile, bracteate, ± 50-flowered, capitate-like umbel with up to 14 open flowers at a time, 5–20(–25) mm in diameter, on main flowering branches and also on a few short lateral branches immediately below main inflorescence forming a compact glomerule; bracteate umbel appears to be enclosed at base by 2 pairs of involucral bracts but only 1 pair immediately below flowers may be regarded as being true bracts as vegetative shoots develop in axils of subdistal pair. *Involucral bracts* 2, widely elliptic to widely obovate, 4.5–6.0(–10.0) × 2.3–4.5(–7.0) mm, coriaceous, green with maroon tinge, glabrous, adaxially concave, abaxially convex, keeled, margin membranous, ciliate, apex acute, mucronate or acuminate. *Flowers* ± actinomorphic, cream, cream with pink tinge or pale mauve, others cream turning mauve with age, unscented, pedicellate. *Pedicel*, dorso-ventrally flattened, oblong to linear, abaxially elongated beyond insertion of flower, 0.3–2.2 mm long, elongating in fruiting stage, densely villous. *Hypanthium* 2.2–3.6(–7.0) mm long, circumscissile quarter to midway from base, upper portion narrowly funnel-shaped, sericeous outside, within adpressed hirsute, basal portion ovoid to obovoid, outside puberulent in upper third to four-fifths, glabrous below, within glabrous. *Sepals* patent, ± equal, adaxially sparsely sericeous or glabrescent, abaxially sericeous, elliptic to widely elliptic, ovate to widely ovate or widely obovate, 1.5–3.5(–4.5) × 1.3–2.5 mm, rounded. *Stamens* exserted, outer, antisepalous whorl inserted at base of sepals, ± length of sepals, inner, antipetalous whorl inserted at rim of hypanthium, shorter than outer whorl; filaments filiform, outer 1.3–3.0(–4.4) mm long, inner 0.8–2.1(–3.5) mm long; anthers oblong to spheroid, 0.3–0.4(–0.8) mm long, abaxially without broad connective tissue. *Scales* exserted, inserted at mouth of hypanthium immediately below antipetalous stamens, obscured by hairs in mouth, filiform, 0.2–0.6 mm long, glabrous, translucent in fresh state. *Ovary* narrowly obovoid or narrowly ellipsoid to ovoid, 0.8–1.5 mm long, glabrous. *Style* filiform, 1.7–4.0(–8.0) mm long, adpressed hairy in the upper half to upper three-quarters. *Stigma* brush-like (Figure 7.75).

Distribution and ecology

Lachnaea globulifera subsp. *globulifera* has been recorded from the lower mountain slopes and flats of the Winterhoeks Mountain north of Tulbagh southwards through Bainskloof to Du Toit's Kloof and southeast to Stettyn Mountain near Villiersdorp. It grows in sandy or sandy, stony soil at altitudes between 200 and 1100 m (Figure 7.76).

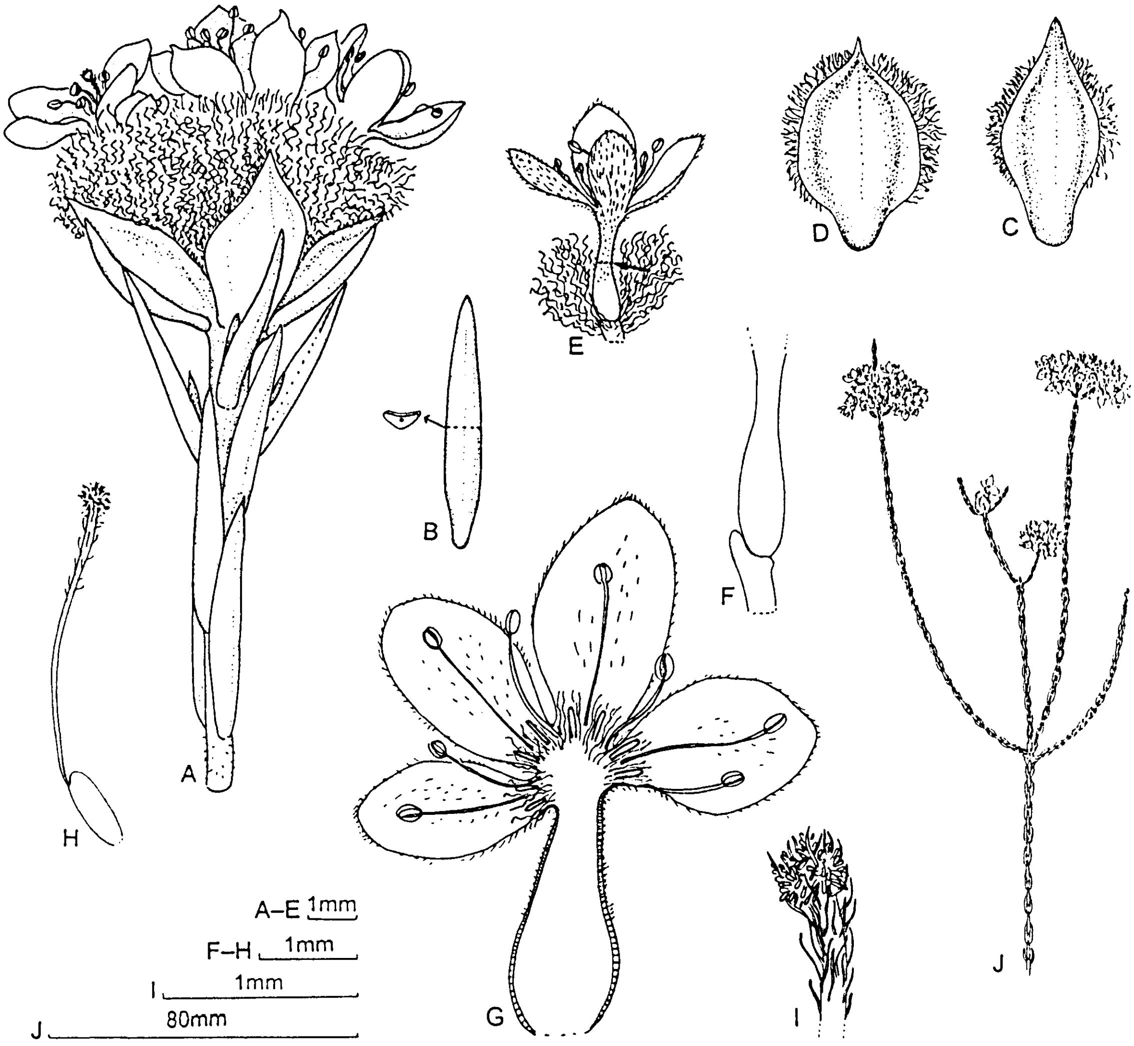

FIGURE 7.75—*Lachnaea globulifera* subsp. *globulifera*, *Beyers 240* (NBG): A, flowering branch; B, leaf (abaxial view and cross section); C, bract-like leaf from pair subtending inflorescence; D, involucral bract; E, flower, note circumscission zone (arrowed); F, pedicel abaxially produced beyond point of attachment of flower (lateral view); G, flower split longitudinally with gynoecium removed; H, gynoecium; I, stigma and upper portion of style. *L. globulifera* subsp. *incana*, *Brown 575* (NBG): J, portion of plant.

Flowering has been recorded mostly in July to November and occasionally in January, February and May.

Conservation status: Lower Risk Least Concern (LRlc). Being a reseeder, frequent fires may impact negatively on this species.

Diagnostic characters and relationships

Lachnaea globulifera subsp. *globulifera* is allied to *L. montana* and *L. pedicellata* based on the shared characters—inflorescence borne on main flowering branches and on short lateral flowering branches and the bracteate umbel with two involucral bracts, which is subtended by two bract-like leaves. It differs from *L. montana* by the ciliate involucral bracts, the smaller flowers and the filiform scales obscured by hairs in the mouth of the hypanthium. It is distiguished from *L. pedicellata* by the ciliate involucral bracts, the densly villous, oblong to linear pedicels and the filiform scales obscured by hairs in the mouth of the hypanthium.

Specimens examined

WESTERN CAPE.—3319 (Worcester): Tulbagh [precise locality unknown], *Pappe* (K); Winterhoeksberg, Tulbagh, (–AA), Nov., *Pappe SAM 1474* (SAM); Tulbagh Dist., Voëlvlei Mtns, summit, 500 m, (–AC), Oct. 1920, *Andreae 638* (NBG); Tulbagh Dist; Waterval, E slopes W of the waterfall on sandy flats, 350 m, (–AC), 29-09-1994, *Beyers 240* (NBG); *ibid.*, on sandy flats amongst retios, 350 m, 10-05-1991, *Hansford 16* (NBG); Tulbagh Waterfall, 500 m, (–AC), Nov. 1879, *Bolus 5259* (BOL, Z); *ibid.*, mountains above waterfall, Oct. 1882, *Bolus 5318* (BOL); *ibid.*, 16-11-1941, *Compton 12402* (NBG); *ibid.*, 330–665 m, Nov., *Ecklon & Zeyher 1.11* (GRA, NBG, Z); *ibid.*, 16-09-1928, *Hutchinson 398* (BOL, K); *ibid.*, mountain next to waterfall, *Pappe Herb. MacOwan* (Z); *ibid.*, above waterfall, 665 m, 26-05-1966, *Rycroft 2956* (NBG); *ibid.*, close to waterfall, 200 m, 04-09-1892, *Schlechter 1393* (GRA, K, S, Z); *ibid.*, 500 m, 15-02-1896, *Schlechter 7460* (BOL, K, Z); mountain slopes between Ontongskop and Tulbagh Waterfall, (–AC), 08-10-1980, *Burgers 2590* (NBG); slopes at E-base of Ontongskop, above Tulbagh Waterfall forestry area, (–AC), 25-10-1973, *Esterhuysen 33282* (BOL, S);Tulbagh-Zevenfontein Nature Reserve A, sandy soil in firebreak, ± 500 m, (–AC), 10-06-1969, *Haynes 108* (NBG); Tulbagh Waterfall Forest Reserve, Ontongskop, E-slopes, ± 465 m, (–AC), 11-07-1968, *Haynes 237* (NBG); *ibid.*, waterfall, E slope, NE of the kop, 700 m, 25-09-1991, *Oliver 9903* (NBG); Kluitjieskraal State Forest, Suurvlakte, ± 465 m, (–AC), 23-10-1973, *Haynes 852* (NBG); plateau between Tulbagh Waterfall and Kluitjieskraal, (–AC), 04-11-1976, *Hugo 767* (NBG); Kluitjieskraal Forest Station, W side, on mountain, (–AC), 04-11-1976, *Spreeth 143* (NBG, PRE); Mostertsberg, ± 315 m, (–AD), 30-01-1892, *Schlechter 856* (Z); *ibid.*, 1100 m, 31-01-1892, *Schlechter 934* (Z); Worcester Dist., Wolwekloof Forest Reserve, Bainskloof, in swamp, (–CA), 20-10-1946, *Barker 4234* (NBG); Bainskloof, (–CA), 30-08-1946, *Compton 18268* (NBG, S); *ibid.*, centre of kloof, N side, 14-11-1928, *Gillett 204* (NBG); *ibid.*, old Toll Gate, 30-08-1946, *Leighton 1980* (BOL, NY); *ibid.*, Nov. 1949, *Stokoe SAM 62668* (SAM); Worcester Div., N end of Du Toits Peak, slopes, E-aspect, 1000 m, (–CA), 06-10-1951, *Esterhuysen 18911* (BOL, NBG, PRE); Worcester Dist., Du Toits Kloof, 265 m, (–CA), 19-07-1962, *Walters 8* (NBG); Rawsonville, veld opposite Gevonden farmstall, (–CA), 19-07-1962, *Walters 475* (NBG); *ibid.*, Slanghoek, farm Ruigtevlei, 07-11-1976, *Walters 1559* (NBG); Goudini, sandflats (IV, B, b), 330 m, (–CB), 08-01-1829, *Drege s.n.* (NY, P, SAM); Rawsonville, hillside opposite Florence farm, (–CB), 30-09-1975, *Walters 859* (NBG); Worcester Dist; Stettyn Mtns, lower E slopes on farm Stettyn, 600 m, (–CD), 27-10-1994, *Beyers 253* (NBG). Grid ref. unknown: Ceres Div., St. Sebastians Kloof on ground level, Sept. 1939, *Stokoe 7102* (BOL, NBG). Without locality: *Ecklon & Zeyher PRE 12303* (PRE); *Liehmann s.n.* (NY).

38b. subsp. **incana** *Beyers*, subsp. nov. a subsp. *globulifera* habitu repullante, ramulis incanis, distributione magis septentrionali differt.

TYPE.—Western Cape, 3219 (Wuppertal): Citrusdal, Middelberg, stony, sandy soil against a rocky incline, (–CA), 3-11-1997, *Hanekom 2939* (NBG, holo.!; BOL!, K!, MO!, NY!, PRE!, S!, Z!, iso.).

L. globulifera var. *coerulescens* Eckl. & Zeyh. ex Meisn. in A.P. de Candolle, Prodromus systematis naturalis regni vegetabilis 14: 576 (1857); C.H.Wright: 24 (1915). Type: [80] *Gonophylla coerulescens* [Clanwilliam, mountains at Brakfontein, July = 76.7], *Ecklon & Zeyher s.n.*, (NY, holo!; S!, SAM!, Z!. iso).

Slender, erect or decumbent shrub, 0.3–0.6–(1.0) m tall, single-stemmed or multistemmed at base; resprouter. *Branches* felted, the older glabrescent. *Leaves* scattered, internodes half to three-quarters length of leaves, narrowly elliptic to lanceolate, 4.4–7.3 × 0.9–1.7 mm; bract-like leaf pair subtending bracteate inflorescence, ovate to elliptic, 3.7–5.3 × 1.9–3.5 mm, glabrous or towards abaxial margins adpressed pillose. *Inflorescence* 5.0–20.0 mm in diameter. *Involucral bracts* ovate to elliptic to widely elliptic, 4.0–5.7 × 2.0–3.7 mm, glabrous or towards abaxial margin adpressed pillose. *Hypanthium* 3.2–4.5 mm long, circumscissile two-fifths to three-fifths from base, basal portion outside puberulent in upper half, trichomes variable, ellipsoid to ± clavate or acicular as in upper portion. *Sepals* ovate, elliptic to widely elliptic or rotund, 2.6–3.8 × 1.7–2.7 mm, apex acute, rounded or obtuse. *Ovary* ovoid to obovoid, 0.8–1.2 mm long.

Distribution and ecology

The known distribution of *L. globulifera* subsp. *incana* extends from the Pakhuis Mountains in the north near Clanwilliam southwards to the Agter Witzenberg Flats in the Ceres District. It seems to occur in sandy or stony soil at altitudes between 650 and 1665 m

(Figure 7.76). Flowering has been recorded in all the months of the year with the exception of June.

Conservation status: Lower Risk Least Concern (LRlc).

Diagnostic characters and relationships

Differs from the typical subspecies in resprouting after a fire and in having branches which are white-felted, at least when young. The two subspecies are allopatric.

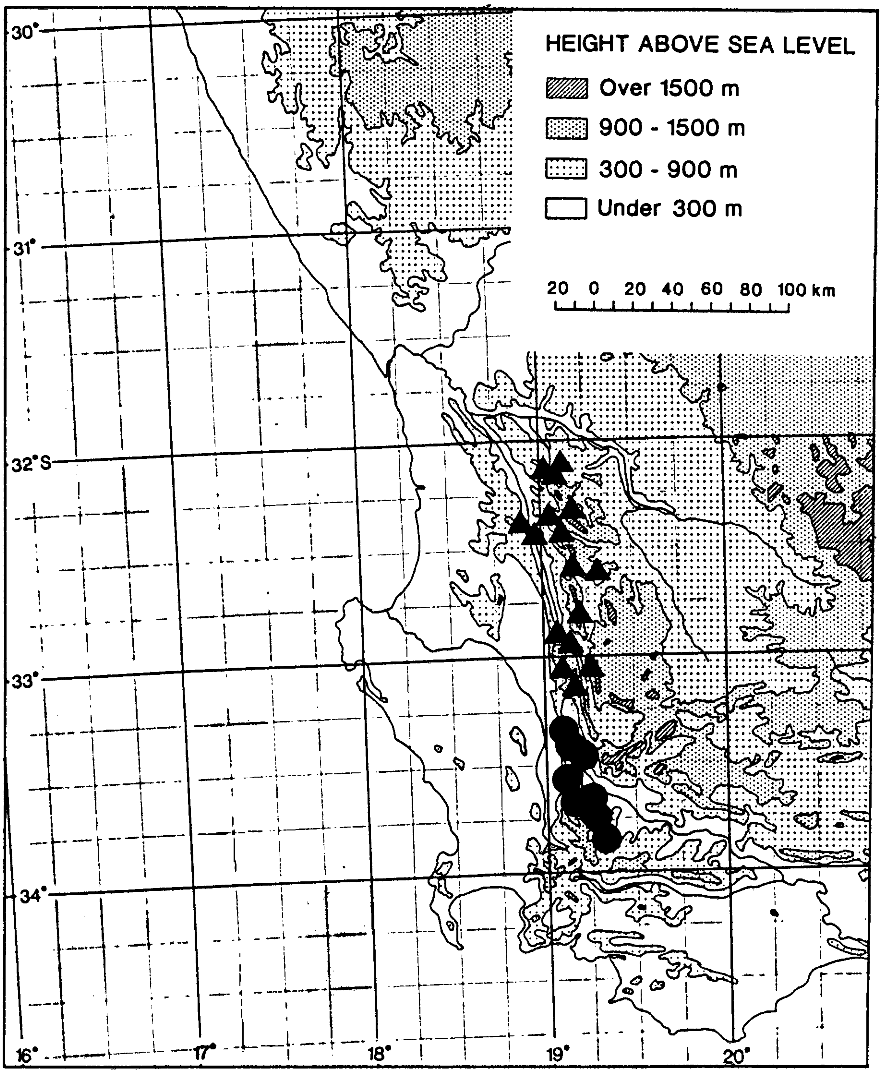

FIGURE 7.76—Known distribution of *Lachnaea globulifera* subsp. *globulifera* (●); and *L. globulifera* subsp. *incana* (▲).

Specimens examined

WESTERN CAPE.—3218 (Clanwilliam): Clanwilliam, Olifantsrivier and Brakfontein, (–BD), Jul., *Ecklon & Zeyher 76.7* (NY, Z); Clanwilliam, mountains at Brakfontein, (–BD), Jul., *Ecklon & Zeyher 80* (NY, S, SAM); Clanwilliam, N slopes of Skimmelberg, (–BD), 12-10-1939, *Pillans 9099* (BOL). —3219 (Wuppertal): Clanwilliam, Cederberg [precise localty unknown], Nov. 1913, *Pattison BOL 14474* (BOL); Pakhuis Pass, 1000 m, (–AA), 29-09-1940, *Compton 9551* (NBG); *ibid.*, Jan. 1935, *Leipoldt BOL 46890* (BOL); *ibid.*, Oct. 1925, *Leipoldt STEU 25888* (NBG); plateau S of Pakhuis Pass, 650 m, (–AA), 28-10-1956, *Dahlgren & Peterson 896* (NBG); Pakhuis, SE slopes, (–AA), 29-09-1940, *Esterhuysen 3303* (BOL); *ibid.*, 28-12-1941, *Esterhuysen 7400* (BOL); *ibid.*, 1000 m, 28-12-1948, *Esterhuysen 14977* (BOL, NBG); *ibid.*, 1000 m, 07-09-1953, *Esterhuysen 21759* (BOL); *ibid.,* sandy plataeu, 830 m, 12-10-1953, *Esterhuysen 21915* (BOL); *ibid.*, slopes and plateau, 1000 m, 12-10-1953, *Esterhuysen 21930* (BOL); *ibid.*, mountain, 1165 m, Dec. 1940, *Leipoldt 3502* (BOL); *ibid.*, N of pass, rocky edge of vlaktes, ± 1050 m, 12-08-1983, *Taylor 10601* (NBG); Cederberg, Heuning Vlei, (–AA), Dec. 1942, *Stokoe SAM 58596* (SAM); North Cederberg, gulley above Kliphuis, upper stony, rocky slope, ± 900 m, (–AA), 28-09-1983, *Taylor 10728* (NBG); Pakhuis Peak, 1000 m, (–AA), September 1936, *Thorne SAM 52689* (SAM); Cederberg, Scorpionsberg, 1330–1665 m, (–AC), Jan. 1930, *Barnard SAM 48247* (SAM); Clanwilliam Dist., Uitkyk Pass, (–AC), 16-12-1941, *Bond 1414* (NBG); Cederberg State Forest, slopes of Grootberg, above Nieuwoudt's Pass Rd, 600 m, (–AC), 27-10-1989, *Brown 575* (NBG); *ibid.*, 08-08-1984, *Le Maitre 384* (NBG); *ibid.*, *Le Maitre 385* (NBG); 3 km W of Algeria, (–AC), 04-11-1956, *Dahlgren & Peterson 1036* (NBG); *ibid.*, *Dahlgren & Peterson 1037* (K, NBG); Cederberg, Uitkyk Peak, (–AC), 16-12-1941, *Esterhuysen 7371* (BOL); South Cederberg, Duiwelsgat (Sneeuberg area), 1000 m, (–AC), 11-10-1946, *Esterhuysen 13137* (BOL); Cederberg, top of Heksekloof above Algeria, (–AC), 02-11-1974, *Goldblatt 3263* (NBG); 3 km S of Algeria, rocky sandstone slope, (–AC), 10-11-1979, *Goldblatt 5319* (S); Clanwilliam, Middelberg, near the Grootkloof Valley, sandy soil, (–AC), Aug. 1898, *Leipoldt 897* (SAM, NBG, BOL, Z); slopes leading up from Algeria to Middelberg plateau, 1000 m, (–AC), 00-09-1927, *Levyns 2223* (BOL); Cederberg, Koupoort, 1000–1330m (–AC), 22-10-1923, *Pocock 542* (NBG); Cederberg near Algeria, (–AC), 03-09-1938, *Salter 7572* (BOL); Algeria Forest Station., Nieuwoudt's Pass, W of labourers' quarters, (–AC), 15-11-1976, *Spreeth 148* (NBG); Algeria Forest Station, (–AC), Mar. 1940, *Stokoe SAM 58597* (SAM); *ibid.*, 15-11-1996, *Van Rooyen, Steyn & De Villiers 127* (NBG); Cederberg, slopes above Lookout on Vensterberg slopes in Algeria Valley, ± 1320 m, (–AC), 23-06-1984, *Taylor 10973* (NBG); Middelberg, 1665 m, (–AC), 20-08-1982, *Viviers 511* (NBG); Syferfontein, summit Maraisberg, (–AC), 08-05-1984, *Viviers 1324* (NBG); S Cederberg; lower slopes SW of Kafferskop above farm Ysterplaat, 1000 m, (–CA), 13-10-1994, *Beyers 246* (NBG); Ceres Dist., De Straat, 930 m, (–CA), 26-09-1936, *Compton 6543* (NBG); *ibid.*, 09-12-1940, *Compton 10096* (NBG); Ceres Dist., Elandskloof, 1665 m, (–CA), 30-09-1944, *Compton 16198* (NBG); Elandskloof, E-end, (–CA), 09-12-1940, *Esterhuysen 3959* (BOL); Citrusdal Dist., lower slopes of Elands Pass, (–CA), 04-08-1974, *Goldblatt 2236* (NBG); *ibid.*, slopes, 1330 m, 15-12-1935, *Levyns 5118* (BOL); *ibid.*, Dec. 1940, *Stokoe SAM 58595* (NBG, SAM); Citrusdal, Middelberg, stony, sandy soil against a rocky incline, (–CA), 3-11-1997, *Hanekom 2939* (BOL, K, MO, NBG, NY, PRE, S, Z); near Waterval between Citrusdal and Elandskloof, (–CA), Aug. 1940, *Stokoe 8030* (BOL); Cederberg, foothills of Sneeuberg, (–CA), Jan.1945, *Stokoe SAM 58598* (SAM); between Grootrivier and Elandskloof, (–CA/CB), Oct. 1939, *Leipoldt 3503* (BOL); Gideonskop, (–CB), 22-04-1957, *Stokoe NBG 101814* (NBG); Porterville Mtns, Berghof farm, deep, dry, sandy soil near stream, ± 2665 m, (–CC), 28-10-1972, *Boucher 1990* (NBG); Cardouw Pass, 1000 m, (–CC), 04-11-1951, *Maguire 1214* (NBG); Porterville Mtns, NW end of Zuurvlakte, 1130 m, (–CC), 28-09-1972, *Oliver 3949* (NBG); Berghof, Cardouw, Porterville Plateau, (–CC), 02-11-1976, *Spreeth 142* (NBG); *ibid.*, *Spreeth 145* (NBG); Skurfteberg on Visgat, W slopes overlooking Olifants River, ± 900 m, (–CC), 05-11-1973, *Taylor 8644* (NBG); Koue Bokkeveld, S of Hexberg, 1260 m, (–CC), 04-12-1989, *Taylor 12097* (NBG).

—3319 (Worcester): on road to Visgat, Agterwitzenberg Flats, (–AA), 29-10-1977, *Emdon 256* (NBG); Piketberg Div., Twenty Four Rivers Mtns above Porterville, (–AA), 23-10-1949, *Esterhuysen 16584* (BOL); Visgat vicinity, flat area, ± 800 m, (–AA), 02-02-1980, *Hugo 2210* (NBG); Piketberg Dist., mountain above Porterville, (–AA), Dec. 1957, *Loubser 1046* (NBG); Groot Winterhoek, W-facing slopes above De Tronk, ± 1100 m, (–AA), 05-10-1980, *Low 1089* (NBG); road between Rosendalfontein and Visgat, (–AA), 25-11-1941, *Pillans 9676* (BOL); Ceres Div., Visgat, between Schurfteberg and Groot Winterhoek Mtns, (–AA), Oct. 1953, *Stokoe SAM 63186* (SAM); Ceres Dist., 6 miles from Visgat towards De Vlakte, 665 m, (–AA), 30-12-1962, *Taylor 4561* (NBG); Tulbagh Dist., E slopes of Witzenberg, (–AC), Dec. 1919, *Andreae 192* (NBG); Ceres Dist., Witzenberg Vlakte, (–AC), 11-01-1960, *Esterhuysen 28395* (BOL). Grid ref. unknown: Cederberg, 15-05-1972, *Andrag 5* (NBG); Ceres Wild Flower Show, 09-10-1990, *Comm. Cillie* (NBG); *ibid.*, 05-10-1936, *Comm. Compton 6711* (NBG); mtns near Porterville, [precise locality unknown], Feb. 1912, *Edwards BOL 14447* (BOL).

39. **L. montana** *Beyers*, sp.nov. primo adspectu *L. eriocephalae* similis, sed distincta inflorescentia bracteata, foliis bracteatis bracteisque involucratis eciliatis, sepalis plerumque plus minsuve regularibus, sepalo anteriore ubi irregulari nunquam duplo sepalo posteriore, squamis linearibus in ore hypanthii pilis non tectis.

TYPE.—3218 (Clanwilliam): Piketberg Mountain, farm Vergesig, northwest of homestead on west slope, 765 m, (–DC), 7-09-1997, *Beyers 267* (NBG, holo.!; BOL!, K!, MO!, PRE!, iso.).

Erect, moderately branched shrub up to 0.6 m tall, single-stemmed at base; reseeder. *Branches* ascending to inclined, semi-rigid, terete, at first covered with short, crisped or straight hairs later glabrescent, leafy, becoming naked without prominent leaf-scars. *Leaves* decussate, adpressed or ascending, scattered with internodes quarter to three-quarters as long as leaves, sessile, epistomatic, narrowly elliptic or lanceolate, 4.2–15.0 × 1.0–2.4 mm, coriaceous, glabrous, adaxially concave, enervate, ± white-punctulate, dull, abaxially convex, enervate or subkeeled towards apex, glossy, apex mucronate, base rounded; distal leaf pair subtending inflorescence bract-like, elliptic or obovate, 6.5–12.0 × 3.5–8.5 mm, coriaceous, green, adaxially concave, glabrous, abaxially convex, keeled, glabrous to tomentose abaxially, margin membranous, more so in upper half, yellow tinged maroon, apex mucronate or cuspidate, base cuneate. *Inflorescence* a terminal, sessile, bracteate, up to ± 40-flowered, capitate-like umbel with up to 20 open flowers at a time, up to 30 mm in diameter, on main flowering branches or also on a few short lateral branches immediately below main inflorescence forming a compact glomerule at apex of main flowering branch; bracteate umbel appears to be enclosed at base by 2 pairs of involucral bracts but only 1 pair immediately below flowers may be regarded as true bracts as vegetative shoots develop in axils of subdistal pair. *Involucral bracts* 2, elliptic to widely ovate or obovate, 7.5–12.0 × 4.0–6.0 mm, coriaceous, green, adaxially concave, glabrous, abaxially convex, keeled, glabrous to tomentose abaxially, margin membranous, more so in upper half, yellow tinged maroon, apex mucronulate or cuspidate, base cuneate. *Flowers* ± actinomorphic, cream, mauve or dirty violet, pedicellate. *Pedicel* linear, abaxially elongated beyond the insertion of the flower, 0.8–3.5 mm long, densely villous, elongating in fruiting stage. *Hypanthium* 7–17 mm long, circumscissile fifth to third-way from base, upper portion narrowly funnel-shaped, sericeous or sericeous-hirsute outside, sericeous within, basal portion narrowly ellipsoid to ovoid, outside puberulent in upper quarter, rest glabrous, glabrous within. *Sepals* patent, ± equal to subequal, adaxially glabrous, abaxially sericeous, narrowly elliptic to elliptic, 3.5–8.0 × 1.5–4.0 mm, acute to rounded. *Stamens* exserted, outer, antisepalous whorl inserted at base of sepals, inner, antipetalous whorl inserted at rim of hypanthium, shorter than outer whorl; filaments filiform, outer 2.2–4.7 mm long, inner 1.2–3.1 mm long; anthers ellipsoid, 0.8–1.2 mm long, abaxially without broad connective tissue. *Scales* exserted, inserted at mouth of hypanthium immediately below antipetalous stamens, linear, 0.4–2.1 mm long, glabrous, translucent in fresh state. *Ovary* narrowly ellipsoid to obovoid, 1.1–2.3 mm long, glabrous. *Style* linear, 5.5–16.0 mm long, sericeous in upper half to upper three-quarters, rest glabrous. *Stigma* brush-like (Figure 7.77).

Distribution and ecology

Lachnaea montana has a disjunct distribution. It is known from the Piketberg Mountain in the west, the Hex River Mountains south and southeast of Ceres and the Keeromsberg northeast of Worcester, at altitudes between 765 and 2330 m. It grows in

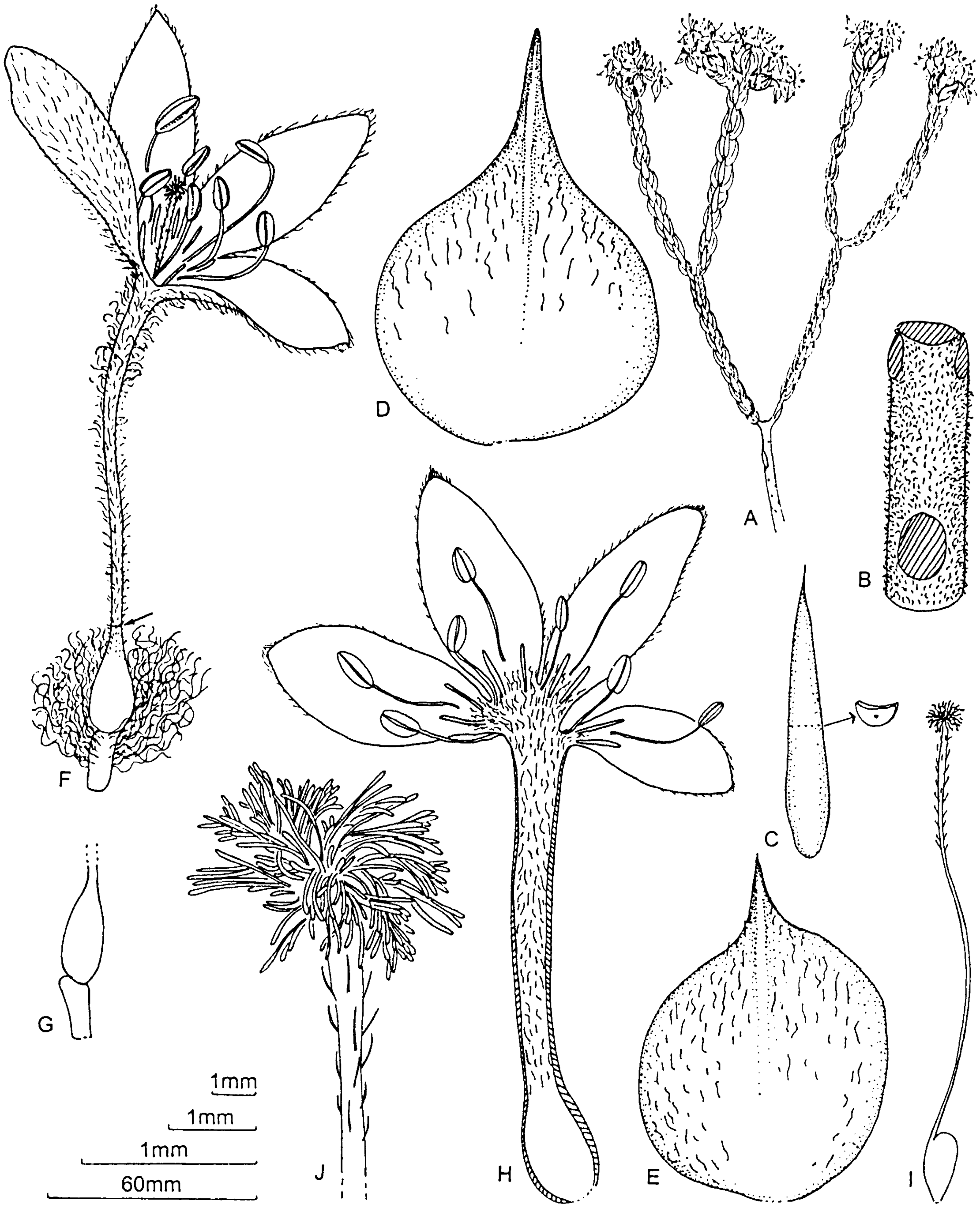

FIGURE 7.77—*Lachnaea montana*. A, portion of plant; B, branch with leaves removed; C, leaf (abaxial view and cross section); D, bract-like leaf from pair subtending inflorescence; E, involucral bract; F, flower, note circumscission zone (arrowed); G, pedicel abaxially produced beyond point of attachment of flower (lateral view); H, flower split longitudinally with gynoecium removed; I, gynoecium; J, stigma and upper portion of style. A, *Beyers 141* (NBG); B–J, *Beyers 267* (NBG).

stony soils probably derived from shale (Figure 7.78). Flowering has been recorded in September to February.

Conservation status: Lower Risk Near Threatened (LRnt). The localised and scattered distribution of the populations puts the species at risk.

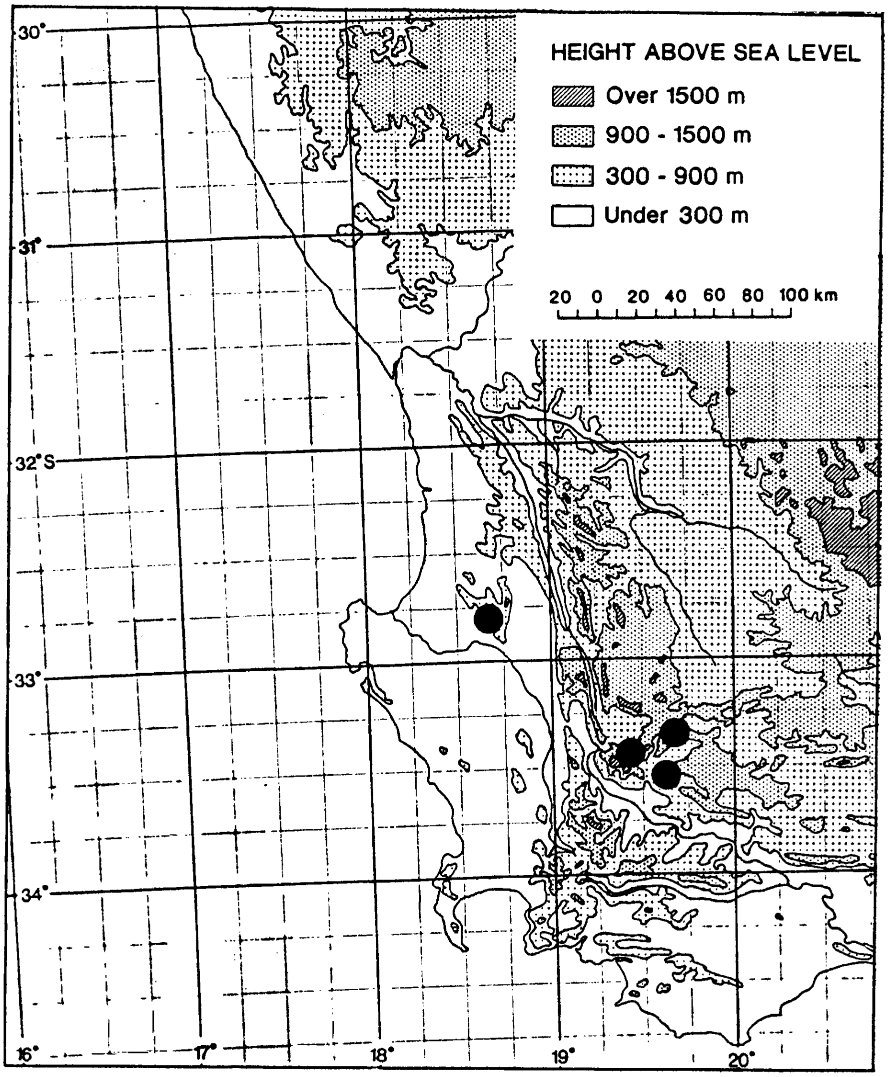

FIGURE 7.78—Known distribution of *Lachnaea montana*.

Diagnostic characters and relationships

Lachnaea montana superficially resembles *L. eriocephala*, but is easily recognised by its bracteate inflorescence, bract-like leaves and involural bracts which are eciliate, sepals usually more or less regular (when irregular, anterior sepal never twice the size of the posterior one), and linear scales not obscured by hairs in mouth of hypanthium. It is allied to *L. globulifera*, from which it differs by the membranous, eciliate involucral bracts, narrowly elliptic to elliptic sepals and the linear scales which are not obscured by hairs in the mouth of the hypanthium. It is also closely related to *L. pedicellata*, from which it can be distinguished by the larger flowers and the linear, villous pedicels.

Specimens examined

WESTERN CAPE.—3218 (Clanwilliam): Piketberg, (–DC), Sept. 1921, *Anon STEU 10205* (NBG); *ibid*., *Anon STEU 10206* (NBG); Piketberg Mountain, farm Vergesig, north-west of homestead on west slope, 765 m, (–DC), 7-09-1997, *Beyers 267* (BOL, K, MO, NBG, PRE); *ibid*., from flower show, 400 m, 07-09-1929, *Krige STEU 10529* (NBG); *ibid*., from flower show, *Krige STEU 10539* (NBG).
—3319 (Worcester): Ceres Dist., Ceres Flower Show [precise locality unknown], 13-10-1989, *Beyers 141* (K, MO, NBG, PRE) and *Beyers 142* (NBG); in grassy mountain, "Hex River" [precise locality unknown], Dec. 1895, *Marloth 2231* (PRE); Worcester Div., Waaihoek Mtns, S slope, 1665 m, (–AD), 15-12-1942, *Esterhuysen 8304* (BOL); Hex River Mtns, Buffelshoek Peak, 2000 m, (–AD), 25-12-1942, *Esterhuysen 8421* (BOL); *ibid*., shale band below Milner Peak, 1830 m, 11-11-1943, *Esterhuysen 9315* (BOL); *ibid*., Milner Peak, SW aspect, 2000 m, *Esterhuysen 35524* (BOL, S); Waaihoek Peak, 2000 m, (–AD), 25-12-1950, *Esterhuysen 18234* (BOL); *ibid*., stony SW slopes, 1665–2000 m, 03-11-1953, *Esterhuysen 22225* (BOL); Matroosberg, 1930 m, (–BC), 02-01-1897, *Bolus A. sub Herb. Guthrie 4390* (NBG); *ibid*., W slopes, shale band, 2000 m, 08-11-1964, *Esterhuysen 30826* (BOL); *ibid*., beside beacon, in shadow of large rocks, 1900 m, 10-12-1981, *Kotze 114* (NBG); *ibid*., Spekrivierkloof, 1600 m, 10-12-1981, *Kotze 115* (NBG); *ibid*., Spekrivierkloof, 1800 m, *Kotze 118* (NBG); *ibid*., in grassy mountain, 1700 m, Dec. 1895, *Marloth 2263* (PRE); *ibid*., 1800 m, Dec. 1895, *Marloth 2356* (BOL); *ibid*., near Laken Vlei, 2330 m, 03-12-1917, *Phillips 2049* (SAM); *ibid*., rocky NW slopes, well drained TMS amongst low fynbos, 2105 m, 10-12-1981, *Winter 248* (NBG, PRE); Ceres Div., Roodeberg, lower slopes of shale band, ± 1665 m, (–BC), Jan. 1940, *Esterhuysen 1582* (BOL); *ibid*., shale band on W slopes, (–BC), 1830 m, 02-12-1947, *Esterhuysen 14188* (BOL); Ceres Dist, slopes of Valsch Gat Kloof between Roodeberg and Matroosberg, ± 1665 m, (–BC), 11-10-1962, *Esterhuysen 29730* (BOL, S); Ceres Dist., Bokkerivier Farms, ridge on top of Roodeberg Mtns, (–BC), 10-11-1963, *Woods s.n.* (NBG); Worcester Div., Keeromsberg, SW side, 1333 m, (–DA), 07-11-1943, *Esterhuysen 9201* (BOL). Grid ref. unknown: Piketberg & Clanwilliam exhibit, Cape Town Flower Show, 08-10-1930, *Anon BOL 19276* (BOL). Locality unreliable: Hottentots Holland, Feb. 1921, *Stokoe 6462* (BOL). Locality uncertain: Ceres Div., probably Conical Peak, Dec. 1940, *Stokoe 8045* (BOL).

