

Characterization of areas

Amaranthaceae

Bosea L.

1. *Bosea cypria* Boiss. ex Schinz. et Aufran

An erect, intricately branched, glabrous shrub up to 1.5 m tall, in growth habit resembling species from the genus *Lycium*. Its leaves are shortpetioled, from ovate-lanceolate to almost elliptic, 5 - 6 cm long, with entire margins, shiny dark-green. The greatest attraction in this shrub are the numerous fruits, small crimson fleshy berries in axillary or terminal spikes, forming jointly a terminal panicle.

This is an endemic species for Cyprus, where it has been discovered in 1860. It is one of the most interesting endemic species in southwestern Asia (besides *Liquidambar orientalis* Miller and *Epigaea gaultherioides* (Boiss. et Bal.) Takht.) and this because of its extremely distant geographic affinities. The genus *Bosea* includes only 3 species, of which *B. yervamora* L. is an endemite of the Canary Is. (Gran Canaria, Tenerife, Gomera, Hierro and Las Palmas) and *B. amherstiana* (Moq.) Hook. f. an endemite of northwestern Himalayas (from Pakistan to Kumaun in India). Differences between these three species are not large and they depend primarily on seed characters.

B. cypria grows on Cyprus primarily on its northern, coastal part, more or less from Lapithos to the Karpas peninsula, and to a lesser extent on the remaining shores. In the central part of the island it is absent altogether (or else it is quite unknown). It occurs on the one hand on a dry, rocky substratum in forests and in maquis and on the other in hedges near villages and on walls, locally abundantly. On scarps and walls the shoots hang downwards. It occurs from the sea level to an elevation of about 600 m. It is not known in cultivation outside Cyprus.

References: 56, 113, 145, 151 (2).

Anacardiaceae

Pistacia L.

2. *Pistacia atlantica* Desf.

This is a long living tree, 5 - 20 m tall with a wide, dense and low set crown and a thick trunk of 1 m diameter, sometimes reaching even 2 - 3 m in diameter. On the basis of available data it appears to be having larger dimensions in the western part of the range. Bark on the stems of old trees is almost black, deeply fissured, on branches ash-gray and on young shoots brownish. Leaves are very characteristically more or less winged on rhachis, imparipinnate, with 2 - 4 (5) pairs of leaflets which are very variable in shape, size and also colouration. Fruits are also variable. As a consequence within the species several subspecies or varieties are recognized the taxonomic rank of which is debatable. Some are even being occasionally treated as independent species. It is still not clear what are the relationship between subsp. *atlantica* and subsp. *mutica* (Fisch. et C. Mayer) Rech. f. nor what are their ranges.

P. atlantica is considered to be an Irano-Turanian species, which penetrated from southwest Asia deeply westwards all the way to northwest Africa (Morocco). A more or less continuous range of this pistache extends from northern and western Pakistan, through Afghanistan, Iran, southeastern Caucasus, northeastern

Iraq and southeastern Anatolia to Syria, Lebanon, Jordan, Israel and Egypt (Sinai). Besides isolated stands are to be found in various parts of Turkey, and on the Greek island Chios where, however, the status of the stand is not sufficiently fully explained as to whether it is native or the result of cultivation as a shade tree. The stands on Cyprus and Rodhos are probably the results of ancient domestication.

As a considerable distance from this compact range there occur groups of stands of *P. atlantica* on Cyrenaica (Libya), on the Caucasus, near Novorossijsk and in southern Crimea. These latter stands are the most northerly ones for the whole range, up to 45° Lat. N. On the other hand *P. atlantica* occurs abundantly in northwest Africa, and the most westerly stands are to be found also on the Canary Is.

As regards the ranges of individual subspecies they can be discussed only in very general terms. The most easterly is subsp. *cabulica* (Stocks) Rech. f., which grows in Pakistan, Afghanistan and in southern Iran. On the other hand the range of subsp. *mutica* (Fisch. et C. Meyer) Rech. f. covers Iran, the Caucasus, Crimea, and Anatolia. Subsp. *kurdistana* (Zohary) Rech. f. occurs in southern and western Iran, in Iraq, Syria, and southeastern Anatolia. This latter subspecies is sometimes described under the name *Pistacia eurycarpa* Yaltirik. The range of the type subspecies – subs. *atlantica* is associated with North Africa.

P. atlantica is a distinctly thermophilous xerophyte. It occurs in open communities of the type of a steppe-forest, steppe or even a semi-desert and not infrequently it is the dominant element of these communities. It appears as a smaller or larger component of degraded oak (*Quercus brantii* Lindley, *Q. macrolepis* Kotschy, *Q. infectoria* Olivier), pine or juniper forests with a large participation of xerophytic shrubs, particularly almonds. It grows on sandy soils, on limestone hills, on stony or rocky, limestone or sandstone slopes. The further southwards the more scattered are the stands and poorer in number of specimens, though in the extreme south, on Negev desert on Sinai relatively large groups of *P. atlantica* trees are to be found. In its vertical distribution it occupies most commonly regions between 800 and 2400 m, however, it appears also at other elevations, on the Negev desert between 600 and 1000 m, in Anatolia between 300 and 1800 m, in Iraq between 600 and 1800 m, in Pakistan between 900 and 2400 m, in Afghanistan between 850 and 2500 m and in Iran between (300) 800 and 3000 m, highest on the Zagros massif in the Bakhtiari Mts and in the vicinity of Kerman.

In regions of its occurrence *P. atlantica* is frequently used as a stock for *P. vera*. Its wood is used for fuel and fruits containing up to 60% of oil are used as fodder for cattle. From the bark and wood a resin is being collected for the production of laquers and it is also used in folk medicine.

References: 64 (2), 103(6), 104(5), 163(2), 228(4), 254, 258 (2), 259(2), 403, 415, 510, 517, 518(2), 521, 532.

3. *Pistacia chinensis* Bunge

A tree, up to 25 m tall with a wide crown and large, up to 25 cm long pinnate (frequently paripinnate) leaves composed of 2 - 6 pairs of lanceolate leaflets of which the apical leaflet when present is smaller than the lateral leaflets. It is a rather heterogenous species, on the region under study represented by subsp. *integerrima* (J. Stewart) Rech. f. with a poorer growth and a smaller number (usually 2 - 4) of wider leaflet pairs.

It is an eastern Asiatic species, the main part of its range covering China and besides it is also known from Formosa and the Phillipines. The range of subsp. *integerrima* covers western Himalayas and extends from Nepal and northwestern India, through Kashmir and Pakistan to eastern Afghanistan, where, at least until now, it has been reported from only one stand. It grows primarily on open places throughout the hills, on hot, bare and rocky limestone slopes, in places commonly, both on lower located regions and in mountains from about 400 m elevation to more or less 2400 m; in Afghanistan to 1600 m.

P. chinensis was introduced into cultivation as an ornamental plant, both in its native regions and in other countries. It is valued particularly for its attractive leaf turning which are crimson in the fall. Its wood is suitable for furniture and various types ornamental objects (sculptures). On its leaves and petioles there appear characteristic crooked galls sold on local bazaars and used in native medicine.

References: 30, 58, 179, 225, 403, 521, 532.

4. *Pistacia khinyuk* Stocks

A small tree, 3 - 7 m tall with imparipinnate leaves, composed of 1 - 3 pairs of leaflets, sometimes, similarly as in *Pistacia vera* L. they are reduced to only one, apical leaflet. These leaflets are up to 10 cm long and are ovate-lanceolate to broadly ovate. Fruits are small, almost globular, scarcely 4 - 6 mm in diameter. It is not unlikely that *P. khinyuk* is of hybrid origin and its parental forms most probably were *P. vera* L. and *P. atlantica* Desf. which is indicated by the considerable variability in size, shape and number of leaflets, the range of the species and the frequent occurrence of it on the same stands as *P. atlantica* Desf.

It is an Irano-Turanian species penetrating into southern Jordan, Egypt (Sinai and shores of the Red Sea) and to north-western Saudi Arabia (Hijaz). The main and relatively compact part of the range of the species extends from southeastern Anatolia to northern Syria, through northeastern Iraq, western and southern montane Iran, and then through Pakistani Makran and Baluchistan to northeastern Afghanistan and northern Pakistan. Besides, single, scattered stands are reported from central and northern Iran where the species attains its northern limit of occurrence, to 38° Lat. N. Furthest to the south it grows in Africa, in Gebel Elba, on the border between Sudan and Egypt, at about 22° Lat. N.

The range of *P. khinyuk* to a large extent coincides with that of *P. atlantica* Desf. In contrast to the latter species, however, which not infrequently is the main element of the plant communities and forms its own associations, the participation of *P. khinyuk* in plant communities is negligible as a rule. *P. khinyuk* grows on dry insolated steppe-forest or steppe regions, on rocky and stony places in the mountains, on tops of outlying limestone hills, in rocky gorges and it is accompanied by trees and shrubs from the genera *Quercus*, *Amygdalus* (primarily spiny ones) and *Astragalus* and in places also by *Cerasus microcarpa* (C. Meyer) Boiss, *Crataegus aronia* (L.) Bosc., *Daphne mucronata* Royle and others. As regards its vertical distribution it can be found between 400 and 2700 m elevation, highest in Iran, in Anatolia to 1800 m, in Afghanistan to 2200 m, in Saudi Arabia to 2300 m and in Pakistan to 2450 m.

Similarly as from other species of the genus *Pistacia* it is possible to collect resin from *P. khinyuk* and in places it constitutes a type of chewing gum or is used for perfume manufacture. Leaves are used as fodder for livestock.

References: 64(2), 107, 228(4), 258(2), 259(2), 403, 415, 510, 518(6), 521, 532.

Pistacia vera L.

It is a dioecious, long living (probably up to 250 - 400 years) tree up to 8 - 10 m tall, frequently with several stems, which on old individuals attain even 100 - 150 cm in diameter. The crown is very dense, spreading, low set, semiglobular. The leaves are usually with three leaflets, long-petioled and the leaflets are leathery, shining, almost sessile, from broadly elliptic to roundish-ovate, up to 12 cm long. In the vegetative state the species may be mistaken for *Pistacia khinyuk* Stocks from which it differs primarily in having several times larger fruits. These fruits, 1 - 2 cm long are long-pedicelled drupes, very variable in shape, from oblong-linear to broadly-ovate and even almost globular, laterally-compressed with a fleshy mesocarp and a bony, dehiscent or indehiscent endocarp.

It is an Irano-Turanian species, the main range of which covers the USSR Middle Asian republics - Uzbekistan, Tadzhikistan, Kirgiziya and the southernmost parts of Turkmeniya and Kazakhstan. Besides it grows in Afghanistan where probably it is much more common than one could judge from the available data. It appears also on a few stands in northeastern Iran, on its border with Turkmeniya and Afghanistan. In the north *P. vera* reaches to more or less 43° Lat. N, to the Karatau, Kirgizskiy and Talasskiy Alatau mountain ranges, while in the south and southwestern Afghanistan, in Paropamisus Mts. in Herat province it reaches 35° Lat. N. Most abundantly and on the most extensive areas it grows in Tadzhikistan, where it occupies an area of about 115,000 ha; in the whole of Middle Asia natural thickets cover about 300,000 ha.

P. vera is a distinctly light demanding species, sustaining extremally dry conditions and it covers regions where the temperature of air during the summer reaches 40°C or even more, and the soil surface heats up to

70°C. This is achieved by the ability to root very deeply, even to 5 - 6 m. *P. vera* grows on fine-grained stony soils and also on rocky slopes. Nowhere does it form dense forests and its communities, in which it is the dominant element, resemble savannas in appearance on which individual pistachio trees are separated from each other by 5 - 100 m. Communities of pistachio are very variable and their floristic composition depends to a large extent on the vertical location and they can be steppe-forests, steppes, or semi-deserts, where besides grasses and wormwoods also trees and shrubs appear from such genera as *Amygdalus*, *Celtis*, *Cerasus*, *Crataegus*, *Juniperus*, *Colutea*, *Rosa* and *Berberis*. Optimal conditions for *P. vera* are to be found in regions located between 800 and 1500 m elevation, however, the species can easily grow lower down, from about 450 m and in the mountains it can attain 1800 m and as single individuals even 2000 m.

