Bothalia 35,1: 7–20 (2005)

FSA contributions 18: Salicaceae *s. str.*

M. JORDAAN†

Deciduous trees or shrubs, sometimes creeping and spreading by suckering, with scaly buds; bark bitter; wood soft and light; plants dioecious. *Leaves* alternate, simple, entire, toothed or occasionally lobed; stipules foliaceous and subpersistent, or small and caducous. *Inflorescences* erect or pendulous spikes or catkins; bracts membranous, entire, toothed or laciniate, fugacious or persistent, subtending individual flowers, often appearing before leaves. *Flowers* unisexual, regular; perianth absent or represented by a cup-shaped or annular disc or 2 scales or glands at base; nectaries when present, varying in size, shape, colour and number. *Male flowers* with 2–many stamens; filaments filiform, free or ± connate; anthers small, ovate or oblong, opening by 2 longitudinal slits; ovary rudimentary or absent. *Female flowers* with ovary superior, sessile or shortly pedicellate, 1-locular; ovules 2–many on each parietal or basal placenta, anatropous, crassinucellar, unitegmic; style short; stigmas 2–4, short, thick, emarginate or 2-fid. *Fruit* a small 2–4-valved capsule, ovoid or oblong, often acuminate. *Seeds* many, very small, with large basal tuft of long, silky, tangled, placental hairs, wind-dispersed, short-lived; endosperm absent or very scanty and oily; embryo small and straight.

A family of two genera and ± 490 species, chiefly of moist or wet habitats, mainly in the cooler parts of the northern temperate and subarctic zones, scarce, and chiefly in highland areas in the tropics, absent from Australasia and the Pacific Islands. Both genera are represented in southern Africa: *Populus* (introduced species only), and *Salix* (both introduced and indigenous species). *Populus* is grown for matchwood, boxwood and pulp, while both genera are cultivated as ornamental trees and shrubs, for shade, fodder, for their sand-binding properties and as windbreaks. Young twigs and leaves of *Salix* are bitter and astringent, but yield salicin and are the antecedent of modern aspirin. Baskets are made out of the slender twigs of *Salix* species and the best cricket bats are made from the timber of *S. coerulea* E.Wolf.

The taxonomic position of the Salicaceae and its relationship with the Flacourtiaceae are still in dispute, but in this article the family concept is being treated in its narrow sense according to the classification of Cronquist (1981). The flowers of *Populus* are wind-pollinated (anemophilous), whereas those of *Salix* are predominantly entomophilous (Fisher 1928). Meeuse (1975), in discussing the taxonomic position of the Salicaceae, argued that the family underwent several, partly divergent evolutionary processes through which *Salix* became predominantly insect-pollinated and developed nectaries. Fisher (1928) was the first to describe the flower structure of the Salicaceae *s. str.* in great detail.

Terminal buds present, rarely lacking; winter buds with several clearly visible unequal outer scales present; leaves broad, deltoid or broadly ovate, broader than long; petiole longer than 15 mm; catkins pendulous; floral bracts apically serrate or laciniate; male disc cup-shaped or annular ..... **Populus*

Terminal buds lacking; winter buds with only 1 calyptrate scale present; leaves narrow, ovate to linear-lanceolate or elliptic, longer than wide; petiole shorter than 10 mm; catkins usually upright; floral bracts entire; male disc of 1 or 2 small distinct glands at base ..... *Salix*

1872000 POPULUS*

***Populus** *L.*, Species plantarum edn 2: 1034 (1753); L.: 456 (1754); Willd.: 802 (1806); Wesm.: 323 (1868); Benth.: 412 (1880); Pax: 35 (1889); C.S.Hubb.: 340 (1926); Chalmers Smith: 275 (1943); Adamson: 311 (1950); Franco: 54 (1964); Willis: 937 (1973); R.A.Dyer: 30 (1975); Jalas & Suominen: 48 (1976); Coates Palgrave: 91 (1977); Wilmot-Dear: 4 (1985); Wilmot-Dear: 121 (1991); Jordaan: 500 (2000). Type species: *P. alba* L. [lecto. fide Britton & Brown: 587 (1913)].

Small or large trees with pale furrowed bark and soft white wood; branches terete or angled, with terminal buds; winter buds often resinous and aromatic, with several unequal outer scales. *Leaves* mostly broadly ovate to rhombic, long-stalked, entire or dentate; stipules membranous, small, narrow. *Inflorescence* a pendulous, drooping, odourless catkin, appearing before leaves. *Flowers* unisexual, wind-pollinated, borne in axil of a serrate or laciniate bract; perianth reduced to a cup-like disc. *Male flowers* with 4–30 or more stamens; filaments free; anthers 2-thecous, oblong to ovate, red. *Female flowers* with ovary sessile or subsessile, 1-locular; ovules many; style very short, 2–4-branched, each branch entire or 2- or 3-fid. *Capsule* 2–4-valved. *Seeds* many, brown, small, ovoid or obovoid, with a tuft of long silky hairs from base.

A genus of ± 40 species (Wilmot-Dear 1985) and confined to northern temperate and subtropical regions apart from the single East African species *Populus ilicifolia* (Engl.) Rouleau. Natural hybrids are common in the genus, and some have been described as species, e.g. *P* × *canescens* (Aiton) Sm. It is possible that other named species are in fact of hybrid origin. In southern Africa a few species have been widely cultivated, principally for wood pulp, matches and boxes, e.g. *P. deltoides* W.Bartram ex Marshall (match poplar), which occasionally escapes from cultivation. *Populus* species are often planted to stabilize dongas but they can spread to adjacent streambeds. *P. alba* L. (white poplar) and *P.* × *canescens* (grey poplar) become naturalized, especially in marshy

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* Naturalized taxon.
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areas and in river valleys, where they spread by suckering. The latter is now one of the most prominent riverine invaders in southern Africa (Henderson & Musil 1984; Henderson 1989, 1991a, 1992, 1998). *P. nigra* L. var. *italica* (Moench) Koehne also escapes from cultivation, and has invaded rivers in various parts of southern Africa.

Key to species

1a Leaves tomentose or puberulous underneath, margins lobed:
  2a Leaves, at least near tip of long shoots, palmately 1–5-lobed and with thick, persistent, distinctly white tomentum below, margin irregularly dentate; flowers sessile . . . . . 1. **P. alba*
  2b Leaves obscurely lobed and thinly greyish tomentose below, becoming almost hairless with age below, margin coarsely serrate; flowers pedicellate . . 2. **P. × canescens*
1b Leaves glabrous, margins serrate or dentate:
  3a Branches spreading or ascending; crown broad (Figure 4B); leaves 70–110 mm long, base truncate; glands present at base of lamina; capsules slender-pedicellate . . . . . 3. **P. deltoides* subsp. *deltoides*
  3b Branches steeply ascending; habit columnar (Figure 6B); leaves 20–60 mm long, base cuneate or rounded; glands absent at base of lamina; capsules ± sessile . . . . . 4. **P. nigra* var. *italica*

1. ***Populus alba** *L.*, Species plantarum edn 2: 1034 (1753); Boiss.: 1193 (1879); Fernald: 522 (1950); D.R.Maire: 39 (1961); Franco: 54 (1964); A.Neumann: 12 (1969); L.H.Bailey & E.Z.Bailey: 901 (1976); Jalas & Suominen: 48 (1976); Browicz & Yalt.: 717 (1982); Meikle: 1490 (1985); L.Hend.: 188 (2001). Type: 'Habitat in Europa temperatiori', *Herb. Burser XXIII: 19* [UPS, lecto., designated by Jonsell: 78 (1993)].

Tree up to 30 m tall, with trunk up to 1 m or more diam. and branches spreading to form a wide, rounded crown; spreading by root sprouts. *Bark* greyish green to whitish grey and smooth on upper part of trunk and branches, rough and fissured on basal part of old trunks; branchlets at first densely white tomentose, becoming dull grey-brown with age; buds ovoid, blunt, densely white-tomentose. *Leaves* of two kinds: those on short lateral shoots and at base of long leading shoots up to 50 mm long, broadly and bluntly ovate, irregularly bluntly serrate-lobed and thinly tomentose or glabrous; those towards apex of long shoots often deeply palmately 3–5-lobed, up to 125 mm long, persistently white-tomentose below, apex acute, base rounded or subcordate, sometimes with 2 glands, margin toothed, teeth triangular; petioles terete, tomentose, shorter than lamina, 20–42 mm long. *Male catkins* not found in southern Africa. *Female catkins* twice as long as male catkins; pedicels 1–2 mm long; discs ± 1.5 mm diam.; floral bracts dentate, margins with long white hairs. *Female flowers*: ovary 3–5 mm long, tomentose; stigmas with 2 terete, horizontally divergent branches. *Capsules* ovoid, 3–5 mm long, 2- or 3-valved. *Seeds* mostly abortive.

A native of central, E and SE Europe and Asia; now naturalized from plantations in Gauteng, Mpumalanga, Free State and Lesotho (Figure 1). Not as widespread as *P. × canescens*. Spreads by suckering, as only female plants are found in southern Africa (Hubbard 1926). Very difficult to distinguish from *P. × canescens*, of which it is one of the putative parents. See the differences under *P. × canescens*.

