

Characterization of areas

Apocynaceae

Nerium L.

1. *Nerium oleander L.*

This is a strong, erect, evergreen shrub, 1 - 5 (- 6) m tall, with coriaceous, stiff, narrowly elliptic, up to 20(- 30) cm long leaves and with bright rose, infundibular, large flowers 3 - 5 cm in diameter, collected in terminal cymose inflorescences.

This is a circum-Mediterranean species (with the exception of Egypt), restricted in its range to a relatively narrow coastal belt. In the eastern Mediterranean it grows along the shores of Yugoslavia and Albania, in southern and eastern Greece and on numerous Greek islands (furthest to the north on Samothraki), and then within the Asiatic part of the range in western and southern Anatolia, on Cyprus, in western Syria, in Lebanon, in Israel and in Jordan. Here it extends as far south as the Judean Desert and Petra, south of the Dead Sea. In this region it is represented by the type subspecies — subsp. *oleander*. Its other subspecies, subsp. *kurdicum* Rech. f., which differs from the type in having smaller flowers and appendices of corolla 4 - 8 and not 3 - 4 dentate, reappears after a certain disjunction in the range further inland, in southeastern Anatolia, in northeastern Iraq and in western Iran.

N. oleander is a thermophyte and a mesophyte which occurs most commonly along rivers and streams and also in seasonally dry beds of water courses. Besides it appears on insolated and apparently dry, steep limestone rocks, however, only in such places where during the winter and spring water flows over the rock. Along dry stream beds it frequently grows en masse forming compact, parallel thicket lines of this single species, giving rise to an association *Nerietum oleandri*. A similar type of thicket can also be formed together with *Platanetum orientalis*. It develops best on exposed places, in full insolation, and then it flowers very abundantly, none the less it sustains shading well though in such conditions flowering is much poorer. This shrub is associated as a rule with lower located regions and is distributed primarily from the seashore to about 400 - 500 m elevation. In Greece, on the Peloponnisis it attains 700 m, in Anatolia up to 800 - 850 m (though on Mt. Cassius near the border with Syria even to 1000 m), in Iraq and on Cyprus to 900 m, in Jordan (Petra) to 1000 m and in Iran even to 1200 m. The lowest stands are to be found in depressions of the Dead Sea down to about -200 or -250 m.

In Mediterranean countries and also on the Caucasus and on Crimea *N. oleander* has been cultivated for centuries and until this day it is a valued ornamental shrub widely used for planting in parks, home gardens, in the streets and along roads. In cultivation it is represented by several forms of various flower pigmentation: white, yellowish-orange (flesh like), pink, red and dark purple, single or double. Beyond the Mediterranean region, in countries with more severe climates *N. oleander* is used for interior decoration, in pots and boxes, removed outside for the summer. *N. oleander* is a strongly poisonous species, dangerous for herbivorous animals. All plant parts contain cardiac glycosides. The poisonous properties of *N. oleander* are known since antiquity.

References: 64 (6), 107, 163 (3), 188, 228 (4), 259 (3), 494.

Araliaceae

Hedera L.

Species from the genus *Hedera* are very similar to each other and difficult to distinguish, thus the number of them given by various authors varies substantially, from 5 to 15. In differentiating them a significant role is played by the shape, size and pigmentation of hairs, stellate or scaly, and by the number and degree of fusion of their rays. The range of the species covers most of Europe, North Africa, the Canary Islands, the Açores and Madeira as well as western, central and eastern Asia. In southwestern Asia there occur 4 species.

2. *Hedera colchica* K. Koch

This is an evergreen, attaching itself to trees woody climber, with large up to 20 - 25 cm wide leaves, entire or with only slightly marked three lobes. The inflorescence and leaves on the dorsal side, particularly when young, are covered with yellowish, scaly hairs with numerous (15 - 25) rays substantially fused with only the upper portions free.

This is a Euxine species, restricted in its range only to the Black Sea shores of Anatolia and the Caucasus, from the valley of Sakarya river in the west to the Suramskij Khrebet in central Georgia in the east. In that part of Asia the range of *H. colchica* coincides to a large extent with that of *H. helix* and the two species can in places be found on one and the same stand. Compared with the latter species *H. colchica* appears to be an even greater mesophilous and grows in shady moist forests or on their edges, climbing up trees and rocks. Commonly it occurs very abundantly forming dense, compact mats concealing almost completely all other vegetation. It occurs from the seashore itself and attains in Anatolia up to 1400 m and on the Caucasus up to 1500 m elevation.

H. colchica, thanks to its large and lustrous leaves, is a valuable ornamental climber, however, in view of its sensitivity to low temperatures it can only be used in countries with a more delicate climate. It has been introduced into cultivation in 1860.

References: 64 (4), 103 (6), 503.

3. *Hedera helix* L.

Syn.: *H. taurica* Carrière *H. caucasigena* Pojark.

It is an evergreen, strong woody climber, attaining up to 20 - 30 m in height, holding on to the substratum with the help of small adventitious roots outgrowing from the shaded part of the stem. It is characterized by a distinct leaf dimorphism. On sterile shoots they are usually wider than longer, palmately 3 - 5-lobed, while on flower shoots they are more or less ovate, unlobed and with entire margins. The form of growth and the flowering of ivy depend to a large degree on the climatic conditions and on light. The further one goes in the northerly or northeastern direction and the more shaded the plant is the more rarely does it climb up higher and the more rarely it flowers; it will creep on the ground and propagate vegetatively. An important characteristic of *H. helix* are the stellate hairs with 5 - 10 rays fused at the base itself. Most closely related to it is *Hedera canariensis* Willd., treated also as its subspecies (*H. helix* subsp. *canariensis* (Willd.) Cout.), which occurs on Canary Islands, the Açores, on Madeira, in northwestern Africa and in Portugal.

H. helix is a Mediterranean-Atlantic species, mesophilous and shade tolerant, distributed over the whole of western, central and southern Europe, and in southwestern Asia (Anatolia, the Caucasus, Cyprus, northwestern Syria, Lebanon, northern Israel, northeastern Iraq and on one stand in western Iran). In the north it reaches a latitude of 60°30' in Norway and in the south, in Israel more or less Lat. 33°. Outlier stands have also been reported further south from Jordan (Petra-Wadi Mūsā). As the range extends in the south-easterly direction with the increasing dryness of the climate the number of stands of *H. helix* declines, they become increasingly scattered and restricted to regions located nearer the sea (eg. in Anatolia). This is associated

with its specific requirements, namely with the fertile, humus soil that does not dry readily and the high air humidity.

Ivy grows in compact thickets and in forests, both deciduous (mainly beech) but also in coniferous ones, near water runs, in narrow and shaded gorges, climbing up tree trunks and rock surfaces, particularly on limestone. Basically speaking this is a species associated with lowland regions and lower reaches of the mountains. In its vertical distribution it usually does not exceed 1000 m, however, in Greece and Iraq it attains 1200 m, in Anatolia 1500 and in the Alps 1800 m.

H. helix is a very valuable ornamental shrub cultivated since antiquity. It finds abundant use in covering various wall, sides of buildings and stems of old trees as well as for the formation of evergreen ground covers within shaded lawns. In cultivation there are various forms differing in rate of growth, shape, size and colour of leaves, as well as colour of fruits. Slowly growing forms raised in flower-pots or in boxes are used as indoor ornamentals.

References: 64 (4), 103 (6), 163 (2), 166 (1), 184 (1), 228 (4), 259 (2), 463, 503.

4. *Hedera nepalensis* K. Koch

Syn.: *H. himalaica* Tobler

An evergreen, self-attaching strong woody climber reaching up to 30 m with old stems as thick as a human arm. It differs substantially from all other west Asiatic ivy species in having triangular, pinnatilobe leaves and a distinctly brighter pigmentation of the venation on sterile shoots and leaves of the flowering shoots are strongly elongate, several times longer than wider. Besides its fruits are not black but yellow to reddish in colour.

It is a Himalayan species. Its range extends from the southern Hindukush in eastern Afghanistan (Nuristan) to northern Pakistan, Kashmir, northwestern India and Nepal as far as Sikkim. Further in the easterly direction, in eastern Himalayas and then in China it is replaced by a closely related species *H. sinensis* (Tobler) Hand.-Mazz.

H. nepalensis is very common, particularly in the central part of the range, in Kashmir and in Nepal. It grows on moist or even swamp soils, on shaded stands, climbing extensively on rocks and on tree trunks, usually above 1000 m elevation. In Afghanistan and Pakistan it occurs more or less up to an elevation of 2450 - 2600 m, in Kashmir up to 2800 m and in India even up to 3000 m.

References: 30, 58, 134, 179, 225, 463, 470, 503.

5. *Hedera pastuchowii* Woronow

This is an evergreen, self-attaching woody climber that attains considerable heights, with leaves on sterile shoots very variable, from entire to 3 - 7-lobed, and also arrow-like with a strongly elongate central lobe. Young shoots, inflorescences and to a lesser degree the dorsal leaf surface have scaly hairs with numerous rays basally fused for about half their length. This ivy is strongly related to the Japanese *Hedera tobleri* Nakai.

It is a Hyrcanian species. It occurs rather rarely along the southern and southeastern shores of the Caspian Sea, in northern Iran (provinces of Gorgan, Mazandaran and Gilan) and on the Caucasus in the USSR (Talış and eastern Transcaucasus) where it penetrates inland along the range of the Greater Caucasus.

H. pastuchowii grows in the lowlands and on lower montane elevations, in moist deciduous forests and also on their edges and within openings, climbing up trees, but not on rocks. It occurs more or less from the seashore usually up to no more than 1200 m in Iran. In province of Gorgan it has also been found even at an elevation of 1800 m.

References: 103 (6), 463.

Berberidaceae

Berberis L.

6. *Berberis crataegina* DC.

This is an erect, spiny shrub, 1.5 - 2 m tall with spines shorter than leaves, young shoots dark purplish-brown or red and with leaves at least 3 times longer than wider. This is a very variable species in leaf length, nature of the leaf blade (from entire to coarsely serrate) and also in the colour and lustre of stems.

The major part of the range of *B. crataegina* covers central Anatolia where it is a quite common species, while it is completely absent from western and southeastern parts of the country. In western Anatolia, in Greece, on Cyprus and in Lebanon it is replaced by a closely related species, *Berberis cretica* L., which differs from it primarily in having a poorer growth and longer spines than leaves. Besides, after a considerable disjunction, *B. crataegina* appears on infrequent, separated from each other stands in northern Iran and southern Turkmeniya (Central Kopet Dag).

In northeastern Anatolia, northwestern Iran and also possibly in the southern Caucasus a multitude of forms is to be found with traits intermediate between this species and *Berberis integerrima* Bunge and *B. vulgaris* L. This is a region of intensive introgression between these three taxa, in which "pure" individuals are extremely rare.

B. crataegina grows on dry, sandy-clayey, stony and rocky, usually limestone slopes, on exposed and insolated meadows, singly or in groups, or else it forms its own or mixed associations with the participation of other xerothermic shrubs. The majority of stands is distributed more or less between 800 and 1500 m elevation, however, in northern Anatolia, closer to the Black Sea specimens appear already from 300 m while in the south they reach 2000 m or even as in province of Antalya, south of Elmali even to 2700 m. In Iran it occurs between 1000 and 2000 m.

References: 64 (1), 218 (2), 219, 467, 499, 502.

7. *Berberis cretica* L.

Syn.: *B. libanotica* Ehrenb.

A compact, rounded, stoloniferous shrub, usually not taller than 50 - 80 cm with sharp, usually tripartite spines, longer than the coriaceous leaves. The closely related to it *Berberis hispanica* Boiss. et Reuter occurs in Spain and in northwestern Africa.

B. cretica is an eastern Mediterranean species, montane, with a fragmented range restricted to eastern and southern continental Greece, Crete and some Aegean islands, western Anatolia, Cyprus, Lebanon and the bordering on Lebanon montane regions of Syria. Populations from Lebanon are sometimes recognized as a separate species, *Berberis libanotica* Ehrenb., however, the small morphological differences are not of great significance.

In Anatolia *B. cretica* is known only from the vicinity of Izmir while its stand reported from province of Isparta, on Davros Dagi, taking into consideration the whole range, appears doubtful and requires verification. On Cyprus the stands are concentrated in the central part of the island, in the Mt. Troödos massif, while in Lebanon on the mountain range of Lebanon and Anti-Lebanon. In the latter two countries as well as on Crete, *B. cretica* is locally abundant and even forms its own association — *Berberidetum creticae*.

