

# Characterization of areas

## Grossulariaceae

### *Ribes* L.

#### 1. *Ribes alpinum* L.

This is an unarmed shrub, 1 - 2 m tall with thin, somewhat pendulous shoots and with 3 (5) lobed leaves 3 - 6 cm long, glabrous or sparingly hairy. The flowers are small, yellowish green in racemes, and fruits are berries, globose 5 mm in diameter, crimson, insipid, staying long on the twigs. It is a characteristic feature of this species that it has a very early and rapid development of leaves in the spring.

The range of *R. alpinum* is disjunctive and it is composed of two basic parts. The main part of the range covers central and partially also eastern, northern and southern Europe and it reaches in the north in Finland 65° Lat. N. In the Balkan peninsula *R. alpinum* does not occur in Albania, Greece and Turkey. A smaller but clearly isolated from the former part of the range covers in southwestern Asia only the western Caucasus and northeastern Anatolia, where the most westerly stands have been reported from province of Giresun. The most southern stands are to be found in northwestern Africa, in Morocco.

*R. alpinum* is a mesophilous shrub, which sustains even considerable shading well, though it grows also in open places. Optimal conditions for its development are to be found in broadleaved or mixed forests, on humus soils, on various geological formations but usually on limestone. It appears also on rocks within forests, singly or in small groups. It occurs both in lower located places and in mountains, in which the stands are much more common, as far as the upper limit of the forest. Further up it is to be found much less commonly. In the Swiss Alps it attains 2000 m, in Bulgaria 2180 m, in the Atlas Mts. in Africa even 3300 m. On the other hand in Anatolia it is distributed between 1150 and 2200 m, highest in province of Artvin.

This currant has been taken into cultivation already towards the end of the XVI c. It found abundant use in forming low natural or formed hedges. It sustains cutting well and it maintains its regenerative capacity until late age.

References: 64 (4), 103 (4), 156 (1), 218 (2).

#### 2. *Ribes bibersteinii* Berland. ex DC.

This is an unarmed shrub, up to 2 m tall with large leaves, up to 12 - 13 cm in diameter, palmately 3 - 5 lobed. The flowers are reddish in pendulous racemes, and the fruits are red berries globose, about 5 mm in diameter. This species is closely related to the central European species *Ribes petraeum* Wulfen.

Almost the whole range of *R. bibersteinii* covers the Caucasus, beyond which only single scattered stands

are known from northeastern Anatolia (provinces of Trabzon, Rize, Artvin and Kars) and from north-western Iran (provinces of Azerbajdzhan and Gilan – in the latter only two stands).

This is a mesophilous species, but light requiring, to be found also in the understorey of deciduous and mixed forests, particularly in places with greater light availability to the forest floor and on their edges as well as along the banks of streams and on exposed limestone rocks. As a rule it grows singly or in places it forms its own pure thickets. On the Caucasus, in Armeniya, it reaches the subalpine zone, to an elevation of 1800 m. In Anatolia it appears at more or less 1200 to 2100 m. In Iran it has been found in a beech wood (*Fagus orientalis* Lipsky) at an elevation of 1900 m.

References: 64 (4), 103 (4), 218 (2), 496.

## *Labiatae*

### *Satureja* L.

#### 3. *Satureja thymbra* L.

This is an aromatic, much-branched, small shrub up to 40 - 50 cm tall, and more or less as wide, grey puberulent having characteristic glandular-punctate leaves, 7 - 20 mm long, linear to obovate-spathulate and subglobose, verticillasters composed of many small mauve flowers.

This is an eastern Mediterranean species. In Europe it occurs only in Sardinia, in Greece, both continental and on the islands, and in Turkey, where, however, it grows only at the tip of the Gallipoli peninsula. On the other hand in southwestern Asia the range of the species extends as a narrow usually coastal belt along western and southern Anatolia, western Syria, Lebanon and reaches in the south to Israel to the Judean Mts. Besides it is known also from Africa, from northern Cyrenaica (Libya) and also from only one stand in northeastern Cyprus.

*S. thymbra* is a thermophilous shrub, which in the north only slightly exceeds 40° Lat. N (Athos in Greece and the Gallipoli peninsula in Turkey). The greatest accumulation of stands of the species occurs in the Greek islands of the Aegean and on Crete. It grows in open exposed places, in dry scrub, particularly in the phrygana and sometimes also in open pine forests (*Pinus brutia* Ten. and *P. halepensis* Miller), on a fragile, limestone substratum. It is most common in lower located regions, almost from the sea level itself up to about 400 - 600 m, and even to 1000 m, however, on Crete, where communities of the phrygana are found even at considerable elevations, *S. thymbra* grows up to 2000 m.

It is a melliferous shrub and it may also have some pharmaceutical importance.

References: 64 (7), 163 (3), 188, 189.

### *Thymbra* L.

#### 4. *Thymbra spicata* L.

Similarly as other species from the genus *Thymbra* it is a small erect shrub up to 40 - 50 cm tall. Its leaves, similarly as in *Satureja thymbra* L. are glandular-punctate, linear to linear-lanceolate, up to 15 - 20 mm long and dense spicate inflorescences are composed of pink flowers.

The whole genus *Thymbra* is represented by only three species and its range is typically an eastern Mediterranean one. *T. spicata* is here the most common species and it determines the range of the whole genus. The other two species are known from only few or even single stands.

The range of *T. spicata* covers primarily southwest Asia, where the shrub grows in Anatolia (particularly northwestern, western and southern), western Syria, Lebanon, Israel and western Jordan, and also in northeastern Iraq and exceptionally also in western Iran. In Greece, where in the northerly direction it does not exceed 40° Lat. N the stands of *T. spicata* are infrequent and known only from the western part of the country and also from a few islands such as Corfu, Euboea, Milos, Chios and Lesvos. In *T. spicata* two varieties are recognized: var. *spicata* – distributed over the whole range of the species and var. *intricata* P. Davis with divaricately branched flowering shoots. The latter variety is an endemite of southern Anatolia and here in the mountains it is to be found at much higher elevations than the typical variety, up to 1520 m. On the other hand var. *spicata* occurs almost from the seashore to an elevation of 600 - 800 m (in Greece no higher than 600 m), and only exceptionally to 1200 m. Higher elevated stands are known from Lebanon and Iraq – up to 1400 m, and from Iran, where in province of Kermanshah *T. spicata* has been reported from an elevation of 1000 - 1800 m.

Throughout the range of its occurrence *T. spicata* grows on usually exposed, dry and insolated places in valleys and on slopes of mountains or on high banks of dried-out rivers and abandoned fields, frequently on rocky calcareous places, in steppe communities, in phrygana and in open pinewoods, singly or in small groups.

References: 64 (7), 163 (3), 188, 259 (3), 540, 551.

## Leguminosae

### *Cercis* L.

#### 5. *Cercis griffithii* Boiss.

A small tree, 3 - 6 m tall with a stem diameter of 6 - 15 cm, or else a strong shrub with numerous stems forming a globular or inversly conical crown. This species is closely related to the Mediterranean *Cercis siliquastrum* L., from which it differs in having smaller dimentions of individual elements, namely smaller purple-violet flowers on half as long peduncles and also shorter though wider pods.

It is an Irano-Turanian species with a range cut up into several parts. The main, continuous part of the range covers southwestern Tadzhikistan, and the closely associated northeastern Afghanistan (Badakhshan). On the other hand in considerable isolation there are the most northern infrequent stands in western Tyan-Shan (Kuraminskiy and Ugamskiy Khrebet). The letter much smaller part of the range covers regions lying near Kabul and the third in the region of Herat (northwestern Afghanistan). Even further in the westerly direction there occurs *C. griffithii* in southern Turkmeniya (Kopet Dag Mts.). Completely isolated and at the same time the most westerly stands have been found thirty years ago on the Caucasus, in southwestern Armeniya (region of Megri).

*C. griffithii* is a xerophytic and light requiring species. It occurs singly or in groups, in places forming its own almost pure thickets, particularly in stony wide river valleys. It grows on loess and gravelly-stony dry slopes and on sandstones and limestones, together with other xerophytic trees and shrubs from the genera *Pistacia*, *Acer*, *Juniperus*, *Celtis*, *Amygdalus*, *Crataegus*, *Rosa*, *Cotoneaster*, *Lonicera*, *Caragana* and *Colutea*. In Armeniya these are *Paliurus spina-christi* Miller, *Rhamnus pallasii* Fisch. et C. Meyer, *Rhus coriaria* L. and *Clematis orientalis* L. While it appears already at low elevations of 200 - 300 m it is most commonly distributed between 800 and 1800 m in Tadzhikistan and between 1200 and 2000 m in Afghanistan. On higher elevations of 2200 - 2400 m it is rather rare.

Similarly as *Cercis siliquastrum* L., though not to such an extent it is outplanted for decorative purposes (flowers) in towns and settlements, however, only within the natural range of its distribution.

References: 218 (3), 517, 539, 552, 559.

## 6. *Cercis siliquastrum* L.

A strong, widely spreading bush with several stout stems or a small tree up to 6 - 10 (15) m tall and in favourable conditions even taller, frequently with a short, stout stem 50 - 60 cm in diameter. Its leaves are orbicular, 7 - 12 cm long, with entire margins, deeply cordate, somewhat coriaceous. As a rule it flowers very abundantly and its pinkish-purple flowers cover densely not only branches of various length but also the stem (it is a cauliflorous species).

This is an eastern Mediterranean species with a range extending from northwestern Yugoslavia (Istria peninsula) to Turkey. In southwest Asia, where *C. siliquastrum* is not as common as in Europe it grows in western and southern Anatolia, in western Syria and in Lebanon, and also in Israel (in the south to the Judean Mts.) and in Jordan. Similarly as several other Mediterranean species it enters inland and its stands are known in southeastern Anatolia, in Iraq, in western, southern and even northern Iran. Further eastwards it is replaced by *C. griffithii* Boiss. In many countries both within the natural range and beyond it, *C. siliquastrum* is cultivated since antiquity for ornamental purposes and sometimes when naturalized it can go wild, as for example on the Iberian peninsula and Crimea in Europe and on the Black Sea shores of the Caucasus and on Cyprus. As a result it is frequently difficult to determine the natural limits of the occurrence of the species.

*C. siliquastrum* is resistant to drought and has considerable demands as regards light and warmth. It grows primarily in maquis communities and in shiblyak as well as in sparse forests, particularly in oak forests, most commonly on stony, limestone substratum. Old tree form individuals of considerable dimensions are to be found primarily near human settlements, near monasteries, within olive plantations and vineyards, where they are protected from felling.

In its vertical range the species is distributed almost from the seashore to 600 - 800 m, rarely to 1000 m. The most elevated stands are to be found in Anatolia at 1370 m, in Greece at 1500 - 1700 m and in Iran even at 3000 m (Bakhtiari Mts.).

This valuable ornamental species is cultivated on the one side for its abundant early spring flowering and interesting leaves and on the other for the flat, thin and wide, dry brown pods. The wood is locally used for cabinet-making.

References: 64 (3), 163 (3), 228 (3), 254, 539, 558, 570.

## *Halimodendron* Fischer ex DC. (monotypic genus)

### 7. *Halimodendron halodendron* (Pallas) Voss

Syn.: *H. argenteum* (Lam.) DC.

It is an erect, very prickly shrub 1 - 2 (3) m tall characterized by a deep, extensive and richly branched root system. Its thorns are very sharp and reach 6 cm in length. The paripinnate leaves are composed of 1 - 5 pairs of grayish-green leaflets. It flowers very abundantly and the flowers are colourful, from pale-violet to pink and occasionally even white (var. *albiflora* (Karelin et Kir.) Priach.).

