

Part Two: Systematic Overview

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Salix L. 1753, Sp. pl.: 1015; 1754, Gen. pl.: 447.

T y p u s: *Salix alba* L. (Britton, Brown, 1913, 1: 591).

KEY TO SECTIONS

1. Bud scales with distinct, overlapping margins on adaxial side 2
- Bud scales cap-like, with connate margins 3
2. Buds positioned at acute angle to shoot, triangular, not compressed, 3–5 mm long. Leaves 6–25 mm broad. Styles short, stigmas two-lobed, subsessile 1. HUMBOLDTIANAE
- Buds accumbent to shoots, lanceolate, 5–10 mm long. Leaves 25–60 mm broad. Styles long, filamentous, distinct almost to their bases, stigmas linear, two-parted 3. URBANIANAE
3. Stamens three or more, distinct 4
- Stamens two, distinct or connate 5
4. Bark exfoliating from old branches and stems in patches of irregular shape. Persistent part of bark remains smooth. Young leaves not producing pitch. Stamens three 2. AMYGDALINAE
- Bark on old stems with coarse longitudinal fissures, not exfoliating in patches. Young leaves glandular, producing pitch. Stamens 4–10 (rarely 3) 4. PENTANDRAE
5. Bracts pale: yellowish, greenish, reddish, or brownish, but not black. In female catkins either all or some of bracts fall off by time when capsules ripen 6
- Bracts persistent 7
6. Stamens two, distinct 5. SALIX
- Stamens two, entirely connate 25. HELIX
7. Stamens connate either partially or completely 8 93
- Stamens distinct 13
8. Leaves narrowly lanceolate, with revolute margins, their lower surface clothed with dense white tomentum composed of extremely thin, tangled trichomes 19. CANAE
- Either leaves glabrous or trichomes look different 9
9. Leaves with numerous prominent parallel veins beneath. Veins clothed with appressed silvery trichomes; frequently the rest of leaf blade beneath is also silvery pilose. By fall, leaf petioles with axillary floriferous buds become abruptly ventricose, embracing their buds. Nectaries linear 18. SUBVIMINALES
- Veins beneath neither prominent nor looking different due to pubescence. Petioles not abruptly ventricose by fall. Nectaries square or rectangular 10
10. Capsules stipitate; stipes 0.5–1.0 mm long. Styles 1.2–2.5 mm long 22. DAPHNELLA

- Styles 0–1.0 mm long 11
11. Leaves linear to linear-lanceolate, 2.0–6.0 mm broad. Stamen filaments glabrous 12
- Stamen filaments pubescent (sometimes inconspicuously, at their very bases, but in that case leaves more than 6.0 mm broad) 25. HELIX
12. Leaves 50–120 mm long, glabrous, emarginate-dentate, bicolorous 24. FLAVIDAE
- Leaves 30–60 mm long, mostly sericeous, delicately serrulate, concolorous 26. CHEILOPHILAE
- 13(7). *Arctica*- or transitional to *alba*-type of bud size gradation along shoot (see chapter 3, section 3 for the description of these types) 14
- *Caprea*-type of bud size gradation 23
14. Prostrate or depressed shrubs without subterranean stolons. Floriferous and vegetative shoots have same size and foliated to same extent. Floriferous shoots with normal axillary buds, which add to stem growth during subsequent year. Leaves exstipulate, round to broadly elliptic, distinctly bicolorous, their margins inconspicuously crenate or entire. Bracts pale or reddish (not black). Capsules small, ovoid, obtuse, subsessile to sessile, styles short or lacking, stigmas short, mostly laterally recurved, two-lobed 7. CHAMAETIA
- Characters not as above. Either subterranean stolons existing, or vegetative shoots more developed and foliated as compared to floriferous ones, or leaves distinctly dentate, or leaves concolorous, lustrous green, or capsules distinctly stipitate, or styles elongated 15
15. Low or totally depressed cushion shrubs. Abundant dead leaves of two, three, or more previous years persistent on branches 11. MYRTOSALIX
- Old leaves not persistent. (Occasionally, in extremely unfavorable conditions, leaves remain during one subsequent year, but fall off if plant removed from substrate.) 16
16. Numerous leafless stolons growing and gradually becoming woody inside substrate 8. RETUSAE
- Stolons lacking 17
17. Leaves green and lustrous on both sides (though occasionally rather pubescent), small (6–30 mm long) 18
- Leaves dull, rather glaucous beneath (if green, then larger: 30–60 mm long; in that case, stamen filaments densely pubescent, male flowers having two nectaries) 19
18. Leaves stipulate 11. MYRTOSALIX
- Leaves exstipulate 8. RETUSAE
19. Leaves exstipulate, ovate to obovate, small (10–35 mm long), entire or with few minute denticles, mostly on their lower half. Female catkins loosely flowered. Capsule stipes 1.0–2.5 mm long, approximately as long as bracts, 1.5–3.0 times longer than nectaries, and also 1.5–3.0 times longer than style length + stigma length (which is 0.5–0.8 mm). 9. MYRTILLOIDES
- Capsule stipes usually not longer than 1 mm. Style length + stigma length exceeding 0.8 mm 20
20. Two nectaries in male flowers, stamen filaments pubescent 10. GLAUCAE
- One nectary in male flowers; if two, then stamen filaments glabrous 21

21. Vegetative shoots much longer and more foliated than floriferous ones. Leaves lustrous above, dull and glaucous beneath, more or less dentate at margins (at least superior ones). Alpine, subalpine, and forest-tundra habitats, but not tundra itself 22
 — Floriferous shoots almost as long and leafy as vegetative ones. If vegetative shoots considerably longer, then plants are prostrate tundra dwarf shrubs. Leaves entire or with some few obsolete denticles, mostly on lower parts of leaf blades 10. GLAUCAE
22. Small shrubs with slender (1–2 mm in diameter), mostly reddish shoots. Floriferous buds up to 7 mm long. Leaves 6–20 mm broad. Anthers 0.3–0.4 mm long 16. ARBUSCELLA
 — Larger shrubs (of moderate height to tall), their shoots more stout (1.7–2.5 mm). Floriferous buds 5–10 mm long. Leaves 20–50 mm broad. Anthers 0.5–1.0 mm long. 13. GLABRELLA
- 23(13). Branches pruinose. Stipules adnate to petioles and fall off together with them (particularly, in leaves with axillary floriferous buds) 22. DAPHNELLA
 — Stipules not adnate to petioles and fall off separately 24
24. Young shoots villous; trichomes rather long, white, either upright or more or less tangled. Leaves beneath covered with dense white tomentum composed of thin tangled trichomes 20. VILLOSAE
 — Leaf pubescence not as above 25
25. Trees or tall shrubs. Leaves lanceolate or narrowly lanceolate, long-tapering toward apices, regularly serrate at margins, flat beneath (veins not prominent), glabrous or puberulous, 70–150 mm long. Stipules acute, semicordate or lanceolate 26
 — Characters not as above 27
26. Floriferous buds 4–7 mm long, ovoid or broadly elliptic, obtuse. Bracts pale; capsules sessile to subsessile 6. SUBALBAE
 — Floriferous buds 8–15 mm long, triangular-lanceolate, their beaks more or less recurved, bracts black; capsules stipitate; stipes 0.5–1.5 mm long 22. DAPHNELLA
27. Leaves elongated, 6–20 (seldom 3–5) times as long as broad, with numerous prominent parallel veins beneath, more or less silky villous, denticulate or entire at margins. Catkins precocious to subprecocious. Capsules sessile to subsessile. Nectaries linear or narrowly rectangular, considerably exceeding capsule stipes. Styles elongated; style length + stigma length exceeding 1.4 mm 28
 — Characters not as above 29
28. Floriferous buds with long, more or less recurved beaks. Leaves mostly broadest above middle. Leaf veins conspicuous beneath, clothed with appressed silvery trichomes. Styles very long (1.5–3.0 mm) 18. SUBVIMINALES
 — Floriferous buds without long beaks. Leaves mostly broadest about or below their middle. Leaf veins obscure, not prominent due to pubescence 17. VIMEN
29. Young shoots clothed with dense, rather long, white trichomes turning gray with age. Stipules distinct, subequilateral, long-tapering. Leaves 1–3 times as long as broad, more or less pubescent, mature ones with prominent reticulation beneath. Catkins precocious, sessile. Capsules sessile, glabrous or puberulous, gradually attenuating into elongated styles 21. LANATAE
 — Either leaf venation, or capsules, or both not as above 30

30. Stipules always persistent, subequilateral, more or less lanceolate. Leaves not large (15–40 mm long), mostly densely glandular-dentate at margins, lustrous at least on upper or on both surfaces. Female catkins erect on distinct stout stalks. Ovaries more or less pubescent, their trichomes flexuous, ribbon-like, strongly refractive (to watch light refraction use a highly magnifying lens) 11. MYRTOSALIX
 — Either ovary pubescence or leaves not as above 31
- 95 31. Stipules equilateral to subequilateral. Leaves densely denticulate at margins. Capsules glabrous, acute. Either capsule stipes or styles elongated 12. HASTATAE
 — Either stipules distinctly inequilateral, or leaves not dentate, or capsules not as above 32
32. Low shrubs with slender (0.8–1.7 mm) shoots. Floriferous buds ovate or lanceolate, faintly pointed, not at all or slightly compressed, up to 8 (rarely 10) mm long. Stipules lacking or small, lanceolate, equilateral, acute. Leaves on short (2–8 mm) petioles, small (10–60 mm long), entire or with few obscure denticles. Styles and stigmas short (style length + stigma length = 0.5–0.8 mm) 33
 — Either stipules distinctly inequilateral, or leaves distinctly dentate and larger, or styles and stigmas longer 34
33. Leaves, at least young ones, more or less silvery pubescent. Stipules always persistent on vigorous shoots. Veins rather prominent beneath mature leaves 23. INCUBACEAE
 — Either all of leaves glabrous or young ones not silvery pubescent. Stipules mostly rudimentary. Veins not prominent beneath mature leaves 9. MYRTILLOIDES
34. Capsule stipes considerably elongating when capsules ripen, reaching length of 2–4 mm, which is larger than bract length. Capsules slender, linear-lanceolate, pubescent; styles and stigmas short (style length + stigma length = 0.6–1.0 mm) 15. VETRIX
 — Characters not as above 35
35. Leaves linear-lanceolate, 6–12 times as long as broad (inferior leaves sometimes considerably broader), more or less revolute, either entire or wavy and delicately emarginate. Numerous veins considerably prominent beneath mature leaves. Stipules, if any, linear. Capsule stipes 0.5–1.5 mm long 17. VIMEN (*Salix udensis*)
 — Leaves not as above 36
36. Floriferous bud apices mostly compressed. Leaves bright green, lustrous above, whitish beneath, their veins delicate, inconspicuous. Either none or obsolete leaf shape gradation along shoots. Capsules acute, gradually attenuating into styles 16. ARBUSCELLA
 — Floriferous bud apices mostly not compressed (or, if apices compressed, then leaf shape gradation pronounced). Leaves distinctly reticulate-veined, often clothed with dense pubescence beneath 37
- 96 37. Leaves flat, rather lustrous above, young ones blackening on drying. Stipes of ripe capsules not considerably elongating. Capsules acute, styles distinct, stigmas shorter than styles 14. NIGRICANTES
 — Leaves may be rather rugose with impressed veins, mostly dull above (occasionally mature ones lustrous), not blackening too much on drying. Stipes of ripe capsules mostly elongating. Styles short: 0.1–0.5 mm, occasionally up to 0.7–0.8 mm, but in that case not longer than stigmas. Stigmas mostly not parted 15. VETRIX

SUBGENUS *SALIX*

Subg. *Amerina* Dum. 1862, Bull. Soc. Bot. Belg. **1**: 145. —Subg. *Protitea* Kimura, 1928, Bot. Mag. Tokyo **42**: 290. —Genus *Toisusu* Kimura, 1928, Bot. Mag. Tokyo **42**: 287.

