

# Characterization of areas

## *Asclepiadaceae*

### *Cionura* Grisebach

#### 1: *Cionura erecta* (L.) Grisebach

Syn.: *Marsdenia erecta* L.

Trailing or climbing shrub with rubbery shoots attaining up to 8 m.

This is an eastern Mediterranean species penetrating inland to northern Iraq, southwestern Iran and even western Afghanistan (only one stand between Jija and Khush). The main region of occurrence of this species is in the Balkan peninsula (Albania, southern part of Yugoslav Macedonia, Greece, southern and eastern Bulgaria, European Turkey) and in Anatolia. Besides *C. erecta* is known also from Crete, some islands of the Aegean, from Cyprus and from northwestern Syria. The most northerly stands are along the Black Sea in Bulgaria, almost up to 43° of Latitude N., and the most southerly ones near Kazerun in Iran, more or less at 29°30' Lat. N.

*C. erecta* is terrophyllous shrub. It is a plant typical of dry and insolated places, occurring mainly in open localities, in sandy soils, in gravels and dunes, especially along sea shores and river beds, sometimes also on rocks, mainly calcareous ones, among steppe grasslands and scrubs, as well as in clear oak-woods. In regions where other shrubs are missing on which *C. erecta* could support itself, it forms wide, subglobose forms with partially prostrate and partially erect shoots reaching up to 1 m. In such conditions it appears sometimes in greater numbers and forms an association of its own — *Cionuretum*.

*C. erecta* grows primarily in the lowlands and in the lower reaches of mountains, from almost the sea shore itself to an elevation of about 600 - 800 m. In Anatolia it has been known to occur up to 1100 to 1400 m, in Iraq up to 1500 - 1800 m and in Iran even up to 1700 - 2000 m.

This shrub has a lactic juice with toxic properties. When in contact with the human skin it causes unpleasant burns and when swallowed it causes spasms and convulsions and even death. *C. erecta* has been used for long in folk medicine, and even today (e.g. in Bulgaria) a brew made of its fruits is taken for stomach pains. As an ornamental shrub it has not attracted attention, which perhaps is associated with its specific ecological requirements. It has been introduced into cultivation already in the 16-th c.

References: 64(6), 78, 163(3), 273, 274, 339, 354.

### *Cyprinia* Browicz (monotypic genus)

#### 2. *Cyprinia gracilis* (Boiss.) Browicz

Syn.: *Periploca gracilis* Boiss.

A delicate climbing or scrambling shrub with more or less persistent leaves.

This is an eastern Mediterranean shrub, restricted in its range only to the central and northern part of Cyprus and to a few stands in southern Anatolia in Içel province. In Cyprus it does not appear to be too com-

mon and it appears primarily on the southern slopes of Mt. Troödos. It grows in rocky places, in maquis and in sparse *Quercus alnifolia* Poech and *Pinus nigra* Arnöld subsp. *pallasiana* (D. Don.) Holmboe forests. Its thin shoots twine around shoots of other shrubs from the genus *Rubus*, *Rosa*, *Tamarix*, *Pistacia*, *Cistus*, *Berberis* and *Styrax*. In its vertical distribution *C. gracilis* occurs in Anatolia at elevations between 200 and 1100 m and on Cyprus between 650 and 1300 m.

References: 56, 64 (6), 272.

### *Periploca* L.

#### 3. *Periploca aphylla* Decne.

This is an erect shrub reaching 3 m in height, with rigid, thick, green and little branched shoots, which as a rule are devoid of leaves. Only on young, thin, slender shoots having a tendency to twine, particularly in the early phases of their development, one can observe very small and rapidly deciduous leaves, only 3-12 mm long and 1-5 mm wide. This is a Nubö-Sindian species. Its range extends as a compact belt from northwestern Pakistan (Chitral) and Nuristan in Afghanistan; through western and southern Pakistan, southern Iran to southeastern Iraq. Besides it occurs on the Rajshatan desert in India, on the Arabic peninsula, particularly its southern part and in Israel and Jordan where it occurs in the valley of the Jordan river and in the depressions of the Dead Sea. The most western, isolated stands are known from Egypt (Sinai and Gebel Elba) and from the mountains of northeastern Sudan.