This is an Irano-Turanian species the more or less continuous range of which extends from western Mongolia through western China (Dzhungaria and Kashgaria) to the central Asiatic republics of the USSR, all

the way to the valley of river Amu Darya in the west (central and southern Kazakhstan, Kirgiziya, Uzbekistan and Tadzhikistan). In that part of the range the most northern stands are to be found in eastern Kazakhstan at about 51° Lat. N (near Semipalatinsk). A further, western part of the range with scattered and much more sparse stands covers western and northern Iran, southern Turkmeniya and southern Caucasus (Gruziya, Armeniya, Nakhichevan). The species has been reported also from single stands in northeastern Anatolia (Kars province) and from western Pakistan (Waziristan), however, from these regions more recent confirmations are lacking. Besides in this range one should include also the stands in the European part of the USSR, from the Ukraine (lower Don basin), however, it appears that these stands concern specimens that went wild.

*H. halodendron* is a thermophilous and light requiring species resistant to drought and low temperatures and also to the salinity of soils. It grows in steppe and semi-steppe regions, on sands and gravels, particularly in valleys of rivers, but in places that do not get periodically flooded. It enters into the composition of thickets and sparse riverside poplar forests, the so called "tugaj" (*Populus euphratica* Olivier, *P. pruinosa* Schrenk) with species from genera *Tamarix*, *Elaeagnus*, *Salix* and *Lycium*. It can also form its own, pure thickets developing frequently after degradation of the above mentioned forests. Due to the ease with which it propagates vegetatively such thickets are characterized by great durability, individuals coming from root suckers appearing even at considerable distances from the maternal shrub.

While in the north of the range *H. halodendron* grows primarily in lowland regions in the south it occupies also more elevated places. Thus in Iran it can be found to 2150 m, in Tadzhikistan to 2600 m and in Afghanistan to 2700 m.

Within the natural range of its distribution *H. halodendron* is frequently cultivated as an ornamental shrub, and in view of its considerable resistance to frost, its cultivation is also possible in regions located further to the north. However, in such conditions it does not flower as abundantly as on natural stands.

References: 103 (5), 177 (5), 218 (3), 364, 558.

## Loranthaceae

### *Arceuthobium* M. Bieb.

#### 8. *Arceuthobium oxycedri* (DC.) M. Bieb.

Syn.: *Viscum oxycedri* DC., *Razoumofskya oxycedri* (DC.) F. Schultz

This is an evergreen hemiparasitic shrub with tufted stems 10 - 12 cm long or somewhat longer, with small, scaly leaves, 0,5 - 1 mm long. It grows on twigs of various species from the genus *Juniperus* L. Depending on geographic distribution, the species of the host plant changes. In the western part of the range it is most common on *J. oxycedrus* L. More rarely it can be *J. communis* L., *J. phoenicea* L., *J. sabina* L., *J. excelsa* M. Bieb., *J. drupacea* Labill., *J. semiglobosa* Regel, *J. servaschanica* Komarov or else *J. turkestanica* Komarov, while in eastern Africa (Kenya) it will be *J. procera* Hochst. Besides the shrub has been also found on *Cupressus macrocarpa* Hartweg on a specimen growing in cultivation in Crimea.

*A. oxycedri* is characterized by having a wide range, extending from Spain and northwestern Africa (Morocco and Algeria) in the west to India in the east. This thermophilous species only occasionally extends beyond 45° Lat. N. and this only in Jugoslavia, while in the south as a rule it does not reach further than 34° Lat. N. Throughout this area its range is disjointed and stands are usually widely scattered. In southern Europe *A. oxycedri* is absent in Portugal and Italy and in the USSR it is known only from Crimea. The Asiatic part of the range includes Anatolia (particularly the southern part), northwestern Syria, northern Lebanon, northern Iraq and the Caucasus, and then after a considerable gap in northeastern Iran and southern Turkmeniya. This hemiparasite is absent in Afghanistan but appears in Middle Asia (USSR) in Tadzhikistan, Uzb-

kistan, Kirgiziya and in the most southern Kazakhstan (western Tyan-Shan). Further east only single stands are known, much isolated from each other, in Pakistan (region of Quetta) and in the Indian Himalayas (Upper Chenab). It is possible that it is more common there, however, in view of the difficulties of observing it the frequency of it being reported is very low. In that part of the range of *A. oxycedri* there occurs also another representative of the genus *Arceuthobium*, namely *A. minutissimum* Hook. f., which is a hemiparasite on young trees of *Pinus griffithii* McClell. and sometimes also on *Cedrus deodara* (D. Don) G. Don. This species belongs to the smallest Dicotyledonous plants, measuring no more than 2 - 5 mm in length.

In its vertical distribution the occurrence of *A. oxycedri* is dependent on the vertical distribution of the hosts. Thus in Albania and in Yugoslav Macedonia the species reaches to an elevation of 1200 m, in Greece and Anatolia to about 1400 m, in Iraq only to 1000 m, in Iran to 2000 m, in northwestern Africa to 2400 m, in Tadzhikistan to 2600 m, in Pakistan to 2700 - 2900 m and in India even to about 3000 m.

References: 64 (7), 103 (3), 123 (3), 163 (1), 177 (3), 228 (4), 242 (2), 538, 556, 566, 572.

### *Loranthus* L.

#### 9. *Loranthus europaeus* L.

This is a hemiparasitic shrub with a stem up to 50 cm long, in appearance resembling *Viscum album* L., from which it differs primarily in having deciduous leaves with a pinnate and not parallel venation. Similarly as in mistletoe its stems are green and fragile. The fruit is a yellow, pyriform-globose berry, 10 mm in diameter. The shrub appears on branches and stems of various species from the genus *Quercus* (but not on evergreen ones) and also on *Castanea sativa* Miller. Just as *Viscum album* L. it does not constitute any major problem for the host plant, however, when it occurs very abundantly it may lead to the host's death.

This is a more thermophilous species than mistletoe and it has a smaller range. It is more widely distributed only in southeastern Europe, particularly on the Appenine and Balkan Peninsulas. In the northerly direction it only slightly exceeds 50° Lat. N, this in E. Germany, Czechoslovakia and the Ukraine. Beyond Europe infrequent scattered stands are known from southern and western Anatolia and from northwestern Syria. It occurs more commonly in northeastern Iraq. Furthest to the east are stands in western Iran (Kurdistan), however, no further than 47° Long. E.

In Europe *L. europaeus* occurs primarily on lowland locations and in lower reaches of the mountains, usually no higher than at 1000 m elevation (in Greece and in Yugoslav Macedonia up to 1200 m). In the Asiatic part of the range its stands are known exclusively above 600 - 800 m (in Iran even above 1450 m) and its elevational maximum is 2000 m.

References: 64 (7), 123 (3), 163 (1), 228 (4), 556.

#### 10. *Loranthus grewinkii* Boiss. et Buhse

This is a hemiparasitic shrub, closely related to *Loranthus europaeus* L. from which it differs primarily in having smaller, half the size leaves and hermaphroditic flowers. In *L. europaeus* leaves are up to 5 cm long and the flowers are usually dioecious.

*L. grewinkii* is a southwest Asia endemite and occurs here almost exclusively in Iran, particularly in its western and southern part. Besides it has been found also in northwestern Afghanistan, in province of Herat. Its range constitutes as it were an easterly extension of *L. europaeus*. It usually grows on trees and shrubs from the family *Rosaceae* (*Amygdalus*, *Prunus*, *Crataegus*, *Pyrus*, *Cotoneaster*) and also on *Acer monspes-*

*sulanum* L. subsp. *cinerascens* (Boiss.) Yalt., and more rarely on oaks. It appears in montane regions in Iran between 1800 and 3000 m and in Afghanistan at 1600 m.

References: 556.

## *Viscum* L.

### 11. *Viscum album* L.

This is an evergreen subspherical shrub with crown diameter up to 1 m, usually pendulous, regularly dichotomously branched, hemiparasitic on various trees and shrubs. Branches are green and fragile, leaves are opposite, obovate-oblong, coriaceous, with an almost indistinct appearance of both sides. The fruit is a white or yellowish, translucent berry 6 - 10 mm in diameter. It is propagated by birds which transfer the seeds with a glutinous substance of the fruits that allow an easy sticking to bark of branches or stems of the host and germinate there. Seedlings take water and mineral salts from the wood of the host with the help of special suckers.

This species is widely distributed throughout a major part of Europe, particularly in Central Europe, western, southwestern and northern Anatolia, on the Caucasus, in northern and western Iran and in Lebanon. Besides it is also known from few stands in Syria, southern Turkmeniya (USSR) and northwestern Africa (Algeria). Furthest to the north it reaches in Europe, in Scandinavia to 59°45' Lat. N. There exist opinions, however, that the range is much greater, disjunctive and composed of two parts, the western one discussed above and the eastern one extending from Pakistan to China and Japan. The systematics of the genus *Viscum* is in the latter part of Asia not sufficiently clear yet, thus there is no certainty whether in fact *V. album* grows there or whether it is some other closely related species. In the present study therefore we have only limited ourselves to the western part.

Depending on the host plant, and also on the shape of the seeds and shape and pigmentation of the fruits three subspecies are recognized within *V. album*, which are frequently treated also as varieties or even as independent taxa: 1. subsp. *album* – on various Dicotyledonous species, primarily from the family *Rosaceae*; this subspecies is distributed almost throughout the range of the species, 2. subsp. *austriacum* (Wiesb.) Vollm. (= *V. laxum* Boiss. et Reuter var. *pini* (Wiesb.) Hayek, *V. austriacum* Wiesb.) – on various species of pines and particularly on *Pinus sylvestris* L. and *P. nigra* Arnold, 3. subsp. *abietis* (Wiesb.) Abrom. (= *V. laxum* Boiss. et Reuter var. *abietis* (Wiesb.) Hayek, *V. abietis* Wiesb.) – on various species of firs, particularly on *Abies alba* Miller, *A. cephalonica* Loudon, *A. nordmanniana* (Steven) Spach and *A. cilicica* (Antoine et Kotschy) Carr.

Vertical distribution of *V. album* is dependent to a large extent on the vertical distribution of the host plant, however, an accurate determination of this distribution for each subspecies is difficult, since frequently data about the stands of mistletoe are devoid of the information about the species of the host. As regards subsp. *album* it appears practically on trees occurring from the seashore to about 1200 m in Europe, to 1500 m in Anatolia and 2050 m in western Iran. On the other hand subsp. *austriacum* grows in Greece and in Anatolia up to 1600 m while subsp. *abietis*, which is known only from highland and mountain regions occurs as a rule between 600 and 2000 m (Anatolia). The latter two subspecies are not known in Iran.

It is a poisonous plant (fruits). Fresh and dry leaves as well as tips of young shoots are used in the pharmaceutical industry for the production of a medicine relieving blood pressure. In many countries whole shrubs of mistletoe or its branches, similarly as branches of evergreen species from the genus *Ilex* are used at Christmas time for decorating of homes.

References: 64 (7), 103 (3), 123 (3), 163 (1), 242 (2), 556.

## Oleaceae

### *Fraxinus* L.

#### 12. *Fraxinus angustifolia* Vahl

Syn.: *F. oxycarpa* M. Bieb. ex Willd. var. *angustifolia* (Vahl) Lingelsh.

This is a tree 25 m tall, sometimes taller, with gray, deeply reticulate-fissured bark and brown winter buds. The leaves are odd-pinnate, composed of 3 - 15 leaflets, oblong-lanceolate or linear lanceolate, distinctly acuminate. This is a very variable species, both in the form of growth and in the number of pairs of leaflets and in their pubescence. In the southeastern direction it is characterized by a tendency to reduce the number of pairs of leaflets and to have poorer growth (even to the form of a shrub). Thus five subspecies are recognized within it, which are frequently treated, particularly in older studies, though not exclusively, as independent taxa.