P. vera is a valuable fruit tree and is used for tannins (leaves, galls and bark). As a result of tapping from male individuals a special resin is obtained which is used in the dye industry. Heavy, narrow-ringed and colourful wood of this pistachio is easy to work with and it is also a raw material for the production of high calory charcoal. However, the most important use of the plant is for its seeds of intensively bright-green colour, a pleasant smell and a considerable content of fat (to 50 - 60%) proteins and sugars. It is valued as a component of various confectionery goods (sweets, ice-creams etc.). In the whole of southwest Asia and also in India it is much reknown, is commonly eaten, both fresh and salted. Thus *P. vera* was already in cultivation since antiquity and particularly in Persia of that time, from where its cultivation spread to Syria and then almost throughout the Mediterranean (already about 2000 years ago). Even towards the end of the XIXc. it was believed that the species comes from Syria, where until this day extensive plantations are to be found in the vicinity of Aleppo and Damscus. Nature trees of *P. vera* in the wild state can give up to 25 - 30 kg of seeds annually. This crop can be even larger particularly on specimens in pomological cultivation and it can reach 50 - 100 kg or more. The size of fruits from cultivation is only slightly larger than that of trees growing wild. Of course in cultivation only female specimens are valued and since times immemorial *P. vera* is being propagated by grafting, using as stocks either seedlings of *P. vera* itself or depending on local possibilities seedlings of *Pistacia terebinthus* L., *P. atlantica* Desf. or *P. chinensis* Bunge.

References: 104(5), 177(6), 252, 258(2), 397, 403, 415, 532.

Apocynaceae

Nerium L.

6. *Nerium indicum* Miller

Syn.: *N. odorum* Sol., *N. kotschy* Boiss.

A strong, erect, evergreen shrub closely related to *Nerium oleander* L. and very similar to it, thus the two species are sometimes treated as conspecific. The differences between them are small and not always well recognized. *N. indicum* is said to have narrower leaves and fragrant flowers with appendices of corolla divided to the base in the form of thread-like fringes (in *N. oleander* L. appendices are serrate or lobed-serrate).

N. indicum is an Asiatic species and its range extends more or less between 50° and 84° Long. E., from southwestern Iran through southern Iran, eastern Afghanistan, Pakistan to northwestern India and Nepal. Besides, in considerable isolation from this continuous range there occur isolated stands in southern India. It has been reported from the Arabian peninsula (Muscat) as *Nerium mascatense* A. DC., however, it appears that this plant should be considered within this species. Furthest to the north *N. indicum* reaches northern Pakistan, from where it is reported even from province of Chitral, however, it does not cross 36° Lat. N.

N. indicum is characterized by similar ecological requirements as *N. oleander* L. — it is a light demanding and thermophilous species occurring along various types of water runs, both permanent and periodic, usually in the form pure thickets or with the participation of representatives from the genus *Tamarix*. In places it is

common. While this shrub does occasionally grow at locations below 600 m in contrast to *N. oleander* is most commonly found at elevations above 800 - 900 m and reaches up to 1600 - 1800 m, and in Pakistan even higher.

In India and Pakistan it is a commonly cultivated species, treasured for its evergreen leaves and colourfull and fragrant flowers. It is cultivated also in other countries, in regions with a mild climate, even on such distant islands as Samoa, Hawaii or Society Islands. All parts of the plant are very poisonous.

References: 30, 81, 179, 225, 494, 518(6), 522.

Rhazya Decne.

7. *Rhazya stricta* Decne.

An erect, evergreen shrub 50 - 100 cm tall occasionally taller (to 1.5 m), with stiff, leathery, linear-lanceolate to oblanceolate, up to 10 cm long leaves which are characteristically raised at an acute angle towards the tip of the shoot. Flowers are fragrant with a hypocrateiformis white corolla, about 15 mm long and with a diameter of 5 mm, collected in terminal erect corymbs. Similarly erect are cylindrical 7 cm long follicles. In general appearance this shrub resembles *Nerium oleander* L. though it is somewhat smaller.

The range of *R. stricta* extends from the southern part of the Arabian peninsula (Yemen), through south-eastern Iran and southern and western Pakistan to eastern Afghanistan up to about 35° Lat. N. In complete isolation from this continuous range of the species there are stands located in the desert regions of southern Iraq. The main part of the range is in Pakistan, where the shrub is quite common and where in the eastern direction it practically does not cross the Indus river, and only in the north it can be found between rivers Indus and Jhelum.

R. stricta is a thermophilous and light requiring species, occurring as a rule gregariously or even as the dominant element of the vegetation, on open, hot and insolated regions, in deserts, on sandy plains and hills, on sandy soils in rocky places and on gravelly slopes above rivers. In its vertical distribution it is usually restricted to lower located places. In Iraq it grows to about 400 m and in Afghanistan, Iran and Pakistan, usually no higher than to 800 - 900 m. Highest located stands are known from Afghanistan and Pakistan at 1260 - 1280 m and in Iranian Baluchistan even at 1500 - 1600 m.

Fruits and leaves of this shrub are locally used in native medicine, and dried stems with leaves are used in regions devoid of woody vegetation as fuel.

References: 30, 179, 225, 228(4), 494, 518(6), 522.

Asclepiadaceae

Calotropis R. Br.

8. *Calotropis procera* (Aiton) Aiton f.

An erect shrub or a small tree 1 - 3(5) m tall with an abundant milky latex, soft wood and a corky bark towards the base. It is a very characteristic species in view of its long, sessile or subsessile, obovate and fleshy leaves, up to 20 cm long and 15 cm wide, and also because of its large flowers with a 2 - 2.5 cm diameter, whitish-green with large, purple patches, collected in dense umbellate cymes. However, most striking are its fruits, inflated, subglobose follicles 10 - 12 cm long, spongy within, with many flat seeds having a tuft of hairs.

On the eastern limit of its range (Afghanistan, Pakistan, India) *C. procera* is represented by subsp. *hamiltonii* (Wight) Ali, which differs from the type species primarily because it has smaller elliptic fruits.

C. procera is a Nubo-Sindian species, widely distributed in desert regions from subtropical to tropical Africa, across the Arabian peninsula, southern Iran, eastern Afghanistan and Pakistan, all the way to the desert regions of western India. Its eastern limit of the range is not known well since in India the range of the species more or less coincides with the range of the closely related species *Calotropis gigantea* (L.) Aiton f. Most probably these two species are not always sufficiently well distinguished from each other. Furthest to the north *C. procera* reaches in Afghanistan, up to 35° Lat. N, while in western Iran to 33° and in Pakistan to 32° Lat. N.

This species grows primarily on open, desert plains, in wadis areas or in depressions, hot oases, in fallow land by rivers, besides water canals, in sandy grit and rocky crevices, as a rule on plains more or less between 10 and 600 - 700 m elevation. In Afghanistan and in Iran it has been found at elevations of about 1200 m and in Pakistan (Baluchistan) even at 1800 m. On the other hand in Palestine, in the Jordan valley and on the Dead Sea it occurs commonly in depressions, 100 - 390 m below the sea level.

In some countries such as Iraq or Israel it is apparently cultivated as an ornamental plant and naturalized. It is a poisonous plant, not eaten by camels. Its latex causes an irritation of the skin and of mucous membranes. It is also used as a laxative. The seed fluff is used for the stuffing of pillows and mattresses.

References: 184(2), 228(4), 259(3), 339, 364, 507, 508, 518(6).

Leptadenia R. Br.

9. *Leptadenia pyrotechnica* (Forskall) Decne.

Syn.: *L. spartium* Wight

An erect, much branched shrub or small tree up to 3 m tall with rod-like, slender, pale green and spine-scented branches, usually without leaves. Its flowers are small, greenish yellow, collected in umbellate cymes, follicles up to 12 cm long, fusiform, pendulous. *L. pyrotechnica* resembles in its general appearance *Periploca aphylla* Decne. in the vegetative state and it can be mistaken for it.

It is a Nubo-Sindian species with a range very similar to that of *Calotropis procera* (Aiton) Aiton f., which is associated with similar ecological requirements of the two plants. Its range covers central and eastern Africa (Algeria, Libya, Chad, Egypt, Etiopia, Sudan, Somalia), Palestine (rarely), the Arabian peninsula, southern Iran, Pakistan and western India. In the latter country the eastern limit of the range is not known well, however, it most probably does not cross 78° Long. E. As distinct from *Calotropis procera* (Aiton.) Aiton f., *L. pyrotechnica* does not occur in Afghanistan and in the north it reaches only 32 - 33° Lat. N.

L. pyrotechnica grows in hilly areas, on sandy plains and sandstones, on deserts and rocky steppe, frequently near streams and in dry river beds, forming dense thickets in places. In its vertical distribution it appears most commonly to an elevation of 400 - 500 m, however, it has been found also higher up, in Iran to 600 - 700 m, in Saudi Arabia and in Pakistan even above 800 m.

Locally fibrous twigs of *L. pyrotechnica* are used for ropes.

References: 184(2), 259(3), 339, 364, 510, 518(6).

Avicenniaceae

Avicennia L.

10. *Avicennia marina* (Forsskal) Vierh.

This is an evergreen shrub or a small tree 1 - 3(5) m tall with entire, leathery leaves, green above and white beneath. It forms numerous characteristic rod-like pneumatophores projecting above soil and water, which function as respiratory organs. It is a viviparous plant, the seeds germinating before their fall.

This tropical species is widely distributed in Africa and southern Asia, Polynesia and southern Australia, and it is associated exclusively with the sea coast where it grows on muddy flats of shallow water in places where near land corral reefs forms and also in small sheltered creeks. It forms there a specific woody formation — mangroves. This may be an almost pure community (*Avicennietum marinae*) or with an admixture from the side of the land of some species sustaining the salinity of water such as those from genera *Halocnemum*, *Nitraria* or *Limonium*. During high tide mangroves can be explored with the help of boats, but during low tides they are impenetrable marshland thickets.

A. marina in the region under investigation occurs at intervals on the one hand on the shores of the Red Sea, in Egypt and in Saudi Arabia on the other on the shores of the Arabian Gulf and Arabian Sea, in Saudi Arabia, on Bahrain Is., in Qatar, Trucial Oman (Abu Dhabi), Muscat or in Iran and Pakistan, in places quite abundantly, as for example near Karachi (Pakistan) and Bandar Abbas (Iran). Here it attains also its northern limit of occurrence, extending even beyond 27° Lat. N. The most northerly stands within the whole range are to be found on the southern extremity of the Sinai peninsula, near Nabq, more or less at 28°10' Lat. N. The most southerly stands occur in Australia at ca 37° Lat. S.

References: 225, 259 (3), 500, 510, 514, 520, 529, 537.

Berberidaceae

***Berberis* L.**

11. *Berberis calliobotrys* Aitch. ex Koehne

Syn.: *B. waziristanica* Ahrendt, *B. gambleana* Ahrendt

An erect, glabrous, spiny shrub 1-2 m tall, occasionally somewhat taller. It is one of the most characteristic species of the genus *Berberis* in southwestern Asia, characterized primarily by pruinose stems, leaves, particularly on the dorsal side, and fruits. Even if occasionally such pruinosity is poorly visible or it is even absent, then *B. calliobotrys* is easy to identify by the characteristic berries on the tops of which a distinct style 1 - 2 mm long is preserved.

The range of this montane shrub extends as a narrow belt from north to south, between 36 and 30° Lat. N, on both sides of the Afghan-Pakistani border. It is also reported from Kashmir. As can be judged from the available data it is most common in Afghanistan in district of Jaji, Chakmanni and Khost and in the neighbouring Pakistani district of Kurram.

B. calliobotrys grows in dry, stony slopes, in thickets together with other species of berberry and with roses, and also in sparse forests of *Quercus baloot* — *Olea ferruginea* and in pine forests. It appears more or less from about 1800 m to about 3000 m and only occasionally (in Afghanistan) at lower elevations.

References: 225, 467, 515.

12. *Berberis integerrima* Bunge

Syn.: *B. densiflora* Boiss. et Buhse, *B. turcomanica* Karelin, *B. iberica* Stev. et Fisch. ex DC, *B. baluchistanica* Ahrendt.

A strong, erect, very spiny shrub 3 (4) m tall with yellowish or brownish shoots, lustrous and with strong spines up to 4 cm long, single or trifide, somewhat lighter than the shoots. Fruits are red. The species is very variable both in the size of leaves (up to 4 cm long, coriaceous) and in the type of margin which can be entire, particularly on flowering shoots, or coarsely serrate, particularly on sterile shoots. This berberry has been

described under various names to which various taxonomic ranks have been assigned, either as independent species, subspecies, varieties of forms. This fact as well as the various and frequently contradictory interpretation of the range of variation coupled with the ease of hybridisation with other species hinders the utilisation of data from literature when trying to determine its geographical range. In some instances an exact determination of the limit of distribution is quite impossible. This concerns particularly its western course, since in north-western Iran and in northeastern Anatolia and probably also on the Caucasus a distinct introgression of this species is to be found with *Berberis vulgaris* L., *B. crataegina* DC. and *B. orthobotrys* Bien. In that region almost exclusively introgressive forms exist, which are more or less akin to the taxa mentioned above and their classification is pointless. Thus for example it appears that in Anatolia pure *B. integerrima* is almost completely lacking while introgressive forms are quite common. In central Pakistan, in the vicinity of Quetta *B. integerrima* forms also hybrids with *Berberis calliobotrys* Aitch. (\times *B. lamondiae* Browicz et Ziel.).