T y p u s: *Salix alba* L.

Trees, often quite large, or tall shrubs. Petioles more or less channeled above, mostly with 1–3 pairs of glands sitting close to base of leaf blade. Leaves linear-lanceolate to subovate, long-tapering, regularly dentate at margins. Catkin rachises soft, often rather pendulous. Bracts pale, mostly abscising by the time capsules ripen. Nectaries mostly two (at least in male flowers), sometimes connate into glandular disk. In female flowers nectary frequently solitary. Stamens distinct, two or more.

The subgenus is the most primitive, having most in common with the poplars. It is impossible to distinguish it (nor the other subgenera) using any single diagnostic character. On the other hand, attempts to divide the subgenus *Salix* into a few subgenera cannot be accepted. The section *Urbanianae* seems to be somewhat more apart from the rest of the subgenus, yet it hardly makes sense to treat it separately. *S. cardiophylla* differs from other species of the subgenus in its reproductive organs; *Amygdalinae* are distinguished by their bark resembling *Chosenia*; *Longifoliae* are different in their leaf anatomy which is also close to that of *Chosenia*.

Sect. 1. *Humboldtianae*

Pax, 1889, in Engler et Prantl, Natürl. Pflanzenfam. **3**, 1: 36.

T y p u s: *Salix humboldtiana* Willd.

Trees, mostly medium-sized; old bark with coarse longitudinal fissures. Floriferous buds similar to vegetative ones, short, triangular, small. Bud scale margins distinct, not connate. Petiolar glands obsolete. Leaves broadly lanceolate to sublinear, flat, serrulate at margins. Bracts small, distinctly pubescent (pubescence short); in female flowers either some or (rarely) all of the bracts abscising. Nectaries two in male flowers; in female ones, nectary solitary, short, broad, truncate. Stamens 3–10, their filaments pubescent at bases, anthers small, nearly globular. Capsules ovoid, stipitate. Styles very short or lacking, stigmas small, two-lobed.

The species of this section are widespread in tropical and subtropical areas of the Old and New World. Of 12–14 species, there is only one in the flora of this country.

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1. **S. *acmophylla*** Boiss. 1846, Diagn. pl. or. **7**: 98; id. 1879, Fl. Or. **4**: 1183; Hook. f. 1890, Fl. Brit. Ind. **5**: 628; Parker, 1924, Forest fl. Punjab: 505; Post, 1933, Fl. Syr. **2**: 529; Nazarov, 1936, Fl. SSSR **5**: 194; Görz, 1937, Fl. Turkm. **2**: 16; Parsa, 1950, Fl. Iran. **4**: 1347; Skvortsov, 1960, Bot. mat. Gerb. Bot. in-ta AN SSSR **20**: 72; id. 1962, Bot. mat. Gerb. in-ta bot. AN UzbSSR **17**: 59; id. 1966, Trudy Bot. in-ta AN ArmSSR **15**: 110. — *S. persica* Boiss. 1846, op. cit. **7**: 99; id. 1879, op. cit. **4**: 1183; Nazarov, 1936, op. cit. **5**: 195; Parsa, 1950, op. cit. **4**: 1348. — *S. dealbata* Anderss. 1851, K. sv. vet. handl. **1850**:

472. —*S. glaucophylla* Anderss. 1851, op. cit. **1850**: 474. —*S. basraënsis* Toepffer, 1920, Sal. Exs.: N 456. —*S. pseudo-safsaf* Camus et Gombault, 1939, Bull. Soc. Bot. Fr. **86**: 136; eid. 1942, op. cit. **89**: 24. —*S. louisii* Camus et Gombault, 1942, op. cit. **89**: 29. —? *S. daviesii* Boiss. 1846, op. cit. **7**: 98; id. 1879, op. cit. **4**: 1183. —? *S. dinsmorei* Enander ex Post, 1933, op. cit. **2**: 529.

T y p u s: "In alpe Kuh-Daë na, Kotschy Pl. Pers. Austr. N 620 et prope urbem Schiraz id. N 323" (G, LE!, JE!, W! et alibi).

HABIT: A medium-sized or small tree (up to 8–10 m tall, but mostly shorter, since the top is usually pruned similarly to our white willow).

HABITATS: Banks of rivers and streams, mostly in the piedmont or mountains (reaching the elevation of 1,200–1,500 m in Turkmenia and on the Pyandzh River; 2,000 m in central Iran; 2,100–2,200 m in Afghanistan, Pakistan, and India).

DISTRIBUTION: The Sinai Peninsula, Israel, Jordan, northern Syria, southeastern Turkey, Iraq, Iran, Afghanistan, northern regions of western Pakistan (including northern Baluchistan), northern India (to Dehra Dun and Tirich Garhwal). Within the territory of the former USSR, it is encountered throughout the Kopet-Dag (being common everywhere east of Kazandzhik), on the Tedzhen and Kushka rivers (close to the border of Tadjikistan and Iran), in the Kugitangtau, and in southern Tadjikistan (where it is very rare, known only from two locations: Shaartuz District and Dzharf on the Pyandzh). It is commonly cultivated, for instance, in nearly every village in and around the Kopet-Dag. Although the natural area of *S. acmophylla* extends very close to the Mediterranean, Caspian, and Persian Gulf shores, this willow never approaches the immediate zone of maritime climate, being entirely restricted to arid continental regions. (Fig. 13.)

NOTE. *S. daviesii*, as it was mentioned earlier (Skvortsov 1960a: 74), is most likely an abnormal form of *S. acmophylla* with 2 or 3 stamens. It also could be a hybrid with *S. excelsa*, which is, however, less likely. *S. dinsmorei*, too, appears to be a hybrid of *S. acmophylla* either with *S. alba* or with *S. excelsa* (compare Post 1933; Camus, Gombault 1939). It also might be merely one more form of *S. acmophylla* (I had no chance to see the type of *S. dinsmorei*). There is no doubt that hybrids of *S. acmophylla* with *S. alba* and *S. excelsa* do exist (I saw herbarium specimens from Palestine as well as three live plants in the Firyuzinskoye Gorge in the Kopet-Dag). The identity of the rest of the synonyms is beyond question.

Sect. 2. *Amygdalinae*

Koch, 1837, Syn. fl. germ. helv.: 644.

T y p u s: *Salix triandra* L.

Tall shrubs, occasionally small trees with short stems and wide crowns. Bark on old branches (larger than 4–6 cm in diameter) exfoliating in patches of irregular shape, not forming coarse longitudinal fissures. Floriferous buds similar to vegetative ones, compressed, obtuse. Petioles distinctly glandular in their upper part. Leaves lanceolate, flat. Catkins serotinous, borne on long, leafy-bracted stalks, narrowly cylindrical, mostly curved or somewhat pendulous. Bracts pale; in female flowers, either all or some of them abscising by the time capsules ripen. Stamens three, their anthers crooked when emptied (because both pollen sacks face forward rather than sideways). Capsules on long (1–2 mm) stipes, subfusiform, small (3–4 mm when ripen). Styles very short, stigmas recurved, very short, two-lobed.

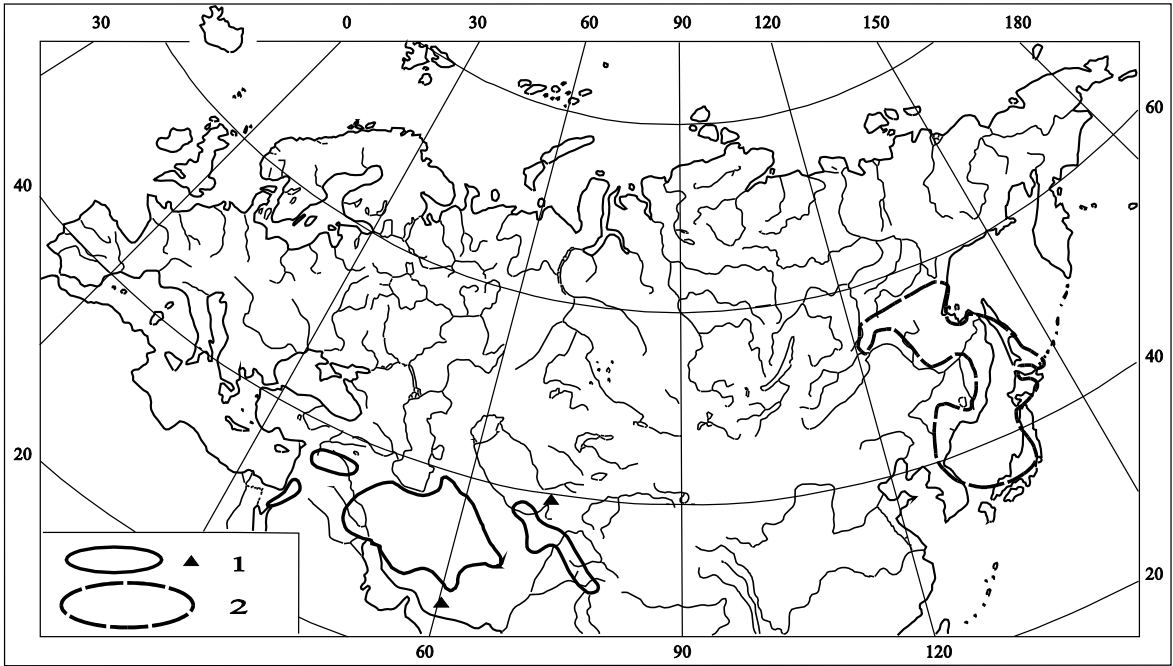


Fig. 13. Distributional areas of *Salix acmophylla* Boiss. (1) and *S. cardiophylla* Trautv. et Mey. (2)

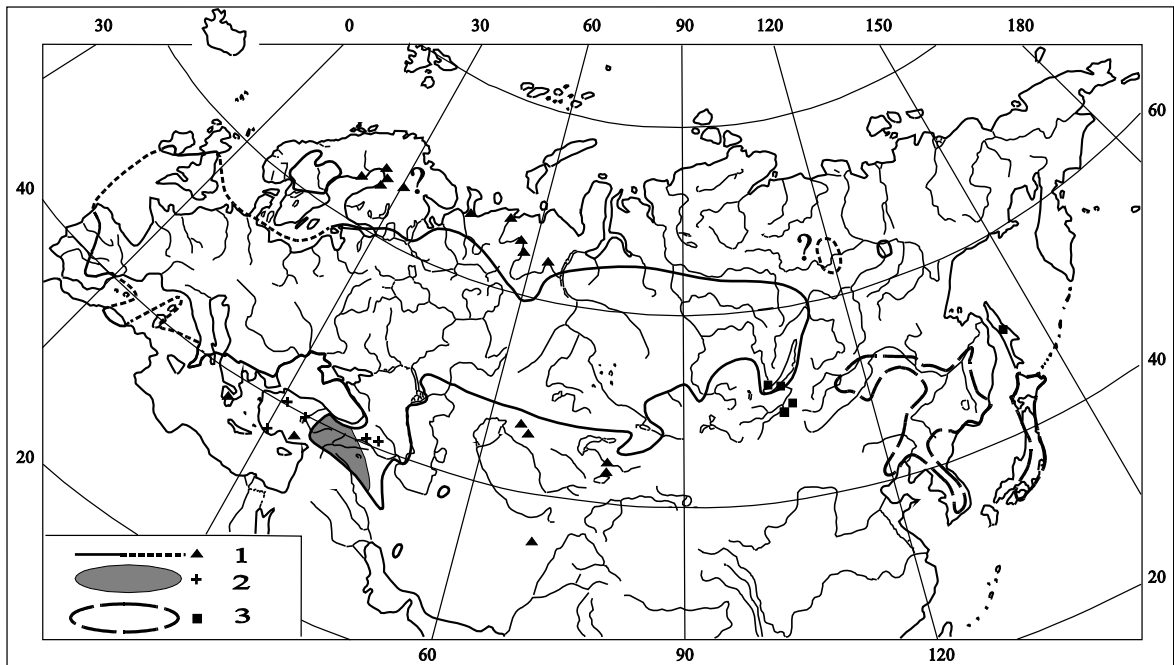


Fig. 14. Distributional areas of *Salix triandra* L. (1), *S. triandra* ssp. *bornmuellerii* (Hausskn.) A. Skv. (2), and *S. triandra* ssp. *nipponica* (Fr. et Sav.)