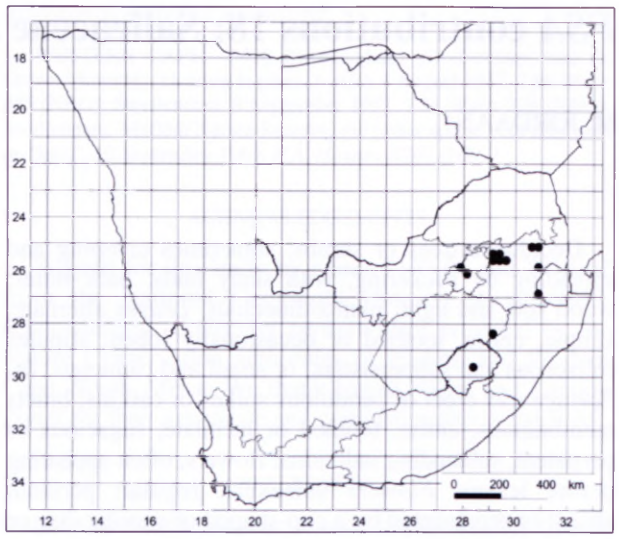

FIGURE 1.—Distribution of *Populus alba* in southern Africa, drawn from SAPIA Database, PPRI, 1979–2005.

Vouchers: *Du Plessis 427* (PRE, PRU); *Henderson 628* (PRE, PRU), *961*, *1010* (PRE); *Kluge 888* (PRE, PRU); *Theron 1908* (PRU).

2. ***Populus × canescens** (*Aiton*) *Sm.* in Flora Britanica 3: 1080 (1804); Burtt Davy: 340 (1921); Burtt Davy: 432 (1932); Fernald: 522 (1950); Butcher: 966 (1961); Jalas & Suominen: 49 (1976); Coates Palgrave: 91 (1977); L.Hend.: 189 (2001). Type from Europe.

Tree up to 25 m tall, with moderately spreading crown, often suckering. *Bark* on young stems white, smooth, becoming rough on old trunks. *Leaves* of long shoots deltoid-ovate, cordate, up to 120 mm long, grey-tomentose beneath, becoming almost hairless with age; leaves on short branches, smaller, suborbicular to ovate, obtuse, subcordate, 30–60 mm long; not ciliate, with a narrow translucent border; apex acute, base cordate, sometimes with 2 glands at base, margin irregularly glandular-serrate, ciliate; petiole terete, 15–35 mm long. *Male catkins* 60–100 mm long; stamens 8–15. Figure 2.

A native of Europe and W Asia which has spread to many parts of the world and is now found as an escape from cultivation and established along streams and rivers in the Limpopo Province, North-West, Mpumalanga, Gauteng, Free State, KwaZulu-Natal and Northern, Western and Eastern Cape (Henderson 1991a) (Figure 3).

Commonly known as the grey poplar, it was originally introduced into South Africa to supply the match industry but in the summer rainfall area at least, it has since been replaced by *P. deltoides*. Although originally named as a species, it is apparently a hybrid between *P. alba* and *P. tremula* L. (Browicz & Yaltirik 1982). Only male plants are found in southern Africa, and the plants spread vegetatively by root suckers. A semi-evergreen variety, 'Rossii', also occurs in the area and was originally described as a taxonomic variety by Hubbard (1926), from a specimen collected at the Apies River, Gauteng. It is fast-growing, very frost-resistant and fairly drought-hardy. It differs from *P. alba* mainly in leaf characters: the leaves are

FIGURE 2.—*Populus* × *canescens*: A, terminal shoot, × 1; B, male inflorescence, × 1; C, floral bract, × 8. A, *Jordaan 356* (PRE); B, C, *Jordaan 3528* (PRE). Artist: G. Condy.

usually smaller, shorter than 40 mm, not lobed, with four or five coarse, broadly rounded teeth on each side and becoming glabrescent with age below. The leaves of *P. alba* are usually longer than 45 mm, are 1–5-lobed and have more than five, small, irregular, sharp, triangular teeth on each side, with the white tomentum persistent below.

Vouchers: *Duggan & Henderson 15* (PRE); *Meadows s.n.* (GRA); *Olivier 1432* (NBG); *Parker 3823* (NBG); *Potts 4968* (UOVS).

3. ***Populus deltoides** *W.Bartram ex Marshall*, Arbustrum americanum: 103 (1785); Britton & Brown: 591 (1913); Fernald: 522 (1950); Franco: 55 (1964); L.H.Bailey & E.Z.Bailey: 901 (1976); Eckenw.: 203 (1977); L.Hend.: 190 (2001). Type: United States of America, Carolina and Florida, *Bartram s.n.* [(BM?, holo., not traced, fide Eckenwalder (1977)].

subsp. **deltoides**

Tree up to 30 m tall, with large, erect trunk, ± 2 m diam.; branches ascending to spreading, forming a broad crown. *Bark* ashy grey, thick, deeply fissured to form broad rounded ridges; branchlets usually stout, glabrous, strongly angular, pale yellowish green to brownish or grey when young, becoming greyish brown with age; buds large, ovoid to ellipsoid, acuminate, resinous, with 6 or 7 scales, outer scales puberulent at base, bright reddish brown, glabrous, 12–30 mm long, crenate-dentate, ciliolate, with 2 or 3 basal glands. *Leaves* deltoid or suborbicular-ovate, 70–180 mm long, apex abruptly triangular-acuminate, base truncate, coriaceous, bright green and glossy above, paler beneath, glabrous, turning yellow in autumn, margin irregularly glandular-serrate, with 2 or more large conspicuous glands at point of attachment with petiole; petiole flattened at summit, slender,

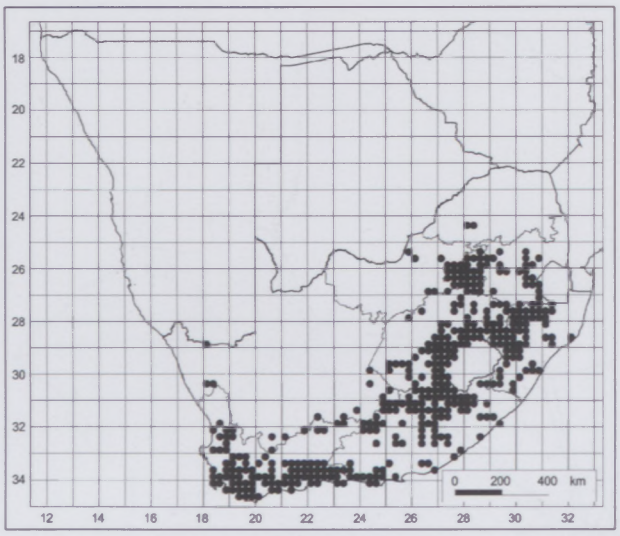

FIGURE 3.—Distribution of *Populus* × *canescens* in southern Africa, drawn from SAPIA Database, PPRI, 1979–2005.

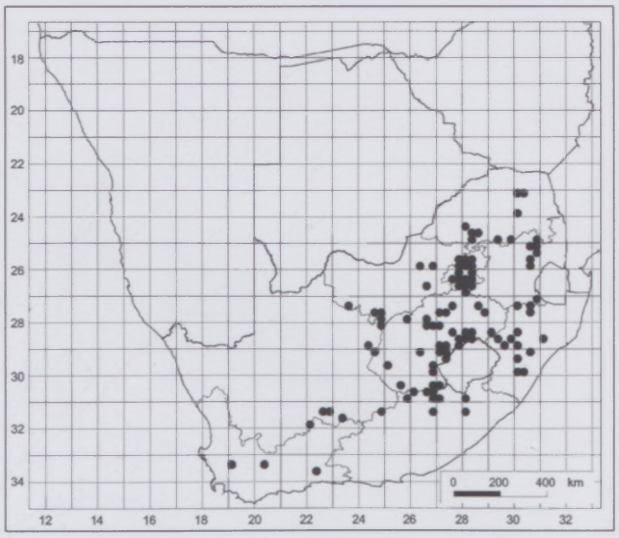

FIGURE 5.—Distribution of *Populus deltoides* subsp. *deltoides* in southern Africa, drawn from SAPIA Database, PPRI, 1979– 2005.

pilose becoming glabrous, yellowish or tinged with red, up to 150 mm long. *Male catkins* densely flowered, cylindrical, 70–100 mm long, red and yellow, appearing in spring; pedicels 8–10 mm long. *Male flowers*: stamens 30–60 or more; anthers ± 1 mm long. Figure 4.

Commonly called match poplar, cottonwood or necklace poplar. A native of the United States of America, but is cultivated and occasionally naturalized along watercourses in South Africa (Henderson & Musil 1984; Henderson 1989, 1991b, 1992, 1998) (Figure 5).

FIGURE 4.—*Populus deltoides* subsp. *deltoides*. A, terminal shoot, × $^{2}/_{3}$; B, tree outline; C, male catkin, × $^{2}/_{3}$. Artist: Marietjie Steyn. Taken from Henderson (2001), with permission.

FIGURE 6.—*Populus nigra* var. *italica*. A, terminal shoot, × 2/3; B, tree outline; C, male catkin, × 1. Artist: Marietjie Steyn. Taken from Henderson (2001), with permission.

Vouchers: *Gubb KMG10755* (PRE); *Henderson 1088* (PRE); *Siebert & Siebert 2012* (PRU).

4. ***Populus nigra** *L.*, Species plantarum edn 2: 1034 (1753); Jacot Guill.: 161 (1971). Type: 'Habitat in Europae temperatiore' (type not designated).

var. **italica** *(Moench) Koehne* in Deutsche Dendrologie: 81 (1893), non Du Roi: 2141 (1772), nom. illeg.; Franco: 55 (1964); Bugala: 45 (1967); A.Neumann: 8 (1969); L.H.Bailey & E.Z.Bailey: 901 (1976); Browicz & Yalt.: 719 (1982); Meikle: 1490 (1985); L.Hend.: 191 (2001). *P. italica* Moench: 79 (1785). *P. nigra* subsp. *italica* (Moench) Seemen: 41 (1908); D.R.Maire: 45 (1961). Type: from Lombardy (Italy).