This shrub grows on a decidedly dry, semidesert or desert, sunny and open sites, in the plains, foothills and mountains, or rocky, gravelly or sandy slopes, occasionally gregariously forming an association of its own - *Periplocetum aphyllae*. Commonly it occurs in southern Pakistan and in southern Iran (Makran, Baluchistan, Laristan). Locally it occurs almost at the sea level (e.g. on islands in the Persian Gulf), up to 200 m in Iraq and up to 500 m in Iran (near Iranshahr even up to 1600 m). On the other hand, in Pakistan, in the south stands are known from 40 m elevation, however, more commonly it grows at much higher locations between 1000 and 2000 m. Its elevational maximum is attained in Afghanistan, in the region of Kabul; at 2600 m, and minimum on the Dead Sea at 250 m, in a depression. In the southern treeless regions *P. aphylla* is an important shrub used as fuel and fodder for camels and goats.

References: 259(3), 271, 278, 339.

#### 4. *Periploca graeca* L.

This is a strong, twining shrub with shoots attaining length of 30 m, climbing up to 12 - 15 m. Entwining strongly around branches and stems of young trees it may strangulate and cause death.

The range of *P. graeca* is a very elongated one from west to east, and the stands are generally scattered. The most westerly occurrence has been reported from Italy - in the north from Toscana and in the south from Calabria and Puglia, however, the naturality of these stands is being questioned. Then it grows in the Balkan peninsula, in Jugoslavia on the Dalmatian coast and in southern Macedonia, in Albania, in Greece, primarily in its northeastern part, in Bulgaria (Macedonia and the Black Sea coast) and in European Turkey. In that part of the range the most northern stands are in eastern Romania (Dobruja, Danube delta) and attain even

the southwestern tip of Ukraine. In Anatolia *P. graeca* is more frequent in the north and east than in the south and west. Scattered over the Caucasus it reaches along the shores of the Caspian Sea to the province of Gorgan in northern Iran. Furthest to the south in south-west Asia it appears in northern Israel (Hula Plain). It is believed to grow also in Jordan (Moav).

*P. graeca* is considered as belonging to the eastern Mediterranean floristic element, however, optimal conditions for its occurrence are to be found not so much on the Mediterranean Sea as in the northern part of the Aegean, on the Black Sea, in the Caucasus and on the Caspian Sea. This is associated with the ecological requirements of this species, namely with high humidity of soil and air and with a considerable fertility of the sites. Thus *P. graeca* attains greatest dimensions coupled with abundant occurrence in river valleys, and particularly at their mouths. Here in boggy deciduous forests including alder, ash, elm, hornbeam and willow, its shoots pendant from branches of the supporting trees entwine with shoots of other climbers such as *Clematis vitalba* L., *Smilax excelsa* L., *Vitis sylvestris* Gmel., *Humulus lupulus* L., *Tamus communis* L. and *Calyptegia sepium* (L.) R. Br. Then impenetrable thickets form resembling a jungle in appearance. Thus *P. graeca* is a species sustaining considerable shading well, however, it appears also in exposed and insolated places, on forest edges and even in pseudomaquis, as a rule, however, near water reservoirs.

Most commonly *P. graeca* grows in regions located near the seas, at elevations of up to 400 - 500 m. In the Caucasus it attains 600 - 800 m, and in Anatolia and Iran 1200 m and in Iraq even 1800 m. The lowest localities have been reported from the Iranian province of Gilan, from the depression of lake Mordab.

This is an ornamental shrub under cultivation since 16-th c.

References: 64(6), 78, 103(7), 163(3), 259(3), 271, 272, 273, 339.

## Cistaceae

### *Cistus* L.

#### 5. *Cistus laurifolius* L.

This is the strongest species of the genus *Cistus* among those occurring in the eastern Mediterranean. It is an aromatic, evergreen, erect shrub 1 - 2(3) m tall with large white flowers having a diameter of about 5 cm.

It is a Mediterranean species with a disjunctive range. On the one hand, it occurs in the west in Africa, in Morocco and Algeria (here only one stand was reported) and in Europe in Portugal, Spain, France, on Corsica and in Italy (near Firenze). On the other, it occurs after a considerable gap in northeastern Greece, where it grows exclusively in eastern Thrace and then in southwestern Asia. Its eastern limit runs through the Yozgat, Tokat and Amasya provinces in northern Anatolia and Adana province in southern Anatolia.

In Greek Thrace *C. laurifolius* reaches for north to within 4 - 5 km from the Bulgarian border, however, it is most common in the hilly region between Souflion and Pessani. It grows there in the understorey of sparse pine forests or in thickets of an impoverished maquis with such species as: *Arbutus andrachne* L., *Erica arborea* L., *Phillyrea latifolia* L., *Coronilla emerus* L. subsp. *emeroides* (Boiss. et Spruner) Hayek, *Fraxinus ornus* L., *Quercus pubescens* Willd., and *Q. frainetto* Ten., *Eriolobus trilobatus* (Poiret) Roem. and others. These stands are located at more or less 100 - 400 m elevation.