*F. angustifolia* is characterized by an extensive range covering almost the whole of southern and partially central Europe (from Portugal to Crimea), northwest Africa (Morocco, Algeria, Tunisia), the Caucasus, southern Turkmeniya, Anatolia, Iran and northwestern Afghanistan, northeastern Iraq, western Syria, Lebanon, northern Israel and northwestern Jordan. The distribution of individual subspecies within this general range is not sufficiently clear, which is frequently associated with different definition of them by various authors. The greatest range is covered by the following three subspecies: 1. subsp. *angustifolia* with leaves glabrous on both sides, composed of 7 - 13 leaflets, 2. subsp. *oxycarpa* (M. Bieb. ex Willd.) Franco et Rocha Alfonso (= *F. oxycarpa* M. Bieb. ex Willd., *F. oxyphylla* M. Bieb.) with leaves more or less villous beneath and 3. subsp. *syriaca* (Boiss.) Yalt. (= *F. syriaca* Boiss., *F. oxyphylla* M. Bieb. var. *oligophylla* Boiss.) with glabrous leaves, however, usually thicker, composed of 3 - 7 leaflets. The first of these subspecies occurs both in southern Europe and in western, southern and inner Anatolia. The second, subsp. *oxycarpa*, has a similar range but extends further northwards also into the Caucasus. The third, subsp. *syriaca* is known only from southwestern Asia and it demarcates the southern and eastern limit of the range for the whole species. The status and ranges of the remaining two subspecies are still insufficiently well known. They are endemites for Iran, subsp. *bornmuelleri* (Lingelsh.) E. Murray and subsp. *persica* (Boiss.) E. Murray.

*F. angustifolia* is a forest species, mesophilous for subsp. *oxycarpa* and moderately xerophytic or moderately mesophilous for the remaining subspecies, however, almost always it is associated with some kind of water runs. In Bulgaria, European Turkey and northern Anatolia it forms its own forests or enters into other deciduous broadleaved forests, particularly on lowland, fertile, deep soils. It is one of the main components of the so-called Longos Forests, which develop near the seashores, along river mouths and on lakes, on wet and swampy places. It is accompanied by the following species of trees and shrubs from genera: *Alnus*, *Ulmus*, *Carpinus*, *Quercus*, *Salix*, *Acer*, *Cornus*, *Crataegus* and *Smilax*. In southwestern Anatolia it appears also in *Liquidambar orientalis* Miller forests. Further southwards and eastwards *F. angustifolia* represents only a component of more or less open forests occurring as a belt along rivers and streams in submontane and montane regions. It can also occur on calcareous rocks. Thus it grows from the seashore to 1450 m in Iraq, to 1800 m on the Caucasus, to almost 2000 m in Anatolia and to 2600 m or even higher in Iran.

In southwestern Asia, particularly in the south, *F. angustifolia* is, similarly as *Salix alba* L. or *S. excelsa* S. Gmelin, *Populus afghanica* (Aitch. et Hemsley) C. Schneider and *Platanus orientalis* L. widely distributed in cultivation, thus it is sometimes difficult to distinguish natural stands from secondary ones. It is a popular tree for planting along irrigation canals. Its wood is used by the local population for various household purposes.

References: 64 (7), 78, 103 (7), 163 (3), 218 (3), 228 (4), 242 (3), 254, 311, 384, 395, 413.



### 13. *Fraxinus excelsior* L.

This is a fast growing when young, long living and tall tree 35 - 40 m in height, with a columnar well cleaning stem, about 1 m in diameter with a bark that is initially olive green and smooth but later it is dark grey and fissured. A characteristic feature of this species are the black winter buds and odd-pinnate leaves composed of 7 - 15 long acuminate leaflets. Two subspecies are recognized within it, subsp. *excelsior* with glabrous shoots, petioles and leaf-rhachis and subsp. *coriariifolia* (Scheele) A. Murray with twigs, petioles and rhachis more or less pubescent. This latter subspecies, occurs in the east of the range of the species, in northern Iran (provinces of Azerbaydzhan, Gilan, Mazandaran and Gorgan), in northeastern Anatolia, in eastern Caucasus and in the Talish Mts. Sometimes it is treated as an independent species *Fraxinus coriariifolia* Scheele.

*F. excelsior* is widely distributed, almost throughout Europe except on its northern, southern and eastern margins. In the north, in Scandinavia it reaches 64° Lat. N. In southwestern Asia it attains its southern limit of distribution in northern Anatolia, southern Caucasus and northern Iran, where in the easterly direction it does not extend beyond 56° Long. E. Isolated stands are also known in southern Anatolia from Amanus Mts. and the nearby Kurd Dagh mountain range in northwestern Syria. In the Balkan Peninsula the southern limit of the range is not fully clear, since *F. excelsior* is frequently mistaken here with *F. angustifolia* Vahl subsp. *oxycarpa* M. Bieb. ex Willd.

*F. excelsior* is an important component of the upper tree zone of mixed and broadleaved forests, and in places it even forms pure stands, however, only of limited size. In river valleys it grows primarily with *Alnus glutinosa* (L.) Gaertner, with either one or the other being the dominant element. While the best conditions for its growth are to be found on moist, fertile and deep soils, it can thrive quite well on relatively dry soils and it dislikes soils which are immersed for long with a stagnating water. While in Europe it is distributed most frequently on lowlands and in submontane areas, usually no higher than at 1500 m elevation, in the Caucasus it can attain as much as 1800 m, in Anatolia 2100 m and in Iran even 2200 m.

This species belongs to very important tree species supplying valuable wood. It is heavy and hard, but pliable, easily splitting and easy to work with. It is used in furniture industry, particularly in the form of veneer, for the manufacture of floor tiles and various kinds of sports goods. *F. excelsior* is valued also as a decorative tree, though its defect is the late development of leaves in the spring. It is being used for planting in parks both in its type form and as the cultivated varieties cv. '*Diversifolia*' with simple leaves and cv. '*Pendula*' with pendulous branches. It is also used along roads and streets.

References: 64 (7), 103 (7), 218 (3), 242 (3), 311, 384, 395, 413, 545.

### *Olea* L.

### 14. *Olea europaea* L.

This is long living, evergreen tree 10 (15) m tall with a characteristic rather short but stout stem, gnarled and frequently twisted around its axis, with characteristic irregular indentations. It grows also in the form of a densely branched shrub 3 - 5 m high and then it has more or less thorny shoots. Its leaves, 2 - 8 cm long and up to 2 cm wide (larger in cultivated forms) are lanceolate, dark green and glabrous above and densely silvery-lepidote beneath. The fruit is an oblong, almost globular drupe, 10 - 35 mm long, originally green, but in the mature state usually black.

Old specimens of olive trees attain sometimes a very great age, 2000 years and possibly more, and they are characterized by impressive dimensions, with stems even 3 m in diameter. Such specimens have not infrequently an empty trunk, often subdivided into many parts, separated from each other or in places secondarily fused together with new coppice rejuvenating the tree. They fruit to the very end and quite abundantly.

Within the species two varieties are recognized: var. *europaea* (= *Olea sativa* Hoff. et Link, *Olea europaea* var. *sativa* (Hoffm. et Link) DC.), which includes all cultivated forms and var. *sylvestris* (Miller) Lehr. (= *Olea sylvestris* Miller, *O. oleaster* Hoffm. et Link, *O. europaea* var. *oleaster* (Hoffm. et Link) DC.), which represents the wild olive.

Olive trees which are browsed to the ground by goats and sheep form very characteristic dense "patches", which differ in shape and size of their leaves from the tree forms. Their leaves are small, usually only 1 cm long, oblong to roundish, thick and almost fleshy. The same type of leaves occur on epicormic shoots appearing densely at the base of old stems of olive trees, which are also browsed by animals. Such shoots are frequently thorny, thus there exists the opinion that the wild olive is spinescent. Probably this is a juvenile trait, occurring independently whether we are dealing with a wild form, feral, or with a cultivated olive. This phenomenon is also known in other species of trees as for example in the genus *Pyrus* or in *Crataegus aronia* (L.) Bosc.

*O. europaea* belongs, besides dates, grapes, figs and pomegranates, to the most commonly cultivated fruiting trees and shrubs. Basing on archeological data its domestication started about 6000 - 5000 years ago, and possibly earlier in the region of Palestine. From there it has been distributed in antiquity by the Phoenicians and then by Greeks through the Mediterranean region, both in Europe and in north Africa. Today the identification of truly wild olives from the domesticated ones which went wild is practically impossible, the more so since the differences between them concern only such traits as size of leaves and fruits and the content of oil in them. Over many centuries of cultivation numerous varieties were selected which usually bear the name of the place in which they were selected. They are propagated vegetatively using tracheons and cuttings as well as through grafting and in fact they are clones. As a consequence of vegetative propagation, which is of particular importance in selection work, a whole range of forms has been obtained more or less different from the initial form. Such differentiated seedlings are frequently to be found in the vicinity of olive plantations, thus the separation of "wild" olive from segregants of cultivated ones becomes problematic.

When we deal with typical plantations of olive trees, laid out in rows the situation is clear, however, not infrequently noble varieties of olives are grafted by the local population on individuals occurring naturally, in maquis communities, which is being cut around the grafted tree. Then the individuals do not grow in rows but are irregularly scattered. It happens that they get forgotten, are not tended appropriately and scatter seed within maquis so that after many years the naturalness of the olives becomes doubtful. Such situations affect the exact identification of the range of olive.

Taking into consideration the specific ecological requirements of the species (temperature, precipitation, soil) one can suspect that the natural range coincides with the Mediterranean range of cultivation. One can have doubts whether the "truly wild" olive still exists anywhere, and if so this is probably only in inaccessible places. As a result of all that was said above in the present study "plantation stands" have been omitted and we included only those which are associated with maquis communities, or with phrygana (browsed, prostrate forms). The range of the species so defined corresponds to the seaside belt of continental Greece and Greek islands including Crete and Cyprus, Albania (?), western Syria and Palestine, where furthest to the south the olive tree reaches the Judean Mts. The wildness of olive tree in Lebanon is questioned. On the other hand it is surprising that it can be found in isolated stands in northern Anatolia.

Within the range of *O. europaea* also eastern and southern Africa is included where it grows as a subspecies that has been recently recognized, subsp. *africana* (Miller) P. Green (= *Olea africana* Miller, *O. chrysophylla* Lam., *O. somaliensis* Baker).

*O. europaea* grows in open woods and scrub (maquis), on shallow stony substratum, on rendzinas derived from the calcareous rocks, on dry slopes and hillsides. It grows best in a relatively dry climate, having a very hot summer and somewhat cool winter. However, it is sensitive to low temperature and freezes killed at temperatures below  $-10^{\circ}\text{C}$ . It occupies lower located places, from the sea level up to about 300 - 450 m, though in places even higher, to 750 m in Greece and Anatolia, and on Cyprus to 900 m.

The species is cultivated for two reasons, as a fruit tree and for the production of oil, thus two types of forms have been selected within it. Olives (as fruits) for consumption, i.e. "table olives", are subjected to special treatment and fermentation. They are considered a true delicacy, particularly green ones, and as such are added to vegetable salads. Black pickled olives, conserved in a concentrated brine are in common consumption, particularly in Balkan countries, and in Anatolia. However, of greater importance are the olives grown for oil, since about 90% of olive trees are grown for this purpose.

The cultivation of *O. europaea* is concentrated primarily in the Mediterranean, the first place in this respect being held by Spain, where the number of trees is more than 300 million and the annual production of fruits exceeds 2 million tons (about 0.5 million tons of oil). This corresponds to more than 30% of the world production. In Italy the production of fruits reaches 1.8 million tons, in Greece almost 1 million (about 90 million trees), and in Turkey more than 800,000 tons. The cultivation of olive trees extends much beyond the Mediterranean region. With greater or lesser success it is conducted in various Asiatic countries (Pakistan, India, USSR on the Caucasus and in Turkmeniya), in west Africa and in the USA (California). Also the wood of olive trees is valued being strong and hard, with a brownish-yellowish tint, darkening with age, easy to polish. It is used in furniture making and in carving though rarely so since the olive trees are too valuable to cut the tree only for the needs of wood production.

References: 64 (6), 151 (2), 163 (3), 546, 547, 548, 571.

#### 15. *Olea ferruginea* Royle\*

Syn.: *O. cuspidata* Wallich ex G. Don

An evergreen tree up to 10 m tall, occasionally to 15 m and then with a stem diameter of about 1 m. The leaves are oblong-lanceolate to ovate, 3 - 10 cm long, coriaceous, dark green on the upper side and shining, brownish below especially when adult. Fruits (drupes) are very small, up to 8 mm long, black when ripe.