Tree up to 30 m tall, with short trunks up to ± 2 m diam.; branches steeply ascending and brittle, giving tree a columnar outline; rarely suckering. *Bark* dark grey and deeply fissured; branchlets terete, glabrous, pale yellowish brown, becoming grey; buds ellipsoid-conic, recurved at apex, resinous, reddish, glabrous, scales with entire margins. *Leaves* firm, glabrous, yellowish green; lamina rhombic to triangular-ovate, 20–60 mm long, apex abruptly acute to acuminate, base rounded to truncate, margins finely crenate-serrate, eglandular at base; petiole slender, 30–50 mm long, flattened laterally. *Male catkins* 50–70 mm long. *Male flowers*: stamens 8–20, red. Figure 6.

Commonly known as the Lombardy poplar, a cultivar from the original species, which is a native of Europe. Infertile and often spreads by means of suckers along watercourses, particularly in the eastern Free State (Henderson 1991a), Lesotho, Western Cape and Eastern Cape (Henderson 1992) (Figure 7).

Vouchers: *Du Preez 1929* (PRU); *Gibbs Russell, Robinson, Herman & Downing 169* (PRE); *Zambatis 169* (PRE).

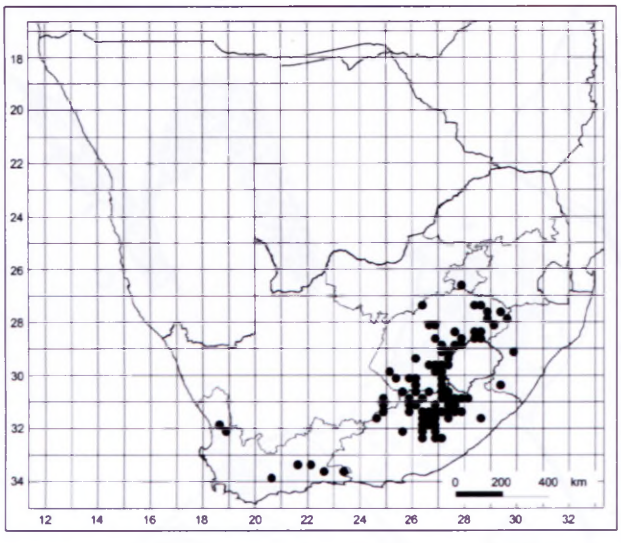

FIGURE 7.—Distribution of *Populus nigra* var. *italica* in southern Africa, drawn from SAPIA Database, PPRI, 1979–2005.

1873000 SALIX

Salix *L.*, Species plantarum, edn 2: 1015 (1753); L.: 456 (1754); Willd.: 655 (1806); Thunb.: 30 (1823); Andersson: 1 (1867); Andersson: 190 (1868); Benth.: 411 (1880); Pax: 36 (1889); Boiss.: 1181 (1879); Marloth: 130 (1913); Engl.: 7 (1915); Burtt Davy: 62 (1922); Skan: 575 (1925); M.J.Fischer: 307 (1928); Burtt Davy: 431 (1932); Adamson: 310 (1950); Ball: 369 (1961); Rech.f.: 43 (1964); Friedr.-Holzh.: 1 (1967); Willis: 1021 (1973); Argus: 2 (1973); Argus: 1613 (1974); R.A.Dyer: 30 (1975); Coates Palgrave: 91 (1977); Wilmot-Dear: 1 (1985); Immelman: 171 (1987); Meikle: 258 (1989); Wilmot-Dear: 120 (1991); McKean: 83 (1996); Jordaan: 500 (2000); Coates Palgrave: 121 (2002). Type species: *S. alba* L. [lecto., designated by Britton & Shafer (1908)].

Deciduous trees or shrubs with usually terete branches lacking terminal buds; winter buds each protected by a single calyptrate scale, buds sometimes glutinous; branches ± flexible. *Leaves* alternate, petiolate or sessile, oblong, lanceolate or linear, entire or serrulate; stipules present or absent. *Inflorescences* dense, usually erect, firm catkins, appearing before or with leaves. *Flowers* unisexual, chiefly insect-pollinated, borne in axil of an entire bract, with 1 or 2 small nectariferous glands at base. *Male flowers*: stamens 2, or in a few species, 3–many; filaments slender, free or sometimes connate, exceeding scale. *Female flowers*: a single ovary, composed of 2 carpels, sessile or stipitate; ovules often 4–8, arranged on 2 placentas; style often short, with 2 short, retuse or bifid stigmas. *Capsule* many-seeded, dehiscing by 2 recurving valves. *Seeds* many, minute, narrowed at ends, dark chestnut-brown or nearly black, enveloped in silky wool; testa white, translucent, surface rough; cotyledons oblong.

A large genus of ± 450 species (Argus 1997), mostly in temperate parts of the northern hemisphere. One indigenous species with four subspecies occurs in southern Africa and is widespread along rivers; three introduced species have become naturalized. *S. mucronata* subsp. *subserrata* (the safsaf willow) occurs in tropical Africa in the north, from Syria and Egypt, the Arabian Peninsula southwards through East and West tropical Africa following the Nile and the great lakes and along the Congo-Zambezi watershed as far south as the Kunene, Zambezi and Chobe Rivers in Namibia and Botswana. No attempt is made so far to propose an infraspecific classification of *Salix* north of the Limpopo River for tropical Africa, because of very inadequate material as pointed out by Meikle (1958) and Friis (1992). Further south in the *FSA* region, only three taxa occur, all geographically correlated to their own river groups and drainage lines. *S. mucronata* subsp. *mucronata* (= subsp. *capensis*) occurs in the Orange and Vaal Rivers and their tributaries (North-West, Free State, Lesotho, Northern Cape and southern Namibia) and Western Cape from the Breede River Valley northwards to the Eastern Cape rivers, mainly the Great Fish River Valley, and as far north as the Umzimkulwana River in southern KwaZulu-Natal. *S. mucronata* subsp. *hirsuta* is confined to the Olifants River and probably the Berg River in Western Cape. *S. mucronata* subsp. *woodii* occurs in the northern provinces of South Africa, in Swaziland, KwaZulu-Natal and Lesotho.

The indigenous *Salix* species in southern and tropical Africa are sometimes difficult to identify because of the dimorphic character of their leaves, which is not always the case with the introduced and naturalized species. Two types of leaves are produced in different seasons. The first spring leaves are usually smaller, broader in proportion to their length, often obovate instead of ovate or lanceolate, with margins entire instead of toothed, apex often rounded instead of acute. The summer leaves which follow, often remain on the branches until pushed off by the swelling buds in their axils, hence these trees are sometimes almost evergreen (Newsholme 2002). Owing to this overlap of leaf characters (leaf shape and proportion), the complete geographical separation, with subspecies restricted to certain drainage basins, is therefore the most distinctive character to use for the infraspecific classification of *Salix mucronata*.

Camus & Camus (1904) classified the European species of *Salix* into sections, mainly on account of the number of nectaries and number of stamens. *S. babylonica* and *S. fragilis* with two nectaries and 4–12 stamens and pubescent filaments belong to section *Fragilis* Koch, and *S. caprea* with one nectary and two stamens belongs to section *Capreae*. Argus (1997) published a new infrageneric classification of *Salix* and placed *S. fragilis* in *Salix* subgenus *Salix* sect. *Salix*. *S. babylonica* belongs to *Salix* subgenus *Salix* sect. *Subalbae* Koidzumi and *S. caprae* to *Salix* subgenus *Vetrix* (Dumort.) Dumort. sect. *Cinerella* Seringe. There has never been any attempt made to place the African species *S. mucronata* in any section. With its nectary represented by an irregularly lobed ring, or sometimes reduced to one abaxial and one adaxial gland and 5–8 stamens, it may constitute a section of its own.

Some species of *Salix*, e.g. *S. babylonica*, *S. fragilis* and *S. mucronata*, are classified as rheophytes, which in nature are confined to the beds of swift-running streams and rivers where they grow up to flood level, but not beyond the reach of regularly occurring flash floods (Van Steenis 1981).