*C. laurifolius* occurs under similar conditions in Anatolia. Here it is primarily a close associate of *Pinus nigra* Arn. subsp. *pallasiana* (Lamb.) Holmboe (more rarely *P. sylvestris* L.) entering into understorey of the pine woods or sitting on their edges. Besides it occurs in degraded oak woods. Sometimes it can be the dominating shrub, particularly in regions on which pine woods have been destroyed to a large extent.

As a rule in Anatolia stands of *C. laurifolius* are located higher up than in Greece, usually between (600)

900 and 1400 m. Near the eastern limit of the species range it grows even higher, above 1500 m (up to 1750 - 1800 m). However, the elevational maximum is attained in northwestern Africa, in the Atlas Mountains of Morocco, at 2800 m. Typical sites for it are dry, stony, insolated, southern slopes.

*C. laurifolius* is an ornamental shrub placed under cultivation in 1731. It forms hybrids with *Cistus monspeliensis* L., *C. salvifolius* L., *C. ladanifer* L. and *C. incanus* L. Similarly as other species from the genus *Cistus* it contains aromatic, resinous oils, which can be used in the perfume industry.

References: 64(1), 282, 322.

## **Ericaceae**

### **Arbutus L.**

#### **6. *Arbutus andrachne* L.**

This is a strong evergreen shrub or a small tree up to 5 - 8(12) m tall and a stem diameter of up to 20 cm. It is characterized by a smooth, and thin, red bark, which periodically peels off in large patches.

It is an eastern Mediterranean species. In Europe it occurs only on the Balkan peninsula, on Crete and on some islands of the Aegean Sea. It is known from southern Albania, Greece — particularly its southern part, southern Yugoslav Macedonia, European Turkey and southern Crimea. Further east it grows in western, southern and northern Anatolia, on Cyprus, in western Syria and also in Lebanon and Palestine, where its most southern stands are on the Judean Mts. Optimal conditions for it are in regions along the Aegean Sea. As a rule the stands are distributed along the sea coasts, more rarely penetrating inland. Of particular interest are stands isolated from the continuous range of the species in Macedonia (valleys of rivers Kongska and Crna), in Abkhazskaya A.S.S.R. on the western Caucasus, and also in southeastern Anatolia in Mardin and Siirt provinces (the latter is uncertain).

The range of *A. andrachne* overlaps partially with the range of *Arbutus unedo* L. and represents a sort of its extension in the easterly direction. Besides *Quercus coccifera* L. and *Q. ilex* L., *Erica arborea* L., *Phillyrea latifolia* L. and other evergreen shrubs and shrublets *A. andrachne* belongs to the characteristic components of maquis. Besides it also enters frequently into the understorey of sparse pine woods (*Pinus brutia* Ten., *P. halepensis* Mill.) and also, particularly in the north into pseudomaquis communities. On many stands it grows side by side with *Arbutus unedo* L. and these two taxa sometimes form natural hybrids — *A. x andrachnoides* Link, reported from western Anatolia and from Greece.

*A. andrachne* is a light requiring species, resistant to drought. It occurs on shales and on sandstone, serpentine or limestone rocks, and also on terra rosa, usually as single individuals or in small groups. Throughout its natural range it occurs at lower elevations, from the sea level to about 500 - 600(800) m, and only in extreme cases up to 1150 m (southern Anatolia, Lebanon) or even to 1300 m as on Cyprus. On the Crimea where it is the only representative of the *Ericaceae* family it belongs to rare species and occurs only on seaside rocks, on steep slopes and cliffs, up to 200 - 300 m elevation. On the Caucasus its occurrence is similar.

References: 64(6), 78, 103(7), 163(3), 198(1), 259(3), 310, 326.

#### **7: *Arbutus unedo* L.**

An evergreen, strongly developed, erect shrub or a small tree 3 - 5 m tall, in extreme case attaining 10 - 12 m and a stem diameter of 30 - 50(60) cm. Such prominent individuals aged 200 - 300 years are known from Ireland. They are characterized by a short stem divided at a height of 1 - 3 m, or branched into several

stems close to the ground. As distinct from *Arbutus andrachne* L. the bark of *A. unedo* is dark brown, rough and scaling in small flakes.