40. **L. pedicellata** *Beyers* sp. nov. *L. montanae* affinis sed ab ea differt floribus brevioribus, pedicellis dorsoventraliter complanatis et anguste obovatis ad obovatis apice plerumque emarginatis abaxialiter sericeis adaxialiter villosis.

TYPE.—3319 (Worcester): Ceres Dist., Waboomsberg, level area west of beacon, 1770 m, (–AD), 24-11-1995, *Beyers 260* (NBG, holo.!; BOL!, K!, PRE!, iso.).

Passerina eriocephala Thunb. Prodromus plantarum capensium: 75 (1794); Thunb.: 375 (1823). Type: *Thunberg 9575* [*Passerina eriocephala*] (UPS, lecto. here designated, —NBG, photo!, —PRE, microfiche!; S! [*L. eriocephala* sub Herb. Montinii], S! [*L. eriocephala* sub Herb. Alstroemerii], isolecto.).

Erect, moderately branched shrub up to 0.6 m tall, single-stemmed at base, branching close to the ground; reseeder. Branches ascending to inclined, slender, lax, terete, at first covered with short, crisped or straight hairs, later glabrescent, leafy, becoming naked without prominent leaf-scars. *Leaves* decussate, adpressed to ascending, scattered with internodes a quarter to three-quarters as long as leaves, those below inflorescence crowded, sessile, epistomatic, linear to narrowly elliptic, 4.5–12.0 × 0.8–1.5 mm, those below inflorescence gradually broader, ovate, up to 2.5 mm wide, coriaceous, glabrous, adaxially ± flat to concave, enervate, white-punctulate, dull, abaxially convex, enervate, glossy, apex mucronate, base rounded; distal leaf pair subtending inflorescence bract-like, obovate to widely obovate, 5.5–7.2 × 3.2–5.0 mm, coriaceous, glabrous, green, adaxially concave, glabrous, abaxially convex, keeled, margin membranous, more so in upper half, yellow usually tinged maroon, apex apiculate to cuspidate, base cuneate. *Inflorescence* a terminal, sessile, bracteate, ± 20-flowered, capitate-like umbel with up to 8 open flowers at a time, up to 15.0 mm in diameter, on main flowering branches and also on a few short lateral branches immediately below main inflorescence forming a compact glomerule; bracteate umbel appears to be enclosed at base by 2 pairs of involucral bracts but only 1 pair immediately below flowers may be regarded as being true bracts as vegetative shoots develop in axils of subdistal pair. *Involucral bracts* 2, elliptic, or obovate to widely obovate occasionally emarginate, 6.0–7.5 × 3.0–7.0 mm, coriaceous, glabrous, green, adaxially concave, abaxially convex, keeled, margin membranous, more so in upper half, yellow usually tinged maroon, apex mucronulate or shortly cuspidate, base cuneate. *Flowers* ± actinomorphic, cream, pedicellate. *Pedicel* dorso-ventrally flattened, abaxially produced beyond point of attachment of flower, narrowly obovate to obovate in outline, 0.9–3.0 mm long, elongating in fruiting stage, adaxially sericeous, abaxially villous, apex usually emarginate. *Hypanthium* 3.0–4.4 mm long, circumscissile a third to midway from base, upper portion narrowly funnel-shaped, sericeous on both sides, basal portion ellipsoid, outside puberulent in upper quarter, rest glabrous, within glabrous. *Sepals* patent, ± equal, adaxially glabrous, abaxially sericeous, elliptic to widely elliptic or widely ovate to very widely ovate, 2.1–3.8 × 1.6–2.6 mm, rounded to obtuse. *Stamens* exserted, outer, antisepalous whorl inserted at base of sepals, inner, antipetalous whorl inserted at rim of hypanthium, shorter than outer whorl; filaments filiform, outer 1.2–3.1 mm long, inner 0.7–2.5 mm long; anthers ellipsoid to widely ellipsoid, 0.4–0.8 mm long, abaxially without broad connective tissue. *Scales* exserted, inserted at mouth of hypanthium immediately below antipetalous stamens, narrowly oblong or narrowly ellipsoid, 0.7–1.1 mm long, ± half to as long as antipetalous filaments, glabrous, pale yellow in fresh state. *Ovary* ellipsoid or obovoid 0.9–1.3 mm long, glabrous. *Style* linear or linear obconical, 3.0–4.3 mm long, sericeous in upper half to upper third, rest glabrous. *Stigma* brush-like (Figure 7.79).

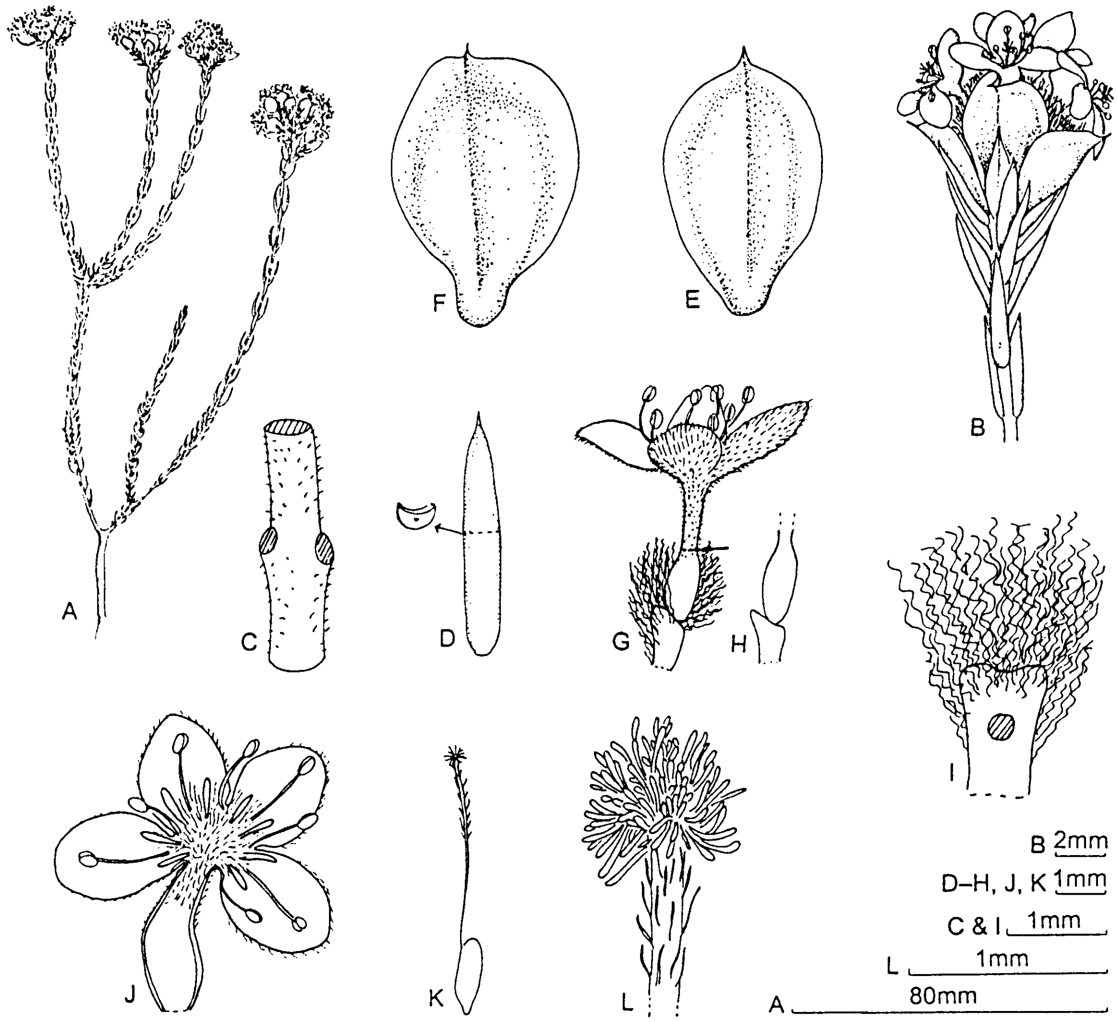

FIGURE 7.79—*Lachnaea pedicellata*, *Beyers 260* (NBG). A, portion of plant; B, flowering branch; C, branch with leaves removed; D, leaf (abaxial view and cross section); E, bract-like leaf from pair subtending inflorescence; F, involucral bract; G, flower, note circumscission zone (arrowed); H, pedicel abaxially

produced beyond point of attachment of flower (lateral view); I, pedicel (adaxial view); J, flower split longitudinally with gynoecium removed; K, gynoecium; L, stigma and upper portion of style.

Distribution and ecology

Lachnaea pedicellata has been recorded from the Cold Bokkeveld at altitudes between 1760 and 1830 m, growing in sandy loam soil probably on underlying shale (Figure 7.80). Flowering has been recorded from October to January.

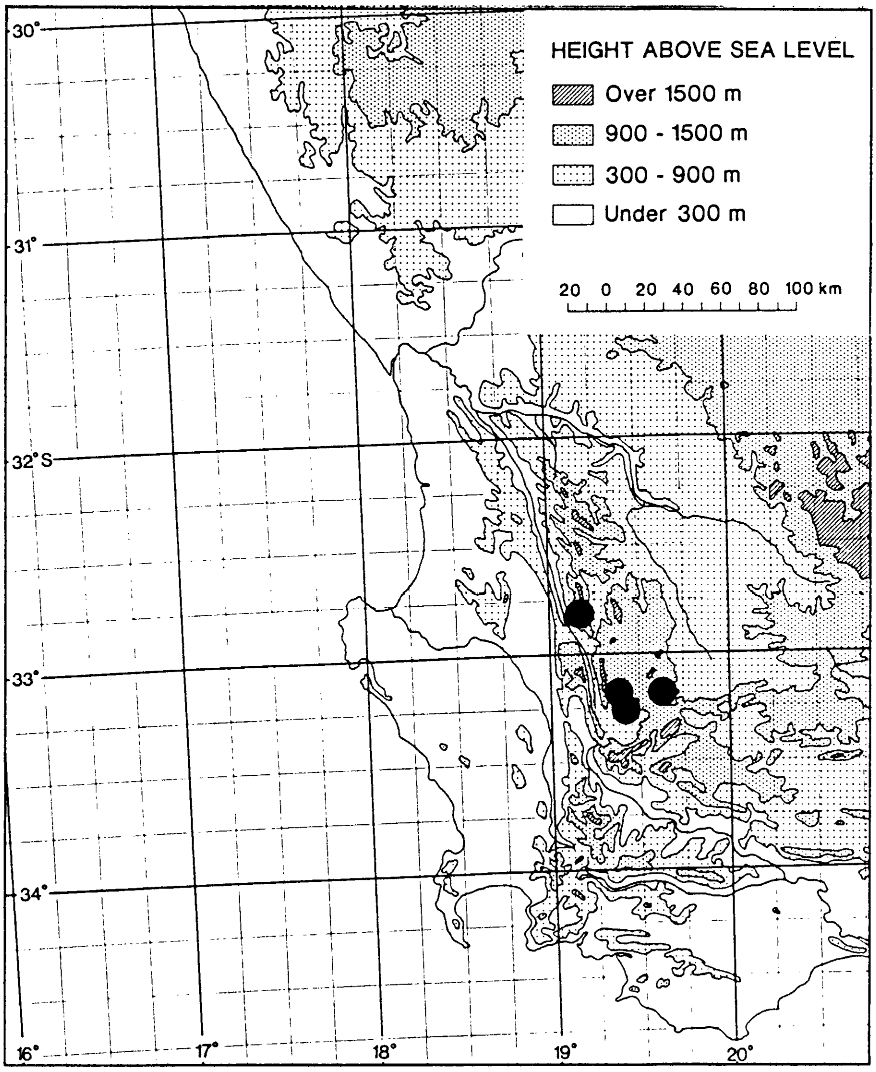

FIGURE 7.80—Known distribution of *Lachnaea pedicellata*.

Conservation status: Vulnerable (VU D2). Known from only a few collections most of which are old. It appears to be a localised species and being a reseeder, would be vunerable to frequent fires.

Diagnostic characters and relationships

Lachnaea pedicillata is allied to *L. montana*, from which it is distinguished by the shorter flowers and the dorso-ventrally flattened pedicels which are narrowly obovate to obovate in outline with apex usually emarginate, sericeous abaxialy, villous adaxially. The only other member of the genus with similar pedicels is *L. naviculifolia*.

Etymology

The distinct pedicels in this species, shared only by one other species in the genus, prompted the specific epithet which is derived from the Latin, *pedicellatus*.

Specimens examined

WESTERN CAPE.—3219 (Wuppertal): Koue Bokkeveld, on farm Appelfontein, (–CC), 09-10-1990, *Du Toit s.n.* (NBG, PRE).

—3319 (Worcester): Ceres, in vlakte [precise locality unknown], Sept. 1938, *Van der merwe s.n.* (NBG); Ceres mountains [precise locality unknown], Sept. 1924, *Marloth 6252* (PRE); Ceres Dist., Gydo, 1830 m, (–AB), 10-11-1946, *Compton 18719* (NBG); Ceres Div., Gydoberg, (–AB), 10-11-1946, *Leighton 2219* (BOL); Ceres Dist., Waboomsberg, level area W of beacon, 1770 m, (–AD), 24-11-1995, *Beyers 260* (BOL, K, NBG, PRE); *ibid.*, S of beacon, 1760 m, (–AD), 12-11-1989, *Oliver 9282* (NBG); Ceres Dist., Baviaansberg, 1830 m, (–BA), 02-01-1942, *Compton 12844* (NBG). Grid ref. unknown: Africa, *Thunberg* [*L. eriocephala* Linn. non Lam.] (S).

7.4 EXCLUDED SPECIES

Lachnaea ciliata (L.) Crantz, Institutiones rei herbariae: 129 (1766). *Passerina ciliata* L., Species plantarum, edn 1, 1:559 (1753) —description is inadequate and cited illustrations in the protologue are not *Lachnaea* species.

Lachnaea conglomerata L., Species plantarum, edn 1, 1:560 (1753)—*Phylica stipularis* L (Cafferty & Beyers 1999).

Lachnaea dodecandra (L.) Crantz, Institutiones rei herbariae: 129 (1766)—*Struthiola dodecandra* (L.) Druce in Report, Botanical Exchange Club of the British Isles 1913: 425 (1914).

Lachnaea dubia Gand., Bulletin de la Société Botanique de France 60: 417 (1913)—Type: Cape, Table Mountain, *Debeaux s.n.*(LY, holo.!) identified as *Gnidia laxa* (L.f.) Gilg.
L. filiformis (L.) Crantz, Institutiones rei herbariae: 129 (1766)—*Passerina filiformis* L., Species plantarum, edn 1, 1: 559 (1753); C.H.Wright: 10 (1915).

Lachnaea hirsuta (L.) Crantz, Institutiones rei herbariae: 129 (1766). *Passerina hirsuta* L., Species plantarum, edn 1, 1: 559—description inadequate, however according to the locality, 'Hispania', cited it is not a *Lachnaea* species.

Lachnaea laevigata (L.) Crantz Institutiones rei herbariae: 129 (1766). *Passerina laevigata* L., Species plantarum, edn 2, 1: 513 (1762)—*Gnidia oppositifolia* L. (Wright 1915).

Lachnaea sericea (L.) Crantz Institutiones rei herbariae: 129 (1766). *Passerina sericea* L., Species plantarum, edn 2, 1: 513 (1762)—*Gnidia sericea* (L.) L. (Wright 1915).

Lachnaea sphaerocephala Burm. f. Flora indica:12 (1768)—the brief description indicates that this is not a *Lachnaea* species since none of the *Lachnaea* species has adpressed, twisted leaves.

Cryptadenia ciliata (Thunb.) Meisn. in Linnaea 14: 407 (1840). *Passerina ciliata* Thunb., Prodromus plantarum capensium, 1: 75 (1794) non L.: 559 (1753)—*Gnidia penicillata* Licht. ex Meisn. (Peterson 1959).

CHAPTER 9

GENERAL DISCUSSION

This study is a step closer to the goal of publishing a definitive "Flora" for southern Africa. The present multidisciplinary study of *Lachnaea* has contributed to an improved understanding of the diversity of the group. Of the 29 species and eight varieties recognised by Van Wyk (1993), 24 species are upheld, three have been reduced to synonymy, all the varieties have been reduced to synonymy and 12 new species and two subspecies have been newly described. Two of the 12 new species have already been validly published (Beyers & Van Wyk 1998a & 1998b). The circumscription of the genus *Lachnaea* has been extended to include all the species of *Cryptadenia*. Of the five *Cryptadenia* species recognised by Van Wyk (1993) four have been transferred to *Lachnaea* and one has been reduced to synonymy. *Lachnaea*, now comprising 40 species and two subspecies, is endemic to the Cape Floristic Region. The species occur almost exclusively in fynbos vegetation on oligotrophic soils derived from the orthoquartzites of the Cape Supergroup. A few species, however, occur on shale or limestone. Most of the *Lachnaea* species can be regarded as montane taxa. The concentration of species is in the 3319 (Worcester) grid, with the number of species per unit area decreasing from this centre of diversity.

The previous full revision of *Lachnaea* was exclusively based on macromorphological characters derived from herbarium specimens (Wright 1915). In the present multidisciplinary study, extensive fieldwork was undertaken to study the live plants and populations, which resulted in a far better understanding of the genus. For the first time attention has been given to the regeneration strategy of the species. Although the regeneration strategy varies infraspecificaly in some species, it is of considerable taxonomic significance.

Phyllotaxis and indumentum of the leaf margins were found to be of taxonomic significance. Other leaf characters, for example, their orientation and shape (in outline and in cross section), were useful but where the range of a character is infraspecifically wide, it becomes less relevant.

In *Lachnaea* the leaf shape varies from linear to orbicular. There are leaf types very similar to those of unrelated groups as illustrated in Dahlgren's (1971) Figures 1–4 of *Cliffortia* (Rosaceae) and *Aspalathus* (Fabaceae) and those in the *Relhania* (Asteraceae) revision by Bremer (1976). These convergent similarities are not restricted only to leaf shape. In three *Relhania* species for example the leaves have several parallel ribs (Bremer 1976) as in *L. striata* and *L. ruscifolia*. Fibre bundles running along the leaf margins, as in *L. aurea* and *L. striata*, were also found in many of the *Relhania* species (Bremer 1976). The similarities discussed above are yet more examples of convergent evolution in leaves of especially the flora of the Cape Floristic Region (Went 1971).

The following leaf anatomical characters are taxonomically impotrant: the occurrence of stomata on both sides of the leaves or only adaxially as well as the position of the stomata in relation to the adjacent epidermal cells; presence of prominent extraxylary fibre caps associated with the mid and lateral bundles, expressed externally by the ribbed leaves and schlerenchymatous fibres running parallel to the leaf margins in the mesophyll; crystals of diosmin, occurring as sphaerocrystalline to somewhat dendritic masses, have for the first time been recorded in the leaves of *Lachnaea*.

Inflorescence morphology in *Lachnaea* is taxonomically significant. Species can be arranged into three main groups, namely, those with terminal, solitary flowers, those with capitula and those with umbels. Three groups within the umbellate group, namely those with ebracteate umbels, pseudobracteate and bracteate umbels are also recognised. Although the pseudobracteate and bracteate umbels are diagnostic features, it is sometimes difficult, when working with herbarium material, to distinguish between them. For that reason in compiling the key to the species the pseudobracteate and bracteate umbels were not used to delimit groups of species. The indumentum and to a lesser degree the shape of the involucral bracts and bract-like leaves were also taxonomically useful.

As with past treatments of *Lachnaea*, floral morphology has proved to be of considerable taxonomic importance. Floral characters that for the first time have been used to delimit species are:

- presence or absence of the pedicel;
- whether the pedicel elongates in the fruiting stage;
- whether the pedicel elongates abaxially beyond the point of attachment of the flower or not;
- whether the upper portion of the hypanthium is basally invaginated;
- the position of the stamen insertion.
- whether the antipetalous stamens are exserted or enclosed or only their anthers are fully or partially exserted;
- presence or absence of filament ridges on the hypanthium;
- presence or absence of broad connective tissue abaxially on the anther;
- position of scale insertion on the hypanthium; whether they are exserted or enclosed and whether they are basally or abaxially attached to the hypanthium wall;
- the shape of the trichomes on the hypanthium.

Palynology proved taxonomically unimportant in the delimitation of the genera in the subtribe Gnidiinae and in the delimitation of the species within *Lachnaea*. Similarly, the chromosome number is taxonomically insignificant at the generic and specific levels.

In the present study the large number of traditional macro- and micro-morphological characters held promise of elucidating possible phylogenetic trends in the group. Unfortunately, many of the characters either vary to a large degree within taxa or are constant in all the taxa. In the present cladistic analysis polymorphic characters were excluded since HENNIG86 (Farris 1988) cannot distinguish between polymorphic and unknown or missing characters. However, polymorphic characters can contain significant phylogenetic information (Thiele 1993; Wiens 1995). The data set, including polymorphic characters, should in future be analysed using PAUP (Swofford 1993), which can accommodate such characters, to compare the outcome with the present cladograms. The incorporation of molecular data is desirable and would, most likely, improve our understanding of the phylogeny of the genus. Available evidence nevertheless strongly supports the monophyletic status of the group. Since this present study is the first to attempt a cladistic analysis of *Lachnaea*, there is clearly room for considerable improvement in searching for new characters and approaching the task from different analytical angles. To the best of my knowledge no cladistic analysis has yet been published on any of the other genera in the tribe Gnidieae.

Allopatric speciation appears to have been the dominant mechanism in the diversification of *Lachnaea*. Additional variables along which diversification may have taken place are altitudinal difference, allochrony and fire regeneration strategy.

Since most *Lachnaea* species occur in localised, small populations, usually in mountainous terrain, it is difficult to locate them in the wild from the often inadequate data on herbarium labels. Many of the species appear to be relictual and particularly vulnerable to disturbance and too frequent burning. Hence, the conservation status of each species was evaluated and the IUCN Red List Categories (Walter & Gillett 1998) were assigned as follows: 18 species—Vulnerable, 18 species—Lower Risk Least Concern, two species—Lower Risk Near Threatened, one species—Extinct and one species—Data Deficient. During my studies I was very fortunate to have had colleagues and associates, who previously had collected *Lachnaea* species, to help me locate them. It is hoped that the seven *Lachnaea* species that were only studied from herbarium material will in the future be located in the wild. These are *L. funicaulis*, *L. leipoldtii*, *L. marlothii*, *L. pendula*, *L. rupestris*, *L. stokoei* and *L. striata*.

Although an attempt was made to ascertain whether the floral scales are nectariferous or act as osmophores, futher more detailed studies are needed. Within the genus these scales vary in shape, position and mode of attachment to the hypanthium. It is most likely that these differences are linked to specific types of pollinators. Unfortunately, during my extensive fieldwork I never observed any pollinators visiting the flowers. I suspect a better knowledge of the pollination biology of the genus could be extremely valuable in the interpretation of the functional significance of the different floral parts, especially the scales.

Fortunately molecular studies in the Thymelaeaceae are underway with the possibility of more of the species of *Lachnaea* being studied (Van der Bank, pers. comm.). If chemotaxonomical studies in *Lachnaea* could also be undertaken, a more complete data set could be compiled, which would improve our understanding of the phylogeny and

CHAPTER 10

CONCLUSIONS

- The genus *Lachnaea* is monophyletic and easily distinguished from other genera of the Thymelaeaceae in southern Africa by the eight floral scales, which are inserted on the upper portion of the hypanthium below the insertion of the two stamen whorls.

- The circumscription of *Lachnaea* has been extended to include the genus *Cryptadenia* (previously with five species).

- Currently *Lachnaea* comprises 40 species and two subspecies. No sections are upheld; the resolution of such species groups is not clear. A key to the species is provided, as well as an illustration and distribution map of each species.

- The conservation status of each species was evaluated and the IUCN Red List Categories (Walter & Gillett 1998) were assigned as follows: 18 species—Vulnerable, 18 species—Lower Risk Least Concern, two species—Lower Risk Near Threatened, one species—Extinct and one species—Data Deficient.

- *Lachnaea* is endemic to the Cape Floristic Region (CFR) as defined by Goldblatt (1978).

- Members of *Lachnaea* occur almost exclusively in fynbos vegetation on oligotrophic soils derived from the orthoquartzites of the Cape Supergroup. A few species occur on shale or limestone.

- The centre of diversity for *Lachnaea* species is in the quarter degree, 3319 AD and the one degree 3319 (Worcester) grids with the number of species per unit area decreasing from this area.

- *Lachnaea* demonstrates a high percentage of regional endemism with 55% of the species endemic to the Northwestern, Southwestern, Karoo Mountain and Langeberg Centres of the CFR. Although species of *Lachnaea* also occur in the Bredasdorp-Riversdale and Southeastern Centres, none of the species are endemic there.

- Macromorphologically, the following characters proved to be of particular taxonomic significance:
    - regeneration strategy (reseeder vs. resprouter);
    - leaf characters, for example phyllotaxis, indumentum of leaf margins, absence or presence of parallel ribs on abaxial leaf surface;
    - type of inflorescence;
    - floral characters:
        - pedicel—present or absent, point of attachment of flower, whether elongating in fruiting stage;
        - hypanthium—shape, indumentum and trichome shape;
        - sepals—zygomorphy, colour and indumentum;
        - androecium—position of insertion and whether exserted or enclosed; anther with or without broad connective tissue abaxially;
        - scales—position of insertion on hypanthium, whether exserted or enclosed, whether basally or abaxially attached to hypanthium wall, shape and indumentum;
        - stigma—shape and length of papillae.

- Taxonomically the most useful leaf anatomical characters include:
    - whether the leaves are amphi- or epistomatic;
    - stomata sunken or on same level as adjacent epidermal cells;
    - presence of prominent extraxylary fibres capping mid and lateral vascular bundles;
    - presence of extraxylary fibres not associated with the vascular bundles running parallel to the leaf margins in the mesophyll;
    - presence of diosmin crystals.

- Anatomical adaptations in the leaves of *Lachnaea* probably enable the plants to withstand the long, dry summers of the mediterranean or semi-mediterranean climate of the CFR.

- Palynology is unimportant in the delimitation of the genera in the subtribe Gnidiinae and in the delimitation of the species in *Lachnaea*. All these groups are characterised by pollen grains which are spheroid in shape, pantoporate, with a *Croton*-pattern. The surface structure of the triangular supratectal subunits revealed a continuum of variation.

- Chromosome number is taxonomically insignificant at the generic and specific level. All the members of the genus investigated have $2n = 18$.

- Both anatomical and morphological characters were used in a cladistic analysis. Two analyses, one with *Struthiola leptantha* as the outgroup (Analysis A) and another with multiple taxa as the outgroup (Analysis B) were done. The cladistic analysis showed that the sections *Sphaeroclinium*, *Conoclinium* and *Microclinium*, established by Meisner (1840) are paraphyletic and are therefore not upheld. Analyses A and B produced conflicting results with regard to the hypothetical evolutionary pathway of certain characters. The hypothesis of relationships within *Lachnaea* presented here should be seen as a starting point and by no means the final word.

- Allopatric speciation appears to have been the most important speciation mechanism in *Lachnaea*. Additional variables along which diversification may have taken place are altitudinal difference, allochrony and regeneration strategy of species after fire.

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SUMMARY

A TAXONOMIC REVISION OF *LACHNAEA* L. (THYMELAEACEAE)

by

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PHILOSOPHIAE DOCTOR
April 2000

The main objective of this study was to provide a taxonomic revision of the genus *Lachnaea*, which is endemic to the Cape Floristic Region. Members of the group occur almost exclusively in fynbos vegetation. In this revision a brief taxonomic history of the genus is given. Taxonomic decisions are based mainly on comparative morphology, distribution and ecology. More than 2500 herbarium specimens from 16 herbaria were studied. This was supplemented with extensive fieldwork.

Leaf-anatomical and palynological studies of all the species were conducted. Chromosome counts for 18 species are presented. Leaf-anatomy proved to be a valuable additional source of evidence for the delimitation of the species. Palynology and chromosome number were taxonomically insignificant at infrageneric levels.

The phytogeographical study showed that the highest number of species occur in the 3319 (Worcester) grid, with the highest diversity of species in the Hex River Mountains (3319 AD), followed by the Groot Winterhoek Mountains (3319 AA). Species richness of the genus declines to the north, south, east and west of the above centres of diversity. *Lachnaea* demonstrates a high percentage of regional endemism with 55% of the species endemic to one of four of the Centres of the Cape Floristic Region.

Circumscription of *Lachnaea* is extended to include the genus *Cryptadenia*. Sections in *Lachnaea* are not upheld. Forty species and two subspecies are now recognised. Four species and all varieties are reduced to synonymy, 12 species and two subspecies are newly described and one new name is proposed. One neotype and 16 lectotypes were selected.

The taxonomic treatment provides keys to the species and to the subspecies. Each species is described in detail and accompanied by a list of specimens examined. Diagnostic features and relationships, distribution, ecology, conservation status and, where applicable, infraspecific variation are discussed for each species. Line drawings and a distribution map are provided for each species.

The dominant process in speciation in *Lachnaea*, as far as can be assessed, appears to be allopatric speciation. Additional variables along which diversification may have taken place are altitudinal difference, allochrony and regeneration strategy of species after fire.

A hypothetical phylogeny of *Lachnaea* using cladistic methodology is presented. Two analyses were made, one with a single species as the outgroup and another with multiple taxa as the outgroup. The results of the analyses show that *Lachnaea* is monophyletic and that the sections are paraphyletic. The two analyses produced mixed resolution regarding the solitary-flowered species and gave conflicting results with regard to the evolutionary pathway of certain characters.

OPSOMMING

‘N TAKSONOMIESE HERSIENING VAN *LACHNAEA* L. (THYMELAEACEAE)

deur
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Die hoofdoelwit van hierdie ondersoek was die daarstelling van ‘n taksonomiese hersiening van die genus *Lachnaea*. Verteenwoordigers van die genus is endemies tot die Kaapse Floristiese Gebied en kom hoofsaaklik in fynbos plantegroei voor. In hierdie hersiening word ‘n kort oorsig van die geskiedenis van die genus gegee. Taksonomiese besluite is hoofsaaklik op ‘n vergelykende ondersoek van die morfologie, verspreiding en ekologie gebasseer. Meer as 2500 herbarium eksemplare van 16 herbaria is bestudeer en deur uitgebreide veldwerk aangevul.

‘n Ondersoek van die blaar-anatomie en stuifmeelmorfologie van al die spesies is onderneem. Chromosoomgetalle van 18 spesies word verskaf. Blaaranatomie het geblyk ‘n waardevolle bykomende bron van inligting te wees vir die omgrensing van die spesies. Stuimeelmorfologie en die chromosoomgetal is daarteenoor taksonomies onbelangrik bevind op infrageneriese vlak.

Die fitogeografiese ondersoek het getoon dat die grootste aantal spesies in die 3319 (Worcester) ruit voorkom en dat die hoogste diversiteit gesetel is in die Hexrivierberge (3319AD) gevolg deur die Groot Winterhoekberge (3319AA). Die hoë spesiediversiteit neem af na die noorde, suide, ooste en weste vanaf bogenoemde sentrums van diversiteit.

Lachnaea toon 'n hoë persentasie van streeksendemisme met 55% van die spesies endemies aan een van vier van die substreke van die Kaapse Floristiese Gebied.

Die omskrywing van *Lachnaea* is verbreed om die genus *Cryptadenia* in te sluit. Seksies in *Lachnaea* word verwerp. Veertig spesies en twee subspesies word tans erken. Vier spesies en al die varieteite is gereduseer tot sinonieme, 12 spesies en twee subspesies is nuut beskryf en een nuwe naam word voorgestel. Een neotipe en 16 lektotipes is gekies.

In die taksonomiese behandeling word sleutels tot die spesies en subspesies verskaf. Elke spesie word in besonderhede beskryf en is vergesel van 'n lys van eksemplare wat ondersoek is. Diagnostiese eienskappe en verwantskappe, verspreiding, ekologie, bewaringstatus en waar toepaslik die variasie binne 'n spesie, word bespreek. Lyntekeninge en 'n verspreidingskaart word vir elke spesie veskaf.

So ver vasgestel kon word, blyk allopatrie die dominante proses in die spesiasie van *Lachnaea* te wees. Addisionele veranderlikes soos verskille bo seevlak, bloeityd en regenerasie strategie van spesies na vuur kon ook bygedra het tot die diversifikasie van dié spesies.

Die filogenie-hipotese van *Lachnaea* gebasseer op kladistiese metodologie word voorgestel. Twee ontledings is gedoen, een met 'n enkele spesie as die buitegroep en een met veelvoudige taksa as die buitegroep. Die resultate van die ontledings toon dat *Lachnaea* monofileties is en dat die seksies parafileties is. Die twee ontledings het verskillende patrone getoon betreffende die spesies met terminale, enkelstandige blomme en teenstrydige resultate met verwysing na die evolusionêre ontwikkeling van sekere eienskappe.

CURRICULUM VITAE

Josephine Bertha Pauline Beyers (nèe Minnaar) was born on 18 April 1944 in Bloemfontein. She attended the Clarendon Girls High School, East London, where she matriculated in 1961. In 1962 she enrolled at the University of Stellenbosch, and in 1964 was awarded a B.Sc. degree with Botany and Zoology as majors. In 1965 she was appointed as Technical Assistant in the Botany Department of the University of the Orange Free State and at the end of that year she married and left to raise a family. Between 1966 and 1987 she held temporary teaching posts in Biology, Science and Mathematics, attained a B.Sc. (Hons.) *cum laude* from the University of Stellenbosch in 1979, worked as a bookkeeper for a firm of attorneys for eight years and was co-director and manager of a ladies boutique.

In 1987 Jo was appointed to the staff of the Stellenbosch Herbarium, one of the regional herbaria of the Botanical Research Institute, later the National Botanical Institute. She obtained her M.Sc. degree *cum laude* from the University of Stellenbosch in 1992. She currently holds the post of Assistant Curator: Collections at the Compton Herbarium, Kirstenbosch, where she is engaged in systematic research, information services and curatorial activities. She has concentrated on collecting plant specimens of the Cape Flora and is the author or co-author of seven scientific publications.

List of publications

1. BEYERS, J.B.P. 1997. New combinations in *Lachnaea*. *Bothalia* 27: 45.
2. BEYERS, J.B.P. & MARAIS, E.M. 1998. Palynological studies of the Thymelaeaceae of the Cape Flora. *Grana* 37: 193–202.
3. BEYERS, J.B.P. & VAN DER WALT, J.J.A. 1994. Inflorescence morphology of *Lachnaea* and *Cryptadenia* (Thymelaeaceae). *Bothalia* 24: 195–202.
4. BEYERS, J.B.P. & VAN DER WALT, J.J.A. 1995. The generic delimitation of *Lachnaea* and *Cryptadenia* (Thymelaeaceae). *Bothalia* 25: 65–85.

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6. BEYERS, J.B.P. & VAN WYK, A.E. 1998b. A new species of *Lachnaea* endemic to the southeastern mountains of the Western Cape. *Bothalia* 28: 49–53.
7. CAFFERTY, S. & BEYERS, J.B.P. 1999. (1398) Proposal to reject the name *Lachnaea conglomerata* (Rhamnaceae). *Taxon* 48: 171–172.

APPENDICES

APPENDIX 1

NEW COMBINATIONS IN *LACHNAEA*[*]

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[*] Published in *Bothalia* 27: 45 (1997).

THYMELAEACEAE

NEW COMBINATIONS IN *LACHNAEA*

The genus *Cryptadenia* Meisn. comprising five species, was established by Meisner in 1840 and based on Drège's collections (Meisner 1840). In De Candolle's *Prodromus* the same five species were recognized by Meisner (1857). Wright (1915) in his treatment of the genus recognized four of these species, reduced one to synonymy and described a new species. Beyers & Van der Walt (1995) concluded that *Cryptadenia* and *Lachnaea* L. are congeneric and that *Cryptadenia* should be included within *Lachnaea*. In accepting these findings, the necessary nomen- clatural changes are made to the five ´species which are currently recognized (Van Wyk 1993) following Wright's treatment of the genus.

Lachnaea filicaulis *(Meisn.) Beyers* comb. nov.

Cryptadenia filicaulis Meisn.: 407 (1840); Meisn.: 574 (1857); C.H.Wright: 17 (1915).

Lachnaea grandiflora *(L.f.) Baill.*: 109, t. 77 (1880).

Passerina grandiflora L.f.: 226 (1782). *Cryptadenia grandiflora* (L.f.) Meisn.: 405 (1840); Meisn.: 573 (1857); C.H.Wright: 16 (1915).

Cryptadenia breviflora Meisn.: 406 (1840); Meisn.: 573 (1857); C.H.Wright: 17 (1915). Type: *Ecklon 360* (?holo, K!; NBG!, iso.).

Lachnaea laxa *(C.H. Wright) Beyers* comb. nov.

Cryptadenia laxa C.H.Wright: 17 (1915).

Lachnaea uniflora *(L.) Beyers* comb. nov.

Passerina uniflora L.: 560 (1753). *Cryptadenia uniflora* (L.) Meisn 406 (1840); Meisn.: 573 (1857); C.H.Wright: 16 (1915).

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APPENDIX 2

PALYNOLOGICAL STUDIES OF THE THYMELAEACEAE OF THE CAPE FLORA.[*]

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[*] Published in *Grana* 37: 193–202 (1998).

Grana 37: 193–202, 1998

Palynological studies of the Thymelaeaceae of the Cape Flora

JOSEPHINE B. P. BEYERS and ELIZABETH M. MARAIS

Beyers, J. B. P. & Marais, E. M. 1998. Palynological studies of the Thymelaeaceae of the Cape Flora. – Grana 37: 193–202. ISSN 0017-3134.

The pollen of the four genera of the Thymelaeaceae occurring in the Cape Floristic Region was studied with the LM, SEM and TEM. All four genera have spherical, pantoporate pollen grains and in *Gnidia*, *Lachnaea* and *Struthiola* the grains have a typical *Croton*-pattern similar to that of the majority of genera in the Thymelaeaceae. The exine of these three genera comprises triangular, supratectal subunits attached to a reticulum or semitectum, which is connected with short columellae to the nexine. In *Passerina* the supratectal subunits are lacking. Instead, the reticulum is ornamented with sparsely distributed spinules and can be described as supra-microechinate. Polymorphism with regard to pollen size was found in some specimens of three of the *Lachnaea* species, but since it was not consistent for all the specimens of the three species concerned, the phenomenon of polymorphism is ascribed to temporary ecological conditions. The structure of the tectum of *Gnidia*, *Lachnaea* and *Struthiola* is very similar and reveals a continuum of variation so that the palynology seems not to be of any taxonomic value within the three genera. The pollen morphology revealed a closer relationship between *Gnidia*, *Lachnaea* and *Struthiola*, which show a *Croton*-pattern, whereas *Passerina*, with the subunits lacking, confirms the present idea of placing it in a separate subtribe.

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The Thymelaeaceae is a medium-sized family comprising 53 genera and 750 species occurring in both temperate and tropical regions (Mabberley 1997). In the Cape Floristic Region four genera occur (Bond & Goldblatt 1984) of which *Lachnaea* L. s.l. (including *Cryptadenia* Meisn.) with 34 species, is endemic to the region (Beyers & Van der Walt 1995). *Gnidia* L. with about 150 species is mainly an African genus (Dyer 1975) with approximately one third of the species (47 species) in the Cape Floristic Region (Bond & Goldblatt 1984). Both *Struthiola* L., with about 40 species, and *Passerina* L. with about 17 species (Bredenkamp & Van Wyk 1996) occur mainly in the Cape Floristic Region. *Passerina* is a Cape Fynbos genus with one species extending to Zimbabwe (Thoday 1924, Dyer 1975) in the northern extensions of the Fynbos biome along the eastern mountains of southern Africa (Bredenkamp & Van Wyk 1996).