B. cretica grows on various kinds of substrata, usually however, on calcareous slopes and screes, in phrygana, on open and insolated places and in pine and juniper forests. Above the tree limit it occurs in tragacanthic communities. As a rule it appears in regions located above 1000 m and only occasionally lower (down to 200 m). In Anatolia it reaches 1700 m, in Greece up to 1900 m, on Cyprus up to 1950 m, in Lebanon up to 2000 m and on Crete even up to 2200 m.

References: 11, 64 (1), 106 (1), 151 (1), 163 (2), 188, 189, 251, 258, 335 (3).

Boraginaceae

Lithodora Griseb.

8. *Lithodora hispidula* (Smith) Griseb.

Syn.: *Lithospermum hispidulum* Smith

This is a compact, dense shrub up to 1 m tall, with a cushiony type of growth and with obovate to linear leaves with short adpressed hairs and tuberculate-based bristles. Flowers are small of variable colour, from white and pink to violet and blue. Depending on the height of the shrubs, flower pigmentation and the mode of setting (from 1 to 6) three subspecies are distinguished within it, (subsp. *hispidula*, subsp. *cyrenaica* (Pamp.) Brullo et Furnari, subsp. *versicolor* Meikle) the systematic value of which, stability of traits, has not been studied sufficiently yet.

It is an eastern Mediterranean species with a narrow and very elongate range of distribution. Furthest to the west it is present in northeast Africa, in Cyrenaica, where an endemic for the region subsp. *cyrenaica* (Pamp.) Brullo et Furnari characterized by strong growth and flowers collected in terminal heads is recognized. Then it appears on Crete and on some southeastern Greek islands such as Kasos, Karpathos, Saria, Rodhos, Tilos, Kos, Kalymnos and Samos (here one finds the most northerly stands of the species). In southern Anatolia stands are rare and far between. Besides the species grows commonly on Cyprus and on one stand in northwest Syria, near the border with Turkey.

L. hispidula is a distinct xerophyte occurring primarily in exposed, insolated and dry places, particularly in communities of the phrygana in which in places it can even dominate. Most frequently it is associated with such species of shrubs as *Cistus incanus* L., *Cistus salvifolius* L., *Cistus parviflorus* Lam., *Genista acanthoclada* DC., *Coridothymus capitatus* (L.) Reichb. f. and *Sarcopoterium spinosum* (L.) Spach. It appears also in the understorey of open pine (*Pinus brutia* Ten.) forests and particularly on their edges. It grows both on rocks and in rocky rubble and on clayey sandy slopes, and even on coastal dunes. It usually occupies lower located regions, more or less to an elevation of 300 - 350 m, however, in Anatolia, in the Amanus Mts. and on Rodhos it reaches as far up as 1000 m elevation, on Cyprus to 1300 m and on Samos, Mt. Kerki even to 1400 m.

References: 5, 56, 64 (6), 113, 145, 163 (3), 188, 466, 483.

Buxaceae

Buxus L.

9. *Buxus balearica* Lam.

Syn.: *B. longifolia* Boiss.

This is an evergreen shrub or a small tree, attaining sometimes up to 8 m in height. It differs from *Buxus sempervirens* L. in having glabrous, young shoots and larger, more elongate and brighter leaves.

This is a Mediterranean, calcicole species. It has a strongly disjunctive range, the main part of which covers northwest Africa (Morocco), the Balearic Is., shores of southern and eastern Spain and Sardinia, and the smaller part lies in southern Anatolia and northwestern Syria (Cassius), where until recently it has been treated as an independent species *Buxus longifolia* Boiss. The rare stands of this box are to be found here in provinces of Antalya, Adana and Hatay, in limestone gorges and rocks, between 150 and 900 m elevation. In Anatolia it grows in the form of a small shrub, usually 1 m tall, more rarely taller.

B. balearica has been introduced into cultivation in the year 1780, however, it did not find as wide a use as *B. sempervirens* L., which is associated with its greater sensitivity to low temperatures.

References: 5, 64(7), 163(2).

10. *Buxus sempervirens* L.

Syn.: *B. colchica* Pojark., *B. hyrcana* Pojark., *B. sempervirens* L. subsp. *hyrcana* (Pojark.) Takht.

This is an evergreen shrub or a small tree, usually not taller than 6 - 8 (10) m. *B. sempervirens* attains largest dimensions on the Caucasus, in Colchida, and in the Talish Mts. where individuals even up to 16-20 m tall and with stem diameters 30 - 50 cm can be found. In Greece on the other hand as a rule it is a shrub not taller than 1 - 2 m. In the eastern part of the range, on the Caucasus and in the regions close to the Caspian Sea two small species have been separated from it, *Buxus colchica* Pojark. and *B. hyrcana* Pojark. differing from each other primarily in the length of the rudimental pistil and in the length of horns at the dry capsule apices. Longer horns (2 - 3 mm) are to identify *B. hyrcana* and the shortest (1.5 mm) *B. sempervirens*, while the horns of *B. colchica* are intermediate (1.5 - 2.0 mm). These features are in fact very small and so far have not been sufficiently studied throughout the range of the species since in herbarium collections usually flowers and fruits are missing. Thus an accurate delimitation of regions characterized by the predominance of a given trait is not, at least for now, possible, thus both *B. colchica* Pojark. and *B. hyrcana* Pojark. have been treated here as conspecific with *B. sempervirens*.

B. sempervirens is characterized by a very extensive range fragmented into smaller and larger portions. In the West it is known from northwest Africa (Morocco, Algeria) and from Spain, and in the East even from the western part of the Iranian province of Gorgan. Furthest to the north it occurs in western Europe, in southern England, in northern France and in southern Belgium (valleys of rivers Meuse and Sambre). In the eastern part of the range it grows on the Balkans, there only in Yugoslavia, Albania and Greece. In Yugoslav Macedonia the majority of the stands is gathered in the basin of rivers Vardar and Treska and in Greece in the montane regions of western Macedonia and in Ipiros. Then, after a disjunction of about 450 km *B. sempervirens* reappears in Asia, in Anatolia where its range is also fragmented into several parts, the most isolated stand being in the mountains near Denizli and a group of stands in the Amanus Mts. On the Caucasus the range of *B. sempervirens* (treated here as *B. colchica* Pojark.) covers primarily Georgia and in particular its coastal regions. Further in the easterly direction, after a certain gap box reappears (here as *B. hyrcanus* Pojark.) scattered in the Talish Mts. (USSR) and in northern Iran (provinces of Gilan, Mazandaran and Gorgan).

B. sempervirens is a mesophilous species with quite differentiated edaphic requirements sustaining well even considerable shading and drought. In Greece it grows on moderately dry serpentine or limestone slopes and also in damp rocky places, as an understorey of beech, oak or pine forests, sometimes quite abundantly, particularly on dewooded slopes, more or less from 500 - 600 m to 1800 m elevation and sometimes even higher up to 2000-2200 m. On these most elevated stands it forms a low subalpine scrub, attaining only a height of 30 - 50 cm. In similar conditions it occurs in Anatolia, but in the north of the country it enters also the understorey of fir forests, from 100 m to 1500 - 1600 m elevation, and in the northern parts of the Amanus Mts. even up to 1800 - 2000 m.

On the Caucasus, particularly in the northeastern parts on the Black Sea stands of box occur from the seashore to an elevation of 600 m (the lower the more moist are the environmental conditions), while deeper inland they attain 1400 - 1600 m. *B. sempervirens* represents here an important component of the understorey in hornbeam, hornbeam-beech and beech-chestnut forests and more rarely in coniferous forests. In deep and moist valleys, along running waters individual box trees attain impressive dimensions and the stems and branches all the way to the top are covered with mosses and lichens, which gives them a most singular appearance.

Finally in the last, most easterly part of the range, box enters into very moist, strongly shaded forests (the so called jungle of Caspian lowland) composed of *Carpinus betulus* L., *Quercus castaneifolia* C. Meyer, *Parrotia persica* C. Meyer, *Zelkova carpinifolia* (Pallas) K. Koch., *Pterocarya fraxinifolia* (Poiret) Spach, *Alnus subcordata* C. Meyer and *A. glutinosa* (L.) Gaertn. subsp. *barbata* (C. Meyer) Yalt., both in depressions and higher up, usually up to 200 - 300 m, more rarely higher (up to 800 m).

B. sempervirens belongs to one of the most common evergreens to be found in cultivation since antiquity, particularly in the countries of the Mediterranean regions and in western Europe. It is valued both for its ability to withstand shading which allows it to be planted under crowns of old trees and for the readiness to

grow in full light. It sustains pruning well and can be easily formed, thus it played a significant role in the so-called classical gardens in which besides yew it was one of the basic plants. Under cultivation it produced about 20 varieties differing from each other in rate of growth and in the size, width and colour of leaves, as well as in the degree of tolerance to low temperatures. Dwarf varieties are used for low hedges.

References: 6, 64(7), 103(6), 204, 431, 492.

Celastraceae

Euonymus L.

11. *Euonymus europaeus* L.

This is a shrub or a small tree, up to 5 - 7 m tall, and in very favourable conditions even taller, with quadrangular shoots and pink, angled capsules with whitish seeds completely covered with an orange aril. This species is very variable both in size and shape of leaves and in the degree of pubescence, which has resulted in the recognition within it of various forms some of which have been even treated as independent taxa. In northern Anatolia (Amasya, Sivas) forms have been found which are characterized by puberulent shoots and distinctly pubescent leaves along the veins. They correspond to *Euonymus czernjaëvii* Klokov, a small species from within *E. europaeus* representing within its range in Europe the southeastern extremity (Moldavia, Ukraine). Possibly it should be treated as a subspecies of *E. europaeus*.

The range of *E. europaeus* covers almost the whole of Europe and in southwestern Asia Anatolia and the Caucasus. Furthest to the north the species reaches Scotland and southern Sweden, more or less as far north as 58° Lat. The further one goes in the southerly direction the less common are stands of this species and more scattered. Thus for example in Greece they appear in northern Peloponnisos and in southeastern Anatolia in the Amanus Mts. While in Anatolia itself stands of *E. europaeus* are infrequent, on the Caucasus it is already a very common shrub, both in the range of the Greater and the Lesser Caucasus.

It is a mesophilous species sustaining well a moderate drought. It grows primarily in the understorey of broadleaved forests (oak, beech and hornbeam) and also in mixed ones, particularly on their edges as well as in various types of thickets, on fertile mineral and limestone soils with a substantial content of humus, and also on limestone rocks. It sustains shading well, however, in such conditions the shoots are often prostrate on the ground. In its vertical distribution it usually occurs no higher than 1200 - 1300 m elevation, however, on the Transcaucasus it grows up to 1500 m, in Anatolia to 1650 m, in Bulgaria to 1800 m and in Greece (Ipiros) even to 1900 m.

References: 64(2), 103(6), 104(5), 242(2), 475, 479, 481.

12. *Euonymus hamiltonianus* Wallich

A strong erect shrub or a small tree, in favourable conditions attaining a height of up to 10 m and a stem diameter of 40 - 50 cm. Its bark is thick and corky, leaves are large, up to 10 cm long, glabrous and the capsules are turbinate with a diameter of 1 cm, the seeds being covered with a purple aril.

An exact delimitation of the range of this species is very difficult, particularly in the east, which is associated with its inadequately established systematic position. On the one hand it is believed to be a collective species, with a wide range covering China in the east and reaching Japan and on the other it is split into several smaller species one of which, the most westerly one, could be considered as *E. hamiltonianus* s. str. It has been also described under a separate name *Euonymus juzepczukii* Leonova.

E. hamiltonianus (s. str.) is a Himalayan species with a range extending from eastern Afghanistan, through northern Pakistan, Kashmir, northwestern India and Nepal to northern Burma. In Afghanistan it grows only in the eastern part of Nuristan province and in Pakistan single stands are known from the districts of South Waziristan, Kurram, Khyber, Chitral, Swat, and Hazara. It is common only in the southern part of Hazara and in Kashmir. This part of the range coincides to a large extent with the range of *Staphylea emodi* Wallich. *E. hamiltonianus* occurs in shady and moist mixed forests, usually singly. In Afghanistan it can be found between 1900 and 2400 m, in Nepal between 700 and 2600 m, the highest stands being known from an elevation of 2750 m.

White compact and close wood of *E. hamiltonianus* is well suited for carving and the production of small household tools, (e. g. spoons). Young shoots and leaves are cut for fodder.

References: 30, 179, 223, 225, 480, 493, 498.