Key to species and subspecies (see Figures 8 & 9)

1a Branches hanging ± vertically; leaves tapering to a long-acuminate apex; stipules persistent, at least 8 mm long; female flowers sessile . . . . . 6. **S. babylonica*
1b Branches ascending, spreading or droopy but not hanging vertically; leaves rounded, acute or acuminate but not tapering to a long apex; stipules varying; female flowers and fruits usually pedicellate:
2a Stipules usually ± present, foliaceous or linear, at least 3 mm long:
3a Catkins pedicellate; mature leaves usually not wider than 15 mm and longer than 45 mm . . . . . 7. **S. fragilis*
3b Catkins subsessile; mature leaves usually wider than 20 mm and not longer than 40 mm . . . . . 8. **S. caprea*
2b Stipules absent or very soon caducous, minute, only up to 0.3 mm long:
4a Leaves and branches densely silver-hirsute; found along the Olifants River and probably the Berg River (Western Cape) and their tributaries . . . . . 5b. *S. mucronata* subsp. *hirsuta*
4b Leaves and branches glabrous or grey-canescent; not found along the Olifants River and probably the Berg River (Western Cape):
5a Leaves (10–)15–40 mm wide; found in N Namibia and Botswana . . . . . 5d. *S. mucronata* subsp. *subserrata*
5b Leaves 4–10(–15) mm wide; absent in N Namibia and Botswana:
6a Summer leaves usually shorter than 55 mm; petioles 2–5 mm long; twigs always glabrous; found mainly along Orange and Vaal Rivers and their tributaries and rivers in Western and Eastern Cape as far north as southern KwaZulu-Natal . . . . . 5a. *S. mucronata* subsp. *mucronata*
6b Summer leaves usually longer than 60 mm; petioles 4–14 mm long; twigs grey-canescent to puberulous, sometimes glabrous; found mainly along the Limpopo, Olifants, Maputo, Komati, Umbuluzi, Tugela and Black and White Umfolozi Rivers and their tributaries . . . . . 5c. *S. mucronata* subsp. *woodii*

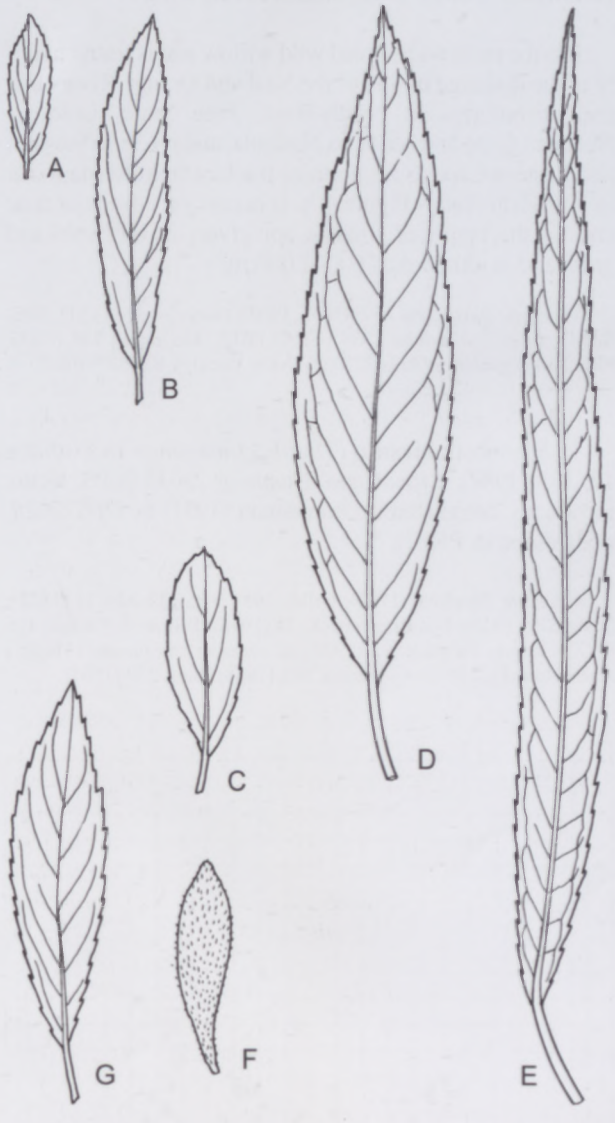

FIGURE 8.—Leaves of *Salix mucronata*. A, spring leaf of subsp. *mucronata*, × 1; B, summer leaf of subsp. *mucronata*, × 1; C, spring leaf of subsp. *subserrata*, × 1; D, summer leaf of subsp. *subserrata*, × 1; E, summer leaf of subsp. *woodii*, × 1; F, spring leaf of subsp. *hirsuta*, × 1; G, summer leaf of subsp. *hirsuta*, × 1. A, *Berry KMG13218* (PRE); B, *Gubb KMG10847* (PRE); C, *Merxmüller & Giess 30494* (PRE); D, *Roux 332* (NBG); E, *Dieterlen 6718* (SAM); F, *Middlemost 1733* (NBG); G, *Van Jaarsveld 4496* (NBG). Artist: G. Condy.

5. **Salix mucronata** *Thunb.*, Prodromus plantarum capensium: 6 (1794); Willd.: 685 (1806); Thunb.: 31 (1807); Andersson: 14 (1867); Burtt Davy: 70 (1922); Friis: 154 (1992); McKean: 84 (1996); Coates Palgrave: 121 (2002); R.H.Archer & Jordaan: 92 (2005). Type: Cape, *Thunberg s.n. UPS23065* [lecto., designated by Immelman (1987), IDC microfiche 1063/968!].

Tree with branches ascending or drooping, slender or stout. *Bark* dark grey or brown, becoming deeply vertically fissured with age; branches glabrous or with dense grey canescence, becoming glabrous with age, often reddish when young. *Leaves* dimorphic, small, entire spring leaves followed by much larger toothed ones, broadly lanceolate to elliptic, 25–160 × 3–15 mm, apex long acuminate to acute to obtuse, base cuneate, usually discolorous, silvery hairy to puberulous to glabrous, soon glabrous on both surfaces or only above, margin entire, subentire, denticulate or serrate, reticulate venation slightly visible above, hardly visible beneath; petiole slender or stout, 3–15 mm long, glabrous or pubescent, often reddish; stipules small, falling soon, serrulate, glandular on adaxial surface, often absent. *Inflorescence*: flowers arranged in dense spikes or catkins. *Male catkins* 34–70 mm long; bracts usually pubescent, sometimes densely so, or sometimes glabrous; gland an irregularly lobed ring, sometimes reduced to one abaxial and one adaxial gland, 0.3–1.0 mm long. *Male flowers* appearing from midwinter to spring and again in late summer; stamens 5–8. *Female catkins* 20–35 mm long. *Female flowers* on pedicels 2–4 mm long. *Capsules* 4–6 mm long, dehiscent to release tufted, woolly seed; fruiting stipe 1.5–3.5 mm long. *Seeds* ovoid, ± 1 mm long.

5a. subsp. **mucronata**. Immelman: 173 (1987).

S. capensis Thunb. var. *mucronata* (Thunb.) Andersson: 14 (1867); Andersson: 198 (1868); Sim: 329 (1907); Skan: 577 (1925).

S. capensis Thunb.: 31 (1807); Harv.: 309 (1838); Andersson: 197 (1868) excl. vars. *mucronata*, *hirsuta*; Sim: 328 (1907); Marloth: 130 (1913); Skan: 576 (1925) excl. var. *mucronata* & syn. *S. aegyptiaca*; Burtt Davy: 432 (1932); Von Breitenbach: 72 (1965); Friedr.-Holz.: 14 (1967); Jacot Guill.: 161 (1971); Palmer & Pitman: 413 (1972); Newsholme: 59 (2002). *S. mucronata* Thunb. subsp. *capensis* (Thunb.) Immelman: 173 (1987); Jordaan: 255 (2002a); Jordaan: 122 (2002b).

FIGURE 9.—Leaves and stipules of introduced species of *Salix*. A, B, *S. caprea*, *Keet STEU13012* (NBG), × 1; C, D, *S. babylonica*, *Haugh 517* (NH) & *Henderson 671* (NH), × 1; E, *S. fragilis* subsp. *fragilis*, *Henderson 786* (PRE), × 1. Artist: G. Condy.

Type: Northern Cape, near rivers in mountains near Hantam, *Thunberg s.n.* (*UPS22958*, lecto., designated here, IDC microfiche 1063/963!).

S. gariepina Burch.: 317, t. 6 (1824); Burtt Davy: 338 (1921); Von Breitenbach: 73 (1965). *S. capensis* var. *gariepina* (Burch.) Andersson: 13 (1867); Andersson: 197 (1868); Sim: 329 (1907); Skan: 579 (1925); Burtt Davy: 432 (1932); Newsholme: 118 (2002). Syntypes: Northern Cape: Prieska District, banks of the Orange River, *Burchell 1637* (K!) and Orange River, near Petrusville, *Burchell 2669* (K!).

S. mucronata var. *caffra* Burtt Davy: 71 (1922). Type: Eastern Cape, Eastern Districts, *Cooper 48* (PRE!, holo.; BM!, K!, iso.).

Tree with dense to sparse drooping crown, up to 10 m tall, occasionally attaining 15–20 m in height, with stem diam. of 300–600 mm; twigs always slender, glabrous, yellow or red. *Bark* becoming rough, deeply furrowed with age; branchlets terete, slender, ± pubescent when young, quite glabrous, often shining and reddish to dark brown when older; wood white to purplish white, satiny, soft, light and brittle. *Leaves* thin, becoming leathery, few reddish hairs when young, otherwise glabrous, green on both sides (Figure 8A); summer leaves (30–)40–55 (–75) × 5–11 mm (Figure 8B), apex acuminate or acute, base cuneate, margin closely or remotely serrulate, rarely entire; petiole glabrous, 2–5(–7) mm long.

In this treatment, subsp. *mucronata* is considered to be the same as subsp. *capensis* and partially as subsp. *mucronata* of Immelman (1987). This view is different from Jordaan (2002a) and Coates Palgrave (2002), where subsp. *mucronata* was applied to the tropical plants and is considered in this treatment as subsp. *subserrata*, because of the correct application of the type of *Salix mucronata* (see elsewhere in this publication). It has the smallest summer leaves of all the subspecies, usually shorter than 55 mm and narrower than 11 mm, and is commonly known as the small-leaved willow.