It is an Irano-Turanian species, a most common and most frequently occurring berberry in southwestern Asia. Its range extends from the Caucasus and eastern Anatolia (?) to western Pakistan and covers northern and southwestern Iran and its frontier with Iraq (Avroman Mts.), southern Turkmeniya, (Balkhan Mts., Kopet Dag Mts. Badkhyz), northern Afghanistan and mountains of Middle Asia – Tyan-Shan and Pamir-Alai, where *B. integerrima* reaches furthest to the north in southern Kazakhstan, however, similarly as on the Caucasus it does not cross 43° Lat. N. In Pakistan it occurs in the north in district of Chitral and in the south in Baluchistan near Quetta, from where it has been described as *Berberis baluchistanica* Ahrendt.

B. integerrima is a distinctly light demanding and thermophilous species with very low soil requirements. It grows on dry and sterile, skeletal soils, even saline ones, on rocky slopes, in valleys of rivers and on banks of streams, singly or in the form of pure thickets, or else it forms them together with other xerophytic shrubs, particularly with those from the genera *Rosa* and *Cotoneaster*, and also with tree form junipers, maples and *Pistacia*. In its vertical distribution it appears in the mountains, usually above 1800 m, in Afghanistan between 1100 and 2800 m, in Iran between 900 and 3000 m and in Tadzhikistan between 1500 and 3200 m.

References: 103 (4), 177 (4), 218 (2), 252, 467, 502, 515, 518 (6).

13. *Berberis vulgaris* L.

A strong, dense, erect, spiny shrub up to 3 m tall with relatively large, up to 5 cm long spinulose-serrate leaves and spines usually 3– sometimes 5–fid. Flowers are yellow, smelling unpleasantly, in pendant racemes. The fruits are juicy, purple, oblong berries. In southeastern parts of the range, on the Caucasus and in Iran forms are known with more coriaceous leaves and with usually single spines, which are treated either as a separate variety (var. *orientalis* (C. Schneider) Grossh.) or as a subspecies (subsp. *orientalis* (C. Schneider) Takht.), or else it is separated out as an independent species *Berberis orientalis* C. Schneider.

B. vulgaris occurs almost throughout Europe, where it reaches furthest to the north in Scandinavia, to 64° N. Most probably, however, its northern limit runs only through Central Europe and the stands in the north are most likely of synantropic nature. In the south of Europe, in the Mediterranean region it is already a rare shrub and it is much scattered. In the Balkans furthest to the south it appears in northeastern Greece, in Pindos Mts. On the other hand in southwestern Asia it is common only on the Caucasus, from the shores of the Black Sea to the Caspian Sea. In Anatolia stands of *B. vulgaris* cover the northern part of the country and they are located north of 40° Lat. N. In several stands we are dealing not so much with “pure *B. vulgaris*” but with intermediates between this species and *Berberis crataegina* DC., which in Anatolia is much more common. Such forms of course hinder substantially the determination of the natural limit of a species range. A similar phenomenon of introgression is to be observed in northern Iran and possibly also on the Caucasus. Even though *B. vulgaris* grows wild in northern Iran (Azerbaijan, Gilan, Mazanderan, Gorgan) reaching as far east as 56° Long. E, here much more common are intermediate forms resulting from introgression particularly with *B. integerrima* Bunge.

B. vulgaris is a mesophytic species which sustains drought quite well. It is a light demanding shrub occurring most commonly in open insolated places, singly or in small groups, in thickets of shrubs, on forest openings and on forest edges, on various types of slopes and in river valleys, on poor sandy or stony, particularly lime-

stone soils, both in the lowlands (in the north) and in the mountains (in the south). In Anatolia the most elevated locations reach 1700 m, in the Caucasus 1800 m, in Iran as much as 2700 m and in Europe *B. vulgaris* has been found in Greece at an elevation of 2100 m and in the Alps as 2310 m.

Fruits of this berberry are edible and contain much vitamin C and maleic acid. They can be consumed fresh or processed into a jam, syrop or compot. In earlier times the shrub has been extensively planted for the purpose. Besides it is an ornamental plant particularly its variety with purple leaves ('*Atropurpurea*') planted in parks, particularly on various escarpments or in wastelands. On the other hand it is frequently being eradicated, eg. near fields in view of the damage it does as an alternate host for the wheat rust (*Puccinia graminis*). From the wood, bark and roots of the shrub a yellow pigment is extracted which can be used for the staining of textiles and skins. It is also a mellaniferous and a medicinal plant.

References: 64 (1), 103 (4), 218 (2), 467, 502.

Caprifoliaceae

Abelia R. Br.

14. *Abelia triflora* R. Br. ex Wallich

Syn.: *Zabelia triflora* (R. Br.) Makino

An erect shrub or a small tree of bushy habit attaining as much as 4 - 5 m in height, with deciduous or sometimes semievergreen leaves, lanceolate to ovate-lanceolate, (1) 3 - 7 cm long, and with pinkish-white, fragrant flowers collected into terminal clusters.

It is a Himalayan species, the only representative of the genus *Abelia* on the region under study. The other species from this genus occur in China and Japan (about 25), and further two in Mexico. *A. triflora* is represented by two subspecies: subsp. *triflora* which occurs in the eastern part of the range and is characterized by larger, pointed leaves and larger flowers, while subsp. *parviflora* (Clarke) Wendelbo has leaves only 4 cm long and usually with rounded or subacute apice, the flowers being smaller and more whitish. This shrub appears already, though rarely, in eastern Afghanistan, in province of Nuristan and then in western (Kurram, S. Waziristan, Quetta, Ziarat, Loralai) and northern Pakistan from where through Kashmir it enters northwestern India and reaches central Nepal.

A. triflora grows in the mountains, usually on open slopes, on dry limestone rocky ground, among thickets together with species from the genera *Crataegus*, *Cotoneaster*, *Rosa*, *Parrotiopsis*, *Pyrus*, *Acer*, *Fraxinus* and *Corylus*, more or less from an elevation of 1500 m to 3000 m in Afghanistan, 3450 m in Pakistan and even 4200 m in Nepal.

This is an ornamental shrub, most resistant to low temperatures from among all species of the genus *Abelia*. It was introduced into cultivation in 1847 and is valued for its fragrant flowers and original fruits — lethy achenes crowned with a persistent, long feathery calyx.

References: 58, 179, 225, 364, 530, 533.

Lonicera L.

15. *Lonicera asperifolia* (Decne.) Hook. f. et Thompson.

Low, strongly and densely ramified shrub, usually not higher than 1 m, with orange-reddish berries and small leaves about 2 cm long, which similarly as the youngest shoots are bristly on both sides.

This is a high elevation plant from the Himalayas with a range extending more or less between 70° and 80°E. long. To the north it reaches as far as Lake Sarezskoye in western Pamir (USSR).

L. asperifolia occurs in eastern Afghanistan (particularly in Nuristan and Wakhan), in south-western Tadzhikistan (Pamir), northern Pakistan, Kashmir and in north-western India. Besides it is also reported from south-western China (Kashgaria and Tibet), however, from the last region accurate data is lacking. The range of the most related species *Lonicera olgae* Rgl. et Schamlh. is removed more to the north and covers in USSR the Tyan-Shan and Pamir-Alai Mts.

Except for Pamir, where *L. asperifolia* is rare, it usually grows fairly frequently in the valleys of mountain rivers, on stony slopes, on moraines and in rock fissures, either singly or in clumps. It occurs at considerable altitudes, usually over 3000 m or even over 3500 m, and only occasionally at lower ones down to 2800 m (Afghanistan). The highest stands are known from Pakistan up to 4000 m, in Afghanistan up to 4150 m, in Pamir up to 4200 - 4300 m and in Kashmir up to 4500 m.

References: 108, 135, 181, 224, 225, 278, 533.

16. *Lonicera caucasica* Pallas

A not very dense, erect shrub about 1 - 3 m tall characterized by more or less violet coloured young shoots and elliptic or ovate leaves up to 7 cm long, dark green above and light green and frequently glaucescent beneath.

This species is divided into two subspecies one of which, subsp. *caucasica* has leaves glabrous on both sides and bracts longer than ovary while subsp. *orientalis* (Lam.) Chamberlain et D. Long has leaves which are villous on beneath and bracts shorter than the ovary. These two subspecies differ from each other also in their ranges of occurrence. Subsp. *caucasica* occurs primarily on the Caucasus and also in northeastern Anatolia, in northern Iran and it reaches as far east as central Elburz in province of Mazanderan, more or less to 52° Long. On the other hand subsp. *orientalis* is considered to be endemic for Anatolia where it is more common in the north of the country and more rarely scattered in the south. However, it is also known from northwestern Syria, from the Jebel el Ansariye.

L. caucasica is a mesophilous shrub entering into the composition of broadleaved forests (*Fagus*, *Quercus*), coniferous ones (*Abies* and *Picea*) and into mixed ones, particularly in the valleys of rivers and along rivers. On more elevated regions it appears in subalpine thickets of rhododendrons, birches, mountain ash and even juniper (*Juniperus communis* L. subsp. *nana* Syme). As a rule it grows above 1000 m elevation, only occasionally coming down lower, to an elevation of 800 - 500 m. Optimal conditions for it are to be found at elevations of 1300 - 2300 m, however, it has been reported from higher stands, on the Caucasus at 2600 m, on Erciyas Dagi in central Anatolia and in Elburz Mts in northern Iran at almost 2800 m.

L. caucasica has been introduced into cultivation in early XIX c., however, it did not become popular, and only occasionally it is planted in parks under canopies of trees. In cultivation only the type subspecies *caucasica* is represented.

References: 64 (4), 163 (3), 533.

17. *Lonicera iberica* M. Bieb.

An erect, densely branched shrub attaining a height of 1.5 - 2 m, dome-shaped, with gray or yellowish-brown twigs having a flaking bark. The short-petioled leaves are broadly ovate or suborbicular, cordate at base or rounded, hairy on both sides and characteristically ciliate, the flowers are yellowish and the berries bright red.

It is a light demanding, montane xerophyte without special soil requirements, distributed in more dry regions of the Transcaucasus (Armenia, southern Gruzija, Azerbaijan), in Dagestan and in Talish Mts. in the USSR, in northern Iran and in northeastern Anatolia. It grows usually singly in degraded open oak or juniper forests, in thickets of shrubs from the genera: *Spiraea*, *Rosa*, *Cotoneaster*, *Crataegus*, *Lonicera*, *Colutea* and *Acer* and also on exposed places in communities of the montane steppe, among rocks and boulders. It occurs most commonly at elevations above 1000 m, and only occasionally below that (700 - 800 m). Optimum for its development is to be found in stands located between 1300 and 2300 m. Highest stands are to be found in Anatolia and on the Caucasus up to 2500 m and in Iran to 2900 m (Demavend Mt.). On extremely elevated stands it is represented by a form with small leaves (f. *microphylla* Kotschy) only 1.5 - 2.0 cm long, i.e. half the length of the typical forms.

L. iberica is an ornamental shrub introduced into cultivation in the year 1824, however, it is not very common in cultivation.

References: 64 (4), 533.

Sambucus L.

18. *Sambucus nigra* L.

A bushy, fast growing tree attaining up to 8 - 10 m in height, with a gray, sulcate, corky bark. It is characterized by very early leaf flushing in the spring, whitish pith, small, whitish flowers collected in large corymbose inflorescences up to 20 cm in diameter and by black, juicy, globose fruits, 5 mm in diameter.

S. nigra is widely distributed almost throughout Europe except for its most northern parts. In Scandinavia it is reported even from 63° Lat. N., through there it is most probably naturalized. It occurs also in northwest Africa and in southwest Asia, namely in Anatolia, the Caucasus, on single stands in northeastern Iraq and in one place in western Iran. A strict delimitation of the range is a difficult task since it is impossible to distinguish natural stands from stands that resulted as a consequence of its going wild very easily. These latter, secondary stands, undoubtedly include those reported from Syria, Lebanon, Palestine and Cyprus.