13. *Euonymus latifolius* (L.) Miller

Syn.: *Kalonymus latifolia* (L.) Prokh.

This is a strong erect shrub 2 - 5 m tall, sometimes a small tree up to 6 m tall, occasionally somewhat taller. It is characterized by large, up to 15 cm long leaves, pointed and long buds (up to 2 cm long), large, usually 5-locular, bright red, narrowly winged on the angles capsules and with whitish seeds completely covered with orange arils. Very characteristic are the loose, pendulous infructescences on thin long peduncles, composed of many fruits (frequently above 10).

E. latifolius is distributed almost throughout the whole of southern Europe reaching southern France and northern Italy in the west and Germany in the north. It is also known from northwest Africa (Algeria, Morocco). In southwestern Asia it occurs almost throughout northern Anatolia, on the Caucasus and in northern Iran where the most easterly located stands are known from the eastern part of Gorgan province (National Park). It is much less common in southern Anatolia and only exceptionally does it grow in northwestern Syria. It is striking that it is completely absent from the Mediterranean and Aegean islands, not only from small ones but also from very big ones such as Corsica, Sardinia, Sicilia, Crete and Cyprus.

It is a moderately mesophilous forest species, shade tolerant, occurring singly or as small groups in the understorey of various types of forests, both broadleaved and coniferous, as well as on their edges and also in open thickets of river valleys, occasionally occurring on isolated limestone rocks inside forests, however, in the latter conditions it does not attain large dimensions. As regards soil conditions it does not have any specific requirements, but it develops better on rich, humus moderately moist soils.

In its vertical distribution *E. latifolius* is rare in the lowlands and common only in the lower reaches of mountains, above 500 - 800 m elevation. In northern Anatolia, in province of Zonguldak it has been found already at 20 - 30 m elevation and in Bulgaria, in the Strandzha Mts. between 100 and 300 m. In Albania it grows between 500 and 1600 m, in Bulgaria between 800 and 1600 m, in Greece between 600 and 1700 m. The most elevated stands have been found on the Caucasus and in Anatolia at about 2000 m, and in Iran, in central Elburz at 2600 m.

It is an ornamental shrub introduced into cultivation already in 1730.

References: 64(2), 103(6), 104(5), 163(2), 242(2), 481, 493, 501.

14. *Euonymus velutinus* (C. Meyer) Fisch. et C. Meyer

This is a shrub or a small tree up to 4 m tall. All parts of the plant, young shoots, buds, leaves (on both surfaces), inflorescences and fruits are more or less densely tomentose or pubescent. *E. velutinus* is closely related to *E. europaeus* L. and sometimes it is being treated as its variety or form.

It is a Hyrcanian species. It occurs along the southern shores of the Caspian Sea in Talish (USSR), in the

Iranian provinces of Gilan, Mazandaran, Gorgan and Khurasan, and also from southern Turkmeniya (southwestern Kopet Dag Mts.). Besides it is known from the Caucasus, southeastern Armeniya and southwestern Azerbaydzhan (Nagorno Karabakh A. O.). The disjunction in the range between Talish and the eastern part of Mazandaran province is probably only apparent and appeared on the map presumably due to lack of sufficient data from the region.

In contrast to *E. europaeus* this species is much more xerophytic. It occurs in thickets and open forests as well as on their edges. In Iran it has been found at elevations between 650 and 1300 m, while in the USSR between 150 and 1800 m.

References: 103(6), 104(5), 481, 493.

15. *Euonymus verrucosus* Scop.

This is delicate shrub, 1 - 3 m tall, sometimes a little taller, resembling a small tree. It is characterized by thin, green shoots densely covered with black warts, by small capsules and black lustrous seeds partially covered by scarlet-red arils.

This is an east European forest or forest-steppe species. In the northeast, in USSR, it attains more or less 59° Lat N, in the west it reaches northern Italy and in the east as far as the Urals. It occurs also on the Caucasus, particularly in its central and eastern part and on infrequent, scattered stands in northcentral Anatolia. Once it has been found in the north Iranian Azerbaydzhan.

E. verrucosus occurs in the understorey of deciduous and mixed forests, sometimes in coniferous ones, particularly in the more open ones and also in xerothermic thickets on open and insolated places and on limestone rocks. It grows on sandy, sandy-clayey, and particularly on limestone, quite rich though not very dry, permeable soils. It sustains shade quite well.

In eastern Europe *E. verrucosus* is distributed primarily on the lowlands and in hilly country (up to 300 - 660 m elevation), but in the south of the range it appears also on higher elevations, usually, however, not higher than 1500 m. In Anatolia its vertical range extends between 300 and 1630 m. The most elevated stands have been reported from Greece, on Mt. Olympus at 1900 m and from the Caucasus at 2100 m.

The root bark of this species contains large quantities of gutta-percha and in order to obtain in special plantations were being established in the USSR. Also other species from the genus *Euonymus* contain gutta-percha, however, in smaller quantities than *E. verrucosus*.

References: 64(2), 103(6), 242(2), 481, 493.

Cornaceae

Cornus L.

16. *Cornus macrophylla* Wallich

Syn.: *Thelycrania macrophylla* (Wallich) Pojark., *Cornus brachypoda* C. Meyer, *Thelycrania brachypoda* (C. Meyer) Pojark.

This is a strong erect shrub or a small tree 10 - 15 m tall with a stem diameter up to 50 - 60 cm. Leaves are large, 10 - 15(20) cm long, glaucous beneath and the flowers are creamy white, collected in terminal panicle-like cymes.

This is an east Asiatic species widely distributed in central and southern China, known also in Japan and Korea. In the westerly direction its range narrows distinctly and is restricted only to the southern Himalayas, extending from Nepal, through northwestern India and Kashmir to northern Pakistan and eastern Afghani-

stan (here only in Nuristan province). This western end of the range is divided into several parts, however, it is a fairly common species here, particularly in the Pakistani Hazara district and in India.

C. macrophylla is a mesophyte. It grows throughout the hills, usually in shady valleys, in patches of moist deciduous forests, particularly in oak woods (*Quercus incana* Roxb.). In Afghanistan it occurs between 900 and 1850 m and in Himalayas between 1200 and 2700 m, being most elevated in Nepal, even up to 3000 m.

The wood of *C. macrophylla* is light-reddish and moderately hard, used locally as fuel, leaves are lopped for goat fodder and the fruits are eaten locally. It has been introduced into cultivation as an ornamental species in 1827. In cultivation it is sometimes confused with *Cornus controversa* Hemsley, from which, however, it differs in having opposite leaves.

References: 30, 179, 225, 471, 490.

17. *Cornus mas* L.

A strong shrub or bushy tree, usually not taller than 5 - 6 m, sometimes attaining even 8 m and a stem diameter of 25 - 30 (45) cm. In contrast to other species of the genus *Cornus* from the region under study it develops flowers before the development of leaves in March and April. Its drupes are very variable in size, shape and pigmentation, usually however, they are ellipsoid to cylindrical, 2 - 2.5 cm long, dark red.

The range of *C. mas* covers on the one hand the central and southeastern Europe and on the other the southwestern Asia. In Europe the species extends in the west to central France and southern Belgium and in the east as far as southern Czechoslovakia, western Ukraine and the Crimea. On the Balkan peninsula, in Greece it reaches as far south as the northern part of the Peloponnisos and in Anatolia as far as northwestern Syria, where it extends only slightly beyond 36° Lat. N. On the Greek islands it is unknown except for Thasos and Lésvos. The Asiatic part of the range covers northern, western and southwestern Anatolia and a major part of the Caucasus. Single stands have been reported also from the north Iranian Azerbaydzhan.

C. mas is resistant to drought and sustains shading rather well, however, it fruits poorly under greater shade. It occurs in the understorey of warm and sparse broadleaf forests, particularly of oak (*Quercus cerris* L., *Q. frainetto* Ten.), hornbeam, beech and even alder, more rarely in coniferous ones, of fir and pine. Besides it enters thickets developing on edges of these forests or in open insolated places among which it can be the dominant component. It grows on various types of soils, usually however, on fertile ones with a good calcium content. It occupies lowland and submontane regions in its vertical distribution rarely exceeding an elevation of 1200 - 1300 m (in Romania only to 800 m); in Anatolia and the Caucasus up to 1500 m. On the Crimea it belongs to one of the most common wild fruit trees.

Juicy, sweetish-sour fruits of *C. mas* contain 7 - 9% of sugars (fructose and glucose) and also large quantities of vitamin C. Within its natural range the fruits are readily eaten by the local population, both fresh and made into jellies, compots, juices, jams, syrups, alcoholic beverages and liqueurs. The fruits are collected either from the wild state or on specially established plantations. The wood of *C. mas* is heavy and very hard, with narrow rings, elastic and splintery, accepting varnish well thus suitable for turnery products. In properties it resembles the wood of *Buxus sempervirens* L. It is a melliferous and ornamental plant popularly planted in parks and landscape architecture, used also for both natural and formed hedges.

References: 64(4), 78, 79, 103(7), 138, 163(2), 490.

18. *Cornus sanguinea* L.

Syn.: *Thelycrania sanguinea* (L.) Fourr., *Swida sanguinea* (L.) Opiz

A strong erect shrub, 2 - 4 m tall or even taller, sometimes in the form of a small tree with a short trunk. It is characterized by leaves with entire margins, 3 - 4 pairs of lateral veins and purplish-black drupes 5 - 8 mm in diameter collected into cymose corymbs. This species is characterized by considerable variability

in the form of pubescence and in the length and shape of sepals. On this basis several taxa of various rank were recognized within it some of which are sometimes even considered to be independent species.

C. sanguinea can be divided into three distinct subspecies; subsp. *sanguinea*, subsp. *australis* (C. Meyer) Jáv. and subsp. *cilicica* (Wangerin) Chamberlain. The former, subsp. *sanguinea*, differs from the latter two in having simple and crispate hairs on the lower leaf surface. In the other subspecies they are straight, median. While subsp. *sanguinea* occurs almost throughout the range of the species (Europe and western Anatolia, in the north as far as 60° Lat. N), the other two are restricted to its southeastern part (from the Balkans to the Caucasus, northern Iran and southern Turkmeniya, in the north as far as eastern Czechoslovakia). The intermediate zone between subsp. *sanguinea* and subsp. *australis*, in which to a varying degree intermediate forms occur, is very extensive from southern Poland to Anatolia. The difficulty in assigning these forms to one of the two subspecies has resulted in their being recognized and treated separately in the rank of subspecies or even species, namely: *Cornus australis* subsp. *czerniaewii* Grosset and subsp. *hungarica* (Kárp) Grosset (= *Cornus hungarica* Kárp.), which has complicated substantially the already complicated systematics of *C. sanguinea*.

C. sanguinea subsp. *australis* occurs in southern Europe, in Anatolia, Syria, Lebanon, Iraq, on the Caucasus, in northern Iran and in Turkmeniya. It differs from subsp. *cilicica* from southern Anatolia in having 2 - 3 times shorter, triangular and not lanceolate sepals. The forms of subsp. *australis* distributed over the eastern fringe of the range, from Talish to Turkmeniya are also recognized as a separate species, *Cornus meyeri* (Pojark.) Pilip., which has been treated here as a synonym of this subspecies.

Basically speaking *C. sanguinea* is a mesophytic, shade tolerant calciphilous shrub with very variable site requirements. In the northern part of the range it grows also in moist places, even on marshes, on banks of rivers and lakes, while from the south increasingly frequently on dry insolated slopes and on limestone rocks. It frequently enters the understorey of various types of forests, both deciduous and coniferous, and together with other shrubs in various proportions it forms thickets on edges of forests or in open places.

It occurs on the lowlands, in lower reaches of mountains, however, in southwestern Asia it has been found even at considerable elevations. In Greece it appears in its vertical distribution usually between 0 and 900 (1000) m, in Anatolia between 0 - 1200 m and in Iraq between 900 and 1500 m. In southern Anatolia it reaches even 1600 m. On the other hand in Iran the amplitude between the lowest and highest stands is substantial and varies from the depressions of the Caspian Sea (-25 m) to the Elburz Mts, 2100 - 2300 m.

C. sanguinea is an ornamental shrub widely used in parks for the formation of compact groups under tree crowns. It is also used as a hedge. In cultivation several forms are known of which the most interesting one is 'Viridissima' with green shoots and fruits.

References: 64(4), 103(7), 474, 476, 489, 490.

Elaeagnaceae

Hippophaë L.

19. *Hippophaë rhamnoides* L.