It is the most widespread wild willow and is found mainly in the drainage basins of the Vaal and Orange Rivers and their tributaries in North-West, Free State, Lesotho, Northern Cape and southern Namibia, and rivers in Western and Eastern Cape as far north as the Umzimkulwana River in KwaZulu-Natal (Figure 10). It occurs on islands or near and on the banks of streams and rivers in bushveld and grassland at altitudes of 600–2 000 m.

Vouchers: *Burtt Davy 1503* (BOL, PRE); *Dieterlen 314A* (NH, PRE, SAM); *Jacot Guillarmod 7384* (GRA, PRE); *McDonald 914* (NBG, PRE); *Merxmüller & Giess 2270* (WIND); *Van Wyk BSA325* (PRU).

5b. subsp. **hirsuta** (*Thunb.*) *Immelman* in Bothalia 17: 173 (1987). Type: Cape, *Thunberg 23038* [UPS, lecto., incorrectly designated by Immelman (1987) as *UPS23028*, microfiche in PRE!].

S. hirsuta Thunb.: 6 (1794); Willd.: 695 (1806); Thunb.: 31 (1823); Skan: 579 (1925); Von Breitenbach: 74 (1965); Palmer & Pitman: 416 (1972); Coates Palgrave: 91 (1977). *S. capensis* var. *hirsuta* (Thunb.) Andersson: 14 (1867); Andersson: 198 (1868); Sim: 329 (1907).

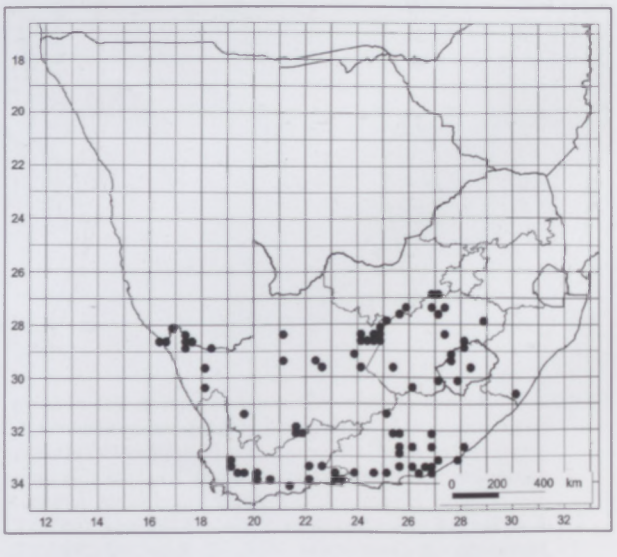

FIGURE 10.—Distribution of *Salix mucronata* subsp. *mucronata* in southern Africa.

Shrub or small tree 2–4 m tall, with yellow winter buds; branches rather stout, densely silver-hirsute. *Bark* smooth, grey; branches at first densely whitish villous, becoming glabrescent, red-brown and somewhat rugose; branchlets angular. *Leaves* oblong to lanceolate, 20–70 × (5–)10–15 mm (Figure 8F, G), apex mucronate, acute or acuminate, base round to cuneate, thinly covered above and densely beneath with grey silky hairs, becoming glabrous, margin entire or sometimes remotely and obscurely serrulate; petiole short, 1–6 mm long, densely hirsute; stipules brown, membranous, obliquely ovate, ± 1.5 mm long, silky-hairy, soon deciduous. *Flowering time*: September to October. *Fruiting time*: October to November.

S. mucronata subsp. *hirsuta* is the most easily distinguished subspecies because of its grey silky indumentum on branchlets, stipules and leaves. Commonly known as the silver willow and confined to the Western Cape along the Olifants River and probably the Berg River and their tributaries (Figure 11).

Krauss (1845), Skan (1925) and Adamson (1950) cited the distribution of *S. hirsuta* as the Cape Peninsula, at Hout Bay, Bergvliet and rivulets near Constantia and Stellenbosch. The natural habitat in the Cape Peninsula and surroundings has been largely destroyed and the distribution of subsp. *hirsuta* given by these early authors has raised the suspicion that it might have been much wider until early in the last century or they must have confused these trees with subsp. *mucronata*.

Vouchers: *Lewis 3524* (SAM); *Marloth 11035* (NBG, PRE); *Pillans 9831* (PRE); *Van Jaarsveld 4496* (NBG, PRE); *Wagener 217* (NBG).

5c. subsp. **woodii** (*Seemen*) *Immelman* in Bothalia 17: 176 (1987). Type: Natal [KwaZulu-Natal], Upper Tugela River, near Colenso, *Wood 4970* (NH, holo.!).

S. woodii Seemen: 53 (1896); J.M.Wood: 121 (1907); Marloth: 130 (1913); Burtt Davy: 339 (1921); Bews: 79 (1921); Skan: 577 (1925); Burtt Davy: 432 (1932); Von Breitenbach: 70 (1965); Jacot Guill.: 161 (1971); Palmer & Pitman: 415 (1972); Compton: 172 (1976).

S. natalensis Wimm. ex Andersson: 14 (1867); Andersson: 198 (1868). Type: Natal [KwaZulu-Natal], Port Natal (Herb. Vindob. *Gueinzius 136*).

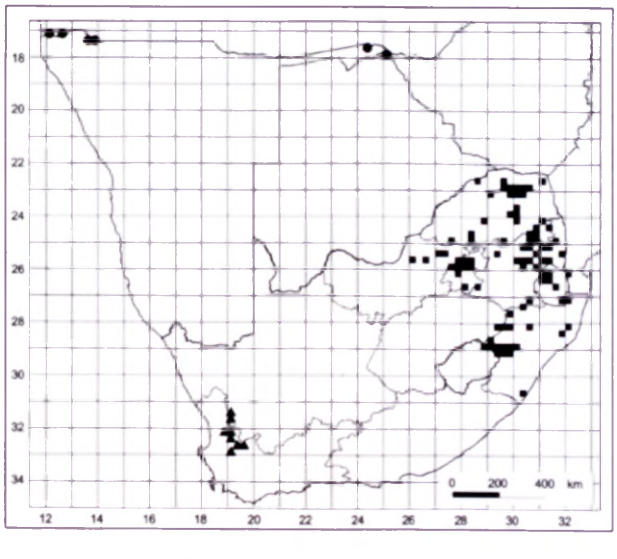

FIGURE 11.—Distribution of *Salix mucronata* subsp. *hirsuta*, ▲; subsp. *subserrata*, ●; and subsp. *woodii*, ■, in southern Africa.

S. wilmsii Seemen: 9 (1900); Marloth: 130 (1913); Burtt Davy: 340 (1921); Burtt Davy: 432 (1932). *S. woodii* var. *wilmsii* (Seemen) Skan: 578 (1925). *S. mucronata* Thunb. subsp. *wilmsii* (Seemen) Immelman: 176 (1987), syn. nov. Type: Eastern Transvaal [Mpumalanga], Lydenburg District, *Wilms 1350* [PRE, lecto.!, designated by Immelman (1987); BOL, isolecto.!].

S. wilmsii × *safsaf* Burtt Davy: 432 (1932). Type: Mpumalanga, Lydenburg, Grootfontein River, foot of Burgers Pass, *Burtt Davy H1559* (PRE, holo.!). Burtt Davy also cites: Eastern Transvaal [Mpumalanga], Barberton, *Pole Evans H2965* (PRE!).

S. wilmsii × *woodii* Burtt Davy: 432 (1932). Type: Eastern Transvaal [Mpumalanga], Barberton, *Galpin 1278* (GRA!, PRE!).

An arborescent shrub or small tree 2–10 m tall, with long, lax, somewhat drooping branches, much-branched; branches always stout, usually sparsely to densely grey-canescent, rarely puberulous to glabrous. *Bark* dark brown, deeply fissured; young twigs red. *Leaves* narrowly lanceolate, (50–)60–160 × 5–15(–22) mm (Figure 8E), apex long-acuminate, tapering at base, smooth to slightly hairy, pale green above, with greyish bloom below, with dense, grey, silky indumentum, sometimes hairy, becoming glabrescent and glaucescent with age, margin entire or serrulate; petiole 2–14 mm long. *Flowering time*: August to September. *Fruiting time*: October to April. Figure 12.

The width of the summer leaves of this subspecies might overlap with that of the other subspecies but it has the longest leaves, up to 160 mm. Commonly known as the flute willow because suitable lengths of the branches are used for making toy whistles (Smith 1966). Occurs in the drainage basins of the Limpopo, Crocodile, Olifants, Komati, Umbuluzi and Maputo Rivers and adjacent streams in Limpopo, North-West, Gauteng and Mpumalanga, and of the Umbuluzi River in Swaziland. Also in the Tugela and Black and White Umfolozi River basins in the eastern Free State, Lesotho and KwaZulu-Natal (Figure 11).

There are no constant distinguishing characters that separate *S. mucronata* subsp. *woodii* and subsp. *wilmsii* (Coates-Palgrave 1977). Specimens have entire to serrate leaves and the young twigs are all hirsute, becoming glabrous with age. Therefore only one taxon occurs in the eastern parts of the Drakensberg Escarpment in the drainage lines of the rivers that run into the Indian Ocean, from the Umzimkulu in the south to the Komati and Maputo Rivers in the north. The subspecific epithet *woodii* is the oldest name and has therefore been used.

Vouchers: *Balkwill & Cadman 2472* (J, PRU); *Bayer & McClean 101* (BOL, PRE); *Compton 31168* (NBG, NH, PRE); *Dieterlen 314B* (NH, PRE); *Galpin 1278* (BOL, SAM); *Theron 3569* (GRA, PRU).

