

# Characterization of areas

## I. *Gymnospermae*

### *Ephedraceae*

#### *Ephedra* L.

##### 1. *Ephedra foeminea* Forsskal

Syn.: *E. campylopoda* C. Meyer, *E. fragilis* Desf. subsp. *campylopoda* (C. Meyer) Stapf, *E. fragilis* Desf. var *campylopoda* (C. Meyer) Asch. et Graebner

This is a more or less climbing or scrambling, also prostrate, shrub with thin, twisted and richly branched stems, with thin green and brittle branchlets, the leaves of which are reduced to scarcely visible sheaths at the nodes. The fruit is a globose syncarp, 2-seeded and the seeds are enclosed in red, fleshy integuments.

It is an eastern Mediterranean species. In Europe it occurs on the Balkan Peninsula, primarily in Greece, Albania, south and western Yugoslavia and also in Turkey as well as on one stand in south-western Bulgaria; just lately it was discovered in Italy (southern Apulia). It is widely distributed on the Greek islands, particularly on the islands of the Aegean Sea. In southwestern Asia it is known from southern Anatolia, from Cyprus, western Syria, Lebanon, Israel and western Jordan as well as from the Sinai peninsula and western Saudi Arabia. Furthest to the north it is to be found in Yugoslavia in Dalmatia, more or less to Lat. 44°N, and furthest to the south in Saudi Arabia (Asir Mts.) more or less as far as 20°N and in higher mountains of northern Ethiopia.

*E. foeminea* is a xerophytic, light requiring shrub very variable in form of growth. When it grows in cracks of vertical rocks or on walls its shoots hang down as festoons, while when it grows on flat ground it creeps on it, however, when it finds appropriate support (other shrubs or trees) it climbs on them to a height of 2 or even 4 meters, and its twigs form compact pendant agglomerations. It occurs both in sparse maquis, in the phrygana and even in open pine forests as well as on bare rocks, primarily in coastal regions, though in places it enters also inland as for example in Anatolia or Jordan. In its vertical distribution it appears almost from the sea level to more or less 900-1000 m and exceptionally higher. In extreme cases as in the mountains of southern Jordan up to 1400 and in Anatolia and Greece even to 1500 m.

References: 64 (1), 78, 105 (3), 151 (1), 163 (1), 188, 211, 259 (1), 579, 580, 592, 621.

##### 2. *Ephedra gerardiana* Wallich ex Stapf

This is a low, rigid, dense, tufted shrub with a gnarled stem, usually not taller than 30 - 40 cm. Its projecting upwards branchlets are green, smooth and striate, and the berry-like fruits are more or less ovoid, sweet and edible.

It is a Central Asiatic montane species, with a range covering primarily the Himalayas and Hindukush. The range extends from eastern Afghanistan and Tadzhikistan (primarily Gorno-Badakhshanskaya A.O.)

through northern Pakistan (particularly Karakoram Range), Kashmir and northwestern India to southern Tibet, Nepal, Sikkim and Bhutan. Two varieties are recognized there, the western var. *gerardiana*, reaching as far as western Nepal and the eastern var. *sikkimensis* Stapf extending from western Nepal. In some isolation from this relatively compact range there occur stands in the Pakistani Baluchistan, in the vicinity of Quetta.

*E. gerardiana* grows on skeletal, stony or gravelly soils on moraines and among stones and rocks, singly or gregariously, in high elevation steppes or deserts, in communities of *Artemisia* or *Astragalus* (from the subgenus *Tragacantha* Bunge). Locally it forms its own petrophytic associations – *Ephedreteia gerardiana*, as for example is the case in southeastern Tadjikistan, in the region of lake Sarezskoye.

This shrub appears frequently at considerable elevations, usually above 2300 - 2400 m, however, most commonly above 3000 m. In Tadjikistan it has been found at 4450 m, in Afghanistan at 4500 m, in Pakistan, in the Karakoram Range at 5000 m and even higher, while in Nepal even at 5200 m.

*E. gerardiana* is grazed by goats and sheep. From its green twigs the alkaloid ephedrine is obtained, which is important in medicine, but which presently is produced synthetically.

References: 108, 135, 171, 179, 181, 218 (1), 225, 364, 608, 619.

## Taxaceae

### Taxus L.

#### 3. *Taxus wallichiana* Zucc.

Syn.: *T. baccata* L. subsp. *wallichiana* (Zucc.) Pilger, *T. yunnanensis* W. C. Cheng et L. K. Fu

This is a medium sized, slow growing evergreen tree, usually not taller than 6 - 10 m, with a stem diameter of about 50 - 100 cm. On extreme occasions it attains even 15 - 18 m (see photo in the work of Raizada and Sahni, 1960). Such aged individuals attain a stem diameter of 150 - 180 cm. *T. wallichiana* is characterized by having a reddish-brown bark and linear leaves up to 4 cm long, but not abruptly cuspidate. In this latter trait it differs from the European *T. baccata* L., with which it is often identified.

It is a Himalayan species. Its range extends as a relatively narrow belt from province of Nuristan in eastern Afghanistan through northern Pakistan, Kashmir, northwestern India and Nepal to Bhutan and southern China (SW Tibet, Yunnan). From the closely related *T. baccata* it is separated in the west by a distance of 1200 - 1300 km in a straight line, while in the east its range more less touches that of *T. sumatrana* (Miq.) Laubenf., which occurs in southeastern Asia as far as Taiwan and the Phillipines.

Similarly as *T. baccata* it is a shade-living species and it requires a dampish and fertile soil. As a rule it grows in the understorey of dense shady conifer forests composed of such species as *Abies pindrow* Royle, *Cedrus deodara* (D. Don) G. Don, *Pinus wallichiana* A. B. Jackson and *Picea smithiana* (Wallich) Boiss, as well as in mixed forests, in which among the broadleaf species there are: *Quercus incana* Roxb. and *Q. dilatata* Royle, *Aesculus indica* (Wallich) Hook. f. and species from the genus *Acer*, *Ulmus*, *Prunus* and *Corylus*. In the Himalayas it is fairly common and locally abundant. As a rule it occurs above 1800 - 2000 m and reaches in Afghanistan an elevation of 2860 m, and in Pakistan and Kashmir up to 3000 m while in eastern Nepal up to 3400 m.

The wood of *T. wallichiana* is valuable, smooth, hard, close grained and durable, reddish brown. Locally it is used for various small ornamental items and in the household and agriculture. Bows are also made of it.

References: 58, 171, 179, 185, 186, 195, 214, 225, 608.

## II. Angiospermae

### Aristolochiaceae

#### *Aristolochia* L.

##### 4. *Aristolochia sempervirens* L.

Syn.: *A. altissima* Desf.

A woody climber with glabrous green, slender stems attaining a length of 3 - 5 m, twining anticlockwise over other shrubs. It has evergreen, subcoriaceous, triangular-ovate, deeply cordate leaves 6 (10) cm long, with entire margins. Very characteristic are its cylindrical flowers, 2 - 4,5 cm long, bent like a pipe, yellow inside and brownish purple outside. The fruits are oblong or spherical capsules, up to 4 cm long with numerous compressed seeds.

It is an eastern Mediterranean species, but penetrating in the west to Sicilia and Algeria. It grows primarily in southern Greece, particularly on the Peloponnisos and on Crete and then on Cyprus, in western Syria, in Lebanon and in Palestine, where in the south it does not cross latitude 32°N. Completely isolated stands are known from the Greek island Samos and from northwestern Anatolia (Kaz Dagi), where, however, for the last 100 years it has not been rediscovered.

*A. sempervirens* enters into various types of thickets, particularly into subhumid maquis together with species from the genera *Quercus*, *Pistacia*, *Rubus*, *Rosa*, *Lonicera*, *Clematis* and *Smilax*. It usually grows on limestone or calcareous substratum, almost from the seashore to usually about 400 - 500 m, but on Samos Is. it has been found between 500 and 800 m, and on Crete also above 1000 m.

References: 65 (7), 151 (2), 163 (1), 188, 259 (1), 587, 607.

### Bignoniaceae

#### *Tecomella* Seeman (monotypic genus)

##### 5. *Tecomella undulata* (Roxb.) Seeman

Syn.: *Bignonia undulata* Roxb., *Tecoma undulata* (Roxb.) G. Don

It is a strong shrub or a small tree, up to 5 - (8) m tall, having impressive gamopetalous, trumpet shaped flowers, up to 5 cm long, in colours ranging from pale-yellow through orange to orangered, and linear-oblong, pod-like fruits (capsules) up to 34 cm long and about 1 cm thick.

This is an Omano-Sindian species, the only woody representative of the tropical family *Bignoniaceae* in southwestern Asia. The main part of its range covers Pakistan, where in places it is relatively frequent, particularly in province of Rawalpindi, Kohat, Waziristan, Baluchistan, Makran and Sind. *T. undulata* extends in the northerly direction to more or less 34° Lat. N., furthest in Abbotabad (Hazara Distr.) and Nowshera (Peshawar Distr.). In the easterly direction, in India, it reaches more or less the vicinity of Delhi and the southwestern feet of the Himalayas. Probably it does not cross here 78° Long. E. In India it is more commonly met in the state of Punjab, more rarely in the southern state Rajasthan, from where, however, accurate data is

lacking. Isolated stands are known also from southern Iran, from province of Khuzistan, Fars, Lar and Kerman, and then from the Arabian peninsula, from where *T. undulata* is reported from the United Arab Emirates (wild?) and from Oman. One stand has been also found in eastern Afghanistan, in province of Laghman.

*T. undulata* grows on hills and gravelly plains, on banks of small rivers, in dry rivers beds or irrigated ditches, on sandy and calcareous ground, and in Arabia on edges of wadis. It appears from very low located places, almost from the sea level to more or less 1110 - 1200 m elevation. In Oman the highest stands have been observed at 850 m, in Pakistan at 1300 - 1500 m (Sulaiman Range), in Afghanistan at 1400 m and in Iran even at 1700 m (province of Kerman).

The wood of *T. undulata* is close-grained, strong and durable, good for working and polishing, used locally for furniture and carving. Bark and seeds are used in folk medicine, and leaves are used as fodder for goats and cattle. The species is remarkably resistant to fire. Sometimes it is cultivated in gardens as an ornamental.

References: 30, 81, 179, 223, 225, 364, 581, 609, 615.

## Buddlejaceae

### *Buddleja* L.

#### 6. *Buddleja crispa* Benth.

Syn.: *B. paniculata* Clarke not Wallich, *B. tibetica* W. Smith

An erect shrub up to 3.5 m tall with white, densely tomentose leaves on both surfaces, twigs and inflorescences. After drying the colour of the indumentum changes to tawny. Flowers are fragrant, lavender-blue, in short dense spikes and arranged in leafy terminal spikes.

It is a Himalayan species with a range extending from eastern Afghanistan, through Pakistan, Kashmir, northwestern India and Nepal to Bhutan. It is also reported from China – from Tibet, Yunnan, Sikang and Kansu. In southwestern Asia it is the most westerly representative of the genus *Buddleja*, the only one to appear in Afghanistan, where it grows only in provinces of Khost, Kunar and Nuristan. Much separated from it, in the south of the Arabian peninsula, in Saudi Arabia and the Yemen Arabic Republic also *B. polystachia* Fresen occurs.

*B. crispa* is locally a quite common shrub. It grows in rather hot, dry places, on slopes with boulders, on southern, exposed cliffs, in thickets, on rocky and sandy clay. In Afghanistan it has been found between 800 and 2000 m, while in Pakistan from 800 - 900 m to 2500 - 2600 m, however, most commonly between 1200 and 1800 m. The most elevated stands have been found in the Himalayas, up to 4000 m.

The hard wood of *B. crispa* is used by the local population as fuel, and the shrub itself is strongly grazed by animals.

References: 58, 179, 225, 364, 573, 604, 616.

## Capparaceae

#### 7. *Capparis decidua* (Forsskal) Edgew.

Syn.: *C. aphylla* Roth

It is a spartioid shrub or small tree up to 4 - 6 m tall, rootsuckering, with linear leaves, up to 2 cm long, however, present only on young twigs, falling off early. Flowers 1 - 2 cm in diameter are on slender up to 1.5 cm long pedicels, red (in shade pink or even yellow) collected into ebracteose corymbs on ends of short lateral shoots, flowering abundantly during hot weather.