This is a species distributed widely in the Mediterranean region and in southwestern Europe, reaching in the north to northwestern Ireland. In North Africa it is absent only in Egypt and in Libya. In the latter country, in Cyrenaica, it is replaced by another, closely related species, *Arbutus pavarii* Pampanini. In the eastern Mediterranean it is much less common than *A. andrachne* L. and practically speaking it is found only in eastern Greece and in western Anatolia, but it is absent from the Caucasus and Crimea. On Cyprus it is known exclusively from the western tip of the island, and it has also been reported from central Lebanon (north of Beirut).

*A. unedo*, similarly as *A. andrachne* L. is a significant component of maquis and of the understorey of sparse pinewoods, and has similar ecological requirements. The basal part of the stem close to the ground and underground is strongly and irregularly swollen with numerous adventitious buds which lead to a rapid regeneration of the shrub after destruction by fire or breakage. Thanks to this characteristic *A. unedo* and *A. andrachne* L. are extremely tenacious of life and exhibit a considerable resistance to the frequent fires of the maquis.

As distinct from *A. andrachne* L., *A. unedo* grows at lower locations, most commonly from the sea coast to about 300 m. In northwestern Anatolia and on some of the Aegean Islands it reaches up to 500 - 550 m, on Kérkira Is. up to 600 m, on the Olympus Mt. of Thessalia and on Crete up to 700 m and in Lebanon up to 800 m.

The fruit of *A. unedo* are somewhat larger and not so dry as those of *A. andrachne* L. They are edible but only to a slight degree used by the local population either in fresh form or for the making of confitures. It is an ornamental shrub flowering abundantly and fruting in the autumn. The fruits are initially green, but then they gradually turn colours to yellow, orange and bright red. The irregularity of their ripening together with the lustrous evergreen leaves, makes the species very attractive. The wood is used for carving spindles, stools and small articles of furniture.

References: 64(3), 163(3), 198(1), 310, 316, 326, 344.

### *Bruckenthalia* Reichnb. (monotypic genus)

#### 8. *Bruckenthalia spiculifolia* (Salisb.) Reichnb.

Subprostrate, evergreen shrublet, 15 - 25 cm tall; forming frequently dense and compact communities resembling in appearance *Calluna vulgaris* (L.) Hull heaths, included in the alliance *Bruckenthalion*.

A Balkan species, occurring in larger and higher mountain massifs in Romanian Carpathians and Transylvania, in Yugoslavia - Macedonia and Serbia, in the west to the border with Bosna, in Bulgarian Stara Planina, Rila, Pirin and western Rodopi and in Greek Macedonia and Thrace. Furthest to the north it attains in northern Romania Muntii Rodnei, more or less up to 47°30' Lat. N. *B. spiculifolia* is distributed in the Balkans usually between 1500 and 2200 (2500) m, however, in places it comes lower and such lowest stands have been reported in Yugoslavia and Greece from 900 m and in Bulgaria even from 700 - 725 m. It grows on acid soils in subalpine lawns and in thickets together with *Juniperus communis* L. subsp. *nana* Syme and species from the genus *Vaccinium* as well as in coniferous or even beech forests.

Besides the Balkan *B. spiculifolia* has been found in the east only on four locations in northern Anatolia. In the west it is known from province of Bursa from Ulu Dağ (Olympus) from an elevation of 1700 - 2500 m and in the east from Trabzon province (1300 m), Gümüşane province (1830 m) and Çoruh (1600 - 2100 m). In the latter locality, on Şavval Tepe near Murgul it occurs in thickets of *Rhododendron caucasicum* Pall.

References: 64(6), 198(1), 261, 294, 316, 355.

9. *Calluna vulgaris* (L.) Hull

A small evergreen, usually erect shrub, 30 - 50 cm tall, attaining in favourable conditions even a height of 1 m.

This is an Euro-Siberian species, occurring primarily in northern, central and western Europe. It is also known from Africa, northern Morocco and from the Açores. *C. vulgaris* grows in the lowlands and in the mountains, on peats and in open, dry pinewoods, on poor acid soils. Frequently it forms compact carpets in open terrain, the so-called heaths, in which single individuals of *Juniperus communis* L. and *Pinus sylvestris* L. appear. In the mountains of central Europe, and particularly in the Alps, it reaches above 2000 m and occasionally even up to 2700 m. As a distinctly light requiring species it disappears as the environment becomes shaded.

In southeastern Europe, on the Balkan peninsula the continuous range of *C. vulgaris* ends in central Romania and in central Yugoslavia, where the most southerly stands are to be found in Serbia. On the other hand, the stands in Bulgaria, in western Rodopi Mts. and in the Strandzha Mts. on the Black Sea are completely isolated. Further east, along the shores of the Black Sea further stands are known, both in European Turkey and in western and eastern Anatolia, but not in its central part. Here *C. vulgaris* grows primarily on lower located sites, between 60 and 400 m, though at the eastern limit of the range (province of Rize) even at 1000 m. It either forms small heaths on open terrain, frequently together with *Erica arborea* L., or enters dwarf thickets of oaks and hazel.