The section appears to contain only the Old World species. The American species *S. amygdaloides* Anderss., which has been traditionally placed here, should be excluded and removed to the section *Humboldtianae*, since it differs significantly from *S. triandra* in its bud and flower structure. Additionally, stem bark of *S. amygdaloides* is that of the common type, with coarse fissures.

Key to Species and Subspecies

1. Leaves either entire, or irregularly glandular, or irregularly denticulate; occasionally, shallowly emarginate, crenate; rarely some leaves regularly dentate. Petiolar glands minute, punctate, sitting as far as 0.5–2.0 mm down from leaf blade base. Catkin rachises below lowermost flowers 0.4–0.6 mm thick. Dry anthers 0.3–0.5 mm long 3. ***S. songarica***
- All leaves (except cataphylls) densely regularly dentate at margins. Petiolar glands conspicuous, sitting close to leaf blade. Catkin rachises below lowermost flowers 0.6–0.8 mm thick. Dry anthers 0.5–0.7 mm long 2
2. Shoots and leaves more or less puberulent 2. ***S. triandra* ssp. *bornmuellerii***
- Shoots and leaves glabrous 3
3. Epicormic shoots pruinose 2. ***S. triandra* ssp. *nipponica***
- Epicormic shoots not pruinose 2. ***S. triandra* ssp. *triandra***

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2. ***S. triandra*** L. 1753, Sp. pl.: 1016; Wimmer, 1866, Sal. Eur.: 12; Anderss. 1867, Monogr. Salic.: 23; Krylov, 1930, Fl. Zap. Sib. 4: 733; Wolf, 1930, Fl. Yu.-V. 4: 39; Nakai, 1930, Fl. sylv. Kor. 18: 87; Nazarov, 1936, Fl. SSSR 5: 184; Buser, 1940, Ber. Schweiz. bot. Ges. 50: 632; Grossheim, 1945, Fl. Kavk. 2 ed. 3: 24; Vicioso, 1951, Salic. Españ.: 37; Nazarov et al. 1952, Fl. URSR 4: 63; Rech. f. 1957, in Hegi, Ill. Fl. Mitteleur. 2 ed. 3, 1: 71; Popov, 1959, Fl. Sredn. Sib. 2: 793; Polyakov, 1960, Fl. Kazakhst. 3: 15; Maire, 1961, Fl. Afr. Nord 7: 53; Skvortsov, 1962, Bot. mat. Gerb. In-ta bot. AN UzbSSR 17: 60; id. 1964, in Mayevsk. Fl. sredn. pol. 9 ed.: 186; id. 1966, Trudy Bot. In-ta AN ArmSSR 15: 113; Rech. f. 1964, Fl. Eur. 1: 46. —*S. amygdalina* L. 1753, op. cit.: 1016; Ledeb. 1850, Fl. Ross. 3, 2: 600; Schmalhausen, 1897, Fl. Sredn. i Yuzhn. Ross. 2: 432; Seemen, 1908, in Aschers. et Graebn. Synopsis 4: 74; Schneider, 1916, in Sarg. Pl. Wilson. 3, 1: 106. —*S. nipponica* Fr. et Sav. 1876, Enum. Jap. 2: 502; Tolmachev, 1956, Der. i kustarn. Sakhal.: 58. —*S. bornmuellerii* Hausskn. 1890, Mitt. bot. Ver. Gesamtthü ringen 9: 21; Görz, 1930, Feddes Repert. 28: 119; id. 1933, op. cit. 32: 393; id. 1934, op. cit. 36: 22, 36; Post, 1933, Fl. Syr. 2: 531; Skvortsov, 1966, op. cit. 15: 115. —*S. kinashii* Levl. et Van. 1905, Bull. Soc. Bot. Fr. 52: 141. —*S. medwedewii* Dode, 1908, Bull. Soc. Bot. Fr. 55: 652; Toepffer, 1925, Sal. Exs.: N 539; Nazarov, 1936, op. cit. 5: 186; Skvortsov, 1960, Bot. mat. Gerb. Bot. In-ta AN SSSR 20: 75. —*S. hamatidens* Levl. 1909, Bull. Soc. Bot. Fr. 56: 301. —*S. armena* Schischk. 1929, Izv. Tomsk. un-ta 81: 436. —*S. subfragilis* auct. (non Anderss. 1858, Mem. Amer. Acad. 6: 450): Kimura, 1943, Acta Phytotax. et Geobot. 13: 188; Ohwi, 1965, Fl. Jap.: 364.

T y p u s: "In Helvetia, Sibiria. Haller Helv.: 152; Gmel. Sib. 1: 155 et tab. 34 fig. 3".

Ssp. **nipponica** (Fr. et Sav.) A. Skv. comb. nova. —*S. nipponica* Fr. et Sav. 1876. —*S. triandra* var. *nipponica* Seemen, 1903, Sal. Jap.: 27; Komarov, Alisova, 1931, Opred. rast. Dalnevost. kr. **1**: 424; Kimura, 1934, in Miyabe, Kudo, Fl. Hokk. a. Saghal. **4**: 401; Sugawara, 1939, Ill. Fl. Saghal. **2**: 666. —*S. amygdalina* var. *nipponica* Schneid. 1916, in Sarg. Pl. Wilson. **3**, 1: 106.

T y p u s: "Nippon media circa Yokoska,—Savatier N 1139; Niigata id. N 2717" (P). [Isosyntypus (Savatier N 2717) LE!].

Ssp. **bornmuellerii** (Hauskn.) A. Skv. comb. nova. —*S. bornmuellerii* Hauskn. 1890. —*S. repens* auct. fl. As. Minor (non L.): Anderss. 1868, in DC. Prodr. **16**, 2: 237 (quoad pl. As. Minor); Boiss. 1879, Fl. Or. **4**: 1190 (pl. As. Minor).

T y p u s: "Asia Minor, Amasia, in humidis fl. Jeschil Irmak, 350 m.—17. VII 1889. J. Bornmueller" (JE!) (Ic. photogr. typi: Toepffer, Sal. Exs. N 362, LE! et alibi).

HABIT: A tall shrub or tree of small to moderate size (some specimens from the Ob are up to 14 m tall).

HABITATS: Banks of rivers and streams, bayou banks on flood plains; occasionally, secondary habitats, such as ditches and gullies. Its vertical range is from lowland to moderate mountain elevations: in the Pyrenees, it ascends as high as 1,700 m; in the Alps, to 1,600(–1,800?) m; in the Carpathians, to 1,200 m; in the Greater Caucasus, to 1,300–1,500 m; in the Lesser Caucasus, to 2,100 m; in the Urals, Tien Shan, Altai, Sayans, and east of these, only to foothills. In China, Japan, and on the Korea Peninsula also not higher than the foothills.

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DISTRIBUTION: The greater part of Spain, a minor area in Algeria, all of France, England, southern Ireland, Italy, Central Europe, the Balkan Peninsula (except Greece, where it is missing or extremely rare); central Sweden and southern Norway (a disjunct part of the area), Finland (some sporadic locations near the Gulf of Bothnia). It is missing from the rest of Fennoscandia. European Russia (nearly everywhere except Karelia and the forest-tundra belt), the Caucasus, Asia Minor, northern Iran; the Kopet-Dag, southern Iran and eastern Afghanistan (some isolated fragments of the area). Northern and eastern Kazakhstan, West and Central Siberia (to latitude 64–65° N), southern Transbaykalia, southern Amur Oblast, Maritime Province, and central Sakhalin. A disjunct fragment of the area on the Lena, around Yakutsk. Northeast China, Korea, and Japan.

Ssp. *bornmuellerii* is distributed in Asia Minor; ssp. *nipponica*, in Prebaykalia (typical specimens are found around Irkutsk) and all the way east of Prebaykalia. According to I. Koropachinskiy and A. Skvortsova (Koropachinskiy, Skvortsova 1966: 92), it is a sporadic but trivial species in Tuva. Yet I never saw any specimens from there. (Fig. 14.)

NOTE. *S. triandra* leaves may be either green, without any glaucous bloom beneath (f. *concolor*), or whitish, glaucous beneath (f. *discolor*). This character is persistent in all leaves of any single specimen, invariable, and very conspicuous. Consequently, C. Linnaeus treated the forms as two different species (*S. triandra* L. and *S. amygdalina* L.), and later some authors supported that point of view (Dumortier 1862; Wołoszczak 1889, 1912, 1920; Szafer, Kulczyński, Pawłowski 1953). There is some difference in the distribution of both forms, f. *concolor* dominating in mountainous locations of Western and Central Europe and the Caucasus, while f. *discolor* being more common there in the lowland. Also, f. *discolor* occurs more often in the south of the Central Russian Upland, and f. *concolor* in the north. It is f. *discolor* which prevails in East Siberia and the Far East. However, in spite of these fluctuations, both forms are distributed across the entire species range (including the areas of the subspecies). Actually, both forms can be found in

any large population. There are no other differences between the forms, except the color of leaves beneath. Intermediate forms with lower leaves green and upper leaves glaucous are not very infrequent. Therefore, I agree here with the majority of authors and do not recognize *S. amygdalina* as a distinct species. There is no doubt though, that *S. triandra* still needs investigation. It would make sense to test the way its leaf color is inherited through a genetic experiment. A. Neumann's proposal (1955), supported by E. Janchen (1956) and K. Rechinger (1957, 1964), to treat the forms of *S. triandra* as subspecies absolutely does not stand up under scrutiny: it is obvious that these forms can be anything but subspecies.

Each of the two subspecies recognized here by me (ssp. *bornmuellerii* and ssp. *nipponica*) actually also has just a single diagnostic difference: one, pubescent shoots and leaves, the other, pruinose epicormic shoots. However, in this case, each diagnostic character is confined to an appropriate geographical area and does not occur within the rest of the species range. On the other hand, both the pruinose bloom and pubescence may be developed to a variable extent, sometimes being very obsolete. Therefore, neither *S. bornmuellerii* nor *S. nipponica* can be treated as a distinct species.

103 It would probably make sense to distinguish one more subspecies consisting of populations from the Caucasus and Iran. They are characterized by more delicate, slender shoots and catkins as well as smaller buds and leaves.

According to the description of *S. armena* Schischk., no one would expect this name to be a synonym of *S. triandra*. Yet it is *S. triandra* that attained an unusual habit of a thick bush with small leaves, probably, due to multiple damage either by cattle or stones in a mountain stream. Its type has been found and preserved in the St. Petersburg Herbarium.

3. ***S. songarica*** Anderss. 1867, Monogr. Salic.: 53 et tab. 3, fig. 34; id. 1868, in DC. Prodr. **16**, 2: 213; Wolf, 1903, Trudy SPb. bot. sada **21**: 181; Nazarov, 1936, Fl. SSSR **5**: 204; Parsa, 1950, Fl. Iran. **4**: 1354; Drobov, 1953, Fl. Uzb. **2**: 53; Polyakov, 1960, Fl. Kazakhst. **3**: 16; Skvortsov, 1960, Bot. mat. Gerb. Bot. In-ta AN SSSR **20**: 75; id. 1962, Bot. mat. Gerb. In-ta bot. UzbSSR **17**: 60; Skvortsov, Derviz-Sokolova, 1966, Spisok rast. Gerb. fl. SSSR **91**: N 4515; Sagitov, 1962, Uzb. biol. zhurn. **3**: 27. —*S. hypericifolia* Goloskokov, 1960, Fl. Kazakhst. **3**: 434.

T y p u s: "In Songaria ad Ajagus et in ripis fl. Tschu et Ili—Schrenk" (LE!).