Wright (1915) maintained *Arthrosolen* C.A. Mey., *Gnidia* and *Lasiosiphon* Fresen. as separate genera. Domke (1934) regarded *Arthrosolen* as a synonym of *Lasiosiphon* and thus recognised *Gnidia* and *Lasiosiphon* as separate genera. Peterson's concept of *Gnidia* included both *Arthrosolen* and *Lasiosiphon* (Peterson 1959), and this concept is still being upheld by Van Wyk (1993). *Gnidia*, *Lachnaea*, *Passerina* and *Struthiola* belong to the subfamily Thymelaeoideae, with *Gnidia*, *Lachnaea* and *Struthiola*, with anthers introrse, belonging to the subtribe Gnidiinae and *Passerina*, with anthers extrorse, to the monogeneric subtribe Passerininae (Domke 1934).

Thoday (1924) described *Passerina* as readily distinguishable from the above mentioned genera by its ericoid leaves and small wind-pollinated flowers with exerted stamens, dust-like pollen and penicillate stigma. Hutchinson (1969) emphasised the wind-pollination by stating that the South African members of the Thymelaeaceae are the most advanced members of the family, and that *Passerina* has become so much evolved and reduced as to have reverted to wind-pollination. None of them gave any reason or confirmation to the assumption that *Passerina* species have wind-pollinated flowers. Bredenkamp & Van Wyk (1996) regarded the distribution of *Passerina* in areas in the Fynbos biome where persistent winds prevail throughout the year, the flowering time shortly after the rainy season when wind velocities are high, and the exerted stamens and extrorse anthers of the flowers as adaptations to anemophily. They also stated that insects could be secondary pollen vectors of *Passerina*. According to Bredenkamp & Van Wyk (1996) characteristics of the pollen grains which enhance the possibility of wind-pollination are the size of the pollen grains and the smoother exine sculpture.

In evaluating the generic delimitation of *Lachnaea* and *Cryptadenia*, differences and similarities in the pollen morphology of these two genera were studied (Beyers & Van der Walt 1995). To understand the value of the differences and similarities within the pollen grains of these two endemic genera of the Cape Flora, we compared them to *Gnidia*, *Struthiola* and *Passerina*, genera of the same family, also

Table I. *Pollen morphology of studied species of Thymelaeaceae (LM, SEM, and TEM*[1]*) and chromosome numbers.*

Diameter of pollen grains: mean with range followed in parentheses; sculpturing of supratectal subunits: smooth (sm); striate (str); striate with horisontal intercostal striations (str/retic); striate-granular (str/gran); granular-striate (gran/str); granular (gran); wart-like spinules[2], indicated after number of spinules; base-sides: emarginate = EM, straight = ST.

				Sculpturing of supratectal subunits								
Taxon	Specimen	Herb	Diameter (µm)	sm	str	str/ retic	str/ gran	gran/ str	gran	no. of spinules	basesides	Chromosome no. (2n)
Lachnaea												
L. alpina Meisn.	Forsyth 508	NBG	36 (30–38)				X			1 & 4	EM	
	Oliver 9299	NBG	40 (35–46)					X		1 & 4	ST	18
L. aurea Meisn.	Beyers 135	NBG	47 (39–51)			X				1	EM	
	Oliver 10550	NBG	54 (49–57)			X				1	EM	
L. axillaris Meisn.	Spreeth 160	NBG	27 (24–30)						X	4	ST	
	Steyn 331	NBG	22 (20–23)		X					1	ST	
	Thomas NBG 84653	NBG	25 (22–27)		X					1	ST	
L. burchellii Meisn.	Oliver 9241	NBG	34 (30–41)			X				1	EM	
	Oliver 9251	NBG	34 (27–38)			X				1	EM	
L. buxifolia Lam.	Beyers 118	NBG	52 (49–55)		X					4	ST	
	Beyers 122	NBG	47 (43–53)		X					4	ST	18
	Compton 21088	NBG	52 (43–58)		X					1	ST	
	Oliver 3791	NBG	51 (43–57)			X				1	EM	
	Taylor 8648	NBG	49 (47–59)		X					1	EM	
L. capitata (L.) Crantz	Beyers 128	NBG	29 (23–33)						X	1 & 4	ST	
	Oliver 10519	NBG	32 (30–35)					X		1 & 4	ST	18
	Rourke 729	NBG	37 (35–41)					X		4	ST	
L. densiflora Meisn.	Beyers 115	NBG	27 (23–31)						X	4	ST	
	Beyers 117	NBG	32 (29–35)		X					1	ST	
	Beyers 145	NBG	29 (23–45)					X		4	ST	18
	Beyers 154	NBG	29 (26–33)			X				4	EM	
	Beyers 244	NBG	29 (27–35)			X				1	EM	
L. diosmoides Meisn.	Beyers 181	NBG	29 (23–33)					X		4	ST	18
	Van Niekerk 53	NBG	30 (27–33)					X		4	ST	
L. elsiae Beyers ined.	Oliver 9689	NBG	27 (22–30)		X					1	EM	
	Stokoe 4504	BOL	26 (24–27)		X					1	±EM	
	Taylor 11775	NBG	26 (22–38)				X			4	±EM	
L. ericoides Meisn.	Beyers 172	NBG										18
	McDonald 1842	NBG	28 (25–31)		X					1	EM	
	Zeyher 3776	SAM	27 (23–31)			X				1	EM	
L. eriocephala L.	Beyers 54[1]	NBG	50 (39–57)			X				1	EM	18
	Beyers 238	NBG	42 (40–46)			X				4	ST	
	Rugge s.n.	NBG	42 (40–46)			X				1	ST	18
	Spreeth 141	NBG	45 (39–55)			X				1	EM	
	Stokoe SAM 65580	NBG	43 (37–48)			X				1	ST	
L. filamentosa (L.f.) Thunb.	Beyers 110	NBG	45 (39–55)		X					1 & 4	EM	
	Beyers 245	NBG	40 (35–46)		X					4	EM	
	Taylor 10675	NBG	43 (37–56)		X					4	ST/EM	
	Taylor 10770	NBG	50 (47–56)		X					1	ST/EM	
L. filamentosa. ssp. nov.	Forsyth 89	NBG	45 (37–56)			X				1	EM	
	Hansford 47	NBG	49 (43–65)			X				1	EM	
	Spreeth 144	NBG	55 (49–67)			X				1	EM	
L. filicaulis (Meisn.) Beyers	Esterhuysen 34370	NBG	33 (29–39)						X	1	ST	
	McDonald 1989	NBG	32 (24–40)					X	X	1 & 4	ST	18
L. funicaulis Schinz	Hugo 2332	NBG	24 (22–27)			X				1	ST	
L. globulifera Meisn.	Beyers 240	NBG	33 (30–38)			X				1 & 4	EM	
ssp. *globulifera*	Beyers 253	NBG	36 (32–41)			X				1	EM	
	Esterhuysen 18911	NBG	33 (30–38)			X				4	EM	
L.globulifera Meisn. ssp.	Beyers 246	NBG	37 (30–49)				X			4	ST	
incana Beyers ined.	Brown 575	NBG	33 (30–35)			X				1	EM	18
L. cf. *globulifera*	Esterhuysen 11102	BOL	29 (24–40)		X					1	ST	
L. glomerata Fourc.	Beyers 192	NBG	38 (32–40)		X	X				1 & 4	ST	18
	Vlok 2378	NBG	31 (27–35)		X	X				1 & 4	ST	18
L. gracilis Meisn.	Bean & Trinder Smith 2689	NBG	29 (27–32)					X		1	ST	
	Bean & Viviers 2613	NBG	29 (24–32)					X		1	ST	
	Beyers 126	NBG	29 (27–32)				X			1	ST	
	Beyers 219	NBG	28 (24–30)				X			1	ST	
	Oliver 10415	NBG	29 (27–32)						X	4	ST	
	Oliver 10416	NBG	33 (30–35)						X	4	ST	18
L. grandiflora (L.f.)	Beyers 129	NBG	56 (47–64)		X					4	ST	

Table I. (*Continued*)

				Sculpturing of supratectal subunits								
Taxon	Specimen	Herb	Diameter (μm)	sm	str	str/ retic	str/ gran	gran/ str	gran	no. of spinules	basesides	Chromosome no. (2n)
Baillon	Beyers 151	NBG	48 (45–58)		X			X		1 & 4	ST	
	Beyers 241[1]	NBG	48 (35–51)				X			1	EM	
	Beyers 242	NBG	47 (32–59)					X		4[2]	EM	
L. greytonensis Beyers ined.	Beyers 209	NBG	26 (19–40)			X	X	X		1 & 4	EM ST	
	Stokoe 8031	BOL	24 (18–26)									
L. laniflora (C.H. Wright)	Forsyth 507	NBG	33 (27–35)			X				1	EM	18
Bond	Oliver 10679	NBG	31 (24–35)		X					4	ST	
L. cf. *laniflora*	Hanekom 667	NBG	32 (27–35)				X			4	ST	
L. laxa (C.H. Wright)	Bolus 7875	BOL	40 (33–43)		X					1	EM	
Beyers												
L. leipoldtii Beyers ined.	Taylor 10871	NBG	27 (22–30)				X	X		1 & 4	ST	
L. macrantha Meisn.	Esterhuysen 17723	BOL	39 (35–43)			X				1	ST	
	Forsyth 527	NBG	36 (33–41)		X					4	±ST	
	Oliver 8029	NBG	41 (38–43)			X				1	EM	
	Oliver, I. 3	NBG	42 (32–46)				X			4	ST	18
L. marlothii Schltr.	Kotze 124	NBG	26 (22–30)			X				1	EM	
L. montana Beyers ined.	Beyers 141	NBG	41 (38–46)			X				4	ST	18
ssp. *montana*	Esterhuysen 29730	BOL	37 (35–40)			X				4	ST	
	Krige s.n. STEU 10539	NBG	48 (43–54)			X				4	ST	
L. montana Beyers ined.	Compton 18719	NBG	33 (27–38)			X				1	EM	
ssp. *pedicellata* Beyers ined.	Oliver 9282	NBG	34 (30–40)				X			4	ST	
L. naviculifolia Compton	Andrag 105	NBG	53 (46–60)			X				4	ST	
	Forsyth 525	NBG	47 (38–51)			X				1	EM	
	Oliver 9038	NBG	49 (41–55)			X				1	EM	
L. nervosa (Thunb.) Meisn.	Beyers 215	NBG	43 (27–49)				X			1	ST	
	De Kock 152	NBG	35 (31–39)		X					4	ST	
	Esterhuysen 19230	BOL	37 (16–49)			X				1	EM	
	Esterhuysen 36180	BOL	36 (26–48)									
	Hansford, M 3	NBG	29 (12–40)									
	Oliver 9259	NBG	37 (30–48)			X				1	EM ST	18
	Stokoe SAM 64621	PRE	50 (49–54)		X	X				1 & 4	EM ST	
L. oliverorum Beyers ined.	Oliver 10478	NBG	42 (27–51)			X	X			1 & 4	EM ST	
	Williams 1195	NBG	30 (24–34)									
L. pendula Beyers ined.	Esterhuysen 29780	BOL	22 (19–24)				X			4	ST	
L. penicillata Meisn.	Beyers 173	NBG	29 (23–39)		X					4	ST	
	McDonald 1631	NBG	26 (22–32)		X					4	ST	
	Oliver & Fellingh 9145	NBG	28 (19–35)		X					4	ST	
L. pudens Beyers	Beyers 161	NBG	26 (24–30)				X			1	EM	
	Beyers 210	NBG	28 (24–32)				X			1	EM	
L. pusilla Beyers ined.	Beyers 243	NBG	27 (28–30)						X	4[2]	ST	
L. ruscifolia Compton	Vlok 2084	NBG	35 (31–39)		X						ST	
L. sociorum Beyers	McDonald 2059	NBG	40 (35–46)			X				1	EM	
	Oliver 10524	NBG	39 (32–46)				X	X		1 & 4	ST EM	
	Beyers 176	NBG	41 (35–49)				X			4	ST	18
L. striata (Lam.) Meisn.	Bolus 9087	BOL	29 (22–33)		X					4	ST	
	Compton 4412	BOL	33 (30–35)			X				1	EM	
	Esterhuysen 21152	BOL	30 (27–43)			X				1	ST	
L. uniflora (L.) Crantz	Beyers 136	NBG	54 (47–62)		X					1 & 4	ST EM	18
	Boucher 4570	NBG	41 (38–43)					X		4	ST	
	Compton 9508	NBG	48 (43–57)				X			1 & 4	ST	
	Haynes 447	NBG	52 (49–55)		X					1	ST	
L. villosa Beyers ined.	Beyers 125	NBG	25 (20–27)				X			1	±EM	
	Du Toit s.n.	NBG	24 (19–27)						X	4[2]	ST	18
	Oliver 9808	NBG										18
	Oliver 10400	NBG	24 (22–27)					X		4	ST	
Gnidia												
G. deserticola Gilg	Taylor 11326	NBG	33 (29–38)					X		1	ST	
(= *Lasiosiphon deserticola*												
(Gilg) C.H. Wright)												
G. laxa (L.f.) Gilg	Hector 2	STEU	32 (30–37)							1	ST ±EM	
(= *Anthrosolen laxa* (L.f.) C.A.												
Mey.)												
G. oppositifolia L.	Beyers 199	NBG	36 (33–37)	X						1	ST	
	Kruger 314	NBG		X						1	ST	
G. penicillata Licht. ex Mey.	Beyers 147	NBG	33 (30–35)				X			2–4	ST	14
G. pinifolia L.	Beyers 198	NBG	32 (30–37)					X		2–4	ST	
	Boucher 438[1]	NBG	34 (27–38)					X		2–4	ST	

Table I. (*Continued*)

Taxon	Specimen	Herb	Diameter (µm)	Sculpturing of supratectal subunits: sm	str	str/retic	str/gran	gran str	gran	no. of spinules	basesides	Chromosome no. (2n)
G. squarrosa (L.) Druce	Koekemoer 528	PRE	49 (44–56)					X		1	ST	
	Koekemoer 565	PRE	36 (30–41)					X		1	ST	
	Pool 36	NBG	40 (32–46)					X		1	ST	
G. versiculosa Eckl. & Zeyh. ex Meisn. (=*Anthrosolen ornatus* Meisn.)	Beyers 133	NBG	39 (27–51)					X		1	ST	
Struthiola												
S. argentea Lehm.	Boucher 2492	NBG	34 (30–37)					X		4		
S. ciliata (L.) Lam.	Beyers 211	NBG	23 (22–24)					X		4		
	Koekemoer 587	NBG	30 (22–33)					X		4		
S. martiana Meisn.	Boucher 1810	NBG	38 (33–40)					X		1		
S. macowanii C.H. Wright	Dahlstrand 2517a	NBG	23 (19–25)					X		1		
S. myrsinites Lam.	Beyers 200[1]	NBG	27 (22–32)					X		4		
	Bos 274	NBG	27 (22–30)					X		4		
S. striata Lam.	Willemse 620	NBG	24 (19–30)					X		4		
Passerina												
P. filiformis L.	Thompson 801	NBG	38 (33–44)									
P. paleacea Wickstr.	Taylor 8166	NBG	37 (33–44)									
P. rigida Wickstr.	Marsh 1327	NBG	40 (37–41)									
P. vulgaris Thoday	Beyers 143	NBG	34 (30–37)									
	Beyers 144[1]	NBG	34 (30–38)									

represented in the Cape Flora. The inclusion of the genus *Gnidia* was important because the latest taxonomic treatment of *Gnidia* includes genera which were previously treated separately, thus representing a similar situation as found in *Lachnaea* s.l. Special emphasis has been placed on the species of *Lachnaea* to assess the taxonomic value of the pollen morphology in the taxonomic treatment of *Lachnaea* s.l.

MATERIALS AND METHODS

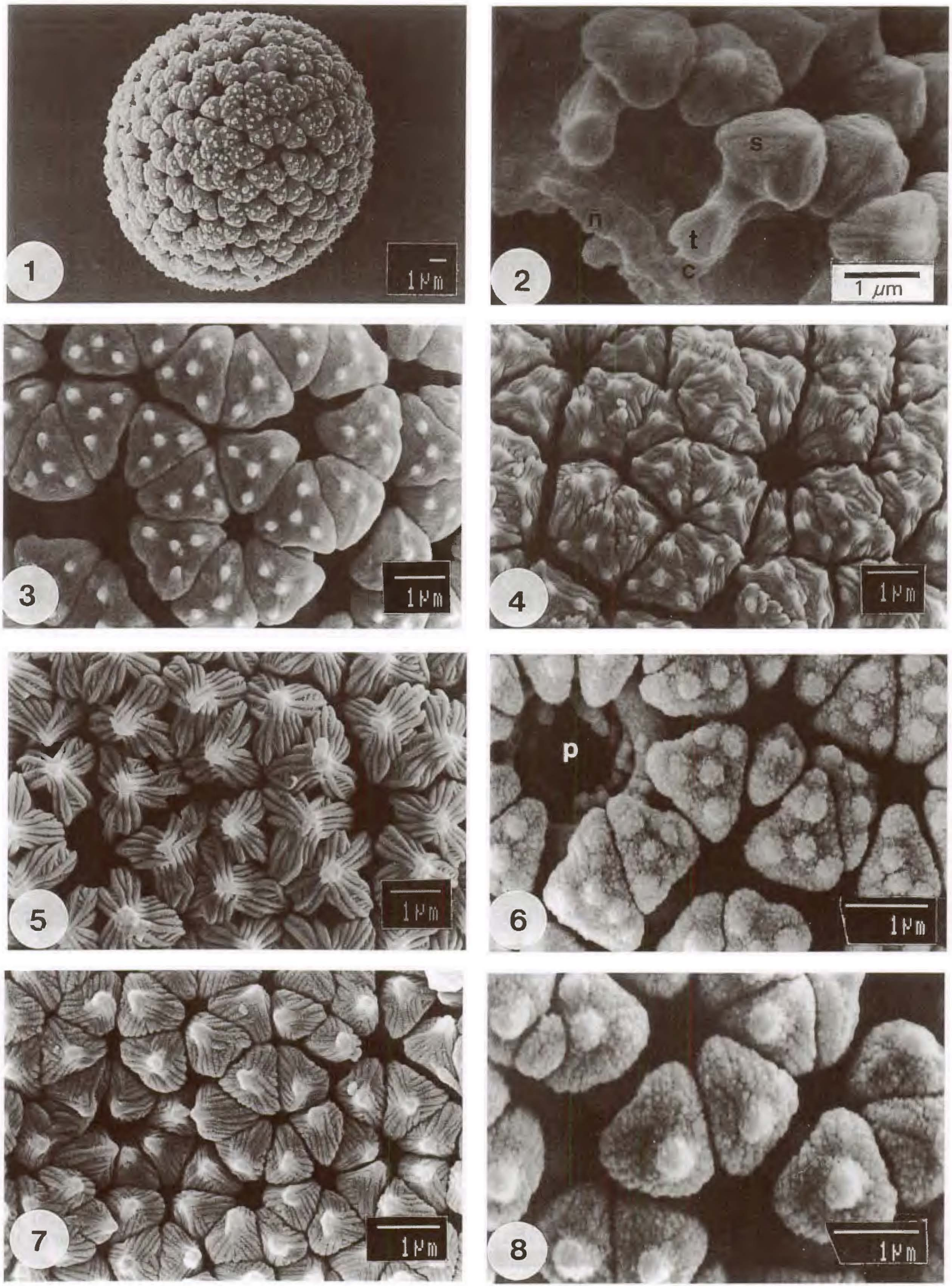
Pollen was taken from herbarium specimens and from material collected in the wild (Table I). For both light microscopy (LM) and scanning electron microscopy (SEM), pollen was acetolyzed according to Erdtman (1960). At least 20 pollen grains of each taxon were measured. Transverse sections of *ca.* 15 µm thick were made with the aid of a freeze-microtome to study the structure of the pollen wall. The terminology used to describe the pollen morphology is that of Punt et al. (1994). *Gnidia* species, selected for this study, included species from the different genera previously distinguished by Wright (1915), but now incorporated in *Gnidia* (Peterson 1959; Table I).

For transmission electron microscopy (TEM) flowers from herbarium specimens (Table I) were embedded in 1% agar (Tiedt 1985) to facilitate the handling of small specimens. Small pieces of agar containing pollen grains were fixed in 2% glutaraldehyde buffered in 0.1 M Na-phoshate (pH 7.4) and 1% tannic acid (Rodewald & Karnovsky 1974). After rinsing in the same buffer, postfixation in OsO_4 and dehydration in acetone followed. Specimens were embedded in spurr (Spurr 1969) and sectioned on a Sovall ultramicrotome. Ultra-thin sections (*ca.* 80 nm) were stained with 4% uranyl acetate (Gabriel 1982), followed by 2% lead citrate (Reynolds 1963).

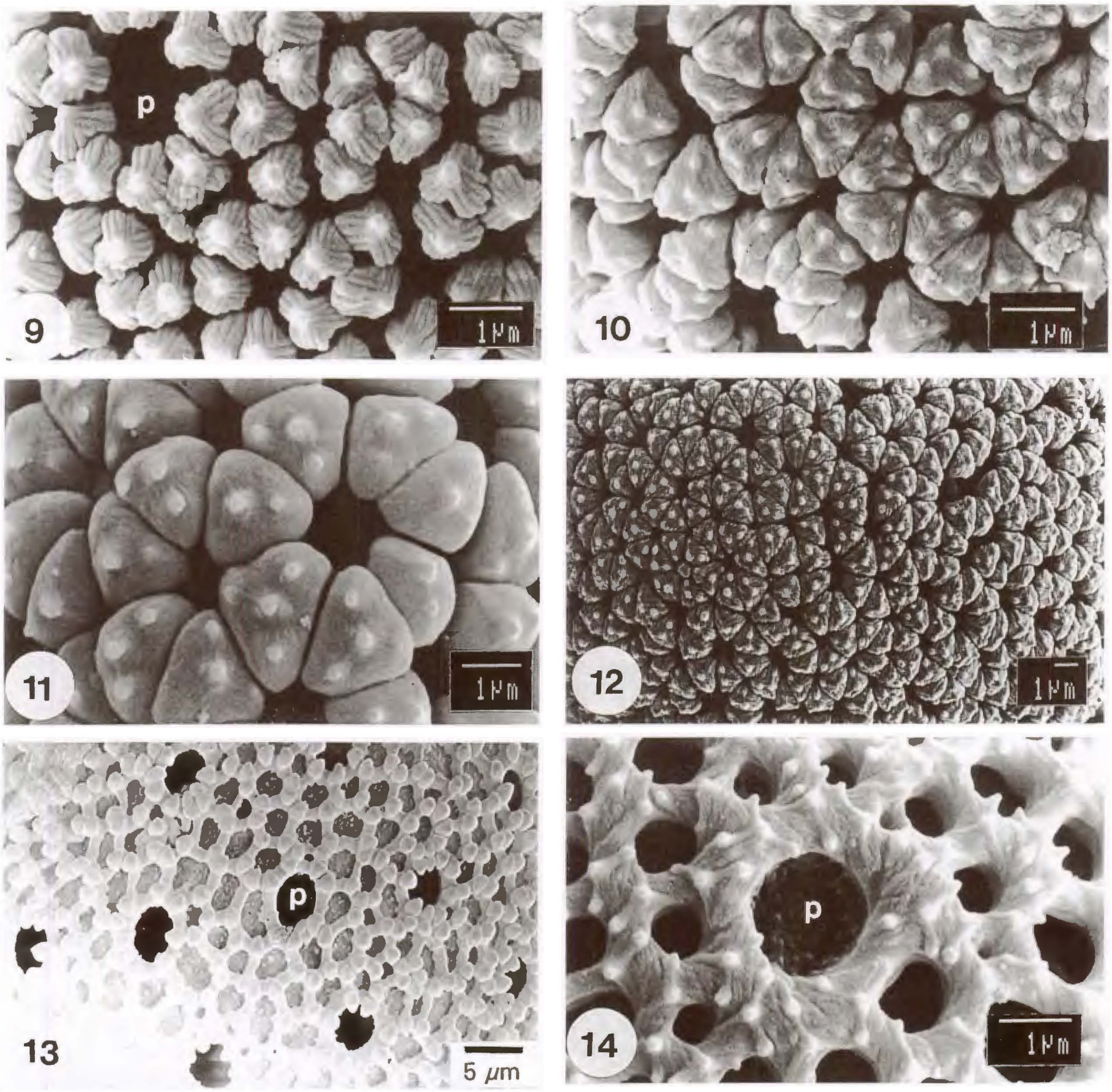
RESULTS

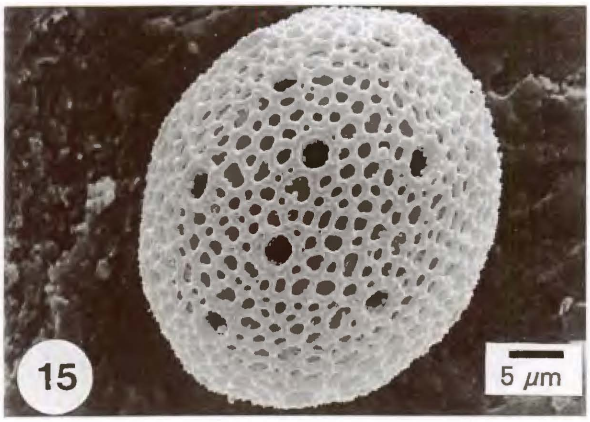
The pollen of the Thymelaeaceae is remarkably uniform: spheroidal in shape, pantoporate, with a *Croton*-pattern or a derivative thereof (Nowicke et al. 1985). The *Croton*-pattern (named by Erdtman 1966) comprises triangular supratectal elements attached to a reticulum (semitectum: Punt et al. 1994) having short or irregular columellae (Nowicke 1994). The triangular supratectal elements or subunits can be psilate, striate, furrowed or ridged, or pitted. The subunits can be closely spaced or arrayed in more open configurations (Nowicke 1994).

Gnidia, *Lachnaea* and *Struthiola* have monads (Fig. 1) with the structure of the triangular supratectal subunits revealing a similar continuum of variation as described and illustrated for several genera of the Thymelaeaceae by Nowicke et al. (1985) and Nowicke (1994), for *Wikstroemia* Endl. by Mayer (1991) and for seven southern African genera of the Thymelaeaceae by Bredenkamp & Van Wyk (1996). The subunits are tetrahedral with a single central spinule (Fig. 2) or it can be flattened but then having four spinules (Fig. 3). The majority of species of *Lachnaea* reveal a striation on the subunit (Fig. 4). Usually, when the basesides of these subunits are emarginate, horizontal intercostal striations also occur (Fig. 5). These intercostal striations are mostly associated with a single central spinule (Fig. 5). A small number of species of *Lachnaea* shows a granular pattern on the subunit (Fig. 6) and these subunits are usually associated with four spinules, or instead of the spinules, wart-like structures or verrucae (Fig. 6). A continuum of variation was found between the striate and granular surfaces (Figs. 7, 8) as well as the number of spinules on the subunits. Variation was not only found amongst species but often within a species or even a specimen (Figs. 9, 10). The subunits in the pollen of *Gnidia* (Fig. 11) and *Struthiola* (Fig. 3) are smooth to granular-striate. The number of spinules also varies between one and four in these two genera. The subunits in all three genera are usually closely spaced giving the sculpture a dense configuration so that in



Figs. 1 -8. SEM micrographs of pollen grains of the Thymelaeaceae. (1) Pollen grain of *Struthiola ciliata* (Beyers 211). (2) Freeze microtome section of the pollen grain wall of *Lachnaea uniflora* (Haynes 477). 3-8. Parts of the pollen grain wall showing the variation of the supratectal subunits. (3) *Struthiola myrsinitis* (Beyers 200). (4) *Lachnaea nervosa* (Stokoe 64621). (5) *L. eriocephala* (Rugge s.n.). (6) *L. gracilis* (Oliver 10416). (7) *L. funicaulis* (Hugo 2332). (8) *L. gracilis* (Bean & Vivier 2613). (*c*) columella, (*n*) nexine, (*p*) pore, (*s*) supratectal subunits, (*t*) tectum, (*arrowhead*) intercostal striation. Scale bars 1 µm.





Figs. 9–15. SEM micrographs of pollen grains of the Thymelaeaceae. 9–11 Portions of the pollen grain wall showing the variation of the supratectal subunits. (9–10) Lachnaea greytonenis (Beyers 209). (11) *Gnidia pinifolia* (Boucher 438). 12–13 Portions of the pollen grain wall to show pores. (12) *L. sociorum* (Beyers 176). (13) *L. grandiflorum* (Beyers 151). 14–15 Pollen grain wall of (14) *Passerina vulgaris* (Beyers 144). (15) *P. filiformis* (Thompson 801). (*p*) pore. Scale bars 1 µm (9-12 & 14), 5 µm (13 & 15).

the majority of species of *Gnidia, Lachnaea* and *Struthiola* the pores are almost indistinct (Fig. 12). In a few species, however, pores are clearly distinguishable and included in a brochus (Fig. 13) as in *Daphne* (Faegri & Iversen 1989).

The exine of the pollen wall of *Passerina* consists of a reticulum, similar to that of *Gnidia, Lachnaea* and *Struthiola* and the different genera of the Thymelaeaceae as illustrated by Nowicke et al. (1985), but it lacks the prominent supratectal subunits. Bredenkamp & Van Wyk (1996) regarded the supratectal subunits as completely fused to form a secondary reticulum, and the basal reticulum is no more discernible but apparently lost through reduction or by fusion with the new reticulum. SEM and TEM studies in this project did not give a clear image as to whether the supratectal units are reduced to spinules or whether there is a fusion of two layers. The SEM micrographs of *Passerina* pollen grains reveal a diagonal striation with sparsely distributed spinules, which could be described as supra-microechinate (Fig. 14). However, the tectum appears much smoother than that of *Gnidia, Lachnaea* and *Struthiola.* Without the presence of supratectal subunits the pores in *Passerina* pollen grains are distinct and each clearly situated within a brochus (Fig. 15).

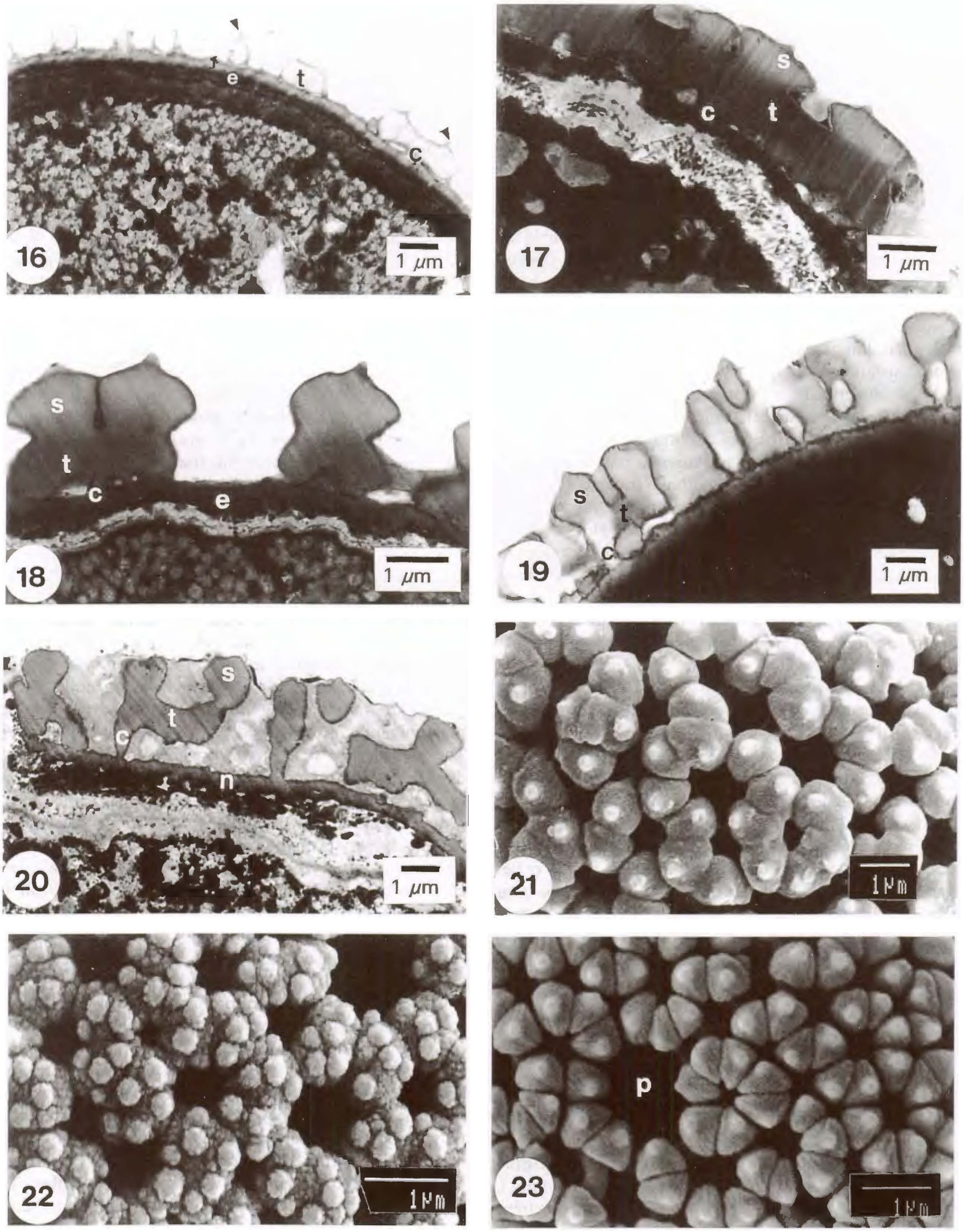
The pollen size of all species investigated ranged from 19–67 µm (Table I). The pollen size for the eight specimens of *Struthiola* ranged from 19–40 µm; for the 11 specimens of *Gnidia* it varied from 27–56 µm; and for the five specimens of *Passerina* from 33–44 µm. The pollen size of all the *Lachnaea* species studied ranged from 19–67 µm. The variation in size formed a gradient from small to medium-sized grains and from medium-sized to large grains. In three species, viz. *L. nervosa*, *L. greytonensis* and *L. oliverorum* the pollen size varied greatly within a specimen, with the smallest grains less than half or almost half the size of the largest grains. In *Lachnaea* the stamens are arranged in two whorls. In these three species the filaments of the inner stamens are shorter than filaments of the outer stamens or the inner whorl is inserted deeper down in the hypanthium and being less exposed. The first pollen specimens studied of these three species showed only small and large grains. Since pollen polymorphism was already described in *Wikstroemia* (Ong & Rao 1973) and because of the differences in the stamen whorls in *Lachnaea*, polymorphism with regard to pollen size was considered for these three species. More samples of the same collections were examined and the anthers of the different whorls were sampled separately. This revealed a continuum of pollen size, ranging from very small to large in each species and this continuum also occurred in both whorls of each species. Eventually seven collections from different localities of *L. nervosa* were sampled. Only three collections (Esterhuysen 19230, BOL, Esterhuysen 36180, BOL and Hansford M 3, NBG) showed the extreme sizes of small to large pollen grains. Subsequent sampling of other collections of *L. greytonensis* (Stokoe 8031, BOL) and *L. oliverorum* (Williams 1195, NBG) did not reveal the extreme sizes of small to large pollen grains as was found initially in the specimens studied of these two species. No tests on the viability of the pollen grains were performed. Variation in pollen size in most plant species is often correlated with the ploidy of the species (Ong & Rao 1973). Unfortunately only the chromosome number ($2n = 18$) of *L. nervosa* (Oliver 9258, NBG) is known and not that of the specimens showing the polymorphism with regard to size. So far no polyploidy is known in *Lachnaea.* All known chromosome numbers for *Lachnaea* species are $2n = 18$ (Table I).

Studies with the transmission electron microscope (TEM) also show the triangular supratectal subunits attached to a reticulum in *Lachnaea*, *Gnidia* and *Struthiola*. In *Passerina* only short spinules are attached to the reticulum (Fig. 16). The tectum is supported by columellae underlaid with a footlayer and endexine. The tectum is about three times of the thickness of the nexine in *S. myrsinites* (Fig. 17); slightly thicker to twice the thickness of the nexine in *G. pinifolia* (Fig. 18), *P. vulgaris* (Fig. 16), *L. grandiflora* (Fig. 20), or more or less the same thickness than the nexine in *L. eriocephala* (Fig. 19). The columellae are well developed in *L. eriocephala* (Fig. 19) and *L. grandiflora* (Fig. 20), but reduced and very short in *S. myrsinites* (Fig. 17), *G. pinifolia* (Fig. 18) and *P. vulgaris* (Fig. 16). The nexine in *S. myrsinites* and *G. pinifolia* comprises a prominent endexine and an extremely thin footlayer. In *L. grandiflora*, *L. eriocephala* and *P. vulgaris* the footlayer has the same thickness or is up to twice the thickness of the endexine. The prominent footlayer in *Passerina* is in agreement with the results of Bredenkamp & Van Wyk (1996).

DISCUSSION AND CONCLUSION

The diameter for the pollen grains of all the species studied lies between 19–67 µm. Although only a small number of specimens of *Struthiola*, *Gnidia* and *Passerina* was measured, it seems that *Struthiola* has the smallest pollen grains (19–40 µm in diameter) and *Gnidia* and *Passerina* have predominantly medium-sized grains (27–56 µm in diameter). The pollen size of *Lachnaea* varies from 19–67 µm in diameter, which represents the whole spectrum of the species studied. Within this range species of *Lachnaea* could not be grouped according to the size of the pollen grains. Although polyploidy may express itself directly in pollen size (Muller 1979), this is not the case in *Lachnaea*, since the known chromosome numbers of 18 *Lachnaea* species are all the same ($2n = 18$; Table I), with no polyploidy known. Pollen size in *Lachnaea* could rather be correlated to flower size (Muller 1979) since small flowers have small pollen grains and larger flowers have larger grains (Table II).

Concerning the variation in pollen size within *L. nervosa*, *L. greytonensis* and *L. oliverorum*, Pozhidaev (1993) pointed out that in most palynological investigations deviated pollen forms are regarded as abnormal and thus left unregistered and that published data do not reveal the true occurrence of these deviations. Mathew & Valsaladevi (1989) described polymorphism of pollen grains as a phenomenon of two or more pollen morphoforms occurring in the same species, or occasionally in a single plant or even the same anther. This polymorphism occurs naturally or due to various factors such as ecological conditions. Mathew & Valsaladevi (1989) and Pozhidaev (1993) also pointed out that deviated pollen forms were found in very different and distant angiosperm groups. As the variation in pollen size in the three *Lachnaea* species was not consistent within a species the phenomenon could be due to temporary ecological conditions or other



Figs. 16–23. TEM and SEM micrographs of pollen grains of the Thymelaeaceae. 16–20. TEM micrographs of thin sections of the pollen grain wall of selected species. (16) *Passerina vulgaris* (Beyers 144). (17) *Struthiola myrsinitis* (Beyers 200). (18) *Gnidia pinifolia* (Boucher 438). (19) *Lachnaea eriocephala* (Beyers 54). (20) *L. grandiflorum* (Beyers 241). 21–23. SEM micrographs to show portions of the pollen grain wall. (21) *G. deserticola* (Taylor 11326). (22) *L. pusilla* (Beyers 243). (23) *L. leipoldtii* (Taylor 10871). (*c*) columella, (*e*) endexine, (*f*) footlayer, (*n*) nexine, (*p*) pore, (*s*) supratectal subunits, (*t*) tectum, (*arrowhead*) spinules. Scale bars – 1 µm.

Table II. *Pollen of Lachnaea species.*

Size of pollen and flower arranged according to pollen size.

Species	Pollen size (μm)	Flower size (mm)
L. pendula	22.0 (19–24)	2.4–3.9
L. funicaulis	24.0 (22–27)	3.7–5.1
L. villosa	24.3 (19–27)	3.2–4.7
L. axillaris	24.6 (20–30)	3.0–4.8
L. greytonensis	25.0 (18–40)	3.2–5.5
L. marlothii	26.0 (22–30)	3.8–5.6
L. elsiae	26.3 (22–38)	2.2–4.2
L. leipoldtii	27.0 (22–30)	4.3–5.6
L. pusilla	27.0 (28–30)	4.0–5.7
L. pudens	27.0 (24–32)	5.0–8.4
L. ericoides	27.5 (23–31)	3.2–4.6
L. penicillata	27.6 (19–39)	3.6–5.3
L. cf. *globulifera*	29.0 (24–40)	3.9–4.1
L. densiflora	29.2 (23–45)	3.4–7.4
L. diosmoides	29.5 (23–33)	3.4–5.8
L. gracilis	29.5 (24–35)	3.9–8.0
L. striata	30.6 (22–43)	4.8–9.5
L. laniflora	32.0 (24–35)	3.9–8.2
L. cf. *laniflora*	32.0 (27–35)	5.3–5.8
L. filicaulis	32.5 (24–40)	4.3–7.5
L. capitata	32.6 (23–41)	3.7–7.4
L. montana ssp. *pedicellata*	33.5 (27–40)	5.1–8.2
L. burchellii	34.0 (27–41)	4.3–9.2
L. globulifera ssp. *globulifera*	34.0 (30–41)	3.7–7.0
L. glomerata	34.5 (27–40)	2.9–4.9
L. globulifera ssp. *incana*	35.0 (30–49)	5.8–8.3
L. ruscifolia	35.0 (31–39)	9.0–10.0
L. oliverorum	36.0 (24–51)	7.1–9.5
L. nervosa	38.1 (12–54)	5.8–18.0
L. alpina	38.0 (30–46)	7.2–12.2
L. macrantha	39.5 (32–46)	14.9–26.9
L. sociorum	40.0 (32–49)	4.2–7.5
L. laxa	40.0 (33–43)	6.2–16.5
L. montana ssp. *montana*	43.5 (35–54)	10.5–24.8
L. eriocephala	44.4 (37–57)	12.0–25.3
L. filamentosa	44.5 (35–56)	12.8–31.2
L. uniflora	49.0 (38–62)	12.0–20.0
L. filamentosa ssp. nov.	49.6 (37–67)	26.5–37.5
L. naviculifolia	49.6 (38–60)	11.0–21.0
L. grandiflora	49.7 (32–64)	11.8–28.5
L. buxifolia	50.2 (43–59)	18.5–29.0
L. aurea	50.5 (39–57)	13.1–23.3

factors, but could not be regarded as being well established within the species.