This is a strongly erect shrub or a small tree, usually 5 - 6 m tall but attaining even 10 - 12 m and a stem diameter of 30 cm; in China it attains even 18 m. It is dioecious, very spiny, much branched and suckering freely, with nitrogen-fixing bacteria in root nodules. All parts of the plant, particularly the younger ones, are covered with silvery stellate scales. Apical or lateral thorns are thin and rigid. Drupe-like fruits are juicy, usually orange in colour, subglobose or ovoid, about 6 - 10 mm long. This is a distinctly polymorphic species, not only in terms of habit but also in leaf length, width and pubescence, in size, shape and colour of fruits and in the degree of flattening of seeds. On this basis 9 subspecies have been recognized within it, 3 of which occur in Europe and 6 in Asia.

The range of *H. rhamnoides* is very extensive but divided into several parts. It extends from western Europe (from Ireland and northwestern Spain) all the way to Mongolia and eastern China. In Europe the species reaches as far north in Norway as latitude 68° (subsp. *rhamnoides*), while in Asia, in southern Siberia only up to 55° (subsp. *mongolica* Rousi). In Europe it either grows on the seashore, on stable dunes or cliffs, or in valleys of mountain rivers up to 1900 m elevation. In southeastern Europe it is known from the Romanian Carpathians and from several stands on the Black Sea, in the Danube delta (subsp. *carpatica* Rousi). It has been also reported from northeastern Bulgaria, from the vicinity of Varna (subsp. *caucasica* Rousi).

In southwestern Asia *H. rhamnoides* is represented by two subspecies, subsp. *caucasica* Rousi and subsp. *turkestanica* Rousi. The former occurs primarily on the Caucasus and in the Talish Mts (USSR) as well as in northern and most eastern, occasionally also southern Anatolia and in north Iranian Azerbaydzhan. Besides there are some stands isolated from this continuous range in northern Iran, in the central part of the Elburz massif. Throughout that region subsp. *caucasica* Rousi grows both on sandy beeches of the Black Sea and in mountains along streams and dry river beds as well as on steep rocky slopes, in Iran up to an elevation of 2000 m, in Anatolia up to 2500 - 2600 m, and on the Caucasus even up to 3000 m.

The range of the second subspecies, subsp. *turkestanica* Rousi is distinctly interior. It extends from eastern Afghanistan on the one hand, through northern Pakistan and Kashmir, and attains even northwestern India, more or less 79° longitude East, and on the other hand, through Tadzhikistan, eastern Uzbekistan and Kirgiziya, southern Kazakhstan to western China. *H. rhamnoides* occurs here frequently, even commonly, forming thickets together with willows, poplars and birches and species from the genus *Myricaria*, along river terraces, dry river beds and even on open mountains slopes. In places it grows in larger or smaller monospecific groups, and in Badakhshan (USSR), in the valley of river Vanch true forest of it are known, composed of trees 8 - 11 m tall. In the northern part of its range, in southern Kazakhstan subsp. *turkestanica* Rousi occurs in its vertical distribution between 400 and 2000 m elevation, however, the further it is to the south the higher is its elevation, usually above 1500 - 2000 m and in Afghanistan to 3000 m, in Kashmir to 3500 m, in Tibet to 3650 m and in southern Pamir (USSR) to 3800 m. Even higher in Tibet, at 4000 m, subsp. *gyantensis* Rousi has been found.

The juicy, sour fruits of *H. rhamnoides*, somewhat gluey when crushed are a rich source of vitamins (C, B₁, B₂, E) and caroten. The local population consumes it fresh or makes jellies, jams, syrups, brews or liqueurs from it. As a result in some countries breeding work was undertaken on the species in order to obtain less spinescent forms with larger fruits set on longer peduncles (for easier gathering). Besides *H. rhamnoides* is a valuable ornamental species, primarily the female specimens being planted which during fruiting, usually very abundant, appear most attractive; the shoots are almost completely coated with colourful fruits which adhere until late winter. Using the capacity of the trees to give root suckers, the species is employed for the fixation of dunes and various types of escarpments.

The wood of *H. rhamnoides* is used as fuel throughout the range of occurrence of subsp. *turkestanica* Rousi and the other east Asiatic subspecies.

References: 64(7), 103(6), 104(5), 484, 486, 495.

Fagaceae

Quercus L.

20. *Quercus dilatata* Royle

This is an evergreen tree 20 - 24 m tall, sometimes taller, even up to 30 m and with a stem diameter up to 2 - 3 m. Leaves are coriaceous, elliptic or lanceolate, up to 12 cm long, entire to spiny toothed with 9 - 12 pairs of veins.

This oak occurs more or less between 70° and 80° Longitude E, starting from eastern Afghanistan (Nuristan) in the west to the valley of Kali river separating Nepal from the Indian Kumaun province in the east. This range coincides here to a large extent with the range of *Quercus semecarpifolia* Smith, however, the two species usually occupy different elevations. *Q. dilatata* covers lower located regions and is distributed more or less between 1400 and 2200 m, more rarely attaining 2800 - 2900 m. It is common in the central and western part of the range, frequently being gregarious but usually associated with other tree species such as *Quercus incana* Roxb. on more dry places and coniferous species on more moist ones.

Q. dilatata has a heavy, durable wood common in construction and household use as well for combustion and charcoal. Its leafy shoots are cut as fodder for goats and sheep so that in regions where the population is greater it is difficult to find larger specimens that would be undamaged.

References: 30, 48, 155, 170, 179, 223, 224, 458.

21. *Quercus semecarpifolia* Smith

This is an evergreen or subdeciduous tree, 20 - 25 m tall, in extreme cases up to 30 m tall and a stem up to 5.5 m in circumference (Nepal). It is characterized by a straight stem and coriaceous leaf of variable shape, entire or dentate, on the dorsal side with a ferruginous tomentum. Dentate leaves occur most commonly on young specimens and on long twigs.

The range of *Q. semecarpifolia* extends as a relatively narrow belt from northeastern Afghanistan through northern Pakistan and Kashmir along the whole length of the Himalayan belt to southern China (western Szechwan). As a species that is very demanding for light it does not form dense stands though when young it can grow even in considerable density. It is gregarious and usually in the form of monospecific sparse communities over larger areas. At higher elevations it enters as a component into coniferous, fir and spruce forests and reaches the upper tree limit. It prefers deep soils and northern or northwestern expositions. From Afghanistan it has been reported from elevations of 1900 - 3200 m and from Nepal between 1700 - 3800 m as the only species of oak reaching so high up. The most elevated stands of this species are known from China, between 3000 and 4600 m.

The heavy, durable wood of *Q. semecarpifolia* is used locally for construction and for agricultural household purposes, supplying also fuel and excellent charcoal. The leaves are commonly used, particularly during the winter as fodder for cattle.

References: 30, 48, 155, 170, 179, 214, 224, 458.

Grossulariaceae

Ribes L.

22. *Ribes orientale* Desf.

This is a polygamo-dioecious shrub, usually not taller than 1 m, with an irregular habit, glandulous hairs on almost all young plant parts and greenish or yellowish flowers.

The range of *R. orientale*, though very extensive, is divided into several smaller or larger parts, sometimes considerably removed from each other. Furthest to the west the shrub occurs in Europe, in southeastern Greece* and then on rare stands in central Anatolia, in Lebanon and in western Syria (Anti-Lebanon Mts.). The largest agglomeration of stands is to be found on the Caucasus and in north-eastern Anatolia. With the latter region are associated the stands from Elburz Mts. in northern Iran, while more isolated stands occur in southern Iran, in mountains situated south of the town Kerman. Finally the last part of the range covers eastern Afghanistan, northern Pakistan and Kashmir, it is difficult, however, to tell where in the east the range

* In 1986 it was discovered in Chios Is.

terminates. Here in Central Asia, besides *R. orientale* there occur further two very closely related and difficult to distinguish species often confused with it: *Ribes villosum* Wallich and *R. heterotrichum* C. Meyer. We are dealing here with an insufficiently studied complex of *R. orientale* sensu lato.

The ranges of these three species overlap to a certain degree and the differences between them concern primarily the pigmentation of the flowers, the degree of pubescence and glandularity of leaves and fruits, and frequently are so imprecise that the existence between the taxa of intermediary forms is probably not uncommon. The range of *Ribes heterotrichum* C. Meyer extends much further to the north, to the Altai and Mongolia and of *R. villosum* Wallich to the south. Since the herbarium collections from the region in question are insufficient and the information from literature, particularly older literature, frequently erroneous, a distinct differentiation of the ranges of these three taxa, particularly in the south and southeast poses considerable difficulties.

R. orientale is a mesophilous montane shrub, which usually grows scattered, singly on stony slopes, on rocks, along mountain streams, or springs, in swards and also in the understorey of subalpine forests. In Greece it occurs at elevations 1650 - 1750 m in Iran at 2300 - 2400 m, on the Caucasus at 1200 - 2000 m, in Lebanon at 1450 - 2200 m, in Afghanistan at 2100 - 3500 m and in Pakistan at 2100 - 3650 m.

References: 50, 51, 64(4), 103(4), 105(1), 163(2), 496, 497.

23. *Ribes villosum* Wallich

This is a deciduous, 1 - 2(2.5) m tall shrub, much branched, frequently procumbent, with leaves covered on both sides with sessile or stipitate glands, and with red flowers. This species is closely related to *Ribes orientale* Desf.

The range of *R. villosum* extends over mountains of southeastern Tadzhikistan (particularly Pamir), eastern Afghanistan, northern Pakistan and Kashmir; it is not clear, however, whether it occurs in the Indian Himalayas (Kumaun) and southern China (Tibet).

R. villosum is a high mountain mesophilous species. It usually grows as single scattered shrubs, more rarely forming thickets, pure or mixed, on stony slopes, in rock fissures or on river terraces. As a rule it appears only above 2000 m. In the mountains of Afghanistan (Wakhan) it attains 3900 m, in Pakistan 4000 m and in Pamir (USSR), in the region of lake Sarezskoye and Karakoram, even 4750 m.

References: 134, 177(4), 181, 252, 278, 397, 496, 497.

Leguminosae

Colutea L.

24. *Colutea armena* Boiss. et Huet

This shrub is up to 2 m tall with older shoots grey-brown, peeling in short and thin fibres. The leaves are up to 9 cm long composed of 3 - 4 pairs of 20 × 18 mm orbicular to broadly-obovate leaflets, the inflorescences are as long or longer than the supporting leaves and the ovaries are appressedly tomentose.

The range of *C. armena* is divided into two parts, separated from each other by 400 km disjunction. The first part covers provinces of Çoruh and Erzurum in northeastern Anatolia and the other is in eastern Caucasus, in northeastern Azerbaydzhan (USSR). *C. armena* grows on stony or rocky mountain slopes, in open deciduous woodland or in juniper-oak forests, usually at lower elevations between 150 and 1500 m.

References: 64(3), 103(5), 459, 460.

25. *Colutea bushei* Shap.

This is a strong shrub up to 3 m tall with large, (ca. 20 - 22 mm) orange-yellow flowers with a keel terminated in a distinct beak, wings with a small spur in place of bending and a silvery tomentose ovary.

It is an Irano-Turanian species with a range restricted to northeastern Iran and southern Turkmeniya. In Iran it occurs in three provinces — Mazandaran, Gorgan and Khurasan, extending furthest to the west to central Elburz, valley of rivers Karadj and Chalus. In that region it is a common shrub. As a rule it grows singly on sandy, gravelly and rocky slopes of river valleys and gorges, in thickets of shrubs from the genera *Berberis*, *Lonicera*, and *Cotoneaster*. It appears also in sparse, open forests, particularly of juniper. While in places it can be found already at 300 m elevation it is most commonly distributed between 1000 and 2400 m, the most elevated stand being at 2700 m. In Turkmeniya its range covers exclusively the southwestern and central Kopet Dag Mts., between 500 and 1500 (2000) m elevation.

References: 459, 460, 465.

26. *Colutea cilicica* Boiss. et Bal.

This is a strong shrub 2 - 3 (-5) m tall with compound leaves 6 - 10 cm long with 3 - 5 pairs of relatively large (to 3 cm) elliptic to obovate leaflets. Flowers are yellow, large, 20 - 22 mm long with wings longer than the keel and with a distinct spur in the place of breaking. This species is closely related to the south European *Colutea arborescens* L., which also has a glabrous ovary, but its wings are as long or shorter than the keel, without a spur or only a slight one.