*O. ferruginea* occurs on the eastern limit of southwestern Asia, from eastern Afghanistan to western Nepal. In Afghanistan its range is limited primarily to province of Nuristan. In Pakistan it is split up into several parts. The first one extends from district of Chitral in the north, where it does not exceed 36° Lat. N, to South Waziristan in the south and from the Afghanistan border to districts of Swat and Hazara, to the border of the country with Kashmir. The second part of the range covers Baluchistan, particularly districts of Quetta, Ziarat and Loralai. Then, far to the south, single stands are known also from district of Kalat. The species appears also in Kashmir and in northwestern India as well as in southeastern Iran (Makran) where, however, it is very rare.

*O. ferruginea* grows gregariously in the warm temperate regions along river valleys and on stony, calcareous hillsides. In places it is quite common, particularly in dry scrub forests. At lower locations besides *Reptonia buxifolia* (Falc.) DC. it participates in the communities of *Acacia modesta* Wallich and constitutes for this akacia a true competition while above 1300 m it forms its own stratum. It is distributed already from an elevation of 500 m to about 1800 m but it is to be found even higher, to 2050 m in Pakistan, to 2100 m in Afghanistan and even to 2600 m in Nepal.

In the lowlands *O. ferruginea* is cultivated commonly. Its wood is very hard and heavy, used for turning and ploughs as well as for fuel. Fruits are eaten and oil can be extracted from them, however, they do not play any greater role, so that for this purpose *Olea europaea* L. is being cultivated in Pakistan.

References: 30, 144, 179, 380, 395.

### *Palmae* (*Arecaceae*)

*Nannorrhops* H. A. Wendl. (monotypic genus)

#### 16. *Nannorrhops ritchiana* (Griffith) Aitch.

Syn.: *N. stocksiana* Becc., *N. naudeniana* Becc., *N. arabica* Burret, *Chamaerops ritchiana* Griffith

This is an original, gregarious, usually small tufted palm, with prostrate branching rhizome or erect stem attaining a height of about 6 m and a diameter of 30 cm. Its leaves 1 - 1.2 m long, 15 - 30 cm of which con-

\* Just lately P. S. Green and G. E. Wickens (1989. The Davis and Hedge Festschrift: 287 - 299. Edinburgh) treated this taxon as subspecies of *Olea europaea* L., identical with *Olea africana* Miller.

stitute the unarmed petiole, are palmately divided to the middle into many segments (up to 40). This species was first described in 1844 from the Kurram valley in Pakistan and it was considered as belonging to the genus *Chamaerops* L.

The range of *N. ritchiana* covers primarily Pakistan and southeastern Iran. Besides several other stands are to be found in western Afghanistan, in province of Khost, adjacent directly to the Pakistani district of Kurram. Besides this palm is known from the eastern part of the Arabian peninsula, from Oman and Hadhramaut, from where it has been described as late as 1943 as a separate species *Nannorrhops arabica* Burret.

Its most northerly stands are to be found in Pakistan as far as Khyber Pass, only slightly beyond 34° Lat. N. In the east except for the northern sector of the range it does not cross the valley of Indus river, while in the west it reaches the vicinity of Bandar Abbas in Iran. In places, particularly in Pakistan it occurs quite commonly, as for example near Harnai in Baluchistan or in districts of Kurram and Khyber.

This is a distinctly thermophilous and light requiring species, growing in regions characterized by a very dry climate, particularly on sandy soils, on rocky limestone hills and on dry river beds, sometimes in the company of a different palm – *Phoenix dactylifera* L. This latter palm is possibly only widely domesticated and cultivated here for edible fruits. *N. ritchiana* occupies lower located places and arid hills, usually at elevations to 500 - 800 m, more rarely to 1200 m, however, it has been also found higher as for example in Afghanistan and Iran to about 1500 m and in the Pakistani province of Kalat even to 1800 m.

In the region of its occurrence, particularly in treeless areas the local population utilises the palm in many different ways. Dry stems and leaves are used for fuel. From the leaves mats, fans, sandals, baskets, hats and various implements of everyday use are made and the fibres are being employed for rope making. Seeds are used as beads for rosaries. Sometimes *N. ritchiana* is cultivated as an ornamental tree.

References: 28, 541, 549, 550, 557.

## Rosaceae

### *Amygdalus* L.

#### 17. *Amygdalus brahuica* Boiss.

Syn.: *Prunus brahuica* (Boiss.) Aitch. et Hemsl.

A low, prickly, more or less prostrate shrub with small, up to 15 (20) mm long leaves, narrowly elliptical to elongate-obovate, with margins indistinctly crenate-serrate. Its flowers are tubular, small with a glabrous hypanthium no more than 5 mm long. Its fruits are very characteristic drupes up to 15 mm long, and the stones are more or less flat but with the surface clearly reticulate-sulcate. In *A. brahuica* two subspecies are recognized: subsp. *brahuica* with pubescent shoots and leaves and subsp. *afghanica* (Pachom.) Browicz (= *Amygdalus afghanica* Pachom.) with glabrous shoots and leaves, and with fruits and stones more flattened.

The range of this species appears to resemble that of *Spiraea brahuica* Boiss., extending north to south from northern Afghanistan, where it does not exceed 36° of Lat. N to southern Pakistan (district of Kalam), to more or less 28° Lat. N. More commonly the shrub appears only in the region of Kabul and Khost in Afghanistan as well as in Pakistani Baluchistan (Quetta region). Isolated stands are known also from Badghis (NW Afghanistan and SE Turkmeniya).

*A. brahuica* grows on dry, insolated slopes, usually on southern expositions, on a rocky substratum (sandstones, granites) and also on stony ground in river valleys or else on loam banks around cultivated fields. In Afghanistan it appears also in sparse *Quercus baloot* Griffith forests. It usually occurs at rather high elevations, above 1800 - 2000 m reaching in Afghanistan as high as 2900 m and in Pakistan up to 3000 m. In places, however, it comes down to *Pistacia vera* L. woodland even sometimes below 1000 m.

References: 51, 218 (2), 554.

**18. *Amygdalus eburnea* Spach**

Syn.: *A. spathulata* Boiss., *Prunus eburnea* (Spach) C. Schneider

A very prickly shrub up to 1.5 m tall with strong white or almost white, smooth and lustrous thorns branching at right angles. It is characterized by sessile narrowly spathulate, glaucous or grayish-green leaves, usually not longer than 12 mm, by tubular flowers with a pubescent hypanthium and small drupes, 10 - 15 mm long.

This shrub occurs almost exclusively in Iran, particularly in southern Iran from the Iraq border in the west to the Pakistani (Makran) border in the southeast. It is also reported from southwestern Pakistan, however, the data from there are unsure and require checking. It is possible that they concern a different species of almond, *Amygdalus brahuica* Boiss. Besides *A. lycioides* Spach, *A. eburnea* is the most common thorny shrub species of almond from Iran.

*A. eburnea* grows in steppe communities together with representatives of the genus *Artemisia* and prickly species from the genus *Amygdalus* as well as in open, sparse steppe forests of oaks and pistache. It occurs on sandy and stony soils, on dry rocky slopes, particularly on limestone ones, but also on granitic ones, forming its own thickets not infrequently over considerable areas. In its vertical distribution it usually appears above 1000 - 1200 m though in places it comes down even to 700 m. Its stands above 2000 m are already rare and the most elevated ones were observed at 2350 m.

References: 51, 449.

**19. *Amygdalus elaeagnifolia* Spach**

Syn.: *A. kermanensis* Bornm., *Prunus elaeagnifolia* (Spach) E. Murray

It is a shrub or a small tree up to 3 - 4 m tall, densely branched and with the bark of older twigs characteristically yellowish-brown to even gray and coriaceous leaves, up to 2 cm long, almost sessile with margins entire or only slightly crenate, white flowers and up to 2 cm long fruits (drupes). This is a species which is very variable in leaf shape and degree of pubescence of shoots, leaves and fruits. As a result of this two subspecies have been recognized within it, subsp. *elaegnifolia* - more or less pubescent and subsp. *leiocarpa* (Boiss.) Browicz which is glabrous. This latter subspecies is sometimes considered as an independent taxon *Amygdalus leiocarpa* Boiss.

It is an Iranian endemite, distributed over southern and southwestern Iran in provinces of Kerman, Fars and Luristan (here more rarely). It is a thermophilous and light demanding species, resistant to drought. It occurs primarily in sparse steppe-forests particularly in strongly opened up and degraded ones all the way to a shrubby remnant - on marly-clay hills and on limestone, on stony hillsides above 1200 m elevation. The most elevated stands are to be found at the eastern limit of its range in province of Kerman, even at 3400 m.

References: 51, 449.

**20. *Amygdalus lycioides* Spach**

Syn.: *Prunus lycioides* (Spach) C. Schneider

Spinescent, much branched, half-globose, dense shrub, about 1 m tall with linear-lanceolate leaves 1.5 - 3 cm long, with sharply pointed apex and crenate-dentate margins. The flowers are tubular, sessile, with glabrous hypanthium and flattened, velutinous drupes up to 15 mm long. Within the species two varieties are recognized, var. *lycioides* and var. *horrida* (Spach) Browicz (= *Amygdalus horrida* Spach). The latter variety is characterized by smaller and more globular fruits and in its distribution is limited to Iran only.

The range of *A. lycioides* is composed of two parts. The larger one covers Iran, particularly its north-western and western part, and the smaller one covers southern Anatolia, provinces of Gaziantep, Urfa, Adiyaman, Diyarbakir and Malatya. In the latter region *A. lycioides* occurs in steppe communities on limestone soils, between 600 and 1200 m elevation. On the other hand in Iran the differentiation of ecological conditions and of plant communities is much greater. Here the shrub is distributed from 200 - 300 m elevation to 2900 m, however, optimal conditions are to be found between 1200 and 2000 m. It enters steppe communities in which *Artemisia* dominates with frequently scattered *Juniperus* trees and thickets formed following the degradation of forests and also in sparse oakwoods (*Quercus brantii* Lindley and *Q. libani* Olivier) and pistache forests (*Pistacia atlantica* Desf. and *P. khinyuk* Stocks) together with *Crataegus aronia* (L.) Bosc., *Cerasus microcarpa* (C. Meyer) Boiss. and *Acer monspessulanum* L. subsp. *cinerascens* (Boiss.) Yalt. It frequently grows on a rocky substratum, limestone or sandstone or even granite, on dry insolated, stony slopes of hills and on clayey-gravelly soils.

In the north, in the vicinity of Tehran, it appears in places together with *Amygdalus scoparia* Spach, a species from a completely different subgenus and section forming natural hybrids with it — *Amygdalus* × *kedjensis* Browicz.

References: 51, 64 (4), 449.

## 21. *Amygdalus spinosissima* Bunge

Syn.: *Prunus spinosissima* (Bunge) Franchet

It is a very prickly shrub 1.5 - 2 m tall which in favourable conditions attains up to 4.5 m (in Tadzhikistan). Such old specimens are characterized by having several twisted stems spreading sideways, with a diameter of 20 - 25 cm each and forming a crown in the form of a reversed cone. The one-year old twigs are purple-red and lustrous, while older ones are gray and have a stem bark which is almost black. The leaves, 1.5 - 3 cm long are very variable in shape, from narrowly-lanceolate to narrowly-spathulate or obovate or even elliptic. The fruits (drupes) are also variable, about 2 cm long from ovate to ovate-lanceolate and more or less flattened to subglobose or globose-ovate. In view of this two subspecies are being recognized within *A. spinosissima*, which differ from each other also in the ranges they occupy. In the eastern part of the species range there occurs subsp. *spinosissima* with stronger growth and larger more elongated fruits and in the west subsp. *turcomanica* (O. Lincz.) Browicz with poorer growth and smaller, globose fruits. Transitional forms between those two subspecies are to be found in the latter part of the range.