It is a Nubo-Sindian species distributed from central Africa (Niger, Tchad), southern Egypt and Sudan, through Ethiopia and Somalia and the Arabian peninsula to southeastern Iran, Pakistan and western India. In the west it reaches as far north as the Upper Jordan Valley in Israel, where, however, it does not cross 33° Lat. N., while in the east, in northern Pakistan in district of Peshawar it reaches 34° Lat. N. Data on the occurrence of this species on the Arabian peninsula, and particularly in Saudi Arabia are so general that the delimitation of the northern limit of the range in that region is at the moment impossible. Also data is insufficient about the stands of the species in the desert regions of western India.

*C. decidua* occurs on dry terrain, in lowlands and submontane regions, in wadis and oases, in hot, more or less desert areas, with deep clayey or sandy, alkaline soils, common in the Punjab and Baluchistan. It frequently grows together with *Salvadora oleoides* Decne. or *Prosopis cineraria* (L.) Druce. In Iran, where *C. decidua* is a rare species, it occurs from almost the seashore to an elevation of 400 - 650 m, while in Pakistan usually from 900 to 1100 m, though sometimes higher, up to 1300 m and in district of Quetta even to 1800 m.

The wood of *C. decidua* is hard and bitter, resistant to injury by white ants. Flower buds and ripe or unripe fruits are pickled.

References: 179, 225, 259 (1), 364, 510, 581, 598, 599, 600, 624.

#### 8. *Capparis sinaica* Veillard in Duh.

Syn.: *C. cartilaginea* Decne., *C. galeata* Fresen., *C. spinosa* subsp. *cartilaginea* (Decne.) Maire et Weiller

This is a more or less prostrate or scrambling, fragile shrub 1 - 2 m tall (larger dimensions are attained in the south of the range in Africa), glabrous and glaucous. Leaves are relatively large, up to 6 cm long, long-petioled, ovate to orbicular, in the fresh condition more or less thick, and after drying cartilaginous. The flowers are strongly zygomorphic, white, with a diameter of 8 - 9 cm, and the fruits are 5 - 9 cm long ovoid or ellipsoid, reddish.

It is an East African species, penetrating in the northerly and easterly direction to Palestine, to the Arabian peninsula, to southern Iraq (?), Iran and to southern Pakistan. In the latter countries it does not go beyond 28° Lat. N. It is widely distributed in Africa, where starting from eastern Egypt, Sudan, Ethiopia and Somalia it reaches the coastal and northern provinces of Kenya, crossing the equator. On the Arabian peninsula it is more commonly found in Saudi Arabia, in its southern and eastern parts. Furthest to the north it reaches in Palestine to the Lower Jordan Valley, more or less as far as 32° Lat. N.

*C. sinaica* grows primarily in ravines and on rocks of hot deserts, in crevices of limestone cliffs and in small wadis. It occurs from the seashore itself and lower located regions to an elevation of 1000 - 1100 m in Saudi Arabia and 1370 m in Iran.

Fresh, fleshy fruits of *C. sinaica* are eaten by the desert animals. The flowering buds and very young fruits, similarly as is the case with other south Asiatic species from the genus *Capparis* can be pickled, however, in taste they are sharper than the "capers" of *C. spinosa*.

References: 184 (1), 228 (1), 256, 259 (1), 581, 598, 601.

#### 9. *Capparis spinosa* L.

Syn.: *C. ovata* Desf., *C. sicula* Dush., *C. rupestris* Sibth. et Sm., *C. herbacea* Willd., *C. canescens* Coss., *C. leucophylla* DC., *C. aegyptiaca* Lam., *C. mucronifolia* Boiss., *C. parviflora* (Boiss) Boiss., *C. himalayensis* Jafri, *C. orientalis* Duhamel.

Straggling shrub with decumbent or ascendent much extended stems, up to 1 m tall, sometimes even taller, with fleshy leaves having entire margins, with or without stipular spines, recurved or straight. Flowers are singular, showy, 5 - 8 cm in diameter, more or less zygomorphic, white, on long peduncles, short-lived -

they wither after one day. Fruits are also very characteristic, berry-like green capsules, ovoid or pyriform, up to 4 cm long, dehiscent by valves, fleshy inside with numerous seeds.

This species is exceptionally variable, in all its traits, both in terms of pubescence and its persistence, in the pigmentation of shoots and leaves, in the size and shape of leaves, in the forms of their apices and in the degree of their fleshiness, in the presence and persistence of stipular spines (from unarmed forms to multistipular ones), size and zygomorphism of flowers, pigmentation of stamens and size and shape of fruits. Thus in *C. spinosa* a large number of varieties or subspecies and forms have been recognized which are also treated as independent taxa. In their treatment there is a considerable diversity of opinions among authors, thus not always in the same understood under a given name. Individual forms frequently appear close to each other on the same stand, or else in various regions much separated from each other. Between these taxa numerous intermediate forms appear as parallel variations and hybridisations are frequent. It appears, however, that one such form which can readily be treated as a subspecies in subsp. *orientalis* (Duhamel) Jafri with large, almost round fleshy leaves, unarmed or almost unarmed, which is distributed in the coastal regions of the Mediterranean Sea, in rock fissures, from which it hangs in garlands down. Other forms do not have so well defined ranges.

All these complexities of the systematics of *C. spinosa* to a large extent make it very difficult to define the range of the species. This in the present study it was decided to treat it in the broad sense, which is not an isolated opinion. The range of so understood *C. spinosa* covers the area of the whole Mediterranean regions, and the Canary Is. It is not quite clear where the southern limit of the species runs. Within the African continent it enters the Sahara and in East Africa it is known not only from Egypt, but also from Ethiopia, Sudan and Madagascar (var. *pyracantha* Boj.). On the other hand in southwest Asia the limit of the range extends from Turkey, Cyprus, Syria, Lebanon to the Arabian Peninsula, through Jordan, Iraq, Iran, Afghanistan and Pakistan to India and Nepal, up to about 90° Long. E. *C. spinosa* grows also in Central Asiatic republics of the USSR (Turkmeniya, Uzbekistan, Tadzhikistan, Kirgiziya, northern Kazakhstan) reaching in the north to lake Balkhash and Chinese Dzhungaria. In the Himalayas a separate variety was recognized – var. *himalayensis* (Jafri) Jacobs. However, this is not the full range yet. After a considerable disjunction *C. spinosa* appears also on the Phillipines, on Timor and in Pacific islands. It reaches even to northwestern Australia as var. *mariana* (Jacq.) K. Schum.

*C. spinosa* is a distinctly light requiring species, resistant to high temperatures and drought thanks to deep rooting extending for several meters. Thus even in a most hot and dry period the plant not only grows but also flowers and fruits. It grows on various types of soils, on sands and clays, on calcareous bare rocks and on limestone cliffs, in waste ground and in fallow fields, in dried up river beds, steppic and semi-desert plains, on gravelly soil and even on salt marshes, usually as scattered specimens. Its seeds are distributed by ants, thus one often sees specimens of *C. spinosa* on completely vertical rocks, on walls of old buildings and on walls of old fortifications or monasteries.

On such an enormous range the differentiation concerns not only morphological traits but also the vertical distribution. In the Mediterranean basic *C. spinosa* grows from the sea level to more or less 200 - 300 m, though in places even higher. In Greece it attains up to 600 m, on Cyprus to 850 m, in Iraq to 900 m, in Lebanon to 1000 m, in eastern Turkey to 1500 - 1600 m, in Iran to 1830 m, in Kashmir to 2300 m, in western Pamir and Nepal to 2400 m, in Afghanistan (Wakhan) to 2500 - 2800 m, and in Ladakh even to 3300 - 3600 m.

*C. spinosa* is a shrub that has been utilized for centuries. Its pickled flower buds, the so called "capers" are used in canning industry as a spicy additive, the most valued being buds of the smallest size. For this purpose they are being picked both from plants growing in the wild state and from specially established plantations, on which selected profusely flowering types are being planted (eg. in southern France). It is not impossible that on some stands *C. spinosa* is only of artificial origin gone wild, as a remnant of an abandoned plantation. Besides in local popular medicine roots of the plant, their leaves and flower buds are used. The shrub is also a valuable melliferous plant.

References: 64 (1), 105 (1), 134, 135, 151 (1), 163 (2), 176, 177 (4), 188, 189, 228 (4), 236, 598, 599, 600, 601, 602, 623, 624.

## Caprifoliaceae

### *Lonicera* L.

#### 10. *Lonicera floribunda* Boiss. et Buhse

An erect, up to 3 m tall shrub with shoots initially yellowish-grey and later dark-grey or brownish-grey with a fibrous peeling bark. Leaves are orbicular, elliptic to ovate, 1.5 - 4 cm long, tomentose on both sides, particularly below. Flowers white or only slightly pinkish, bilabiate, 12 - 18 mm long, two on long peduncle. Fruits are red berries, in pairs but not fused.

This shrub is considered to be endemite of southwestern Asia, however, besides northern Iran and southwestern Turkmeniya it occurs also singly, isolated from the main part of the range on the Caucasus, from where it has been reported from Dagestan, Karabakh and Armeniya. The major part of the range covers the northern massif of the Elburz in the Iranian province of Mazandaran and Gorgan. On the other hand in Turkmeniya its stands are more rare, though still more common than in the Kara-Kala region. Beyond the Kopet Dag massif *L. floribunda* has been reported also from Turkmeniya from the Bolschyje Balkhan Mts.

It is a light demanding species, occurring in various types of xerothermic thickets, and also in low, sparse broadleaf forests, on stony and rocky mountain slopes, in places quite commonly. On the Caucasus, in Armeniya it occurs between 800 and 1400 m elevation, in Iran usually above 1000 m though single stands have been found below that, even at 500 m. The most elevated stand occurs in central Elburz Mts. at 2350 m.

References: 218 (3), 533.

#### 11. *Lonicera nummulariifolia* Jaub. et Spach

Syn.: *L. persica* Jaub. et Spach, *L. arborea* Boiss. var. *persica* (Jaub. et Spach) Rehder

An erect shrub, 4 - 5 m tall, more rarely a small tree up to 6 - 8 (- 10) m tall, with a short trunk, in old specimens up to 60 cm in diameter at base. Leaves are ovate to suborbicular, up to 5 cm long, dark-green, puberulent or pubescent above, lighter and dense by pubescent beneath. Flowers are white up to 2.5 cm long. The berries are also white, having a diameter of 5 mm. It is a species closely related with the western *Lonicera arborea* Boiss. occurring in Spain and in northwestern Africa, sometimes identified with the latter.

It is an Irano-Turanian montane species penetrating in the western limit of its range to the Mediterranean region. The range is composed of two basic parts, a southern and a northern one. The former extends from southern Greece (together with Crete) where stands are infrequent and scattered, through southern Anatolia and northeastern Iraq to southwestern and southern Iran. Somewhat isolated from the relatively continuous range *L. nummulariifolia* grows also in Lebanon and in southwestern Syria as well as in northeastern Africa, in Cyrenaica.

The second, northern part of the range covers northern Iran and northern and central Afghanistan. In the latter country the range ends in Nuristan, on the Pakistani border. Further to the east *L. nummulariifolia* is replaced by the related *L. quinqueocularis* and most probably at the juncture of these two species hybrids are formed. In the north of the discussed part of the range the species covers the Soviet Middle Asiatic republics, namely Turkmeniya (Bol. Balkhan, Kopet Dag, Badhyz), Ubzekistan, western Tadjikistan, Kirgiziya and southern Kazakhstan, where furthest to the north *L. nummulariifolia* occurs in Syrdarian Kara Tau Mts., more or less at 44° Lat. N. On the other hand the most southerly stands occur in Iran at about 29° Lat. N.

*L. nummulariifolia* is a moderate xerophyte, which on the one hand grows in fir (Greece) and cedar (Anatolia, Lebanon) forests or in degraded oak woods, most commonly, however, on their edges or in opened up

places, while on the other in various kinds of open and insolated thickets, on gravelly and stony limestone slopes and also in subalpine scree and on rocks as well as in valleys of rivers and streams. In the northern part of the range it is a common component of sparse juniper forests. It occurs as single specimens or else forms small pure thickets, usually above 1000 m elevation, exceptionally a little lower, most commonly, however, between 1300 and 2000 m. The most elevated stands have been found in Greece at 1500 m, in Lebanon at 1800 m, in Iraq, Uzbekistan and Kirgiziya at 2300 m, in Anatolia at 2600 - 2700 m, in Iran and Afghanistan at 3000 m and in Tadzhikistan (Badakhshan) even at 3100 m.