The triangular supratectal subunits in *Gnidia*, *Lachnaea* and *Struthiola* reveal a variation between one and four spinules per subunit. This variation was found not only within a species as seen in *Lachnaea* where several specimens per species were studied (Table I), but also within a specimen as in *L. greytonensis* (Figs. 9, 10). The surface structure of the supratectal subunits and the spinules varied from smooth (*G. deserticola*; Fig. 21) through striate (Figs. 4, 5) to granular (Figs. 6–8). This character seemed almost to be consistent within a specimen (Table I), but where several specimens per species were studied transitional forms degrade the taxonomic value of this character.

No correlation could be made between the inflorescence types or the flower morphology in *Lachnaea* and the structure of the supratectal subunits. As in the size of the pollen grains, the sculpture of the tectum revealed a continuum of variation. Although species could not be grouped according to the pollen morphology, the pollen morphology can assist in some cases in the delimitation of species with similar inflorescence and floral structures. For example in two closely related species, viz. *L. pusilla* (Fig. 22) and *L. leipoldtii* (Fig. 23), the sculpture of the supratectal subunits can be used as one of the distinguishing characters. In the former species the supratectal subunits are granular with wart-like spinules whereas in the latter the subunits are striate-granular with one or four spinules.

The ultra-structure of the pollen wall reveals a closer relationship between *Gnidia* and *Struthiola* because both have very thin footlayers and reduced columellae. *Passerina* shares the reduced columellae with *Gnidia* and *Struthiola*, but the presence of a more prominent footlayer with *Lachnaea*. According to Nowicke et al. (1985) the well-developed columellae of *Lachnaea* show a resemblance to those of *Thymelaea arvensis* Lam., *Linodendron cubanum* (A. Rich.) Urb. and *Daphne mezereum* L.

The differences in the pollen morphology of *Gnidia* species, previously included in the genera *Arthrosolen* and *Lasiosiphon*, are insignificant and made no contribution to the subdivision of *Gnidia*. Similar to this is the insignificance of the variations in the structure of the tectum in *Gnidia*, *Struthiola* and *Lachnaea*. This wider spectrum in the palynology of the Cape Flora genera of the Thymelaeaceae convinced us that the palynology is not an important tool to apply in the delimitation of the different genera of the subtribe Gnidiinae and did not contribute anything in the decision to include *Cryptadenia* into *Lachnaea*. Neither did pollen morphology contribute much to the delimitation of species in *Lachnaea* or to the grouping of species within the genus. This conclusion corresponds with the results of Heads (1990) for *Kelleria* and *Drapetes* and for the Hawaiian species of *Wickstroemia* (Mayer 1991).

The sculpture of the tectum reveals a closer relationship between *Struthiola*, *Gnidia* and *Lachnaea* whereas *Passerina*, with the subunits lacking, stands apart. The closer relationship between *Gnidia*, *Lachnaea* and *Struthiola* supports the placement of these genera in the same subtribe, whereas the distinctly different pollen morphology of *Passerina* supports the classification by Domke (1934), where *Passerina* is placed in a separate subtribe or the newly instated tribe Passerineae (Domke) Bredenkamp & Van Wyk by Bredenkamp & Van Wyk (1996).

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APPENDIX 3

INFLORESCENCE MORPHOLOGY OF *LACHNAEA* AND *CRYPTADENIA* (THYMELAEACEAE).*

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Inflorescence morphology of *Lachnaea* and *Cryptadenia* (Thymelaeaceae)

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Keywords: *Cryptadenia*, inflorescence morphology, *Lachnaea*, Thymelaeaceae

ABSTRACT

The current delimitation of *Lachnaea* L. and *Cryptadenia* Meisn. is based on the inflorescence morphology. In *Lachnaea* both indeterminate and determinate inflorescences occur, whereas in *Cryptadenia* only determinate inflorescences are present. The indeterminate inflorescences in *Lachnaea* are capitate or umbellate. The determinate inflorescences in both genera comprise a solitary, terminal flower. It is concluded that the two genera cannot be distinguished on inflorescence structure.

UITTREKSEL

Lachnaea en *Cryptadenia* word tans op grond van hul bloeiwyses onderskei. Beide onbepaalde en bepaalde bloeiwyses kom by *Lachnaea* voor, terwyl by *Cryptadenia* net bepaalde bloeiwyses voorkom. Die onbepaalde bloeiwyses by *Lachnaea* is hofies of skerms. Die bepaalde bloeiwyses by beide genera bestaan uit 'n enkel, terminale blom. Die gevolgtrekking word gemaak dat dié twee genera nie op grond van die struktuur van die bloeiwyses onderskei kan word nie.

INTRODUCTION

The Thymelaeaceae, which is regarded as a medium-sized family comprising 50 genera and 720 species, occurs in both temperate and tropical regions (Mabberley 1990). Most genera belong to the subfamily Thymelaeoideae including the genus *Lachnaea* L. and the genus *Cryptadenia* Meisn. Both these genera are endemic in the Cape Province.

In the classification systems of the Thymelaeaceae by Endlicher (1847, sec. Domke 1934), Meisner (1857), Bentham & Hooker (1880), Gilg (1894) and Domke (1934), *Lachnaea* and *Cryptadenia* have always been placed next to each other, reflecting their close affinity. Only one previous worker, Baillon (1880), did not regard *Cryptadenia* as a separate genus but as a section of *Lachnaea*. In the last taxonomic treatment of the two genera, Wright (1915) followed the classification of Bentham & Hooker (1880).

The floral morphology of *Lachnaea* and its closest related genus, *Cryptadenia*, is similar. The flowers are bisexual, tetramerous, apetalous, with eight floral scales inserted on the hypanthium below the insertion of the eight stamens, which are arranged in two whorls of four each. To distinguish between these two genera Wright (1915) used the inflorescence structure. In *Lachnaea* he regarded the flowers to be terminal, capitate or rarely solitary, whereas in *Cryptadenia* he described them as axillary, solitary and bibracteolate. A study of the descriptions of the different taxa of both genera revealed that *L. axillaris* Meisn., *L. micrantha* Schltr. and *L. ruscifolia* Compton have flowers which are axillary and solitary, whereas the flowers of *L. penicillata* Meisn., according to Wright (1915), are terminal and solitary. If one should apply the criterion used by Wright (1915), the former three species should rather be placed in *Cryptadenia*. Thus, the criterion used by Wright does not hold.

A preliminary examination of herbarium specimens of the Western Cape herbaria has brought to light numerous misidentifications and *incertae*, illustrating the poor state of our knowledge of *Lachnaea* and *Cryptadenia*. The confusion which presently exists regarding the delimitation of *Lachnaea* and *Cryptadenia* can be partly ascribed to the inconsistencies in Wright's interpretation of the inflorescence morphology of these two genera (Wright 1915). As the inflorescence has been considered to be of great taxonomic importance in the past, the study of the inflorescence morphology was undertaken with the view to improving our understanding of these two genera.

Meisner (1840) instituted three sections, *Sphaeroclinium* Meisn., *Conoclinium* Meisn. and *Microclinium* Meisn., within *Lachnaea*, based on the inflorescence morphology. In his later publication of 1857 he followed the same classification. In the section *Sphaeroclinium* he included those taxa having a terminal, dense, many-flowered capitulum, which was either involucrate or evolucrate, the sessile flowers being arranged on a moderately thick, globose receptacle. Meisner (1840, 1857) included *L. buxifolia* Lam. and *L. filamentosa* (Thunb.) Meisn. in this section. In the section *Conoclinium* he regarded the inflorescence as a terminal or subterminal, few- to many-flowered, evolucrate capitulum. Here the moderately thick receptacle was at first hemispherical to conical but by later elongating, became subcylindrical. From the regular arrangement of the flower scars on the receptacle, he regarded the inflorescence as a spike and not a capitulum. In this section he included *L. capitata* (L.) Meisn. and *L. densiflora* Meisn. In the section *Microclinium* he included those taxa having flowers in sessile, terminal, subcapitate or subsolitary inflorescences, or those rarely having axillary, solitary flowers, namely *L. axillaris*, *L. diosmoides* Meisn., *L. ericoides* Meisn. and *L. penicillata* Meisn. Meisner (1840)

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regarded the flowers of *Cryptadenia* as terminal, solitary or geminate, or occasionally as axillary and solitary, but in his later publication of 1857 he described the flowers as being terminal and subsolitary.

Gilg (1894) regarded the inflorescences in *Lachnaea* as usually being terminal, many-flowered heads, but occasionally, when consisting of two flowers, as mostly axillary. In *Cryptadenia* he regarded the flowers as solitary, axillary, with two bracteoles.

Domke (1934) described the inflorescences in *Lachnaea* as being usually terminal heads, which are basally enclosed by an involucre, or congested heads without an involucre. No mention was made of the solitary-flowered inflorescence in his generic description of the genus. In *Cryptadenia* he regarded the flowers as being solitary or few, either terminal or axillary with two bracteoles.

Dyer (1975) followed Wright (1915) and also used the inflorescence structure to distinguish between *Lachnaea* and *Cryptadenia*. According to Dyer (1975) the flowers in *Lachnaea* are arranged either in terminal, bracteate or ebracteate heads or a congested spike, or are rarely solitary, whereas in *Cryptadenia* the flowers are axillary and solitary.

In the most recent publication on the inflorescence morphology of the Thymelaeaceae, Weberling & Herkommer (1989) regarded the inflorescences in *Lachnaea* as being capitate or spicate, or having solitary, axillary flowers borne on a proliferating spike as in *L. axillaris*. In *Cryptadenia* they considered the flowers as being solitary and terminal.

From the above literature survey there seems to be consensus with regard to the terminal, many-flowered heads but not with regard to the position of the single-flowered inflorescences in *Lachnaea*. Similarly in *Cryptadenia* different views are expressed with regard to the position of the inflorescence and the number of flowers in an inflorescence.

The aim of the present investigation was to determine whether the inflorescence morphology could be used to delimit the two genera.

MATERIALS AND METHODS

Material used in this study comprised herbarium specimens and plants collected in the wild, with the exception of *L. nervosa* Meisn. of which fresh material was unobtainable. Eighteen taxa were selected, 14 from *Lachnaea* and four from *Cryptadenia*. The aim in selecting the taxa was to have as broad a representation as possible of all the taxa in the two genera. The criteria used for selecting the taxa were: 1, taxa representative of the three sections instituted by Meisner (1840), taking in account the variation in each section; and 2, taxa with solitary flowers.

Four of the five species of *Cryptadenia* currently recognized were studied. *Cryptadenia breviflora* Meisn. was excluded as it is an intermediate taxon between *Cryptadenia grandiflora* (L.f.) Meisn. and *Cryptadenia uniflora* Meisn. Levyns (1950) considered *C. breviflora* as a hybrid between the two species.

The 18 species studied were: *Lachnaea aurea* Eckl. & Zeyh., *L. axillaris*, *L. burchellii* Meisn., *L. buxifolia*, *L. capitata*, *L. densiflora*, *L. diosmoides*, *L. ericoides*, *L. eriocephala* L., *L. filamentosa*, *L. funicaulis* Schinz, *L. nervosa*, *L. penicillata*, *L. ruscifolia*, *Cryptadenia filicaulis* Meisn., *C. grandiflora*, *C. laxa* Wright and *C. uniflora* (nomenclature according to Arnold & De Wet 1993).

RESULTS

Inflorescence structure within *Lachnaea*

Both major types of inflorescences, as recognized by Radford *et al.* (1974) and Cronquist (1988), namely indeterminate and determinate, occur in *Lachnaea*.

Indeterminate inflorescences

Within the indeterminate inflorescences the capitulum and the umbel are represented.

1. Species with capitula

L. buxifolia, *L. capitata*, *L. densiflora* and *L. filamentosa* have terminal, multi-flowered, ebracteate capitula. These capitula are borne singly at the ends of branches on sericeous peduncles, which vary in length from 3–10 mm. The sessile flowers are arranged on a moderately thick, convex receptacle, which elongates during the flowering period, becoming narrowly conical or conical. Different stages of flower development are present within a capitulum. The fruiting stage may be present basally while buds are still developing distally. An accurate number of flowers in an inflorescence is therefore not easily determined. The number of mature flowers, at a given time, varies from ± 50 in *L. buxifolia*, 20–50 in *L. filamentosa*, ± 12 in *L. densiflora* and only 1–3 in *L. capitata*.

After flowering, vegetative growth is resumed by lateral branches developing in the axils of the upper leaves immediately beneath the capitulum. These will eventually terminate in new capitula in the following flowering period. However, some of these lateral shoots, as in *L. densiflora*, may terminate in capitula within the same flowering period. Lateral branches may also develop from the axils of the leaves below the distal leaf on the main flowering branches. These branches will, in the following flowering period, be terminated by capitula (Figure 1).

2. Species with umbels

Two types of indeterminate umbels, namely bracteate umbels as in *L. eriocephala* and ebracteate umbels as in *L. diosmoides*, are recognized. The pedicels remain in the old inflorescences for some time after the upper portion of the flowers and the fruits have been shed. The number of pedicels present indicates the number of flowers in each inflorescence.

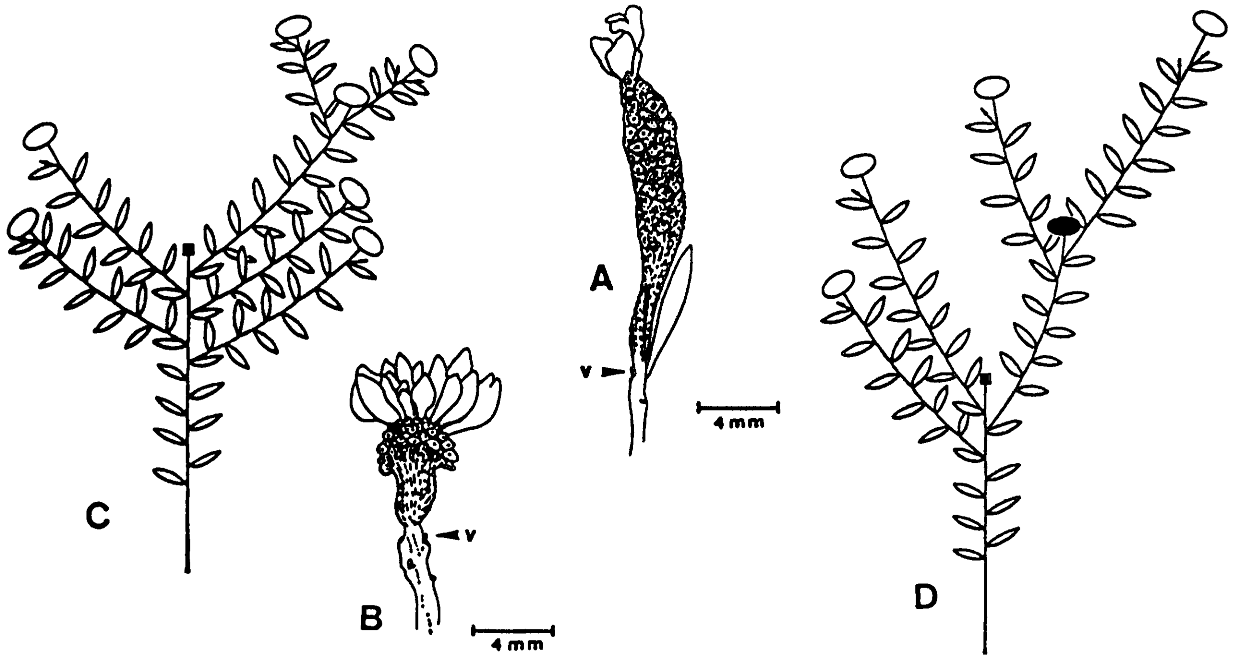

FIGURE 1.—Capitate inflorescences of *Lachnaea* species. A, capitulum of *L. capitata, Beyers 128*, illustrating elongated receptacle after lower flowers have been shed; B, capitulum of *L. buxifolia, Beyers 122*, with flowers partly removed. Diagrammatic illustration of branching pattern of flowering branches: C, *L. densiflora*; D, *L. filamentosa*: ■, remains of previous year's inflorescence; ○, flowering capitulum; ●, capitulum with fruits only; v, bud of new vegetative shoot.

2.1. Species with sessile bracteate umbels

Sessile, bracteate umbels occur in *L. aurea, L. eriocephala* and *L. penicillata*. In *L. eriocephala* (Figure 2) the inflorescence is comprised of about 40 shortly pedicellate flowers, which are surrounded by a bracteate involucrum consisting of four large bracts, in two whorls of two. These bracts follow on the stem after the linear-elliptic to lanceolate leaves. Similarly in *L. aurea* the ± 50-flowered umbel is surrounded by 8–10 bracts which are spirally arranged. From the axils of the foliage leaves immediately below the bracteate umbels, vegetative growth is resumed by lateral branches in both species. These lateral branches will eventually terminate in bracteate umbels in the following flowering period. Lateral branching is not only restricted to the axil of the distal leaf when the leaves are alternately arranged as in *L. aurea*, or to the distal pair of leaves, when opposite as in *L. eriocephala*, but may originate from the axils of the other upper foliage leaves. These lateral branches are also terminated by bracteate umbels in the following flowering period. In both cases the lateral branches may elongate considerably.

In *L. penicillata* (Figure 3) the inflorescence is also a terminal bracteate umbel. The umbel, usually eight-flowered, is surrounded by four bracts, in two whorls of two each. Only the distal portion of a single mature flower is visible at a time. Wright (1915) inadvertently regarded the flowers as being 'terminal, solitary, sessile'. The elongated pedicels and buds enclosed by the bracts were ignored by him. Lateral branching arises from the axils of either the first or second pair of foliage leaves immediately below the inflorescence. These lateral branches may elongate considerably or may be reduced to comprising only one or two pairs of foliage leaves before being ter-

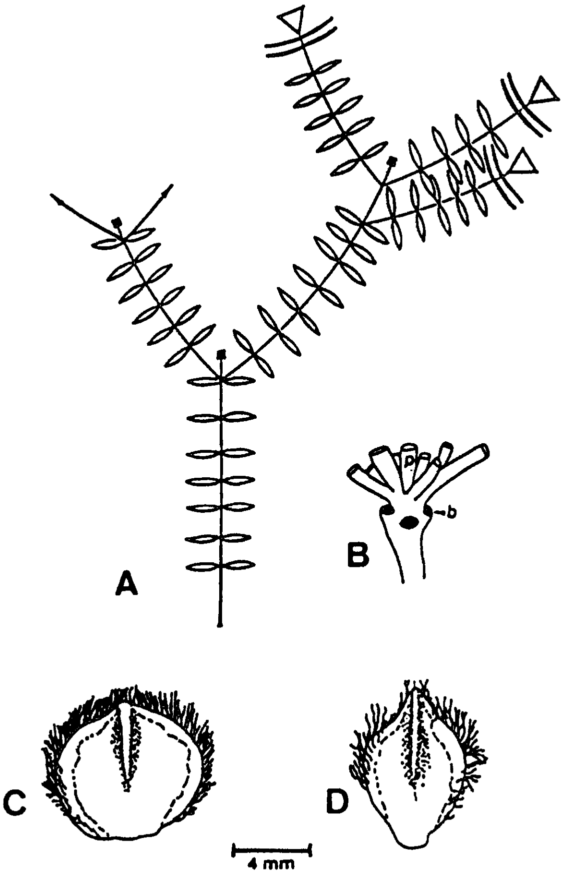

FIGURE 2.—*L. eriocephala, Beyers 54*. A, diagrammatic illustration of branching pattern of flowering branches; B, bracteate umbel with flowers and bracts removed; C, abaxial view of one of inner pair of bracts; D, abaxial view of one of outer pair of bracts; ■, remains of previous year's inflorescence; ▽, umbel; b, scar of removed bract; p, pedicel.

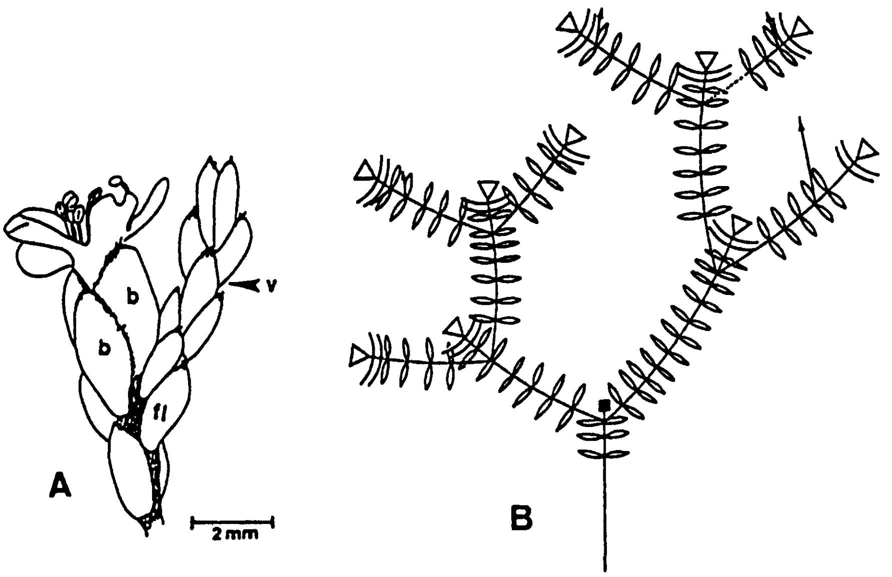

FIGURE 3.—*L. penicillata*, *Oliver & Fellingham 9145*. A, flowering branch with a terminal bracteate umbel; B, diagrammatic illustration of branching pattern of flowering branches; ■, remains of previous year's inflorescence; ∇, umbel; b, bract; fl, foliage leaf; v, new vegetative shoot.

minated by an inflorescence. Up to three generations of flowering branches may develop in one flowering period. Vegetative growth is resumed by lateral branches developing from the axils of the upper foliage leaves of the last flowering generation.

2.2. Species with sessile ebracteate umbels

In *L. diosmoides*, *L. ericoides*, *L. funicaulis* and *L. nervosa* the flowers are borne in sessile, ebracteate umbels at the tips of the branches. No bracts surround the inflorescence as new vegetative growth arises from the axils of the leaves immediately beneath the umbel (Figure 4). The number of flowers per umbel varies among the different species and also within each species. In *L. diosmoides* and *L. funicaulis* 6–20 flowers are present, whereas in *L. nervosa* the number varies from 4–14 and in *L. ericoides* from 2–8. As a result of the different developmental stages of the flowers present in each umbel, only a few mature flowers are present at a time. Lateral branching is resumed from the axil of the upper leaves below the inflorescences but is not restricted only to the most distal leaves immediately behind the inflorescence. In *L. nervosa* (Figure 4) short, lateral branches also arise in the axils of the leaves lower down on the main flowering branch, which in the same flowering period are terminated by inflorescences. Consequently the main flowering

FIGURE 4.—Diagrammatic illustration of branching pattern of flowering branches: A, *L. ericoides*; B, *L. nervosa*. C, terminal ebracteate umbel in *L. nervosa*, *De Kock 152*, illustrating new vegetative shoot (v) in the axil of the distal foliage leaf (fl). ■, remains of previous year's inflorescence; ∇, umbel.

branch has the appearance of a racemose inflorescence. Similarly in *L. diosmoides* lateral vegetative shoots arising in the axils of the leaves immediately below the inflorescence, may be terminated by inflorescences in the same flowering period. Here they may overtop the umbel on the main flowering branch, forming a dense cluster of umbels, and at the same time reduced lateral shoots may develop lower down in the axils of the foliage leaves of the same main branch with a racemose appearance, as in *L. nervosa*.

In *L. ericoides* (Figure 4) a first and second generation of flowering shoots may occur. These shoots, as in the previous taxa, develop from the axils of the leaves immediately below the inflorescence. Below the most distal leaf on the main flowering shoot, further lateral shoots may develop which may terminate in inflorescences in the same flowering period or in the next flowering period. These flowering shoots are, unlike those in *L. diosmoides*, restricted to the upper leaves on the main flowering branch. Vegetative shoots may also develop lower down on the main flowering branches of the previous flowering period which again will be terminated by inflorescences in the following flowering period.

In *L. funicaulis* a pair of bract-like foliage leaves occurs at the base of the umbels. These umbels appear bracteate and resemble those of *L. penicillata*, but, unlike *L. penicillata*, lateral vegetative growth develops in the axils of the bract-like foliage leaves. These lateral vegetative shoots will terminate in ebracteate umbels in the following flowering period. Reduced lateral shoots also develop in the axils of the upper leaves, behind the bract-like foliage leaves on the main flowering branch, which may terminate in ebracteate umbels within the same flowering period, forming a cluster of inflorescences towards the end of the main flowering branch.

In *L. burchellii* (Figure 5), contrary to the interpretation of Meisner (1840, 1857) and Wright (1925) who regarded the inflorescences to be bracteate, the inflorescences are terminal, sessile, ebracteate umbels. The umbels consist of up to ten flowers, with 1 or 2 mature flowers at a time. Vegetative growth is resumed from the axils of the leaves immediately below the umbels. On some specimens the inflorescences appear to be bracteate. These 'bracteate' umbels are in fact reduced lateral branches, each terminated by an ebracteate umbel. The leaves on these branches differ in size and shape from the foliage leaves on the rest of the plant. In the axil of the most distal leaf

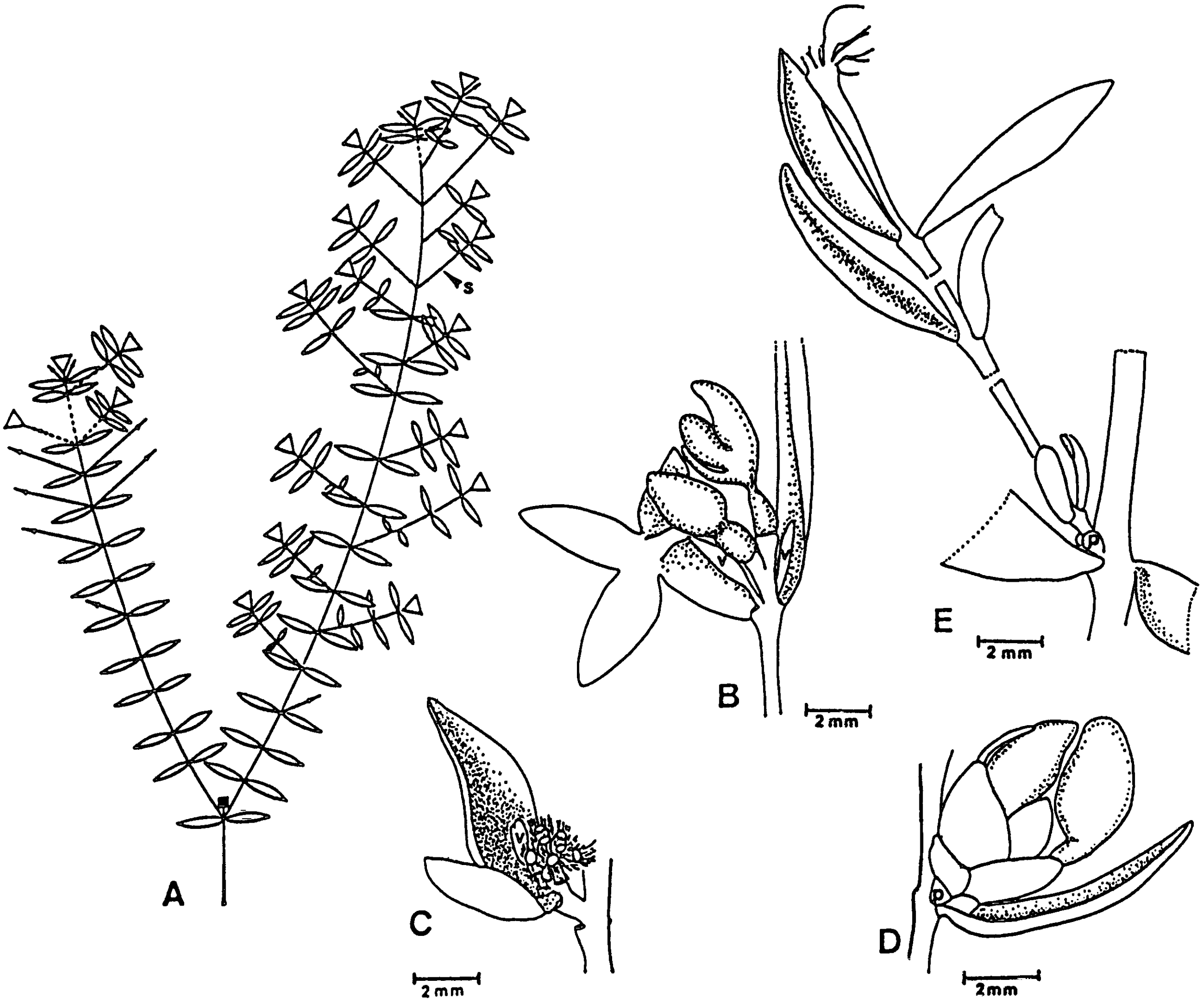

FIGURE 5.—*L. burchellii*. A, diagrammatic illustration of branching pattern of flowering branches; B, terminal ebracteate umbel, *Spreeth 155*; C, short lateral flowering shoot illustrating new vegetative shoot (v) in axil of bract-like leaf, *Spreeth 155*; D, short lateral flowering shoot, *Oliver 9251*; E, elongated lateral flowering shoot showing similar small prophylls (p) basally; s, scar of caducous bract-like leaves; ∇, umbel.

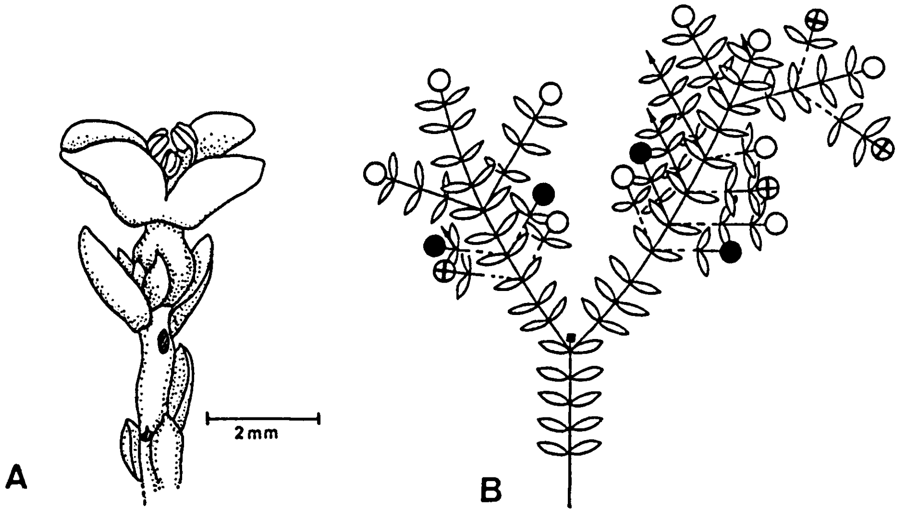

FIGURE 6.—*L. axillaris*. A, flowering shoot illustrating new vegetative shoot in axil of distal leaf, *Morley 174*; B, diagrammatic illustration of branching pattern of flowering branches; ■, scar of flower of previous year; ⊕, flower bud; ○, open flower; ●, fruit.

on one of these reduced flowering branches, a well-developed bud of the new vegetative shoot was observed. The lower two pairs of leaves on some of the elongated lateral flowering branches, resemble those modified foliage leaves of the reduced flowering branches. These leaves are often caducous. Vegetative growth is resumed by lateral branches developing from the axils of the upper leaves immediately below the umbel and may also originate from the leaf axils lower down on the main flowering branch. These lateral branches will terminate in umbels in the following flowering period. Flowering branches may develop at random on the main flowering branch, as in *L. nervosa*. These flowering branches arise from the axils of the leaves behind the most distal leaf pair during the same flowering period. The main flowering branch thus has the appearance of a racemose inflorescence.

Determinate inflorescences

Meisner (1840) described the flowers of *L. axillaris* as being axillary, opposite or scattered, always solitary, with two intra-axillary bracteoles. In his later publication (1857) he referred to the flowers as being subsolitary, axillary or rarely terminal. Wright (1915) regarded the flowers as being axillary and solitary. According to Weberling & Herkommer (1989) the flowers of *L. axillaris* are solitary, axillary with two transverse bracteoles.

The flowers of *L. axillaris* were found to be solitary and terminal. A well-developed bud of the new vegetative shoot occurs in the axil of one of the leaves of the pair of foliage leaves immediately below the flower (Figure 6). Lateral branches, each terminated by a solitary flower, develop at random on the main flowering branches within the same flowering period. These flowering branches arise from the axils of the foliage leaves below the leaf pair immediately behind the terminal flower. These lateral flowering branches vary in length and may even be reduced to having one pair of opposite leaves. Consequently the main flowering branch may have the appearance of a racemose or spicate inflorescence (Figure 6). Previous authors inadvertently regarded these leaves immediately behind the solitary flower as transverse bracteoles. It was found that the new vegetative growth originates in the axils of these leaves and terminates in flowers in the following flowering period. This growth is not always visible on herbarium material as specimens are usually collected when they are in full flower.

The flowers of *L. ruscifolia* were regarded by Compton (1953) as being 'solitary, axillary, sessile'. On studying fresh material in the fruiting stage, well-developed vegetative buds were found in the axils of the bracteoles (Figure 7). These bracteoles are in fact bracteose foliage leaves similar to those found on the short lateral flowering shoots in *L. burchellii*. In *L. ruscifolia* the flowers are therefore solitary and terminal on much reduced, lateral, flowering shoots which develop at random in the axils of the foliage leaves on the main flowering branches giving them a spicate appearance (Figure 7). Occasionally the lateral flowering shoot may consist of an additional pair of foliage leaves between the bracteose leaves (prophylls) and the flower (Figure 7). No terminal flower was observed on the main branches probably due to the abortion of the apical meristem. From the axil of the leaf behind the aborted meristem new vegetative growth may resume or a reduced flowering shoot may develop (Figure 7). Two scarious prophylls which resemble the bracteose leaves on the lateral flowering shoot, occur at the base of the developing lateral vegetative shoot (Figure 7).

Thus, in both *L. axillaris* and *L. ruscifolia* the inflorescences are determinate, consisting of solitary, terminal flowers.

Inflorescence structure within *Cryptadenia*

The inflorescences in *Crytadenia* are all cymose. In all the taxa well-developed buds of the new proliferating shoot develop in the axils of the upper leaf pair immediately behind the flower (Figure 8). These vegetative shoots usually terminate in flowers in the following flowering period, except in *C. filicaulis* and *C. grandiflora* where they may terminate in flowers in the same flowering period. Lateral branches may also arise at random from the axils of the leaves beneath the distal pair below the terminal flower on the main flowering branch. These branches vary in length and may even be reduced to only the terminal flower and a pair of foliage leaves as in *C. filicaulis* (Figure 8). Consequently the main flowering branch, as in *L. axillaris*, has the appearance of a racemose or spicate inflorescence. Lateral branches, each terminating in a solitary flower in the following flowering period, may also develop from the axils of the leaves lower down on the main flowering branches (Figure 8).

DISCUSSION

In the genus *Lachnaea* the flowers are arranged in terminal, indeterminate, capitate or umbellate inflorescences, or they are solitary and terminal. In *Cryptadenia* the flowers are solitary and terminal. Determinate inflorescences occur in both *Lachnaea* and *Cryptadenia*, whereas indeterminate inflorescences occur only in *Lachnaea*. Table 1.

In both genera the differentiation of a long shoot/short shoot system can be observed. In some taxa within *Lachnaea* and *Cryptadenia* this system is more conspicuous than in others. In both genera new vegetative growth arises from the axils of the foliage leaves immediately below the inflorescences, and this may terminate in an inflorescence within the same flowering period. Thus two generations of flowering branches may occur together on a plant (Figures 4 & 8).

Weberling & Herkommer (1989) regarded the terminal, single-flowered inflorescence found in *Cryptadenia* as a monotelic inflorescence. The inflorescence in *L. axillaris* and *L. ruscifolia* can therefore be regarded as monotelic. The polytelic inflorescence on the other hand would, according to their terminology, include the capitulum and umbel in *Lachnaea*. According to Weberling (1983) the polytelic type of inflorescence has probably been derived repeatedly from the monotelic type during the evolution of angiosperms by the reduction of the terminal flower and specialization of the paracladia of the monotelic system. The distal elements are reduced to single lateral flowers or lateral cymes, which constitute elements of an apical system composed of lateral flowers. Therefore the floral axis, instead of terminating in a single flower, terminates in a multi-flowered polytelic inflorescence.

According to Weberling & Herkommer (1989) *Gonystylus* Teijsm. & Binn. and *Amyxa* van Tiegh. of the Gonystyloideae which is regarded as a relatively primitive group, have monotelic synflorescences (synflorescence according to Weberling 1983). Within the Thymelaeoideae, the Gnidioideae and probably the Aquilarioideae, certain taxa were also found to have monotelic synflorescences. They came to the conclusion that, considering the other more or less primitive characters and the different taxonomic evaluation of those combinations, it was impossible to draw any taxonomic conclusions exclusively from the existence of the monotelic synflorescences within those taxa.

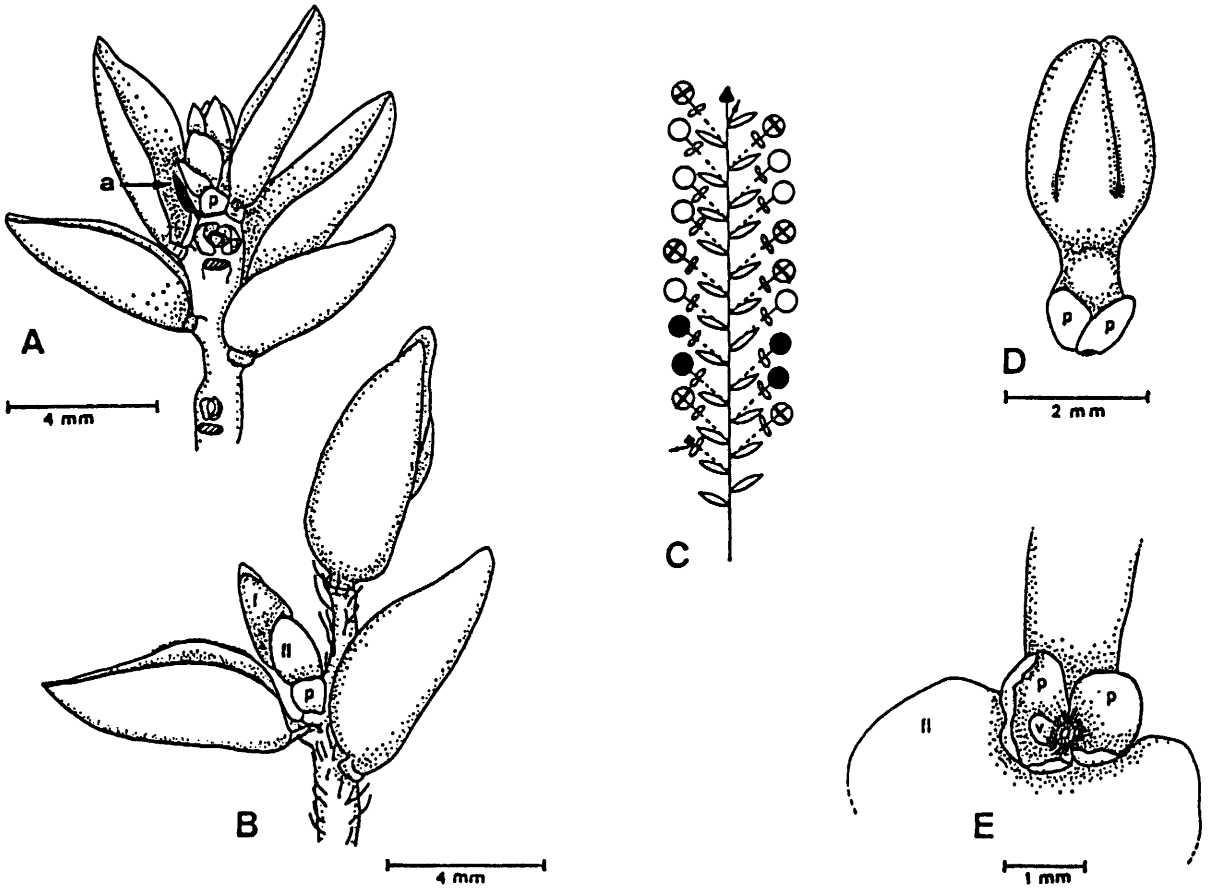

FIGURE 7.—*L. ruscifolia*. A, branch illustrating aborted apical meristem (a) being displaced by new lateral shoot developing from axil of distal foliage leaf, *Marshall 39*; B, main branch with short lateral flowering shoot, *Vlok 166*; C, diagrammatic illustration of branching pattern of flowering branches; D, flower bud with two bracteose leaves (p), *Vlok 166*; E, vegetative shoot (v) arising from axil of one of bracteose leaves; f, flower; fl, foliage leaf; ▲, aborted apical meristem; ⊕, flower bud; ○, open flower; ●, fruit; ■, scar of flower of a previous year.