Within the subgenus *Dodecandra* (Spach) Browicz of the genus *Amygdalus*, to which almonds belong with small, clearly tubular flowers and abundant, frequently branching thorns, *A. spinosissima* is characterized by having the most northerly range, more or less up to 43° Lat. N (southern Kazakhstan). The range of *A. spinosissima* is composed of two parts (various subspecies), and the discontinuity between them occurs in eastern Turkmeniya and central Afghanistan. The eastern part of the range extends from the north to south, from southern Kazakhstan to eastern Afghanistan (near Kabul). Within the range are included the Soviet central Asiatic republics — western Kirgiziya, southeastern Uzbekistan and western Tadzhikistan. On the other hand the western part of the range covers southern Turkmeniya, particularly Kopet Dag Mts., north-eastern Iran and northwestern Afghanistan.

*A. spinosissima* occupies the most dry and warm regions, where the total annual precipitation varies between 250 and 400 mm. It occupies completely open and insolated, sandy and clayey, stony slopes, steep escarpments, particularly their upper parts. It appears in steppe communities in xerothermic thickets of shrubs (*Rosa*, *Atraphaxis*, *Zygophyllum*) and also sparse groups of junipers and *Pistacia vera* L. wood-land. Locally, particularly on degraded and eroded places it forms its own pure thickets even over considerable areas. Its vertical range extends between 300 and 1800 m and at these elevations the species attains its developmental optimum. However, it can occur higher, in Tadzhikistan to 2400 m and in Afghanistan to 2700 m.

*A. spinosissima* subsp. *spinosissima* forms natural hybrids with other species of almonds, in Uzbekistan with *A. bucharica* Korsh. (= *A.* × *saviczii* Pachom.), in southern Kazakhstan with *A. communis* L. (= *A.* × *kalmykovii* O. Lincz.) and in Afghanistan with *A. kuramica* Korsh. (= *A.* × *andarobii* Seraf.) while *A. spinosissima* subsp. *turcomanica* in Turkmeniya hybridizes with *A. communis* L. (= *A.* × *vavilovii* Popov).

Fruits of this almond have no consumptive value, however, the shrub itself can be utilized for the planting of various escarpments and landslides in order to fix the ground, on dry, poor and shallow soils.

References: 51, 177 (5), 218 (2), 252, 439, 440, 445, 555.

## *Prunus* L.

### 22. *Prunus spinosa* L.

A very prickly, intricate and suckering shrub 1 - 3 m tall, growing in favourable conditions even into a small tree 5 - 8 m tall, characterized by having a black bark. This species is very variable in its morphological traits, in the size and colour of flowers (as a rule white), in the size and shape of fruits, in the thickness and abundance of thorns and also in the degree of pubescence of shoots and leaves. In the southern and south-eastern part of the range it is represented by subsp. *dasyphylla* (Schur) Domin with leaves that are persistently pubescent on lower side, with pubescent twigs and penduncles and with more or less pubescent sepals. The typical central European subsp. *spinosa* has glabrous shoots and leaves.

The range of this very common and widely distributed shrub covers almost the whole of Europe (except for the extremally northern and northeastern regions) furthest to the north reaching in Scandinavia to 60° - 61° Lat. N. Besides *P. spinosa* occurs in northwestern Africa, on the Caucasus, in Anatolia (particularly western) and as single stands in northern Iran, and in Turkmeniya (upper run of river Sumbar). This latter stand is at the same time the most easterly stand within the whole range.

*P. spinosa* is a light requiring and thermophilous species, sustaining drought and frost well. It occurs in various types of thickets, on edges of forests, in hedgerows, on pastures, in roadside escarpments, on insolated slopes of river valleys and even on limestone rocks. It does not enter deeply into forests, and with greater shade it gradually dies. In places it forms dense, extensive, pure thickets, spreading thanks to numerous root suckers.

It usually grows in the lowlands (particularly in Europe) and in lower reaches of mountains. In the Balkan peninsula, in Greece, it appears no higher than at an elevation of 1200 m, on the Caucasus to 1600 m, in Anatolia to 1700 m and in Iran in the massif of Elburz Mt. it has been found even at an elevation of 2200 m.

Fruits of this plum are tart but edible, particularly after they got frost bitten and locally they are used for the making of liquers or for jams. The shrub itself, in view of its root suckers can be used for the consolidation of escarpments and slopes, and as root stocks for noble plum varieties. It forms natural hybrids with *Prunus domestica* L. It is a melliferous species.

References: 64 (4), 79, 103 (5), 138, 218 (2), 242 (2).

## *Spiraea* L.

### 23. *Spiraea brahuica* Boiss.

A low shrub, closely related to *Spiraea pilosa* Franchet, but differing from it in having sharp tips of intricate shoots, smaller leaves (up to 13 mm), below usually tomentose but not villous and with fewer flowers per inflorescence (to 11 and not to 20).

It is a montane species with an elongated range from the northeast to southwest, more or less along the Pakistan-Afghanistan border, from 35°30' to 29° Lat. N.

*S. brahuica* grows on limestone rocks, as a rule above 2000 m elevation, rarely coming down lower, as

for example in Afghanistan down to 1700 m. Its elevational maximum is attained in Pakistani Baluchistan at 3000 - 3200 m.

References: 51.

#### 24. *Spiraea pilosa* Franchet

This is a much branched shrub 30 - 70 (100) cm tall with leaves up to 2 cm long, obovate or more rarely orbicular, strongly dentate above the middle, and even with the teeth becoming small lobes. It is rather variable in terms of pubescence of leaves and stems.

The range of *S. pilosa* is divided into two distinct parts. One of them, the northern one, is much richer in stands, and it covers two major montane massifs Tyan-Shan and Pamir-Alai and in particular the western parts (primarily Tadzhikistan and Kirgiziya). In Pamir Mts. the shrub does not occur. On the other hand the southern part of the range cover Afghanistan, where the majority of stands are located in Nuristan, in the region of Kabul and in northwestern Pakistan. In the latter country only a few stands are known from district of Chitral and Kurram.

It is a light demanding species, moderately mesophilous, growing primarily on stony, open places and in rock fissures forming characteristic low hedges, primarily on northern exposition. It enters as a component into thickets together with species from the genera *Rosa* and *Berberis*. It appears at more or less 1000 m elevation in Middle Asia, at 1200 m in Afghanistan and goes as high as 2500 - 2700 m. The most elevated stands have been found in Pakistan (Chitral) at 3000 m.

References: 51, 177 (5), 218 (2).

### Rubiaceae

#### *Wendlandia* Bartling

#### 25. *Wendlandia ligustroides* (Boiss. et Hohen.) Blakelock

Syn.: *W. kotschy* Boiss. et Hohen.

This is a low, erect shrub with opposite coriaceous, up to 4 cm long leaves having short petioles and entire margins. Flowers are small, white, sweet-fragrant, in terminal thyrses. Fruits are dehiscent, globose capsules 2 mm in diameter.

It is an endemite of Iraq, the only representative of the genus *Wendlandia* in southwestern Asia and much isolated from all others. The other species of this genus occur primarily in southeastern Asia and in Australia, in eastern Africa and in southern Arabia.

In Iraq the range of the shrub is restricted to only a small area in the northern part of the country, located between the Turkish border and the valley of river Tigris and Great Zab. One can expect that *W. ligustroides* is present also in neighbouring southeastern Anatolia, however, so far it has not been found there yet.

*W. ligustroides* grows on slopes of gorges and on rocky precipices, on a limestone substratum, in open and insolated places, though sometimes it enters into open pine or oak forests. It appears usually on lower located stands, usually between 450 and 950 m, though in places it reaches higher, even to an elevation of 1500 m.

References: 228 (4), 542.



*Salix* L.**26. *Salix acmophylla* Boiss.**

Syn.: *S. persica* Boiss., *S. pseudo-safsaf* A. Camus et Gomb.

It is a shrub or more commonly a tree of medium size, up to 8 (10) m tall with a wide, low spreading crown and with a trunk up to 30 cm in diameter. This species is very variable but it is easy to recognize by having long linear to lanceolate-linear and glabrous leaves, and in particular by its buds, which in contrast to other willows of southwestern Asia have scales with free margins. Some of its more distinctive forms in morphological traits are sometimes recognized as independent species such as *S. pseudo-safsaf* A. Camus et Gomb. in Israel and Syria.

It is an Irano-Turanian species. Its range covers almost completely southwestern Asia, extending from the eastern shores of the Mediterranean Sea in the west to province Kumaun in northwestern India. More or less frequently the species occurs in Israel, in Jordan, in southwestern and northern Syria, in southeastern Turkey, in northeastern Iraq, in Iran, in southern regions of Soviet Turkmeniya and Tadzhikistan (Pyandzh), in Afghanistan, Pakistan, Kashmir and in northwestern India.

*S. acmophylla* grows on sufficiently moist soils, almost exclusively in valleys of rivers and streams, usually in lower reaches of mountains or on hillock, not infrequently, however, as for example at the southwestern limits of its occurrence it comes down almost to the seashores. In Turkey it occurs from 700 to about 1900 m elevation, in Iran up to 2300 m and in Afghanistan up to 2200 - 2600 m.

Locally it is used as a basket willow and besides it is valued as a melliferous plant and for this purpose it is planted in villages and in their vicinity.

References: 30, 64 (7), 163 (1) 174, 177 (3), 218 (1), 225, 228 (4), 560, 562, 565.

**27. *Salix aegyptiaca* L.**

Syn.: *S. medemii* Boiss.

It is a shrub or a tree up to 5 - 10 m tall with reddish, persistently pubescent shoots and relatively long, wide leaves. The wood under bark of 2 - 3 years old shoots has numerous longitudinal ridges. In morphological and ecological sense this species is very close to *S. caprea* L., with which it is sometimes confused. It differs from it in having the ridged shoots and in having a basically different range of occurrence.

*S. aegyptiaca* is an endemite of southwest Asia. Its relatively small range of distribution extends as a narrow belt from the western shore of lake Van in Anatolia through southern regions of the Caucasus (Armeniya, western Azerbajdzhan, Talish), the Iranian province of Mazandaran to Kopet Dag Mts., on the border between Iran and Soviet Turkmeniya. Beyond the continuous range it has been noted also on infrequent stands in central and southwestern Iran. In contrast to *S. caprea* L. it propagates readily vegetatively through shoot cuttings and thus it is commonly planted, sometimes far away from its natural range of occurrence as for example in Egypt, Syria or Kashmir.

*S. aegyptiaca* grows as a rule in open places, on edges of forests, on fellings, on rocky slopes, on wasteland, and most commonly on moist locations on edges of lakes, rivers and streams, along canals etc. In Turkey and in Iraq it occurs from 1500 to 2700 m and in Iran from the sea level to about 2200 - 2600 m.

The wood of *S. aegyptiaca* is used for the production of small household implements and for fuel. Thicker branches are used as fascine and in the production of simple fences.

References: 64 (7), 174, 218 (1), 228 (4), 560, 565.

## 28. *Salix alba* L.

This is a tree up to 30 m tall and more than 1 m in stem diameter. It is characterized by an ovate crown and narrow leaves sericeous on both sides.

*S. alba* is most closely related and morphologically very similar to *Salix excelsa* S. Gmelin from which it differs among others in having more delicate shoots, persistently pubescent buds and narrower catkins. Both these willows constitute a pair of species that replace each other, and they differ in their ranges.

It is an Euro-Siberian species with a range extending from Spain in the west to western Siberia in the east. In southwest Asia *S. alba* in spite of attaining here the limit of its occurrence is the most common willow. It occurs quite commonly throughout Turkey, on Cyprus, in Lebanon, in northern Israel, in northeastern Iraq, on the Caucasus and in northwestern Iran.

*S. alba* belongs to the most commonly cultivated tree-form willows. It easily propagates vegetatively from shoot cuttings, thus for a long time it has been planted both within its natural range of occurrence and beyond its borders. It goes wild easily, thus an accurate determination of its natural range of distribution in southwestern Asia is presently very difficult. The difficulty is also enhanced by the existence of various hybrids which *S. alba* forms with *S. excelsa*. They are most common in regions where the ranges of the two species overlap. These hybrids are also often cultivated, and they are not infrequently difficult to distinguish from the "pure" *S. alba*.