HABIT: A tall shrub (to 8–10 m) or tree with a short, lowly branching stem and wide crown.

HABITATS. The species is strictly alluvial and is associated with fine sandy or muddy drifts. Hence, it is widespread and abundant only at lower reaches of the largest rivers.

DISTRIBUTION: The rivers of Lake Balkhash Basin; the Chu and Talas; Syr Darya (from Ferganskaya Valley to Dzhusaly); Amu Darya (sporadically, mostly extinct at its upper and middle reaches, yet common at the Lower Amu Darya); Murghab and Tedzhen rivers. There are a few rare locations in mountainous areas: the Shorlok River in the Kopet-Dag, Sotchkhar in the Shugnan, Okhotnichye on the Narynkol River, the Ulutau (isolated location). It is also encountered on the Hari Rud River in Iran, near Aq Chah in northern Afghanistan, and in Sinkiang. (Fig. 15.)

NOTE. The species is rather uniform throughout its entire, rather limited, range. *S. hypericifolia* is nothing but an individual deviation (mutation) characterized by obtuse leaf apices. There are no specimens collected, other than the type.

Sect. 3. *Urbanianae*

(Seemen) Schneider, 1916, in Sarg. Pl. Wilson. **3**, 1: 103.

T y p u s: *Salix cardiophylla* Trautv. et Mey.

Tall trees reproducing only by seeds. Bark on old stems with coarse longitudinal fissures. Floriferous and vegetative buds similar: lanceolate, compressed. Bud scale margins not connate. Petioles glandular. Leaves broad, mature ones with veins conspicuously prominent beneath. Catkins pendulous, long-stalked. Leaves on catkin stalks normally developed. Bracts large, pale, at base more or less connate either with stamens or ovary stipes. In female flowers, bracts abscising after flowering. Nectaries mostly three: two of them transverse, adaxial, and one abaxial. Stamens 5–10, their filaments glabrous to puberulous. Ovaries stipitate; styles elongated, laciniate (cleft); stigmas two-lobed; lobes linear, acute. Stylodes (style branches) breaking off after flowering. This presumably is a monotypic section.

4. ***S. cardiophylla*** Trautv. et Mey. 1856, in Middendorff, Reise Sibir. 1, **2**: 77 et tab. 19–20; Anderss. 1867, Monogr. Salic.: 37; Wolf, 1903, Trudy SPb. bot. sada **21**: 177; Koidzumi, 1913, Bot. Mag. Tokyo **27**: 97; Schneider, 1916, in Sarg. Pl. Wilson. **3**, 1: 103; Komarov, Alisova, 1931, Opred. rast. Dalnevost. kr. **1**: 424; Nazarov, 1936, Fl. SSSR **5**: 107; id. 1937, Fl. Zabayk. **3**: 13; Tolmachev, 1956, Der. i kustarn. Sakhal.: 58; Kimura, 1950, Symb. Iteol. **10**: 546. —*S. urbaniana* Seemen, 1896, Bot. Jahrb. Beibl. **52**: 9; id. 1903, Salic. Jap.: 24; Schneider, 1916, op. cit. **3**, 1: 103; Makino, 1956, Fl. Jap.: 670; Tolmachev, 1956, op. cit.: 58. —*S. maximowiczii* Kom. 1901, Trudy SPb. bot. sada **18**: 442; id. 1903, op. cit. **22**: 25 et tab. 1; Schneider, 1916, op. cit. **3**, 1: 100; Nakai, 1930, Fl. sylv. Kor. **18**: 72; Komarov, Alisova, 1931, op. cit. **1**: 424; Nazarov, 1936, op. cit. **5**: 207. —*Toisusu cardiophylla* Kimura, 1928, Bot. Mag. Tokyo **42**: 288; id. 1934, in Miyabe, Kudo, Fl. Hokkaido **4**: 396; Sugawara, 1939, Ill. Fl. Saghal. **2**: 662. —*Toisusu urbaniana* Kimura, 1934, op. cit. **4**: 397; Sugawara, 1939, op. cit. **2**: 664; Ohwi, 1965, Fl. Jap.: 362.

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T y p u s: "Ad fl. Polowinnaja prope Udskoj 7.VI 1844; ad sin. Ujakon 23.III–1.IX 1844. A. Middendorff" (LE!).

Ssp. ***urbaniana*** (Seemen) A. Skv. comb. nova. —*S. urbaniana* Seemen 1896. —*S. cardiophylla* var. *urbaniana* Kudo ex Makino, 1956, Fl. Jap.: 67.

T y p u s: "Japonia, prov. Nambu, in subalpinis ad rivulos, a. 1865 Tschonoski" (B, LE! et alibi).

HABIT: A large, straight-stemmed tree up to 30–35 m tall and 1 m in diameter.

HABITATS: Banks of small streams. The species never reaches high elevations ascending to 800 m in the Sikhote-Alin and to 600–700 m in the Stanovoy Range. Throughout its entire area, it occurs sporadically, either solitary or in small clusters, never growing en masse.

DISTRIBUTION: From the Upper Olekma Basin to Ayan, central Sakhalin, Kunashir, Maritime Province, northeastern North Korea, southeastern part of Northeast China, Hokkaido, and the mountains of Hondo.

Ssp. *urbaniana*: Japan, Kunashir, and southern Sakhalin. Plants from central Sakhalin are to be assigned to ssp. *cardiophylla*, which comprises the continental part of the species' range. (Fig. 13.)

NOTE. According to V. Komarov and M. Nazarov, *S. maximowiczii* should differ from the "typical" *S. cardiophylla* in its somewhat narrower leaves and also in the length of its ovary stipe. Yet, while analyzing massive material, one comes to the conclusion that these characters are not consistent and reliable. Still more bizarre was the placement of *S. maximowiczii* in the section *Pentandrae* and *S. cardiophylla* in *Urbanianae*, as C. Schneider (1916) did! Earlier, in 1903, O. Seemen had mentioned that he had not been able to distinguish *S. maximowiczii* from *S. cardiophylla*. Yet he had recognized *S. urbaniana*, which is hardly more distinct. The distinguishing feature was the leaf pubescence and occasionally also capsule pubescence. However, these characters vary considerably: sometimes the leaf pubescence disappears even before the leaves expand. Neither any other diagnostic characters, such as the stipule and leaf base shape, nor catkin length, mentioned by A. Tolmachev (1953), are consistent.

Sect. 4. *Pentandrae*

(Borrer) Schneider, 1904, Handb. 1: 29.

T y p o s: *Salix pentandra* L.

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Trees, sometimes (in unfavorable conditions) nearly shrubs. Bark on old stems with coarse longitudinal fissures. Floriferous buds similar to vegetative ones; bud scale margins connate, scales cap-like. Petioles always glandular; glands conspicuous, two or three pairs positioned at blade base. Glands often developing into foliolaceous outgrowths. Leaves lustrous above, densely glandular-dentate at margins. Glands of young leaves producing odorous pitch (resembling poplars). Catkins serotinous, borne on leafy stalks, dense, rather stout. Bracts mostly with one or two glands at apex; in female flowers, bracts abscising by the time when capsules ripen. Nectaries two; occasionally in male flowers a few nectaries forming cup-like structures around bases of stamens. Stamens 3 to 10. Ovaries stipitate, styles short, stigmas two-lobed, deflected to sides. Mature capsules large.

The section consists of 7 or 8 species and is widely distributed in regions with the temperate cold climate in Eurasia and North America. The two distinct species groups within the section may be considered as subsections. One group consists of three species belonging to the flora of this country and a Chinese species (*S. paraplesia* Schneid.) that are closely related, as well as one North American species (*S. serissima* Fern.). The other group includes two or three boreal North American species (*S. lucida* Muhl., *S. lasiandra* Benth., *S. caudata* Heller).

Key to Species

1. Buds narrowly triangular-lanceolate, narrowly acuminate. Lowermost cataphylls pubescent along margins as well as at apices on the outer side, their dense, persistent trichomes exceeding margins by approximately 2.0–2.5 mm 6. ***S. pseudopentandra***
- Buds lanceolate or ovoid, obtuse or faintly short-pointed. Margins of lowermost cataphylls silky ciliate. Trichomes about 1 mm long, fugacious 2
2. Leaves dark green above, pale beneath, distinctly bicolorous. Buds lanceolate, acuminate 5. ***S. pentandra***
- Leaves not distinctly bicolorous. Buds ovoid, obtuse 7. ***S. pentandroides***

5. **S. pentandra** L. 1753, Sp. pl.: 1016; Ledeb. 1850, Fl. Ross. **3**, 2: 597 (p. p. excl. pl. Sib. Or. et Caucasi!); Wimmer, 1866, Salic. Eur.: 22; Anderss. 1867, Monogr. Salic.: 35 (p. p. !); Seemen, 1908, in Aschers. et Graebn. Synopsis **4**: 61; Wolf, 1930, Fl. Yu.-V. **4**: 37; Krylov, 1930, Fl. Zap. Sib. **4**: 727; Floderus, 1931, Salic. Fennoscand.: 158; Perfilyev, 1936, Fl. Sev. kr. **2-3**: 32; Nazarov, 1936, Fl. SSSR **5**: 205 (ex parte: excl. pl. Sib. Or., Orientis Extr. et Caucasi); Buser, 1940, Ber. Schweiz. bot. Ges. **50**: 627; Vicioso, 1951, Salic. Españ.: 34; Nazarov et al. 1952, Fl. URSR **4**: 73; Shlyakov, 1956, Fl. Murm. **3**: 55; Rech. f. 1957, in Hegi, Ill. Fl. Mitteleur. 2 ed. **3**, 1: 65; Polyakov, 1960, Fl. Kazakhst. **3**: 15; Skvortsov, 1960, Trudy MOIP **3**: 249; Rech. f. 1964, Fl. Eur. **1**: 45.

T y p u s: "In Europae paludibus montosis duris. Hort. cliff. 454; Fl. Suec.: 792; Fl. Lapp.: 370 et tab. 8 fig. 3".

HABIT: A tree up to 15–18 m tall in favorable conditions.

HABITATS AND DISTRIBUTION: Graminoid forest fens dominated by *Carex* and *Calamagrostis*; transitional zones around *Sphagnum* bogs (*S. pentandra* plays an essential role there forming open canopies together with *Betula pubescens*); meadows that develop after logging on early stages of the vegetation recruitment, especially in valleys, hollows, and places where ground waters come out to the surface. At southern limits of its range, in West Siberian forest-steppes, the species occurs in *kolki* growing in *zapadina*'s. In the steppes of southern European Russia, it is found in lower parts of flood plains and also in *zapadina*'s amidst inland sandy territories, such as those between the Archeda and Don or along the Middle Dnieper. In Central and Western Europe, it is encountered mostly in the mountains, ascending to 2,000 m in the Alps (even to 2,400 m in the Italian Alps); to 1,400 m in the French Massif Central; to 1,000–1,200 m in the Sudetes and Carpathians. In the Urals and Altai, it goes up nearly to the timberline. (Fig. 16.)

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NOTE. *S. pentandra* exhibits its characters rather consistently across its nearly entire range. Yet the specimens originating from the Pyrenees, French Massif Central, and Alps have their buds somewhat more stout, resembling those of *S. pentandroides*. There is an option of treating these populations as a subspecies (besides, they are geographically isolated). Unfortunately, cultivated plants were often used for the earliest herbarium collections in Western Europe. This makes it difficult to evaluate the actual range of *S. pentandra* in that area, so that it still remains obscure. Therefore, it is impossible so far to segregate the West European subspecies with confidence. Plants from the Balkans appear to be not different from Scandinavian, Central Russian, or Siberian ones.