5d. subsp. **subserrata** *(Willd.) R.H.Archer & Jordaan* in Bothalia 35: 92 (2005). Type: Egypt, near Cairo, Bulak, *Herb. Willd. 18137* (B-WILLD, holo., fragm., IDC microfiche 7440-30/1313!).

S. subserrata Willd.: 671 (1806); Milne-Redh.: 474 (1936); Meikle: 588 (1958); D.R.Maire: 50 (1961); Von Breitenbach: 70 (1965); Friedr.-Holzh.: 14 (1967); Léonard & Geerinck: 2 (1967); Palmer & Pitman: 413 (1972); Wilmot-Dear: 1 (1985); Meikle: 258 (1989); Wilmot-Dear: 121 (1991).

S. safsaf Forssk.: LXXVI (1775) as *S. safsaf baelledi* nom. nud. ex Trautv.: 6, tab. 2 (1836); Andersson: 196 (1868); Boiss.: 1183 (1879);

FIGURE 12.—*Salix mucronata* subsp. *woodii*. A, terminal shoot, × 0.9; B, female flower, × 8.8; C, female catkin, × 8.8; D, dehiscent capsule with seeds, × 4.4; E, male flower, × 8.8. A, B, C, E, *Poynton IH10464*; D, *Obermeyer TM31027*. Artist: G. Condy.

Skan: 318 (1917); Newsholme: 118 (2002). Type: Egypt, *Herb. Sieber* (?LE, holo., K? iso.).

S. aegyptiaca sensu Thunb. non Willd.: 30 (1806).

Tree up to 12 m tall; branches drooping, slender or stout, glabrous or with dense grey canescence, becoming glabrous and often reddish with age. *Leaves* broadly lanceolate to elliptic, 40–100(–150) × (10–)15–40 mm (Figure 8C, D), apex acute to obtuse, base cuneate, olive-green and glossy above, glaucous below, soon glabrous on both surfaces, margin subentire or denticulate, reticulate venation slightly visible above, hardly visible beneath; petiole slender or stout, 3–15 mm long, glabrous or pubescent. *Flowering time*: early spring. *Fruiting time*: July to December.

S. mucronata subsp. *subserrata* has the broadest leaves, up to 40 mm wide, and is widespread in Africa, from North Africa (Egypt and Arabian Peninsula) southwards through tropical Africa to southern Africa in Namibia along the Kunene and Zambezi Rivers and abundant along the Chobe River in Botswana. A widespread tree in fringing bush, on sandy soil along rivers and streams, and on islands in places likely to become inundated for at least part of the year (Figure 11).

Vouchers: *Maguire 1707* (NBG); *Merxmüller & Giess 30494* (PRE, WIND); *Roux 332* (NBG, PRE); *Tinley 1493* (WIND); *Van Wyk BSA52* (PRE, PRU); *Ward, Ward & Seely 10438* (PRE, WIND).

6. ***Salix babylonica** *L.*, Species plantarum edn 2: 1017 (1753); Andersson: 212 (1868); Boiss.: 1185 (1879); A.Camus & E.-G.Camus: 246 (1904); E.F.Linton: 21 (1913); Britton & Brown: (1913); Burtt Davy: 338 (1921); Burtt Davy: 81 (1922); M.J.Fischer: 311 (1928); Burtt Davy: 431 (1932); Fernald: 506 (1950); D.R.Maire: 57 (1961); A.K.Skvortsov: 28 (1969); Jacot Guill.: 161 (1971); Coates Palgrave: 91 (1977); Meikle: 1488 (1985); Wilmot-Dear: 124 (1991); A.E.van Wyk & P.van Wyk: 154 (1997); L.Hend.: 161 (2001). Type: Orient, Tournefort (*Herb. LINN1158.20*, lecto., designated here, microfiche in PRE!).

A weeping tree up to 10 m tall with long, slender, dense, spreading crown and branches hanging ± vertically and reaching the ground; stems yellow-brown, terete, glabrous. *Leaves* narrowly ovate-lanceolate to linear-lanceolate, 60–85 × 8–17 mm, tapering into a long fine acumen (Figure 9C, D), apex asymmetrical, base cuneate, bright green above, glaucous beneath, glabrous, margin regularly serrulate; petiole 3–6 mm long, glabrous or

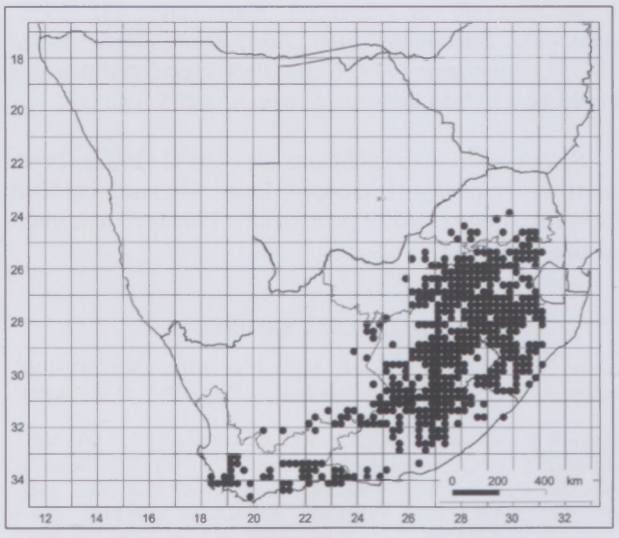

FIGURE 13.—Distribution of *Salix babylonica* in southern Africa, drawn from SAPIA Database, PPRI, 1979–2005.

thinly pubescent; stipules foliaceous, 4–12 mm long, ovate-lanceolate, dentate, caducous. *Inflorescences* on short axillary branches, appearing with the leaves or soon after; bracts ovate-lanceolate, glabrescent, axis, basal part and margins with long white hairs. *Female catkins* 15–25 mm long; female flowers with 1 nectary gland; ovary glabrous, sessile or subsessile; style very short, ± 2 mm long; stigmas 2-lobed.

The weeping willow was introduced from Europe, but originally came from central and southern China and is planted extensively in southern Africa, along rivers and around dams. It is one of the most widespread invaders of watercourses in South Africa and is particularly abundant in the Grassland Biome, where in places, it forms pure stands along whole river reaches (Henderson 1991a). Only female trees are known to exist in southern Africa (Poynton 1973)—the University of the Free State, Bloemfontein, has one male tree—see Henderson (1991c).

Naturalized in southern Africa since at least the time of Ecklon (± 1823–1832). Now recorded from most of southern Africa where there is permanent water (Figure 13). A widespread weed in many parts of the world, spreading in marshy places and along streambanks by means of branches breaking off and taking root. Place of origin uncertain, probably China. Despite the specific epithet, it does not occur naturally in the Middle East.

Vouchers: *Burtt Davy 1887* (NH, PRE); *Du Preez 1910* (PRU); *Gubb KMG10838* (PRE); *Henderson 671* (NH, PRE); *Jacot Guillarmod 2970* (GRA, PRE); *Oliver 3121* (PRE, NBG).

7. ***Salix fragilis** *L.*, Species plantarum edn 2: 1017 (1753); Andersson: 209 (1868); Boiss.: 1184 (1879); A.Camus & E.-G.Camus: 257 (1904); E.F.Linton: 14 (1913); Britton & Brown: (1913); Fernald: 505 (1950); D.R.Maire: 51 (1961); Rech.f.: 45 (1964); Jalas & Suominen: 14 (1976); A.K.Skvortsov & J.R.Edm.: 707 (1982); L.Hend.: 162 (2001). Type: 'Habitat in Europae borealibus' (*Herb. LINN1158.19*, lecto., designated here, microfiche in PRE!).

var. **fragilis**

A robust tree up to 15 m tall, with a broad rounded crown; branches ascending; trunk deeply furrowed. Bark grey; branchlets at first thinly pubescent, becoming glabrous and brittle with age. *Leaves* narrowly lanceolate to slightly rhomboid-lanceolate, 60–160 × 15–40 mm (Figure 9E), acute at both ends, glabrous, dark glossy above, glaucous below, margin coarsely serrulate; petiole 5–15 mm long, with 2 glands at base of leaf; stipules small, sublinear, 4–7 mm long, caducous. *Inflorescences* axillary, short-stalked, appearing with the leaves, drooping; axis hairy; bracts green, covered with many long, silky hairs. *Female catkins* very slender, cylindrical, 60–110 mm long. *Female flowers* with 2 nectaries; ovary sessile or shortly pedicellate, narrowly acuminate, slender; style very short, ± 1 mm long; stigmas 2-lobed. No male plants found in southern Africa.

Commonly known as the crack or brittle willow and originally from Western Europe. An invasive alien species less widely distributed than *S. babylonica*, but in places forming pure stands along rivers (Henderson 1991a) at high altitudes in Free State, KwaZulu-Natal and Eastern Cape, with one record from the Cape Peninsula (Figure 14).

Vouchers: *Compton 21071* (NBG); *Fuls 183* (PRE, PRU); *Henderson 930* (PRE); *Hilliard & Burtt 13432* (NU, PRE); *Scott 32* (NH); *Wolley Dod 2517* (BOL).

8. ***Salix caprea** *L.*, Species plantarum edn 2: 1020 (1753); Andersson: 222 (1868); Boiss.: 1188 (1879); A.Camus & E.-G.Camus: 102 (1905); E.F.Linton: 47 (1913); Britton & Brown: (1913); Fernald: 517 (1950); Rech.f.: 50 (1964); Newsholme: 59 (2002). Type: 'Habitat in Europae siccis' [*Herb LINN 1158.88*, lecto., designated by Jonsell & Jarvis: 151 (1994)].