While *S. alba* is a relatively variable species it has not formed many geographic varieties. The most distinctive ones in the morphological sense are the populations from Colchida (USSR) with delicate shoots and relatively small leaves, which are sometimes recognized as a subsp. *micans* (Andersson) Rech. f. Informations about the occurrence of this taxa in other regions are erroneous.

The natural regions of occurrence of *S. alba* are banks of rivers and streams. With other species of willows and with poplars it locally forms characteristic riverside communities. Besides these communities it can be found on marshy meadows, on edges of lakes, on hedgerows, along roads, near buildings etc. In the majority of cases the latter stands may appear to be natural but are in fact of antropogenic nature.

It is a lowland species, in places reaching, however, considerable elevations. On the Caucasus and in Turkey it grows from the seashore to 1800 (1900) m, in Iran from 100 m in the north to 2400 m in the central part of the country.

The wood of *S. alba* is used in cellulose and paper industry and also for the production of small household instruments as well as for fuel. Thicker twigs of truncated stems are used as fascine and for the construction of simple fences. From the bark tannins and salicin are produced.

References: 64 (7), 103 (3), 123 (3), 151 (1), 163 (1), 174, 218 (1), 228 (4), 242 (2), 560, 565.

## 29. *Salix amplexicaulis* Bory et Chaub.

This is a shrub 2 - 3 (5) m tall with feeble, twiggy shoots and oblanceolate, alternate, semiamplexicaule leaves.

This species is closely related to the Eurasiatic *Salix purpurea* L. within which it is sometimes considered as its subspecies or variety (*S. purpurea* L. subsp. *amplexicaulis* (Bory et Chaub.) Hayek, *S. purpurea* L. var. *amplexicaulis* (Bory et Chaub.) Boiss). It differs from it primarily in having characteristically positioned leaves on shoots and also in its range.

*S. amplexicaulis* is a sub-Mediterranean species. The major parts of its range cover the Balkan peninsula and northwestern Anatolia, and besides it occurs on a few stands in southern Italy (Calabria) and in southern France.

On the Balkans *S. amplexicaulis* grows quite frequently throughout continental Greece and in Bulgaria, less frequently in Albania and Yugoslav Macedonia. In the Asiatic part of Turkey *S. amplexicaulis* attains the southern limit of its occurrence. Furthest to the east are stands located in the valley of river Kizil Irmak,

approximately to 35° Long. E, and in the south the species attains Kaz Dagi Mts. in Canakkale province, the upper run of river Gök in province of Kütahya and Ankara.

*S. amplexicaulis* grows as a rule in open places, everywhere where at least periodically there is an abundance of water. These are banks of rivers, streams, lakes, moist gorges, roadside ditches etc.

The twiggy shoots, thank to which the species sustains well the periodic flooding are locally used for the production of baskets.

References: 64 (7), 103 (3), 123 (3), 564, 565.

### 30. *Salix armeno-rossica* A. Skvortsov

This is a shrub 2 - 3 (5) m tall with long, twiggy shoots and narrow, sericeous pubescent leaves.

This species is closely related to the European *S. viminalis* L. from which it has been separated out not long ago. It differs from it in having poorer growth, leaves pubescent also on the upper side, usually black bracts, longer styles and also in having a different range of distribution.

*S. armeno-rossica* is an endemic species for southwestern Asia. Its small range is restricted to Soviet Armeniya in the southwestern regions of the Caucasus and to northeastern and eastern Anatolia. Besides it has been reported from one stand away from the continuous range on the northern slopes of Greater Caucasus on Mt. Bestau.

*S. armeno-rossica* grows primarily on banks of rivers and streams, on sands brought in by water, on gravelly areas, not infrequently among stones and boulders, usually in open places or in loose thickets. It occurs from 1200 to 2200 m elevation. The most elevated stands are to be found in Turkey in province of Agri, east of Tahir pass.

References: 64 (7), 218 (1), 565.

### 31. *Salix blakii* Goerz

Syn.: *S. linearifolia* E. Wolf

This is a shrub, more rarely a tree 6 - 8 (10) m tall, with delicate fragile shoots and glaucous oblanceolate or linear leaves 4 - 8.5 cm long.

The range of *S. blakii* covers the Middle Asiatic republics of the USSR (southern Kazakhstan, Kirgiziya, Tadzhikistan, eastern Uzbekistan), northern Afghanistan and northwestern Pakistan. The most numerous though irregularly distributed stands of *S. blakii* occur in the Middle Asiatic republics while in Afghanistan and Pakistan it is known from only a dozen or so much scattered stands removed from the main part of the range. These are the most southerly stands of the species.

*S. blakii* grows primarily on banks of rivers and streams, usually on open places, in riverside gravels and on water borne sands. It usually occurs in lower reaches of mountains and in the hillock. In Tadzhikistan it has been observed between 1100 and 2400 m, in Afghanistan between 1400 and 2400 (2700) m where the most elevated stands are to be found in Wakhan.

References: 174, 177 (3), 218 (1), 562, 565.

### 32. *Salix caprea* L.

Syn.: *S. idae* Goerz

This is a shrub or more commonly a medium sized tree up to 10 (15) m tall with stiff, thick twigs and relatively large leaves usually pubescent on the lower side. This species is very characteristic, particularly during flowering, when its large yellow catkins are visible from far away.

This taxon is closely related to and commonly confused with *S. aegyptiaca* L. The morphological differences between the two species are rather subtle, since in practice they boil down to the presence of longitudinal ridges in the wood of 2 - 3 years old shoots on *S. aegyptiaca* L., while such shoots in *S. caprea* are completely smooth. These willows, which form a pair of vicarious species, differ rather distinctly in their ranges of distribution.

*S. caprea* is an Euro-Siberian species. It has one of the most extensive ranges within the genus *Salix*. With smaller or larger gaps it extends from Spain and Great Britain in the west to Japan in the east.

In southwestern Asia *S. caprea* occurs only on the Caucasus and in Turkey. On the Caucasus it grows commonly almost throughout the massif of these mountains except for Talish and southeastern parts of Azerbaijan where it is replaced by *S. aegyptiaca* L. In the Asiatic part of Turkey it grows most commonly in the north while it is very rare and in places even lacking completely in the southeast, where again *S. aegyptiaca* L. appears. In view of the difficulty in distinguishing these two morphologically similar species attempts at determining an exact limit of the ranges in the region in question meets with considerable difficulties.

*S. caprea* is a species with a wide ecological scale. It grows both on open places and in forest communities, on dry as well as on moist stands. Most commonly it can be found in edges of forests, on gaps in forests, on wasteland, on hedgerows, in field thickets, on banks of rivers and streams, not infrequently near village buildings. It appears as a pioneer species on forest felling areas and after forest fires. It occurs most readily in the lowlands and in the lower reaches of mountains. In southwest Asia it grows from the seashore to about 2300 m, attaining its elevational maximum in northeastern Anatolia in province of Kars on Küçük Agri Dagi Mt.

The wood of *S. caprea* is used for fuel and the branches as fascine and in the construction of simple fences.

References: 64 (7), 103 (3), 123 (3), 218 (1), 242 (2), 565.

### 33. *Salix capusii* Franchet

Syn.: *S. coerulea* E. Wolf

This is a tree 6 - 8 m tall, more rarely a wide crowned, dense bush with delicate, twiggy, white pruinose shoots and narrowly lanceolate leaves.

*S. capusii* has a small range covering in the USSR eastern regions of Uzbekistan and Tadzhikistan, northeastern Afghanistan and northern Pakistan. It is most common in Tadzhikistan, particularly in Pamir. South of river Pyandzh which separates Tadzhikistan from Afghanistan it appears only on infrequent, clearly isolated stands.

Places of abundant occurrence of this willow include primarily banks of rivers and streams, moist gorges and slopes. It grows in the mountains and in prealps up to about 3400 - 3500 m elevation.

References: 174, 177 (3), 218 (1), 225, 562, 565.

### 34. *Salix caucasica* Andersson

It is a shrub up to 1.5 (2) m tall with relatively large, oblanceolate or elliptic-oblong leaves and glabrous ovaries.

It is an endemic species for southwest Asia with a limited range of occurrence restricted to the Caucasus and northeastern Anatolia.

On the Caucasus *S. caucasica* occurs primarily in the western regions of Greater Caucasus, in southwestern Gruzija and in Adzharia, while in Turkey it grows in coastal provinces of Rize, and Artvin and in one isolated stand in a place called Bostan in province of Kastamonu, removed westwards from the continuous range

of the species by about 500 km. The form of *S. caucasica* found on this latter stand requires, however, further studies since it differs substantially from the typical forms of the species.

*S. caucasica* occurs in sufficiently moist and fertile places, on banks of streams, on edges of forests, in forest openings, on edges of montane bogs, in rock fissures, in moist gorges, primarily in the subalpine zone and in the upper portions of the forest zone. On the Caucasus it grows most commonly between 1500 and 2400 m elevation, however, in places it comes down to 200 - 300 m. In Turkey it has been observed between 1100 and 2450 m.

References: 67 (4), 103 (3), 104 (2), 218 (1), 565.

### 35. *Salix cinerea* L.

Syn.: *S. pseudomedemii* S. Wolf

It is a shrub up to 3 (6) m tall, in conditions of free growth having a characteristic semiglobular crown. The shoots are arching upwards, persistently tomentose. Leaves are oblanceolate, tomentose, coriaceous. The wood under bark of 2 - 3 years old shoots has numerous longitudinal ridges.

It is an Euro-Siberian species with a range extending from Ireland, France and Italy in Europe to Yenisey river on the boundary between western and central Siberia in Asia. In southwestern Asia *S. cinerea* occurs only on the Caucasus and in Turkey, where it attains the southeastern limit of its range. It grows there on relatively infrequent and usually scattered stands. In places, as for example in central Anatolia this species is lacking altogether.

The forms from the Caucasus and eastern Anatolia which differ somewhat from the typical European *S. cinerea* are sometimes recognized as an independent species *S. pseudomedemii* E. Wolf. A delimitation of the two taxa is in practice very frequently impossible due to quite subtle differences that are not fully correlated with each other.

*S. cinerea* is strictly associated in its occurrence with moist places. Most commonly it grows on banks of lakes, ponds, rivers, streams, canals, on marshy meadows, on bogs, in roadside ditches etc. On the Caucasus it grows from the sea level to 2000 m elevation and in Turkey up to 2500 m.

References: 64 (7), 103 (3), 104 (2), 123 (3), 218 (1), 565.

### 36. *Salix disperma* Roxb. ex D. Don

Syn.: *S. grisea* Wallich, *S. julacea* Andersson, *S. wallichiana* Andersson

This is a shrub, more rarely a small tree with slender shoots, elliptic or lanceolate leaves usually with entire margins, and with large compact catkins. This is a distinctly polymorphic species. Some of its more characteristic and easier to define forms have been until recently treated as independent taxa.

The range of *S. disperma* extends from northeastern Afghanistan in the west, through northern Pakistan, Kashmir, northwestern India, Nepal, Buthan, the Assam province of India, northern Burma to Szechwan in China in the east. On the studied area this willow attains the western limit of its range, thus it occurs here only on single scattered stands. In Afghanistan it is known only from Nuristan and from one isolated stand, at the same the most westerly one, near Kabul. In Pakistan it can be found only in the northern part of the country, north of river Kurram. It is relatively common in Kashmir and possibly also in northwestern India, however, information about its occurrence in the latter area are as a rule very general.

*S. disperma* appears most commonly in moist places in valleys of rivers and streams, on slopes of easy gorges, on riverside meadows, in open places or in thickets. It occurs in the mountains, however, not at very high elevations. In Afghanistan it grows between 1300 and 2500 m, in Pakistan between 1500 and 3000 m and in Kashmir between 1500 and 3500 m.

Stems of *S. disperma* are locally used for basket weaving, thus the willow is sometimes planted in villages or along nearby rivers and streams.