TABLE 1.—Inflorescence characters of *Cryptadenia* and *Lachnaea*

Species	Indeterminate inflorescences				Determinate inflorescences with solitary flower
	Capitulum	Umbel	No. bracts	No. flowers	
Cryptadenia					
filicaulis					x
grandiflora					x
laxa					x
uniflora					x
Lachnaea					
aurea		x	8–10	± 50	
axillaris					x
burchellii		x	0	±10	
buxifolia	x		0	± 50 (mature)	
capitata	x		0	1–3 (mature)	
densiflora	x		0	± 12 (mature)	
diosmoides		x	0	6–20	
ericoides		x	0	2–8	
eriocephala		x	4	± 40	
filamentosa	x		0	20–50 (mature)	
funicaulis		x	0	6–20	
nervosa		x	0	4–14	
penicillata		x	4	± 8	
ruscifolia					x

Weberling & Herkommer (1989) regarded the ramification type of the polytelic synflorescences in the Thymelaeaceae to be thyrsic. Within many genera, according to them, these synflorescences have been reduced to racemes, spikes or umbels and in some taxa, as in *Lachnaea*, the umbel-like aggregation of flowers is combined with the formation of an involucrum.

From the above one could conclude that within *Lachnaea* the terminal, solitary flower is the primitive state and that the bracteate umbel is the advanced state.

CONCLUSION

The inflorescence morphology revealed determinate and indeterminate inflorescences in *Lachnaea* and only determinate inflorescences in *Cryptadenia*. In both genera the determinate inflorescence comprises a solitary, terminal flower. No distinct differences with regard to the inflorescence morphology could be found between these two genera. Therefore the inflorescence structure can not, as in the past, be used to distinguish between the two genera.

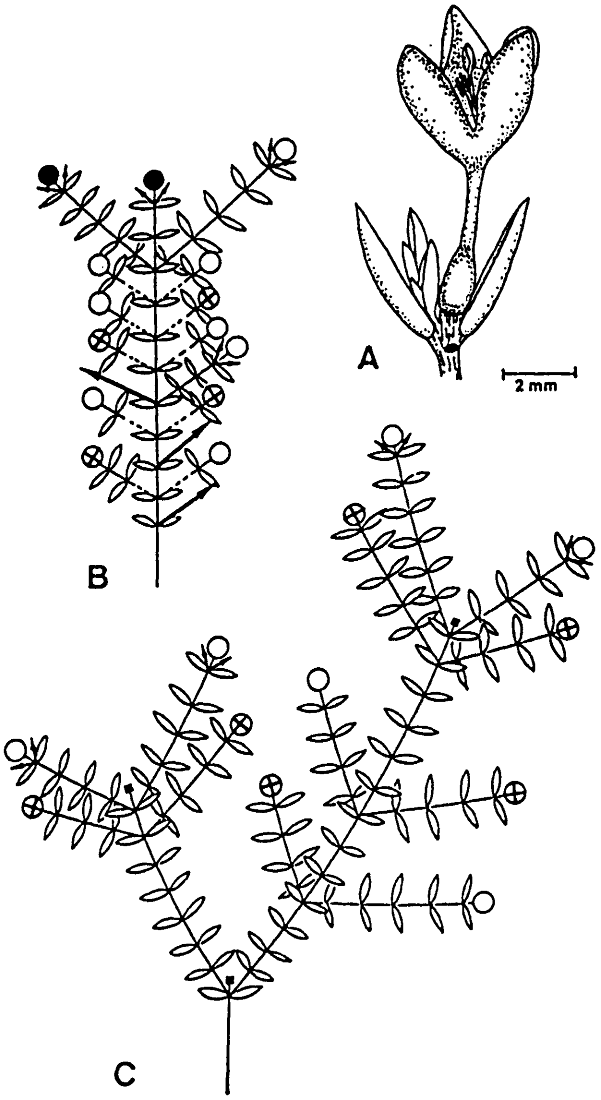

FIGURE 8.—Inflorescence structure and branching patterns of *Cryptadenia* species. A, flowering shoot in *C. laxa. Bodkin sub Guthrie 3585*. Diagrammatic illustration of branching pattern of flowering branches: B, *C. filicaulis*; C, *C. uniflora*: ⊖, flower bud; Ↄ, open flower; ●, fruit; ■, scar of flower of a previous year.

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APPENDIX 4

THE GENERIC DELIMITATION OF *LACHNAEA* AND *CRYPTADENIA* (THYMELAEACEAE).[*]

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The generic delimitation of *Lachnaea* and *Cryptadenia* (Thymelaeaceae)

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Keywords: *Cryptadenia*, generic delimitation, *Lachnaea*, Thymelaeaceae

ABSTRACT

The current generic delimitation of *Lachnaea* L. and *Cryptadenia* Meisn. was investigated. A multidisciplinary approach was followed. This included a study of the habit, phyllotaxis, morphology and anatomy of the leaves and flowers, pollen morphology and karyology.

No major differences were found between the two genera. The range of variation of certain diagnostic characters of these genera is such that the genera merge into each other. It was concluded that the two genera are congeneric and the inclusion of *Cryptadenia* within *Lachnaea* is proposed.

UITTREKSEL

Die huidige generiese afbakening van *Lachnaea* L. en *Cryptadenia* Meisn. is ondersoek. 'n Multidissiplinêre benadering is gevolg. Die groeiwyse, blaarstand, morfologie en anatomie van die loofblare en blomme, stuifmeelmorfologie en kariologie is bestudeer.

Geen noemenswaardige verskille tussen die twee genera is gevind nie. Die variasiegradiënt van sekere diagnostiese kenmerke van hierdie genera is van so 'n aard dat die twee genera oorvleuel. Die insluiting van *Cryptadenia* binne die omskrywing van die generiese grense van *Lachnaea* word voorgestel.

CONTENTS

INTRODUCTION

The genera *Lachnaea* L. and *Cryptadenia* Meisn. belong to the family Thymelaeaceae. Their close affinity is reflected by their placement in the different classification systems of the Thymelaeaceae (Endlicher 1847, sec. Domke 1934; Meisner 1857; Bentham & Hooker 1880; Gilg 1894 and Domke 1934). Only Baillon (1880) did not recognize *Cryptadenia* as a separate genus but treated it as a section of *Lachnaea*. He found that the flowers of *Lachnaea* varied from regular to irregular and that intermediate forms made it impossible to split the genus.

The genus *Lachnaea*, based on two species, was established by Linnaeus in 1753. In subsequent publications, such as Lamarck (1792, 1804), Salisbury (1808) and Sims (1813, 1814), new species were described, but only in 1840 was a detailed taxonomic account of the genus published by Meisner based on Drège's collections. Three sections were established, namely *Sphaeroclinium* Meisn., *Conoclinium* Meisn. and *Microclinium* Meisn., based on the inflorescence structure. Thirteen species and six infraspecific taxa were recognized (Meisner 1840). Meisner's earlier contribution on *Lachnaea*, with some alterations, was published in De Candolle's *Prodromus* in

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which 18 species and 17 infraspecific taxa were recognized (Meisner 1857). The most recent taxonomic treatment of the genus was that of Wright (1915) in *Flora capensis*. In this treatment no mention was made of the sections established by Meisner. Wright (1915) recognized 19 species and eight infraspecific taxa, and referred to one imperfectly known species. In the Addenda to the same volume, a further two species and two infraspecific taxa were added (Wright 1925). Since then four new species have been described, namely three by Compton (1934a & b, 1953) and one by Fourcade (1934). When Thoday (1924) published the revision of the genus *Passerina*, he noted that the type of *Passerina laniflora* C.H. Wright was not a *Passerina* species but indeed a species of *Lachnaea*. Bond (1982) proposed the new combination, *Lachnaea laniflora* (C.H. Wright) Bond. *L. marlothii* Schltr. (Schlechter 1896) and *L. gracilis* Meisn. (Meisner 1840) were both overlooked by Wright. At present 29 species and eight infraspecific taxa are recognized (Van Wyk 1993).

The genus *Cryptadenia*, comprising five species, was established by Meisner in 1840 and was also based on Drège's collections (Meisner 1840). According to Meisner (1840) the main characters by which *Cryptadenia* can be distinguished from the closely related genus *Lachnaea*, are the glands which are positioned much lower down in the hypanthium just above the ovary, and by the conspicuous filaments which are adnate to the hypanthium. In De Candolle's *Prodromus* the same five species were recognized by Meisner (1857). The most recent taxonomic treatment of *Cryptadenia* was that of Wright (1915) in *Flora capensis*, in which four of the species in Meisner's treatment were recognised, whereas one was reduced to synonymy. A new species was also described. The criterion used by Wright (1915) to delimit the two genera was the position of the flowers: 'Flowers axillary, solitary' in *Cryptadenia* opposed to 'Flowers terminal, capitate, rarely solitary' in *Lachnaea*. At present *Cryptadenia* is considered to comprise five species (Van Wyk 1993).

Both *Lachnaea* and *Cryptadenia* are endemic to the Cape Province. *Lachnaea* is found mainly at high altitudes from Clanwilliam in the north to the Cape Peninsula in the south and eastwards along the coastal areas as far as Uitenhage. Further inland it occurs on the mountain ranges from Ceres through Worcester to Ladismith (Bond & Goldblatt 1984). The centre of diversity is in the south-western area. *Cryptadenia* occurs on sandy flats and lower mountain slopes from Piketberg in the west to the Cape Peninsula, and along the coastal areas to Bredasdorp and inland to Ceres (Bond & Goldblatt 1984).

Lachnaea and its closest related genus, *Cryptadenia*, are both characterized by the absence of petals and by a hypanthium having scales below the insertion of the stamens. Beyers & Van der Walt (1994), contrary to Wright (1915), found that the two genera could not be distinguished on the inflorescence structure. With the large number of herbarium specimens now available, compared to the small range of material on which earlier studies were based, a sound delimitation of the two genera is possible. The aim of the present investigation was to compare the two genera using a multidisciplinary approach, with the view to establishing whether they are congeneric or not. Besides the morphological study accompanied by field work, anatomical, palynological and karyological investigations were undertaken to assess the taxonomic value of the evidence derived from these sources.

MATERIALS AND METHODS

Eighteen taxa were selected, 14 from *Lachnaea* and four from *Cryptadenia*. The aim in selecting the taxa was to have as broad a representation as possible of all the taxa in the two genera. The criteria used for selecting the *Lachnaea* taxa were as follows: a, taxa representative of the three sections instituted by Meisner (1840), taking into account the variation in each section; b, all taxa with solitary flowers; c, the position of the scales in the floral tube; d, the stigma types; e, the degree of asymmetry of the calyx lobes.

Wright's revision of *Lachnaea* and *Cryptadenia* in *Flora capensis* (1915 and 1925) was followed. Type specimens and quoted specimens were examined to verify the species concepts for the taxa used in this study. Infraspecific variation has been included in each taxon studied and has not been treated individually.

Four of the five species of *Cryptadenia* currently recognized were studied. *Cryptadenia breviflora* Meisn. was excluded as it is an intermediate taxon between *Cryptadenia grandiflora* (L. f.) Meisn. and *Cryptadenia uniflora* Meisn., which Levyns (1950) considered to be a hybrid between these two species.

The following species were studied: *Lachnaea aurea* Eckl. & Zeyh., *L. axillaris* Meisn., *L. burchellii* Meisn., *L. buxifolia* Lam., *L. capitata* (L.) Meisn., *L. densiflora* Meisn., *L. diosmoides* Meisn., *L. ericoides* Meisn., *L. eriocephala* L., *L. filamentosa* (Thunb.) Meisn., *L. nervosa* Meisn., *L. penicillata* Meisn., *L. ruscifolia* Compton, *Cryptadenia filicaulis* Meisn., *C. grandiflora*, *C. laxa* C.H. Wright and *C. uniflora* (author citations according to Van Wyk 1993).

For the anatomical study of the foliage leaves, both material preserved in FAA and herbarium material was used. The herbarium material was soaked in 50% ethanol for 24 hours, thereafter treated as preserved material. The preserved material was dehydrated and embedded in wax according to the tertiary butyl method (Johansen 1940). Transverse sections 12 µm thick were made through the middle of the leaf blade with the aid of a rotary microtome and stained with Alcian Green Safranin (AGS) (Joel 1983). Scanning electron micrographs of the leaf surfaces were obtained by mounting portions from the same region of the leaf blade of herbarium material on stubs which were coated with gold and studied with a Joel JSM-35 scanning electron microscope. Epidermal cell patterns of the leaf blade were studied under a light microscope after the adaxial and abaxial epidermal layers were peeled off and mounted in water.

The anatomical study of the flowers was done on material preserved in FAA. The preserved material was dehydrated and embedded in wax according to the tertiary butyl method (Johansen 1940). For the anatomy, transverse

TABLE 1.—Voucher specimens of *Lachnaea* species for the leaf anatomy, floral anatomy, pollen morphology and karyology

Species	Voucher specimens	Leaf anatomy	Floral anatomy	Pollen morph.	Karyology
aurea	*Beyers 135* (STE)	×		×	
axillaris	*Beyers 127, 180* (STE)	×	×		
	Beyers 197 (STE)		×		
	Schlechter 7702 (BOL)	×			
	Steyn 331 (NBG)			×	
burchellii	*Oliver 9241* (STE)	×		×	
	Oliver 9251 (STE)	×			
buxifolia	*Beyers 118* (STE)		×	×	
	Beyers 122 (STE)	×		×	
	Taylor 8648 (STE)			×	
capitata	*Beyers 128* (STE)		×	×	
	Beyers 138 (STE)	×			
	Hugo 231 (STE)			×	
densiflora	*Beyers 115* (STE)	×		×	
	Beyers 117 (STE)			×	
	Beyers 145 (STE)	×		×	×
	Beyers 171 (STE)	×			
	Beyers 177 (STE)	×			
diosmoides	*Beyers 181* (STE)	×	×	×	×
	Spreeth 158 (STE)	×			
	Van Niekerk 53 (BOL)			×	
ericoides	*Beyers 172* (STE)	×			×
	McDonald 1842 (STE)			×	
	Zeyher 3776 (SAM)			×	
eriocephala	*Beyers 54* (STE)	×	×	×	×
	Spreeth 141 (STE)			×	
filamentosa	*Beyers 110* (STE)	×		×	
	Taylor 10770 (STE)			×	
funicaulis	*Beyers 125* (STE)	×		×	
	Du Toit s.n. (STE)				×
nervosa	*De Kock 152* (STE)	×		×	
penicillata	*Beyers 173* (STE)	×		×	
	McDonald 16321 (STE)			×	
	Oliver & Fellingham 9145 (STE)			×	
ruscifolia	*Beyers 193* (STE)	×			
	Goldblatt & Manning 8870 (STE)	×			
	Vlok 2084 (STE)	×	×	×	

sections were used almost exclusively and longitudinal sections were resorted to only to verify the points of attachment of the floral structures. Serial sections were cut 12 µm in thickness. AGS staining (Joel 1983) as well as Crystal Violet and Erythrosin staining (Jackson 1926) were used. The AGS staining technique was found to give better results.

Pollen was taken from herbarium specimens and from material collected in the wild. For both light microscopy (LM) and scanning electron microscopy (SEM), pollen was acetolyzed according to Erdtman (1960). Acetolyzed samples were prepared for both SEM and LM according to the method of Marais (1990). At least 20 pollen grains of each taxon were measured. Transverse sections ± 15 µm thick were made with the aid of a freeze-microtome to study the structure of the pollen wall of two taxa in each genus. The terminology used to describe the pollen morphology is that of Walker & Doyle (1975).

For chromosome studies inflorescences were fixed in Carnoy's fixative in the field. After 24 hours, the fixative was replaced with 85% ethanol for 15 minutes and then finally replaced with 70% ethanol. Flower buds were stained in Snow's fluid (1963). The anthers were removed and squashed in 45% acetic acid.

Voucher specimens for the anatomy of leaves and flowers and for pollen morphology and karyology are given in Tables 1 and 2.

RESULTS

Habit

In *Lachnaea* the species are sparsely to densely branched, erect shrubs or erect to sprawling shrublets 0.15–2.00 m high. There is considerable variation in appearance and size among, and sometimes within species. The *Cryptadenia* species are erect or sprawling, moderately to densely branched shrublets 0.12–0.80 m high. In both genera the species are either basally single-stemmed, multi-stemmed, or single-stemmed and multi-stemmed within a single species. The branches are leafy, usually with an adpressed pubescence, later becoming naked and glabrous, and usually marked with the leaf scars of the fallen leaves.

Morphology of foliage leaves

In *Lachnaea* the leaves are alternate or decussate, but in *L. burchellii* they are opposite or subopposite and in *L. diosmoides* they are alternate to subopposite. The leaves are adpressed, ascending, patent or occasionally reflexed, and imbricate to scattered. The leaves in *Cryptadenia* are decussate, adpressed, ascending or sub-patent, and imbricate or scattered. In both genera the orientation and position of the leaves on the axis may vary inter- and intraspecifically.

TABLE 2.—Voucher specimens of *Cryptadenia* species for the leaf anatomy, floral anatomy, pollen morphology and karyology

Species	Voucher specimens	Leaf anatomy	Floral anatomy	Pollen morph.	Karyology
filicaulis	*Boucher 5071* (STE)	×	×		
	Esterhuysen 34370 (BOL)			×	
	McDonald 1989 (STE)				×
	Oliver 9803 (STE)	×	×		
grandiflora	*Beyers 129, 151* (STE)	×		×	
	Beyers 196 (STE)		×		
laxa	*Bolus 7875* (BOL)	×		×	
	I. Oliver 4 (STE)	×	×		
uniflora	*Beyers 136* (STE)	×	×	×	×
	Haynes 447 (STE)			×	

The leaves in both genera are always entire and usually sessile except in *L. ruscifolia* where they may be subpetiolate. The shape of the leaves in *Lachnaea* can be linear-elliptic to elliptic, oblanceolate, obovate or ovate (Figures 1, 2). Again, the variability is not only among the species but may be within a particular species (Figure 2). The leaves range in size from 2–34 × 0.6–9.0 mm. Within some species, as in *L. filamentosa* (Figure 2), the variation in leaf size may be considerable, namely from 5–34 × 1.8–12.0 mm. In *Cryptadenia* the shape of the leaves can be lanceolate, narrowly elliptic, narrowly ovate or obovate. In *C. uniflora* the leaves are always narrowly elliptic but in *C. grandiflora* they are narrowly elliptic, narrowly obovate, obovate or oblanceolate. As in *Lachnaea* the shape and size of the leaves vary inter- and intraspecifically (Figure 3). The range in leaf size is 2.9–12.8 × 0.6–3.2 mm. The leaves in both genera are coriaceous but in *L. densiflora* they are occasionally semi-succulent.

In *Lachnaea* the abaxial side of the leaves may be flat, obtusely convex to convex, or faintly keeled or keeled in the distal half. Adaxially they may be flat, obtusely concave or concave. Both surfaces of the leaves are usually smooth. However, the abaxial surface in *L. ruscifolia* and *L. nervosa* has several longitudinal ribs, whereas in *L. diosmoides* there is only a single midrib. The abaxial surface is usually green and shiny, whereas the adaxial surface is usually pale green, dull and white-punctulate but in some species the leaves are concolorous. The concolorous leaves are usually green but in *L. buxifolia*, and sometimes in *L. filamentosa*, they are glaucous. In *Cryptadenia* the abaxial side of the leaves is convex, faintly

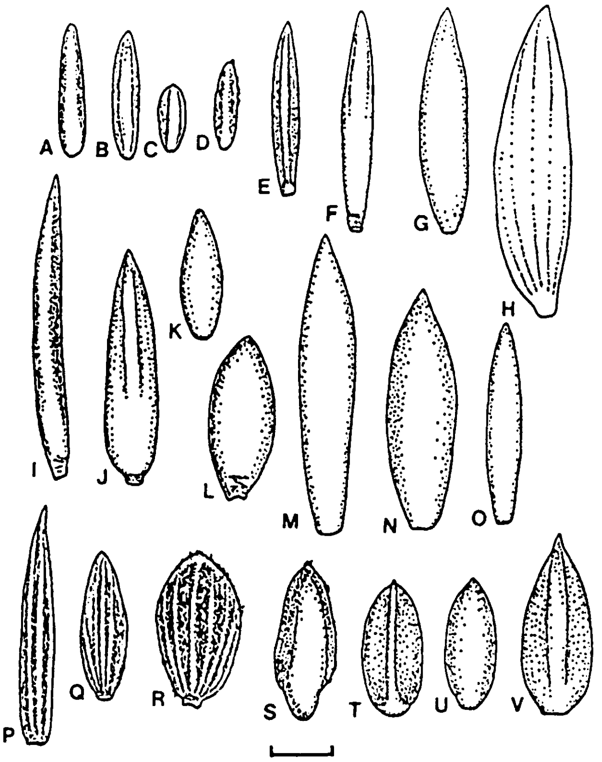

FIGURE 1.—*Lachnaea*. Variation of leaf shape and size, abaxial view. A, *L. eriocephala*, *Beyers 54*; B & C, *L. ericoides*, *Beyers 172*; D, *L. funicaulis*, *Beyers 125*; E, *L. diosmoides*, *Beyers 181*; F, *L. capitata*, *Beyers 128*. G & H, *L. burchellii*: G, *Oliver 9251*; H, *Spreeth 155*. I–L, *L. densiflora*: I & J, *Oliver 9129*; K, *Taylor 12023*; L, *Beyers 171*. M–O, *L. aurea*, *Beyers 135*; P & Q, *L. nervosa*, *De Kock 152*; R, *L. ruscifolia*, *Beyers 193*; S, *L. penicillata*, *Beyers 173*. T–V, *L. axillaris*: T, *McDonald 1395*; U & V, *Beyers 197*. Scale bars: A–R, 3 mm; S–V, 1 mm.

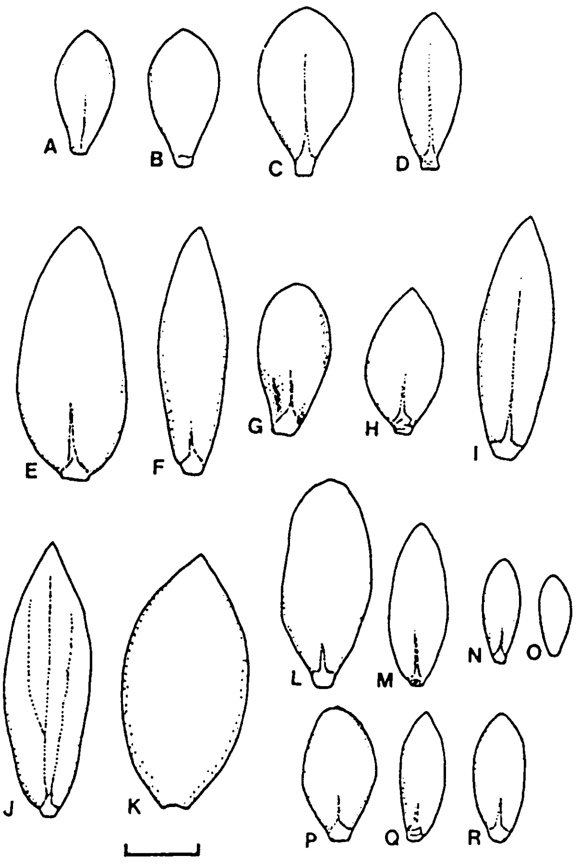

FIGURE 2.—*Lachnaea buxifolia* and *L. filamentosa*. Variation in leaf shape and size, abaxial view. A–I, *L. buxifolia*: A–C, *McDonald 1683*; D, *Marais s.n.*; E–G, *Beyers 118*; H & I, *Beyers 122*. J–R, *L. filamentosa*: J & K, *Low 1246*; L & M, *Beyers 109*; N & O, *Beyers 118*; P–R, *Taylor 12001*. Scale bar: 6 mm.

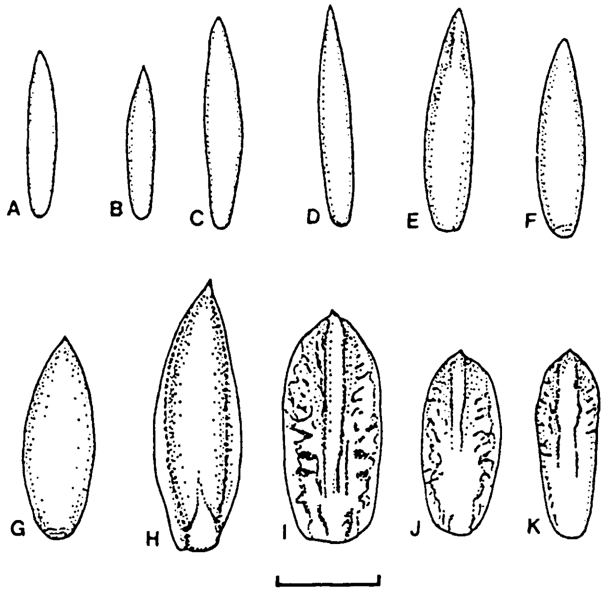

FIGURE 3.—*Cryptadenia*. Variation in leaf shape and size, abaxial view. A–C, *C. filicaulis*: A, *McDonald 1988*; B & C, *Oliver 9803*. D, *C. uniflora*, *Beyers 136*; E & F, *C. laxa*, *I. Oliver 4*. G–K, *C. grandiflora*: G, *Beyers 136*; H, *Vlok 2179*; I–K, *Beyers 129*. Scale bar: 3 mm.

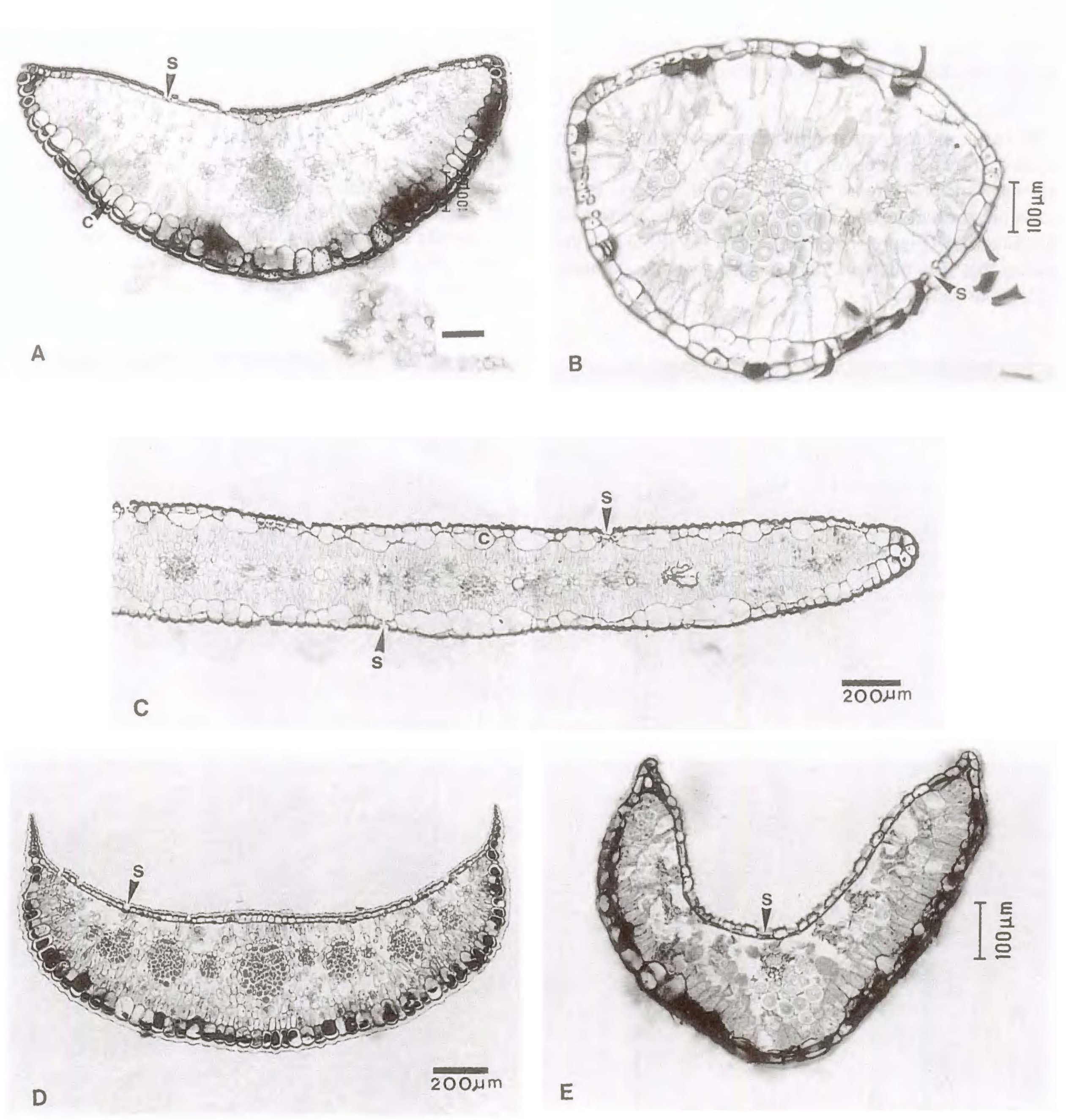

FIGURE 4.—*Lachnaea* and *Cryptadenia*. Leaf transections, adaxial face above. A, *L. eriocephala*, *Beyers 54*; B, *L. densiflora*, *Beyers 115*; C, *L. buxifolia*, *Beyers 122*; D, *C. grandiflora*, *Beyers 151*; E, *C. laxa*, *I.Oliver 4*. c, large cells of inner layer of biseriate epidermis; s, stoma. Scale bars: A, B, E, 100 µm; C, D, 200 µm.

keeled or keeled, smooth or transversely rugulose towards the margins with a shiny, green surface, whereas adaxially they are concave with a smooth, dull, pale green, white-punctulate surface.

In *Lachnaea* the leaves are glabrous or pubescent at the margins but the marginal pubescence is often deciduous, whereas in *Cryptadenia* the leaves are always glabrous.

Anatomy of foliage leaves

In transverse sections the leaves of most *Lachnaea* species and all *Cryptadenia* species appear concave adaxially and convex abaxially (Figure 4A, D, E), but in *L. densiflora* both surfaces are flat or the adaxial one may be slightly convex (Figure 4B); in *L. buxifolia* (Figure 4C) and *L. filamentosa* both surfaces are flat.

Cuticle

In *Lachnaea* the cuticle is well developed and of even thickness on both sides, or thicker on the abaxial side, whereas in *Cryptadenia* the well-developed cuticle is always thicker abaxially. Under the SEM the adaxial and abaxial cuticles of the *Lachnaea* species are unsculptured (Figure 5A, D), undulate (Figure 5B, E) or minutely papillate (Figure 5C, F). In *Cryptadenia* the cuticle is usually minutely papillate adaxially, as in *C. grandiflora* (Figure 6A), but in *C. filicaulis* it is unsculptured (Figure 6B). The relief of the abaxial cuticle is either minutely papillate (Figure 6C) or undulate (Figure 6D). In *C. grandiflora*, however, both types of cuticular sculpturing occur abaxially.

Waxes in the form of small flakes occur commonly on the adaxial leaf surfaces of *Cryptadenia* species and most *Lachnaea* species (Figure 7A, C). In both genera, when waxes are present on the abaxial surface, they are sparse and flakelike (Figure 7B, D). Cutter (1978) is of the opinion that it is this wax deposit that gives the 'bloom' to glaucous leaves.

Trichomes, when present, are non-glandular and uniseriate in both genera.

Epidermis

In both genera the adaxial epidermis is composed of small cells with thin anticlinal and inner tangential walls and slightly thicker outer tangential cell walls. In *L. eriocephala* the outer tangential cell walls are the thickest (Figure 4A). In *Lachnaea* and *Cryptadenia* the adaxial epidermis is uniseriate as in *L. eriocephala* (Figure 4A)

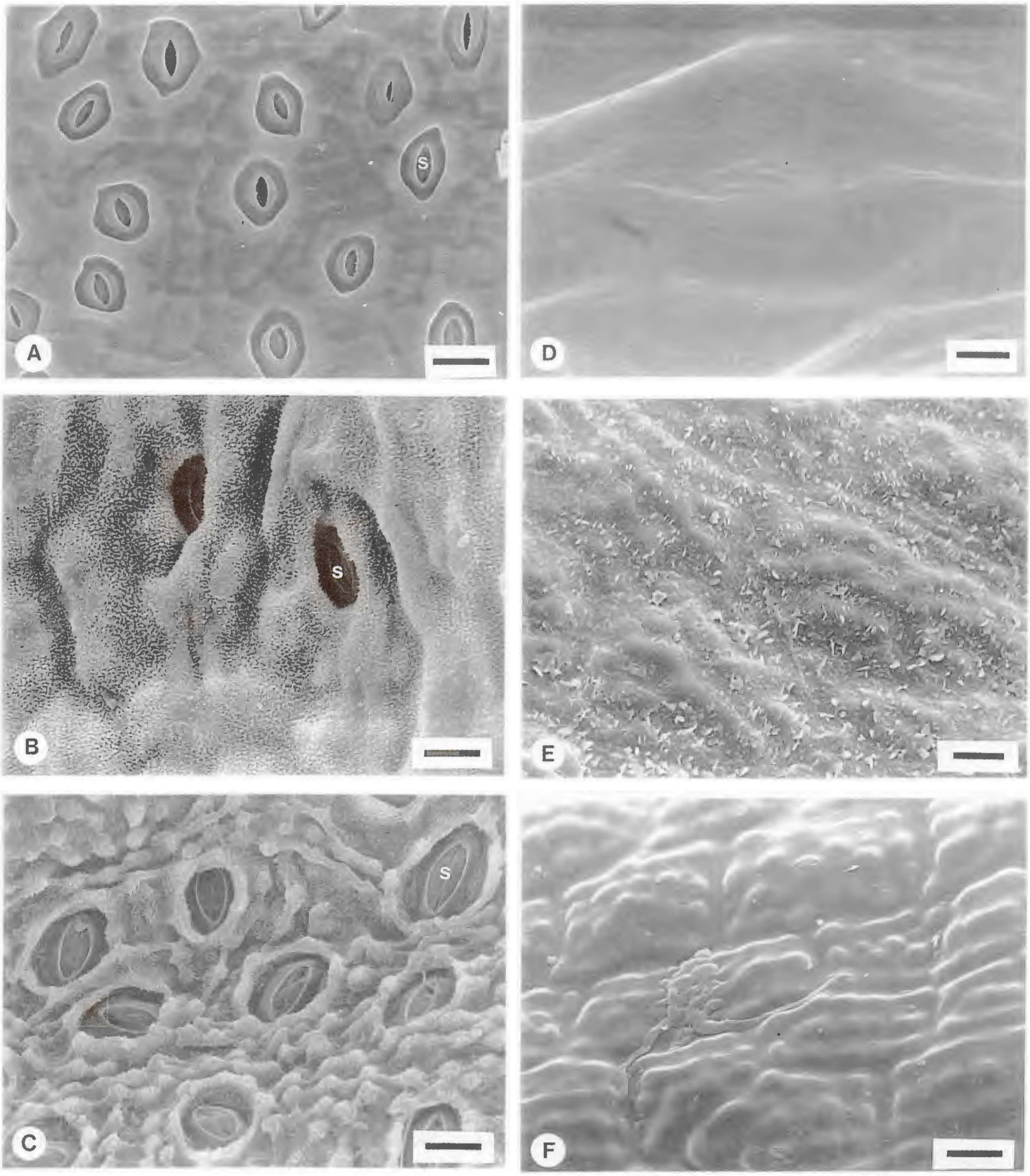

FIGURE 5.—*Lachnaea*. SEM micrographs of cuticular relief of leaf. A–C, adaxial surface: A, *L. funicaulis*, *Beyers 125*, smooth; B, *L. buxifolia*, *Beyers 122*, undulate; C, *L. ericoides*, *Beyers 172*, minutely papillate. D–F, abaxial surface: D, *L. ericoides*, *Beyers 172*, smooth; E, *L. diosmoides*, *Beyers 181*, undulate; F, *L. funicaulis*, *Beyers 125*, minutely papillate. s, stoma. Scale bars: A–F, 20 µm.

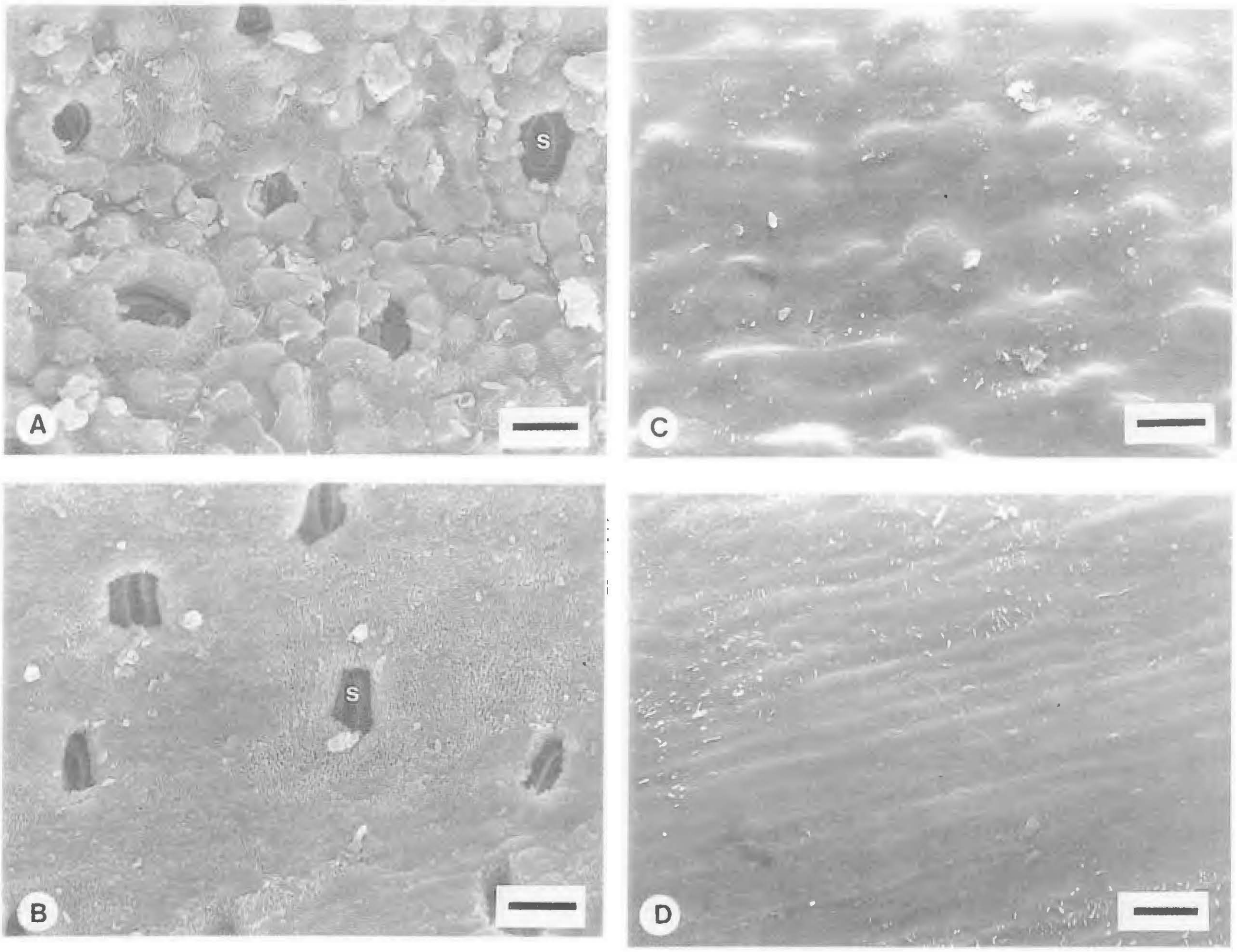

FIGURE 6.—*Cryptadenia.* SEM micrographs of cuticular relief of leaf. A, B, adaxial surface: A, *C. grandiflora, Beyers 129*, minutely papillate; B, *C. filicaulis, Boucher 5071*, smooth. C, D, abaxial surface: C, *C. grandiflora, Beyers 129*, minutely papillate; D, *C. filicaulis, Boucher 5071*, undulate. s, stoma. Scale bars: A–D, 20 µm.

and *C. grandiflora* (Figure 8D, E), incompletely uniseriate (occasional cells with periclinal walls) as in *L. ericoides* (Figure 8A) and *C. uniflora* (Figure 8C), incompletely biseriate (occasional cells without periclinal walls) as in *L. densiflora* (Figure 4B) and *C. laxa* (Figure 4E) or biseriate as in *L. buxifolia* (Figure 4C). The abaxial epidermis is usually biseriate in both genera. However, in *L. axillaris* and *L. ericoides* (Figure 8A) it is incompletely biseriate and in *C. grandiflora* it may be uniseriate (Figure 8D) or incompletely biseriate (Figure 8E).