6. **S. pseudopentandra** Flod. 1933, Ark. bot. **25A**, 10: 12; Skvortsov, 1960, Trudy MOIP **3**: 250; Sergiyevskaya, 1961, Fl. Zap. Sib. **12**: 3221; Koropachinskiy, Skvortsova, 1966, Der. i kustarn. Tuvy: 92. —*S. pentandra* ssp. *pseudopentandra* Flod. 1926, Ark. bot. **20A**, 6: 57; Hultén, 1928, Fl. Kamtch. **2**: 17; Karavayev, 1958, Konsp. fl. Yak.: 84; Malyshev, 1965, Fl. Vost. Sayana: 110. —*S. pentandra* auct. fl. Sibir. Orient. et Orientis Extremis non L.: Turcz. 1854, Fl. Baic.-Dah. **2**, 2: 371; Maxim. 1859, Primit. Fl. Amur.: 242; Komarov, 1929, Fl. Kamch. **2**: 7; Komarov, Alisova, 1931, Opred. rast. Dalnevost. kr. **1**: 424; Nakai, 1930, Fl. sylv. Kor. **18**: 82; Nazarov, 1937, Fl. Zabayk. **3**: 193; Grubov, 1955, Konsp. fl. Mong.: 101; Tolmachev, 1956, Der. i kustarn. Sakhal.: 62; Popov, 1959, Fl. Sredn. Sib. **2**: 792; Cherepnin, 1961, Fl. yuzhn. ch. Krasnoyar. kr. **3**: 22 (p. p.).

T y p u s: "Kamtchatka, Opala volkano, 19.VII 1921. E. Hultén N 2225" (S) (isotypus: LE!).

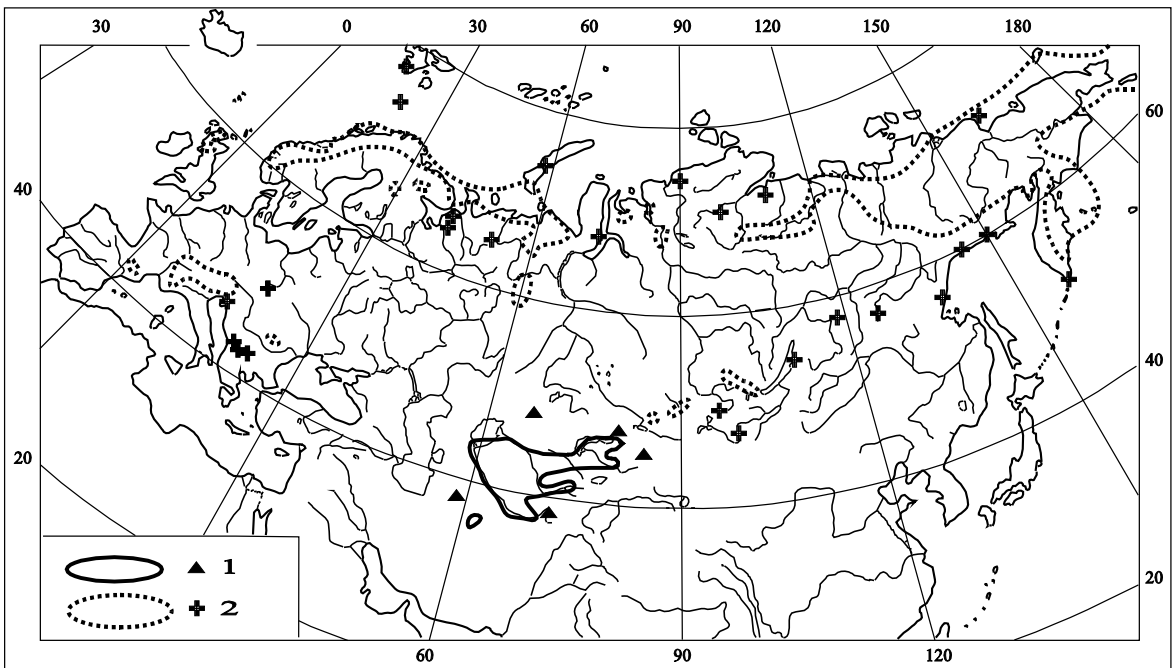


Fig. 15. Distributional areas of *Salix songarica* Anders. (1) and *S. reticulata* L. (2)

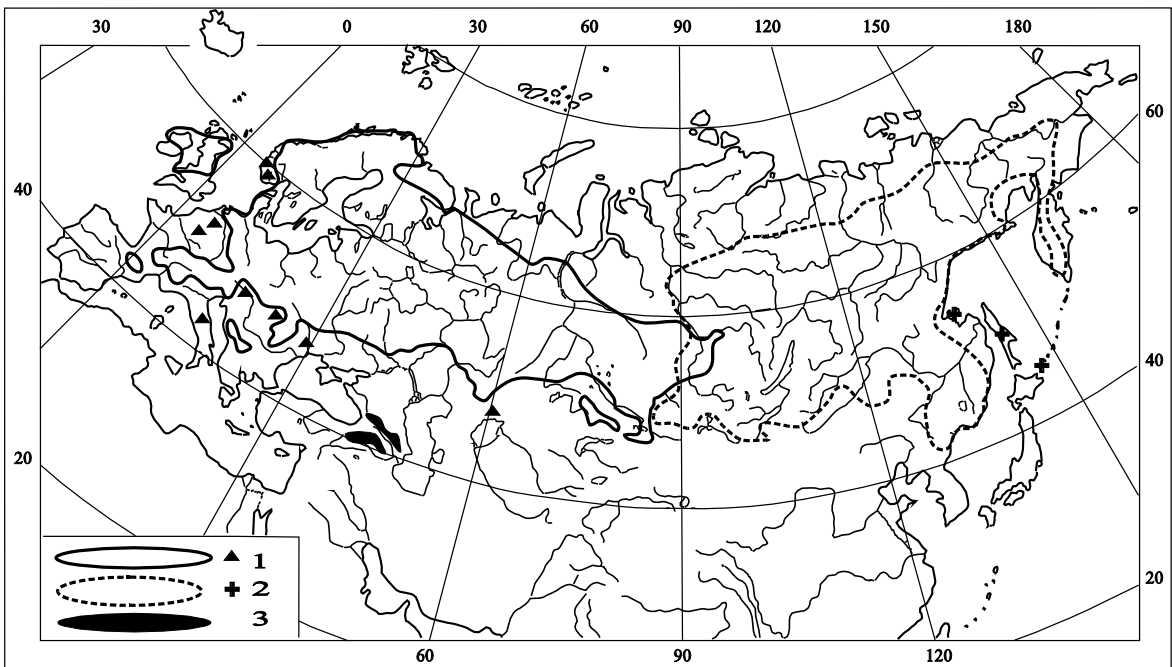


Fig. 16. Distributional areas of *Salix pentandra* L. (1), *S. pseudopentandra* Flod. (2), and *S. pentandroides* A. Skv. (3)

HABIT: A small tree, usually 2–5 m tall (up to 8–10 m and 12–15 cm in stem diameter).

HABITATS: Damp depressions, bog edges, and paludal open woodlands from lowland to near the upper forest limit. The species is not uncommon; however, in most places, it occurs sparsely, not growing en masse.

DISTRIBUTION. The left bank of the Yenisei is the westernmost point on the plain. 107
In the mountains, it is distributed farther west, across the southern Altai. The southern part of the range includes northern Mongolia and much of Northeast China. The northeastern Korea Peninsula, Maritime Province (common, but no collections from the Lower Amur available so far), Sakhalin (a single known locality at the middle reaches of the Tym), the Kurils (another single finding on Iturup), the Shantar Islands, Sea of Okhotsk Coast, Kamchatka (nearly everywhere), the Anadyr River down to the mouth of the Belaya (so far not found on the Koryak Plateau). The northern border of the species range almost exactly follows the parallel of 68–69° N, which is close to the limit of the forest-tundra belt. In the Sayans and Altai, it ascends to 1,800–2,100 m; in the Stanovoye High Plateau, to 900–1,000 m. (Fig. 16.)

NOTE. The specific distinctness of *S. pseudopentandra* is absolutely beyond question. Morphological differences between *S. pentandra* and *S. pseudopentandra* are even more pronounced than those between *S. pentandra* and, say, the Chinese species *S. paraplesia* Schneid. or between *S. pentandra* and the American *S. serissima* Fern. However, this is not the only point. Of more importance is the fact that within the area of their range overlap, both *S. pentandra* and *S. pseudopentandra* remain completely distinct.

7. ***S. pentandroides*** A. Skv. 1960, Dokl. AN ArmSSR **31**: 299; id. 1960, Trudy MOIP **3**: 253; id. 1961, Feddes Repert. **64**: 74; id. 1966, Trudy Bot. in-ta AN ArmSSR **15**: 111. —*S. pentandra* auct. fl. Caucasi et Asiae Minoris, non L.: Boiss. 1879, Fl. Or. **4**: 1184; Görz, 1930, Feddes Repert. **28**: 113; id. 1933, op. cit. **32**: 389; id. 1934, op. cit. **36**: 226; Nazarov, 1936, Fl. SSSR **5**: 206 (quoad pl. caucas.); Grossheim, 1945, Fl. Kavk. **3**: 27; Makhatadze, 1961, Dendrofl. Kavk. **2**: 51.

T y p u s: "Caucasus septentr., prov. Kuban, pineto-betuletum in angust. Dshalan-Kol, 22.V 1908, N. et E. Busch. (♂)" (ERE, LE). "Caucasus septentr., Balkaria, in ripa rivuli Baschyl-sugusu, alt. 1950 m., 1.IX 1939. R. Jelenevski (♀)" (MW).

HABIT: A small, delicate tree.

HABITATS: Mostly damp and paludal minor valleys and slopes within the elevation range 800–2,300 m in the forest and subalpine zones.

DISTRIBUTION: Nearly all across the Greater Caucasus (although not that common in the eastern part, particularly, in Azerbaijan). In the Lesser Caucasus, it is more sporadic, known only from a few locations in northern Armenia, Borzhomi and Bakuriani vicinity, and Lake Geck-Gel. In Turkey, it grows on oozes in Kars, Erzurum, Bayazit, and Gü mü shane provinces. (Fig. 16.)

Sect. 5. *Salix*

T y p u s: *Salix alba* L.

Large or moderate-sized trees. Bark on old stems with coarse longitudinal fissures. Floriferous buds look similar to vegetative ones. One pair of petiolar glands sitting near leaf blade base. Leaves lanceolate, narrowly acuminate, serrulate at margins, not producing pitch, flat, stoutish. Catkin stalks leafy. Bracts pale, eglandular at apex, abscising in female

flowers after flowering. Nectaries two in male flowers and mostly one in female ones. Stamens two, their filaments densely pubescent. Capsules glabrous, moderate-sized, stipitate; stipes short, styles rather short, stigmas recurved, two-parted.

108 This section consists of only three species, of which *S. fragilis* to some extent resembles *S. pentandra* (in its bud shape and structure, as well as shape of the stipules). This fact reveals close relationship between the two sections. Besides, both in *S. alba* and *S. fragilis* there occur some specimens with an abnormally large number of stamens (up to four or even eight in a flower). A traditional treatment of these specimens as hybrids with *S. pentandra* is not always reasonable. This point was made long ago by A. Kerner and N. Andersson (Andersson 1867: 42). The multistaminate specimens I have inspected by no means could be treated as hybrids with *S. pentandra*. These abnormalities are more likely atavistic features, which could be one more proof of close relation between the sections *Salix* and *Pentandrae*.