References: 30, 58, 108, 174, 179, 223, 225.

### 37. *Salix elaeagnos* Scop.

Syn.: *S. incana* Schrank

This is a spreading shrub, more rarely a small tree up to 6 (8) m tall with very characteristic narrowly linear leaves, densely white tomentose below and with down turned margins.

The range of *S. elaeagnos* occupies almost entirely the mountain regions of southern and western Europe. Beyond the European continent this willow occurs in northwest Africa and in southwest Asia. On the area under study *S. elaeagnos* is frequent only in the Balkans, primarily on higher locations in Bulgaria, Albania and continental Greece. In Asia it grows relatively rarely and only so in northern regions of Anatolia where the southern limit of the range runs approximately through Eskışehir, Ankara and Amasya.

*S. elaeagnos* occurs primarily on stony banks of rivers and mountain streams, on rocky precipices, on riverside gravels, on scree and on slopes of moist gorges, particularly on limestone, most commonly in the mountains or in the prealps and only exceptionally in the lowlands. It occupies regions located between (300) 500 and 1800 (2000) m elevation attaining its elevational maximum in the Alps and in the Atlas Mts. in Africa. On the Balkans it occurs from 800 to 1600 m, in Turkey from (400) 500 to 1600 (1900) m, the latter elevation being attained on Ak Dag Mt. in the vicinity of Amasya.

*S. elaeagnos* is sometimes planted on banks of streams and mountain rivers in order to fix the banks and sometimes it is also cultivated as an ornamental shrub.

References: 65 (7), 123 (3), 565.

### 38. *Salix elbursensis* Boiss.

This is a shrub, less commonly a small tree up to 6 - 8 m tall, with slender shoots and narrow oblanceolate leaves 4 - 10 cm long. The species is closely related to the very similar Eurasiatic *S. purpurea* L. with which, especially in older publications, it was treated jointly. It differs primarily in having smaller flower buds, longer inflorescence peduncles and somewhat narrower leaves. It also has a different range of distribution.

*S. elbursensis* is an endemite of southwestern Asia. Its small and strongly cut up range covers the Caucasus, eastern Anatolia and northwestern Iran. In the latter country *S. elbursensis* is known only from infrequent stands isolated from the more or less continuous part of the range.

*S. elbursensis* grows most abundantly on stony banks of rivers and streams, on alluvial sands and gravels, more rarely on the bottom and slopes of shady gorges, in rock hollows and gullies. On the Caucasus it appears from the sea level to the upper tree limit, in Gruzija on the Greater Caucasus up to 1800 m and in Armeniya up to 2000 (2100) m. In Turkey it is known exclusively in the mountains from 1200 to 1950 m while in Iran it attains even about 2500 (2600) m. This maximal elevation is attained in province of Mazanderan, in the valley of river Chalus.

References: 64 (7), 174, 218 (1), 565.

### 39. *Salix excelsa* S. Gmelin

Syn.: *S. australior* Andersson

This is a tree attaining 25 - 30 m in height with lanceolate, usually silvery pubescent leaves.

This species is related to and morphologically very similar to *Salix alba* L. form which it differs primarily in having somewhat thicker and more fragile at the base annual shoots, glabrous or slightly pubescent buds and thicker catkins.

The range of distribution of *S. excelsa* is associated with southwest and central Asia. It occurs in northern and eastern Turkey, on the Caucasus, in Iran (except central eastern part), in the Middle Asiatic republics of the USSR (southern Kazakhstan), in Afghanistan and in northern Pakistan. It is sometimes mentioned also from eastern China (Kashgaria), Kashmir, Lebanon, Syria and Iraq, however, these informations are either doubtful or they concern planted individuals.

*S. excelsa* has been for centuries one of the most commonly cultivated trees in the area under discussion. It goes wild rather easily thus the determination of its natural range of distribution is difficult. It is quite probable, that in some regions of its present occurrence it is only an introduced species. An interpretation of the range of *S. excelsa* is further made difficult by the hybrids with *Salix alba* L. which are frequently to be found not only in regions where the two species occur side by side (Caucasus, Turkey) but also beyond the region of their direct contact. These hybrids form in the morphological sense a whole range of forms between the parental species and in practice are often very difficult to distinguish from them.

The natural locations where *S. excelsa* occurs are primarily the moist valleys of rivers and streams. In cultivation it can be found along irrigation canals, near roads, on meadows, near village houses etc. In Turkey *S. excelsa* occurs from the sea level to 1700 m, on the Caucasus up to about 1800. In Afghanistan it grows from 500 m to 2000 m, in Pakistan it has been noted even at an elevation of 1800 - 1900 m and in Middle Asia it reaches 2200 m.

*S. excelsa* is utilized similarly as *Salix alba* L. and *S. fragilis* L.

References: 54 (7), 174, 177 (3), 560, 562, 565.

#### 40. *Salix fragilis* L.

This is a tree up to 15 (18) m tall with a wide crown, fragile, easily breaking annual shoots and glabrous, lanceolate leaves.

The range of *S. fragilis* covers primarily the European continent. Beyond Europe this species grows on relatively few stands in western Siberia, in southwestern Asia and in northern Africa.

Within the studied area *S. fragilis* attains the southeastern limit of its occurrence. In the Balkans it is common only in Bulgaria while in Greece and Albania it is known from only single, scattered stands. In southwestern Asia it occurs almost exclusively in Turkey forming here two isolated groups of stands, one in the north, west of river Kizil Irmak, and the other in northeastern Anatolia. Besides the borders of that country it is known from only one stand on the Caucasus, in southwestern Gruzija in the vicinity of a place called Achalcicha.

Determination of the accurate limit of the occurrence of *S. fragilis* encounters today considerable difficulties, since this species has been under cultivation for a long time and it goes wild easily, propagating both generatively and vegetatively, among other reasons because young shoots are broken off by wind and take root. An interpretation of the range is further made difficult because of various hybrids which *S. fragilis* forms both in nature and in cultivation with *S. alba* L. These hybrids (= *Salix rubens* Schrank) obliterate almost completely the morphological differences between these two species.

*S. fragilis* is associated with moist, fertile soils. It grows in valleys of rivers and streams, on banks of lakes, on moist meadows etc. It is sometimes planted along roads, canals and near buildings, on hedgerows and on edges of fields. In vertical distribution it occurs from the seashore to 1700 m. It is utilized similarly as *S. alba* L.

References: 64 (7), 218 (1), 565.

#### 1. *Salix iliensis* Regel

A tall shrub, more rarely a small tree attaining in optimal conditions up to 7 (8) m in height, with a low stem and a wide, spreading crown and elliptic, glaucous leaves 3.5 to 7.5 cm long.

The range of *S. iliensis* covers central and southwestern Asia including the Tyan-Shan massif both on the Chinese and Soviet side, northwestern regions of Kashgaria in western China, Pamir - Alai Mts. (Tadzhikistan) except for the most westerly regions, Afghan and Pakistani Hindukush, Karakoram and northern regions of Kashmir.

*S. iliensis* is a forest species associated in its occurrence primarily with spruce forests (*Picea schrenkiana* Fisch. et C. Meyer and *P. smithiana* (Wallich) Boiss.). It grows most commonly on edges of these forests, in gaps, on stony hills within the forests, in open places along streams, more rarely on edges of larger rivers. Beyond forest communities it appears in open places, relatively frequently in valleys of streams and on marshy meadows above the forest limit.

It is a montane species. In Hindukush it occurs at elevations from 3000 m to 3800 m, and in Karakoram and eastern Pamir attains 3900 m. As far as is known nowhere does it come lower than 1400 (1200) m and the lowest located stands occur in Kazakhstan in the Khrebet Dzhungarskiy Alatau and Zailiyskiy Alatau.

References: 174, 177 (3), 181, 218 (1), 225, 562, 565.

#### 42. *Salix karelinii* Turcz. ex Stschegl.

A shrub up to 1 (1.5) m tall with ovate or elliptic leaves strongly pubescent on both sides. The hairs on leaves are delicate characteristically entangled with each other.

The range of *S. karelinii* consists of two basic parts, clearly isolated from each other. One of them covers Central Asia where the species grows primarily in the central Asiatic republics of the USSR (Khrebet Tarbagatay, Dzhungarskiy Alatau, Tyan-Shan and eastern Pamir-Alai). The second part covers Nuristan in northeastern Afghanistan, Chitral in northern Pakistan, Karakoram and Himalayas from Kashmir to central Nepal.

*S. karelinii* grows on sufficiently moist places, in rock fissures, on scree, on slopes of gorges and in higher locations also on banks of rivers and streams. It occurs exclusively in mountains above 2500 (3000) m elevation in the subalpine or alpine zone. In Tyan-Shan it reaches as far as 3300 m, in the Khrebet Zailiyskiy Alatau on the border between Tadzhikistan and Kirgiziya up to 3500 m, in Afghanistan to 4000 m, in China to 4500 m. The most elevated stands are known from Karakoram in the region of Gharesan Glacier at 5000 (5100) m.

References: 174, 177 (3), 218 (1), 225, 562, 565.

#### 43. *Salix pentandra* L.

Syn.: *S. pentandroides* A. Skvortsov

This tree grows up to 10 (15) m in height and in favourable conditions to 18 m. It has relatively large, glabrous leaves with densely glandular margins and late ripening fruits. In the spring, bursting buds and young leaves are glutinous with an aromatic resin.

Forms of *S. pentandra* occurring on the Caucasus and in northeastern Anatolia are recognized recently as an independent species, *S. pentandroides* A. Skvortsov, which is to differ from the typical *S. pentandra* in having large projecting buds and more bright dull-green upper leaf surfaces. However, these traits are not fully correlated with each other, thus an exact separation of these two taxa and an accurate delimitation of their ranges is not possible.

It is an Eurasiatic species with a wide range extending from the Pyrenees and Great Britain in the west to the central course of Yenisey river in Siberia in the east. On the studied area it is already rather rare here and attains its southeastern limit of occurrence. On the Balkans it is known only from Albania, from western regions of Yugoslav Macedonia and from western Bulgaria, while it is completely missing from Greece.



In southwestern Asia *S. pentandra* occurs exclusively on the Caucasus and in Turkey. In the latter country, particularly in its central and western regions it is known from only few, very scattered stands.

*S. pentandra* usually grows on fertile, sufficiently moist places, on banks of rivers, streams and lakes, on marshy meadows, on easy slopes etc. Over the major part of its range in Europe and Siberia it occurs usually at lower elevations, while in southwest Asia primarily in hillock and in the mountains – on the Caucasus from 800 to 2400 m and in Turkey from 800 to 2100 m.

References: 64 (7), 104 (2), 218 (1), 561, 565.

#### 44. *Salix pycnostachya* Andersson

This is a tall shrub or tree up to 8 - 10 m in height with dull green, linear or lanceolate, 4 - 10 cm long leaves with finely serrate or entire margins. It can be distinguished from *S. acmophylla*, with which it is often confused, having bud scales with completely fused margins.

The relatively small range of *S. pycnostachya* is restricted to central and southwestern Asia. It covers Kashgaria in western China, western Tyan-Shan, Pamir-Alai, eastern Turkmeniya (Khrebet Kugitangtau) within the Soviet Union, northwestern India, Kashmir, northern Pakistan and northeastern Afghanistan. Besides the species grows on infrequent stands separated from the main part of the range in northeastern and southeastern Iran.

*S. pycnostachya* occurs primarily in valleys of rivers and streams singly or in small groups, on open places and sometimes in loose birchwoods. In its vertical distribution it is associated exclusively with mountains. In the Tyan-Shan massif it grows from 1200 to 2500 m, in Afghanistan from 1800 to 3300 m, in Iran from 1660 to 3500 m and in Pamir-Alai from 1400 to 4300 m. The most elevated stands have been found in the Pamir.

References: 30, 174, 177 (3), 181, 218 (1), 225, 297, 560, 562, 565.

#### 45. *Salix schugnanica* Goerz

This is a shrub 0.3 - 1.5 (2) m tall with, small lanceolate leaves and globular, small inflorescences.