Tree up to 6 m or occasionally up to 9 m tall, with spreading branches forming a broad crown; branchlets pubescent, becoming glabrous, reddish or dark brown. *Bark* grey, fissured. *Leaves* broadly ovate to ovate-oblong, 60–160 × (8–)20–50(–80) mm (Figure 9A, B),

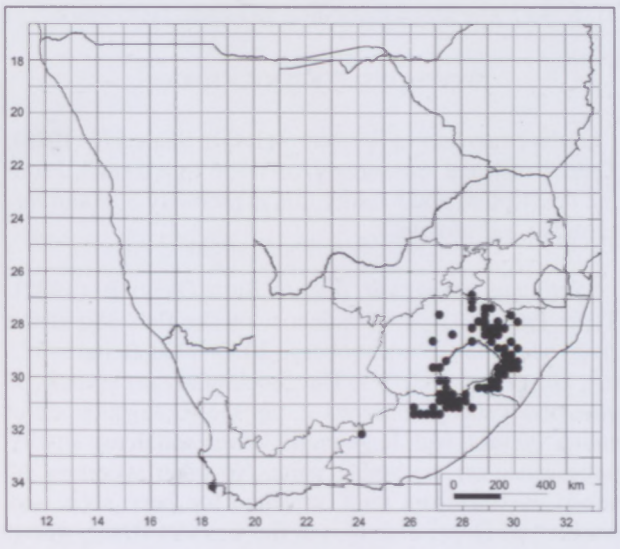

FIGURE 14.—Distribution of *Salix fragilis* var. *fragilis* in southern Africa, drawn from SAPIA Database, PPRI, 1979–2005.

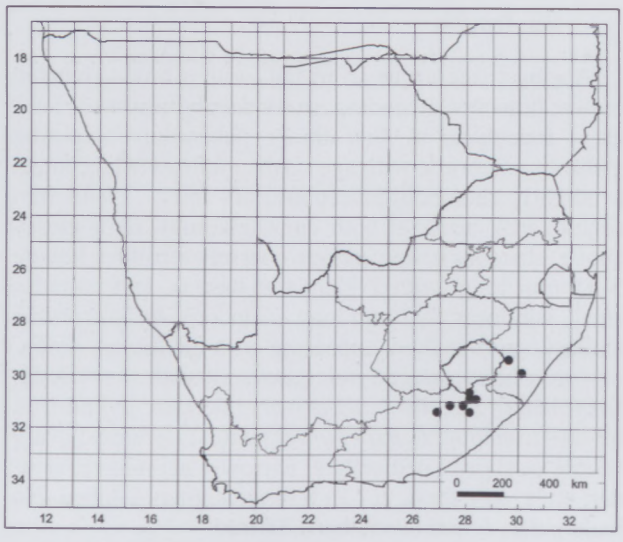

FIGURE 15.—Distribution of *Salix caprea* in southern Africa, drawn from SAPIA Database, PPRI, 1979–2005.

apex acute with a twisted tip, base rounded or cordate, glabrescent and green above, persistently softly pubescent beneath, margin undulate, crenate or entire; petiole up to 6 mm long; stipules semicordate, acuminate, often dentate, persistent. *Inflorescences* axillary, catkins, silky, silver-grey, appearing before leaves in late winter, subsessile; bracts narrowly ovate, subacute, with long silky hairs, brownish below black upper portion. *Male catkins* rather stout, 30–45 × 15–23 mm. *Male flowers*: stamens 2, long-exserted, ± 10 mm long; nectary cylindrical, short. *Female catkins* very slender, 20–30 mm long, cylindrical. *Female flowers*: nectary 1; ovary hairy, pedicellate, pedicel much longer than nectary; style very shorter; stigma small, undivided. *Capsules* ovoid, up to 10 mm long, subsessile on axis. *Seeds* 1.0 × 0.4 mm, cylindrical, with fine vertical ridges, grey.

Commonly known as the goat willow or great sallow. It was introduced from Europe and has been recorded as an occasional escape from cultivation in KwaZulu-Natal and the northeastern parts of Eastern Cape (Henderson 1991c) (Figure 15).

Vouchers: *Bester 1001* (PRU); *Henderson 668, 670* (PRE); *Jacobs 8572* (PRE); *Keet STEU13012* (NBG); *Loock NBG18870* (NBG).

SPECIES INSUFFICIENTLY KNOWN

Salix crateradenia Seemen: 9 (1900); Skan: 578 (1925). Type: Botswana, *Passarge 41* of 1896 (not found). From the description and locality this is probably *S. mucronata* subsp. *subserrata*.

Salix mucronata var. *integra* Burtt Davy: 70 (1922). Type: Eastern Cape, Camdeboo, on the flats and at the river near the Camdebooberg, 2000–3000 ft [615–923 m], *Drège s.n.* (K!, S!). The Stockholm specimen is *S. mucronata* subsp. *mucronata*, but the Kew specimen is subsp. *hirsuta*, with large entire leaves and dense silvery pubescence on the young parts. No other specimen of subsp. *hirsuta* from the Camdeboo has been seen, and neither did Drège collect it at the Olifants River, where subsp. *hirsuta* occurs. It is possible that the Kew specimen has been mislabelled.

Salix woodii var. *grandifolia* Burtt Davy: 432 (1932) *nom. nud.* Specimens cited: *Burtt Davy 10614*; *Legat H4331*; *Robertson 1474*. Burtt Davy speculated that this could be a hybrid between *S. woodii* and *S. wilmsii*.

Salix woodii × *safsaf*? Burtt Davy: 432 (1932). Type: northern Transvaal [Limpopo], Louis Trichardt, 3100 ft [954 m], *Rogers 21690* (not found). This is *S. mucronata* subsp. *woodii*.

SPECIMENS EXAMINED

Abbott 2696 (5a) PRU. *Acocks H828* (5a); *10120* (5c) NH, PRE. *Adamson 1002* (5a) BOL, PRE. *Archibald 3967* (5a) GRA; *5238* (5a) PRE.

Balkwill & Cadman 2472 (5c) J, PRU. *Barker 4828, 6257* (5a) NBG. *Barnard SAM36109* (5a) SAM. *Bayer 1873* (5c) NH. *Bayer & McClean 101* (5c) BOL, PRE. *Bayliss BRI.B.87* (5a) GRA, PRE; *BRI.B.159, BRI.B.1358* (7) PRE; *BRI.B.6160* (6) PRE. *Berry KMG13219* (5a) PRE. *Biggs 5* (5c) PRE. *Bohnen 8896* (5a) NBG. *Bolus 468* (5a) BOL; *A7767* (5a) GRA. *Botha 793, 1447* (5c) PRE, PRU. *Botha & Ubbink 1033* (5a) PRE. *Boucher 1985* (5b) NBG, PRE; *3509* (7) NBG, PRE. *Bourquin 888* (5a) PRE. *Brink s.n.* (5a) PRE. *Britten 2439* (5a) GRA, PRE. *Brown 557* (5b) NBG. *Buckle 13980* (5c) BOL. *Buitendag 616, 997* (5c) NBG, PRE; *1082* (5c) NBG. *Burke 330* (5c) BOL. *Burrows 3785* (5a) GRA. *Burtt Davy 605* (5c) PRE; *1266* (5c) BOL; *1503* (5a) BOL, PRE; *1559, 1584* (5c) PRE; *1887* (6) NH, PRE; *5185* (5c) GRA.

Codd 8246, 10095 (5c) PRE. *Codd & De Winter 5558* (5c) PRE. *Coetzee 600* (6) PRE. *Compton 4960, 6913* (5b) NBG; *7405, 18349, 21058* (5a) NBG; *19743* (5c) NBG; *21071* (7) NBG; *27697, 30094* (5c) NBG, PRE; *30731* (5c) NBG, NH; *31168* (5c) NBG, NH, PRE. *Cooper 223* (5a) BOL. *Culverwell 0183* (5c) PRE.

Devenish 889, 1016, 1464 (5c) PRE. *De Winter 7685* (5c) PRE. *Dieterlen 314A* (5a) NBG, NH, PRE, SAM; *314B* (5c) NH, PRE; *6718* (5c) SAM. *Dinter 5132* (5a) PRE, SAM. *Dlamini s.n.* (5c) PRE. *Duggan & Henderson 15* (2) PRE; *24* (5c) PRE; *52* (6) PRE. *Du Plessis 387* (6) PRE; *427* (1) PRE. *Duthie STEU10587, 17701* (5a) NBG.

Ecklon & Zeyher 147 (5a) BOL, NBG. *Edwards 2033* (5c) PRE; *2054* (7) PRE; *2059* (5c) PRE. *Ellery 267* (5c) PRE. *Erasmus KMG12112* (5a) PRE. *Esterhuyse 424* (5d) WIND. *Eyles 706* (5d) SAM.

Ferrar 1873 (5a) NH. *Flanagan 1417* (5a) NBG. *Fourcade 3105* (5a) BOL, NBG. *Fuls 72* (5a) PRE; *181* (5a) PRU; *183* (7) PRE; *196* (5c) PRE.