Key to Species

1. Mature shoots light-colored, grayish-yellow or nearly ivory, glabrous, rather lustrous, growing at nearly right angles to branches, getting broken off at bases very easily. Buds acute, rather convex on adaxial side and therefore not appressed to shoots, either entirely or partially blackening by wintertime. Stipules broad, semicordate. Leaves yellowish-green, glabrous. Capsule stipes 1–1.5 mm long 10. **S. fragilis**
- Mature shoots of different colors, never growing at right angles and never too fragile, except crowns of really old trees. Buds flat on their adaxial side, closely appressed to shoots, colored similarly to shoots, never blackening by winter. Stipules lanceolate or subulate. Foliage coerulescent, leaves sericeous, at least superior ones. Capsule stipes 0.2–1.2 mm long 2
2. Buds lanceolate-oblong, to 2 mm broad, their abaxial side flattened. Bracts up to 1 mm broad. Anthers 0.5–0.7 mm long. Mature capsules 4–5 mm long. Style length + stigma length = 0.5–1.0 mm 8. **S. alba**
- Buds ovoid-lanceolate or ovoid-triangular, about 2.5 mm broad, distinctly convex on their abaxial side. Bracts mostly more than 1 mm broad, with straight, long, fugacious cilia at margins. Anthers 0.7–0.9 mm long. Mature capsules 5–7 mm long. Style length + stigma length = 0.8–1.5 mm 9. **S. excelsa**

8. **S. alba** L. 1753, Sp. pl.: 1021; Ledeb. 1850, Fl. Ross. **3**, 2: 598; Wimmer, 1866, Salic. Eur.: 16; Andersson. 1867, Monogr. Salic.: 47; Wolf, 1930, Fl. Yu.-V. **4**: 42; Krylov, 1930, Fl. Zap. Sib. **4**: 730; Nazarov, 1936, Fl. SSSR **5**: 188; Buser, 1940, Ber. Schweiz. bot. Ges. **50**: 629; Grossheim, 1945, Fl. Kavk. **3**: 26; Vicioso, 1951, Salic. Españ.: 42; Nazarov et al. 1952, Fl. URSR **4**: 66; Skvortsov, 1955, Bull. MOIP **60**: 121; id. 1960, Bot. mat. Gerb. Bot. in-ta AN SSSR **20**: 78; id. 1966, Trudy Bot. in-ta AN ArmSSR **15**: 117; Andreyev, 1957, Der. i kustarn. Mold. **1**: 80; Rech. f. 1957, in Hegi, Ill. Fl. Mitteleur. **3**, 1: 68; Rasinš, 1959, Ivy Latv.: 90; Polyakov, 1960, Fl. Kazakhst. **3**: 17 (excl. var. *australior*); Cherepnin, 1961, Fl. yuzhn. ch. Krasnoyar. kr. **3**: 21; Maire, 1961, Fl. Afr. Nord **7**: 54; Rech. f. 1964, Fl. Eur. **1**: 45. —*S. vitellina* L. 1753, op. cit.: 1016. —*S. massalskyi* Goerz, 1930, Feddes Repert. **18**: 116.

T y p u s: "Ad pagos et urbes Europae. Hort. Cliff. 473; Fl. Suec. N 812; It. Scan.: 200".

Ssp. **micans** (Anderss.) Rech. f. 1963, Öst. bot. Z. **110**: 338. —*S. micans* Anderss. 1867, op. cit.: 49; Nazarov, 1936, op. cit. **5**: 190; Grossheim, 1945, op. cit. **3**: 26. —*S. massalskyi* Goerz, 1930, op. cit. **18**: 116. —Non *S. micans* auct. fl. Europ. nec auct. fl. Asiae Mediae.

T y p u s: "Caucasus—Nordmann; Asia Minor—Wittman" (LE!).

HABIT: A large tree: up to 30 m tall and 1 m in stem diameter.

HABITATS: River banks and valleys (on sandy and especially sandy-muddy drifts). Near northern limits of its range, it occurs only in valleys of large rivers, whereas in the south, particularly within the steppe belt, it is common even along the smallest streams. On flood plains of many southern rivers, it forms groves extending for many kilometers, often together with poplars. It naturally ascends to 900–1,000 m in the Alps and 700–800 m in the Carpathians. When cultivated, it goes up for additional 200–300 m. In the Pyrenees, Caucasus, and Asia Minor, it is encountered as high as 1,800–1,900 m; in Morocco, at 2,400 m; in the Urals and Altai, presumably not higher than 600 m.

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DISTRIBUTION. On the British Isles, *S. alba* appears to be naturally distributed only in eastern England (and probably southeastern Ireland), although, according to some British authors (White 1890; Elwes, Henry 1913), it is doubtful if there are any natural occurrences. The area includes France, the Iberian Peninsula, maritime part of Algeria, mountains of Morocco, Central and Southern Europe, the largest Mediterranean islands (including Crete and Cyprus), Asia Minor, and the Caucasus. In Europe, the northern limit of the continuous area is not yet enough clarified. Some localities in northern Netherlands and the Northern German Lowlands are presumably beyond this border. This is a common species in Latvia, whereas in Estonia as well as Pskovskaya, Leningradskaya, and Novgorodskaya oblast's it does not occur naturally. It is rare in Tver(-skaya), Yaroslavl (Yaroslavskaya), and Kostroma (Kostromskaya) oblast's (on the banks of the Volga or close to it). In Pre-Uralia, it reaches nearly 60° N (at Usolye) growing along the Kama River, although in the Urals, it is not distributed farther than 55° N. The northernmost locality is at the confluence of the Irtysh and Ob. To the south, it penetrates as far as the Chinese part of the Black Irtysh; to the east, as far as the Chulyshman. A disjunct part of the area is on the Yenisei around Minusinsk. In Siberia, the southern border of the area goes via the Kazakh Uplands (probably excluding the Ulutau); it nearly reaches the Aral Sea going down the Turgay River and across the Mugodzhary. Along the Ural River (except its lowermost reaches) as well as down the Lower Volga (including the delta), *S. alba* is a very common species. Ssp. *micans* is distributed in western Transcaucasia and Turkish Lazistan.

Everywhere within and beyond its natural distributional range, *S. alba* is favored for cultivation on residential lots, at roadsides, on banks of reservoirs, in parks, and sometimes also forest plantings. For instance, it is common around St. Petersburg as a cultivated species. Another large cultivation locus is found in Semirechye, where *S. alba* is one of the most common plants in spite of the fact that it does not grow there naturally. It is also cultivated around Irkutsk. (Fig. 17.)

NOTE. Across the major part of its range, *S. alba* is exhibiting a very uniform set of characters. The plants, say, from Algeria look absolutely alike those from the Volga or Minusinsk. However, two important exceptions are to be mentioned. First, the populations from Colchis Floristic Area form a very distinct race of a subspecies rank, characterized by smooth, slender shoots and relatively broad, short, conspicuously silvery pubescent leaves (ssp. *micans*). This is a strict endemic race of Colchis. Other localities of ssp. *micans*, such as South European (Rechinger 1963, 1964), or Central Asiatic, or Iranian (Bornmüller

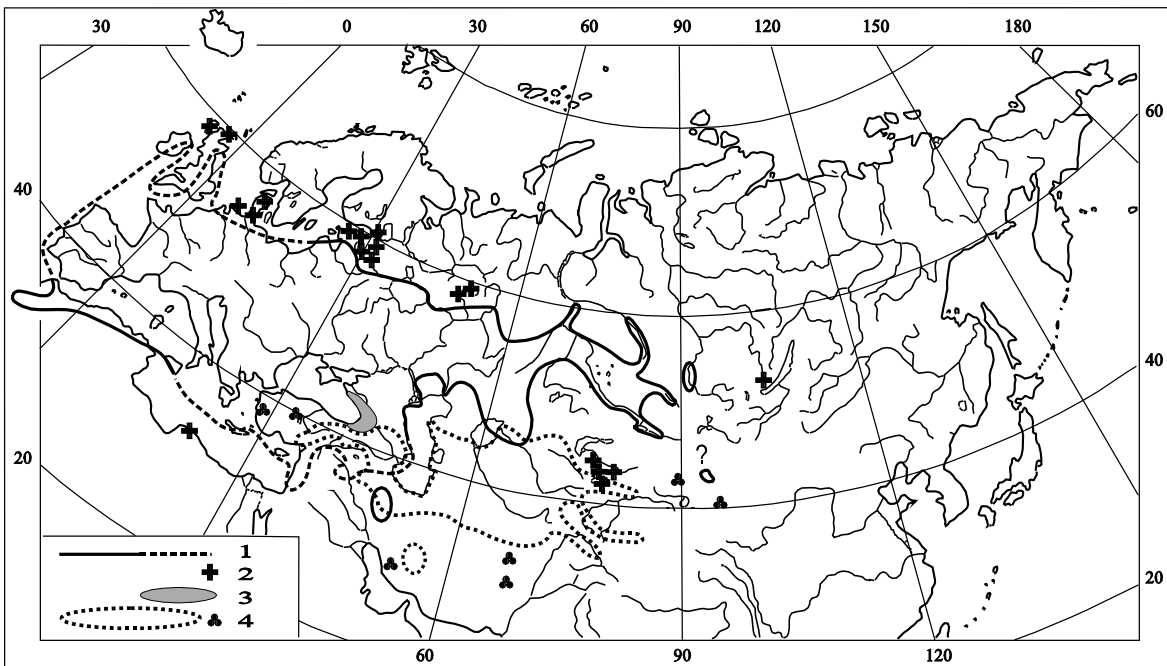


Fig. 17. Distributional areas of *Salix alba* L. (1), *S. alba*, undoubtedly cultivated (2), *S. alba* ssp. *micans* (Anderss.) Rech. f. (3), *S. excelsa* S. G. Gmelin, wild and cultivated (4)

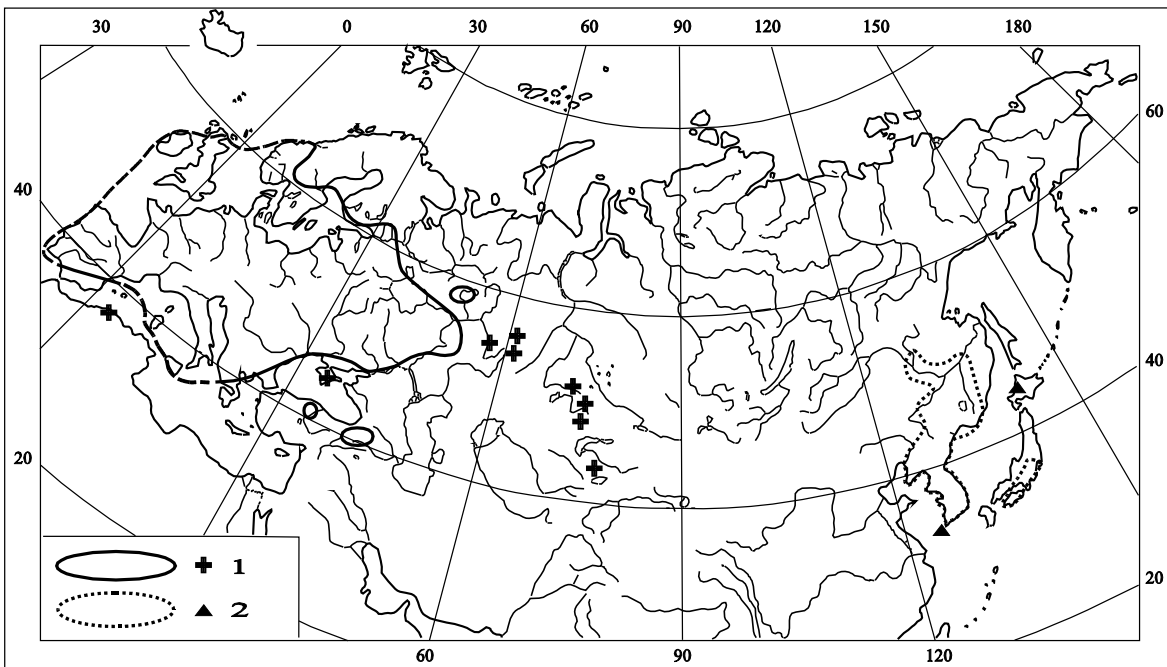


Fig. 18. Distributional areas of *Salix fragilis* L. including its hybrids with *S. alba* L. (1) and *S. pierotii* Miq. (2)

1915; Nazarov 1936; Drobov 1953), were reported due to misunderstanding of the subspecies' characters. Another major deviation from the uniformity is attributed to hybridization of *S. alba* and *S. excelsa* en masse in Asia Minor, Syria, the Caucasus, and also to some extent in Middle Asia (see details in the note concerning the next following species).