It is a meso- and nitrophilous species, tolerant to shade, and to a lesser extent to drought, not having any major soil requirements. It grows best on relatively fertile and moist places. It occurs in various types of forest communities, both coniferous and broadleaved, frequently on banks of streams and rivers. It easily spreads in regions modified by man and enters into synantropic communities, into field thickets, onto fallow fields and onto various types of ruins, or rubble near farm buildings in villages and even in towns. It avoids dry regions thus in southern parts of the Balkan peninsula, in Greece, it is rare and scattered. It is absent on Crete and on the majority of Greek islands. It is similarly rare in southern Anatolia, and only in northern Anatolia it is somewhat more common, while on the Caucasus it is quite common.

Its vertical distribution depends primarily on the moisture conditions. Practically speaking it occurs almost from the sea level, all the way to the mountains, higher for stands localized in the south and in the eastern parts of the range. In Greece it reaches 1300 m elevation, in Yugoslav Macedonia 1500 m, on the Caucasus to 1900 m, in northeastern Anatolia even to about 2300 m, usually, however, no higher than to 1700 m.

S. nigra is under cultivation for centuries, for consumption, for medical needs and for decorative purposes. Its fruits are used in various countries for the making of confitures, jellies, juices, wine dyeing etc. Dried flowers, fruits and bark are used in medicine as a diaphoretic and a diuretic and these properties of the plant have been known already in antiquity. The pith from stems is used in microscopic techniques (to help make sections of plant parts). As an ornamental *S. nigra* is planted in parts in several varieties characterized by fruits or leaves of a different colour or by incized leaflets.

References: 64 (4), 228 (4), 533.

19. *Viburnum cotinifolium* D. Don

An erect shrub, up to 4 m tall, sometimes even a small tree, with spreading branches, stellate-tomentose when young. Leaves are similarly pubescent, particularly on the dorsal surfaces and so are inflorescences. This species is closely related to *Viburnum lantana* L. form which it differs primarily in having smaller less branched inflorescences and in leaf shape since they are usually orbicular-ovate, crenate or subentire.

It is a Himalayan vicarious species in this part of Asia for *Viburnum lantana* L. The distance between the most easterly stands of this latter species in Iran and the most westerly stands of *V. cotinifolium* in Afghanistan amounts to 1500 km.

V. cotinifolium occurs throughout the crest of the Himalayan Range from Bhutan in the east to Kashmir in the west, and then it enters also into northwestern Pakistan and northeastern Afghanistan (Nuristan). Besides that it is reported also from southern Tibet. Single isolated stands are known also from the Pakistani Baluchistan. On the one hand it grows in coniferous forests and on the other in open places in full sun, on granities, on damp slopes and in steep valleys, locally quite commonly. While it can be met already at elevations from 1300 - 1500 m it is most commonly found between 2000 and 3000 m. The most elevated stands are to be found in Pakistan at 3200 m, in Nepal at 3500 m, in Afghanistan at 3600 m and in Kashmir at 3700 m.

References: 134, 135, 179, 224, 225, 278, 533.

20. *Viburnum lantana* L.

This is a strong erect shrub or even a small tree, up to 5 (6) m tall. It is characterized by naked buds, large, 10 - 15 cm long, ovate or obovate leaves and also by compressed-ovoid, originally red and when ripe black fruits. Both stems, leaves and inflorescences are stellate-tomentose. This species is closely related to *Viburnum cotinifolium* D. Don occurring in Afghanistan and Pakistan.

The major part of the range of *V. lantana* covers central, and southern Europe, where the most northerly stands of the species occur in England, Belgium and Czechoslovakia. It is also reported from northwest Africa, from Morocco and Algeria. On the Balkan peninsula it is absent in Turkey and in Greece it is rare, known from only a few stands located in the north of the country. In southwest Asia it is common throughout the Caucasus, and it is not rare in northern Anatolia, but much less common in northern Iran, almost exclusively in Elburz Mts.

It is a light requiring and thermophilous species, resistant to drought. It is a characteristic component of open deciduous forests (particularly oak-woods) or mixed ones and of xerothermic thickets developing on sandy, stony and rocky slopes, particularly limestone ones with a southern exposition. It grows singly or in small groups together with such species as *Acer tataricum* L., *Cornus mas* L. and *C. sanguinea* L., *Fraxinus ornus* L., *Euonymus europaeus* L., *Crataegus monogyna* Jacq. and roses. In its vertical distribution it is scattered primarily in lower montane elevations and in mountains, in Albania to 1700 m, in Greece to 2100 m, on the Caucasus and in Anatolia more or less between 800 (occasionally lower) and 2400 (2500) m and in Iran between 1500 and 3000 m.

V. lantana is an ornamental shrub, cultivated in many countries for many years now and in places it goes wild. It is valued particularly for its autumn colouration of turning leaves and fruits collected in umbellate cymes. It is planted particularly in large parks, in groups or singly, and also in the form of uncut hedges, always in sunny places. It can be used for the fixing of dry escarpments.

References: 64 (4), 533.

21. *Viburnum opulus* L.

An erect shrub, 2 - 4 m tall with 3 - 5-lobed leaves and white flowers collected in umbellate cymes of 5 - 10 cm diameter in which the small inner flowers 6 mm in diameter are bisexual, while the external flowers 15 - 20 mm in diameter are sterile. Fruits are globose, 8 - 10 mm long, bright red.

It is a Euro-Siberian species, widely distributed almost throughout Europe except for the extreme south and extreme north. Furthest to the north it reaches in Scandinavia, more or less to 67° Lat. N. Besides it occurs in western Siberia and in Middle Asia (northern and eastern Kazakhstan), eastern Dzhungaria, north-western China and on the Caucasus. Infrequent and scattered stands of the species are known also from north-west Africa, from northern Iran (only in provinces of Gilan and Mazandaran) and from Anatolia, particularly its northern part. The closely related and replacing it species *Viburnum sargentii* Koehne and *Viburnum trilobum* Marsh are reported from northeastern Asia and North America respectively.

This shrub sustains limited shading well and grows both in the understorey and on edges of moist broad-leaved and mixed forests as well as in thickets, particularly near various types of water runs or even on marshes. While in the major part of its range it occurs in the lowlands and in lower montane regions, in the south it enters also upper parts of mountains. In the Alps it attains 1400 m, in northern Anatolia 1500 m, on the Caucasus more or less 2000 m, and in Iran in the Elburz Mts. even 2670 m.

V. opulus is a decorative shrub frequently planted in parks and gardens, particularly its attractive variety 'Roseum' is known at least from the XVI c. It is frequently referred to as the "snowball tree" or "Boule de neige". It has globular inflorescences in which all flowers are sterile. Bark, flowers and fruits of *V. opulus* have been used in folk medicine.

References: 64 (4).

22. *Viburnum orientale* Pallas

An erect shrub, 1 - 3 m tall with characteristic up to 15 cm long, palmate, 3-lobed leaves, umbellate cymes 6 - 10 cm in diameter and elliptic scarlet drupes. This species is closely related to the North American *Viburnum acerifolium* L. occurring in the eastern part of USA and in southeastern Canada (New Brunswick).

V. orientale is a typical representative of Euxinian flora with a range coinciding to a large extent with that of *Picea orientalis* (L.) Link. On the one hand it occurs in northeastern Anatolia where furthest to the west it occurs in the vicinity of Erbaa (Prov. of Amasya) and on the other in western Transcaucasus, particularly in Georgia, Adzhariya and Abkhazskaya A.S.S.R. In its vertical distribution it appears in Anatolia between 500 and 1500 m elevation and only occasionally does it extend beyond 1800 m. On the other hand in the Caucasus it usually grows above 900 m reaching as far up as 2000 m or even higher.

This shrub belongs to species which sustain even very heavy shading and it grows primarily in the understorey of relatively moist forests of spruce, beech and beech with fir. In places it forms its own thickets together with other species from the genera *Vaccinium*, *Rubus*, *Rhododendron*, *Euonymus* and also *Lonicera*. In conditions of strong shading it is represented by vegetatively propagating individuals, the prostrate twigs of which rest on the ground and when covered with litter readily root. As the availability of light increases individual shoots grow up, flower and fruit. In gradually opening stands this shrub makes room for other more light demanding species of shrubs or high ferns.

References: 64 (4), 286.

23. *Viburnum tinus* L.

A strong, densely ramified, evergreen shrub, 1 - 4 m tall, sometimes even taller, adopting tree form with a semispherical crown. It is characterized by dark, glossy green leaves with entire margins and by black drupes which are initially deep blue in colour.

It is a circum-Mediterranean species (found also on the Açores and on the Canary Is.), however, it is more common in the west. In the eastern Mediterranean its range is strongly cut up into several parts and the stands are infrequent. *V. tinus* is known from Greece in the wild state (as far as one can judge) only from a few very isolated stands on Kérkira and Lesvos islands. It is commonly cultivated, particularly in the south of the country, in towns and villages and sometimes also along roads, however, it does not go wild. In southwest Asia it has been known until recently only from western Lebanon and from northern Israel from where the most southerly stands are reported from Mt. Carmel and Mt. Tabor. During the last 10 years it has been discovered also in western Anatolia, on the one hand from the north of provinces of Balıkesir and Çanakkale and on the other from the south between Izmir and Samsun Dag in provinces of Izmir and Aydin. It grows also in northeast Africa in Cyrenaica, on Jebel el Akhdar.

V. tinus enters into the composition of more moist maquis fragments and appears such among species as *Arbutus unedo* L., *Phillyrea latifolia* L., *Erica arborea* L., *Erica manipuliflora* Salisb. or *Cistus incanus* L. In Anatolia it grows between 60 and 400 m elevation, in Lebanon somewhat higher, to 460 m, while in northwest Africa it attains even 2000 m.

It is a much valued ornamental shrub widely known in cultivation throughout the Mediterranean and in the countries of western Europe that have a milder climate. It is considered to be one of the most valuable evergreen shrubs suitable for mass planting, particularly in the form of trimmed or uncut hedges. It is characterized by very early flowering (flowers white) during the winter and early spring.

References: 161, 163 (3), 184 (1), 254, 259 (3), 535.

Cistaceae

Cistus L.

24. *Cistus incanus* L.

Syn.: *C. villosus* auct., vix L.

An evergreen, erect, densely branched shrub, 30 - 100 (150) cm tall, with a semispherical habit and large purplish-pink flowers, 3 - 6 cm in diameter. It is a very variable species, particularly in the size, undulation and degree of pubescence of leaves and in the size of flowers and length of peduncles. As a result three subspecies are distinguished, of which subsp. *corsicus* (Loisel.) Heyw. is characterized by a very small range restricted to Corsica and Sardinia. Of the two remaining ones, subsp. *incanus* occurs primarily in the western European part of the range and subsp. *creticus* (L.) Heyw. is known primarily from the Asiatic part.

C. incanus is a Mediterranean shrub (central and eastern Mediterranean), the range of which extends from Balearic Is. in the west to the eastern shores of the Black Sea in USSR in the east, thus more or less between 3° and 42° Long. E. The most northerly stands are on the Crimea at 45° Lat. N and in the south it reaches as far as the Judean Mts. in Israel, where, however, it does not exceed 31° Lat. N. On the Balkan peninsula the northern limit of the range of distribution runs through southern Bulgaria and southern, Yugoslav Macedonia. Within the range almost the whole of Greece is included, both continental and insular, western, northern and southwestern Anatolia, Cyprus, western Syria, Lebanon, northern and central Israel and western Jordan. This species is also mentioned from northern Africa from Cyrenaica.

C. incanus is a thermophilous and light demanding species, occurring in open dry and insolated places, on sandy-clayey, calcareous soils, on sandstones and limestone rocks, and on terra rossa in phrygana communities and in low, sparse maquis. It enters also into sparse pine forests and into degraded oak forests, however, most frequently it is restricted there to forest edges. In many places it constitutes the main floristic component and forms dense carpets (*Cistetum*) with the participation of other low Mediterranean shrubs such as *Cistus salvifolius*, *Sarcopoterium spinosum*, *Coridothymus capitatus*, *Genista acanthoclada* or *Lithodora hispidula* (in

the south). During flowering time, shrubs from the genus *Cistus* give to these communities a very characteristic appearance.