The range of *C. cilicica* covers primarily southwest Asia, and strictly speaking only its western part. The shrub occur primarily in Anatolia, where it is the most common representative of the genus. Besides it is also known from the Caucasus, particularly from the southern part (Armeniya, Azerbaydzhan), from northern Iraq, from Lebanon and also from single stands in Syria and northern Iran (Karadagh Mts.). It has been also reported from Israel (Mt. Carmel), however, this stand most probably does not exist any more. Data on the presence of *C. cilicica* in central Greece require verification. It is possible that the information concerns difficult to classify forms of intermediate nature to *Colutea arborescens* L.

C. cilicica is a light requiring shrub resistant to drought. It grows in open oak or pine forests as well as in maquis or phrygana and in steppe communities on mountain slopes, in abandoned vineyards, on limestone and serpentine rocks, singly or in small groups. In Anatolia where it occurs sometimes on lower located sites already at an elevation of 50 - 70 m it is most common above 1000 m and attains 1800 - 2000 m. In Iraq it occurs between 950 and 1900 m.

It is an ornamental shrub, in appearance very similar to *Colutea arborescens* L. with which it is often confused. It has been in cultivation since the year 1892.

References: 64 (3), 103 (5), 118, 228 (3), 459, 460, 465.

27. *Colutea istria* Miller

Syn.: *C. halepica* Lam.

This shrub is 1 - 2 (-3) m tall with red-brown, lustrous shoots, small 5 - 10 (-15) mm long leaflets, yellow, 18 - 20 mm long flowers and a densely hairy ovary.

C. istria is characterized by having an original, disjointed, remnant range of distribution extending parallel with the eastern shores of the Mediterranean, from north to south more or less between 37° and 28° Lat. N. It occurs in only five countries, in Egypt, Jordan, Israel, Syria and Turkey. In Egypt the stands of *C. istria* are collected in two places on the Sinai peninsula, in the north at Gebel Maghara and Gebel Yellaq and in the south, in the mountain regions neighbouring with Gebel Katherina. On the other hand in Jordan they are restricted to province Edom, between Ma'an and Shaubak, in southern Syria to Jebel ed Druz and

in Israel they are scattered in Lower Galilee, Judean Mts. and the Negev. Most isolated are the northern stands in Turkey in Amanus Mts. and near Gaziantep.

The conditions in which *C. istria* grows are not sufficiently well known yet. This distinct xerophyte occurs in extremely dry regions, where the annual precipitation is frequently below 90 mm. It appears on rocky slopes and cliffs and in desert wadis. From Israel it is reported from a semi-steppe association *Stachydetum aegyptiacum* and from southern Jordan from loose forests of *Juniperus phoenicea* L. In its vertical distribution it most probably does not go below 600 m. In Anatolia it is found up to 1000 m. In Jordan (and possibly in southern Sinai) the stands are restricted to 1000 - 1500 m. On Sinai, in the Monastery of St. Catherine, and also in various places in Israel *C. istria* is probably cultivated.

References: 29, 64 (3), 162, 163 (2), 175, 184 (1), 459, 460, 500.

28. *Colutea persica* Boiss.

This shrub is up to 2 m tall with bark peeling in long fibres, violet-brown and lustrous after peeling, and with flowers having a rounded keel at the top, without a beak, with a glabrous ovary and glabrous fruits.

This is an Irano-Turanian species, an Iranian endemite, restricted in its range to the mountains of southern Iran. It occurs only in provinces of Fars and Kerman, on infrequent scattered stands, much isolated from the remaining species of the genus *Colutea*. It grows on rocky limestone slopes and screes, on banks of rivulets, in irrigated fields and also in open *Amygdalus-Acer-Pistacia* or *Quercus* forests, particularly in more humid and sheltered places. As a rule it appears in regions located above 2000 m and in places (Kuh-e Khabr in province of Kerman) even up to 3500 - 3800 m.

This species is frequently reported erroneously from other regions of Iran, particularly from the north where *Colutea buhsei* Shap. occurs with densely pubescent ovaries. Besides *C. persica* is also mentioned from cultivation, however, here it is usually confused with the European *Colutea arborescens* L.

References: 292, 459, 465.

29. *Colutea porphyrogramma* Rech. f.

This is a low shrub with thick, rigid and more or less spinescent shoots. Its imparipinnate leaves are composite with 2 (3) pairs of very small leaflets scarcely 2 - 3 mm long, flowers are 8 - 11 mm long, deep purplish with yellow spots near base of the standard. This species is included in section *Armata* Browicz, in which 4 species of spinescent shrubs belong characterized by completely isolated from each other and very local ranges. On the one hand, *C. porphyrogramma* is closely related to the Pakistani *Colutea armata* Hemsley et Lace and on the other with the south Caucasian *Colutea komarovii* Takht.

C. porphyrogramma is an endemic species for Iran which has been discovered only in 1950 and described in 1964. It occurs in northeastern Iran in province of Gorgan and Khurasan, between 900 m and 1900 m elevation (occasionally slightly higher) on dry sandy-stony limestone slopes, among thickets of shrubs particularly of *Paliurus spina-christi* Miller.

References: 460, 465.

30. *Colutea uniflora* G. Beck

This is shrub with virgate shoots, partially spinescent and leaves up to 6 cm long, composed of two, more rarely 3 pairs of leaflets and light yellow flowers 14 - 15 mm long with tomentose ovaries. Judging by the size of the leaves, size and colour of flowers and the more rare spines *C. uniflora* appears to be species that links section *Armata* Browicz with section *Rostrata* Browicz.

It is an endemic shrub for Iran. Similarly as the other three species of section *Armata*, namely *Colutea*

komarovii Takht., from southern Caucasus, *C. porphyrogramma* Rech. f., from northeastern Iran and *C. armata* from the Pakistani Beluchistan, it is characterized by a very limited range of occurrence, restricted to only a few stands. *C. uniflora* grows only in the southeastern extremity of Gilan province, in lower portions of the Elburz massif, between 500 and 1200 elevation. Closer information on its requirements and growth conditions are absent.

References: 459, 465.

Coronilla L.

31. *Coronilla emerus* L.

This is a 1 - 2 (2.5) m tall shrub with slender, dark green one-year shoots, pinnate leaves composed of 2 - 4 pairs of leaflets and 5 - 11 cm long very narrow (2 mm) segmented legumes.

This species has an extensive range in Europe from Spain in the west to the Crimea in the east. It occurs also in southwestern Asia where most easterly stands reach in USSR the vicinity of Novorossiysk on the northeastern shores of the Black Sea, more or less up to 38° longitude East. This range can be divided into two closely connected parts. In the first of these, the western one, *C. emerus* is represented by the type subspecies — subsp. *emerus* characterized by having inflorescences composed of 1 - 5 flowers on peduncles about equalling the leaves; while in the eastern part, covering the Balkan peninsula, Crimea and southwestern Asia by subsp. *emeroides* (Boiss. et Spruner) Hayek having richer inflorescences (up to 8 flowers) on peduncles which are longer than leaves; sometimes these two taxa are treated as independent species.

C. emerus subsp. *emeroides* is a fairly common shrub in almost the whole of continental Greece, but rather rare in the eastern, Aegean islands. In Anatolia it grows primarily in the south of the country and only occasionally in the north. It is also known from northern Cyprus, from northwestern Syria and from Lebanon, reaching in this latter country as far as Beirut. It usually occurs singly, more rarely in small agglomerations, as a rule in various types of thickets, both shiblyak and maquis type and also in open pine and juniper forests, both in insolated places and in shade, frequently near streams and small rivers, on dry, stony slopes and on rocks, particularly on limestone. On the latter sites, when shaded more, the shrubs bend downwards or are even pendulous. In its vertical distribution it is usually located in the lower reaches of mountains, from the seashore to about 900 - 1100 m, more rarely to 1300 m. Occasionally it has been found further up, as for example in Anatolia, up to 1500 m, on Euboea to 1600 m, in Jugoslavian Macedonia to 1700 m and in Greece on Mt. Othris even to 1725 m.

References: 64 (3), 103 (5), 105 (1), 151 (1), 163 (2), 188, 242 (2), 505.

Spartium L. (monotypic genus)

32. *Spartium junceum* L.

This is a strong, fast growing, erect and widely spreading shrub with a copular form of crown, or a small tree up to 3 m tall, in cultivation even taller (to 4 - 5 m). The shoots are rodlike poorly branched, striate and green for several years, almost leafless. Small lanceolate leaves caducous early. It is characterized by large, 2 - 3 long, golden-yellow and sweet-scented flowers, which are so numerous that during blossoming the shrubs are almost completely covered forming yellow patches easily visible from a long distance.

It is a circum-Mediterranean species, occurring also on the Canary Islands and on the Açores. In the north it reaches the feet of the Alps. In the eastern Mediterranean it is common along the shores of Albania, Greece, the Greek islands and in western Anatolia, while it is rare in southern Anatolia and completely absent on Cyprus. In northern Anatolia, on the Black Sea infrequent scattered stands of it are known as far eastwards as Trabzon. Besides *S. junceum* grows in western Syria, in Lebanon and in Israel, where it reaches as far south as the Judean Mts.

S. junceum is a characteristic component of maquis, in which it not infrequently forms compact small groups. This distinctly light inquiring and thermophilous species, resistant to drought and having very minimal soil requirements is characterized by having a deep tap root. It grows on sandy, sandy-clayey and stony substratum, particularly on limestones and it sustains even a considerable salinity of the soil, thus it appears on the seashore itself, on cliffs and even on dunes. In its vertical distribution it usually does not exceed 500 - 600 m (in Cyrenaica to 350 m). In Anatolia, in the Amanus Mts. it has been even observed at 1100 m, in Greece, on the Peloponnisos and on Mt. Iti at 1200 m and in Lebanon, on Mt. Hermon at about 1500 m.

In the Mediterranean countries as well as in the southern regions of western and eastern Europe *S. junceum* is commonly planted as an ornamental shrub, particularly along roads (near *Nerium oleander* L.) and also on roadside escarpments. In places it is naturalized as for example on Crimea, on the Caucasus, in Bulgaria, Jordania, Pakistan, India and even in South America. Earlier it was considered to be a medicinal plant, the seeds being purgative. Its long shoots supply fibres used in France and Spain for the manufacture of cord and rope, and it is also possible to make baskets out of them.

References: 64 (3), 163 (2), 188, 189, 228 (3), 258, 259 (2).

Linaceae

Linum L.

33. *Linum arboreum* L.

An erect, loosely branched, glabrous shrub, up to 1 m tall, with persistent, spatulate, thick, originally green, later glaucous leaves, often crowded in rosettes and with yellow flowers collected in usually few-flowered cymes.

This is an eastern Mediterranean species (south Aegean). It occurs only on some Greek islands, both European and Asiatic, on Crete, Kasos, Karpathos, Saria, Rodhos and Astipalaia, and besides in southwestern Anatolia in province of Mugla, district Marmaris. On individual stands it is a rather rare shrub known only to exist as single, scattered individuals.

L. arboreum grows primarily in fissures of limestone rocks, particularly on coastal ones, frequently on inaccessible and very steep cliffs. In Anatolia, on Marmaris peninsula, it appears also in cushiony phrygana, on rocky serpentine slopes, and here only at elevations 150 - 350 m. On Rodhos, in its western part it attains 700 m elevation, and the most elevated stands have been observed at 1100 - 1200 m on Karpathos and Crete. On the latter island, on higher located stands up to 2000 m it is replaced by another, closely related species, endemic for Crete, namely *Linum caespitosum* Sibth. et Smith. It is characterized by poorer growth, and smaller dimensions of all plant parts. However, it is a critical species and it is possible that it should be considered as a subspecies within *L. arboreum*. It grows not only on rocks but also on rock rubble and stony meadows.

References: 64 (2), 188, 189, 251.

Moraceae

Ficus L.

34. *Ficus carica* L.

A shrub, or a small tree, usually not taller than 5 - 7 m, however, in favourable conditions may attain even 10 - 12 m and a diameter up to 75 cm. It attains an age of 50 - 60 years, but older trees are rather rare. It is characterized by thick, poorly branched shoots and very variable leaves, which can be from entire to

lobed, sometimes even deeply and from subglabrous to more or less tomentose, particularly on the dorsal leaf surface and up to 35 cm long. The size of the trees and the size of the leaves appear to depend to a large extent on site conditions. The more moist the environment the greater the dimensions. Single, freely growing individuals form a compact, widely semiglobular crown with a diameter of 5 - 10 m, the lower branches being prostrate on the ground. The fruits of *F. carica* are small achenes enclosed in enlarged syconiums usually referred to as figs. The shape, size and pubescence of the figs as well as their external and internal colour vary to a considerable extent. In cultivated forms figs can be as much as 8 cm long.