On most of the European part of its distributional area, *S. alba* also hybridizes en masse with an adventive species *S. fragilis*. Yet it is important that this hybridization has led to the swamping of both species only in places where there are no natural habitats left for *S. alba* to grow. There *S. alba* has lost its characteristic features. However, the typical *S. alba* still exists in localities where natural habitats are available for it and its natural regeneration is possible, such as Moskovskaya (Moscow), Kaluzhskaya (Kaluga), Tulsкая (Tula), and Voronezhskaya oblast's. Hybrids *S. alba* × *S. fragilis* are as well abundant in the same territories, being restricted to various secondary and disturbed habitats.

Numerous varieties (cultivars) of *S. alba* have been bred as ornamental plants. The most popular are those with bright yellow shoot color, which is persistent till the age of 3–5 years or even longer (the so-called var. *vitellina*), and also those of bright orange-red color (var. *brizensis*, var. *coccinea*). There also exists a weeping variant of var. *vitellina*: "*vitellina pendula*" = *S. chrysocoma* Dode. All these ornamental cultivars are obviously products of ancient peoples' selection and originate from Central and Southern Europe. Their poor hardiness in Moscow Oblast as well as southern pattern of their seasonal growth are proofs of their southern origin (in Moscow, they still manage to produce three or four shoot generations per season and keep growing throughout the entire season). Var. *vitellina* was widespread in Europe already at the time of C. Linnaeus, who treated it as a distinct species, *S. vitellina* L.

9. ***S. excelsa*** S. G. Gmelin, 1774, Reise 3: 308 et tab. 34, fig. 2; J. Gmelin, 1791, in Linnaei, Syst. Naturae, 13 ed. 2, 1: 74; Skvortsov, 1960, Bot. mat. Gerb. Bot. in-ta AN SSSR 20: 76 et fig. 1; id. 1962, Bot. mat. Gerb. In-ta AN UzbSSR 17: 61; id. 1966, Trudy Bot. in-ta AN ArmSSR 15: 118. —*S. australior* Anderss. 1867, Monogr. Salic.: 43; Görz, 1930, Feddes Repert. 28: 114; id. 1937, Fl. Turkm. 2: 18; Nazarov, 1936, Fl. SSSR 5: 191; Grossheim, 1945, Fl. Kavk. 3: 16. —*S. fragilis* δ *australis* Anderss. 1868, in DC. Prodr. 16, 2: 210. —*S. fragilis* auct. fl. orient., non L.: Boiss. 1879, Fl. Or. 4: 1184; Post, 1933, Fl. Syr. 2: 530; Parsa, 1950, Fl. Iran. 4: 1351; Makhatadze, 1961, Dendrofl. Kavk. 2: 51. —*S. variifolia* Freyn et Sintenis, 1902, Bull. Herb. Boissier 2, 11: 907; Parsa, 1950, op. cit. 4: 1353. —*S. lisopclados* Dode, 1908, Bull. Soc. Bot. Fr. 55: 651 et fig. H. —*S. oxica* Dode, 1908, op. cit. 55: 653; Lakschewitz, 1914, Spisok rast. Gerb. russk. fl.: N 2453; Nazarov, 1936, Fl. SSSR 5: 193; Grossheim, 1945, Fl. Kavk. 3: 27; Drobov, 1953, Fl. Uzbek. 2: 51. —*S. neodaviessi* Bornm. et Goerz, 1934, Feddes Repert. 35: 283. —*S. dischgensis* Goerz, 1934, op. cit. 35: 284. —*S. litwinowii* Goerz ex Nasarov, 1936, op. cit. 5: 708, 120; Görz, 1937, Fl. Turkm. 2: 33. —*S. euapiculata* Nasarov, 1936, op. cit. 5: 713, 192; Drobov, 1953, op. cit. 2: 51.

Т y п у с: "Persia, Rescht. S. G. Gmelin" (LE!).

HABIT: A large tree (as large as the previous species).

HABITATS: River banks (same habitats as those of *S. alba*).

DISTRIBUTION. Defining limits of *S. excelsa* natural range is even more complicated a task than doing it for *S. alba*, as *S. excelsa* was widely cultivated since ancient times. There is no doubt that its modern area of cultivation is very different from the original, natural one. One can tell with confidence that it is growing wild in Iran, occasionally in the Kopet-Dag, and probably at some locations in Afghanistan and Middle Asia. It appears to

be quite natural in Middle Asia growing solitarily and in clusters on river pebbles and in ravines (*say's*) near streams, yet I did not succeed in finding any young populations which could be confidently considered to have originated from seeds, except in the Kopet-Dag. V. Drobov (1953) stated that wild growing *S. alba* or any species close to it were absolutely missing from Uzbekistan. That opinion may turn out to be true; however, it is also quite possible that the majority of natural groves have been merely exterminated.

S. excelsa is cultivated on the territory extending from Israel and Syria to Kashgaria, Kashmir, and western Gansu. In the Elburz Mountains, it ascends to 2,500 m; in Middle Asia, to 2,000 m (in the Darvaz and western Pamirs, to 2,200 m); to 2,800 m around Kabul. (Fig. 17.)

NOTE. Numerous intermediate forms are found in the areas where *S. excelsa* is cultivated within the range of *S. alba* and particularly where both willows have been cultivated for a long time, such as Syria, eastern Asia Minor, central and eastern Transcaucasia, and partially Middle Asia. These forms, which are difficult to identify, appear to be hybrids¹.

10. ***S. fragilis*** L. 1753. Sp. pl.: 1017; Ledeb. 1850, Fl. Ross. **3**, 2: 598 (p. p.); Wimmer, 1866, Salic. Eur.: 19; Anderss. 1867, Monogr. Salic.: 41; Seemen, 1908, in Aschers. et Graebn. Synopsis **4**: 70; Nazarov, 1936, Fl. SSSR **5**: 201; Buser, 1940, Ber. Schweiz. bot. Ges. **50**: 629; Nazarov et al. 1952, Fl. URSR **4**: 71; Skvortsov, 1966, Trudy Bot. in-ta AN ArmSSR **15**: 116; Rech. f. 1957, in Hegi, Ill. Fl. Mitteleur. 2 ed. **3**, 1: 66; id. 1964, Fl. Eur. **1**: 45. —Haud *S. fragilis* sensu Boiss. 1879, Fl. Or. **4**: 1184. —*S. decipiens* Hoffm. 1791, Hist. Salic. **2**: 9 et tab. 30; White, 1890, J. Linn. Soc. **27**: 348, 371; Linton, 1913, Brit. will.: 16 (p. ssp.). —*S. australior* var. *pseudofragilis* Goerz, 1933, Feddes Repert. **32**: 393 (Sal. Asiat. N 37).

T y p u s: "In Europae borealibus. Fl. Lapp. N 394 et tab. 8 f. B; Fl. Suec. N 795; Iter. Scan.: 200".

HABIT: A moderate-sized or, occasionally, quite tall tree (up to 15–18 m).

HABITATS: Banks of mountain streams.

DISTRIBUTION: Northern Asia Minor and the Armenian High Plateau (scattered). Within the territory of the former Soviet Union, it is known only from the vicinity of Akhaltsikhe (Georgia).

In Europe, it is widespread in cultural and semicultural landscapes, but is absolutely missing from undisturbed habitats. It is common along river banks, on shores of reservoirs, in damp depressions, along roads and ditches, and on residential lots. It is easily propagated and self-dispersed by rooting of wind-broken branches. As a result, it is distributed on major European territory outside this country (excluding southern Spain, the southern Balkan Peninsula, and most of Fennoscandia; known in Norway only south of 65° N; in Finland, only near the Gulf of Finland). In this country, the border of the continuous distribution of *S. fragilis* (together with hybrids *S. fragilis* × *S. alba*) runs across the Karelian Isthmus, the cities Nizhniy Novgorod, Samara, Rostov-on-Don, and the lower reaches of the Dnieper and Dniester. Beyond that territory, there are just a few isolated locations or small locuci of hybrids *S. fragilis* × *S. alba*, which appear to have been recently introduced there. These are locations in the Urals, Crimea, northern Kazakhstan, Semirechye, and the Upper Vyatka Basin. In the Carpathians and Alps, *S. fragilis* ascends

¹ In later years, I preferred to synonymize *S. excelsa* with *S. alba*. Most probably, what had been called *S. excelsa*, are several robust clones of *S. alba* very widely cultivated (author's note to the English edition).

to 800–1,100 m. Hybrids with *S. alba* are also widely distributed in the boreal belt of North America. (Fig. 18.)

Var. **sphaerica** Hryniewiecki, 1933, Tent. Fl. Lith.: 67 = var. *capitata* Snarskis, 1954: 225 = var. *bullata* hort. (see also Kobendza 1935; Rasinš 1959). This is an outstanding ornamental variety with a short trunk and dense spherical crown that looks as if trimmed. It has been known in the Baltic Countries since the late 18th century and is still rather popular in Lithuania; it is also occasionally found in Poland, Latvia, and around St. Petersburg (for instance, in Zelenogorsk and Luban). Of course, it deserves to be introduced more widely.

NOTE. As it was mentioned in chapter 3, section 5, in Europe *S. fragilis* most frequently hybridizes with *S. alba*. Long before scientists learned about the ability of willows to form hybrids, many of *S. fragilis* × *S. alba* hybrids had been assigned specific names, some of which occasionally may still be found in the literature, for example, *S. rubens* Schrank, 1789, Baier Fl. 1: 226; *S. russelliana* Sm. 1804, Fl. Brit. 3: 1045; *S. viridis* Fr. 1828, Novit. fl. Suec. 2 ed.: 283; *S. fragilissima* Host, 1828, *Salix*: 6; *S. palustris* id. 1828, op. cit.: 7.

According to results of multiple observations made by different researchers in various regions of Europe, the "pure" *S. fragilis* occurs there much more rarely than its hybrids with *S. alba* (Wimmer 1866: 133; Wołoszczak 1889: 292; Petunnikov 1901: 38; Szafer 1921: 33; Görz 1922: 31; Nazarov 1936: 203; Buser 1940: 630; Lawalrée 1952: 38; Chassagne 1956: 259; Rechinger 1957: 66). My own observations in the European temperate belt and Carpathians have led me to the same conclusion. More than that, a revision of the West European literature makes it clear that on many occasions hybrids of *S. fragilis* were mentioned under the name of "pure" *S. fragilis*. Consequently, data on the range of the "pure" *S. fragilis* in Europe need to be radically revised and reduced. For example, in the old as well as recent editions of the "British Flora" (Linton 1913; Moss 1914; Clapham et al. 1962), "*S. fragilis*" is, for certain, a collection of hybrids. The real *S. fragilis*, known in the British literature under the name of var. *decipiens*, is infrequent in England, occurring mostly in its southern parts. There is no doubt that botanists of the Iberian Peninsula, as well, have listed mostly hybrids under the name of *S. fragilis* (that was noticed by R. Görz as early as 1929). The same is true for the flora of the Balkans. Relying on this information, one can say with enough confidence that hybrids of *S. fragilis* prevail over the species within the European part of its range.

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Sect. 6. *Subalbae*

Koidzumi, 1913, Bot. Mag. Tokyo 27: 88.

T y p u s: *Salix pierotii* Miq.

Trees of moderate size. Bark on old stems with coarse longitudinal fissures. Floriferous buds considerably different from vegetative ones. Petiolar glands obsolete. Leaves lanceolate, narrowly acuminate, densely and sharply serrate at margins. Catkins precocious or coetaneous, short-stalked, small. Bracts persistent. Nectaries two in male flowers, one or two in female ones. Stamens two, their filaments short, anthers small, globular. Capsules sessile, ovoid, small, glabrous or pubescent; styles variably developed: nearly none to 1 mm long; stigmas small, two-lobed or two-parted.

This is an East Asian section, parallel to the European-West Asian section *Salix*. It appears to consist of just two species.