References: 64 (4), 163 (3), 177 (9), 189, 218 (3), 533, 610.

### 12. *Lonicera quinqueocularis* Hardwicke in Hook.

A strong, erect shrub or a small tree up to 6 m tall with a short trunk. Leaves broadly ovate or elliptic, up to 7 (8) cm long, pubescent on both sides, more intensively so on the lower side. Flowers in pairs, tubular, corolla yellow up to 2 cm long. Berries very characteristic, white and translucent, with blackish violet seeds, free.

A Himalayan species extending in the east to western China and in the west to northeastern Afghanistan (Kabul, Nuristan). In Pakistan it occurs primarily in the north of the country, but it appears also in the south, in Southern Waziristan and Baluchistan, where, however, it does not cross 30° Lat. N. In western Himalayas, in Kashmir and in northern Pakistan it is considered to be the most common and the strongest species of the genus *Lonicera* replacing here the more western and similarly strong growing *L. nummulariifolia*.

*L. quinqueocularis* prefers warm, dry sunny places and grows on grassy hill slopes, on stony and rocky banks of streams and rivers and in open forests. Most commonly it appears at elevations above 2000 m, however, in Afghanistan it has been found also between 1200 and 2800 m and in Pakistan between 1000 and 2750 m, in Nepal between 1500 and 2750 m and in Kashmir and northwestern parts of India also above 3000 m.

References: 30, 179, 364, 533, 574.

### 13. *Lonicera spinosa* (Decne.) Walp.

A low, dense, glabrous shrub, 1 - 1.2 m tall, more or less spiny forming dense mats, with glaucous-green linear-oblong leaves, up to 15 (25) mm long with incurved margins. Flowers are pink, tubular, about 1 cm long, fragrant. The closely related *Lonicera alberti* Regel from the Soviet Middle Asia (Kirgiziya and SE Kazakhstan) and Chinese Dzhungaria with slender unarmed, arching or prostrate shoots is sometimes treated as its variety: *L. spinosa* (Decne) Walp. var. *alberti* (Regel) Rehder.

*L. spinosa* is a Himalayan, high altitude species, with a range extending from Sikkim in the east, through Nepal and northwestern India to eastern Kashmir in the west. It includes also southeastern Tibet. Much isolated from this continuous range there occur stands of *L. spinosa* in eastern (Hindukush) and central Afghanistan. Specimens occurring in this latter region in their general morphological characteristics much resemble *L. alberti*. The presence of *L. spinosa* in Pakistan, in its northeastern part is not quite certain and requires confirmation.

This shrub occurs primarily in the western part of the Himalayas, in their inner and arid ranges. It is a light demanding species, which often grows gregariously on exposed places, in subdesertic alpine steppe, on bare and gravelly slopes. It has been also found above lakeshores and along river valleys. In Afghanistan it appears more or less between 2500 m and 3200 m elevation, in Kashmir the same but also above 4000 m, in Nepal it reaches 4600 m and in northwestern India 4800 m or even higher.

It is an interesting ornamental species resistant to frost and drought, however, it is unknown in cultivation. On the other hand *Lonicera alberti* is more widely used in cultivation.

References: 30, 179, 533, 590.

## Chenopodiaceae

### *Atriplex* L.

#### 14. *Atriplex halimus* L.

An erect shrub, 2 - 3 m tall with silvery – white pubescent twigs and leaves, as a result of which it is readily visible even from a considerable distance. Flowers are small, unisexual, collected into terminal paniculate inflorescences.

It is a halophilous plant. The species is circum-Mediterranean with scattered stands, primarily along the seashore. In southwestern Europe it is more common than in southeastern. In northwestern Turkey it is represented only in the vicinity of Istanbul and Troy. It is also known from the Atlantic shores of northwestern Africa and Portugal as well as from the Canary Is. In places it enters deeper inland, as for example in Spain, in Egypt or Jordan. It is also reported from northern parts of Saudi Arabia.

*A. halimus* grows in open places, on maritime sand and on salt marshes, on sandy and even rocky slopes. While on the Mediterranean Sea it is found on rather low elevations, usually no higher than at 200 - 300 m, in the southeastern limit of its range in Egypt, Jordan and Israel, it is distributed from the depression of the Dead Sea at more or less – 350 m to an elevation of even 1000 - 1500 m. The most elevated stands are known from northwestern Africa (Atlas Mts.) at 1700 m. In desert regions it is often the dominating element of halophytic communities, particularly in various types of wadis, especially on calcareous substrata.

Locally the leaves of *A. halimus* are used by the native population for food (fresh or cooked) and forage. In Israel, on Negev desert, it is even planted for pasture.

References: 123 (5), 151 (2), 163 (1), 184 (2), 188, 256, 258 (2), 510.

#### 15. *Atriplex portulacoides* L.

Syn.: *Halimione portulacoides* (L.) Aellen, *Obione portulacoides* (L.) Moq.

It is a decumbent or ascendent shrub, usually only 50 - 80 cm tall and occasionally even taller to 1 - 1.5 m, with silvery – lepidote, elastic, easily rooting stems and oblong-elliptical or linear-lanceolate rather fleshy, up to 7 cm long, leaves.

This species has a very elongated range covering almost the whole of the Mediterranean region, from Spain and northwestern Africa in the west to Jordan in the east. Besides it occurs on Canary Is. and on the Atlantic shores of Europe from southern Portugal to France, Ireland, Great Britain and Denmark. In the latter two countries it is mentioned even somewhat beyond 55° Lat. N.

In the region under study, it is known from the Balkan peninsula, from the Adriatic coast of Jugoslavia and Albania, from the coastal regions of Greece and from Greek Is. (together with Crete) as well as from single stands in eastern Black Sea regions of Bulgaria (near Burgas) and from Turkey. In southwestern Asia greater agglomerations of stands are to be found in western Anatolia. This shrub occurs also in southwestern Cyprus, in western Syria, in Lebanon, Israel and in Jordan, as well as in northern Egypt.

*A. portulacoides* is a littoral species and only exceptionally can it be found deep inland as for example in Anatolia, in provinces of Konya and Nigde. Frequently it is accompanied by such species of halophyte shrubs as representatives of the genera *Arthrocnemum*, *Tamarix*, and *Inula crithmoides* L. The range of *A. portulacoides* is conditioned by the ecological requirements of the species. It grows on saline marshes, particularly on edges of channels and pools, frequently quite near the seashore. Higher elevated stands are known from the saline steppe of central Anatolia, there even quite high up to 950 - 1000 m.

References: 64 (2), 123 (5), 151 (2), 163 (1), 176, 184 (2), 188, 236, 256, 259 (1).

## Compositae

### *Centaurea* L.

#### 16. *Centaurea spinosa* L.

A densely branched, compact shrub up to 50 - 100 cm tall, sometimes even taller, with a very characteristic form of growth, almost globular or copular, with numerous short spines, representing leaf endings and leaf-segments. Diameter of such shrubs is up to 1 m. It is a variable species, both in terms of shoot and leaf pigmentation, ranging from bluish-gray to greenish, and of flowers either white, creme or pink. These forms can occur close to each other, on one and the same stand.

It is an Aegean, maritime species. Most of its stands occur on islands of the Aegean Sea, and only infrequent ones are located on the eastern shores of Greece (particularly Attica), on northern shores of Crete and on northwestern shores of Anatolia, however, it is absent on Karpathos and islands of the Dodecanese (Rodhos, Kos and others). In Europe beyond Greece since stands have been found in Turkey, in the vicinity of Istanbul and on Geliobolu peninsula.

*C. spinosa* usually occurs in large, closely agglomerated groups, the specimens frequently entering one upon the other, forming then as if irregular hillocks. In places it represents the dominant element of the vegetation. The shrubs grow on dry open and insolated places (a decidedly light requiring species), from the sandy seashores, even only a few meters from water itself, and on limestone cliffs up to 600 - 700 m, sometimes even up to 1000 m. These most elevated stands occur in the interior of some islands, such as Naxos, Chios and Samos. On the latter island *C. spinosa* occurs even at an elevation of 1400 m and there it is recognized as a separate variety - var. *tragacanthoides* (Rech. f.) Wagenitz, sometimes treated as an independent taxon. It is particularly abundantly represented on the northwestern limit of Chios Is., where it grows almost continuously from the sea level to the peak of Mt. Amani, there being most commonly, though not exclusively, in the type, bluish-gray form (= subsp. *spinosa* = subsp. *tomentosa* (Halácsy) Hayek).

References: 64 (5), 105 (2), 188, 189, 614, 620.

### *Ptilostemon* Cass.

#### 17. *Ptilostemon chamaepeuce* (L.) Less.

Syn.: *Cirsium chamaepeuce* (L.) Ten., *Chamaepeuce alpini* Jaub. et Spach

A dwarf shrub, up to 1 m tall, in favourable conditions even somewhat taller, which when growing free is characterized by a round shape. In young age, in its appearance it resembles few years old seedlings of pine (*Pinus halepensis* Miller, *P. brutia* Ten.). Shoots are thick but elastic, rubber-like, when young densely white-tomentose, later greyish-floccose. Leaves are numerous, densely placed, linear, entire with revolute margins, 10 (15) cm long and about 1.5 mm wide, dark green above and whitewoolly beneath. Flowers are purple, in terminal, solitary capitulate forming corymbs. Their involucre are very variable on the basis of which several varieties of *P. chamaepeuce* have been recognized.

It is an eastern Mediterranean species. In Europe it occurs only in Greece, where it grows primarily on the Peloponnisos, in Attika, in southern Thessalia and on numerous islands, particularly on Crete. Furthest to the north it appears on Athos peninsula, where only slightly does it cross 40° Lat. N. On the other hand in southwest Asia it is known from the shores of southwestern, and to a lesser degree southern, Anatolia and then from only few stands in Syria, from Lebanon and Cyprus. On the latter island it is represented by an endemic variety - var. *cyprius* Greuter. Furthest to the south it reaches northern Israel (Upper Galilee) at more or less 33° Lat. N.

*P. chamaepeuce* is a light demanding shrub, thus it most commonly occupies open places, exposed, insolated on calcareous or igneous rocky slopes and in rock-fissures, as well as on serpentine soils. It usually grows singly, but in places as for example near Malona on Rodhos island it forms pure thickets. It occurs primarily in coastal regions and only exceptionally does it enter deeper inland, usually along slopes of river valleys. It is distributed almost from the seashore usually to about 300 - 500 m elevation, and more rarely higher. Thus in Anatolia it grows up to 850 m, on Crete to 950 m, on Cyprus also above 1000 m and even to 1650 m on Mt. Troödos.

References: 64 (5), 163 (3), 151 (2), 188, 189, 259 (3), 596.

## **Labiatae**

### ***Phlomis* L.**

#### **18. *Phlomis fruticosa* L.**

A much-branched, erect shrub up to 1.5 m tall with fissured, pale brown bark. Young shoots, leaves (especially beneath) and inflorescences greyish stellate tomentose. Leaves up to 10 cm long, ovate-oblong to lanceolate with reticulate venation, distinctly prominent below. Flowers are 2 - 3 cm long, with yellow, 2-lipped corolla in terminal heads and verticillasters.

It is an eastern Mediterranean species occurring primarily on the Balkan peninsula, in Greece, Albania, southwestern Jugoslavia, on Crete and on some Aegean and Ionian islands. In the west the range of *P. fruticosa* reaches through southern Italy to Sicillia and Sardinia and in the east to western and southern Anatolia and northern Cyprus – in southwestern Asia stands are few and scattered.

*P. fruticosa* is a shrub very resistant to drought occurring as a rule on open, strongly insolated places, on rocky slopes and limestone hill sides, in degraded, stony maquis, and in phrygana, also in the understorey of open pine woods, in places forming its own pure thickets very attractive during flowering time. It appears also on edges and banks of roads, usually not far from the seashore, usually between 10 - 500 (600) m elevation, the highest stands being at 1000 m in Anatolia and 1100 m in Greece.

References: 64 (7), 151 (2), 188, 606.