Galpin 1278 (5c) BOL, SAM; *7873* (5a) PRE; *9157, 12169* (5c) PRE; *BOL13733, BOL21497* (5c) BOL. *Geldenhuys 276, 343* (5a) NBG; *344* (5a) NBG, PRE. *Gemmell 6474* (5a) PRE. *Germishuizen 6093* (5c) PRE. *Gerstner 3852* (5c) NH; *5492* (5c) PRE. *Gertenbach & Groenewald 9221* (1) PRE. *Giess, Volk & Bleissner 5399* (5a) PRE. *Gibbs Russell et al. 169* (4) PRE. *Giffen 249* (5a) PRE; *G940* (5a) GRA. *Gillett 1946* (5a) NBG; *2955* (5c) BOL. *Gilmore 428* (5c) PRE. *Glen 2473, 3092* (5c) NH; *3640* (5a) PRE. *Goldblatt 3278* (5b) NBG. *Goossens 1144* (5a) PRE. *Gubb KMG10755* (3) PRE; *KMG10838, KMG10840, KMG11175* (6) PRE; *KMG10845, KMG10847, KMG12165* (5a) PRE.

Hafström H961 (5a) PRE. *Haugh 517* (6) NH. *Hanekom 1272* (5b) NBG, PRE. *Hardy 401, 975* (5c) PRE. *Hemm 452* (5c) PRE, PRU. *Henderson 628, 643, 653* (1) PRE; *595, 679, 794, 906, 996, 1017, 1090, 1102* (2) PRE; *1088* (3) PRE; *989* (5a) PRE; *823* (5c) PRE; *671* (6) NH; *681, 782, 807, 833, 897, 903, 919, 928, 931, 976, 988, 995* (6) PRE; *784, 786, 788, 798, 814, 824, 828, 898, 930, 992, 999, 1004* (7) PRE; *668, 670* (8) PRE. *Henrici 3090* (5a) PRE. *Herbst 21* (5a) PRU. *Herre STEU12072* (5a) NBG; *STEU20350* (5d) NBG; *STEU24283* (2) NBG. *Heson NH26940* (5c) NH. *Hilliard & Burtt 13257* (5a) NU, PRE; *13432* (7) NU, PRE. *Hugo 746* (5b) NBG, PRE. *Hutchinson, Forbes & Verdoorn 139* (5c) NH.

Immelman PRE60975 (1) PRE.

Jacobs 8572 (8) PRE. *Jacot Guillarmod 2970* (6) PRE; *2972, 2973, 7384* (5a) GRA, PRE; *8691* (5c) GRA. *Jarman 22* (1) PRE. *Jenkins s.n.*

(5b) PRE; *JMH8168* (5c) BOL. *Jordaan 356, 3528* (2) PRE. *Jürgens 22419* (5a) PRE.

Keet 1463, 1567 (5c) NBG; *STEU13011* (5a) NBG; *STEU13012* (8) NBG; *STEU13015, STEU24285* (2) NBG. *Killick 510* (6) PRE; *4309* (7) PRE; *4383* (5a) PRE. *Killick & Marais 2130* (5c) PRE. *Kinges 1797* (6) PRE. *Kluge 48* (2) NBG; *888* (1) PRE. *Krynauw 281* (5c) PRE.

Leendertz 4272 (5c) PRE. *Legat 161* (5c) PRE. *Leistner 1342* (5a) PRE. *Leistner et al. 110* (5d) PRE. *Le Roux & Ramsey 219* (5a) NBG, PRU; *811* (5a) NBG, PRE. *Letty 483* (5c) PRE. *Lewis 1511* (5c) SAM; *2922* (5a) SAM; *3534* (5b) SAM. *Long 769* (5a) PRE. *Loock NBG18870* (8) NBG. *Louw 1467* (5a) PRE.

MacMurtry 1659 (5c) PRE. *MacOwan 1645* (5a) SAM. *Maguire 1707* (5d) NBG; *1974* (5a) NBG. *Marais 343* (7) PRE. *Marloth 817, 6188* (5a) NBG; *11035* (5b) PRE, NBG; *11493* (5b) NBG; *8941, 11843, 12387* (5a) NBG, PRE. *McDonald 914* (5a) NBG, PRE. *Merxmüller & Giess 2270* (5a) PRE, WIND; *3661* (5a) PRE; *30494* (5d) PRE, WIND. *Metelerkamp 380* (5a) BOL. *Meyer 987* (5c) PRE. *Middlemost 1733* (5b) NBG; *2168* (5a) NBG. *Moffett 627* (6) NBG, PRE. *Mogg 7543, 14134, 19529, 37129* (5c) PRE. *Moll 5278* (5c) NH; *5290* (5c) NH, PRE. *Muir 3857* (6) PRE. *Muller 1099* (5a) PRE. *Munro s.n.* (5c) PRE.

Noel RU11610 (5a) GRA.

Oates 319 (5a) PRE. *Obermeyer 576, TM31027* (5c) PRE. *Oliver s.n.* (5b) NBG; *3121* (6) NBG, PRE; *STE30264* (5a) NBG. *Olivier 1432* (2) NBG. *Onderstall 1173, 1346* (5c) PRE. *Örtendahl 294* (5a) PRE.

Pearson 3111, 3255 (5a) SAM. *Pegler 529, 937* (5a) BOL, PRE. *Penzhorn 5805* (5a) PRE. *Phillips MOSS1323* (5b) PRE; *1403* (5a) PRE. *Pillans 5101* (5a) BOL; *9831* (5b) PRE. *Player 70* (5c) PRE. *Powrie 107* (5a) PRE. *Poynton 17889* (5a) PRE. *Pringle 14790* (5a) PRE. *Prior 33* (5c) PRE. *Prosser 1036* (5c) PRE.

Ramsay 1600 (5a) GRA. *Range 595, 1551* (5a) SAM. *Rattray 121* (5a) PRE. *Rehmann 6509* (5c) BOL, NBG. *Repton 3485* (5c) PRE. *Retief & Herman 114* (5c) PRE. *Roberts STEU17438* (2) NBG. *Rodger 3858* (6) GRA. *Rodin 3687* (5a) BOL, PRE. *Rogers 2736* (5c) BOL, GRA; *TM4759, TM4834* (5c) BOL, PRE. *Ross 2032* (5c) NH. *Roux 332* (5d) NBG, PRE; *1212* (5a) NBG; *1231* (5c) NBG, PRE. *Rudatis 1243* (5c) NBG.

Salisbury 443 (5a) GRA. *Scharf 1491* (5a) PRE. *Scheepers 1196* (5c) PRE. *Schelpe 8121* (5a) BOL. *Schlechter 3938* (5c) BOL; *9016, 9017* (5a) NBG, PRE. *Schmitz 8844, 9355* (7) PRE. *Scott 32* (7) NH. *Shearing 79, 654* (5a) PRE. *Sim 1* (7) PRE; *1503* (5a) PRE. *Smith 6054* (5c) PRE. *Smook 7268* (5a) PRE; *7317* (7) PRE; *8023* (5a) PRE. *Smuts PRE51969* (5c) PRE. *Smuts & Pole Evans 857* (5c) NBG, PRE. *Stayt 5* (5c) PRE. *Steynberg 714* (5c) PRE. *Strey 5866* (5a) NH; *7695* (6) NH; *10995* (5c) NH, PRE. *Sutton 295* (5a), *907* (5c) PRE.

Taylor 370, 557 (5a) NBG, PRE; *11799* (5b) NBG. *Teague 125* (5d) SAM. *Theron 1249, 1312* (5a) PRE; *1402* (5c) PRE, PRU; *3569* (5c) GRA, PRU. *Thode 8175* (5c) NBG. *Thompson 1545* (5b) NBG, PRE. *Thorncroft 586* (5c) NH; *2150, 3007* (5c) PRE. *Tinley 1493* (5d) WIND. *Trauseld 623* (5c) PRE; *818* (6) PRE. *Troughton 226* (5a) PRE. *Tyson 2504* (5a) SAM.

Ubbink 988 (5c) PRE.

Van der Merwe 29 (6) PRE. *Van der Schijff 51, 357, 812, 4750* (5c) PRE, PRU. *Van der Westhuizen 44/78* (5a) NBG, PRE; *97/80* (5a) NBG. *Van Graan & Hardy 459* (5c) PRE. *Van Jaarsveld 2410, 2411* (5b) NBG; *2596* (5a) NBG, PRE; *2640, 2647, 2651, 2711* (5a) NBG; *4496* (5b) NBG, PRE; *4621, 5741, 6853A* (5a) NBG. *Van Jaarsveld & Bean 5788* (5a) NBG, PRE. *Van Jaarsveld, Forrester & Jacobs 8448* (5a) NBG. *Van Rensburg 27* (6) PRE. *Van Wyk 1843* (5a) *PRU. Van Wyk BSA52* (5d) PRE, PRU; *BSA3102* (5d) PRU; *169* (6) PRE. *Van Wyk & Kok 5781* (5a) PRE. *Van Wyk, Retief & Herman 6737* (5a) PRE. *Venter 8124* (5a) PRE; *11834* (5c) PRE. *Viviers 903* (5a) NBG.

Wagener 217 (5b) NBG. *Walgate BOL33831* (5a) BOL. *Ward 2224* (5c) GRA; *2225* (5c) NH. *Ward, Ward & Seely 10438* (5d) PRE, WIND. *West 496* (5c) PRE; *1329* (7) PRE. *Westphal TM25* (5c) PRE. *Wilman 2600* (5a) BOL. *Wilms 1350* (5c) BOL, PRE. *Wolley Dod 2517* (7) BOL. *Wood 6669* (5c) NH; *9769* (5c) SAM.

Zambatis 169 (4) PRE; *1028* (5c) PRE. *Zietsman & Zietsman 1247* (5a) PRE.

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