When the epidermis is biseriate, the cells of the inner layer are usually larger than those of the outer layer. The epidermis contains mucilage, except in *C. grandiflora* where it was not always observed. The mucilage may be present in the cells of the inner and outer epidermal layers, or in the cells of the inner layer only.

Tannin occurs in the epidermis of *L. axillaris, L. burchellii, L. diosmoides, L. ericoides, L. funicaulis, L. penicillata, C. grandiflora* and *C. uniflora.*

Druse crystals were observed in the epidermis of *L. buxifolia, L. filamentosa* and *L. ruscifolia*, and sometimes in the adaxial epidermis of *C. grandiflora.*

Stomata

The stomata in both genera are anomocytic and sunken except in *L. funicaulis* and *L. penicillata* where they are on the same level as the outer walls of the surrounding epidermal cells. In *Lachnaea* the leaves are epistomatic or amphistomatic but in *Cryptadenia* they are only epistomatic. When the leaves are amphistomatic, there are usually more stomata adaxially.

Mesophyll

In both genera the cells of the mesophyll are chlorenchymatous and palisade-like (elongated perpendicular to the axis) with the exception of *C. grandiflora* where they are either palisade-like (Figure 8E) or short and more or less round (Figure 8D). As a result of the size of the intercellular spaces, the leaves can be classified as dorsiventral or isobilateral. When dorsiventral, the smaller intercellular spaces occur abaxially and the larger ones adaxially as in *L. axillaris, L. diosmoides* (Figure 8B), *L. ericoides, L. eriocephala, L. funicaulis, L. nervosa, L. penicillata, C. filicaulis, C. laxa* and *C. uniflora* (Figure 8C). The isobilateral arrangement occurs in *L. aurea, L. burchellii, L. buxifolia, L. capitata, L. densiflora* (Figure 4B), *L. filamentosa* and *L. ruscifolia.* In *C. grandiflora* however, a dorsiventral or an almost isobilateral arrangement is found.

Tannin occurs in the parenchymatous cells surrounding the median vascular bundle in *L. penicillata* and sometimes in the mesophyll in *C. grandiflora.*

Druse crystals are present in the mesophyll of *L. aurea, L. axillaris, L. burchellii, L. buxifolia, L. capitata, L. densiflora, L. filamentosa, L. nervosa* and the four *Cryptadenia* species, and in the vascular tissue of *L. filamentosa.*

Venation and vascular bundles

The venation in both genera is reticulate and the vascular bundles are collateral. As Metcalfe & Chalk (1950) stated, no internal phloem occurs in the midrib.

In both genera, extraxylary fibres occur abaxially in association with the vascular bundles. A prominent median fibre strand (Figure 8) is present in all the species except in *L. buxifolia* and *L. filamentosa.* In addition to the prominent median fibre strand, equally prominent fibre strands occur in association with the larger lateral vascular bundles in *L. nervosa, L. ruscifolia* and *C. grandiflora* (Figure 8E). In *L. ruscifolia* the median and larger lateral strands extend to the abaxial epidermis.

Extraxylary fibres not associated with the vascular bundles, occur along the lateral margins immediately below the epidermis in *L. aurea* (Figure 8F).

Morphology of flower and fruit

Pedicel/floral articulation

The flowers in *Lachnaea* are either sessile or shortly pedicellate with pedicels up to 2.5 mm long. In *Cryptadenia* the flowers are always sessile. In *L. eriocephala, L. funicaulis* and *L. penicillata* the sericeous to villous pedicels elongate in the fruiting stage and remain on the plant long after the fruit has been shed. These hairy pedicels are responsible for the woolly appearance of the old inflorescences. The flowers of *Lachnaea* and *Cryptadenia* are at their bases surrounded by a ring of trichomes, which occurs at the floral articulation of the sessile flowers or on the pedicels.

Hypanthium

In *Lachnaea* the basal portion of the hypanthium is ellipsoid to widely ellipsoid, ovoid to widely ovoid, or obovoid, whereas the portion above the plane of circumscision is funnel-shaped, cylindrical, obconical, cup-shaped or cup-shaped with a sigmoid curve at the base (Figure 9). In *Cryptadenia* the basal portion of the hypan-

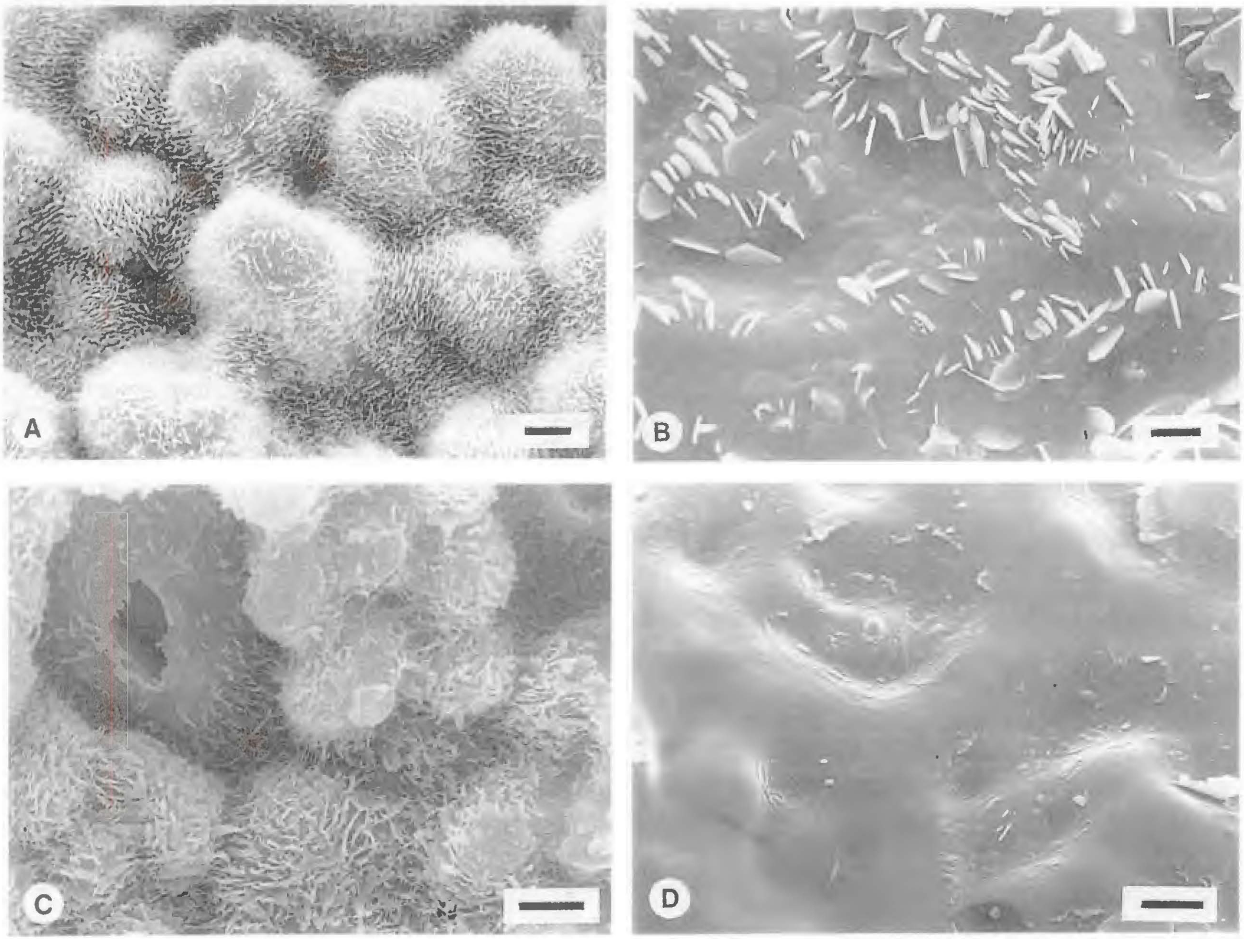

FIGURE 7.—*Lachnaea* and *Cryptadenia.* SEM micrographs of flaky surface wax on leaf. A, B, *L. aurea, Beyers 135*: A, adaxial surface; B, abaxial surface. C, D, *C. laxa, Bolus 7875*: C, adaxial surface; D, abaxial surface. Scale bars: A–D, 5 µm.

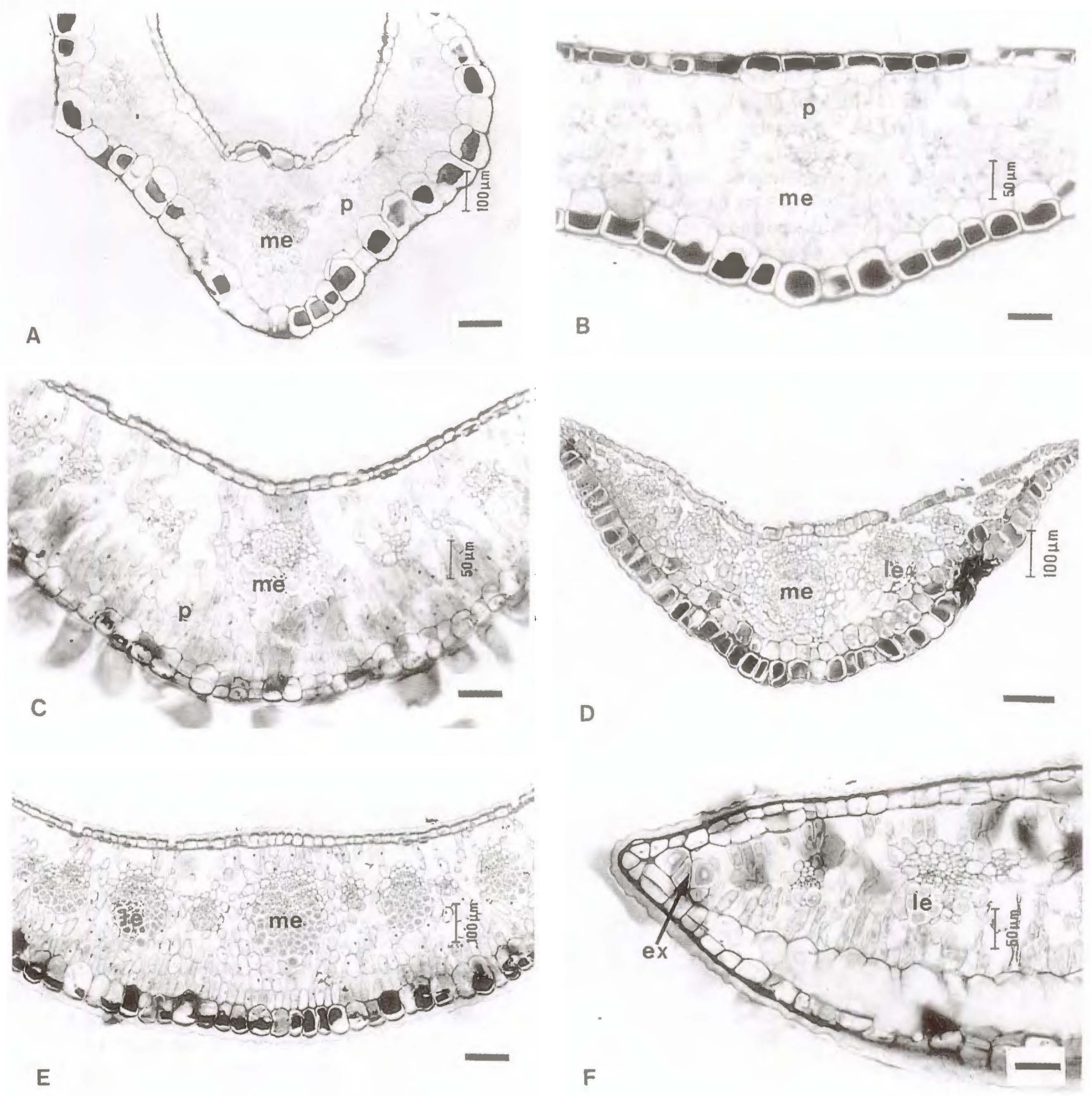

FIGURE 8.—*Lachnaea* and *Cryptadenia*. Leaf transections, adaxial face above. A–E, median vascular bundle: A, *L. ericoides*, *Beyers 172*; B, *L. diosmoides*, *Beyers 181*; C, *C. uniflora*, *Beyers 136*; D, *C. grandiflora*, *Beyers 129*; E, *C. grandiflora*, *Beyers 151*. F, leaf margin of *L. aurea*, *Beyers 54*, showing extraxylary fibres (ex) along lateral margin. p, palisade-like chlorenchyma; me, median extraxylary fibre strand; le, lateral extraxylary fibre strand. Scale bars: A, D, E, 100 µm; B, C, F, 50 µm.

thium is ovoid or ellipsoid, whereas the upper portion above the plane of circumscision is funnel-shaped or cup-shaped (Figure 9). The position of the plane of circumscision, expressed as a percentage of the length of the base to the total length of the hypanthium, varies from 20–80% in both genera. The upper portion of the hypanthium abscises soon after seedset at the plane of circumscision. The length of the hypanthium ranges from 1.5–17.5 mm in *Lachnaea* and from 2.2–11.0 mm in *Cryptadenia*.

The outer surface of the base of the hypanthium is pubescent or glabrous in *Lachnaea* and pubescent in *Cryptadenia*, whereas the inner surface is usually glabrous in both genera, except in *L. buxifolia* and *C. uniflora* where it is pubescent. The outer and inner surfaces of the upper portion of the hypanthium in both genera are usually pubescent, but in *L. axillaris* the outer surface is glabrous.

In both genera the shape of the trichomes and type of pubescence on the outer surface of the hypanthium often changes around the plane of circumscision. In *L. burchellii* the trichomes on the basal portion are clavate, whereas those on the upper portion are longer and acicular (Figure 10). In *C. laxa* the trichomes of the basal portion are obtuse, whereas those of the upper portion are acicular. The pubescence on the outer surface of the hypanthium is denser in the vicinity of the scales in both *Lachnaea* and *Cryptadenia*. The upper portion of the hypanthium and the calyx are concolorous.

Calyx

The calyx in both genera comprises four sepals which are fused to the rim of the hypanthium. In *Lachnaea* the sepals vary from being almost equal to distinctly unequal, but with a gradual transition from one form to the other (Figure 11). In the distinctly zygomorphic forms the anterior lobe is usually the longest. The sepals are narrowly to widely elliptic, ovate to widely ovate, or obovate to widely obovate. The size of the anterior sepal ranges from 1.3–22.0 × 0.8–7.5 mm, that of the two lateral sepals from 1.3–7.5 × 0.6–4.5 mm, and that of the posterior sepal from 1.2–5.5 × 0.7–3.5 mm. Because the flowers of *L. axillaris* and *L. ruscifolia* are solitary, the outer sepals represent the posterior and anterior sepals and the two inner sepals represent the two lateral sepals. The abaxial surface of the sepals is pubescent, except in *L. axillaris* where it is glabrous. The adaxial surface of the sepals is usually pubescent, but in *L. aurea* and *L. nervosa* it is glabrous and in *L. axillaris* and *L. funicaulis* it is partly glabrous and partly pubescent. The calyx is white, cream, pink, pale blue, white or cream tinged with pink or blue, or yellow.

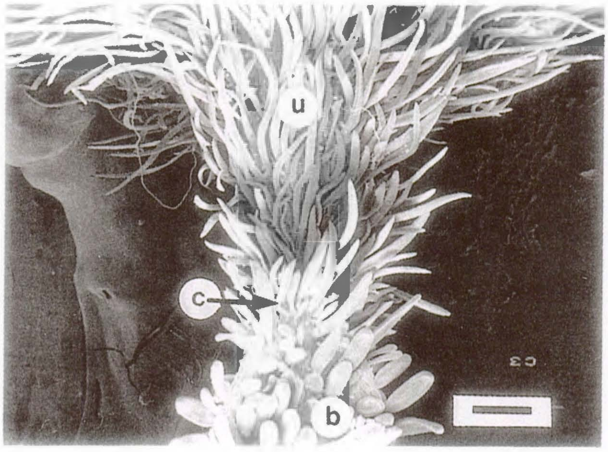

FIGURE 10.—*Lachnaea burchellii, Oliver 9241.* SEM micrograph of trichome structure on outer surface of hypanthium around circumscision zone. b, basal portion of hypanthium; c, plane of circumscision; u, upper portion of hypanthium. Scale bar: 200 µm.

The sepals in *Cryptadenia* are almost equal (Figure 12), narrowly to widely elliptic, ovate or orbicular, varying in size from 1.6–10.7 × 1.2–5.8 mm with the apices acute, rounded or obtuse. The abaxial surface is pubescent whereas the adaxial surface is either glabrous or pubescent. The calyx is white, cream, white tinged with pink, pink or mauve-pink.

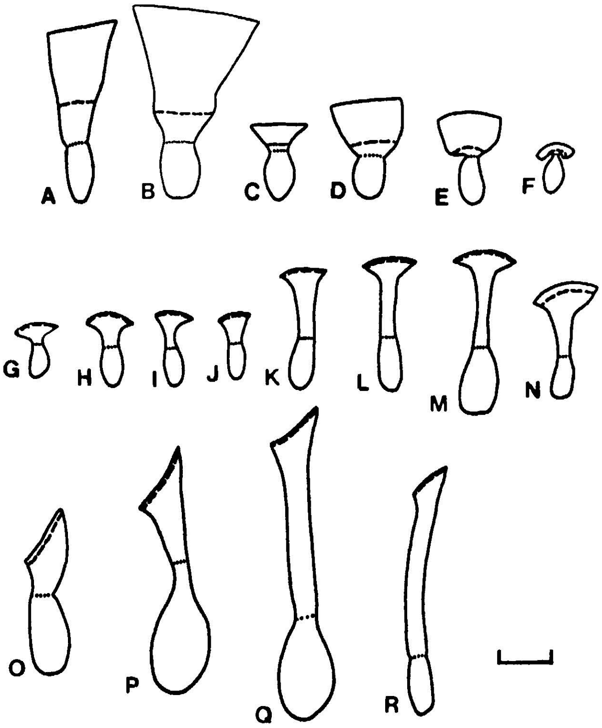

FIGURE 9.—*Lachnaea* and *Cryptadenia.* Hypanthia, showing plane of circumscision, lower dotted line; and scales, upper dashed line. A, *C. uniflora, Beyers 136*; B, *C. grandiflora, Beyers 129*; C, *L. densiflora, Oliver 9129*; D, *L. capitata, Beyers 138*; E, *C. filicaulis. Thompson 3789*; F, *L. axillaris, Bolus 8596*; G, *L. ericoides, Beyers 172*; H, *L. burchellii, Oliver 9241*; I, *L. funicaulis, Beyers 125*; J, *L. penicillata, Beyers 173*; K, *L. ruscifolia, Vlok 2084*; L, *C. laxa, Bolus 7875*; M, *L. nervosa, De Kock* 152; N, *L. diosmoides, Compton 7580*; O, *L. aurea, Beyers 135*; P, *L. filamentosa, Beyers 110*; Q, *L. buxifolia, Beyers 118*; R, *L. eriocephala, Beyers 54.* Scale bar: 2 mm.

The aestivation of the sepals is decussate-imbricate in *Lachnaea* and *Cryptadenia.*

Petals

Petals are absent in all taxa.

Androecium

Eight stamens in two whorls of four are present in all taxa. In *Lachnaea* the outer whorl, the antisepalous stamens, are episepalous, inserted on the basal portion of the sepals, or they are inserted on the rim of the hypanthium (Figure 11). The stamens of the inner whorl, the antipetalous stamens, are inserted on or very close to the rim of the hypanthium or a third of the way down the throat of the upper portion of the hypanthium as in *L. capitata* (Figure 11F).

In *Cryptadenia* the outer whorl, the antisepalous stamens, are episepalous, fused to the basal portion of the sepals as in *C. grandiflora* and *C. laxa*, or inserted in the upper throat of the hypanthium as in *C. uniflora* and *C. filicaulis* (Figure 12). The inner whorl, the antipetalous stamens, are inserted at the rim of the hypanthium in *C. laxa*, a quarter of the way down in the upper portion of the hypanthium in *C. uniflora* and a third of the way down in *C. filicaulis* and *C. grandiflora* (Figure 12). The stamens are fully exserted in *Lachnaea* (Figure 11). In *Cryptadenia* the antisepalous stamens of all the taxa and the antipetalous stamens of *C. laxa* are exserted. In the other *Cryptadenia* species only the anthers of the antipetalous stamens are exserted or semi-exserted (Figure 12).

The anthers are basifixed and introrse. In *Lachnaea* they are either spherical or oblate-spherical, whereas in *Cryptadenia* they are ellipsoid or ovoid.

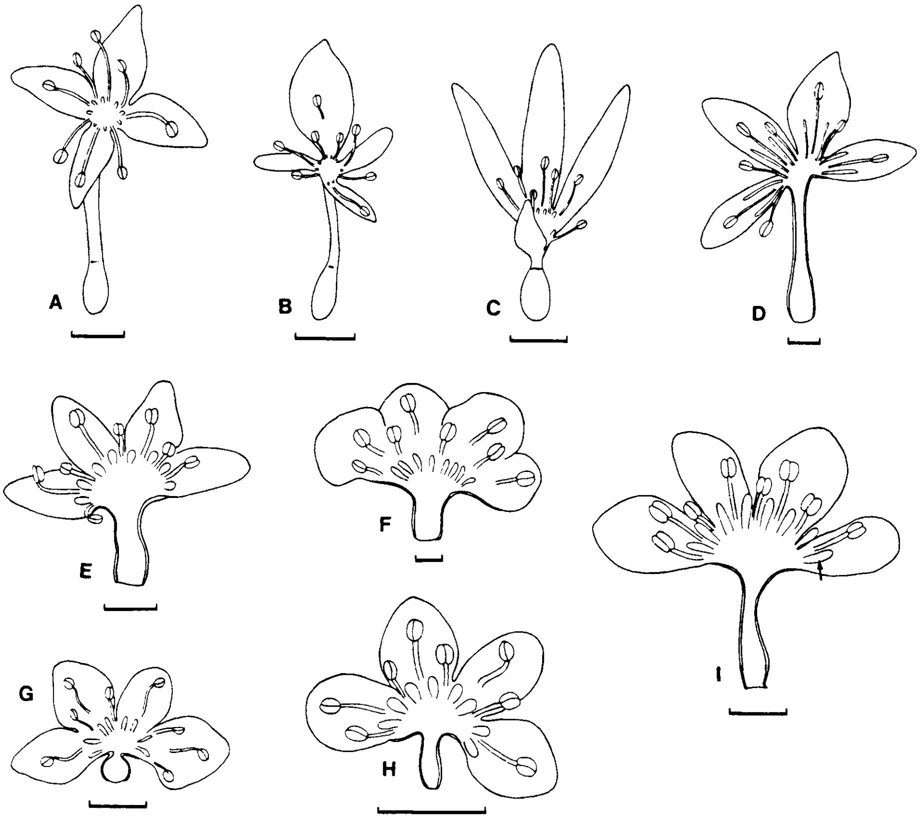

FIGURE 11.—*Lachnaea*. Flowers. A, *L. buxifolia*, *Beyers 122*; B, *L. filamentosa*, *Kruger 977*; C, *L. aurea*, *Gillett 4343*; D, *L. nervosa*, *De Kock 152*; E, *L. funicaulis*, *Marsh 758*; F, *L. capitata*, *Beyers 138*; G, *L. densiflora*, *Boucher 1767*; H, *L. ericoides*, *McDonald 2027*; I, *L. penicillata*, *Oliver & Fellingham 9145*. D–I: flowers split longitudinally with gynoecia removed; floral scales (arrow in I) shown in each flower below stamens. Scale bars: A–C, 4 mm; D–I, 2 mm.

Scales

Eight scales are inserted on the upper portion of the hypanthium below the attachment of the antipetalous stamens and alternating with the stamens. The position of the scales varies in different species of both genera. In most *Lachnaea* species the scales are inserted at the mouth of the hypanthium but in some species they are inserted two thirds or halfway down the upper portion of the hypanthium (Figure 11). In *Cryptadenia* they are inserted either at the mouth of the hypanthium or from midway to three quarters of the way down the upper portion of the hypanthium (Figure 12).

The shape of the scales varies in the different taxa. They can be linear, clavate, subrotund, capitate, ovoid or obovoid in *Lachnaea*, whereas in *Cryptadenia* they are subrotund, narrowly oblong, oblong or ellipsoid. In both genera the scales are either translucent-white or yellow. They are usually glabrous, except in *L. buxifolia* where they have long stiff trichomes at their apices. In all the *Lachnaea* species and in *C. laxa* the scales are basally attached to the hypanthium. In *C. filicaulis* the scales are basally and partly abaxially attached to the hypanthium, and in *C. grandiflora* and *C. uniflora* they are abaxially attached to the hypanthium.

Disc

A disc is absent in both genera.

Gynoecium

In *Lachnaea* the ovary is sessile, oblong, narrowly ellipsoid, ellipsoid, ovoid or obovoid, 0.5–4.4 × 0.2–2.5 mm, completely glabrous or glabrous with a tuft of hairs at the apex. In *L. filamentosa* the ovary is usually glabrous with a tuft of hairs at the apex but occasionally it may also be adpressed hairy and tufted at the apex.

In *Cryptadenia* the ovary is sessile, ellipsoid, 0.7–1.8 × 0.4–0.7 mm, usually glabrous, but in *C. filicaulis* it is

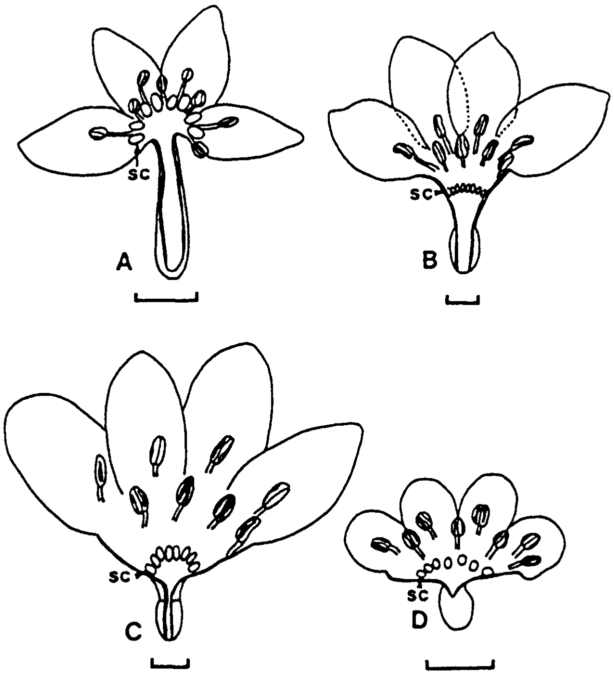

FIGURE 12.—*Cryptadenia*. Flowers split longitudinally with gynoecia removed. A, *C. laxa*, *I. Oliver 4*; B, *C. uniflora*, *Beyers 197*; C, *C. grandiflora*, *Beyers 151*; D, *C. filicaulis*, *Thompson 3789*. sc, scale. Scale bars: A–D, 2 mm.

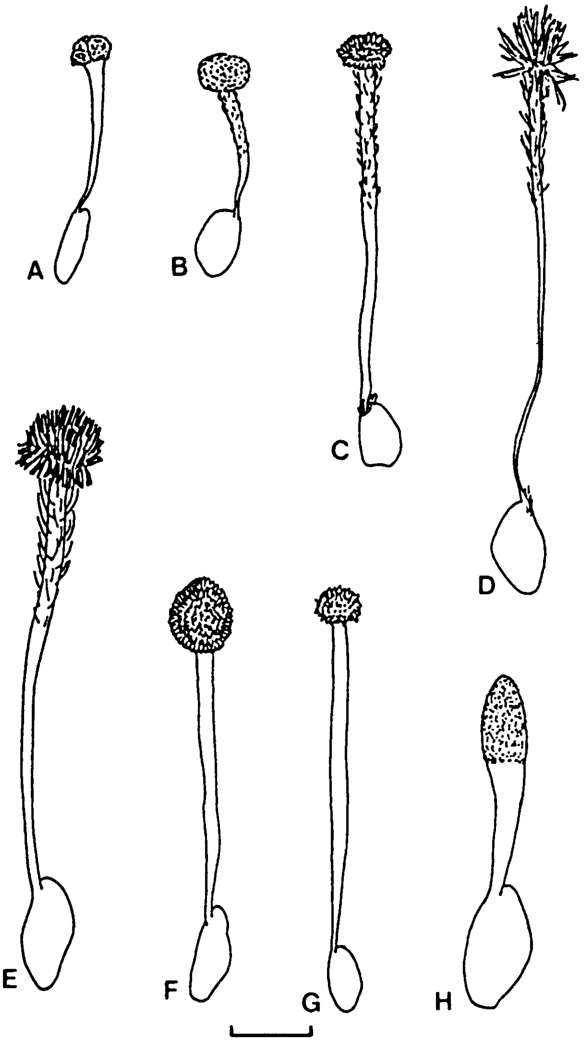

FIGURE 13.—*Lachnaea* and *Cryptadenia*. Gynoecia. A, *L. funicaulis*, *Marsh 758*; B, *L. ericoides*, *Beyers 172*; C, *L. ruscifolia*, *Goldblatt & Manning 8870*; D, *L. nervosa*, *De Kock 152*; E, *C. laxa*, *I. Oliver 4*; F, *C. uniflora*, *Beyers 197*; G, *C. grandiflora*, *Leighton BOL 21142*; H, *C. filicaulis*, *Thompson 3789*. Scale bars: A–E, H, 1 mm; F, G, 2 mm.

either glabrous or pubescent towards the apex on the side where the style is inserted.

In both genera the ovary is unilocular, with a solitary anatropous ovule laterally attached near the top of the ovary; the style is laterally attached, linear or linear-obconical. The style is either completely glabrous or pubescent in the distal third to two thirds, or completely pubescent in *Lachnaea*, whereas in *Cryptadenia* it is usually glabrous but in *C. laxa* the distal half is pubescent.

The stigma in *Lachnaea* is either brushlike or capitate and papillate, or capitate and elongate-papillate (Figure 13). In *Cryptadenia* it is either conical or capitate and elongate-papillate, or brushlike (Figure 13).

Fruit

The fruit in both genera is an achene which is enclosed in the persistent base of the hypanthium. The pericarp is dry and thin, whereas the seed coat is thick and crustaceous.

Vascular anatomy of the flower

The basic vascular pattern is the same in both genera. The eight traces supplying the calyx, depart from the vascular tissue of the pedicel or the floral axis, where they are arranged in a continuous cylinder (Figure 14A) or in a ring of bundles (Figure 15A) in *Lachnaea* and in a continuous cylinder in *Cryptadenia* (Figure 16A). The eight sepal traces extend upwards in the hypanthium. The lateral bundles of the sepals arise commissurally after the departure of the antipetalous stamen traces (Figure 17A, C, G, H, I) or at the same point of departure of the antipetalous stamen traces (Figure 17B, D, E, F, J) at various levels on the hypanthium. The vascular supply of the sepals consists of a midrib bundle and two lateral bundles.

The stamens are single-trace organs. The antipetalous stamen traces are fused to the commissural sepal traces, and the antisepalous stamen traces to the sepal midrib traces at their point of origin from the stele. The stamen traces separate from the sepal traces in two whorls at different levels in the hypanthium. The antipetalous stamen traces diverge from the commissural sepal bundles before

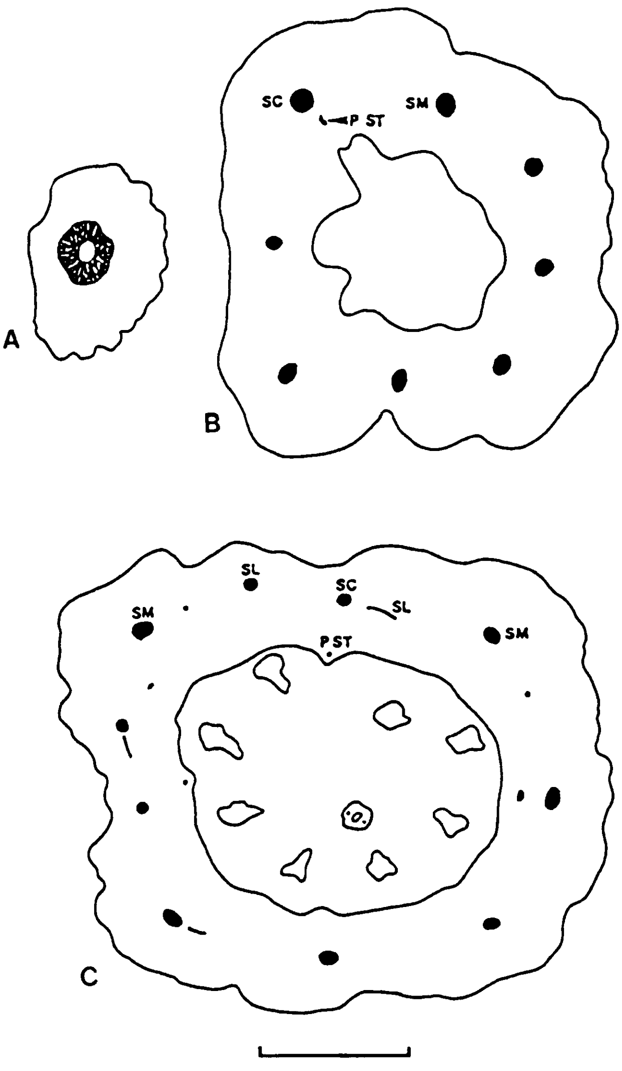

FIGURE 14.—*Lachnaea capitata*, *Beyers 128*. Floral anatomy. A, transection through floral axis. B, C, transections of flower: B, vasculature of hypanthium, separation of antipetalous stamen trace (P ST) from commissural sepal bundle (SC); C, splitting of commissural sepal bundles into sepal lateral bundles (SL). SM, sepal midrib bundle. Scale bar: 500 µm.

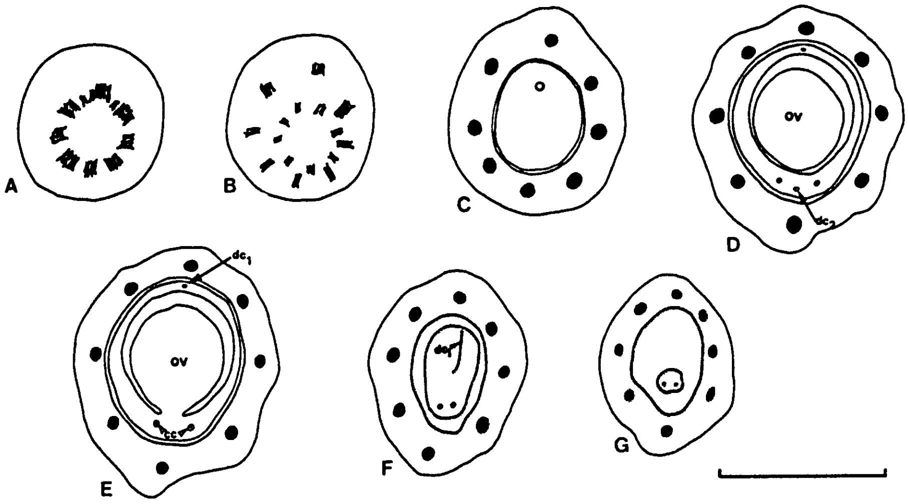

FIGURE 15.—*Lachnaea diosmoides*, *Beyers 151*. Transections of flower. A, pedicel showing ring of vascular bundles; B, base of hypanthium showing departure of whorl of eight bundles; C, hypanthium at base of ovary; D, lower portion of ovary; E, middle of ovary; F, top of ovary; G, base of style. o, ovary; ov, ovule; dc_1, dorsal carpellary of fertile carpel; cc, commissural carpellary; dc_2, dorsal carpellary of sterile carpel. Scale bar: 500 µm.

the antisepalous stamen traces diverge from the sepal midrib bundles (Figure 14). The antisepalous stamen traces leave the sepal midrib bundles at or just below the rim of the hypanthium, except in *C. filicaulis* (Figure 17H) where they depart a quarter of the way down the upper portion of the hypanthium. The antipetalous stamen traces leave the commissural sepal bundles at various levels on the upper portion of the hypanthium. In *L. buxifolia* (Figure 17F), *L. diosmoides* (Figure 17B), *L. eriocephala* (Figure 17D), *L. ruscifolia* (Figure 17E) and *C. laxa* (Figure 17J) these stamen traces depart near the rim of the tube, in *L. axillaris* (Figure 17C), *C. filicaulis* (Figure 17H), *C. grandiflora* (Figure 17I) and *C. uniflora* (Figure 17G) they depart midway and in *L. capitata* (Figure 17A) they depart three quarters of the way down the tube. The stamens become free from the hypanthium a short distance above the divergence of their traces as in *L. buxifolia* (Figure 17F) and *C. filicaulis* (Figure 17H), or are adnate to the hypanthium for some distance before becoming free as in *L. capitata* (Figure 17A) and *C. uniflora* (Figure 17G). In *L. buxifolia* (Figure 17F), *L. diosmoides* (Figure 17B), *L. eriocephala* (Figure 17D), *C. grandiflora* (Figure 17I) and *C. laxa* (Figure 17J) the antisepalous stamens are adnate to the basal portion of the sepals. In *Cryptadenia*, with the exception of *C. laxa*, the hypanthium, above the insertion of the scales, is further augmented by small median sepal bundles whose stelar extensions have been aborted (Figures 17G, H, I; 18A). Branches of these median sepal bundles may anastomose with the midrib bundles and the commissural sepal bundles. A rich vascular plexus exists in the hypanthium of *C. laxa* at the level of insertion of the scales (Figure 17J).

The eight scales arise as emergences from the adaxial wall of the hypanthium (Figure 19) at different levels on the upper portion of the hypanthium. They emerge a short distance below the divergence of the antipetalous stamen traces from the commissural sepal bundles, as in *L. capitata* (Figure 17A) and in *C. grandiflora* (Figure 17I), or just above the divergence of the antipetalous stamen traces and the lateral sepal traces from the commissural sepal bundles, as in *L. buxifolia* (Figure 17F) and in *C. laxa* (Figure 17J). No vascular tissue is present in or at the base of the scales, even in those taxa in which the scales are inserted in close juxtaposition to the sepal lateral bundles and the sepal midrib bundles. In *Lachnaea* the scales are usually non-glandular (Figure 20A) but in *L. axillaris* (Figure 20B) they are composed of compact thin-walled cells rich in cytoplasm with large nuclei, thus appearing glandular (Esau 1965). Similarly in *Cryptadenia* the scales are either non-glandular or appear glandular. No secretion was observed from the scales in either genus.

The ovary is bicarpellate. In *Lachnaea* the dorsal carpellary bundle of the fertile carpel is always present, whereas the dorsal carpellary bundle of the sterile carpel is present in *L. capitata* and *L. diosmoides* (Figure 15), but absent in *L. eriocephala* (Figure 21) and *L. axillaris*. In *Cryptadenia* the dorsal carpellary bundle of the fertile carpel is usually present, but absent in *C. filicaulis* (Figure 16) whereas the dorsal carpellary bundle of the sterile carpel is always present (Figure 16).

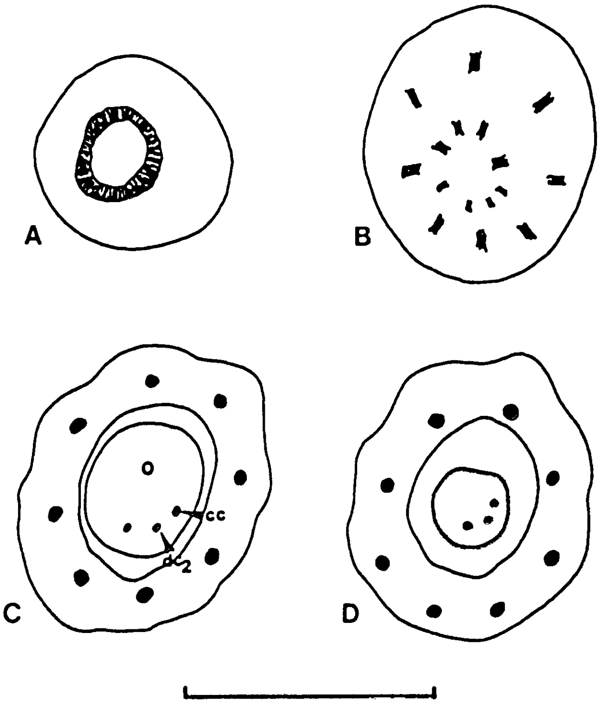

FIGURE 16.—*Cryptadenia filicaulis*, *Oliver 9803*. A, transection through floral axis. B–D, transections of flower: B, base of flower showing departure of whorl of eight bundles; C, lower portion of ovary showing abortion of dorsal carpellary of fertile carpel; D, base of style showing commissural carpellaries and dorsal carpellary of sterile carpel entering style. cc, commissural carpellary; dc_2, dorsal carpellary of sterile carpel. Scale bar: 500 µm.