### ***Rosmarinus* L.**

#### **19. *Rosmarinus officinalis* L.**

This is an evergreen, densely leaved shrub, erect or ascending, but sometimes even prostrate, up to 50 - 200 cm tall. These various forms of growth have been even described as distinct varieties. Leaves of *R. officinalis* are very characteristic, coriaceous, linear, up to 5 cm long, with revolute margins, whitefelted beneath. Flowers are about 12 mm long, pale blue.

This is a western Mediterranean species, widely distributed in southwestern Europe and northwestern Africa, penetrating into the eastern Mediterranean, where, however, it is represented on infrequent and scattered stands in Greece (also on the islands), in Anatolia, on Cyprus, in Lebanon and in Libya (Cyrenaica). It is not quite clear whether all the stands in the latter region are natural. Possibly some of these stands are secondary in character and formed as a result of escapes of *R. officinalis* from cultivation and going wild, sometimes even to such a degree that they appear almost completely wild.

*R. officinalis* is a distinctly light demanding species, resistant to drought. It grows on open, insolated territory, on calcareous and schistose hills, on rocky and stony ground, in dry scrub and degraded pine forests, not infrequently becoming the dominant element of plant communities or codominant with *Erica manipuliflora* Salisb. It appears usually near the seashores, in low places and occurs more or less from 10 - 30 m to about 250 m in Anatolia and on Cyprus, to 450 - 500 in Greece and to 600 m in Lebanon and Cyrenaica.

This shrub has been known already in antiquity, where a use was found for it in religious practices and it entered also into Greek and Roman myths and presently into the folklore of many European countries. It has been cultivated in southern Europe already in early Middle Ages as a spice and as a medicinal plant. Leaves of *R. officinalis* have been used for sauces and various dishes, particularly of sea fishes and roasts. From the flowers, floral shoots, leaves and roots an ethereal oil is obtained which has a considerable use in the perfume industry and in soap making, particularly in southern France. In countries with a more mild climate *R. officinalis* has been introduced into cultivation as an ornamental shrub and occasionally it become fully naturalized.

References: 64 (7), 105 (2), 151 (2), 188, 189.

### *Teucrium* L.

#### 20. *Teucrium brevifolium* Schreber

This is a densely, intricately branched dwarf shrub up to 30 - 50 cm tall with more or less linear, small, revolute-margined grey on both sides leaves. Flowers are solitary in the axils of upper leaves, blue, about 1 cm long, forming short racemes.

It is an eastern Mediterranean species with a range restricted primarily to the south Aegean region. It is related to the western Mediterranean species *Teucrium fruticans* L. The majority of its stands occur in Greece, primarily on the Aegean islands, and they are rare on the continental shores on the Peloponnisos — on the southern tip of Mani peninsula and in southern Attica. In southwestern Asia *T. brevifolium* is known from only a few stands, namely on some Asiatic Greek islands of the Dodecanese and on the Anatolian peninsula Resadiye, in province of Mugla. Furthest to the north it is to be found on the southwestern shores of Chios Is., and the most easterly stands are in the small Kastellorizo islands located close to the shores of Anatolia, more or less to 29°30' Long. E. It has been also reported from Cyprus, however, this information was not confirmed. Besides it occurs also in North Africa, in Cyrenaica and in northwestern Egypt, close to the border of this country with Libya.

*T. brevifolium* grows on exposed, insolated places, in communities of the driest types of phrygana, primarily on sublithoral limestone slopes. It occurs from the seashore to more or less 200 m elevation. The most elevated stands were found in Cyrenaica at 300 m, on Crete at 400 m and on Karpathos even at 500 m.

References: 64 (7), 188, 251, 300, 301, 303, 323.

### *Leguminosae*

#### *Caragana* Lam.

#### 21. *Caragana grandiflora* (M. Bieb.) DC.

This is a dwarf, densely branched shrub up to 1 m tall with paripinnate leaves composed of two pairs of small leaflets and solitary 15 - 20 mm long yellow flowers. This species is very variable in terms of pubescence of shoots, leaves and legumes. Closely related to it and sometimes considered as conspecific is *C. scythica*

(V. Komarov) Pojark. It is reported from the European part of the USSR from Moldavia and Black Sea Ukraine including Crimea.

*C. grandiflora* occurs on the one hand on the Caucasus, where the majority of stands is concentrated and on the other in Middle Asia, on the eastern side of the Caspian Sea, in western Turkmeniya (Bolschyje and Malyje Balkchany) and in southwestern Kazakhstan. A few stands are also known from northeastern Anatolia, from province of Erzurum, from the vicinity of lake Tortum and the locality Tortum. Recently a single stand has been found in the northern part of Iranian Azerbajdzhan.

It is a light demanding, xerophytic species. It grows on dry, limestone or calcareous slopes, and also, though less commonly, on sandy hills, forming specific thickets with the participation of steppe and semisteppe plants. It appears also in distinctly dry and sparse juniper and pistache forests.

On the Caucasus it is distributed in lower located regions, usually between 400 and 900 m. In Middle Asia between 750 - 1500 m, however, in the vicinity of Caspian Sea much lower. In Turkey its stands occur between 1200 and 1500 m, in Iran at 1500 m.

Young shoots and leaves of *C. grandifolia* are grazed by sheep.

References: 64 (3), 103 (4), 104 (4), 218 (3), 558, 603.

## 22. *Caragana ulicina* Stocks

This is a dwarf spinescent and pubescent shrub with dark brown bark. Its pinnate leaves are composed of 2 - 3 pairs of obcordate-obovate leaflets scarcely 5 mm long and the yellow flowers stand singly or in pairs, their standards attaining 18 mm in length.

It is a montane species, until recently considered to be a Pakistani endemite, however, it turned out that it occurs also in eastern Afghanistan, in the adjacent on Pakistan provinces of Urgun and Ghazni. In Pakistan itself the range of *C. ulicina* is enclosed between 30° (perhaps even 29°) and 34° Lat. N, while in the easterly direction it does not cross river Indus.

*C. ulicina* grows on dry, open, stony terrain and on slopes of river valleys (e.g. it is common in the Kurram valley) and it appears in communities of woody junipers (*Juniperus seravschanica* V. Komarov), as is the case in the Pakistani province of Quetta and in Afghanistan, and even in open pine forests (*Pinus gerardiana* Wallich). In its vertical distribution it grows in Pakistan between 600 and 2300 (2500) m elevation, usually, however, above 1500 m, while in Afghanistan it has been found between 2300 and 2500 m.

References: 464, 506, 558, 575, 593, 603.

## *Ebenus* L.

### 23. *Ebenus stellata* Boiss.

Syn.: *E. tragacanthoides* Jaub. et Spach

An erect, densely tufted, small shrub up to 30 - 50 cm tall, very spiny, with (1) 3 - 5 palmately arranged leaflets. The rachis is deciduous or persistent and in the latter case strong, woody, prickly, 5 - 7 cm long. Also characteristic are red flowers collected into dense heads on peduncles 3 - 8 cm long. In its appearance the shrub resembles prickly species of *Astragalus* from the subgenus *Tragacantha* Bunge and within the genus *Ebenus* it has been included in the separate, monospecific section *Tragacanthoides* Jaub. et Spach.

It is a Nubo-Sindian species, which in the north of its range enters the Irano-Turanian territory. It occurs primarily in southern Iran and Pakistan, where in the easterly direction it does not cross the valley of the Indus.

Besides it is also known from Khost province in eastern Afghanistan and from the eastern part of the Arabian Peninsula (Muscat, Oman). Furthest to the north it is to be found in Pakistan, as far as the valley of Kurram, more or less to 34° Lat. N., while in western Iran only slightly does it cross Lat. 32° N. This is the only representative of the genus *Ebenus* occurring in the eastern part of the studied region. Most of the species grow in the eastern Mediterranean region, in North Africa, in Greece and in Turkey, from where as many as 14 endemites are reported (herbaceous plants).

*E. stellata* grows on bare gravelly soils, on dry limestone, sandy and conglomerate rocky hills, in *Artemisia* steppe, in semi-desert and stony desert, in open and insolated places, locally becoming the dominant element of plant communities, usually above 1200 m elevation. In Afghanistan it has been found also at 1550 and in Iran and Pakistan at 2000 - 2100 m. Its most elevated stands are known from the Arabian Peninsula, from the peak Jabal al Akhdar, 3000 m, where it occurs in communities of junipers.

References: 81, 179, 259 (2), 364, 506, 558.

## *Genista* L.

### 24. *Genista carinalis* Griseb.

Unarmed, low shrublet up to 15 - 20 (30) cm tall, usually spreading. Flowers are yellow, with standard much shorter than the keel, collected in lax terminal racemes. Very characteristic are its small one-seeded, ovoid-acuminate legumes. It is a species closely related to *Genista micrantha* Ortega, occurring in the north-western part of the Iberian peninsula. However, it differs from the latter in having linear-oblong and not elliptical leaves and having flowers with the base of the standard cordate-truncate and not truncate or obtuse.

It is a sub-Mediterranean and Balkan species. In the east of its range it enters slightly into northwestern and western Anatolia. The main part of the range covers northern Greece (Thraki, Makedonia, Thessalia), European Turkey and southern Bulgaria, where *G. carinalis* does not cross in the northerly direction latitude 43° N.

*G. carinalis* is a light demanding species and usually it appears on edges of broadleaf forests, particularly oak (*Quercus pubescens* Willd., *Q. frainetto* Ten.) and beech (*Fagus sylvatica* L., *F. orientalis* Lipsky) ones and sometimes also in pinewoods (*Pinus nigra* Arnold), in sparse thickets and on grassy escarpments of roads, on clayey-sandy limestone soils. It grows both on lowland terrain and in the mountains, usually at elevations from 200 to 1500 m, though in places, in southern Bulgaria and northern Greece it has been found also at elevations of 2000 m, while in Anatolia, on Kaz Dagi and in the massif Boz Sira Daglari near Izmir not higher than at 1400 - 1500 m.

References: 64 (3), 188, 295.

### 25. *Genista lydia* Boiss.

Syn.: *G. rumelica* Velen.

This is a shrub 100 cm tall, sometimes taller, erect or more or less procumbent, with simple, linear leaves up to 1 cm long. Its yellow flowers with broadly-ovate standards are collected in short racemes on lateral branches. Legumes are several-seeded. *G. lydia* is closely related to *Genista januensis* Viv., occurring in the more western and northern parts of the Balkan peninsula and in Italy, however, the latter has usually 3-winged stems. Strongly growing forms of *G. lydia*, with rather stiff, straight branches are known primarily from the Balkan peninsula, and these are sometimes treated as independent taxon – *G. rumelica* Velen. (*G. lydia* var. *rumelica* (Valen.) Bornm).

It is a Balkan-Asia Minor species with a range in the western part coincident with that of *G. carinalis* Grieseb. It is not impossible that the slower growing forms are in the vegetative form confused with the latter species.

In the Balkan peninsula *G. lydia* occurs primarily in southern Bulgaria and northeastern Greece (Thraci, Makedonia) and besides on scattered stands in Yugoslav Makedonia and in European Turkey. On the other hand in southwestern Asia the range of *G. lydia* covers northwestern (east of Mt. Ilgaz Daglari), western and southern Anatolia, where the shrub appears also in the Amanus Mts. Further in the southerly direction stands are also known in western Syria and in Lebanon.

Similarly as *G. carinalis*, *G. lydia* is a light demanding species and grows in similar conditions, that is in dry stony and grass covered places and in sparse broadleaf forests (*Fagus-Quercus-Carpinus*) or pine woods. In Lebanon it reaches an elevation of 1250 - 1400 m, in Bulgaria up to 1500 m, in Greece up to 1800 m and in northern Anatolia even to 2100 m.

References: 64 (3), 163 (2), 188, 295.

## 26. *Genista tinctoria* L., s. 1.

Syn.: *G. depressa* M. Bieb., *G. elata* Wender., *G. ovata* Waldst. et Kit., *G. patula* M. Bieb.

A more or less erect shrub, sometimes procumbent, usually 50 - 100 cm tall, but also taller, even up to 2 m, unarmed with simple, elliptic to oblanceolate, 5 - 50 mm long leaves, subglabrous to densely pubescent. Flowers are yellow, borne singly, in terminal, simple or compound racemes. This species is exceptionally variable, both in terms of form of growth and in the size, shape and degree of pubescence of leaves and in the degree of pubescence of the calyx and the legumes. In consequence several small local species have been described, closely related to *G. tinctoria* and almost identical with it. Opinions differ widely about their systematic value. Montane forms of small size occurring primarily in the Balkans have narrow leaves, small flowers and poor inflorescences. These are sometimes considered to be an independent taxon - *G. depressa* M. Bieb.