In *F. carica* it is possible to recognize two basic subspecies, namely subsp. *carica* and subsp. *rupestris* (Hausskn.) Browicz. The former, subsp. *carica* has larger leaves, usually more than 10 cm long, more or less lobed, roundish in general shape and characterized by a more intensive growth. On the other hand subsp. *rupestris* is a shrub 1 - 2 (3) m tall with smaller leaves, usually less than 10 cm long, entire, broadly ovate to ovate-oblong, deeply cordate at the base.

The description of the range of subsp. *carica*, particularly with the point map technique, is very difficult, almost impossible. This taxon has been in cultivation for several millenia and as a result of selection it now has several hundred forms, more or less common or of only local importance. These forms do not differ morphologically from the natural ones except for the size and succulence of the figs. As a result of the cultivars going wild and in view of the antro- and zoo-choric dispersal of achenes it is impossible to distinguish natural populations from secondary (feral) ones. Thus the opinions about the value of several stands of subsp. *carica* expressed by various authors and collectors are so diverse and frequently contradictory that it is difficult to take a convincing position on this basis. Thus it was decided to indicate with a continuous line the approximate range of subsp. *carica* and to refrain from making a point map. On the other hand a point map was prepared for subsp. *rupestris*. This is fully justified, since as far as is known this subspecies has not been cultivated or only exceptionally so, thus its stands as a rule are natural. It has to be remembered, however, that intermediate forms between subsp. *carica* and subsp. *rupestris* are known and have been reported from southern Anatolia and western Iran. Within the range of the species subsp. *rupestris* covers the southeastern regions. Further description concerns only this latter subspecies.

The range of *F. carica* subsp. *rupestris* covers southeastern Anatolia, northern Syria, northern and north-eastern Iraq and southwestern Iran, the greater agglomeration of stands occurring in the eastern regions. The most southerly stands occur in Iran, near Shiraz, in province of Fars, where only slightly do they extend beyond 30° Lat. N. Thus they are the most southerly stands for the whole species. This shrub occurs in open places, insolated and usually dry, on sandy and stony slopes, in fissures of limestone rocks and in degraded pistacia and oak forests. In its vertical distribution it appears more or less from 500 m to 1500 m in Iraq, 1770 m in Turkey and 2000 m in Iran.

F. carica is considered to be one of the oldest fruit trees cultivated by man, at least for the last 5000 years. Its cultivation extended far beyond the natural range of occurrence and became common in many countries, wherever the climatic conditions permit it. Fig orchards are being established throughout the Mediterranean region as well as in the United States. The species is also planted in Central Europe, in Afghanistan, in Pakistan and in western India. Figs are consumed both fresh and when dried. Economically most important are dried figs and their world production in the years 1955 - 1965 amounted to 300,000 tons. They can be also conserved in the forms of compots in tins or jars and also very sweet jams are made from them (eg. in Albania).

References: 64 (7), 104 (2), 123 (3), 163 (1), 177 (3), 205, 218 (1), 228 (4), 259 (1), 464.

35. *Ficus johannis* Boiss.

Syn.: *F. persica* Boiss., *F. geraniifolia* Miq., *F. malvastrifolia* Warb., *F. vitifolia* Warb.

This is a densely branched shrub 1 - 3 m tall, sometimes even taller (up to 4 m) and then having a habit of a small tree with several stems. It is characterized by very variable leaves both in terms of size and in the mode of lobing. Two subspecies are recognized within it. The first is subsp. *johannis* with small 1 - 3 (6) cm

long leaves, either shallowly and widely lobed or lobed so deeply and with so reduced leaf surface that they appear to be veins only deprived of all blade by insects. The second, subsp. *afghanistanica* (Warb.) Browicz, has been sometimes treated as an independent taxon — *F. afghanistanica* Warb. It has larger leaves, 7 - 9 (13) cm long, deeply lobed, with the lobes having irregularly dentate or incise-serrate margins, even with small second order lobes.

F. johannis is an Irano-Turanian species having a range restricted almost exclusively to Iran and Afghanistan. Only occasionally it appears on infrequent stands in southernmost Turkmeniya (USSR), in western Pakistan and on the southeastern tip of the Arabian peninsula in Oman.

The type subsp. *johannis* covers within this range the more southern and central regions, while subsp. *afghanistanica* the more northern ones. Some forms of the latter subspecies, particularly those with the largest leaves may sometimes be mistaken with the deeply lobed forms of *Ficus carica* L., particularly since the two taxons hybridize in places (Turkmeniya, Iranian Khurasan). It is not impossible that similarly as was the case with *Ficus carica* L. subsp. *carica* this subspecies represents primarily the cultivated forms (eg. it is commonly cultivated in southern Tadzhikistan).

Of the three species from the genus *Ficus* occurring in southwestern Asia that are deciduous, *F. carica* L., *F. palmata* Forsskal and *F. johannis* Boiss. the latter species is most xerophytic and covers the most dry, warm and insolated regions. It grows in fissures of various types of rocks, limestones, sandstones and vulcanic ones, on shales and conglomerates and even on gypsum, in strongly degraded open forests, on steppes and semideserts and also on edges of dried rivers and on slopes of their valleys, both in lower located places and in the mountains, more or less between 500 and 2000 - 2200 m elevation. The lowest stands have been noted on the Iranian island Qeshm in the Arabian Gulf at 100 m elevation and the highest ones in southern Iran in Kerman province on Kuh-i-Jupar at 2600 - 3000 m.

References: 177 (3), 464.

36. *Ficus palmata* Forsskal

This is a shrub or a small tree with a short stem, 4 - 10 m tall, with entire or only slightly lobate, dentate or dentate-serrate leaves cuneate to truncate at the base or even subcordate and with stipitate figs on 4 - 20 mm long pedicels.

Range of *F. palmata* is distinctly divided into two parts. One covers eastern Africa (Ethiopia, Somalia, Sudan) and the southern part of the Arabian peninsula. Here it is represented by the type subspecies (subsp. *palmata*), which is characterized by more elongate, distinctly acute or acuminate leaves, only weakly pubescent or glabrous. On the other hand the second part of the range belonging to subsp. *virgata* (Roxb.) Browicz covers the most easterly part of the Iranian Baluchistan, northeastern Afghanistan, Pakistan, Kashmir, northwestern India and Nepal. However, in the latter country the course of the eastern limit of the range is unknown. The subspecies is characterized by broadly ovate or suborbicular leaves, which are acute or obtuse at the top softly pubescent on the dorsal side. It appears that the further one goes in the easterly direction the stronger is the leaf pubescence.

F. palmata subsp. *virgata* grows on wet, open places, on stony or rocky slopes, even very steep ones, particularly in valleys of rivers and streams, on limestones, gneisses, various shales and conglomerates. It can also be found along irrigation canals and in waste places near gardens. Here and there it belongs to the most common trees, as for example in Nuristan (Afghanistan) near the border with Pakistan. It appears from lowland regions, at more or less 400 - 600 m elevation up to more than 2000 m. The most elevated stands have been found in Nepal, up to 2300 m and in India (Sutlej region) even to 2750 m.

Figs of this species can be succulent, sweet and pleasant, thus it is frequently cultivated in the hills, both for fodder and for human consumption. In Pakistan *F. palmata* subsp. *virgata* is probably selected for the purpose and sometimes wrongly considered to be *Ficus carica* L.

References: 30, 31, 58, 179, 223, 224, 225, 464.

Ranunculaceae

Clematis L.

37. *Clematis vitalba* L.

This is a strong, luxuriant, fast growing woody climber with stems up to 30 m long catching hold with the help of twining petioles and inflorescence axes. The stems are distinctly stripped, when older greyish, longitudinally fissured into strands. This species is closely related to *Clematis flammula* L. from which it differs primarily in having a stronger growth, 1-pinnate and not 2-pinnate leaves and hairy internodes.

C. vitalba covers with its range almost the whole of western, central and southern Europe, northwest Africa, the Caucasus and Anatolia. Besides it occurs also on infrequent stands in western Syria and in northern Lebanon. It has been also reported from Cyprus where it appears to be cultivated and has escaped, and also from Iran, however, the information from the latter country are uncertain and doubtful. As a mesophytic species it avoids extremely dry regions, so that in Greece it is becoming increasingly rare in the southerly direction and in southern Peloponnisos it is known only from infrequent stands. The same concerns Anatolia except for the Amanus Mts. It is also rare on the Greek islands, where it has been found only on Thasos, Samothrake, Lesbos (?), Euboea and Andros.

C. vitalba occurs primarily in regions with greater humidity of air and soil, usually in broadleaf or mixed forests and in shrub thickets. It is an aggressive species, expanding rapidly and sometimes it covers so tightly with its leaves and stems the species over which it climbs that it can deprive them of light all together and cause them to dry. It attains greatest dimensions in forests of "Longos" type, near river estuaries.

In its vertical distribution it usually does not reach higher than 1000 m elevation. However, on the Caucasus it reaches 1200 - 1300 m, in Anatolia 1500 - 1600 m (Amanus Mts and the vicinity of Trabzon), in Greece, in Ipiros even 1600 - 1700 m.

This shrub is valued for its abundant and longlasting blossoming and has been in cultivation for a long time being frequently planted in parks and used for the covering of building walls, various fences and old tree stems. In many countries it easily goes wild and this happens even beyond its natural range of occurrence. It is resistant to low temperatures.

References: 64 (1), 105 (1), 151 (1), 163 (2), 335 (3), 363, 389.

Rosaceae

Comarum L.

38. *Comarum salesovianum* (Stephan) Asch. et Graebner

Syn.: *Potentilla salesoviana* Stephan

This is delicate, dwarf, frequently prostrate shrublet, 25 - 100 (150) cm tall with imparipinnate leaves composed of 2 - 4 pairs of oblong leaflets with large, white flowers of 3 - 3.5 cm diameter standing singly or in 3 - 4 clusters on tips of shoots.

It is a central Asiatic, montane species. Its range is restricted to the great mountain massifs of the USSR, Afghanistan, Pakistan, Kashmir, northwestern India, Mongolia and China. In USSR, in the Middle-Asiatic republics it grows in Tadzhikistan, in Pamir-Alai Mts, between 2600 and 4500 m elevation (highest stands in the Pamir), in Kirgiziya around lake Issyk-Kul at 2000 - 3200 m (Khrebet Kungey Alatau and Terskey Alatau), in southeastern Kazakhstan (Khrebet Zailiyskiy Alatau, Khr. Ketmen, Khr. Dzhungarskiy Alatau and Khr. Tarbagatay) and in southern Siberia in the Altai (up to 1700 m) and in Tuvinskaya Avt. Obl. (up to 1600 m). In the latter region *C. salesovianum* attains the northern limit of its distribution, only insignificantly

extending 50° Lat. N. Furthest to the West it is to be found at 69° Long. E in the mountains of the Zeravshan basin, in Tadzhikistan.

In Afghanistan *C. salesovianum* is known from only one stand located in the Wakhan, in the northwestern part of the country (at 3350 m). It is more common in northeastern Pakistan (at 3000 - 4000 m) and then further east, particularly in Kashmir, in the Karakoram range (3000 - 4500 m) and in Lahul (4800 m). In the Indian Himalayas it most probably does not extend eastwards beyond 79° Long. E. and in Nepal it does not occur. Besides *C. salesovianum* has been reported from the mountains of south-western Mongolia and from China, from Kansu province, northwestern Sinkiang and western Tibet (here between 1500 and 5200 m).

This oligotrophic plant appears in open places, on moist stony or gravelly slopes, on shaded rocks, on stony terrain along rivers and streams and on moraines. In Badakhshan (USSR) it is in places the dominating element in the high elevation plant communities (*Comareta salesoviani*).

The local population uses this species as a tea substitute. It is also used as fodder for goats and yaks.

References: 51, 108, 135, 177 (4), 179, 181, 225, 278, 397.

Crataegus L.

39. *Crataegus curvisepala* Lindman

Syn.: *Crataegus monogyna* Jacq. subsp. *curvisepala* (Lindman) Soó, *C. calycina* Peterm. subsp. *curvisepala* (Lindman) Franco

This is a small, thorny tree, up to 8 (11) m tall, usually growing in the form of a bushy tree. This species is closely related to *Crataegus monogyna* Jacq. from which it differs primarily in having longer sepals and in the serration of external margins of leaf lobes.