Optimal conditions for the development of *C. incanus* are to be found in regions located below 700 m elevation, however, it does appear higher though not abundantly. In Italy and in the Aegean islands as well as in Israel it can be found up to 800 - 900 m, in continental Greece, on the Pindos Massif to 1150 m, on Crete to 1200 m, and in Anatolia even to 1300 m and higher (eg. on Tahtali Dag, Nif Dagi, Honaz Dag),

Similarly as in other species from the genus *Cistus* the leaves and young shoots of *C. incanus* supply a resinous substance (ladanum), which is being used in the perfume industry and in medicine.

References: 64 (1), 103 (6), 104 (5), 151 (2), 163 (2), 188, 242 (2), 259 (2), 531.

25. *Cistus monspeliensis* L.

An evergreen, erect, densely branched shrub, up to 1 m tall, covered with glands containing an aromatic viscid resin. It is notable for its very characteristic linear or lanceolate leaves with strongly revolute margins. Flowers are white about 2 cm in diameter. In its general appearance, particularly when in a vegetative state it resemble *Ledum palustre* L. It forms hybrids with *Cistus parviflorus* Lam. and *C. salvifolius* L.

It is a circum-Mediterranean species, however, not fully so because it is absent in southern Anatolia, in Syria, Lebanon, Palestine and Libya. In the west it is known also from the Canary Islands and from Madeira. In the eastern Mediterranean, where it is much less common than in the west it occurs primarily in the continental, coastal Greece and particularly in Attica, on the Kassandra, Sithonia and Athos peninsulas and in the western part of the Peeloponnisos. It has been also found on some of the islands and more commonly on Crete. On the other hand in southwestern Asia is represented on only two stands in western Anatolia (Çesme peninsula and Bodrum) and on Cyprus. On the latter island the stands of *C. monspeliensis* are the most easterly ones within the whole range of the species. They are located on the southwestern part of the island where locally the shrub is quite common and sometimes even constitutes the main floristic element.

Similarly as with other species of the genus *Cistus*, *C. monspeliensis* is a light requiring and thermophilous shrub growing both in the phrygana and in sunny clearings and edges of pine forests, on rocky slopes and on waste, schistose ground. In Greece it appears more or less to about 300 - 400 m elevation, on Cyprus attaining 600 m, in Italy to 1000 m, in Morocco to 1300 m and in Spain to 1500 m.

References: 151(2), 188, 523, 531.

26. *Cistus parviflorus* Lam.

An evergreen, somewhat spreading shrub, up to 60 cm tall, occasionally somewhat taller, with leaves grey stellate-tomentose on both sides and with pink flowers 2 - 3 cm in diameter. It forms hybrids with *Cistus monspeliensis* L. (\times *C. skanbergii* Lojac.).

It is an eastern Mediterranean species with its centre of occurrence in the Aegean region. Furthest to the west it reaches the Italian island Lampedusa (between Tunisia and Malta). Of all the representatives of the genus *Cistus* distributed in the region in question it is undoubtedly the most thermophilous species reaching no further north than 38°30' Lat. N, on Chios Is. and on the Çesme peninsula near Izmir in Anatolia. The stand reported from European Turkey, from Ganos Dagi, appears doubtful in view of the general pattern of the range as a whole and thus it was not included on the map.

C. parviflorus is primarily an insular species which occurs in the central and southern islands of the Aegean Sea, and also on Crete with adjoining islands and on Cyprus. In continental areas it is much less common and appears only at slight distances from the sea, in North Africa (Cyrenaica), in southern Greece (Attica, Corinthia and Lakonia — southern tip of Mani peninsula) and in southern Anatolia (provinces of Izmir, Mugla and İçel).

C. parviflorus is a typical representative of the driest and hottest parts of the phrygana, however, it can also be found on edges of pine forests. It grows both on siliceous as well as on calcareous ground, on dry stony slopes, on rocky shores and in fallow fields. It forms there larger or smaller groups, either pure or with the participation of *C. salvifolius* L. and *C. incanus* L. (eg. on Rodhos). As distinct from the latter two species it occupies primarily lower located places, in Anatolia up to 100 m elevation, on Crete to 500 and in Cyrenaica to 550 m. Only occasionally its presence has been noted in continental Greece (Mt. Yerania) at an elevation of 800 m and on Cyprus at 900 m.

References: 64(1), 151(2), 188, 341, 531.

27. *Cistus salvifolius* L.

This is an evergreen, small, abundantly flowering, spreading or procumbent shrub, usually 50 - 60 cm tall, exceptionally taller to 1 m. The flowers are snow white, 2 - 4 cm in diameter with intensively yellow anthers. This shrub is characterized by considerable variability in flower size and number per inflorescence (1 - 4) and in the length of the peduncles. It forms hybrids with *Cistus monspeliensis* L. (\times *C. florentinus* Lam.).

It is a circum-Mediterranean species, covering Spain, Portugal and Madeira in the west. The most northerly stands are to be found in the west of France at 47° Lat. N, while in the east, on the eastern shores of the Black Sea (USSR), between Gagra and Suchumi at about 43° Lat. N. In the eastern Mediterranean the range of *C. salvifolius* is almost identical with the range of *Cistus incanus* L. — the species, however, is absent from the Crimea, from southwestern Bulgaria and from Yugoslav Macedonia. In the south, similarly as *C. incanus* L. it reaches the Judean Mts. in Israel.

C. salvifolius is a very characteristic component of the phrygana and a loose maquis where it grows primarily on calcareous ground, on dry, stony and strongly insolated places, usually together with *C. incanus* L. with which it frequently forms dense carpets. It occurs primarily on seaside regions at an elevation of about 300 - 500(600) m, more rarely in higher located stands. In the Amanus Mts. (Anatolia) it reaches 850 m, on Crete and in Kephalinia and on continental Greece to more or less 1000 m, in Lebanon to 1150 m, on Cyprus to 1350 m and in northwestern Africa even to 2100 m.

References: 64(1), 103(6), 105(5), 151(2), 163(3), 259(2), 531.

Ericaceae

Vaccinium L.

28. *Vaccinium vitis-idaea* L.

This is a small, evergreen, poorly branched shrub, usually not taller than 15 - 25 cm, erect or decumbent, with a strongly creeping rhizome. Leaves are coriaceous, dark green and lustrous and the flowers are campanulate, small, pinkish in 2 - 8 flowered, crowded and pendant racemes. Fruits are globose, with a diameter of about 8 mm, red and sour.

It is a Holarctic species with a circumpolar distribution, reaching very far North, to 76° Lat. N. (Greenland) and in Europe its most southerly stands are to be found on the Balkan Peninsula, in northern Greece (eastern Macedonia), where, however, it does not cross in the southern direction 41° Lat. N. In southwest Asia, besides the Caucasus, *V. vitis-idaea* is known from only infrequent stands in the mountains of north-eastern Anatolia and this even slightly south of 41° Lat. N. On the Caucasus, on the other hand, it is a very common species in the Greater Caucasus and much less so in the Lesser Caucasus.

V. vitis-idaea is characterized by low site requirements. This acidophilous shrub grows on sandy and sandy-clayey soils, on elevated peats, in the ground vegetation of coniferous forests (*Pinus*, *Picea*), on high montane swards and scree, and also in the Arctic tundra, both if full insolation and in shade. It is considered to be the characteristic species for the associations *Vaccinio-Piceetea*. In its vertical distribution it occurs both in the lowlands (particularly in the North) and in high mountains. Thus for example in Bulgaria it has been found between 700 and 2000 m, in Greece between 1350 and 1700 m, in Anatolia between 1900 and 2400 m and on the Caucasus between 1800 and 3300 m.

Fruits of *V. vitis-idaea* are rich in vitamins and are used for preserves (compots, jellies, jams, meat additives). They contain also benzoic acid as a result of which they are durable and can be stored long. Both the berries and leaves are used in medicine.

References: 64(6), 79, 103(7), 106, 361.

Fagaceae

Quercus L.

29. *Quercus aucheri* Jaub. et Spach

This is small, evergreen tree, up to 5 - 10 m tall, sometimes taller, with a dense, compact crown and ultimate branches pendulous. This species is closely related to *Quercus coccifera* L., from which it differs primarily in having densely stellate-tomentose young shoots and leaves (or their dorsal side). In older individuals and on short shoots these leaves have entire margins and are not serrate-spiny as in *Q. coccifera* L.

It is an eastern Mediterranean species. It occurs almost exclusively in southwest Asia, namely on the one hand in southwestern, coastal Anatolia and on the other on some island located near its shores: Gökceada (Turkey), Samos, Kos, Sime and Rodhos (Greek). Besides it is reported from only one stand in European Greece, namely from Jura Is. in the Northern Sporades.

Similarly as *Q. coccifera* L., *Q. aucheri* is a xerophytic oak, which grows most commonly on exposed, isolated, dry limestone rocks or pasture grounds, in communities of phrygana type, in which it appears usually in the form of single, scattered individuals, though in places as for example near the eastern coast of Rodhos and in southern Anatolia (Antalya province) it can form small groups. As a rule it grows at slight distances from the seashore usually no higher than at 300 - 400 m elevation and only occasionally as in Rodhos up to 450 m.

Q. aucheri is a little known species so far, deserving further investigation and in view of its scarcity it also deserves to be protected.

References: 64(7), 457, 509, 536.

30. *Quercus petraea* (Mattuschka) Liebl., s. 1.

Sym.: *Q. sessiflora* Salisb., *Q. sessilis* Ehrh.

incl. *Q. delechampii* Ten., *Q. polycarpa* Schur

It is strong tree, up to 30 - 40 m tall (in the Asiatic part of the range only up to 25 - 30 m) and with a stem diameter of more than 1 m, with glabrous twigs and sinuately lobed leaves with 5 - 10 pairs of lateral veins and 1 - 2.5(3.5) cm long petioles.

This species is widely distributed almost throughout Europe except for the most northern and southern extremes, and in the western part of southwest Asia (Anatolia, the Caucasus, northern Iran). Furthest to the north it reaches in Europe about 62° Lat. N in Norway and furthest to the south in the Amanus Mt.

in southern Anatolia where most probably it does not cross 36° Lat. N. It is sometimes reported from Lebanon, however, these reports are uncertain and require confirmation. The eastern limit of the range runs through northeastern Poland and western Ukraine. In Europe it is one of the more important tree forming deciduous forest.

Q. petraea is characterized by considerable variability, particularly in the Balkan peninsula and in southwestern Asia. In the Balkans two small, closely related species are recognized which are sometimes considered to be only varieties or subspecies of *Q. petraea*. These are *Q. dalechampii* Ten. and *Q. polycarpa* Schur. Distinguishing them is sometimes difficult, thus the information about their stands are uncertain. For this reason these two species are treated here jointly with *Q. petraea*, the more so since their ranges are almost completely concurrent. On the other hand in southwest Asia, the range of *Q. petraea* is composed of the ranges of as many as five subspecies. Differences between them depend on the size of the leaves, the depth of sinuses, the number of lobes and the pubescence of the dorsal leaf surface. The first and most widely spread subspecies is subsp. *iberica* (Stev.) Krassiln. (= *Q. iberica* Stev.), which occurs in northern Anatolia, on the Caucasus, in Talish and in northern Iran. The second, subsp. *pinnatiloba* (K. Koch) Menits. grows almost exclusively in southeastern and southern Anatolia. It is also reported from the border regions between Transcaucasus and Anatolia or Iran. The third subspecies – subsp. *petraea*, besides Europe is known only from the northern Caucasus and from northwestern Anatolia. The systematic rank of the remaining subspecies, subsp. *medwediewii* (A. Camus) Menits. and subsp. *dshorochensis* (K. Koch) Menits. is not sufficiently clear and these two taxa are sometimes identified with subsp. *iberica*.

Q. petraea belongs to one of the most important broadleaf trees occurring in southwestern Asia and it frequently forms pure or mixed stands together with *Quercus robur* L., *Carpinus betulus* L., *Fagus orientalis* Lipsky, *Castanea sativa* Miller and others. These forests are not infrequently extensively exploited, particularly for fuel, by the local population and consequently frequently attain an appearance of bushy thickets.

Q. petraea is a light demanding and thermophilous hemixerophyte, thus in mixed forests it yields ground to other species which have smaller requirements as regards warmth or which are more shade tolerant. In contrast to *Q. robur* L. which is characterized by similar biological properties it may occur on more dry and poorer soils, on slopes or rocks. In its vertical distribution, except for Iran, from where it is reported from stands above 2000 m (even up to 2400 m), it is primarily distributed at elevations between 300 and 1300 m, however, in Talish Mts. and in the mountains around lake Van in eastern Anatolia up to 1800-1900 m.