It is an Euro-Siberian species, widely distributed almost throughout southern and central Europe, reaching in the north to southern Scotland. In Western Siberia the limit of this range is determined by the valley of river Tobol in the Kurgan region. In southwest Asia *G. tinctoria* occurs quite commonly in northern Anatolia. Besides it is also known from the Caucasus and from one stand in Iranian Azerbajdzhan, from the Qara Dagh Mts.

*G. tinctoria* is characterized by a considerable scale of ecological requirements. Basically it is a mesophilous shrub, sustaining well moderate shading. It appears both in the understoreys and in gaps of dry coniferous forests and in more moist mixed broadleaved forests, both in shade and in open places, insolated, in meadows, on grassy roadside banks and also on rocky slopes, frequently calcareous. Usually it grows as single individuals or in small groups composed of few individuals. It is characterized by a long flowering period, extending from spring to autumn. As regards its vertical distribution, it is very differentiated. In the north of the range, in Europe *G. tinctoria* occurs in lowland regions, while on the south, also in the mountains, even at substantial elevations. Thus for example on the Balkan peninsula (as *G. depressa* M. Bieb.) in Greece its stands are known from an elevation of 2400 m, in Bulgaria from 2900 m. In Anatolia the optimal conditions for *G. tinctoria* are between 30 and 1300 - 1500 m, more elevated stands being much more rare, up to 2600 - 2700 m.

This shrub has been introduced into cultivation for decorative purposes in Europe as well as in Asia and North America, however, it has not been used very much. Earlier on, its shoots, leaves and flowers were collected for the manufacture of a yellow dye (whence the Latin name) used for the staining of flax and woolen textiles.

References: 64 (3), 242 (2), 295, 622.

## *Onobrychis* Miller

### 27. *Onobrychis cornuta* (L.) Desv.

This is a dwarf, intricately branched shrub, forming compact cushions 50 - 60 cm tall and in diameter, with numerous spines formed from persistent and lignifying peduncles. Its leaves are imparipinnate, composed of 2 - 5 pairs of small, more or less linear leaflets pubescent on both sides. The inflorescences are peduncled racemes with 2 - 5 reddish-purple, lavender, pink or white flowers. The species resembles in appearance an *Astragalus*. Two subspecies have been recognized within it, the western subsp. *cornuta* and the eastern (east Afghanistan and Pakistan) subsp. *leptacantha* Rech. f., which is characterized by more delicate spines, narrower leaflets and stronger growth (cushions up to 1 m in diameter).

It is an Irano-Turanian, montane shrub, widely distributed in the high mountain ranges of southwest Asia. Its range extends more or less from 27° Long E (Anatolia) to 72° Long E (northwestern Pakistan). It covers southern and northeastern Anatolia, northeastern Iraq, southern and eastern Caucasus, northern and southern Iran and southern Turkmeniya. In some isolation from this relatively compact range there occur groupings of stands of *O. cornuta* in the mountains of Lebanon and western Syria, in Tadzhikistan, in western and eastern Afghanistan and in the Pakistani districts of Chitral, Kurram and Quetta.

*O. cornuta* is a montane xerophyte occurring in exposed places singly or in groups or in the form of more or less loose pure communities with the participation of other similarly thorny shrubs from the genera *Astragalus* L., *Acantholimon* Boiss. and *Acanthophyllum* C. Meyer. It grows on stony terrain and on rock rubble, usually on slopes of southern exposition, often at considerable elevations. While it does occur occasionally also at lower elevations, it is most frequent above 2000 m, in Anatolia between 1200 and 3100 m, in Iraq between 2400 and 3500 m, in Iran between 1300 and 3800 (4000) m, in Afghanistan between 2100 and 3300 m, in Tadzhikistan between 2400 and 3900 m and in Pakistan between 2100 and 3150 m.

This shrub is locally used in the high mountains as fuel.

References: 64 (3), 103 (4), 163 (2), 177 (5), 218 (3), 228 (3), 506, 558.

## *Prosopis* L.

### 28. *Prosopis cineraria* (L.) Druce

Syn.: *Mimosa cineraria* L., *Prosopis spicigera* L.

A strong shrub or a small tree up to 7 - 10 m tall, sometimes taller, with armed branches, with pointed and somewhat compressed prickles on internodes. Leaves are bipinnate with opposite pinnae in 7 - 13 pairs of oblong, about 1 cm long leaflets. Small cream-coloured sessile flowers are collected in 10 - 12 cm long spikes. Fruits are up to 25 cm long and pendulous pods with 10 - 15 compressed seeds.

A Nubo-Sindian species, but of Sindian origin. Its range is not fully known yet in view of the lack of detailed data about its stands, particularly from its eastern and southwestern limits. *P. cineraria* occurs in desert, dry regions of western India, where in the easterly direction it most probably does not cross the valley of the Ganges. It is represented here in Punjab, Rajasthan and Deccan, reaching far south, almost to 6 - 7° Lat. N. In Pakistan it is reported primarily from Sind, Baluchistan and Makran, and in the north it reaches the vicinity of Lahore, more or less up to 31°30' Lat. N. Besides in southwestern Asia it is also known from Iran and from the Arabian peninsula: Dubai, Sultanate of Oman, southern Yemen, Saudi Arabia.

*P. cineraria* is a gregarious tree, forming larger or smaller coppices and even small woods, pure or mixed with species from the genera *Acacia*, *Salvadora* and *Capparis decidua* (Forsskal) Edgew. Single specimens are

frequently surrounded by a mass of stiff, entangled, thorny branches and suckers. It is a light demanding species, resistant to drought and heat waves thanks to a deep root system (even up to 20 m) "...the tree is able to come into fresh leaf and flower at the hottest season of the year". In places, in western India and in Pakistan it is quite common. It grows in the plains in sandy and gravel-sandy clay ground, at elevations between 10 and 900 m.

In India and Pakistan, and possibly also in other parts of the range its foliage is lopped for fodder and the wood is used for fuel, as a result of which trees are frequently deformed and strongly injured. Also the fruits are used for fodder and their sweetish pulp around the seeds is eaten, especially in times of scarcity. In Iranian Baluchistan *P. cineraria* supplies also an orange dye.

References: 518 (6), 576, 581, 588, 589, 605.

**29. *Prosopis farcta* (Banks et Sol.) J. F. Macbr.**

**Syn.: *Mimosa farcta* Banks et Sol., *Prosopis stephaniana* (M. Bieb.) Kunth ex Sprengel, *Lagonychium farctum* (Banks et Sol.) Bobrov**

This is a low, shrub propagating by suckers, branching close to the ground with spreading and frequently prostrate stems, usually attaining only 50 cm in height, more rarely 1 m. In the south of its range, on the rivers of Iraq and Palestine, it attains even 2 - 3 m, behaving almost as a liana and forming there dense, impenetrable thickets. Its leaves are 4 - 5 cm long, 2-pinnate, composed of 3 - 5 pairs of pinnae and 10 - 15 pairs of small leaflets, scarcely 3 - 7 mm long. Very characteristic are the numerous, small and sharp, spines, thicker at the bases and dark brown indehiscent pods, ovoid or ellipsoidal, unevenly swollen, 2 - 5 cm long.

It is a western Irano-Turanian species, penetrating into the eastern Mediterranean region and onto the Arabian Peninsula. Its range is composed as if of two parts separated from each other to a greater or lesser extent by central Iran and central Afghanistan. Possibly this disjunction is only apparent, conditioned by lack of sufficient data from that region.

The northern part of this range extends from southeastern Caucasus, through northern Iran, southern Turkmeniya, northern Afghanistan and southern Uzbekistan to southwestern Tadzhikistan, more or less to 70° Long E. The most northerly stands are known from Uzbekistan from the valley of river Serafshan (c. 40° Lat. N) and the Caucasus (c. 41°31' Lat. N.). On the other hand the second part covers southeastern Anatolia (furthest to the west in province of Mersin), Cyprus, Lebanon, Syria, Israel and Jordan, and then Iraq, southern Iran, southern Afghanistan and ends in Pakistan. In the latter country *P. farcta* is known from districts of Peshawar and Dera Ismail Khan, however, it does not cross 72° Long E in the easterly direction. Where exactly does the range terminate in the south is not known. The further to the south the less common are the stands, they are more scattered and they are reported from desert regions of Egypt (oases) and from the Arabian Peninsula. *P. farcta* grows here in northern and central Saudi Arabia, in Oman and in Hadhramaut of southern Yemen.

This species is resistant to drought thanks to its root system reaching to a depth of 15 m and even deeper. It occurs in open terrain, on insolated and warm steppe regions, on semideserts and deserts, usually on heavy and saline soils, along river valleys on the alluvial plains. It appears also on dry waste places, alongside wheat fields and on fallow fields as a noxious weed. In places it forms almost pure compact communities (*Prosopidetum farctae*). In its vertical distribution it is to be found primarily in lowland and submontane regions, from the sea level to more or less 900 m. Further up it appears rarely as for example in Afghanistan to 1300 m, in Iraq to 1500 m, in Turkey to 1600 - 1700 m and in Iran to 1900 m.

Pods of *P. farcta* are eaten by cattle, and are used in folk medicine as an astringent and an anti-desyneric. They well as the roots can be used as for tanning.

References: 56, 64 (3), 103 (4), 134, 151 (1), 163 (2), 176, 177 (5), 184 (1), 218 (3), 228 (3), 258 (1 - 2), 259 (2), 576, 617.

### 30. *Prosopis koelziana* Burkart

A small tree up to 5 - 10 m tall and only occasionally taller, with a gray bark and bipinnate leaves with pinnae in 10 - 11 pairs of 3 - 5 mm long leaflets. Its fruits are very characteristic, linear pods, 4 - 6 (9) cm long, stipitate and cuneate at the base, reddish. The species is insufficiently known yet. It was described in 1976. It has features, particularly of fruits, which are intermediate between *P. farcta* (Banks. et Sol.) Macbride and *P. cineraria* (L.) Druce and it is not unlikely that only hybrids of these two species exist. Further critical studies are needed.

*P. koelziana* has been reported so far from very few stands only in southern Iran (region of Kerman, Bam, Jaz Murian, Bandar Abbas), NE Saudi Arabia and southern Yemen (Hadhramaut). It grows on dunes in subdeserts or deserts. In Iran it appears up to 800 - 1000 m together with xerophytic shrubs and trees from the genera *Calligonum*, *Haloxylon*, *Acacia*, *Ziziphus* and *Salvadora*.

References: 518 (6), 588, 605.

## Oleaceae

### *Jasminum* L.

#### 31. *Jasminum humile* L.

Syn.: *J. revolutum* Sims

An erect shrub, up to 2 m tall, usually, however, shorter, with green, angled branches, glabrous in the type form and pubescent in f. *pubigerum* (D. Don) Grohm. Its leaves, deciduous or evergreen, are alternate, imparipinnate, composed of 3 - 5 (7), dark green leaflets very variable in size. Flowers are yellow, tubular, up to 2.5 cm long in terminal corymbose panicles. Fruits are black berries up to 5 - 8 mm in diameter.

It is a Himalayan species with a range extending to southwestern China in the east, along the whole belt of temperate Himalayas, through Nepal, northwest India, Kashmir to northern Pakistan and northeastern Afghanistan (particularly Nuristan) in the west. In places it is quite common. In Pakistan it occurs primarily in the zone of montane forests in districts of Chitral, Dir, Swat and Hazara and isolated stands are known also from Baluchistan and from the Salt Range.

*J. humile* is a mesophilous shrub growing most commonly along streams, on well-drained soils composed of rock debris, in oak (*Quercus baloot* Griffith, *Q. incana* Roxb.) forests and in coniferous ones, particularly pinewoods (*Pinus wallichiana* A. B. Jackson), in not exceptionally shaded places and also in open spots. It is frequently grazed by forest animals. Its vertical distribution covers elevations more or less between 1200 and 2400 m, and sometimes it reaches up to 3000 m.

It is an ornamental shrub because of its flowers, both in the regions of natural occurrence and beyond it, known to be in cultivation already since XVII century.

References: 179, 364, 380, 395, 594.