The range of *C. curvisepala*, particularly its western part, is very difficult to demarcate since the species, particularly earlier on, but also today, is frequently not differentiated from *Crataegus monogyna* Jacq. and *C. calycina* Peterm, or treated within these two taxa as a subspecies. In many countries it has not been distinguished sufficiently well, thus detailed data on its stands are not available. For this reason regions from which accurate information is lacking and where *C. curvisepala* most probably occurs have been marked on the map with loose broken lines. It appears that in Europe it occurs from the central and eastern part as far north as northern Estoniya SSR and possibly also southern Scandinavia and southern England. In the south it reaches Crimea and northern Greece, where it has been found on only two stands. In the southeastern part of the range, in USSR it is most probably even more common than *C. monogyna* Jacq. In Asia *C. curvisepala* is widely distributed over the Caucasus and Talish Mts. and in northern Anatolia. In the south of the latter country it is known from only a few scattered stands. Besides it has been found also in northern Iraq, near Rowanduz. It has not been reported from Iran but it probably exists there.

C. curvisepala is a light requiring, moderate mesophyte, without major requirements with respect to the soil (preferably limestone). It grows on open, insolated slopes, on banks of rivers and among thickets of different shrubs or else in the understorey of open forests, particularly broadleaf ones of oak, hornbeam or beech. In the Slovak Tatras it reaches 1050 m elevation, on the Crimea 1200 m, in Bulgaria 1300 - 1400 m and in Anatolia and the Caucasus 1800 m.

References: 64 (4), 79, 103 (5), 104 (4), 138, 218 (2), 426, 453, 473.

40. *Crataegus monogyna* Jacq.

This is small, thorny tree 5 - 8 m tall, frequently growing in bushy form. In favourable conditions it attains larger dimensions, to about 12 m in height and a stem diameter to 30 - 60 cm. Taller individuals are rare. This species is exceptionally variable in all its features, particularly in size and shape of the leaf blade, depth of sinuses between lobes, degree of pubescence of shoots, leaves, the hypanthium and inflorescences, as well as in the size and colour of fruits and the length of pedicels and peduncles. As a result several forms have

been recognized within it and new ones continue to be described with various taxonomic ranks being assigned, forms, varieties, or subspecies. Evaluation and classification of these forms is very difficult since in almost every country particularly in the Balkans the same or similar forms have been described under different names. This requires some further basic research. The difficulties are intensified by the formation of hybrids between *C. monogyna* and other species. In the region under study, southwest Asia and the eastern Mediterranean basically only two subspecies are represented, subsp. *monogyna* with glabrous leaves, shoots and hypanthium and subsp. *azarella* (Griseb.) Franco with leaves and shoots more or less pubescent, particularly when young and with a villous hypanthium. While subsp. *monogyna* occurs almost throughout the range of the species, subsp. *azarella* covers within the range only the more southern regions.

The range of *C. monogyna* covers northwestern Africa and almost the whole of Europe including the British Isles, however, without the northeastern regions. The Asiatic range includes primarily Anatolia, except for its central and at the same time the driest part and the northeastern part. Besides *C. monogyna* is known also from northwestern Caucasus, from northeastern Iraq, from western Syria and from Lebanon. Furthest to the south it reaches northern Israel (Upper Galilee) and in the east to the Elburz Mts. in northern Iran. In the latter country the range of *C. monogyna* has not been studied enough yet. In Greece and Anatolia, besides *Crataegus orientalis* Pallas *C. monogyna* belongs to the most common hawthorns, though nowhere does it play any major role being represented only by single specimens, more rarely by small loose groups.

Throughout its range *C. monogyna* occurs in a similar manner, in various types of both forest and thicket communities, particularly in open warm broadleaf forests, on not too dry, mineral, clayey soils with a substantial calcium content. Frequently it occurs beyond forests on open slopes, on hedgerows and in pastures. It is a light requiring moderately mesophytic species, distributed primarily in submontane regions, more or less between 300 - 400 and 1400 - 1500 m elevation. However, it can be found on lower located stands, then, however, usually either near the sea or in river valleys. The most elevated stands have been reported from Cyprus 1525 m, Albania and Lebanon 1600 m, Yugoslav Macedonia (Mt. Galicica) 1630 m, Greece (Mt. Smolikas) 1650 m and Anatolia even 2200 m.

C. monogyna is commonly cultivated, used for cut or not formed hedges.

References: 64 (4), 79, 103 (5), 104 (4), 138, 163 (2), 188, 218 (2), 228 (2), 259 (2), 426, 473.

41. *Crataegus pentagyna* Waldst. et Kit.

Syn.: *C. melanocarpa* M. Bieb.

This is a small tree 5 - 8 m tall, sometimes taller (10 - 12 m) with a stem diameter to about 20 cm, frequently growing in the form of strong shrub. It has short thorns, 3 - 7 lobed leaves, many-flowered inflorescences and blackish fruits with (3) 4 - 5 stones.

In Europe *C. pentagyna* occurs primarily in Bulgaria, where stands of it are distributed almost throughout the country. It is equally common in Crimea. Besides it grows in southern and eastern Romania, in Yugoslavia, in northern Albania and also in southeastern Ukraine. Very few stands are also known from Turkey, Hungary and even from southern Czechoslovakia and western Moldaviya. Recently it has been found in Thrace of eastern Greece. In the north it does not extend beyond 48 - 49° latitude N. The southwestern part of the range is not known well yet, since in this region the closely related and frequently confused *C. nigra* Waldst. et Kit occurs.

In the Asiatic part of the range *C. pentagyna* is distributed over the Caucasus and in Talish Mts., almost throughout northern Iran and in Anatolia where the majority of stands is located in the northwestern part of the country. One stand has been reported from Iraq (Quaradagh) which, however, taking into consideration the whole range of the species seems doubtful.

C. pentagyna is a light requiring, mesophytic species, which grows singly or in small groups, on deep and fertile soils, in thickets of shrubs, particularly of shiblyak type, on edges of forests and in forest openings, in the understorey of sparse broadleaf forests of oak, hornbeam or beech-chestnut. Throughout the major part of its range it covers lower located regions, thus for example in Bulgaria, between 50 and 300 - 400 m elevation, in Anatolia to 760 m, on Crimea to 900 - 1000 m and only in Iran between 100 and 1850 m and

exceptionally to 2300 m. From southern Anatolia it has been reported from the Amanus Mts. at 1100 m' however, this report requires confirmation.

References: 51, 64 (4), 103 (5), 104 (4), 138, 218 (2).

Pyracantha Roemer

42. *Pyracantha coccinea* Roemer

Strongly spinescent, evergreen shrub, 2 - 3 m tall, in favourable conditions even taller (up to 5 - 6 m), particularly in cultivation. It is characterized by small, globular, brightly coral-red fruits in dense corymbs. Fruiting is sometimes so abundant that the fruits almost completely cover the greenness of the leaves.

It is an Euxine species, however, it extends in the eastern and western directions substantially beyond the Black Sea region. Its range in Europe is difficult to define, since opinions differ concerning the origin of several stands, particularly of the most westerly ones from Spain, France and Italy, where possibly the shrub is only introduced and gone wild. Thus it appears that the western limit of the range passes through Jugoslav Dalmatia. In Greece *P. coccinea* is frequently used for roadside planting (particularly motorways), however, in spite of annual and very abundant fruiting seedlings are nowhere to be found in the vicinity. The stands in Greece are few, isolated from each other and as a rule located far from the place of cultivation.

On the Balkan peninsula, besides Jugoslavia and Greece, *P. coccinea* grows also in Albania, on few stands in southeastern Bulgaria in the Strandsha Mts. and in Turkey. The main part of the range covers northern Anatolia, from Istanbul in the west to the frontier with the USSR in the east, the western coast of the Caucasus as far as Novorossiysk in the north and southwestern Crimea. Further eastwards the range extends along the Greater Caucasus to eastern Azerbaydzhan (USSR). A few stands isolated from this continuous range are also to be found in southern Anatolia, northern Lebanon and northern Iran (Gorgan province).

P. coccinea is a light requiring and thermophilous shrub, resistant to drought and low temperatures. It occurs most commonly on dry and insolated places, on sandy dunes, rocky limestone slopes, in valleys of small rivers and streams, on edges of pine and oak forests or in an oak scrub and in maquis. Besides it can sometimes appear in conditions of greater shade, on moist soils. It attains larger dimensions then, but is characterized by loose branching and poor flowering. On dry strongly insolated places it forms irregular, very dense clumps 50 - 100 cm tall. Sometimes at higher elevations it also enters mixed or even fir forests.

In its vertical distribution *P. coccinea* grows primarily at lower elevations, more or less between 50 and 1200 m, however, on the Caucasus it attains 1650 m and in Anatolia (Amanus Mts.) 1600 - 1800 m. In Lebanon it has been found at 1300 m while in Jugoslav Macedonia no higher than at 700 m.

It is a valuable ornamental shrub, long under cultivation, however, usually its varieties are planted characterized by stronger growth, various degrees of pubescence of leaves and in particular orange-red or orange coloured fruits. It is used primarily in the form of natural or pruned hedges, exclusively on open, fully insolated locations.

References: 51, 64 (4), 103 (5), 138, 218 (2), 461.

Sarcopoterium Spach (monotypic genus)

43. *Sarcopoterium spinosum* (L.) Spach

Syn.: *Poterium spinosum* L.

A very spiny, intricately branched shrub or subshrub, usually no taller than 50 - 60 cm with a cushiony or mound form of growth. Its shoots are dichotomously terminated, with thin and leafless spines. Small imparipinnate leaves differ in the magnitude of leaflets depending on the season. Those produced in the

summer, during the greatest drought, are very small, scarcely 2 - 3 mm long, while those produced in the winter and spring are 5 times larger.

It is an eastern Mediterranean species (except Egypt) reaching as far west as the southern shores of Sardinia, Sicilia and Tunisia (a small island near Cape Bon), and in the north it runs along the shores of Jugoslavia to northern Dalmatia. In southern and central Greece, as well as on the Greek islands it is a common shrub, while in Anatolia (western and southern) it is much less common. Furthest to the south it reaches Israel, to W. and N. Negev and in Jordan to Edom where it grows on Jabal Sarab, north of Rashadiya (30°42'N and 35°35'E). In both these countries it is abundant.

S. spinosum is ubiquitous and a heliophyte which usually occurs gregariously or even en masse. It not only forms its own association — *Sarcopoterietum spinosi*, but it is also the characteristic species for the alliance *Sarcopoterion spinosi* and order *Sarcopoterietalia spinosi*. In this order all dwarf shrub communities of the phrygana and batha type are included in which the dominating species besides *S. spinosum* are *Coridothymus capitatus* Reichb. f., *Cistus salvifolius* L., *C. incanus* L., *C. parviflorus* Lam., *Fumana arabica* (L.) Spach, *Calicotome vilosa* (Poir.) Link, *Genista acanthoclada* DC. and *Satureja thymbra* L.

S. spinosum readily occupies waste and overgrazed regions formed after destruction of forests and maquis, usually ruderal in nature, and it enters also abandoned fields, field edges and olive groves. This is achieved due to the production of large numbers of seeds spread by water flows following winter and spring rainstorms and also by wind. If the shrub is not suppressed by other competitive species or burned out by permanent fires its communities are of stable nature. Besides it appears also in an opened up maquis and in the understorey of open pine forests (e.g. on Rodhos).

S. spinosum is associated with decidedly dry and usually low located regions, from the sea level to an elevation of more or less 500 - 700 m, more rarely to 1000 m. On Cyprus it reaches as far up as 1200 m, in Jordan to 1530 m and even higher on Crete up to 2000 m.

In Mediterranean countries, in regions lacking wood, whole shrubs of *S. spinosum* which are easy to eradicate are used for fuel and for the fencing of cultivated fields.

References: 64 (4), 151 (1), 163 (2), 188, 189, 251, 258, 259 (2), 341, 482, 487.

Sorbaria (Ser.) A. Braun

44. *Sorbaria tomentosa* (Lindley) Rehder

Syn.: *Spiraea lindleyana* Wallich, *Sorbaria lindleyana* (Wallich) Maxim.

It is an erect, wide crowned, freely suckering shrub, 1.5 - 4 m tall, sometimes taller, but on most elevated stands attaining scarcely 50 - 100 cm. The leaves are imparipinnate, composed of 7 - 10 pairs of doubly serrate leaflets and its small white flowers are collected into terminal large panicles up to 30 - 40 cm long. It appears that *Sorbaria gilgitensis* G. Zinserl. described from Gilgit, considering its doubly serrate leaflets, can be included within this species possibly representing only its high elevation form.