The wood of *Q. petraea*, similarly as the wood of *Q. robur* L. is heavy and hard (though less so than wood of *Q. robur*), and it splits well. It is characterized by great durability and resistance to the action of water. It finds wide use in cabinet making, barrel making, furniture making and also it is used as fuel (in Anatolia and the Caucasus). The bark is rich in tannins and thus can be used in tanneries and in herbicidal medicine.

References: 48, 64(7), 103(3), 104(2), 154, 155, 218(1), 519, 536.

31. *Quercus robur* L.

Syn.: *Q. pedunculata* Ehrh.

This is a long living, magnificent tree, up to 40 - 50 m tall (however, in southwest Asia usually not taller than 25 m), and with a diameter of 3 - 4 m in free growing individuals, covered with a thick, deeply fissured bark. Its leaves are usually obovate, with 5 - 7 pairs of more or less deep lobes, on very short petioles usually hidden in auriculate leaf bases.

The range of *Q. robur* covers almost the whole of Europe except for the extreme northern and southern (Mediterranean) regions. In the north, in Scandinavia it reaches 63° Lat. N and in the east it reaches southern Urals. In southwest Asia *Q. robur* is widely distributed almost throughout the Caucasus and to a lesser degree in Anatolia, where larger agglomerations of stand are to be found only in the northwestern part in provinces of Bolu, Zonguldak, Kastamonu and Ankara and in the southeastern part in provinces of Bingol, Muş, Bitlis and Hakkari. This species is also reported from northeastern Iran, however, it appears that these stands would require verification.

Similarly as *Q. petraea* (Mattuschka) Liebl., *Q. robur* is characterized by considerable variability, particularly in the southeastern part of the range, thus on the Balkan peninsula and in southwestern Asia three subspecies are being recognized within it. The first one, subsp. *robur* is characteristic for the northern Caucasus and grows also in northwestern Anatolia. The second subspecies, subsp. *pedunculiflora* (K. Koch) Menits. occurs in the eastern and southern Caucasus, in eastern Anatolia and on southern Balkans, where in Greece it has been found as single stands in the Peloponnisos peninsula. It is characterized by leaves puberulent on the dorsal side (in subsp. *robur* they are glabrous, or almost glabrous) and by longer petioles. The identification of the above two subspecies is not always correct and one can suspect that subsp. *pedunculiflora* occurs in Anatolia not only in the east but also in the west. The third subsp. *imeretina* (Woronow) Menits. has been reported from the western Caucasus, however, its separatedness from subsp. *robur* is not sufficiently clear. Between the range of *Q. robur* in Anatolia and the range on the Caucasus there is a distinct gap about 250 km wide.

Q. robur is a moderate mesophyte, with large requirements as regards soil fertility, and as distinct from *Q. petraea* (Mattuschka) Liebl. it is less light demanding and less resistant to drought. In the European forestry it plays a very important role, however, much less so in southwest Asia (except for the northern Caucasus). In Anatolia it is most commonly scattered in deciduous forests in valleys of rivers and streams, or else it appears in steppe communities, in lowlands and on stony slopes. It avoids decidedly dry places. On the Caucasus its stands are lower located more or less between 300 and 1250 (1400) m while in Anatolia subsp. *robur* occurs more or less between 100 and 1000 m elevation and subsp. *pedunculiflora* from 1200 to 1800 m, highest in the mountains of Hakkari province.

The wood of *Q. robur* belongs to one of the most valuable, it is heavy, hard and durable, difficult to split. It is used on a large scale in land and under water construction and in the furniture industry. This species has several varieties and forms of ornamental value, which differ in colour or shape of leaves, or else in the habit of the whole crown. Very common in cultivation is the variety 'Fastigiata' with a dense, spindle shaped crown, which is considered one of the most valuable piramidal trees, much used in the green architecture of towns and settlements.

References: 64(7), 103(3), 104(2), 154, 155, 218(1), 519, 536.

Leguminosae

Colutea L.

32. *Colutea nepalensis* Sims

An erect shrub up to 3 m tall with stems having a bark that peels off in long fibres. It is a very characteristic species for the genus *Colutea*, thanks to large flowers, an exceptionally well marked 2 - 3 mm long beak at the keel and a silvery tomentose ovary.

It is a Western Himalayan species. Its range is relatively small, narrow and elongated — extending from eastern Afghanistan, through northern Pakistan and Kashmir to northwestern India and Nepal. Within the whole range it is a rare shrub and scattered, and it appears to occur somewhat more frequently only in Afghanistan. It grows on siliceous rocky and stony slopes and on vertical cliffs near rivers, usually on stands located above 2000 m. Occasionally it appears at lower elevations, as for example in Afghanistan, at an elevation of 1200 m. The highest elevations in Afghanistan have been reported from an elevation of 2600 m, in Pakistan from 2750 m in Indian Himalayas even from 3500 m. Unfortunately no information about the ecological requirements of the species is available.

References: 30, 179, 225, 459, 460, 465, 506.

33. *Colutea paulsenii* Freyn

An erect shrub, 2 - 3 m tall. Its two-year-old shoots peel in long thin fibres, at first yellowish and later reddishbrown, lustrous. It is a very variable species in the size of flowers (they are smaller on individuals from higher located stands), size of leaflets and the size and shape of inflated 3 - 9 cm long legumes. Two subspecies are recognized within it. The first one, subsp. *paulsenii* occurs in western and central part of the range while the latter, subsp. *mesantha* (Shap.) Ali with narrower fruits (to 2.5 cm) gradually narrowing into a long, acute top, in the eastern part.

It is an Irano-Turanian species with the most extensive range of all the Asiatic representatives of the genus *Colutea*. This range covers central and northeastern Afghanistan, the southeastern part of the USSR Middle Asia (Tadzhikistan, eastern Uzbekistan, southern Kirgiziya) northern Pakistan and Kashmir. In the eastern part of the range as can be judged from the available data it is a much less common shrub than in the western part and also it appears there at higher mountain locations.

C. paulsenii is a xerophytic shrub, which grows on dry mountain slopes, in gorges and river valleys, on sandstone, limestone or loessy substratum, in steppe communities, in thickets and in open juniper or pistache woods. It is accompanied by other shrubs with similar requirements from the genera: *Rosa*, *Cotoneaster*, *Crataegus*, *Amygdalus*, *Cerasus*, *Lonicera*, *Acer*, *Ephedra* and others. *C. paulsenii*, however, does not form pure thickets. In Tadzhikistan it occurs between 800 and 2800 m, in Afghanistan between 1100 - 2900 m and in Kashmir reaches even an elevation of 3300 m.

References: 177(5), 459, 460, 465, 506.

Genista L.

34. *Genista anatolica* Boiss.

A spreading, small shrub only 10 - 15 cm tall, forming dense, almost cushion like but flattened forms. Flowers are small, yellow in short terminal racemes, terminated by needle like spines. This shrub is closely related with *Genista germanica* L. which is common almost throughout Europe.

It is an eastern Mediterranean species with a very limited range divided into two distinct parts. The first one covers in Europe southeastern Bulgaria and Turkey (only Gallipoli peninsula), and in southwestern Asia western Anatolia and the Greek islands of Lesbos and Chios. In Bulgaria stands of this shrub are gathered in the valleys of rivers Arda, Maritsa and Tundzha. The second and much smaller part of the range covers the Amanus Mts. in southern Anatolia and the forest region located between Latakia and Kessab in western Syria. Here *G. anatolica* is represented by var. *cassia* (Boiss.) Boiss. (= *Genista cassia* Boiss.) which differs only slightly from the type species, particularly in having flowers with a glabrous standard.

C. anatolica grows on dry stony or gravelly, limestone substratum, in open pine forests (*Pinus brutia* Ten.) on insolated, deforested regions and on uncultivated ground forming smaller or bigger colonies, in places common, though this on small areas. In Bulgaria it appears on lowlands, up to 300 m elevation, on Greek islands to 550 m and in Anatolia to about 1300 m.

References: 64(3), 163(2), 295.

35. *Genista aucheri* Boiss.

A small, erect, unarmed shrub, up to 50 - 70 cm tall, with thin, subopposite or alternate branches and 3-foliolate leaves. It is a species closely related to *Genista sessilifolia* DC., which occurs on the Balkan peninsula and the range of which in Anatolia coincides in part with the range of *G. aucheri*.

It is an Irano-Turanian element and an Anatolian endemite. The shrub is distributed almost exclusively in central part of Anatolia, in provinces of Kütahya, Eskişehir, Ankara, Yozgat, Sivas, Erzincan, Gümüşane, Erzurum and Konya. It grows in steppe regions on stony slopes and on fallow fields, more or less at elevations between 500 m (though usually, however, above 800 m) and 1800 m and occasionally up to 2000 m.

References: 64(3), 295.

Teline Medicus

36. *Teline monspessulana* (L.) K. Koch

Syn.: *Cytisus monspessulanus* L., *Cytisus syriacus* Boiss. et Blanche, *Cytisus monspessulanus* L. var. *syriacus* (Boiss. et Blanche) Briq.

It is an erect, multicaulis shrub attaining a height of 120 cm, with trifoliolate leaves, yellow flowers collected in congested axillary racemes and with 2 cm long pods with 2 - 6 seeds.

It is a Mediterranean species occurring both in Europe (from S. Portugal), on Açores and in northwest Africa (Algeria, Morocco) as well as in southwest Asia, however, it is more frequent in the West than in the East. In the Balkan peninsula it is known only from scattered infrequent stands in European Turkey and in continental Greece. It was also found on some of the Greek islands such as Euboea, Lesvos, Andros, Ikaria, Samos and Khalki. In southwestern Asia its stands are grouped in three regions isolated from each other — two in Anatolia, near Istanbul, and in southwestern, coastal part of Izmir province, and third in central Lebanon. Very isolated stands are known also from the western Transcaucasus (region of Sochi).

T. monspessulana does not form anywhere larger groups and it usually appears singly, either in open pine woods (*Pinus brutia* Ten., *P. halepensis* Miller, *P. nigra* Arn.) or in thickets of the type of maquis. Besides the shrub occurs sometimes along roadsides and in mixed woodlands composed of *Abies cephalonica* Loudon and *Castanea sativa* Miller as is the case for example on Euboea. It grows on limestone or on sandy schistose ground, as a rule in lower located regions. In Anatolia at elevations of about 300 m, in Greece from 600 to 900 m and in Lebanon even up to 1100 m.

References: 64(3), 103(5), 163(2), 188, 218(3), 513.

Rhamnaceae

Rhamnus L.

37. *Rhamnus kurdicus* Boiss. et Hohen.

This is a spiny shrub up to 1(2) m tall, erect or procumbent. The latter form of growth it probably attains only at higher located stands on rocks. This species is closely related to *Rhamnus persicus* Boiss., from which it differs primarily in having two or even three times larger leaves (up to 3 cm) with petioles up to 1 cm long and also with crenate or denticulate margins. Its small fruits are drupes about 5 mm in diameter, reddish-brown or red in colour.

It is an Irano-Turanian species with a range split into three clearly isolated parts. Most of the stands are grouped in the central part of northern Iraq, in southeastern Anatolia and in the adjoining parts of western Iran. The western part of the range, which appears to be the poorest, covers northwestern Syria, and the neighbouring southern Anatolia — however, the specimens of *R. kurdicus* occurring here require a critical analysis.

The third part of the range occurs in southwestern Iran in the central and southern ranges of Zagros Mts., and particularly in subprovince of Bakhtiari.

This shrub grows in calcareous hills and mounts, on rocky slopes, in rock fissures of steep walls of gorges, on a rocky rubble and also in degraded oak forests, particularly on lower located stands. In Iraq it is rather common between 700 and 1200(1700) m, however, in places it reaches an elevation of 2000 m and in the Avroman Mts., on the border with Iran it even exceeds that elevation (to c. 2100 m). On the other hand in southwestern Anatolia, in province of Bitlis it has been found only between 1800 and 1900 m. The most elevated stands occur in Iran, where *R. kurdicus* appears from about 1100 m to 2400 m.

References: 64(2), 163(2), 228(4), 372.

38. *Rhamnus pentapomicus* Parker

This is a subspinescent shrub or small tree with leaves 5 - 6 cm long and 2 cm wide, elliptic to lanceolate, glabrous when mature or only on the dorsal side slightly puberulous.

This species is little studied so far, thus its range is difficult to draw, particularly as regards its eastern limit of occurrence. It is known primarily from Pakistan, where it occurs from Baluchistan in the south to province of Swat in the north. Besides it is sometimes found on infrequent stands in eastern Afghanistan (Kabul, Khost, Nuristan). It is also reported from Kashmir, however, this data is very general and does not allow the localisation of stands on the map. It grows on mountain slopes, in valleys and gorges, on dry rocky or shale, limestone substratum, in open places or in open forests of pistache, olives (*Olea ferruginea* Royle) or oak (*Quercus baloot* Griff.), in places commonly, as in Kurram valley in western Pakistan. It appears between 1380 and 2050 m in Afghanistan and between 700 and 2250 m in Pakistan.