## Palmae (Arecaceae)

### *Phoenix* L.

#### 32. *Phoenix theophrasti* Greuter

A tree up to 10 - 15 m tall with a slender stem up to about 60 cm in diameter, terminated by a plumage of pinnatisect leaves up to 2 m long, in older age pendant in the lower part of the crown. The segments of the leaves are rigid, up to 50 cm long. The fruits are yellowish-brown, fibrous, about 15 mm long, 2 to 5 times

longer than fruits of the closely related and widely cultivated *Phoenix dactylifera* L. The Theophrast palm has been described only lately, in 1967, from eastern Crete, the vicinity of Vai and it is the second, after *Nannorrhops ritchiana* (Griffith) Aitch. from Pakistan and southeastern Iran, species of wild palm in southwest Asia.

The range of this species is very limited and beyond Crete (5 stands) it grows also in southwestern Anatolia where it has been discovered in 1982. In the latter region *P. theophrasti* was noted on only 3 stands, two of which, Datca Peninsula (province of Mugla) and Kumluca-Karaöz at the side of Finike Bay (province of Antalya) are represented by numerous specimens of various age while the third stand on the seashore near Güllik (province of Mugla) has only few trees. The stand of a palm on the Greek island Nisiros, located near the western limit of Datca Peninsula possibly also belongs to this species.

Conditions in which *P. theophrasti* grows on individual stands differ substantially, though they are all near the sea. Thus for example the classical stand near Vai is located on the shore of a sandy beach and near a stream and this palm forms there pure groups, while in Anatolia near Kumluca-Karaöz the site consists of rocky slopes with shallow soil and deep crevices the palm being associated with *Pinus brutia* Ten. and other typically Mediterranean plants. All these stands are located very low, from the seashore to an elevation of 200 m, highest on Crete near Ajos Nikitas at 230 m. They have a relict character and deserve full protection.

References: 64 (8), 577, 583, 595, 597.

## Polygonaceae

### *Atraphaxis* L.

#### 33. *Atraphaxis pyrifolia* Bunge

A shrub 1 - 2 m tall with spreading twigs spinescent at the tips. It is a very characteristic species, differing from all other representatives of the genus *Atraphaxis* occurring in southwestern Asia, primarily in having orbicular or broadlyobovate, bright green and bilaterally glabrous leaves 1.5 - 2.5 cm long. Its nuts are trigonous, dark brown, only 3 - 4 mm long.

It is a montane Irano-Turanian species. Its range covers primarily the Middle Asiatic Republic of the USSR in such montane massifs as Tyan-Shan and Pamir-Alai (but not in Pamir itself), in Tadzhikistan, Uzbekistan, Kirgiziya and also in southeastern Kazakhstan (Dzhungarskii Ala-Tau) and southeastern Turkmeniyya (Khrebet Kugitang). Few stands are also known from northern Afghanistan and in northwestern Pakistan as well as in western China (Dzhungaria). This range coincides to a large extent with the northeastern part of the range of *Atraphaxis spinosa* L. and these two species not infrequently appear near to each other forming joint communities.

*A. pyrifolia* in places grows quite commonly, singly or in groups, on open regions, on stony and gravelly slopes and on alluvial river valleys and on pebbles, in montane steppe and in thickets. In Tadzhikistan it occurs in submontane and montane regions, between 600 and 2700 m, highest in Badakhshan, in Pakistan between 1800 and 2400 m, and in Afghanistan between 1500 and 2600 m but in Wakhan it reaches even 3050 m.

References: 177 (3), 181, 218 (2), 618.

#### 34. *Atraphaxis spinosa* L.

A more or less spreading shrub, usually not taller than 80 - 100 cm with thin, sinuate twigs, frequently leafless and spinose on tips. Leaves are ovate to orbicular, glaucous or bluish-green, quite thick, 3 - 9 mm long and the fruits are lenticular nuts, flattened, yellowish-green or brownish. Fruiting is usually copious.

It is an Irano-Turanian species, the most widely distributed and most common in southwestern Asia

representative of the genus *Atraphaxis*. Its range covers an enormous region, from central Anatolia in the west through southeastern Caucasus, Iran and Afghanistan to western Pakistan in the south and the Soviet Middle Asia republics of Turkmeniya, Uzbekistan, Tadzhikistan, Kirgiziya, southern Kazakhstan to western China (Dzhungaria) in the north. In the north *A. spinosa* attains 50° - 52° Lat. N, while in the south 27°52' N, in northwestern Saudi Arabia on Jabal Dabbagh. Single stands are known also from Lebanon, western Syria, Jordan and Israel and also from eastern Egypt (Sinai, Arabian Desert).

*A. spinosa* is a xerophyte, occurring on open, dry and insolated places, on stony and clayey wormwood steppee, in semideserts and deserts and also on various types of rocks. It grows singly and in groups together with shrubs and shrublets of similar nature and in thickets of almonds, junipers and pistaches and even in open, very sparse oakwoods. In its vertical distribution as a rule it appears above 900 - 1000 m elevation, exceptionally somewhat lower. In Anatolia it reaches as far up as 2000 m, in Saudi Arabia to 2300 m, in Tadzhikistan to 2800 m, in Iran and Pakistan to 3000 m and in Afghanistan even higher.

References: 64 (2), 163 (1), 177 (3), 181, 218 (2), 225, 500, 610, 618.

### *Pteropyrum* Jaub. et Spach

#### 35. *Pteropyrum aucheri* Jaub. et Spach

A widely spreading, unarmed shrub, 50 - 100 cm tall with divaricate greyish-white stems. In its appearance it resembles species from the genus *Atraphaxis* from which it distinctly differs in the appearance of fruits (nuts), which are three winged, while in *Atraphaxis* they are without wings. Their leaves are 8 - 15 mm long and about 2 mm wide, more or less linear and have revolute margins.

It is an Irano-Turanian species, the main range of distribution of which being Iran. Besides it is known from few stands in southern Pakistan and southern Afghanistan and also from eastern Iraq. Some stands have been found also in southern Turkmeniya where the shrub is represented by scarcely 1000 individuals.

*P. aucheri* occurs in open, dry and insolated regions, in steppee communities of *Artemisia herba-alba* Asso, on semi-deserts and on deserts, in company of species from the genera *Ziziphus*, *Calligonum*, *Haloxylon* and *Tamarix*, locally even dominating the communities. It grows on sandy clayey, sometimes saline soils, on stony plains and dry wadis, primarily in lowlands and on lower mountain reaches — in Iraq more or less between 150 and 600 m elevation, in Pakistan between 250 and 1250 m, and in Iran between 250 and 1500 m. In the latter country, where it is a very widely distributed species stands are known located even higher, above 2000 m and occasionally even at 2600 m.

References: 225, 518 (5), 610, 618.

#### 36. *Pteropyrum olivieri* Jaub. et Spach

Syn.: *P. gracile* Boiss.

An unarmed shrub, up to 1 m tall, but usually smaller, closely related to *Pteropyrum aucheri* Jaub. et Spach and very similar to it thus possibly it should be treated only as a subspecies or a variety. It differs from the latter in having leaves that are oblong-spathulate and not linear, flat or only with slightly revolute margins and similarly as in *P. aucheri* very variable in size, usually, however, 3 - 10 mm long and 3 - 5 mm wide.

It is an Irano-Turanian species with a range to a large extent concurrent with that of *P. aucheri*, however, as can be judged from the data available so far it is completely absent from northeastern Iran. It appears also that it is much more common than the previous species in southern and southwestern Pakistan and in Afgha-

nistan. It is only sporadic in western Iraq and only once and this was more than 80 years ago it has been found in southeastern Anatolia, in province of Van, at an elevation of 1700 m. This latter stand is at the same time the most northerly stand of *P. olivieri*, more or less at about 38° Lat. N. Furthest to the south *P. olivieri* reaches Pakistan in the vicinity of Karachi at about 25° Lat. N.

*P. olivieri* occurs in similar conditions as *P. aucheri* and it is similar in its vertical distribution, occurring in Iran between 100 and 1500 (1700) m elevation and in Pakistan between 180 and 1850 m. A stand in the Iranian province Kerman is an exception, where in the mountains near Rabor the shrub has been found as high up as at 2800 m.

References: 64 (2), 166 (4), 225, 618.

## Rosaceae

### *Amygdalus* L.

#### 37. *Amygdalus erioclada* Bornm.

Syn.: *Prunus erioclada* Bornm.

This is a low, spreading shrub, 0.5 - 1 m tall. Its rigid spines when young, as well as young shoots are white or whitish-grey tomentose. The narrowly-elliptic leaves and young fruits are also white tomentose. This species is insufficiently known yet and it requires further studies.

It is an Irano-Turanian species with a disjunctive range divided into two parts. The first covers southwestern Iran, province of Fars, and the other eastern Afghanistan, extending more or less from Kandahar to Kabul. This type of disjunction in southwest Asia is not unusual, though it is rather rare.

*A. erioclada* grows in the mountains on dry, limestone stony terrain and rock slides, usually above 1700 m elevation, reaching 2050 m in Iran and 2560 m in Afghanistan.

References: 51, 586.

#### 38. *Amygdalus korshinskyi* (Hand.-Mazz.) Bornm.

Syn.: *Prunus korshinskyi* Hand.-Mazz., *Amygdalus communis* L. var *microphylla* Post.

A shrub or a small tree up to 3 - 4 m tall, branching from the very base, with an ovoid crown, the ultimate branches being somewhat spinescent. Its leaves are ovate-lanceolate to oblongelliptical, 2 - 3 (4) cm long, with crenate-dentate margins and petioles about 1 cm long. Fruits are ovoid to ellipsoidal drupes, 1 - 2 (3) cm long, compressed, obtuse with very hard, irregularly pitted stones. This species is closely related to *A. communis* L. and it was earlier considered to be its small-leaved variety. However, it differs not only in the size of leaves but also in having subspinescent shoots and much smaller flowers and drupes.

*A. korshinskyi* is characterized by a very original range of distribution. Most of its range covers Lebanon and Israel and to a lesser degree western Syria bordering on Lebanon and western Jordan (Gilead, Moav, Edom). Besides isolated stands are known also from southern Syria, from the Jebel ed Druz massif and N. W. Saudi Arabia. On the other hand at a considerable distance from the continuous range *A. korshinskyi* appears in southern Turkey on several stands in province of Marash and Konya, where in the northerly direction it scarcely crosses 38° Lat. N, while in the south, in Israel it reaches also the Judean Mts. and Negev.

This species occurs in the more dry parts of maquis and in steppe-forests near *Pistacia atlantica* Desf. and *Crataegus aronia* (L.) Bosc., in regions where the total annual precipitation is only 150 - 250 mm. It grows more or less from an elevation of 200 m to 1800 m, highest in Lebanon on Hermon Mts. In southern Anatolia, north of Konya, similarly as on Jebel ed Druz in Syria it has been found at an elevation of 1250 m.

References: 64 (4), 162, 163 (2), 259 (2), 423, 586.

## Cotoneaster Medicus

### 39. *Cotoneaster integerrimus* Medicus

Syn.: *C. vulgaris* Lindley

This is an erect or spreading shrub, up to 1 - 2 m tall, sometimes even taller, with suborbicular or ovate leaves, greyish tomentose beneath, having short petioles and entire margins. Fruits are subglobose, red, 6 - 8 mm in diameter. Closely related with this species and sometimes considered to be its variety is *C. uniflorus* Bunge, which, however, is characterized by having singular flowers (not grouped 1 - 4 as in *C. integerrimus*), and very poor growth (30 - 40 cm).

This species is widely distributed in Europe, particularly in its montane, central part and in Scandinavia, where it extends far to the north, almost to the polar circle. Beyond Europe it grows also on the Caucasus and in Anatolia, more commonly in its northeastern part, and it is also reported from northern Iran, where, however, it is very rare. The occurrence of *C. integerrimus* east of the Caucasus, in the republics of Middle Asia, from where it is sometimes reported, is very problematic and requires clarification.

This shrub occurs primarily on stony and rocky terrain, usually on limestones, in exposed and insolated places, in loose thickets and on their edges, even in open pine or mixed forests as well as in oak and beechwoods. It usually grows single, more rarely in groups. On higher elevated locations, beyond the upper forest limit, on Alpine meadows, in rocks and screes, it does not attain larger dimensions (up to 50 cm) and its twigs are short and thick.