S. tomentosa is a central Asiatic shrub, the range of which, particularly in the central and eastern part is little known. The infrequent data on its occurrence indicate, however, that it is quite common here. The range covers eastern Afghanistan (particularly Nuristan province), northwestern Pakistan (Waziristan, Kurram, Khyber, Chitral, Dir, Swat and Hazara), Kashmir, northwestern India and Nepal. Out of all the taxa from the east Asiatic range of the genus *Sorbaria* *S. tomentosa* extends furthest in the southwestern direction.

It is a mesophilous species, usually growing in wet places, in montane valleys of rivers and streams, along irrigation canals, in roadside ditches and also in forest openings, often gregariously. In Afghanistan and Pakistan it appears already from an elevation of 1000 - 1100 m, most commonly however above 1600 m and usually it grows as high up as 2900 - 3000 m, and in Nepal at 2100 - 2900 m. The most elevated stands have been reported from Afghanistan at 3300 m and from Pakistan at 3500 m.

References: 51, 223, 224, 225.

Rubiaceae

Putoria Pers.

45. *Putoria calabrica* (L. f.) DC.

This is a small procumbent shrub 10 - 20 cm tall, richly ramified in places forming compact mats, somewhat convex in the central parts and attaining a diameter of 1 m. It is characterized by small, oblong, leathery leaves, when crushed having a foetid smell, and pink flowers with a long tube, in terminal clusters.

P. calabrica occurs almost throughout the Mediterranean region (in Europe, however, it is absent in France). In the eastern part of the range it is known from western Yugoslavia, Albania and continental, particularly western Greece as well as from some of the Greek islands, such as the Ionian Is., Euboea, northern Sporades (Alonissos and Yioura), Crete, Karpathos and Rodhos. In southwestern Asia it grows scattered on infrequent stands in southwestern and southern Anatolia (only occasionally in northern), and also in northwestern Syria, in Lebanon and in Palestine, the most southerly stands reaching the vicinity of Jerusalem. It is also known from the central and western parts of Cyprus where locally it is even abundant and it was once founded in N. Iraq. In northeastern Africa it is represented only in the coastal areas of Jebel el Akhdar, in Cyrenaica.

This shrub behaves as a pioneer species and appears primarily in exposed, dry and insolated places, where it is not endangered by competition from other plants. These are usually eroded, sandy or clayey slopes, mobile scarps, shales, conglomerates, limestone and sandstone rocks and also river gravels. It grows almost from the sea level and in its vertical distribution usually reaches an elevation of 900 - 1100 m, however, in the mountains of southern Anatolia it has been found at elevations of 1750 - 1770 m, in Lebanon at 1920 m and on Crete even at 2000 m.

References: 64 (7), 105 (1), 151 (1), 163 (3), 166 (1), 188, 288 (4), 251, 259 (3).

Staphyleaceae

Staphylea L.

46. *Staphylea emodi* Wallich

This is a large shrub 2 - 3 m tall or even a small tree up to 6 m tall, with elongate 3 - 8 cm long inflated capsules, tricuspidate at the tip and with an olive-greenish bark stripped white.

This is a Himalayan species with a narrow, restricted, and apparently disjuncted range extending from eastern Afghanistan (only in Safed Koh Mts.), through northern Pakistan to Kashmir and the valley of river Sarda on the boundary between India and Nepal. Its stands, particularly in the western part of the range are few and far between. Thus for example in northern Pakistan single stands are known only from Kurrame and Swat districts being more frequent only in the southern part of Hazara district.

S. emodi usually grows singly in the understorey of mesophytic forests, mixed or coniferous and in moist shady ravines, as a rule between 1500 and 2900 m elevation, rarely lower.

Long straight stems of this species are being used as walking sticks by the local people, who believe that they protect them from snakes, which is probably associated with the specific fissured pattern of the bark, resembling the skin of a snake.

References: 30, 58, 179, 223, 225, 462, 485.

47. *Staphylea pinnata* L.

A strong, erect shrub, usually 3 - 5 m tall, with several thick stems, resembling *Corylus avellana* L. in growth. In favourable conditions it attains even 7 - 9 m in height and a stem diameter of 15 - 20 cm, sometimes assuming the appearance of a small tree. It is characterized by an olive-gray or brownish bark with distinct whitish fissures, inflated fruits (membranous capsules), 3 - 5 cm in diameter and with hard light brown and lustrous seeds up to 1 cm long.

The range of *S. pinnata* covers partially the central, southern and particularly southeastern Europe (except for Greece and Turkey), and also the western Caucasus and almost the whole of northern, Black Sea Anatolia. In the latter country isolated stands from the main range of the species are to be found also in the south in province of Seyhan, in the Amanus Mts. Furthest to the north, in eastern Europe *S. pinnata* reaches the southern Poland and central Ukraine, and on the Caucasus as far as Anapa on the Black Sea.

This is a mesophytic, forest species, sustaining shading well. It occurs in beech and oak forests, in mixed ones and in coniferous ones, particularly of fir, on fertile, humic, deep soils with a large content of calcium carbonate, not drying during the vegetative season. In such conditions it propagates well from seeds as well as vegetatively through subterranean stems and root suckers. It is most common in hilly country and in lower reaches of mountains, usually above 300 - 500 m. However, in its vertical distribution it is distributed almost from the seashore itself to an elevation of 1000 m and even higher. In Romania it attains 1100 m, on the Caucasus up to 1300 m, in northern Anatolia to 1500 m and in southern Amanus Mts. up to about 1800 m.

It is a precious ornamental shrub, valued for its original fruits and characteristically coloured bark. Various types of folk customs and religious cults used to be associated with it. From the hard fruits of *S. pinnata* rosaries were made and oil was extracted to be used for lamps and in medicine. On the Caucasus, its inflorescence, similarly as the inflorescences of the closely related species *Staphylea colchica* Steven, with immature flowers, are fermented as cabbages obtaining a rich in vitamins spice called "dshondsholi".

References: 64(2), 103(6), 104(5), 472.

Verbenaceae

Vitex L.

48. *Vitex agnus-castus* L.

An erect, bushy shrub, usually 1 - 3 m tall, sometimes even taller, to 5 - 6 m, occasionally growing in the form of a small tree with a stem diameter to 12 - 18 cm (e. g. in Greece near Thermopylai). It is a characteristic feature of this species that it has digitate leaves opening very late, towards the end of April and in early May when all other shrubs are already fully leaved and even flower. Its flowers are small with a 2-lipped corolla, usually bluish-violet but sometimes also pinkish or white, in terminal panicles.

V. agnus-castus is one of the most common representatives of the woody Mediterranean flora. It occurs almost throughout southern Europe, on all major islands of the Mediterranean (the Belaric Is., Corsica, Sardinia, Sicilia, Crete and Cyprus) and on the majority of Greek islands. It is also known from northwest Africa, where in Morocco it grows not only on the northern coastal regions, but also on the western Atlantic ones.

The Asiatic range of the species is composed as it were of two parts. The first consist of a narrow belt running across western and southern Anatolia, western Syria, Lebanon, northern and central Israel and western Jordan. In the latter part of this range the most southerly stands occur on the Dead Sea and appear not to exceed beyond 31° Lat. N. The second part lies in the basin of the Black Sea, northern Anatolia and the Caucasus. In that basin, in Europe *V. agnus-castus* occurs also on Crimea and in southern Bulgaria (only one stand near Miczurin).

It is a mezophilous, light demanding and thermophilous species sustaining a moderate salinity of the soil. In its occurrence it is restricted primarily to the seashore and very rarely does it enter inland, as a rule no more than for a distance of 40 - 50 km, however, in places, along river valleys, even to 80 - 100 km. It grows

most commonly on the banks of rivers and streams, on stony, desicated river beds, on coastal dunes, usually on sandy or sandyclayey substratum, but also on rocks near the sea, particularly on limestone ones. In agricultural areas it can be found along irrigation canals and roadside ditches. On the alluvial plains of the coastal belt or river banks it can be the dominating element in brunshwoods and forms its own association – *Vitacetum agni-casti*, competing with other associations developing in similar conditions such as *Nerietum oleandri* and *Tamaricetum smyrnensis*.

V. agnus-castus usually occupies lowland regions, more or less to an elevation of 350 - 400 m, sometimes, however, it extends a little higher as for example in continental Greece to 650 m, on Crete to 800 m, in Anatolia on Amanus Mts to 750 m and on Mt. Cassius even to 900 - 1200 m. Also in northwest Africa it goes up to 1000 m. The lowest located stands are reported from Palestine, from the depression of Lake Tiberias and the Dead Sea at – 200 or even – 350 m elevation.

It is a melliferous, ornamental shrub, frequently cultivated in countries with a milder climate, valued primarily for its late (from June) and extended (till October) flowering. Its dry seeds have a spicy taste, and locally, particularly in Asia, they are used as pepper substitute (Monk's pepper-tree).

References: 64(7), 103(7), 163(3), 188, 189, 228(4), 259(3), 478, 504.

49. *Vitex pseudo-negundo* (Hausskn.) Hand.-Mazz.

Syn.: *V. × hybrida* Moldenke

It is a bushy 1 - 3 m tall shrub, closely related to *Vitex agnus castus* L., which it resembles in form of growth and in several morphological features. It differs from the latter primarily in having flowers, the throat of corolla of which is densely bearded (in *V. agnus-castus* the lower lip of the corolla is glabrous or with few hairs), in having less compact cymes and a richer venation of the calyx. These slight differences have resulted in the taxon being initially described as a variety of *V. agnus-castus* (var. *pseudo-negundo* Hausskn.) and this opinion is sometimes held till the present. Since, as one can judge from the available data in some regions as for example in Turkmeniya or in Palestine, there occur intermediate forms difficult to classify, it would perhaps be justified to include *V. pseudo-negundo* in *V. agnus-castus* as a subspecies.

As distinct from the range of *V. agnus-castus*, which has a littoral character, *V. pseudo-negundo* is an inland species. It does not occur anywhere in Europe and the most westerly stands are to be found in southeast Anatolia and in eastern Syria. It has been also reported from Israel, however, these data are insufficiently clear. The major part of the range of *V. pseudo-negundo* covers on the one hand northeastern Iraq, southwestern and southern Iran, southern Afghanistan and western Pakistan and on the other northeastern Iran, Turkmeniya and Tadzhikistan. It is not a continuous range but a subdivided one into several parts.

V. pseudo-negundo occurs in similar conditions as *V. agnus-castus*, (however, not on the sea). It appears to be more resistant to drought and grows on more highly located stands. In Iraq, where it has been found also in oakwoods it is distributed to an elevation of 950 - 1150 m, in Tadzhikistan between 800 and 1200 m, in Iran and Pakistan up to about 1500 - 1600 m and in Afghanistan to 1650 m.

References: 64(7), 228(4), 252, 259(3), 477, 478, 488, 504.

Vitaceae

Ampelopsis Michaux

50. *Ampelopsis orientale* (Lam.) Planchon

Syn.: *Vitis orientalis* (Lam.) Boiss.

A trailing or climbing shrub several meters long, without tendrils, leaves bipinnate, biternate or simply pinnate. This species is an exception in the genus *Ampelopsis* Michx. because it has 4-merous and not 5-merous flowers. Most closely related to it is *Ampelopsis arborea* (L.) Koehne which occurs in southwestern United States and in Mexico.

It is an eastern Mediterranean species, the range of which is restricted almost exclusively to southern Anatolia. On infrequent stands it occurs also in northwestern Syria where it reaches as far south as the vicinity of Slenfé in the Jebel el Ansariye.

In Anatolia itself the range is divided into two parts. The western one is primarily in province of Antalya and to a lesser extent in provinces of Mugla and İçel. On the other hand the eastern one covers provinces of Maraş, Seyhan and Hatay (here primarily the Amanus Mts.). Thus it resembles to some extent the range of *Cytisopsis pseudocytisus* (Boiss.) Fertig, though the latter species extends further south, as far as northern Israel.

A. orientale grows on limestone rocks, on stony scree, in exposed places and in open deciduous forests, particularly of oak (*Quercus cerris* L.). It appears in Anatolia from the seashore at an elevation of 50 m up to about 1000 - 1200 m and exceptionally up to 1800 m, while in Syria it has been reported from locations between 950 and 1400 m.

References: 5, 64(2), 118, 161, 163(2), 184(1), 291, 334.