Key to Species

1. Floriferous buds broadly ovoid, occasionally nearly round, rather flat on their adaxial side, conspicuously convex on the back. Stipules slightly inequilateral, flat, shorter than petioles, mostly fugacious. Anthers bright orange when alive. Capsules pubescent, styles elongated, often cleft 11. **S. pierotii**
— Floriferous buds oblong-ovoid or ovate, nearly equally convex on both sides. Stipules distinctly inequilateral, their margins revolute, usually more persistent. Anthers yellow when alive. Capsules glabrous or rather pubescent. Styles very short * **S. babylonica**

11. **S. pierotii** Miq. 1867, Ann. Mus. Lugd.-Bat. **3**: 27 et seorsim (Prolusio Fl. Jap.) **4**: 215; id. 1871, Bijdr. Fl. Jap. **4**: 6; Toepffer, 1909, Salic. Exs. **4**: N 181; Koidzumi, 1926, Bot. Mag. Tokyo **40**: 346. —Non *S. pierotii* auct.: Komarov, Alisova, 1931, Opred. rast. Dalnevost. kr. **1**: 426; Nazarov, 1936, Fl. SSSR **5**: 128 (these notes actually refer to *S. kangensis* Nakai). —*S. koreensis* Anderss. 1868, in DC. Prodr. **16**, 2: 271; Komarov, 1903, Fl. Manchzh. **2**, 1: 24; Koidzumi, 1913, Bot. Mag. Tokyo **27**: 89; id. 1916, op. cit. **30**: 332; Schneider, 1916, in Sarg. Pl. Wilson. **3**, 1: 111; Nakai, 1930, Fl. sylv. Kor. **18**: 164; Nazarov, 1936, op. cit. **5**: 201; Ohwi, 1965, Fl. Jap.: 365. —*S. eriocarpa* Fr. et Sav. 1876, Enum. Jap. **2**: 503; Koidzumi, 1913, op. cit. **27**: 88; Schneider, 1916, op. cit. **3**, 1: 108; Ohwi, 1965, op. cit.: 364. —*S. mixta* Korsh. 1892, Trudy SPb. bot. sada **12**, 8: 391; Komarov, Alisova, 1931, op. cit. **1**: 424. —*S. dolichostyla* Seemen, 1901, Bot. Jahrb. Beibl. **67**: 39; id. 1903, Salic. Jap.: 26 et tab. 2; Nazarov, 1936, op. cit. **5**: 198; Hao, 1936, Syn. Chin. *Salix*: 65. —*S. jessoënsis* Seemen, 1903, Salic. Jap.: 31 et tab. 3, fig. F-L; Schneider, 1916, op. cit. **3**, 1: 110; Miyabe, Kudo, 1921, Icon. forest tr. Hokkaido **1**: N 14; Ohwi, 1965, op. cit.: 365. —*S. pogonandra* Levl. 1912, Feddes Repert. **10**: 437. —*S. hondoensis* Koidz. 1913, op. cit. **27**: 87 (p. p.); Schneider, 1916, op. cit. **3**, 1: 110 (p. p.). —*S. hirosakensis* Koidz. 1913, op. cit. **27**: 264. —*S. pseudokoreensis* Koidz. 1926, op. cit. **40**: 346. —? *S. feddei* Levl. 1912, op. cit. **10**: 436. —? *S. pseudo-jessoënsis* Levl. 1912, op. cit. **10**: 436.

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T y p u s: "Japonia: in Monte Iwajama—Siebold; ins. Kiusiu, promont. Nomo-Saki—Pierot" (U!) (fragmenta typi—LE!).

HABIT: A tree of a moderate size (to 15–18 m tall and 50–60 cm in stem diameter).

HABITATS. Often it is found close to running water; however, even more frequently, solitary trees or small groves are scattered amidst wet graminoid meadows dominated by *Calamagrostis*, which are very common on flat bottoms and slanting slopes of valleys in the south of the Russian Far East (it is a very typical landscape plant there). In this country, it never ascends high up in the mountains (it is found as high as 750 m in the southern Sikhote-Alin).

DISTRIBUTION: Southern Amur Oblast (at the Lower Zeya and Amur, downstream of its confluence with the Zeya); Birobidzhan; the Amur immediately downstream of Khabarovsk; southern Maritime Province and its marginal zone bordering the Ussuri River; the southeastern part of Northeast China (not found west of the Sungari and Liao Ho). *S. pierotii* also occurs on the Korea Peninsula and in Japan, from southern Hokkaido (Sapporo) to Kyushu. (Fig. 18.)

* **S. babylonica** L. 1753, Sp. pl.: 1017; Anderss. 1867, Monogr. Salic.: 50; Boiss. 1879, Fl. Or. **4**: 1185; Hook. f. 1890, Fl. Brit. Ind. **5**: 629; Seemen, 1903, Salic. Jap.:

29; Schneider, 1916, in Sarg. Pl. Wilson. **3**, 1: 42; Hao, 1936, Synops. Chin. *Salix*: 65; Nazarov, 1936, Fl. SSSR **5**: 196; Grossheim, 1945, Fl. Kavk. **3**: 17; Skvortsov, 1960, Bot. mat. Gerb. Bot. in-ta AN SSSR **20**: 82; id. 1962, Bot. mat. Gerb. in-ta bot. AN UzbSSR **17**: 62; id. 1966, Trudy Bot. in-ta AN ArmSSR **15**: 119; Rech. f. 1957, in Hegi, Ill. Fl. Mitteleur. **3**, 1: 70; Ohwi, 1965, Fl. Jap.: 364. —*S. subfragilis* Anderss. 1858, Mem. Amer. Acad. **6**, 2: 450. —*S. lasiogyne* Seemen, 1903, op. cit.: 32; Koidzumi, 1913, Bot. Mag. Tokyo **27**: 265. —*S. pseudogilgiana* Levl. 1912, Feddes Repert. **10**: 436. —*S. pseudolasiogyne* Levl. 1912, op. cit. **10**: 436; Nakai, 1930, Fl. sylv. Kor. **18**: 168. —*S. matsudana* Koidz. 1915, Bot. Mag. Tokyo **29**: 312; Schneider, 1916, op. cit. **3**, 1: 107; Hao, 1936, op. cit.: 66; Ohwi, 1965, op. cit.: 364. —*S. neolasiogyne* Nakai, 1928, Bull. Soc. Dendr. Fr. **66**: 47. —*S. dependens* Nakai, 1928, op. cit. **66**: 49; id. 1930, op. cit. **18**: 170. —*S. jeholensis* Nakai, 1936, Rep. Sci. Exped. Manchoukuo **4**, 4: 74. —*S. ohsidare* Kimura, 1946, Symb. Iteol. **9**: 79; id. 1958, op. cit. **16**: 113. —*S. pseudomatsudana* Chou et Skvortz. 1955, in Liou Tchen ngo, Ill. Fl. Tr. Shr. Northeast China: 552 et tab. —*S. capitata* Chou et Skvortz. 1955, op. cit.: 551. —? *S. pseudo-jessoënsis* Levl. 1912, op. cit. **10**: 436.

T y p u s: "In Oriente. Hort. Cliff.: 454; Royen Lugd.—bat.: 84; Tournef. Coroll.: 41".

HABIT: A tree up to 15 m tall, sometimes taller.

HABITATS AND DISTRIBUTION. The species originates from arid and semiarid regions of Central and North China: Gansu (Kansu), Ningxia (Ningsia), Shaanxi (Shensi), Shanxi (Shansi), Suiyuan, and Jehol, growing there along rivers, on damp valley bottoms, in depressions amidst sand, and other similar habitats. There, huge specimens (up to 20 m tall and more than 1.75 m in diameter) were found by S. Chetyrkin (collections of 1909) in the oases of A-la Shan (Ho-lan Shan).

It is cultivated nearly everywhere in temperate regions of the world. In Eurasia, northernmost localities of its successful cultivation match limits of commercial peach orchards area and include southern England, Belgium, southern Germany, Czechia, Hungary, southern Romania, the Crimea and Caucasus, Uzbekistan, piedmont Kirghizia, the warm central part of Northeast China, major part of the Korea Peninsula, and Japan. Also, there are some cultivated specimens on southern Sakhalin around Kholmsk. In southern Middle Asia, it is successfully grown as high as 2,000–2,200 m in the mountains (in Vanch and Khorog); in northern India, at 2,700 m.

NOTE. *S. babylonica* was probably introduced to Europe from the Near East in the 17th century. An originally introduced female clone with weeping branches is still the only one that appears to grow everywhere in Europe. The same clone was brought (presumably from Europe) to the Crimea and Black Sea Coast. However, there are at least three different clones existing in Middle Asia, one of which is a male. This fact supports the idea that *S. babylonica* was independently introduced to Middle Asia directly from China. In China as well as Japan and Korea, there are even more cultivars known, and this explains the abundance of existing synonyms. It is in China where one can find non-weeping forms, which are quite common there. They prevail in herbarium collections brought from the area of the species original distribution, although these collections as well appear to mostly represent cultivated specimens.

A couple of very special horticultural varieties, which are occasionally found in arboreta, are, undoubtedly, products of ancient Chinese selection. These are var. *annularis*, its leaves curved into rings, and var. *tortuosa* with its irregularly tortuous shoots.

Sometimes, *S. cantoniensis* Hance and *S. heteromera* Hand.-Mazz. are mentioned in the literature as synonyms of *S. babylonica*. This appears to be wrong.

Besides *S. babylonica*, there are a few more ornamental weeping willows. One of them, a cultivar of *S. alba*, "*vitellina pendula*" = *S. chrysocoma* Dode, has been mentioned here. The other two are *S. blanda* Anderss. and *S. salomonii* Carrière.

S. blanda Anderss. 1867, Monogr. Salic.: 50; Skvortsov, 1962, Bot. mat. Gerb. In-ta Bot. AN UzbSSR **17**: 62; id. 1966, Trudy Bot. in-ta AN ArmSSR **15**: 120. — *S. elegantissima* K. Koch, 1871, Wochenschr. Ver. Beförd. Gartenb. Preuss. **14**: 380; Seemen, 1908, in Aschers. et Graebn. Synopsis **4**: 73, 213; Dostá I, 1950, Květ. ČSR **2**: 881; Rech. f. 1957, in Hegi, Ill. Fl. Mitteleur. **3**, 1: 68. — *S. petzoldii* hort. — *S. sieboldii* hort.

This willow is known only as a cultivated plant. There exist a few clones, at least three or four. Traditionally, it is considered to be a hybrid of *S. babylonica* and *S. fragilis*. Yet some of its characters do not fit well within this concept. It is more likely that one parent was *S. babylonica* and the other one was a hybrid from the series *S. alba* × *S. fragilis*. *S. blanda* appears to be selected relatively recently, somewhere in Europe. K. Koch (op. cit.) assumed that this willow was of Japanese origin, and this opinion of his has been occasionally referred to in the literature. However, there is no evidence in support of that hypothesis. Although *S. blanda* is considerably inferior to *S. babylonica* regarding its ornamentality, it is much more hardy. It is doing quite well in the Baltic States and retains its ornamental qualities even in Moscow if grown at sheltered sites.

S. salomonii Carrière, 1872, Rev. Hortic. **64**: 115; Schneider, 1904, Hand. **1**: 36; Skvortsov, 1966, Trudy Bot. in-ta AN ArmSSR **15**: 120. — *S. sepulcralis* Simonkai, 1889, Termesz. Fü z. **12**: 157; Seemen, 1909, in Aschers. et Graebn. Synopsis **4**: 204; Dostá I, 1950, Květ. ČSR **2**: 883; Vicioso, 1951, Salic. Españ: 53.

One can say with much confidence that this form is a hybrid *S. alba* × *S. babylonica*. It is nearly as hardy as *S. blanda* or *S. alba* var. *vitellina* and at the same time almost as ornamental as *S. babylonica*. It is rather common in Azerbaijan (Baku) and also occasionally found in Armenia, Georgia, as well as Lithuania (in Vilnius and its suburbs).