In the north of the range stands of *C. integerrimus* are frequently located at very low elevations, at 200 - 300 m, however, in the south they are much higher, above 1000 m. Thus in Greece they are between 1300 and 2400 m, and in northeastern Anatolia, in mountains of province of Rize they have been found even at 3400 m.

*C. integerrimus* is an ornamental shrub, sometimes cultivated, but it is not of any greater importance.

References: 64 (4), 103 (4), 138, 622.

### 40. *Cotoneaster nummularia* Fischer et C. Meyer

Syn.: *C. racemiflorus* (Desf.) K. Koch var. *nummularius* (Fischer et C. Meyer) Dippel.

A more or less erect, richly branched shrub 1 - 2 m tall, sometimes, particularly on very elevated stands and on rocky substratum, prostrate. Young shoots and orbicular, ovate or obovate leaves on their undersides white or grey tomentose. Flowers are white, small with spreading orbicular petals, usually collected 3-5-7 in congested cymes. Fruits are red, 6 - 8 in diameter, with two pyrenes.

It is a very variable species, particularly in the degree of pubescence of shoots, leaves, receptacles and fruits, often included in the *Cotoneaster racemiflorus* complex, among which are included several small and critical segregates. These latter taxa are still insufficiently known and as a result their geographic distribution is unclear and variously presented by different authors. A monographic study of this complex throughout south-west Asia is a subject for the future.

*C. nummularia* is characterized by a very elongated range, extending from western Anatolia in the west, through the Caucasus, northern Iran and Turkmeniya, to Tadzhikistan and Kirgiziya in the east. It is not impossible that the shrub grows also in Afghanistan, however, there is no direct evidence for this. In south-west Asia it is the most common species of the genus *Cotoneaster*, though not to the same degree throughout the area. A kind of gap in the range is noticeable in northern Iran, though possibly it is only apparent, conditioned by inadequate recognition of the *C. racemiflorus* complex. In Lebanon, Syria, Iraq and on Cyprus it is the only representative of the genus *Cotoneaster*. Single isolated stands are known also from two Greek islands (Crete and Chios), from western Jordan and from western Saudi Arabia, where *C. nummularia* reaches

furthest to the south, to 19° Lat. N. On the other hand the relation of *C. nummularia* to *C. orbiculatus* Schlecht occurring in the south of Sinai peninsula is not clear. Possibly the latter should be considered as a subspecies of *C. nummularia*.

*C. nummularia* is a light demanding species, resistant to drought and thus it occurs most commonly on open, insolated, dry, stony, mountain slopes, in limestone rubble and on rocks as well as on sandy banks of river valleys, entering singly or in smaller or larger groups into xerothermic shrub thickets, particularly of the genera *Crataegus*, *Rosa*, *Berberis* and *Lonicera*. It occurs also in sparse semixerophytic juniper and oak forests. In Anatolia and Lebanon it has also been found in cedar forests. In its vertical distribution it grows from an elevation of 300 - 400 m but most commonly, however, above 900 - 1000 m. In Jordan reaches 1520 m, in Iraq 1800 m, on Crete to 1900 m, on Cyprus in the Troödos massif to 1950 m, in Iran to 2300 m, in Anatolia (Erciyas Dagi) to 2500 - 2600 m and in Tadzhikistan even to 3200 m.

References: 64 (4), 163 (2), 177 (4), 218 (2), 610, 622.

#### × *Malosorbus* Browicz

#### 41. × *Malosorbus florentina* (Zuccagni) Browicz

Syn.: *Crataegus florentina* Zuccagni, *Pyrus crataegifolia* Targ.-Tozz., *Pyrus florentina* (Zuccagni) Ehrh., *Sorbus florentina* (Zuccagni) Nyman, *Malus crataegifolia* (Targ.-Tozz.) Koehne, *Malus florentina* (Zuccagni) C. Schneider.

Most probably this is an old, intergeneric hybrid between the genus *Sorbus* (*S. torminalis* (L.) Crantz) and *Malus* (possibly *M. sylvestris* Miller).

It is a small tree, up to 4 - 5 (6) m tall characterized by broadly ovate leaves, 3 - 8 cm long, very variable in serration of margins and in lobing as well as in the degree of pubescence particularly on the dorsal side of the blade. Deeply lobed leaves resemble *Sorbus torminalis* (L.) Crantz. Flowers are white, about 2 cm in diameter, on long peduncles and the fruits are globular or ellipsoid pomés, with a diameter of about 1 cm, red and lustrous.

The species occurs mainly in southern Europe, primarily in Italy and in southern Yugoslavia (Makedonia). Besides it is also known from few stands in Yugoslav Serbia, in Albania and in Greece, where, on the Peloponnisos peninsula the most southern stands are to be found, in Taygetos Mts.

In southwestern Asia × *M. florentina* is to be found exclusively in Anatolia. Here its single stands are scattered from the northwestern part of the country eastwards to more or less 36° Long. E. (Amasya). Both in Greece and in Anatolia, on individual stands (exception - Mt. Parnis near Athens) × *M. florentina* is represented as a rule by only a few specimens, usually grazed by animals and growing poorly.

× *M. florentina* usually occurs in dry places, in various types of thickets, particularly in degraded maquis or in shibljak, at elevations of 100 to 1200 m, usually, however, between 300 and 900 m.

It is a very valuable decorative species particularly in the fall with beautiful leaves turning colour (orange to violet) and fruits, however, it is little known in cultivation.

References: 64 (4), 584, 585, 591.

#### *Padus* Miller

#### 42. *Padus cornuta* (Wallich ex Royle) Carrière

Syn.: *Cerasus cornuta* Wallich ex Royle, *Prunus cornuta* (Wallich ex Royle) Steudel, *Prunus padus* L. var. *cornuta* (Wallich ex Royle) Henry et Elwes.

It is a deciduous tree in favourable conditions up to 20 m tall with a stem diameter to 50 - 60 cm (sometimes even more). It is characterized by having a brown bark with elongate, lighter coloured lenticels. Leaves are ovate-elliptic to obovate-oblong, up to 15 cm long (or even longer) sharpened at the top and on the mar-

gins regularly serrate. The flowers are white about 1 cm in diameter, collected in more or less drooping racemes up to 20 cm long, during fructification even up to 30 cm.

It is a Himalayan species. Its range extends as a relatively narrow belt along temperature Himalayas and Hindukush, from northwestern Afghanistan (Nuristan province) in the west through northern districts of Pakistan (Chitral – from where exact data is still lacking, Kurram, Swat, Hazara and Rawalpindi), then through southern and central Kashmir and northwest India to Nepal and Bhutan in the east. The species is reported also from western China and southern Tibet. In places, as for example in Kashmir and India (Jaunsar and Tehri-Garhwal) it belongs to the largest and commonest deciduous trees, occurring between 2000 and 3000 m elevation.

*P. cornuta* grows primarily in more moist places, particularly near various water runs, both in conifer forests (*Abies* and *Pinus*) and in mixed places, frequently together with *Aesculus indica* (Wallich ex Cambess.) Hook. f., *Quercus dilatata* Lindley, and *Cornus macrophylla* Wallich. In Pakistan it has been found up to 2500 m elevation, in Afghanistan up to 2700 m, in Kashmir to 3050 m, and in eastern Nepal even to 3500 m. It rarely comes down below 2000 m, though in places it can be found even at 1500 - 1600 m elevation.

The wood of *P. cornuta* is sometimes used as fuel, and the sour, dark-purple or black fruits 1 cm in diameter are consumed by the local population.

References: 30, 51, 135, 179, 225.

### *Pyrus* L.

#### 43. *Pyrus pashia* Buch. – Ham. ex D. Don

Syn.: *P. variolosa* Wallich

Small or medium sized tree up to 12 m tall with a short trunk and an oval crown. It is characterized by very variable leaves both in terms of length and shape. They are 6 - 12 cm long, ovate to ovate-lanceolate, long-acuminate, lustrous, with crenate margins to almost serrulate, on 4 cm long petioles, blackening after drying. On young specimens and on root suckers leaves are frequently lobed or even pinnatifid, sharply serrate. Fruits of this pear 2 - 3 cm in diameter are subglobose with raised lenticels and a deciduous calyx features of pears from section *Pashia* Koehne.

It is a Himalayan species, moderately mesophyllous. In the east it is known from southwest China and Burma whereas in the west in southwest Asia it occurs in Kashmir, northern Pakistan and in northeastern Afghanistan only in province of Nuristan. It grows in sparse, montane forests and in thickets, on open places in cultivated areas, common in many parts of the Himalayas. It appears more or less from 750 - 900 m and reaches in the mountains to 2750 m, however, it is most commonly distributed between 1500 and 2300 m. In places this pear is in cultivation within the natural range of its occurrence.

The fruits of *P. pashia* are sour and harsh, with low consumption value, however, after a certain period of storage and softening they are edible and are eaten by the local population.

References: 30, 51, 179, 214, 225.

### *Rubus*

#### 44. *Rubus canescens* DC.

Syn.: *R. tomentosus* Borkh.

A low shrub with arching, procumbent or almost erect, angled or terate stems, glabrous or pubescent. The prickles are rather weak, unequal, falcate. Leaves are pedate with 3 - 5 leaflets, greyish tomentose or almost glabrous above, grey or white tomentose beneath. Inflorescences are many-flowered panicles usually with tomentose axes. Flowers are white. Fruits are black, edible drupelets. It is a very polymorphic species, especially

in the pubescence of leaves and stems. In Europe, particularly on Crimea, several closely related small species have been described which it appears come fully within the range of variation of *R. canescens*. Hybrids are known between this species and *Rubus ulmifolius* Schott.

*R. canescens* occurs almost throughout southern and central Europe (in the north as far as Belgium), and in southwestern Asia, in Anatolia, the Caucasus, in western Syria, in Lebanon, in northern Israel and in northern Jordan, more or less as far as 33° Lat. N. In that region its range coincides to a large extent with the range of *R. ulmifolius* and the two species frequently grow next to each other. As distinct from *R. ulmifolius* it grows also in Hungary and in Romania, while it is absent on Cyprus, and Crete as well as in North Africa and in the Atlantic islands.

It is a light demanding species, occurring in open regions, in sparse forests and scrub, on stony hills and on roads' de embankments, frequently in regions which are under agriculture, near human settlements, on edges of vineyards and olive groves, in fruit orchards and also on hedgerows. It forms pure thickets frequently difficult to traverse or else it accompanies other xerothermic species of prickly shrubs. It grows from the seashore and in the mountains, though most commonly between 300 and 1300 - 1500 m elevation. In Greece and Lebanon it has been found up to 1800 m elevation and in Anatolia up to 2150 m.

References: 64 (4), 105 (1), 103 (4), 163 (2), 259 (2), 622.

#### 45. *Rubus ulmifolius* Schott

Syn.: *R. anatolicus* (Focke) Focke, *R. ulmifolius* Schott subsp. *anatolicus* Focke, *R. sanguineus* Friv., *R. turcomanicus* Freyn, *R. sanctus* auct.

It is a much branched, 1 - 2 m tall shrub, without suckering roots. Its turions (sterile stems) are arching, climbing or sprawling, rooting at the tips, armed with numerous straight or recurved, reddish or yellowish prickles. Flowering shoots have small prickles. Leaves are pedate on turions, 5-foliolate, on fertile stems 1-3-foliolate, glabrous above, white tomentose beneath, variously toothed. Flowers 1.5 - 2.5 cm in diameter, with pink or sometimes white petals, in more or less long and lax panicles. Fruits are edible, compound of small black drupelets.

It is an exceptionally variable species in practically all its features – in the degree of pubescence of leaves, stems and inflorescences, in the size and shape of leaflets, in the size, branching and leafing of inflorescences and in the abundance of flowering. As a result numerous varieties (over 90) and subspecies (over 20) have been recognized as well as several small local species about which there is a lack of a unified opinion. Also the nomenclature of the species as well as its synonymy are variously presented by various authors.

*R. ulmifolius* is characterized by an enormous range covering the whole of central and southern Europe (except for Hungary and Romania), northern Africa (more commonly in the west than in the east) and the whole of southwest Asia together with the Caucasus. Furthest to the east *R. ulmifolius* reaches as far as north-eastern Pakistan and western Kashmir, most probably not further than 75° Long E and furthest to the south on Siani peninsula (Gebel Katherina). Recently it has been found even further, on a completely isolated stand in southwestern Saudi Arabia at about 20° Lat. N. On the other hand in the north it reaches Belgium, the Netherlands, England and Ireland in western Europe and in the west as far as the Açores, Madeira and Canary Islands. In Turkey and in Iran, as well as in Greece it is the most common species of the genus *Rubus*. On the eastern extremity of the range in Afghanistan and in Pakistan it is much less common.