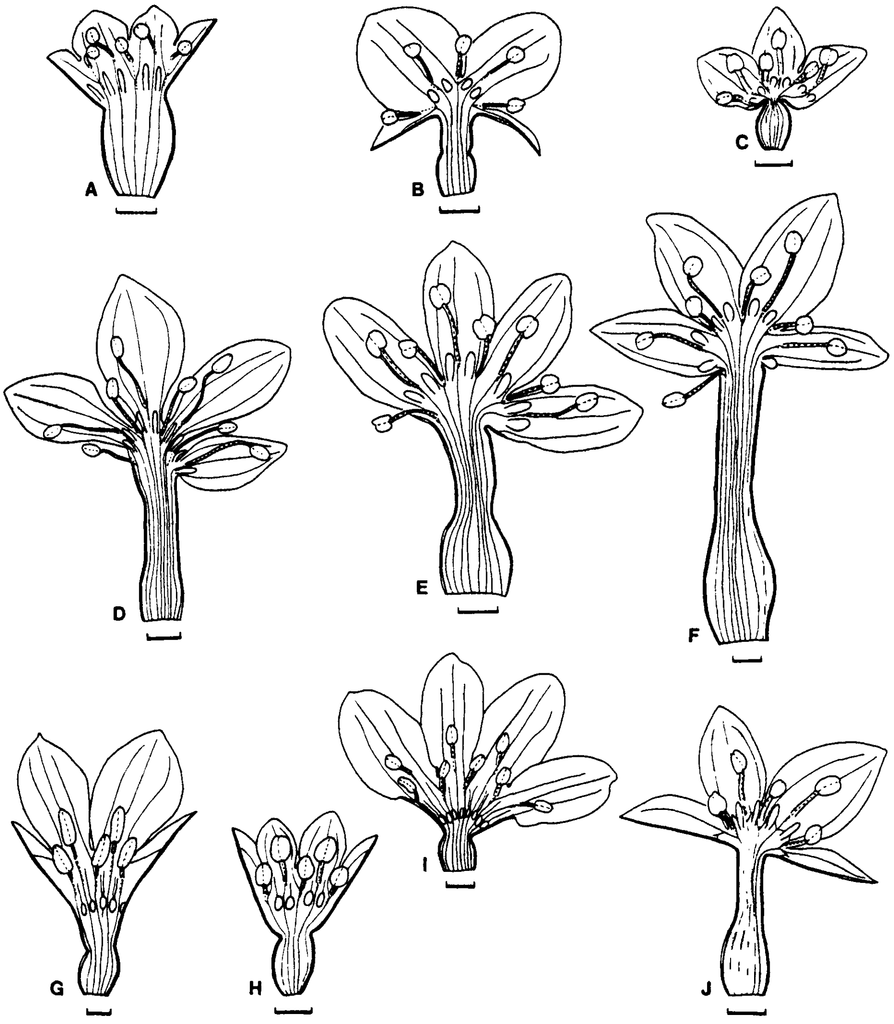

FIGURE 17.—*Lachnaea* and *Cryptadenia*. Vasculature of hypanthium, stamens and sepals. A, *L. capitata, Beyers 128*; B, *L. diosmoides, Beyers 151*; C, *L. axillaris, Beyers 197*; D, *L. eriocephala, Beyers 54*; E, *L. ruscifolia, Vlok 2084*; F, *L. buxifolia, Beyers 118*; G, *C. uniflora, Beyers 136*; H, *C. filicaulis, Oliver 9803*; I, *C. grandiflora, Beyers 196*; J, *C. laxa, I. Oliver 4*. Scale bar: 1 mm.

The commissural carpellary bundles (Heinig 1951) are closely associated with the dorsal bundle of the sterile carpel (Figures 15, 16), or when the latter is absent they are in the associated position (Figure 21).

The vasculature of the style is variable. It may consist of: the commissural carpellary bundles as in *L. diosmoides* (Figure 15), *L. axillaris* and *L. capitata*; the two ventral bundles of the sterile carpel arising from the split commissural carpellary bundles as in *L. eriocephala* (Figure 21); the dorsal bundle of the fertile carpel, the dorsal bundle of the sterile carpel and the commissural carpellary bundles as in *C. grandiflora*; the dorsal bundle of the sterile carpel and the commissural carpellary bundle as in *C. filicaulis* (Figure 16) and *C. uniflora*; or the dorsal bundle of the fertile carpel and the dorsal bundle of the sterile carpel as in *C. laxa*.

Pollen morphology

Pollen grains of the *Lachnaea* and *Cryptadenia* species examined, have the same basic morphology. The grains are monads, globose and polyforate (Figure 22) with a diameter of 22–52 µm in *Lachnaea* and 40–50 µm in *Cryptadenia* (Table 3).

The pollen is tectate and supra-ornate (Figure 22). Erdtman (1971) describes the sculpture pattern as crotonoid. The sexine is thicker than the nexine. The sexine is attached to the nexine by means of columellae, which unite into a tectum above. The tectum is reticulate with supratectal triangular projections. These supratectal structures are trihedral to shallowly trihedral with the basal sides straight as in *L. buxifolia* (Figure 23A), *L. ruscifolia* (Figure 23B) and *C. uniflora* (Figure 23E) or emarginate as in *L. aurea* (Figure 23C), *L. eriocephala* (Figure 23D) and *C. laxa* (Figure 23F). A vestigial spinule occurs at

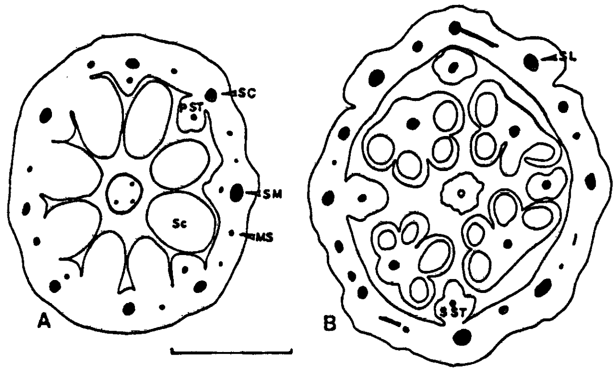

FIGURE 18.—*Cryptadenia filicaulis, Oliver 9803*. Transection of hypanthium of flower. A, at level where scales (Sc) separate from hypanthium; B, where antisepalous stamens (S ST) separate from tube. P ST, antipetalous stamens; SM, sepal midrib bundle; SC, commissural sepal bundle; SL, sepal lateral bundle; MS, median sepal bundle. Scale bar: 500 µm.

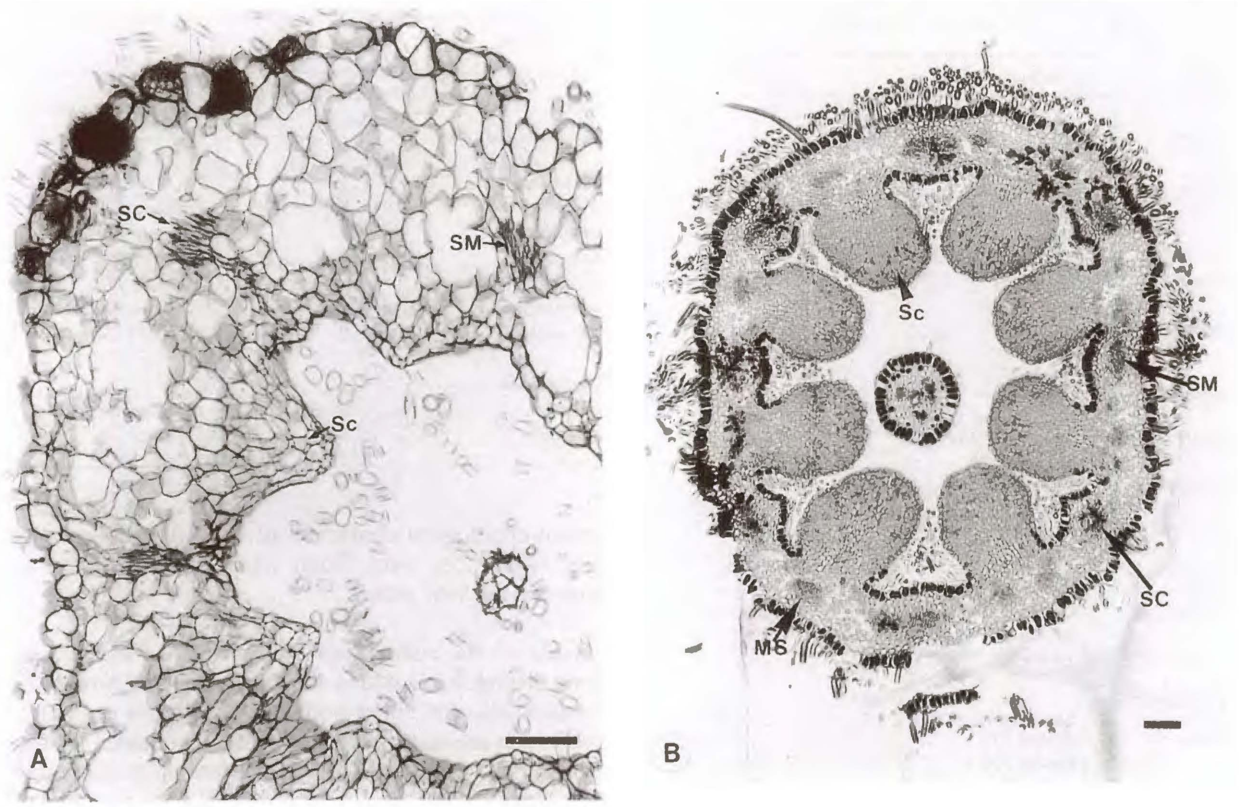

FIGURE 19.—*Lachnaea* and *Cryptadenia*. Floral anatomy of hypanthia. Vasculature and scales (Sc) arising from adaxial wall. A, *L. capitata*, *Beyers 128*; B, *C. grandiflora*, *Beyers 196*. SM, sepal midrib bundle; SC, commissural sepal bundle; Sc, scale; MS, median sepal bundle. Scale bars: A, B, 100 µm.

the base of each of the three main ridges in some *Lachnaea* species (Figure 23A, B) but was absent in all the *Cryptadenia* species (Table 4). The surface of the lateral sides of the supratectal trihedral projections is striate in all the species (Figure 23).

Karyology

The haploid chromosome number of n = 9 was observed in six species of *Lachnaea* and in two species of *Cryptadenia* (Table 5). The meiotic chromosome behaviour was normal.

DISCUSSION

Habit, phyllotaxis and foliage

The habit, phyllotaxis and macromorphological characters of the foliage leaves are rather variable among the

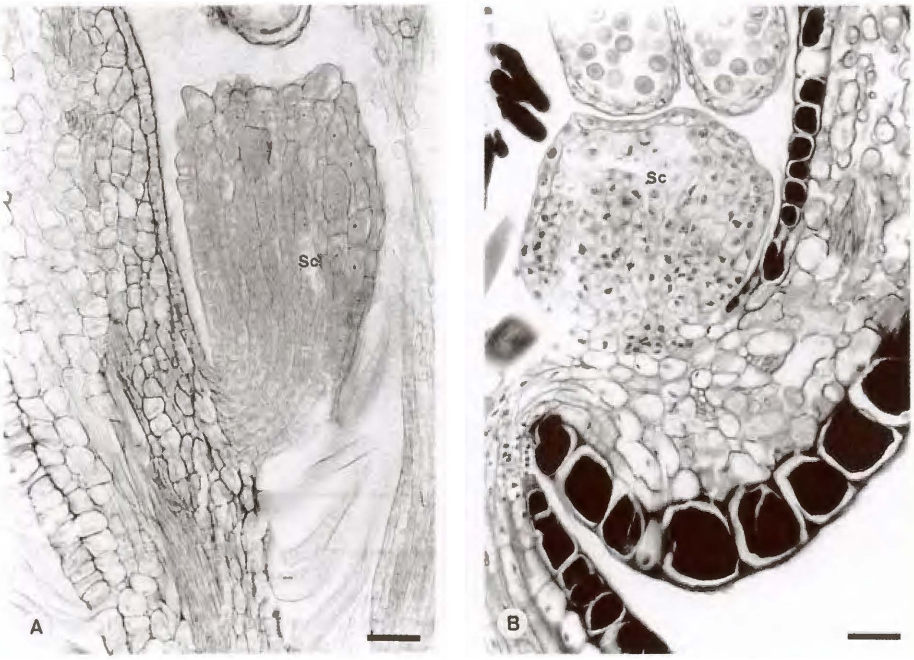

FIGURE 20.—*Lachnaea*. Longitudinal section of scale. A, *L. capitata*, *Beyers 128*; B, *L. axillaris*, *Beyers 127*. Sc, scale. Scale bars: A, B, 50 µm.

TABLE 3.—Size range of pollen grains (mean followed by range in parentheses) in *Lachnaea* and *Cryptadenia*

Taxon	Collector	Diameter (µm)
Lachnaea		
aurea	*Beyers 135*	47 (39–51)
axillaris	*Steyn 331*	22 (20–23)
burchellii	*Oliver 9241*	29 (23–37)
buxifolia	*Beyers 122*	47 (43–53)
	Beyers 118	52 (49–55)
	Taylor 8648	49 (47–59)
capitata	*Hugo 231*	26 (23–29)
	Beyers 128	29 (23–33)
densiflora	*Beyers 145*	29 (23–45)
	Beyers 117	32 (29–35)
	Beyers 115	27 (23–31)
diosmoides	*Beyers 181*	29 (23–33)
	Van Niekerk 53	30 (27–33)
ericoides	*McDonald 1842*	28 (25–31)
	Zeyher 3776	27 (23–31)
eriocephala	*Beyers 54*	50 (39–57)
	Spreeth 141	45 (39–55)
filamentosa	*Beyers 110*	45 (39–55)
	Taylor 10770	50 (47–56)
funicaulis	*Beyers 125*	25 (20–27)
nervosa	*De Kock 152*	35 (31–39)
penicillata	*Oliver & Fellingham 9145*	28 (19–35)
	Beyers 173	29 (23–39)
ruscifolia	*Vlok 2084*	35 (31–39)
Cryptadenia		
filicaulis	*Esterhuysen 34370*	33 (29–39)
grandiflora	*Beyers 151*	48 (45–58)
	Beyers 129	56 (47–64)
laxa	*Bolus 7875*	40 (33–43)
uniflora	*Haynes 477*	52 (49–55)
	Beyers 136	54 (47–62)

species and sometimes even within individual species of *Lachnaea* and *Cryptadenia*. The variation range within *Cryptadenia* is smaller than in *Lachnaea* but one must take into account that *Cryptadenia* is a much smaller group of species. With regard to the habit, phyllotaxis and macromorphological characters of the foliage leaves no major differences were found which could be used to demarcate the two genera.

TABLE 4.—Comparison of sculpturing of supratectal projections of tectate pollen in *Lachnaea* and *Cryptadenia*

Taxon	Base sides		Vestigial spinules at base of main ridges
	± straight	emarginate	
Lachnaea			
aurea	–	+	–
axillaris	+	–	–
burchellii	+	–	+
buxifolia	+	–	+
capitata	+	–	+
densiflora	+	–	+
diosmoides	+	–	+
ericoides	–	+	–
eriocephala	–	+	–
filamentosa	–	+	+
funicaulis	–	+	–
nervosa	+	–	+
penicillata	+	–	+
ruscifolia	+	–	+
Cryptadenia			
filicaulis	+	–	–
grandiflora	+	–	–
laxa	–	+	–
uniflora	+	–	–

TABLE 5.—Chromosome numbers of *Lachnaea* and *Cryptadenia* species studied

Taxon	Haploid chromosome number	Voucher specimen
Lachnaea		
buxifolia	9	*Beyers 122*
densiflora	9	*Beyers 145*
diosmoides	9	*Beyers 181*
ericoides	9	*Beyers 172*
eriocephala	9	*Beyers 54*
funicaulis	9	*Du Toit s.n.*
Cryptadenia		
filicaulis	9	*McDonald 1989*
uniflora	9	*Beyers 136*

Based on the anatomy of the leaves, two leaf groups can be distinguished within *Lachnaea*: 1, those which are amphistomatic and either isobilateral or almost centric; 2, those which are epistomatic and either isobilateral or dorsiventral. The leaves of *Cryptadenia* are epistomatic and either almost isobilateral or dorsiventral. The anatomy of the latter resembles that of the second group in *Lachnaea*. Similar cuticular patterns, namely unsculptured, minutely papillate or undulate, occur in both genera. These characters confirm the close relationship between *Cryptadenia* and *Lachnaea*.

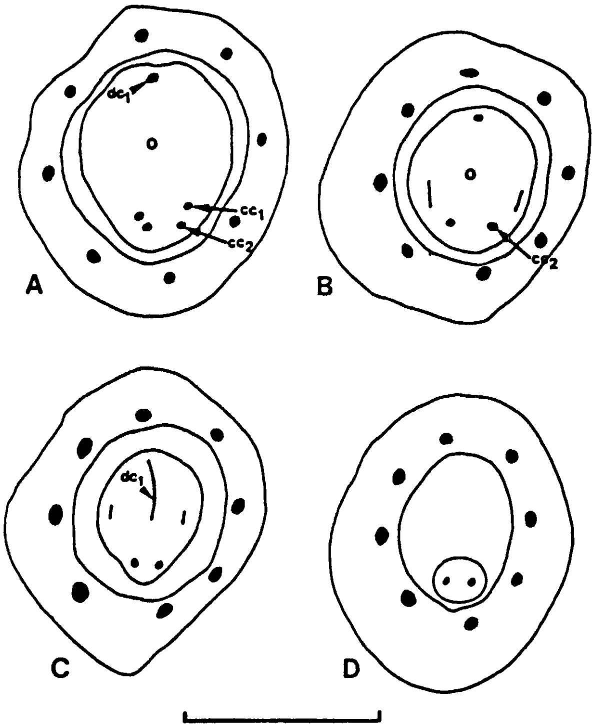

FIGURE 21.—*Lachnaea eriocephala*, *Beyers 54*. Transections of flower: A, base of ovary; B, upper portion of ovary; C, top of ovary; D, base of style. o, ovary; dc_1, dorsal carpellary of fertile carpel; cc_1, commissural carpellary of fertile carpel; cc_2, commissural carpellary of sterile carpel. Scale bar: 500 µm.

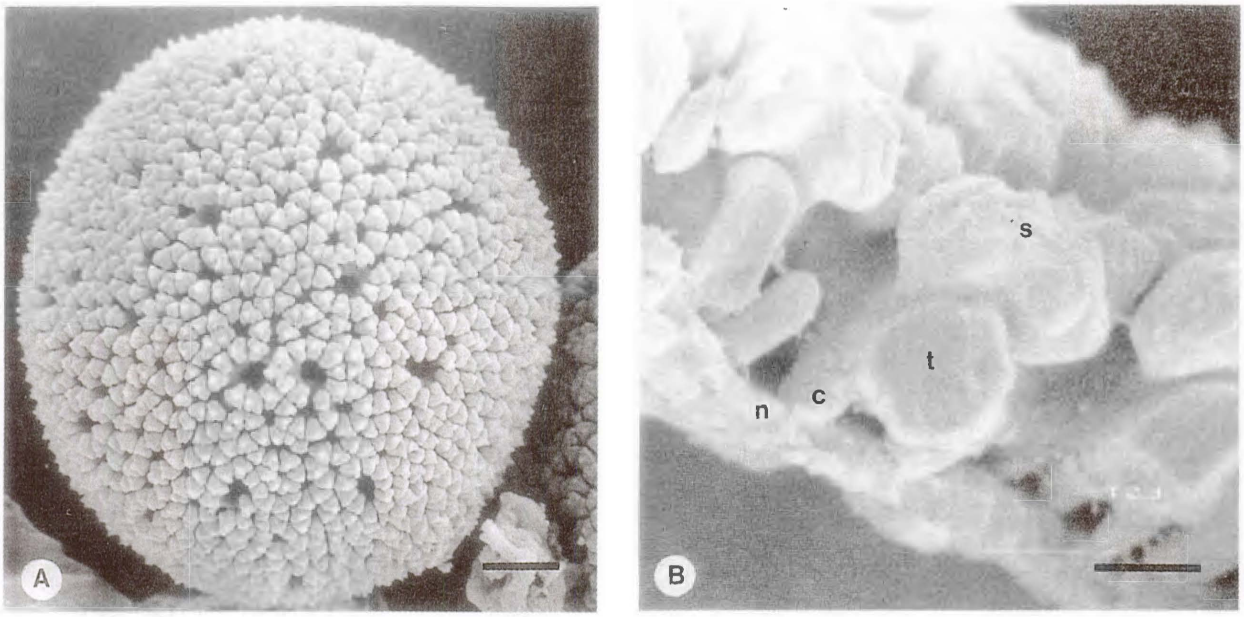

FIGURE 22.—*Lachnaea* and *Cryptadenia*. SEM micrographs of pollen morphology. A, *L. aurea*, *Beyers 135*, pollen grain; B, *L. buxifolia*, *Beyers 122*, transection of pollen grain wall. n, nexine; c, columella; t, tectum; s, supratectal structure. Scale bars: A, 5 µm; B, 1 µm.

Morphology of flower and fruit

Pedicel/floral articulation

The study of the floral morphology revealed the strong similarity between *Lachnaea* and *Cryptadenia*. Sessile flowers are found in both genera. The ring of trichomes at the base of the flower, occurring at the floral articulation, corresponds to that found by Heads (1990) in *Kelleria* Endl. This structure, according to Heads (1990) is reminiscent of the calycular pappus of many members of the Asteraceae and the peltate hairs of Elaeagnaceae, and could be regarded either as a compressed pubescent 'pedicel' or as the 'calyx' of a sessile flower. The pedicels of pedicellate flowers of *Lachnaea* species are always pubescent. The trichomes at the floral articulation do not differ from those on the pedicel and it is therefore more acceptable to regard the ring of trichomes at the base of the sessile flowers as a compressed pubescent 'pedicel'.

Hypanthium

The nature of the hypanthium of the flower of the Thymelaeaceae has been interpreted as being appendicular (foliar) and representing a calyx tube by Meisner (1857), Wright (1915), Peterson (1959) and Dyer (1975), or as being receptacular by Eichler (1878), Baillon (1880), Gilg (1894), Wettstein (1935), Rendle (1938) and Bunninger (1972). According to Lawrence (1951) the hypanthium is more commonly and inaccurately termed the calyx tube or floral tube. Heads (1990), Heinig (1951) and Saunders (1939) regard the floral tube of the Thymelaeaceae as a hypanthium. The vascular anatomy undertaken in this study has shown that the floral tube in both genera can be regarded as a hypanthium.

The position of the plane of circumscision expressed as a percentage of the total length of the hypanthium varies in both genera between 20% and 80%. The shape, length and pubescence of the hypanthium of *Cryptadenia* falls well within the variation range found in *Lachnaea*.

Calyx

The sepals in *Lachnaea* vary from being almost equal to distinctly unequal. The transition from one form to the other is gradual. The sepals of *Cryptadenia* are almost equal which was one of the reasons why Baillon (1880) incorporated *Cryptadenia* as a section in *Lachnaea*.

The aestivation of the sepals is the same in both genera and a basic floral vascular pattern is common to both genera.

Androecium

Eight stamens in two whorls of four each are present in both genera. The position of insertion on the floral tube shows a varying degree of adnation within both *Lachnaea* and *Cryptadenia*. The stamens are always exserted in *Lachnaea*, but in *Cryptadenia* they are either exserted or only the antisepalous stamens are fully exserted.

Scales

In the different genera of the Thymelaeaceae organs comparable to the scales in *Lachnaea* and *Cryptadenia* have been interpreted by various authors as petaloid glands, scales, mere outgrowths of the perigynium, aborted stamens, squamellae which should be regarded either as new structures of uncertain origin or as modified parts of the androecium, stipules or petals which might be reduced or greatly modified in form (Heinig 1951).

In *Lachnaea* various views regarding the nature of these scales have been expressed, namely that they should be regarded as staminodes, scales, glandular or scale-like receptacular effigurations, or petaloid scales homologous

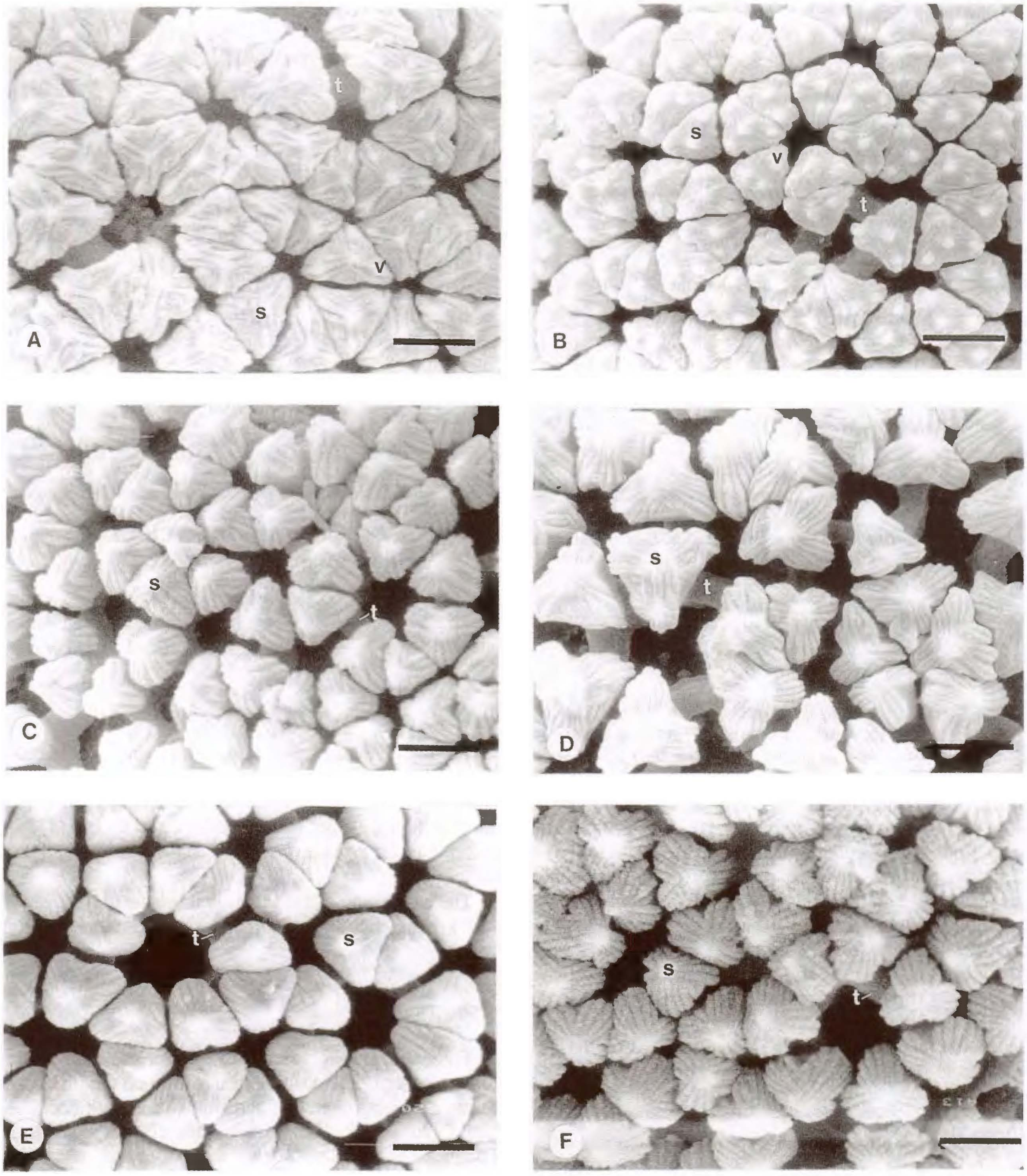

FIGURE 23.—*Lachnaea* and *Cryptadenia*. SEM micrographs of pollen grains. A, *L. buxifolia*, *Beyers 122*; B, *L. ruscifolia*, *Vlok 2084*; C, *L. aurea*, *Beyers 135*; D, *L. eriocephala*, *Beyers 54*; E, *C. uniflora*, *Haynes 477*; F, *C. laxa*, *Bolus 7875*. s, supratectal structure; t, tectum; v, vestigial spinule. Scale bars: A–F, 2 µm.

to petals. In those species of *Lachnaea* where these structures are narrowly straplike or filiform, Domke (1934) regarded them to be in their original form and for that reason Meisner (1840), according to Domke (1934), mistakenly considered them to be staminodes. These structures, in their original position according to Domke (1934), are inserted at the base of the calyx lobes and slightly higher than the insertion of the antipetalous stamens but through zygomorphy these structures have positioned themselves in a single whorl at the same height as, or sometimes below, the filament insertion. This situation is not met in other genera such as *Gnidia* and *Struthiola*, where the petal-like structures are inserted above the insertion of the filaments at the mouth of the tube. From the vascular anatomy of the flowers one would rather believe the converse, namely that the scales were orginally positioned below the antipetalous stamen whorl and through zygomorphy have been slightly displaced to above the antisepalous stamen insertion, as in *L. filamentosa*. Heinig (1951) considered these structures to be stipules of the calyx lobes and found no reason to consider them to be vertical extensions of the disc as Gilg (1894) did. Taxonomists have not been eager to accept the interpretation of the petaloid scales as stipules on the grounds that stipulate sepals would not occur in a group in which the foliage leaves are exstipulate. Heinig (1951) supported her interpretation on the grounds that the absence of stipules on the foliage leaves and the presence of stipular appendages in the floral organs should be considered another aspect of the progressive reduction from a more primitive state. Heads (1990) rejects Heinig's interpretation of the petaloid scales being stipules on the grounds that she used the concepts of 'leaf' and 'stipule' of Eames & MacDaniels (1948) which were in turn derived from Van Tieghem's (1871 in Heads 1990) morphology which he regards as being fundamentally flawed. Heads (1990) refers to the comparable organs in *Kelleria* as gland scales.

In *Cryptadenia*, as in *Lachnaea*, different views regarding the scales have been expressed. They have been referred to as glands, scales, glandular or scale-like receptacular effigurations, or petaloid scales. Although Domke (1934) referred to them as 'glands', he regarded them as petaloid scales homologous to those of *Lachnaea*. According to Domke (1934) the 'effigurations' in *L. axillaris*, *L. diosmoides* and *L. ericoides*, because of their position and shape, lead directly to those in *Cryptadenia* where these structures are nearly completely attached abaxially to the hypanthium.

Because of their position and anatomy, we regard these structures in both *Lachnaea* and *Cryptadenia*, as scales which are mere emergences of the adaxial wall of the hypanthium.

The position of the scales in both genera is usually below the insertion of the antipetalous stamens. In the more zygomorphic forms in *Lachnaea* and in one species of *Cryptadenia*, where they are in close juxtaposition to the stamens, they emerge between the insertion of the antipetalous and antisepalous stamens. The position of the scales in the upper portion of the hypanthium is variable in both genera. Those of *Lachnaea* are inserted at the mouth of the hypanthium to midway down the upper portion of the hypanthium, whereas those in *Cryptadenia* are inserted at the mouth of the hypanthium to three quarters of the way down the upper portion of the hypanthium. On the grounds of the position of the scales, a generic character used by Meisner (1840, 1857), no cutoff point can be made to separate the two genera as the displacement of the scales is gradual. In both genera the scales may be non-glandular or glandular. Another generic character which Domke (1934) used, was the attachment of the scales to the hypanthium. According to him the scales in *Lachnaea* are basally attached, whereas those in *Cryptadenia* are abaxially attached. In *L. axillaris* the cup-shaped and sigmoid basal part of the upper portion of the hypanthium gives the impression that the scales are basally attached. If however, the sigmoid curve is removed by extending the hypanthium upwards, the scales would in fact be abaxially attached and would correspond to the situation in the flower of *C. filicaulis*.

Gynoecium

The ovary in both genera is sessile, pseudomonomerous (consisting of one expanded or fertile carpel and one contracted or sterile carpel) and unilocular with a solitary anatropous ovule laterally attached near the top of the ovary. The style is always laterally attached to the ovary. The stigma is either brush-like or capitate in both genera but may also be conical in *Cryptadenia*.

Zygomorphy is expressed in both genera through the lateral placement of the style and the single locule.

Fruit

In both genera the fruit is an achene which is enclosed within the persistent base of the hypanthium. According to Domke (1934) the achene is, without exception, characteristic of the Thymelaeoideae and thus at the generic level the fruit is not of taxonomic importance.

Pollen morphology

The pollen grains of *Lachnaea* and *Cryptadenia* have the same basic morphology. Based on the sculpture of the supratectal structures two pollen grain types can be distinguished within *Lachnaea*, namely those with vestigial spinules at the base of the three main ridges and those without spinules. In *Cryptadenia* the supratectal structures are devoid of spinules at the base of the three main ridges and are thus similar to the latter pollen grain type of *Lachnaea*. Furthermore, in both genera, the lateral sides of the trihedral structures are striate and the basal sides are either straight or emarginate. The pollen grain size, following Radford *et al.* (1974), is medium to large in *Cryptadenia* and small to large in *Lachnaea*. This feature, therefore, also overlaps in the two genera.

Karyology

In most Thymelaeaceae the haploid chromosome number ($n = 9$) and the somatic chromosome number ($2n = 18$) have been observed (Nevling & Woodbury 1966 in Ornduff 1968. The following references are given in Moore 1973: Sharma & Sarkar 1967, 1968, Bjorkquist *et al.* 1969, Delay 1969, Gupta & Gillett 1969, Majovsky *et al.* 1970. Bhat *et al.* in Löve 1974. In Moore 1977: Kuzmanov 1973, Loeve & Kjellqvist 1974, Majovsky *et al.* 1974. Heads 1990). Polyploidy has been recorded in *Daphne* (Heads 1990), *Daphnopsis* (Nevling & Woodbury 1966 in Ornduff 1968), *Edgeworthia* Meisn. (Heads 1990), *Pimelea* Banks & Sol. (Heads 1990), and *Wikstroemia* Endl. (Gupta & Gillett 1969 in Moore 1973; Heads 1990).

The chromosome number of *Lasiosiphon eriocephalus* Decne., according to Subramanyan & Kamble in Löve 1967, is $n = 8$. The genus *Lasiosiphon* Fresen. was incorporated in the genus *Gnidia* for southern Africa (Dyer 1975). Although the above species is not indigenous to South Africa, it was the only chromosome number previously available for a genus of the Thymelaeaceae represented in South Africa.

The chromosome counts of $n = 9$ here reported for the species of both *Lachnaea* and *Cryptadenia*, are the first records for these two genera. The basic chromosome number of $x = 9$ was recorded for most genera of the

TABLE 6.—Comparison of characters in *Lachnaea* and *Cryptadenia*

Character	*Lachnaea*	*Cryptadenia*
Habit	shrubs or shrublets multi- or single-stemmed at base, 0.15–2.0 m tall	shrublets multi- or single-stemmed at base, 0.12–0.8 m tall
Phyllotaxis	alternate or decussate	decussate
Flower	hermaphrodite, tetramerous	hermaphrodite, tetramerous
Hypanthium	circumscissile	circumscissile
Position of circumscision zone above base of hypanthium	⅕–⅘	⅕–⅘
Basal portion of hypanthium	ellipsoid, widely ellipsoid, ovoid, widely ovoid or obovoid	ovoid or ellipsoid
Upper portion of hypanthium	funnel-shaped, cylindrical, obconical, cup-shaped or cup-shaped with a sigmoid curve	funnel-shaped or cup-shaped
Stamens	4 + 4, exserted	4 + 4, exserted or semi-exserted
Stamen insertion	epipetalous to third of the way down upper portion of hypanthium	epipetalous to three quarters of the way down upper portion of hypanthium
Floral scales	8, non-glandular or glandular	8, non-glandular or glandular
Scale insertion	mouth of hypanthium to midway down upper portion of hypanthium	mouth of hypanthium to three quarters of the way down upper portion of hypanthium
Style	lateral	lateral
Stigma	brush-like or capitate	brush-like, capitate or conical
Fruit	dry, enclosed in persistent base of hypanthium	dry, enclosed in persistent base of hypanthium
Leaf anatomy	epistomatic, isobilateral or dorsiventral; or amphistomatic, isobilateral or almost centric	epistomatic, almost isobilateral or dorsiventral
Pollen grains	monads, globose, polyforate, 22–52 µm in diameter, tectate and supraornate	monads, globose, polyforate, 40–50 µm in diameter, tectate and supraornate
Sculpture of supratectal structures	vestigial spinules present or absent, lateral sides of trihedral structures striate	vestigial spinules absent, lateral sides of trihedral structures striate
Chromosome number	n = 9	n = 9

Thymelaeaceae and can therefore not be used to demarcate genera.

CONCLUSIONS

The Thymelaeaceae is a family in which it is difficult to find sound characters for generic delimitation. According to Peterson (1959), only a few characters can be used and they are of superficial significance. While revising the thymelaeaceous genera of the African continent, Peterson (1959) experienced difficulties with the classification. According to him these difficulties were not so much connected to the species concept but rather to the delimitation of genera which showed morphologically continuous characters which merged them into each other.

According to Baillon (1880), the only other worker who has discussed generic characters in the Thymelaeaceae, the following characters are generally of generic value:

* the number of floral parts,

* the point of insertion of the stamens and the dimension of their filaments which render them exserted or enclosed,

* presence or absence of the scales in the throat of the hypanthium,

* presence or absence of a disc at the base of the gynoecium,

* whether the base of the hypanthium is shed or persists growing around the ripe fruit, and

* the arrangement of the inflorescence.

In evaluating the results obtained from the present multidisciplinary study, consideration was given to those characters which Baillon (1880) advocated as being of value at generic level as well as those used by Heads (1990) to illustrate the major differences between *Kelleria* Endl. and *Drapetes* Lam. The results of this multidisciplinary approach, as summarized in Table 6, illustrate the great similarity between *Lachnaea* and *Cryptadenia*. These also show that several characters within *Lachnaea* exhibit a variation range which includes the variation in *Cryptadenia*, and that in a few other characters the variation range is extended in *Cryptadenia*. No distinguishing characters of generic value were found to support the present demarcation of *Lachnaea* and *Cryptadenia*. Furthermore Beyers & Van der Walt (1994) concluded that the inflorescence morphology revealed no distinct differences between *Lachnaea* and *Cryptadenia*.

With the view of establishing natural genera, and on the basis of the findings of this multidisciplinary study, we support the viewpoint of Baillon (1880) that *Cryptadenia* should be included within *Lachnaea*. A detailed taxonomic treatment of *Lachnaea sensu lato* should now be undertaken.

ACKNOWLEDGEMENTS

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APPENDIX 5

A NEW SPECIES OF *LACHNAEA* (THYMELAEACEAE) FROM THE WESTERN CAPE.[*]

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A new species of *Lachnaea* (Thymelaeaceae) from the Western Cape

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Lachnaea pudens Beyers, a new, one-flowered shrublet from the Western Cape is described. Descriptions and illustrations of the macromorphology, leaf anatomy, and pollen, as well as a distribution map, are provided. The new species resembles *L. axillaris* Meisn. in floral shape, but differs in that the flowers are dark red and sericeous on the outside, whereas those of *L. axillaris* are cream to dark pink and glabrous.

Keywords: Anatomy, *Lachnaea*, new species, palynology, taxonomy, Thymelaeaceae.

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Introduction

Lachnaea L., with about 34 species, is endemic to the Cape Floral Region as defined by Bond and Goldblatt (1984). The species are found mainly on mountain ranges, often at high altitudes and the centre of diversity of the genus lies in the southwestern area.

The most recent taxonomic revision of *Lachnaea* is that of Wright (1915). In the course of a new revision of the genus, which is currently in progress, this new species was identified. The generic position of the new species was in doubt until recently, and specimens were filed in herbaria under *Lachnaea* or doubtfully under *Cryptadenia*. However, the delimitation of these two genera has recently been resolved (Beyers & Van der Walt 1995).

Material and Methods

Transverse sections of wax-embedded leaves were cut with a rotary microtome and stained with alcian green safranin (Joel 1983). Leaf surfaces were studied by mounting portions of the leaf blade obtained from herbarium material on stubs which were coated with gold and studied with a Joel scanning electron microscope (SEM). For both light microscopy (LM) and SEM, pollen was acetolised according to Erdtman (1960). At least 20 pollen grains of each sample were measured.

Sprecies treatment

Lachnaea pudens Beyers, sp. nov. distincta propter ramos florescentes declinatos floribus solitariis atrorubentibus; *L. axillaris* affinis sed floribus externe sericeis, non glabris, atrorubentibus, non albidis ad atroroseis.

TYPUS.—Western Cape: Riviersonderend Mountains, Jonaskop, upper north slopes, 3319 DC, *Beyers 161* (NBG, holotypus; BOL, K, NY, PRE, isotypi).