*S. schugnanica* is most closely related with the Eurasiatic *S. rosmarinifolia* L., within which it is sometimes considered as one of its subspecies. It differs from the latter in having thicker stems and more stiff leaves with a clearly projecting venation.

The small range of *S. schugnanica*, which constitutes an extension of the range of *S. rosmarinifolia* L. in the southern direction, covers northeastern Afghanistan, northern Pakistan, eastern Pamir-Alai and eastern and central Tyan-Shan in the USSR. Relatively common occurrence of this willow is observable only in the Pamir and in the neighbouring Wakhan, while further southwards the number of stands rapidly declines. It is known here from only infrequent stands particularly in northeastern Afghanistan, where furthest to the west it attains province of Bamian. In the southeast it is also a very rare species and it has been noted there only from single stands in the Kuen Lun mountain range in western China and in Karakoram, unfortunately, however, information about its occurrence in the latter massif are only very general.

*S. schugnanica* grows in valleys and in depressions of the terrain, on wet meadows, in marshes, on edges of small montane bogs and at higher elevations also on banks of rivers and streams.

In its typical form the willow is distributed primarily in central and southern parts of its range, where it appears almost exclusively in mountains above 2300 m elevation. In Afghanistan and Pakistan it attains 3600 - 3800 m, while in Pamir even up to 4300 m. These are its most elevated stands.

In the north *S. schugnanica* grows also at lower elevations, in the hillock and in places also in lowlands, here, however, it forms numerous hybrids and introgressive forms with *S. rosmarinifolia* L. that grows together with it. To a considerable extent this makes it difficult to determine the northern course of the range of *S. schugnanica*.

Leaves and young shoots of *S. schugnanica* are readily eaten by animals, thus the willow is locally used as fodder for animals and not infrequently also as fuel.

References: 174, 177 (3), 181, 218 (1), 562, 564.

#### 46. *Salix triandra* L.

Syn.: *S. amygdalina* L.

This is a shrub, less commonly a small tree up to 10 m tall, only exceptionally up to 14 m tall, with narrow, lanceolate leaves with large stipules and with a very characteristic, fissured bark, peeling off similarly as in plane trees.

*S. triandra* has a wide, disjunctive range extending from Spain and Great Britain in the west to Japan in the east. In the studied region it attains the southern limit of its occurrence, appearing rather rarely in northern Balkan regions: northern Greece, Albania, Bulgaria and Yugoslav Macedonia. It is more commonly in southwestern Asia: in Israel, in Turkey, on the Caucasus, in western and northern Iran and in the Kopet Dag Mts. on the border between Iran and Soviet Turkmeniya. At a considerable distance from the extreme stands in Kopet Dag it reappears again on infrequent stands in central Afghanistan.

Within its extensive range *S. triandra* formed several geographic races, to which usually the rank of subspecies is attached. One of them is subsp. *bornmuelleri* (Hauskn.) A. Skvortsov, from eastern Turkey and northern Iraq. In contrast to typical subsp. *triandra*, to which belong forms with glabrous shoots and leaves it contains forms with shoots and leaves that are more or less pubescent.

*S. triandra* occurs almost exclusively in direct proximity of various water reservoirs or runs. It is most common on banks of rivers and streams and on edges of lakes and ponds. It can be also found in moist roadside ditches, on marshy meadows etc. It forms monospecific, sometimes quite extensive thickets, or else it is accompanied by other willows.

Over the main part of its range *S. triandra* is distributed in the lowlands, however, in places reaching even to quite substantial elevations as for example in Turkey it attains 1950 m and on the Caucasus and in Iran up to 2100 m. The most elevated stands at 2900 m have been observed in Afghanistan, in the valley of river Helmand, near Behrud.

Locally *S. triandra* is being used for basket weaving. It is also valued as a melliferous plant.

References: 64 (7), 103 (3), 123 (3), 174, 218 (1), 562, 565.

#### 47. *Salix turanica* Nas.

This is tall shrub or a tree up to 10 m tall, with rather thick though slender, persistently pubescent shoots lanceolate, 4.5 to 12 cm long leaves sericeous below with revolute margins.

This species is closely related to the Eurasiatic species *S. viminalis* L., from which it has been separated out not long ago. It differs among other things in having black bracts, longer styles and it also has a different range.

The clearly disjunctive range of *S. turanica* covers almost completely central and southwestern Asia. It extends from central Afghanistan through northern Pakistan, Kashmir, northwestern India to western Nepal. North of Afghanistan *S. turanica* occurs in the Middle Asiatic republics of the USSR (Tadzhikistan, central and northern Kirgiziya, southeastern Kazakhstan) attaining more or less 47 - 48° Lat. N at Lake Balkhash and the valley of river Ayaguz. Besides it is known from western China (Kashgaria) and from several isolated stands from western Mongolia. It is most common in the Pamir, in eastern Hindukush and in Karakoram.

In the southern and central part of the range *S. turanica* occurs exclusively in the mountains, in Afghanistan from 2200 to 3800 m elevation, in Pamir-Alai up to 3900 m, in Karakoram to 3500 m, and in Nepal it is known from 2900 m. On the other hand in the north it comes down along river valleys to the hillock and even to the lowlands (valley of river Ayaguz, Chu, banks of lake Dijlikol etc.). It grows almost exclusively in valleys of rivers and streams, on riverside gravels, on alluvial sands, usually among riverside thickets, on marshy meadows etc.

References: 174, 177 (3), 181, 218 (1), 225, 562, 565.

#### 48. *Salix wilhelmsiana* M. Bieb.

A spreading, very branchy shrub, more rarely a small tree, 2 - 7 m tall with long, delicate twigs and very narrow linear, sericeous leaves 2.5 - 6.5 cm long.

*S. wilhelmsiana* has exceptionally strongly cut up and irregular range of distribution composed of several very distant parts. The largest one covers the Middle Asiatic republics of the USSR (SE Kazakhstan, E. Uzbekistan, Kirgiziya, Tadzhikistan), western China (Kashgaria, Dzhungaria), northern Kashmir, northern Pakistan and northeastern Afghanistan. Besides this region *S. wilhelmsiana* occurs as outliers in the lower run of Amu-Darya river, on the border between Turkmeniya and Uzbekistan, in southwestern Iran (Zagros Mts.), on the Caucasus and in the adjoining regions of northern Iran and northeastern Anatolia.

*S. wilhelmsiana* usually grows on shores of rivers and streams, on water borne sands, on riverside gravel, not infrequently in beds of dried up streams. It occurs most commonly in prealps and in mountains. On the Caucasus it attains up to 1500 m elevation, in Turkey from 1500 to 1900 m, in Tyan-Shan up to 2200 m, in Pamir up to 3500 m, in Karakoram, where it attains its elevational maximum to 3600 m. The lowest located stands are to be found in NW Uzbekistan, where in the delta of Amu-Darya *S. wilhelmsiana* comes down to almost the sea level.

References: 64 (7), 103 (3), 104 (2), 174, 177 (3), 218 (1), 225, 562, 565.

### Tamaricaceae

#### *Myricaria* Desv.

#### 49. *Myricaria germanica* (L.) Desv.

This is an erect shrub up to 2 - 2.5 m tall with a characteristically reddish-brown or yellowish-brown lustrous bark and linear-lanceolate bluish, 2 - 5 mm long leaves, densely covering the twigs. Its small white-pinkish or pink flowers are collected in dense, simple or sometimes branched racemes.

The systematics of the genus *Myricaria* is still insufficiently clear, thus in the literature there are considerable contradictions in the way various taxa are treated and concerning their geographic distribution (ranges to a greater or lesser extent overlap or exclude each other, particularly from the *M. germanica* group). Two tendencies appear to manifest themselves. One is to restrict the range of *M. germanica* only to Europe and to consider the taxa closely related to it from western and central Asia as belonging to *Myricaria bracteata* Royle (= *M. alopecuroides* Schrenk) and *M. squamosa* Desv. The other is to treat the latter two species as identical with *M. germanica* or as its subspecies or even varieties: *M. germanica* var. *bracteata* (Royle) Franchet, *M. germanica* var. *alopecuroides* (Schrenk) Maxim., *M. germanica* subsp. *alopecuroides* (Schrenk) Kitam., *M. germanica* var. *squamosa* (Desv.) Maxim., *M. alopecuroides* var. *squamosa* (Desv.) Grossh. In the present study we have treated *M. germanica* in the broad sense, including the taxa discussed above assigning them the status of varieties or subspecies.

The range of *M. germanica* so defined is very extensive, but divided into several parts. It extends from western Europe (Spain) to northwestern and western China, Mongolia and the Himalayas in Nepal. Furthest to the north *M. germanica* reaches in Europe in Scandinavia, even beyond 70° Lat. N. On the Balkan peninsula it is known only from Romania, with infrequent stands in southern Yugoslavia and it is absent from Albania, Bulgaria, Turkey and Greece. It grows also on the Crimea. In southwestern Asia it occurs in Anatolia, more frequently only in its montane eastern part. It is widely distributed on the Caucasus and here primarily in the Great Caucasus massif. Isolated stands have been reported also from northern and northwestern Iran. East of them there is a major gap in the range covering eastern Iran and western Afghanistan. Starting from province of Bamian in central Afghanistan and western Tadzhikistan the range is continuous and covers the Middle Asiatic republics of the USSR, eastern Afghanistan, northern Pakistan, Kashmir and northwestern India as well as the Chinese provinces Kashgaria and Dshungaria.

This range resembles that of *Hippophaë rhamnoides* L. and in places is identical with it. Both the species are characterized by having similar ecological requirements and frequently grow together and with various species of willows. Also in *Hippophaë rhamnoides* L. the intraspecific taxonomy demonstrates a similar pattern.

*M. germanica* is a moderate light requiring hygrophyte. It grows on scree and stony regions in mountain valleys of rivers and streams which it colonises as a pioneer. This shrub is well adapted to specific conditions which occur in these valleys. Inflorescences of *M. germanica* and then the infructescences develop gradually, from the base to the top, which assures the distribution of seeds over a long period of time and provides the opportunity for the seeds to appear at the right moment for germination and the further development of the seedlings. The seeds germinate immediately after maturation, and seedlings, as a rule appearing abundantly, develop a strong root system, so that in spite of periodic flooding and washing away of the gravel always a certain number of the seedlings is able to persist, to occupy the region, form a thicket and turf the soil. Besides *M. germanica* sustains well the covering of shoots with sand and mud during flooding. However, as growth proceeds, within the thickets representatives of other species of trees and shrubs appear and the deteriorating light conditions lead to the dying of *M. germanica*. Another danger, concerning almost all stands in central Europe is the regulation of mountain rivers and streams, which reduces the natural biotope for *M. germanica*, particularly for the natural regeneration of seedlings. In this manner several stands were liquidated and others are in serious danger.

The vertical distribution of *M. germanica* is very differentiated. In Europe this shrub migrates downwards along river valleys into submontane regions, even to elevations of less than 400 m, while the most elevated stands, in the Alps are at 2350 m. In Anatolia the maximal elevations attained are around 2500 m, in Iran 2700 m, in Tadzhikistan 4000 m and in Afghanistan (Wakhan) and Pakistan even slightly higher.

References: 64 (2), 78, 103 (6), 177 (6), 218 (3), 242 (2), 365, 397.

## Vitaceae

### *Ampelopsis* Michaux

#### 50. *Ampelopsis vitifolia* (Boiss.) Planchon

Syn.: *Vitis persica* Boiss., *V. aegiophylla* Boiss., *Ampelopsis aegiophylla* Planchon in DC.

A climbing or prostrate shrub with glabrous elongate shoots and broadly-ovate or deltoid leaves, entire or obscure 3-lobed, sharply or coarsely dentate, 8 - 10 cm in diameter. The berries are globose, 5 - 7 mm in diameter, black.

The range of this species occupies primarily the Middle Asiatic republics of the USSR (Tadzhikistan, Uzbekistan), eastern Afghanistan and northern Pakistan, where *A. vitifolia* grows on more or less scattered