*R. ulmifolius* grows primarily in exposed places, insolated, though not in the driest parts, in open scrub or on rocky slopes and banks of small streams and springs and of marshes, frequently along roads and in waste places with shallow ground water, as well as on edges of forests frequently forming pure thickets or ones mixed with *Prunus spinosa* L. and *Rubus canescens* DC. In its vertical distribution it extends from the seashore to the mountains up to an elevation of 600 m in Bulgaria, 1200 m in Greece, 1500 m on Cyprus and in Iraq, 1700 m in Turkey, 1800 m in Pakistan, 2000 m in Kashmir, 2100 m in Afghanistan and 2300 m in Iran.

References: 51, 64 (4), 103 (4), 151 (1), 163 (2), 225, 228 (2), 259 (2).

46. *Sorbus aria* (L.) Crantz s. 1.

An erect shrub with several stems, up to 3 - 5 m tall or a small tree attaining up to 10 (15) m, frequently in bushy form. Young twigs, leaves (especially beneath) and inflorescences are white tomentose. Leaves are 5 - 12 cm long, ovate, elliptical to suborbicular with 7 - 15 pairs of veins, usually 10, irregularly biserrate or incise-serrate. Fruits are subglobose, 8 - 15 mm in diameter, scarlet.

This is a very variable species particularly in the shape and size of leaves, in their serration and pubescence. This has led to the identification within it of a whole series of more or less local forms or varieties, sometimes recognized as independent taxa. Their nomenclature is complicated and frequently contradictory with each other in various authors. Classification difficulties are also associated with the ease of hybridization of *S. aria* with other species, both within the same section and with species of other sections. Such hybrids are formed primarily with *S. torminalis* (L.) Crantz (particularly in Hungary) and with *S. aucuparia* L., and possibly also with *S. umbellata* (Desf.) Fritsch in the Balkans and in Anatolia. In the present study *S. aria* has been treated widely with a division into two basic subspecies: 1. subsp. *aria* characterized by having a usually rounded base of leaves and fruits with usually numerous small lenticels. The range of this subspecies covers primarily northern and central part of Europe (up to Britain and Ireland) and to a smaller degree the southern part, and 2. subsp. *cretica* (Lindley) Holmboe, which usually grows in shrub forms, has leaves more or less cuneate at the base and fruits with sparse and inconspicuous lenticels.

The latter *S. aria* subs. *cretica* (= *S. graeca* (Spach) Kotschy, *S. aria* (L.) Crantz var. *graeca* Boiss, *S. cretica* (Lindley) Fritsch et Reehinger, *S. umbellata* (Desf.) Fritsch var. *cretica* (Lindley) C. Schneider) is distributed in the Mediterranean area, from south Spain to Greece and then throughout montane Anatolia, in Lebanon, in western Syria, on Crimea and the Caucasus and in northern Iran. Besides it occurs also on Cyprus in Troödos Mts. Furthest to the north, and here in forms akin to subsp. *aria* it reaches Czechoslovakia and even southern Poland (Pieniny Mts.). In Anatolia it appears to be the most common species of the genus *Sorbus*.

*Sorbus aria* subsp. *cretica* is a mesophitic shrub growing usually singly, more rarely in small groups, on rocky limestone cliffs and ledges, in open parts of oak, beech and pine forests, on edges of forests and in thickets in open places. In Europe *S. aria* subsp. *aria* occurs primarily in the mountains and reaches in Bulgaria an elevation of 1800 m, in Alps up to 2150 m. On the other hand subsp. *cretica* grows in Greece between 700 and 2200 m, and in Anatolia, on the Caucasus and in Iran usually above 1300 - 1500 m as far as 2500 m.

*S. aria* in its type subspecies is used as an ornamental tree in parks and to line streets. In cultivation particularly valued are such varieties as cv. 'Aurea' with yellowish leaves, cv. 'Magnifica' with a strong erect growth and cv. 'Majestica' with exceptionally large leaves up to 15 cm long.

References: 64 (4), 93, 94, 103 (4), 126, 151 (1), 163 (2), 622.

47. *Sorbus lanata* (D. Don) Schauer

Syn.: *Pyrus lanata* D. Don

A strong, erect shrub or a moderate size tree up to 9 - 10 m tall with very characteristic wide-ovate or ovate-elliptic leaves up to 16 cm long, dark green and almost completely glabrous above and white tomentose beneath with 7 - 9 pairs of shallow and wide lobes. Fruits are red, frequently single, 3 cm in diameter, edible.

It is a west Himalayan high mountain species. In the west it appears on infrequent stands in eastern Afghanistan, in province of Nuristan and then in northern Pakistan (Chitral, Swat, Hazara and Kurram districts). In Kashmir and in northwestern India it is increasingly frequent and in places quite common. In the east it reaches central Nepal.

It occurs in temperate and sub-alpine forests, primarily in coniferous (*Pinus wallachiana* A. B. Jackson, *P. gerardiana* Wallich, *Abies pindow* Royle, *Cedrus deodara* (D. Don) G. Don and mixed pine-oak stands with

such species as *Quercus incana* Roxb. and *Q. dilatata* Royle. As a rule it grows above 2000 m, however, in Afghanistan it has been found somewhat lower at 1900 m. In Afghanistan and in Pakistan it reaches in the mountains to 3000 m, while in Kashmir and in India to 3300 - 3350 m and in Nepal even to 3400 m.

Within section *Sorbus* of the genus *Sorbus*, to which *S. lanata* belongs, the greatest specific differentiation is observable in Europe, in Turkey and on the Caucasus, while the remaining species are known from the Himalayas and from China. *S. lanata* is the most westerly species of the section within the eastern centre of distribution.

References: 30, 51, 94, 134, 135, 179, 225.

#### 48. *Sorbus persica* Hedlund

Syn.: *S. aria* (L.) Crantz subsp. *persica* (Hedlund) Bornm.

A strong shrub up to 3 - 5 m tall with several erect stems up to 10 - 12 cm in diameter or else a small tree in extreme conditions up to 13 m tall (in Tadzhikistan). Bark on young twigs is reddishbrown, on older individuals grey a reddish tint. Leaves are broadly elliptic in outline, 5 - 12 cm long, glabrous or almost glabrous above and white tomentose beneath, with 4 - 7 pairs of veins and subobtusely lobes extending to 1/4 of the way to the midrib. Pomes are 15 mm long, dark orange.

It is an Irano-Turanian species with a range consisting of two basic parts. The first, the western one, extends from eastern Anatolia, through southern Transcaucasus (southern Armeniya, Nakhichevan, southwestern Azerbaydshan) and north Iran to southern Turkmeniya (Kopet Dag). In this part of the range, except for the Caucasus, the stands are poor and scattered. Most westerly, much isolated from the continuous range is the stand in southern Anatolia, in the massif of Taurus, on Bolkar Daglari. In the second, eastern, part of the range, which covers Tadzhikistan, Uzbekistan, Kirgiziya and southern tip of Kazakhstan stands are richer. Here *S. persica* reaches in the north to the Syrdarian Kara Tau Mts. This part of the range coincides to a large extent with the range of the closely related species *Sorbus turkestanica* (Franch.) Hedlund, which has deeper leaf sinuses and more acute lobes.

*S. persica* is a montane, light requiring mesophyte occurring as a rule singly on exposed rocky slopes, on edges of rivers, in thickets and in strongly opened up juniper and oak forests in the republics of Middle Asia also in maple (*Acer turkestanicum* Pax) and walnut (*Juglans regia* L.) forests. It is most commonly found between 1500 and 2200 m elevation, however, in Anatolia it can be found already at an elevation of 700 m. In Anatolia it attains up to 2100 m, in Armeniya up to 2200 m in Iran and Kirgiziya up to 2400 m and in Tadzhikistan even up to 2600 - 2700 m.

References: 51, 64 (4), 94, 103 (4), 177 (4), 218 (2).

#### 49. *Sorbus umbellata* (Desf.) Fritsch

Syn.: *S. flabellifolia* (Spach.) Hedlund, *S. turcica* G. Zinslerling, *S. aria* (L.) Crantz var. *umbellata* (Desf.) Stoy., Stefanoff et Kitan.

Usually it is an erect shrub or a small bushy tree up to 5 m tall. Leaves are subrhombic to ovate-orbicular 3 - 7 cm long, coarsely dentate, with 4 - 7 pairs of lateral veins, shallowly lobed in the upper half, white tomentose beneath. The lobes are more or less rounded. It is a very variable species in terms of leaf size and number of pairs of veins and the depth of sinuses between lobes. Possibly in some instances this is a consequence of hybridization of this species with *S. aria* (L.) Crantz subsp. *cretica* (Lindley) Holmboe. Most probably between these two taxa, similarly as between *S. aria* and *S. torminalis* (L.) Crantz introgression takes place and individual segregants forming in this manner behave like apomicts locally forming morphologically uniform populations. All of this hinders classification of such forms.

The range of *S. umbellata* coincides to a large extent with the eastern part of the range of *S. aria* subsp. *cretica* – except for Crimea, Iran, Iraq and Cyprus. In Europe the species occurs only on the Balkan peninsula, primarily in Greece and to a lesser degree in Albania, in Yugoslav Macedonia, in Bulgaria and Romania. In the latter four countries the distribution of *S. umbellata* is unfortunately not sufficiently clear yet. Throughout the range of distribution it is a much less common species than *S. aria* subsp. *cretica* and it is represented on infrequent, scattered stands usually only as single individuals. It grows in similar conditions and at similar elevations as *S. aria* subsp. *cretica*, however, it is very rare above 1800 m elevation and only exceptionally up to 2200 m, most commonly between 1200 and 1500 m.

References: 64 (4), 93, 94, 103 (4), 126, 151 (1), 218 (2), 526.

## *Tamaricaceae*

### *Tamarix* L.

#### 50. *Tamarix aphylla* (L.) Karsten

Syn.: *T. articulata* Vahl

A tall, strong shrub or a tree up to 15 (20) m tall with a stem diameter of up to 1 m. When it grows singly it forms an oval broad crown and in its appearance it resembles *Casuarina* from a distance. The bark is reddish-brown to grey and the twigs slender. Leaves are reduced, vaginate, sheath-like and measure scarcely 2 mm in length. They are hoary due to salt deposition excreted by special glands. Flowers are pinkish white, bisexual with 5 petals and 5 stamens, in dense racemes 3 - 6 cm long. It is one of the most characteristic species of the genus *Tamarix*, relatively easy to define.

It is a Saharo-Sindian species with a large range extending in the east from southeastern India (native?) through Pakistan, southern Afghanistan, southern Iran and southern Iraq and then through Jordan and southern Israel to north Africa including Egypt, Libya, Algeria and Morocco. Stands furthest to the north occur in Pakistan, where it does not cross 35° Lat. N. It also occurs in the Arabian peninsula and in east Africa – in Sudan, Ethiopia, Somali and even in Kenya, where in the southerly direction it crosses the equator. In that region and possibly in many others it is only an introduced species, thus frequently it is difficult to tell the nature of a particular stand.

*T. aphylla* grows in dry regions, even with annual precipitation of 50 mm, on sandy soils and dunes, in wasteful water, however, thanks to very deep rooting system, reaching down to 20 m and even deeper, its intensive transpiration is secured. It is distributed over lowland regions, and in Israel and Jordan even in depression zones around the Dead Sea, down to - 240 m. Most commonly in its vertical distribution it appears no higher than up to 900 m, however, the most elevated stands have been found at an elevation of 1100 m in Pakistan, at 1200 m in Afghanistan and at 1350 m in Saudi Arabia.

The species can be easily propagated by cuttings. It is used commonly in desert regions as a decorative, shade and afforestation tree and it is frequently planted along roads and cultivated fields. Its wood is used in rural households and the bark is used for tanning. Similarly as several other desert species of the genera *Tamarix*, *Hammada*, *Anabasis*, *T. aphylla* is a producer of the so called "manna" – a white sweet fluid which is excreted by scale insects living on its stems.

References: 30, 179, 228 (4,1), 259 (2), 362, 364, 578, 611, 612, 613.