References: 225, 372, 381, 526.

39. *Rhamnus persicus* Boiss.

It is strongly spinescent shrub, 2(3) m tall with characteristic short petioles (2 - 3 mm), small (5 - 15 mm) leaves as a rule with entire margins. This species is closely related to *Rhamnus kurdicus* Boiss. et Hohen. and possibly should be treated as one of its subspecies. Forms are known with intermediate traits.

It is an Irano-Turanian species, and an Iranian endemite (in Pakistani Baluchistan?). It occurs in the mountains of southwestern and southern parts of the country, more or less from the Iraq border in the west to Kerman province in the east (to 58° Long. E.), in the north not crossing 35° Lat. N. It grows in degraded forests of oak and in open places, in stony regions and on dry rocky, limestone slopes and cliffs. While it appears from more or less an elevation of 1200 - 1300 m, it is most common above 1500 or even 1700 m and it reaches as high as 2300 - 2700 m elevation.

References: 372, 526.

40. *Rhamnus prostratus* Jacquem.

Syn.: *R. minutus* Grubov

This is low, compact prostrate or even cushion like shrub, 10 - 30(50) cm tall, short but profusely and horizontally branched with stiff and thickened twigs appressed to the substratum. Shoots have needle like spines on their tips. This is a species replacing the more western *R. persicus* Boiss. from which it differs in form of growth and in having crenulate or denticulate leaves.

It is a Central Asiatic montane species, the continuous range of which covers southeastern Tadzhikistan (USSR), eastern Afghanistan, northern Pakistan, Kashmir and northwestern India all the way to Kumaun and the Tibetan border. It is also known in Chinese Pamir (Kashgaria). Besides it occurs as single scattered stands in higher elevations of eastern Iran and on the Turkmen and Uzbekistan border in the Kugitangtau range.

It grows in the subalpine and alpine zone, usually as single specimens in rock fissures, on open dry plateaus and on limestone or conglomerate slopes, sometimes also in forest edges and even inside forests of *Cedrus deodora* (D. Don) G. Don and *Pinus griffithii* McClelland. While it does appear at elevations of 2300 - 2400 m it is more common from 2700 m or even 3000 m up. In Iran it reaches to 3900 m (near Kerman), in Afghanistan to 4000 m, in Kashmir to 4100 m, in Tadzhikistan to 4200 m and in the Karakoram Range even somewhat higher. *R. prostratus* belongs to shrubs which in the region under study attain highest elevations.

References: 108, 177(6), 179, 181, 225, 372, 381, 526.

Ziziphus Miller

41. *Ziziphus lotus* (L.) Lam.

A widely spreading dense, very spiny shrub up to 1 - 2 m tall, very intricately branched, with small 1 - 2 cm long leaves and subglobose, yellow fruit. This is a vicarious species for the more easterly occurring *Ziziphus nummularia* (Burm. f.) Wight et Arn., from which it differs primarily in having glabrous leaves. Ranges of the two species meet in Palestine.

The range of *Z. lotus* is divided into three, very distinctly isolated parts. The first covers North Africa and southeastern Spain and Sicily. In that region the shrub is very rare in Egypt where it grows only on the border with Libya near Sollum. The other part covers Cyprus and Palestine, and also, though to a slight degree western Syria and southern Anatolia (near Mersin and Antakya). Finally the third part of the range is restricted to the western and southern parts of the Arabian peninsula (Saudi Arabia, Yemen, Hadhramaut) and Socotra. Furthest to the east *Z. lotus* reaches the Syrian border with Turkey and Iraq, where it grows on river Tiger. One stand on the Balkan peninsula, in Greece near the isthmus of Corinth has not been seen for a very long time. The disrupted range of the species may indicate that it is of relict nature and probably of Paleo-African origin.

Z. lotus grows on stony slopes and alluvial plains and in places it forms its own communities. On Cyprus and in Palestine as one can judge, several stands are of secondary origin. They formed probably as a result of the devastation of maquis and forests, onto which regions *Z. lotus* entered and became domesticated, becoming a noxious weed on abandoned and dry fields. It occupies lower located regions, from depressions of -250 m to an elevation of 300 - 400(500) m above sea level, and only in the south of the Arabian peninsula it appears at much higher elevations, even to 2400 m.

References: 56, 64(2), 113, 151(1), 161, 163(2), 254, 259(2).

42. *Ziziphus nummularia* (Burm. f.) Wight et Arn.

This is a many stemmed, widely spread, shrub, usually not taller than 1 - 2 m, however, in favourable conditions attaining even 4 m and a form of a small tree with divaricate flexuose branches armed below leaves by a pair of sharp stipular spines, one of which is longer and straight and the other much shorter and

curved. The fruit is a globose drupe, 6 - 8 mm in diameter, orange or red in the mature state. The plant forms hybrids with *Ziziphus spina-christi* (L.) Desf.

It is a Nubo-Sindian species with a range extending from Palestine, northwestern Saudi Arabia, through southeastern Iraq, southern Iran, to Pakistan, eastern Afghanistan and western India. Its accurate range on the extreme east and on extreme west are not sufficiently well known yet. It is also not known how far does *Z. nummularia* extent southwards, however, in the north it does not exceed 35° Lat. N (Iraq, Afghanistan, Pakistan). On the other hand it is known that the most westerly stand occur in Jordan, in the southern part of Arva Valley. On the Arabian peninsula, the range includes northern and central Saudi Arabia, Kuwait, Bahrain, Qatar, and Trucial Oman.

Z. nummularia grows on deserts and subdeserts, more rarely on steppes, in open, hot plains and in ravines, also in slight wadis and depressions on gravelly and silty soils. It forms its own, usually extensive thickets, or else it appears in the company of *Ziziphus spina-christi* (L.) Desf. and species from the genera *Calligonum*, *Haloxylon*, *Zygophyllum* and *Leptadenia*. In desert regions of Iraq it attains an elevation of 300 m, on the Arabian peninsula 500 m, in Afghanistan and Pakistan 1200 m and in Iran about 1500 m.

Edible fruits of *Z. nummularia* are used by the poor population for consumption and in medicine. Leaves, which frequently fall during dry periods and hot weather are used as fodder for camels, sheep and goats. This shrub is also planted as a hedge.

References: 107, 166(1), 225, 228(4), 259(2), 372, 518(6), 526.

43. *Ziziphus spina-christi* (L.) Desf.

An evergreen, long living and very deeply rooted, medium size tree, attaining in Africa up to 15 - 20 m and a diameter of 50 - 60 cm. It is characterized by a large, oval, intricately branched crown, oblong-elliptic leaves up to 5 cm long and relatively large globose, 1.5 cm in diameter yellowish or reddish-brown fruits. On shoots of this species, similarly as on shoots of other representatives of the genus *Ziziphus* from the region under study, there occur stipular spines. Unarmed individuals are included in variety *inermis* Boiss., and they probably represent cultivated forms. *Z. spina-christi* forms in Iran hybrids with *Z. nummularia* (Burm. f.) Wight et Arn.

It is a Saharo-Sindian species with an extensive range covering northern (particularly Maghreb countries) and eastern Africa, the Arabian peninsula, Palestine, southern Iraq, southern Iran and Pakistan. It has also been found on a few stands in Afghanistan, in Lebanon, in western Syria and on Cyprus (wild?). In the north the range of the species attains in Pakistan and Afghanistan more or less 35° Lat. N, and in Iran it only slightly exceeds this latitude. A strict delimitation of the northern limit is very difficult as a consequence of cultivation and naturalisation, thus it is not possible to distinguish with any certainty the primary stands from the secondary ones. The latter most likely include stands in Cyprus and Lebanon and it is possible that a fair proportion of the stands in Palestine and Iraq. In some regions, as for example on the Arabian peninsula, where, as one can judge from the most general data (see: M. Zohary, C. C. Heyn, D. Heller, 1983 *Conspectus Florae Orientalis*, 2) *Z. spina-christi* is everywhere represented though scattered, the northern limit of the range natural or possibly deformed as a consequence of cultivation, is indicated on the map, similarly as for *Z. nummularia* (Burm. f.) Wight et Arn., by a broken line.

It is a desert or semi-desert plant, occurring in oases and in wadi beds, mostly on alluvial soils and also on coastal calcareous foothills, in abandoned fields and irrigation ditches, solitary or associated with *Ziziphus nummularia* (Burm. f.) Wight et Arn. and with other desert trees or shrubs from the genera *Calotropis*, *Salvadora*, *Prosopis*, *Acacia*, *Capparis*, *Periploca*, *Balanites*. In places it forms specific thermophilous communities and it is quite common as for example in Palestine.

In its vertical distribution *Z. spina-christi* appears already from depression regions of Palestine (-380 to 500 m elevation), all the way to 2000 m in southwestern parts of the Arabian peninsula. On the other hand in Iran and Pakistan it usually grows not higher than at 800 - 900 m and only occasionally to 1150 m.

Throughout its natural range to a larger or lesser degree *Z. spina-christi* is cultivated, in view of its edible and sometimes marked fruits having a juicy sweet mesocarp. It is also valued as a tree giving much shade.

References: 151 (1), 161, 163 (2), 166 (1), 228 (4), 254, 259 (2), 372, 510, 518 (6), 526.

Ruscaceae

Danaë Medikus (monotypic genus)

44. *Danaë racemosa* (L.) Moench

This is an evergreen, rhizomatous, branching, shrub-like plant, which when growing in flat areas or on slight slopes can attain a height of 100 (120) cm, while in moist, steep rocks with a seeping water, the pendulous stems of the shrub can even attain a length of 2 - 2.5 m with a stem diameter at the base of about 2 cm. Alternate, leaf-like cladodes up to 8 cm long and 2.5 cm wide, are very thin, more or less lanceolate, acuminate, bilaterally glabrous and lustrous.

This is a typical representative of the Hyrcanian flora. It occurs primarily along the southern shores of the Caspian Sea. The major part of the range covers northern Iran where *D. racemosa* grows in provinces of Gilan, Mazandaran and Gorgan, in the east as far as Long. 56°. Besides it is known from Azerbaijan in the USSR, on the one hand in Lenokoran and this part of the range is associated with that in Iran and the other as isolated stands in northeastern part of the country, on the southern slopes of the Great Caucasus, in district Kutašensk and Ismaily. This range coincides almost exactly with that of *Acer velutinum* Boiss. However, the greatest surprise is the presence of this species on a very limited region at a distance of 1000 km from the Caspian Sea in the Amanus Mts. in southern Anatolia and on Jebel el Ansariye in northwestern Syria.

D. racemosa is a distinctly mesophilous shrub, thermophilous and shade-requireing. It grows in the understorey of deciduous forests (*Acer velutinum* Boiss., *Fagus orientalis* Lipsky, *Parrotia persica* C. Meyer, *Diospyros lotus* L., *Pterocarya fraxinifolia* (Poiret) Spach) on moist slopes of gorges and on rocky banks of rivers, frequently in groups or even in the form of rows. In its vertical distribution it is most common between 300 and 1000 m, however, it does appear already at 20 m (in Iran) and can reach as high up as 1200 m.

This shrub has been introduced into cultivation already in the year 1713 and it is treasured for its bamboo-like habit. It is planted in parks and gardens in countries with a mild climate, in moist semi-shaded places. Its "leafy" stems are used, particularly during the winter for bouquets and garlands.

References: 64 (8), 104 (1), 163 (1), 525.

Ruscus L.

45. *Ruscus aculeatus* L.

This is a rhizomatous, evergreen, shrub-like plant, up to 1 m tall, usually, however, lower, subdioecious, with short rhizomes, dark green and glabrous stems and leaf-like, sclerophyllous cladodes, spinose at apex. Fruits are globose, red berries ca. 7 mm in diameter. The species is represented by two varieties, one of which, var. *aculeatus* is characterized by wide cladodes (2 - 3 as long as broad) and it occurs primarily in the western and central parts of the range, while the second var. *angustifolius* Boiss., sometimes treated as an independent species (= *Ruscus ponticus* Woronow ex Grossh.), is characterized by lanceolate cladodes, mostly four or

more times as long as broad and it occurs in the eastern part of the species range, particularly in the Middle East, on the Caucasus and on Crimea.