Erect to decumbent, much branched shrub to 0.6 m tall, multistemmed at base. *Branches* flexuous, intertwined, moderately thick, ridged below leaf bases, tomentose or tomentose-sericeous, leafy, becoming glabrescent and naked with prominent leaf scars; flowering branches declinate. *Leaves* decussate, ascending incurved, imbricate, distal two pairs of leaves inclined, erect or slightly recurved, subverticillate, sessile, 3.8–5.7 × 1.0–1.3 mm, elliptic, subfleshy, glabrous, adaxially flat to obtusely concave, smooth, dull, ± white-punctulate, abaxially convex, keeled, glossy, smooth, sometimes with a reddish brown tinge, apex apiculate, base obtuse. *Inflorescence* terminal, one-flowered, but appearing to be axillary when much-reduced, lateral branches comprise only one pair of leaves and a solitary flower. *Flowers* sessile, subactinomorphic, dark red.
Hypanthium 3.0–4.5 mm long, circumscissile four-fifths from ba
upper portion widely cup-shaped with a basal invagination, ba
portion pyriform, sericeous outside, upper portion glabrous wit
but villous above circumscission zone in vicinity of scales, ba
portion glabrescent within. *Sepals* 4, patent, subequal, 2.0–3.9 × 2.
3.6 mm, widely ovate or widely depressed ovate, acute or obtu
abaxially sericeous, adaxially glabrous. *Petals* absent. *Stamens* 4
4, exserted, outer, antisepalous whorl adnate to upper portion
hypanthium and becoming free just above base of sepals, inner an
petalous whorl adnate to upper hypanthium and becoming f
two-thirds up hypanthium; filaments filiform, 0.3–0.5 mm lo
anthers 0.5–0.6 mm long, depressed-spheroid, abaxially with bro
connective tissue. *Scales* 8, inserted midway on upper portion
hypanthium below antepetalous stamens, 0.3–0.4 mm long, sub
tund, glabrous. *Ovary* 1.0–1.3 mm long, ovoid, glabrous. *Style* 2.
2.6 mm long, linear-obconical, glabrous. *Stigma* penicillate (Fig
1).

Leaf anatomy (vouchers: *Beyers 161 & 210*)

Blade dorsiventral, epistomatic, glabrous, more or less triangular
transverse section (Figure 2). *Cuticle* well developed, equally thi
ad- and abaxially; surface papillate adaxially, smooth or wea
papillate abaxially, both surfaces with flaky wax deposits, partic
larly adaxially (Figure 3). *Epidermis* uniseriate, epidermal cells us
ally square to periclinally elongated, slightly larger abaxially, ou
tangential walls thicker than inner tangential walls (before gelati
zation), inner tangential cell walls abaxially wholly gelatinized w
abundant mucilaginous deposits, adaxially partly gelatinized, mai
towards lateral blade margins; stomata on same level as adjacent e
dermal cells. *Mesophyll* differentiated into palisade and spon
parenchyma; palisade abaxial, uniseriate; spongy parenchyma ada
ial, cells palisade-like, loosely arranged with fairly large intercellu
spaces. *Vascular bundles* comprising a large mid-bundle and ve
small lateral ones; mid-bundle capped abaxially by a prominent bu
dle of large extraxylary fibres, bundle sheath present, uniseriate, p
enchymatous, incomplete, interrupted by extraxylary fibre ca
lateral bundles without fibre caps and with poorly developed pare
chymatous bundle sheath. *Crystals* of diosmin (potasium hydroxi
test: Jackson & Snowdon 1990) present in epidermis and mesoph
occurring as shaerocrystalline to somewhat dendritic masses, p
yellow. *Tanniniferous* deposits absent.

Palynology (vouchers: *Beyers 161 & 210)*

Pollen grains shed as monads, spheroidal, pantoporate, 26–28 μm
diameter. Tectum reticulate with tetrahedral supra-tectal subun
(crotonoid pattern *sensu* Erdtman 1966); supra-tectal subunits tria
gular in surface view, with a single central spinule, lateral sides

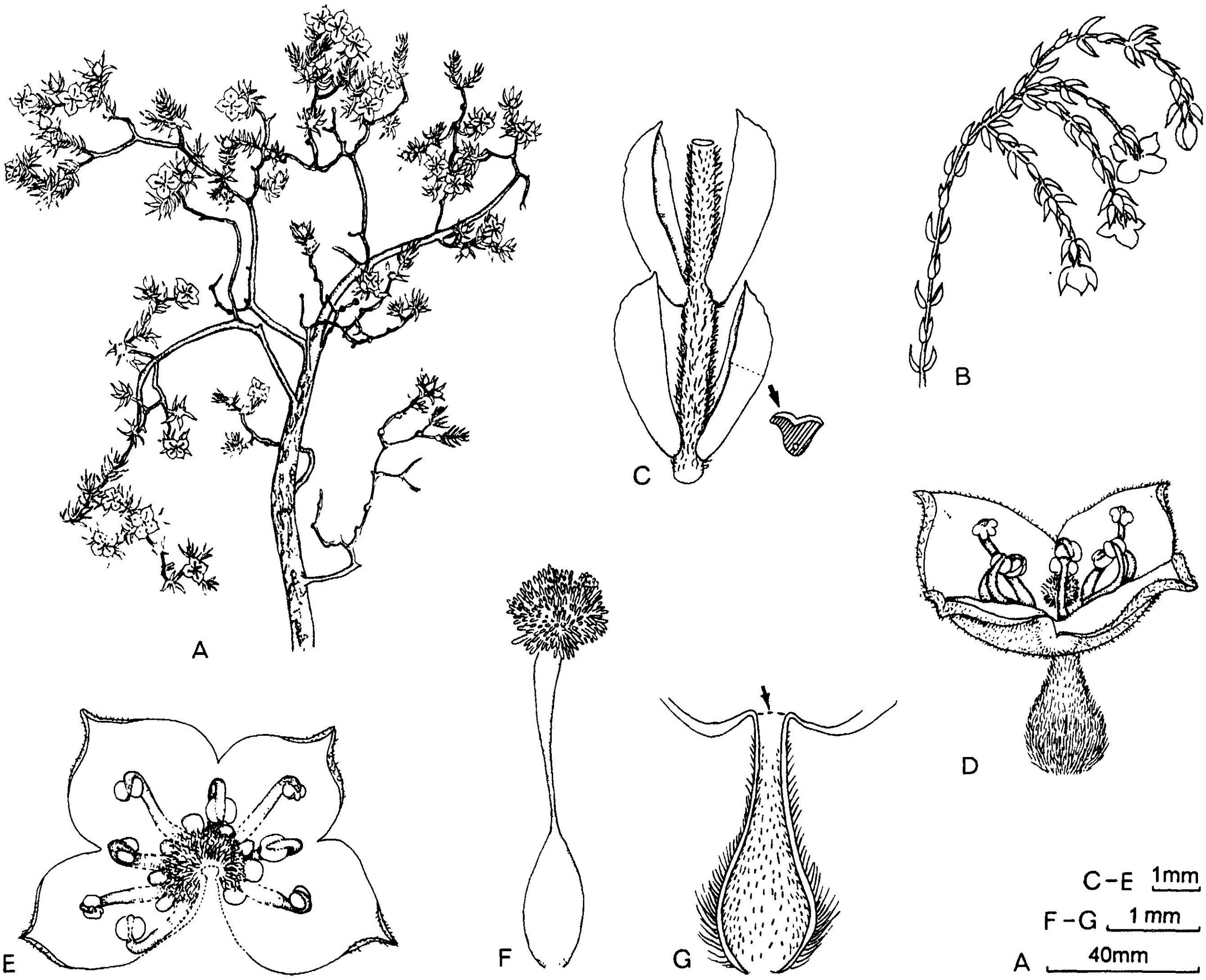

Figure 1 *Lachnaea pudens* (drawn from the type collection, *Beyers 161*). **A**, portion of plant. **B**, flowering branch (life size). **C**, branch with leaves and cross section of a leaf (close-up). **D**, flower. **E**, upper portion of a flower above the circumscission zone. **F**, gynoecium. **G**, portion of the hypanthium with the gynoecium removed (in half section), illustrating the basal invagination of the upper portion of the hypanthium just above the circumscission zone (arrowed).

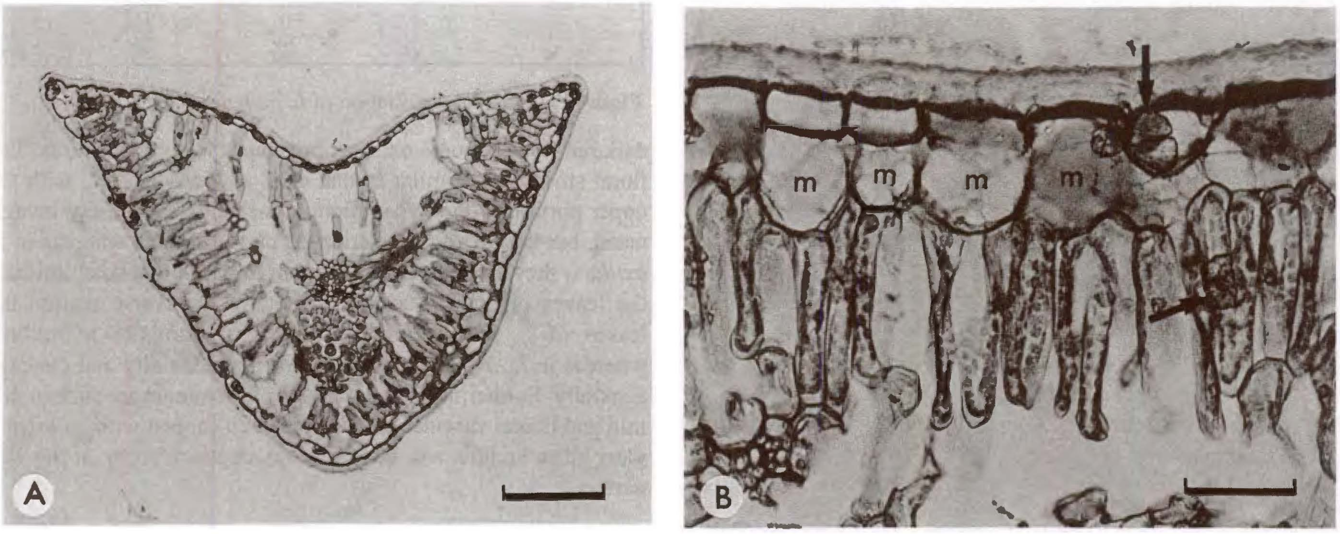

Figure 2 *Lachnaea pudens*, leaf anatomy, transverse sections (*Beyers 210*). **A**, leaf lamina; note triangular outline, lack of tanniniferous deposits and abaxial epidermal cells with inner tangential cell walls wholly gelatinized. **B**, Portion of lamina showing abaxial epidermal cells with gelatinized (mucilaginous) inner tangential walls (m), and sphaerocrystalline masses of diosmine crystals in epidermal and palisade cells (arrowed). Scale bars: **A** = 200 µm; B = 50 µm.

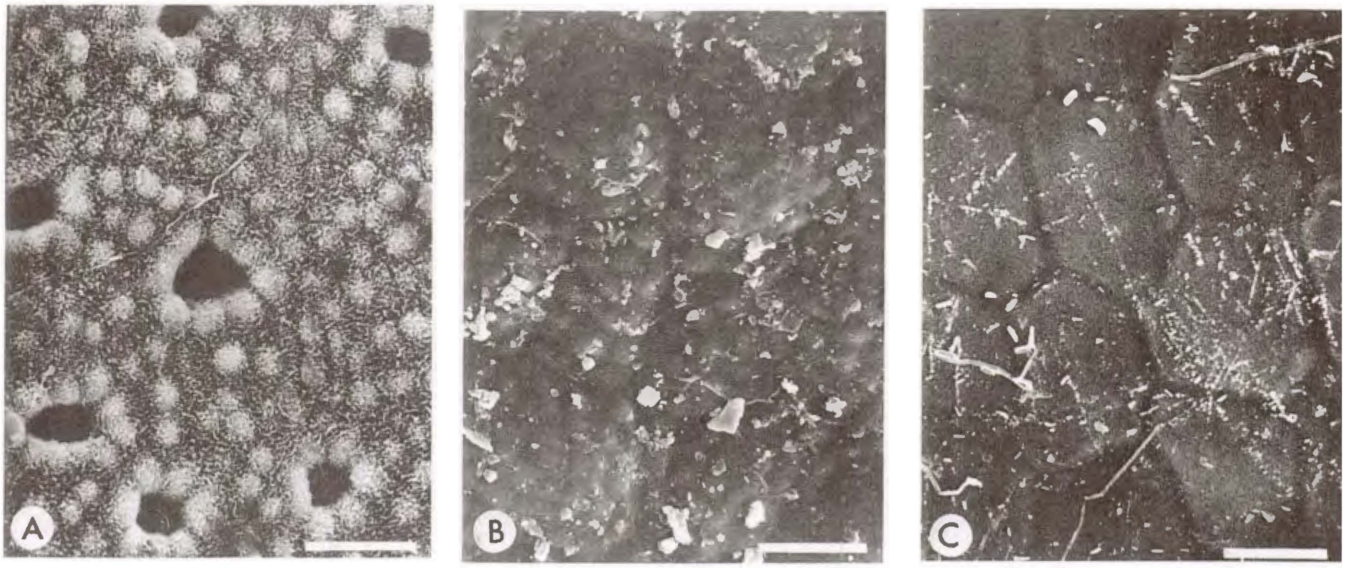

Figure 3 *L. pudens*. SEM micrographs of leaf surfaces illustrating the cuticular relief (**A** & **C**, *Beyers 161*; **B**, *Beyers 210)*. **A**, adaxial cut cle papillate with flake-like wax deposit. **B**, abaxial cuticle shallowly papillate with a sparse flake-like wax deposit. **C**, abaxial cuticl unsculptured with a sparse flake-like wax deposit. Scale bar on A–C = 2 μm.

emarginate, surface around spinule granular-striate, with muri (ridges) often cross linked (Figure 4).

Distribution and ecology

This species occurs on the mountain slopes of Jonaskop near Villiersdorp and on the Riviersonderend Mountains above Greyton and Genadendal, at altitudes between 330–1530 m, growing in sandy, stony soils overlying sandstones of the Table Mountain Group of the Cape Supergroup (Figure 5). Flowering has been recorded in February, May, August and October to December.

Etymology

The specific epithet, *pudens*, meaning shy, bashful or modest, refers to the flowers which are borne on short branches facing downwards; only when the main flowering branches are lifted upwards do the dark red-coloured flowers become noticeable.

Diagnostic characters and relationships

Lachnaea pudens is easily distinguished by the terminal, solitary, dark red flowers borne on short branches facing downwards. Th floral structure is similar to that of *L. axillaris* Meisn., with th upper portion of the hypanthium cup-shaped and basely invag nated, but the flowers are sericeous on the outside whereas in *axillaris* they are glabrous and cream to dark pink. Anatomical the leaves of the two species differ. In transverse section th leaves of *L. pudens* are more or less triangular in outlin whereas in *L. axillaris* they are flattened adaxially and concav abaxially. Furthermore, in *L. axillaris* the stomata are sunken, th mid and lateral vascular bundles are each capped with an extra ylary fibre bundle, and tanniniferous deposits occur in the ep dermis.

Figure 4 *L. pudens* (*Beyers 161*). SEM micrograph of a pollen grain illustrating the crotonoid tectum. Cross-links between muri (ridges) indicated by an arrow.

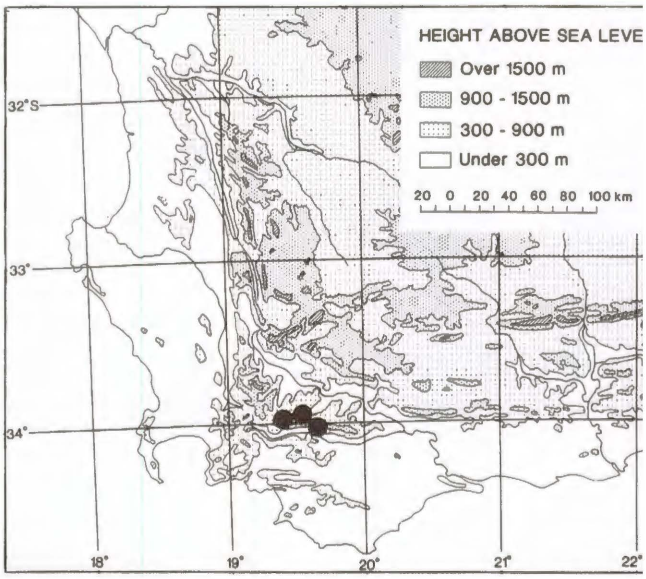

Figure 5 Known distribution of *L. pudens*.

Specimens examined

Western Cape

—**3319** (Worcester): Villiersdorp, Paulsgat area above Kleinfontei NE slopes SW of Vetkop, 680 m, (–CD), 4–10–1997, *Oliver 107* (K, PRE, NBG); Riviersonderend Mountains, lower N slopes

Boesmans Pass road, E-facing slopes E of Koenieskloof, 660 m, (–DC), 14–10–1991, *Bean & Viviers 2737* (BOL, K, NBG, PRE); Riviersonderend Mountains, Jonaskop, N slopes, 660 m, (–DC), 19–11–1989, *Beyers 166* (BOL, K, NBG, PRE); Jonaskop, S side near summit to W of S.A.B.C. tower, ± 1530 m, (–DC), 16–12–1975, *Boucher 3038* (NBG); Jonaskop, N slope, roadside quarry above 2nd gate, ± 700 m, (–DC), 25–05–1985, *Boucher 5094* (NBG); Jonaskop, (–DC), October 1977, *Hugo 958* (NBG); Jonaskop, upper NE slopes, 1200 m, (–DC), 08–08–1986, *Oliver 8980* (NBG); Genadendal Mountains top of Bavisanskloof, 1500 m, (–DC), October, *Stokoe 2524* (NBG, PRE); Boschjeveld Mountains, Worcester side, (–DC), 01–10–1955, *Stokoe SAM 69967* (NBG, SAM); Boschjeveld Mountains, Villiersdorp side, 1500 m, (–DC), February 1940, *Stokoe SAM 58590* (SAM).

—**3419** (Caledon): Riviersonderend Mountains, Greyton, Boesmanskloof, jeeptrack to Die Galg, 640 m, (–BA), 12–11–1992, *Beyers 210* (BOL, K, NBG, NY, PRE); Wildepaardeberg, (–BA), 00–10–1933, *Stokoe 2762* (BOL, PRE); Genadendal Mountains, (–BA), 00–11–1930, *Stokoe 6759* (BOL, PRE); Genadendal, plateau W of The Trail, 700 m, (–BA), 24–05–1996, *Volk 249* (NBG). Grid ref. unknown: Riviersonderend, 330 m, 20–10–1894, *Schlechter 5643* (BOL, Z).

Acknowledgements

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APPENDIX 6

A NEW SPECIES OF *LACHNAEA* ENDEMIC TO THE SOUTHEASTERN MOUNTAINS OF THE WESTERN CAPE.[*]

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[*] Published in *Bothalia* 28: 49–53 (1998).

THYMELAEACEAE

A NEW SPECIES OF *LACHNAEA* ENDEMIC TO THE SOUTHEASTERN MOUNTAINS OF THE WESTERN CAPE

Lachnaea sociorum *Beyers*, sp. nov., structura inflorescentiae florisque *L. ericoidis* similis, sed sepalis tomentosis, stigmate penicellato, foliis lanceolatis ad anguste ellipticis, abaxiale leviter 3-costatis, apice acuto, glabris.

TYPE.—Western Cape, 3321 (Ladismith): Langeberg, Bergfontein, S-facing midslopes of Kokspsosberg, 379 m, (–DC), 18-01-1991, *McDonald 2059* (NBG, holo.; BOL, K, NY, PRE, iso.).

Erect, compact, moderately branched shrub up to 0.6 m tall, multistemmed at base, resprouting after fire. *Branches* erect, slender, ridged below leaf bases, covered with long, straight, adpressed hairs admixed with crooked ones, densely leafy, becoming naked with prominent leaf scars. *Leaves* alternate, ascending or occasionally inclined to patent, with apex curled inward, imbricate, sessile, lanceolate to narrowly elliptic or occasionally elliptic to obovate, 3.6–6.0 × 0.9–2.4 mm, coriaceous, green, those below inflorescence sometimes tinged maroon, glabrous, adaxially concave, smooth, dull, ± white-punctate, abaxially convex, faintly 3-ribbed or subkeeled towards apex, glossy, subpapillate, apex acute, base cuneate. *Inflorescence* a terminal, sessile, ebracteate, 6–14-flowered umbel with up to 9 open flowers at a time, on main flowering branches. *Flowers* subactinomorphic, white, skunk-scented. *Pedicel* 0.3–0.7 mm long, sericeous. *Hypanthium* 2.5–3.7 mm long, circumscissile, three-fifths to three-quarters from base, upper portion funnel-shaped, tomentose outside, adpressed hirsute within, basal portion oblong, glabrous, rarely tomentose outside, glabrous within. *Sepals* 4, patent, subequal, widely ovate or subrotund, 1.7–3.0 × 1.7–3.2 mm, apex rounded or obtuse, adaxially and abaxially tomentose. *Petals* absent. *Stamens* 4 + 4, exserted, outer, antisepalous whorl inserted at base of sepals, 0.7–1.5 mm long, inner, antipetalous whorl inserted at rim of hypanthium, 0.5–1.2 mm long (inner stamens the shortest or equal to the shortest of outer stamens); anthers widely ellipsoid, 0.4–0.6 mm long, abaxially without broad connective tissue. *Scales* 8, exserted, inserted at mouth of hypanthium immediately below antipetalous stamens, obovoid or subglobose, 0.3–0.5 mm long, glabrous, translucent-white when fresh. *Ovary* ellipsoid or obovoid, 0.9–1.4 mm long, glabrous. *Style* linear-obconical, 2.0–2.9 mm long, with straight, adpressed or incurled hairs in upper half to two-thirds. *Stigma* penicillate. *Chromosome number*: 2n = 18 (*Beyers 176*). Figure 8.

Leaf anatomy

Blade dorsiventral, epistomatic, glabrous, in transverse section slightly concave to more or less plane adaxially, convex abaxially (Figure 9). Cuticle well developed, thicker abaxially, surfaces papillate, with flaky wax deposits, particularly adaxially (Figure 10). *Epidermis* uniseriate, adaxial epidermal cells much smaller than abaxial ones, usually periclinally elongated; abaxial epidermal cells square to radially elongated, with outer tangential walls thicker than inner tangential walls (before gelatinisation), inner tangential cell walls of some cells gelatinised; adaxial epidermal cells incompletely and weakly gelatinised; stomata sunk below adjacent epidermal cells. *Mesophyll* differentiated into palisade and spongy parenchyma; palisade abaxial, 1- or 2-seriate; spongy parenchyma adaxial, cells palisade-like, loosely arranged with fairly large intercellular spaces. *Vascular bundles* comprising a large mid-bundle, flanked by 2 smaller lateral bundles on either side, with small intermediate bundles in between these two types; each bundle capped abaxially by large extraxylary fibres which are particularly well developed in the mid- and lateral bundles; bundle sheath present, uniseriate, parenchymatous, incomplete, interrupted by extraxylary fibre cap. *Crystals* of diosmin (potassium hydroxide test: Jackson & Snowdon 1990) present in adaxial epidermis and mesophyll, occurring as shaerocrystalline to somewhat dendritic masses, pale yellow; crystals and tanniniferous deposits mutually exclusive. Tanniniferous deposits present in all abaxial, and in some adaxial epidermal cells.

Vouchers: *Beyers 176; McDonald 2059.*

Pollen morphology

Pollen grains shed as monads, spheroidal, pantoporate, 39–41 μm diam. Tectum reticulate with triangular supratectal subunits, (crotonoid pattern *sensu* Erdtman 1966); supratectal subunits triangular in surface view, with either a single central spinule or with usually four spinules, lateral sides of subunits straight or emarginate, surface around spinules striate to granular-striate, with muri (ridges) cross-linked in subunits with lateral sides emarginate. Figure 11.

Vouchers: *Beyers 176; Oliver 10524.*

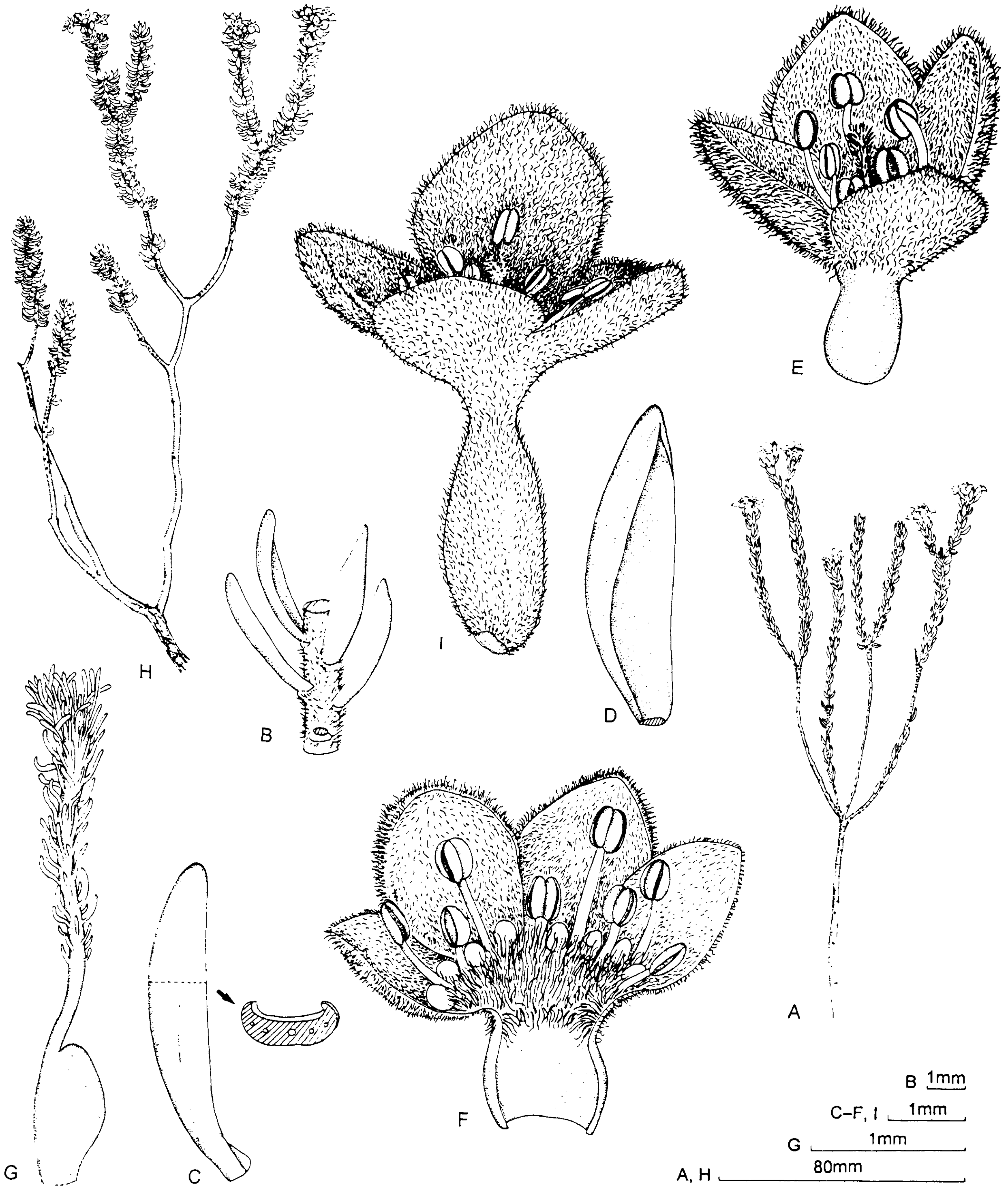

FIGURE 8.—*Lachnaea sociorum*. A, portion of plant; B, branchlet (enlarged); C, leaf (abaxial view and cross section); D, leaf (lateral view); E, flower; F, flower split longitudinally with gynoecium removed; G, gynoecium; H, portion of plant; I, flower; atypical pubescent form. A–G, *McDonald 2059*; H, I, *Beyers 176*.

Distribution, ecology and variation

Recorded from the eastern end of the Langeberg Mountains, from Perdeberg in the west eastwards to Gavelsbos and the southern slopes of the Attakwa Mountains below Perdekop. Plants occur in stony soil on the southern and northern slopes, at altitudes between 300 and 1 100 m (Figure 12). Flowering recorded from August to January.

The population on the northern side of the Langeberg at Tygerberg, west of Huisrivier, is very localised and reasonably old. These plants are single-stemmed at the base, branching close to the ground and are open at the crown

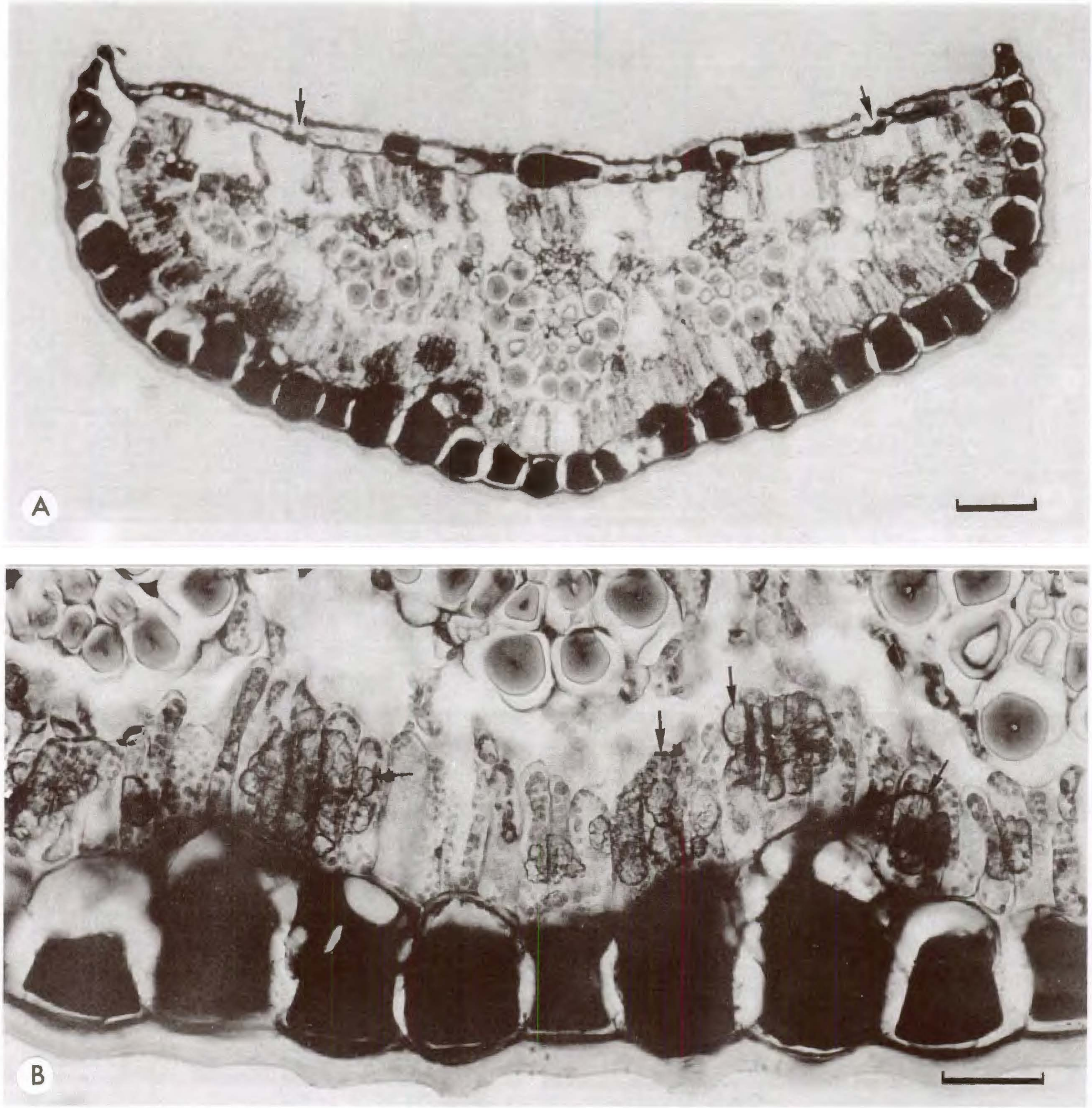

FIGURE 9.—*Lachnaea sociorum, McDonald 2059*, leaf anatomy, transverse sections. A, leaf lamina, note outline of shape, tanniniferous epidermal cells (particularly abaxially), sunken stomata (arrowed) and vascular bundles with prominent caps of extraxylary fibres; B, portion of lamina showing tanniniferous abaxial epidermal cells, adjacent palisade layer and extraxylary fibres, note masses of diosmin crystals (arrowed) in palisade cells. Scale bars: A, 100 µm; B, 50 µm .

with decumbent branches. Whether they would resprout after a fire remains to be seen. Two collections were made from this area, viz. *Beyers 176* and *McDonald 1780.* In all the material collected by McDonald, the basal portion of the hypanthium is glabrous as in all collections from other localities. However, in the material collected by Beyers the basal portion of the hypanthium on the outside is tomentose like the rest of the flower. This variation in hairiness needs further investigation before it can perhaps be formally expressed taxonomically.

Etymology

The specific epithet, *sociorum*, is derived from the Latin *socius*, meaning associate or colleague. This species is dedicated to colleagues Ted Oliver and Dave McDonald, who on field trips always scouted for fresh *Lachnaea* material for the first author.

Diagnostic characters and relationships

Lachnaea sociorum is closely related to *L. ericoides* Meisn. Both have a similar inflorescence and floral structure. In both species the lower portion of the hypanthium is glabrous (except for the one collection of *L. sociorum, Beyers 176*, where it is tomentose). In *L. sociorum* the leaves are usually lanceolate to narrowly elliptic, abaxially faintly 3-ribbed, with an acute, glabrous apex, the sepals adaxially tomentose and the stigma penicillate. In *L. ericoides*, on the other hand, the leaves are narrowly

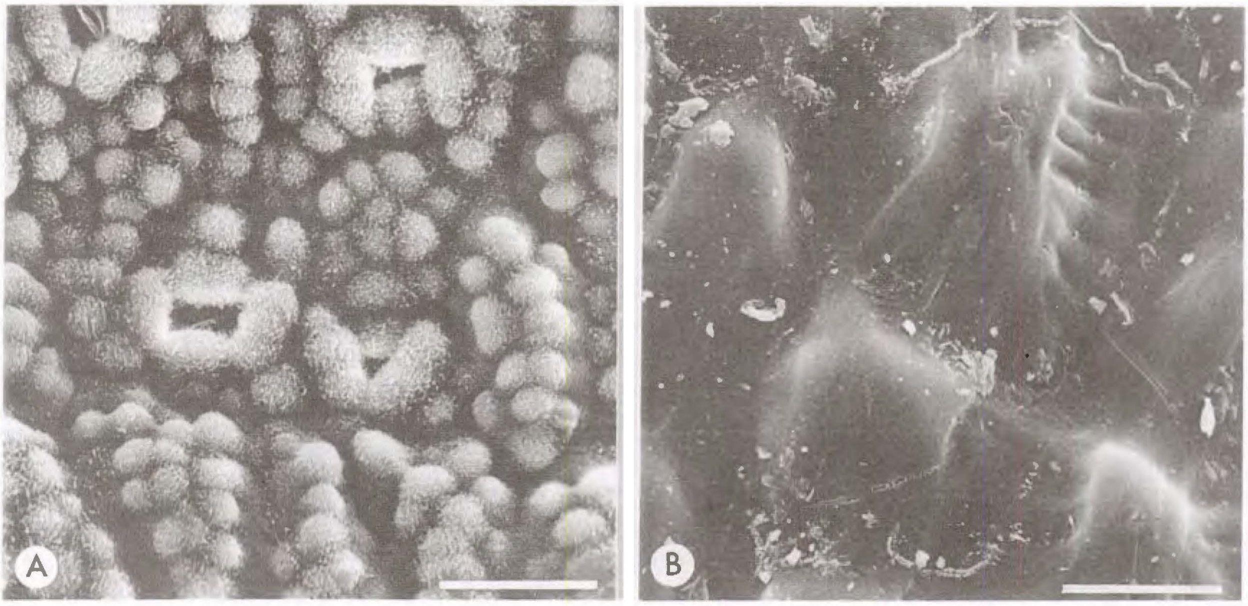

FIGURE 10.—*Lachnaea sociorum, McDonald 2059.* SEM micrographs of leaf surfaces illustrating papillate cuticular relief: A, adaxial surface with dense flake-like wax deposit; B, abaxial surface with sparse flake-like wax deposit. Scale bar: 2 µm .

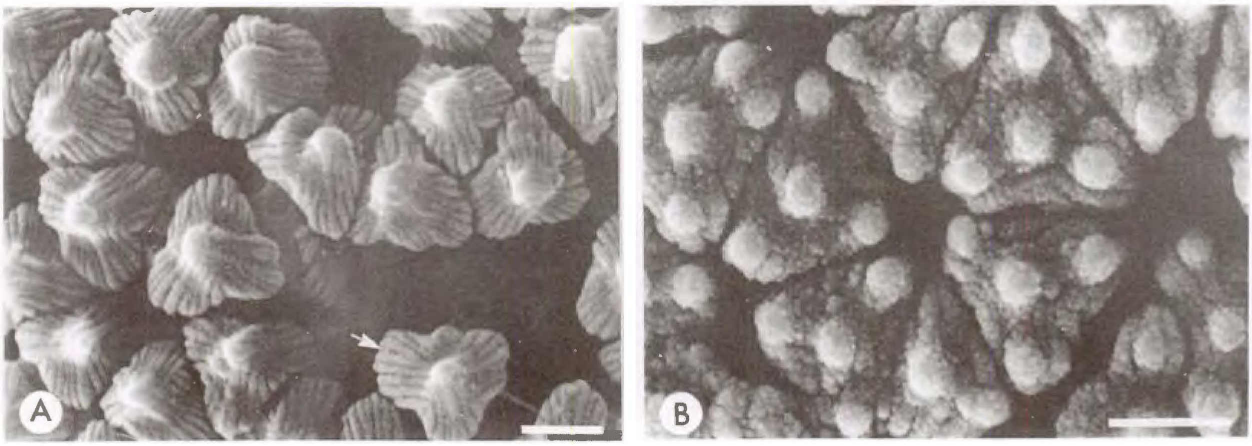

FIGURE 11.—*Lachnaea sociorum.* SEM micrographs of acetolized pollen grains illustrating crotonoid tectum. A, supratectal subunits with single spinule, sides emarginate and with surface striate, note cross-links between muri (ridges), indicated by an arrow, *McDonald 2059*; B, supratectal subunits, each with usually four spinules, sides straight and surface granular-striate, *Oliver 10524* . Scale bar: 1 µm .

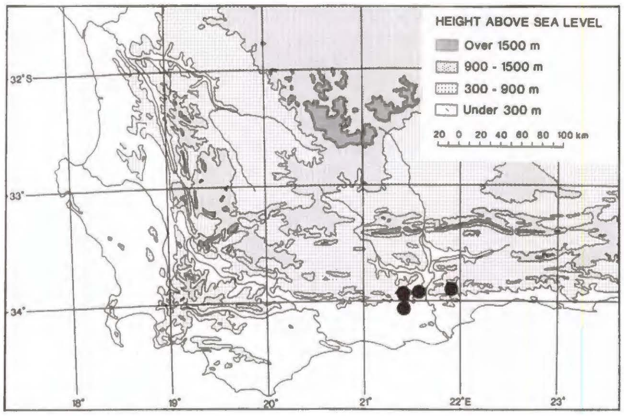

FIGURE 12.—Known distribution of *L. sociorum.*

elliptic to obovate, abaxially keeled, with a rounded, tufted apex, the sepals adaxially sericeous-tomentose and the stigma capitate with elongated papillae. The leaf anatomy of these two species is very similar except that in transverse section the leaves of *L. ericoides* are deeply concave adaxially and the extraxylary fibre strands capping the lateral vascular bundles are not as prominent as in *L. sociorum* (Beyers & Van der Walt 1995: fig. 8a).

Specimens examined

WESTERN CAPE.—3321 (Ladismith): Langeberg, Paardeberg, 1 100 m, (–CD), 11-08-1977, *Haynes 1401* (NBG); E of Garcia's Pass on northern side of Langeberg, Tygerberg, west of Huisrivier, 300 m, (–DC), 15-12-1989, *Beyers 176* (BOL, K, NBG, NY, PRE, Z), 17-12-1988, *McDonald 1780* (BOL, NBG, PRE); Langeberg, Bergfontein area, lower slopes of Koksposberg, 425 m, (–DC), 30-10-1990, *McDonald 1963* (PRE, NBG); Langeberg, Bergfontein, S-facing mid-slopes of Koksposberg, 379 m, (–DC), 18-01-1991, *McDonald 2059* (BOL, K, NBG, NY, PRE); Riversdale Dist., Langeberg, W of Witelsberg, upper Witelsrivierkloof, 610 m, (–DC), 01-09-1994, *Oliver 10524* (BOL, NBG, PRE); Langeberg, lower SW slopes of Witelsberg, N of Koksposberg, 488 m, (–DC), 01-09-1994, *Oliver 10536* (BOL, K, NBG, PRE, Z); Mossel Bay Road to Perdekop before forest plantation, 600 m, (–DD), 17-10-1978, *Bond 1578* (NBG). 3421 (Riversdale): Riversdale, Farm Gavelsbos, mountain slope, SW aspect, stony soil, 307 m, (–AB), 08-09-1984, *Bohnen 8479* (NBG, PRE). Grid ref. unknown: Riversdale Flower Show, 01-09-1994, *comm. Oliver* (NBG); Riversdale Div., Langeberg, 01-10-1923, *Muir 2824* (BOL), *Muir 3053* (PRE).

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