R. aculeatus is a Mediterranean species. It grows also on the Açores and Canary Is. In Europe it reaches relatively far to the north, to central Britain, Switzerland, southern Hungary, northern Romania and Crimea. In the eastern part of the range the stands are distributed primarily along coastal regions. In that region the most southerly stands of *R. aculeatus* are to be found in northern Africa (Cyrenaica), on Crete, Cyprus and in Israel (up to Sharon).

This shrub occurs primarily in thickets and in forests of oak, hornbeam, juniper (Crimea) and pine, singly or in small clusters. While generally it is a xerophytic species, as forests get degraded and insolation increases it gradually disappears or survives only as feeble specimens scarcely 10 - 15 cm tall, frequently hiding under fissured limestone rocks. It grows in the lowlands and on submontane regions, almost from the seashore to an elevation of 500 - 600 m, however, in Syria it attains a height of 700 m, in Lebanon 750 m, on Crete 800 m, on the Aegean Is. 900 m, on Cyprus and in southern Anatolia (Amanus Mts.) about 1100 m and in northwest Africa (Atlas Mts.) it has been even found at 2000 m.

R. aculeatus has been introduced into cultivation as an ornamental shrub, valued primarily during fruits and used most commonly for the planting of shaded places. In some countries its evergreen stems are used for wreath making and for the manufacture of brooms.

References: 64 (8), 104 (1), 151 (2), 163 (1), 188, 342.

46. *Ruscus hyrcanus* Woronow

This species is similar to the previous one, however, it differs from it in having a somewhat poorer growth (to 40 cm), smaller cladodes and a form of stem ramification, where 4 - 6-branches sprout out as a whorl from the top of a stem with only one node.

It is a Hyrcanian species restricted in its occurrence to a narrow belt extending along the southern shores of the Caspian Sea from Lenkoran in the USSR, through the Iranian provinces of Gilan and Mazandaran to province of Gorgan. It grows in the understorey of coastal, dense and moist broadleaved forests (*Fagus-Parrotia-Carpinus-Buxus*), often in considerable shade in places forming dense clusters covering the ground. It occurs primarily in the lowlands and on hills up to an elevation of 800 - 900 m. The most elevated stands have been reported from Iran, in central Elburz in the valley of the river Chalus at 1150 m and from Talish (USSR) at 1200 m.

References: 104 (1), 534.

Salvadoraceae

Salvadora L.

47. *Salvadora oleoides* Decne.

This is an evergreen, large shrub or a small tree up to 3 - 4 (5) m tall, with a short, bent trunk up to 40 cm in diameter and with a low set, broad crown. This species is closely related to *Salvadora persica* L., from which it differs primarily in having narrower leaves, with acute tips and not obtuse, smaller inflorescences and yellow and not red fruits.

The range of *S. oleoides* coincides almost ideally with the Asiatic part of the range of *S. persica* L., with which species it frequently occupies one and the same stand. It grows in southeastern Iran, southern and central Pakistan and in western dried regions of India, where it reaches in the easterly direction the Indus valley (on both sides). In Pakistan *S. oleoides* reaches somewhat further north than *S. persica* L., almost to 34° Lat. N. (districts of Peshawar and Kurram). Besides in literature it is quoted from the southern part of the Arabian peninsula (Aden), however, it is not confirmed.

S. oleoides grows in dry flatlands, on argillaceous steppe and sand desert as well as on sandy rocks besides sea on stony rivers gullies, often on saline soils. In Pakistan and in India it belongs to some of the most common woody plants in desert regions and over large areas it frequently represents the dominant floristic element. Besides *S. persica* L. it is accompanied by species from the genera *Capparis* and *Prosopis*. In its vertical distribution it is known already from 10 m elevation to more or less 1000 m, usually, however, it does not exceed 700 - 900 m.

Fruits of this species are sweetish, edible and are being sold on bazaars (Sind). Leaves and young shoots constitute food for camels, however, they are not grazed by other animals. This tree supplies much shade, thus it is used in deserts by people and animals to hide under the crowns from the sun.

References: 31, 179, 225, 364, 527, 528.

48. *Salvadora persica* L.

An evergreen, strong shrub or small tree, usually not taller than 5 - 6 m, however, in favourable conditions attaining even 12 m, with a stem diameter of about 80 cm. Sometimes the stem is prostrate on the ground. The bark is bright, gray or almost white, on old specimens it is irregularly rugose. It is a characteristic feature of this species that its crown is wide and spreading or drooping, thin branches resembling shoots of climbers. Flowers are small, with diameters of about 3 mm, collected in axillary or terminal racemes forming diffuse panicles. The fruits are berry like drupes 4 - 8 mm in diameter, globular, fleshy, red when ripe.

It is a Nubo-Sindian species the main part of its range occupying central Africa, from the Atlantic shores to the Red Sea, where it is a characteristic feature of the Sahel. It grows also in dry coastal regions of southwestern and eastern Africa, in the southern and western parts of the Arabian peninsula and in Palestine, where the most northern stands of the species can be found in the lower Jordan valley at 32° Lat. N. In southwestern Asia the species occurs on infrequent stands in southeastern Iran, in southern and southeastern Pakistan (furthest to the north at 31° Lat. N.), on Sri Lanka (Ceylon) and in the driest regions of western and southern India. On the latter region the limit of the range is insufficiently known though it is claimed that the range extends to the Ganges valley to Patna, that is to about 85° Long. E.

S. persica is a distinctly thermophilous tree which does not lose its foliage even during extreme drought. It grows on sandy and loamy soils, in hot desert oases, on bare rocky slopes above dry wadis, sometimes also on salines. It is gregarious, together with several prickly desert shrubs, and in the Asiatic part of the range frequently together with *Salvadora oleoides* Decne. When covered with sand it forms characteristic more or less permanent hillocks. It is known from the depression of the Jordan valley and the Dead Sea in Palestine at down to -380 m. In Iran it has been found from the sea level to about 350 m elevation, in Pakistan to 700 m and in Africa, in Hoggar Mts. to 800 m, while in the mountains of coastal Nubia to about 1000 m.

Twigs of *S. persica* as well as roots in segments 5 - 15 cm long, are used by natives as toothbrushes, and whence the common name of the species "Toothbrush tree". Such twig segments deprived in their upper part of bark and appropriately crushed, become frayed like the bristles of a toothbrush thanks to the specific anatomical structure of the wood. They are used once only and besides the role of cleaning teeth probably play an antiseptic role in view of the content of trimethylamine. Leaves and fruits are characterized by a pungent taste, however, they are edible - leaves being consumed by camels and fruits by children. They are also used in folk medicine as a diuretic. The tree is sometimes planted in Islamic cementaries.

References: 31, 179, 225, 254, 259 (2), 510, 511, 516, 518 (6), 524, 527, 528.

Smilacaceae

Smilax L.

49. *Smilax aspera* L.

It is an evergreen, dioecious, strong climber with thin, ropelike, flexuose stems generally with more or less numerous short usually recurved prickles (sometimes unarmed), attaining a length of 10 - 15 m, creeping, scrambling or more or less climbing. Its leaves are very variable, both in terms of size and shape, usually triangular in outline, frequently ovate-lanceolate, cordate, hastate or sagittate at the base, on margins unarmed or prickly. Prickles sometimes appear also on petioles and on the veins on the dorsal leaf surface. Presumably the form and size of leaves depends somewhat on the conditions of growth. In more moist and more or less shaded places leaves are wider, cordate-triangular, unarmed or almost unarmed, resembling the leaves of *Smilax excelsa* L. Such forms are included in a separate variety — var. *altissima* Moris et De Notaris (= var. *mauritanica* (Desf.) Gren. et Gordon) reported from various regions throughout the range of the species. These forms, particularly in a vegetative condition, may create difficulties when trying to distinguish them from *Smilax excelsa* L. The latter species, however, has flowers collected in solitary, long-pedunculate umbels, while those of *S. aspera* are fascicles, or subsessile umbels arranged along an elongate, 2 - 10 cm long, flexuose axis. These differences are particularly well visible during fruiting.

S. aspera is a generally Mediterranean species and occurs from the Canary Islands, Madeira and Açores in the west to western Syria, Lebanon and Israel in the east. In the Asiatic part of the range it grows along the Aegean and Mediterranean shores of western and southern Anatolia where furthest to the north it reaches almost as far as 38° Long. E. In that region it reaches as far south as Jerusalem in Israel. Besides it is reported from two completely isolated regions much separated from that range, namely from Ethiopia and from Paristan, Kashmir, India and Sri Lanka. This sort of disjunction is most surprising and it appears that it requires a critical analysis. One can suspect that we are dealing here with a completely different, though closely related species to *S. aspera*.

S. aspera is a distinct xerophyte, one of the most characteristic components of maquis which in places is so completely intertwined with its prickly stems that it becomes almost impossible to pass. As maquis becomes degraded, in open places, in communities between maquis and the phrygana and in phrygana itself, not having sufficient shrubs of other species to support itself on nor trees on which it could climb vertically, it develops dense clumps of irregularly entangled stems sitting on the ground, particularly on limestone rocks, in dry and strongly isolated places.

In vertical distribution *S. aspera* is to be found most commonly in lower located places, usually already from the seashore to about 300 - 500 m. The most elevated stands have been observed much higher up, eg. in Anatolia (Amanus Mts.) and in Lebanon to about 800 m, on Ionian Is. (Kefallinia) to 900 m, on Crete to 1200 m and on Cyprus to about 1300 m.

References: 64 (8), 128, 151 (2), 163 (1), 184 (1), 188, 211, 512.

50. *Smilax excelsa* L.

This is a late deciduous, rhizomatous climbing shrub with stems more or less prickly, up to 20 (25) m long and with a maximum diameter of 1 - 2 cm. They recline or climb on neighbouring trees and shrubs adhering to them with the help of tendrils growing out in pairs from leaf bases. Leaves are large, 9 - 12 cm long, broadly-ovate or orbicular, membranous or subcoriaceous, with entire margins or with minute prickles on them. Flowers are small in axillary umbels.

This is an Euxino-Hyrcanian species. In Europe it is known only from southern and eastern Bulgaria,

where along the coast of the Black Sea it reaches in the north to the mouth of river Batova (north of Varna), and also from Turkey and infrequent stands in northeastern Greece. The major part of the range covers southwestern Asia, particularly northern Anatolia, the Caucasus and northern Iran close to the Caspian Sea. In western Caucasus, along the seashores *S. excelsa* reaches even further north than in Bulgaria, as far as 45° Lat. N. Besides single scattered stands of this species appear in southern Anatolia and in northwestern Syria, in the region of Bassit between the Turkish border and Latakia.

Throughout this range *S. excelsa* occurs as a rule in lowland regions, on flood areas and in swampy forests, climbing up to the sun and drooping down forming together with other climbers (*Clematis vitalba* L., *Vitis sylvestris* C. Gmelin, *Periploca graeca* L., *Tamus communis* L., *Calystegia sepium* (L.) R. Br.) entangled thickets difficult to pass, and resembling a jungle in appearance. This species is very characteristic for the so called Longos forests, which develops particularly abundantly at the mouths of rivers to the Black Sea. Several species of trees enter such a forest, particularly *Alnus glutinosa* (L.) Gaertner, *Fraxinus excelsior* L., *Quercus hartwissiana* Steven, *Ulmus minor* Miller and *U. glabra* Hudson, *Pterocarya fraxinifolia* (Poir.) Spach, *Acer campestre* L. and *Carpinus betulus* L., and in Iran also *Parrotia persica* C. Meyer and *Albizzia julibrissin* Durazz. In places, along river valleys *S. excelsa* enters also deeply inside the forests, which is best seen on the Caucasus, where scattered stands are distributed along the range of the Greater Caucasus thereby joining the Euxinian and Hyrcarian provinces.

S. excelsa is a mesophilous, moderately thermophilous, light demanding climber which gradually dies out when the substratum becomes dry and when much shade is created as a result of crown closure. When a stand is felled in which *S. excelsa* occurred it quickly spreads, covering with its many stems all shrubs and small trees, preventing their development. It grows on various types of soil, provided they are rich and moist. The vertical distribution includes lower located regions, from the seashore or even coastal depression regions (Iran) to an elevation of about 300 - 400 m, however, in favourable conditions it can reach even 1100 m in Anatolia (near Trabzon), 1300 m in Iran and 1400 m in western Transcaucasus.

The youngest juicy stems developing in the spring are sometimes used by the local population for consumption purposes, and long, older but not lignified stems for the weaving of baskets.

References: 64(8), 104(1), 111, 163(1), 218(1).