References: 64(6), 293, 316.

*Epigaea* L.

10. *Epigaea gaultherioides* (Boiss. et Bal.) Takht.

Syn.: *Orphanidesia gaultherioides* Boiss. et Bal.

This is an evergreen, prostrate shrublet, with a rooting main stem up to 50 cm long with small twigs raising up vertically to a height of 10 - 15 cm with large white, flushed pink, flowers. The genus *Epigaea* is represented by only three species and is characterized by a Tertiary relict distribution. One of these species *E. asiatica* Maxim. occurs in Japan on Honshu and Hokkaido islands and a second one, *E. repens* L. in eastern North America.

The range of the third species, *E. gaultherioides* is restricted to only a very small mountain area on the Black Sea in which the shrub is known from only a few stands. In USSR on the Caucasus, in southern Adzhariya, near the Turkish border, there is the most northerly stand. *E. gaultherioides* grows here only on Mt. Koronistavi, at an elevation of 970 m in *Betula medwedewii* Regel groves and in thickets of *Rhododendron unguernii* Trautv. and *R. ponticum* L. The remaining stands occur in northeastern Anatolia in the mountain region west and north of the Çoruh river valley, in provinces of Çoruh, Rize and Erzurum. In that region *E. gaultherioides* occurs in beech woods (*Fagus orientalis* Lipsky) and spruce (*Picea orientalis* (L.) Link) forests undergrown with rhododendrons and *Vaccinium arctostaphylos* L. as well as sometimes in open places, on northern slopes between 920 and 2290 m elevation.

References: 64(6), 103(7), 286, 355.

11. *Erica arborea* L.

An evergreen, erect shrub or a small tree, attaining in favourable conditions 6 - 7 m height and stem girth at the base about 75 cm. From the Canary Islands specimens have been reported which are 15 - 20 m tall and have a stem girth of 1 m. It flowers white in early spring, but dried, brownish flowers remain on the branches for a long period of time, almost to the autumn.

This is a Mediterranean and East African species. Its range consists of two parts. One of them covers eastern tropical Africa extending from northwestern Ethiopia (more or less from 17° Lat. N) and northern Eritrea, through Uganda and Kenya to Tanzania where south of the equator it reaches even the lake Nyasa (more or less to Lat. 9° S). Here *E. arborea* occurs in the mountains from about 1900 m to 4000 m and even higher. The other part of the range covers almost the whole of the Mediterranean region except for Cyprus, Syria, Lebanon, Israel, Egypt and Libya. *E. arborea* is also known from Madeira and the Canary Islands. Between these two parts of the range there is a linking stand in central Sahara in northern Tchad on a summit of Tibetsi.

In the eastern Mediterranean, on the Balkan peninsula, the range of *E. arborea* extends as a more or less narrow belt along the sea coast in Jugoslavia, Albania, Greece (together with Crete and the Aegean Islands), in European Turkey and in Bulgaria (here only in the Strandsha Mts., near the Turkish border). Further east this heath is more rare and occurs only in western and northern Anatolia along the Black Sea, as far east as the river Of in Trabzon province. Besides it occurs on a few stands only in Abkhazskaya A.S.S.R. on the Caucasus.

*E. arborea* besides *Quercus coccifera* L. and *Q. ilex* L., species from the genus *Arbutus*, *Phillyrea latifolia* L. and *Juniperus phoenicea* L. is one of the most characteristic components of maquis dominating in places. It is in such communities that it attains its largest dimensions. It occurs also in open deciduous forests, particularly in oakwoods (e.g. *Quercus frainetto* Ten.); hornbeam or beech forests, as well as in coniferous forests (*Pinus halepensis* Miller, *P. brutia* Ten.). In these forests it plays the role of the undergrowth and is then usually only a shrub 1 - 2 m tall. In degraded maquis and in the phrygana it commonly occurs with another species of *Erica*, namely *E. manipuliflora* Salisb. At the northern limit of its range, in Bulgaria and in Turkey it is in places accompanied by *Calluna vulgaris* (L.) Hull.

This heath grows on acid soils, on rocks, banks and cliffs, usually from almost the coast itself to an elevation of 400 - 600 m. On Crete it attains an elevation of 700 m, in Albania it can be found up to 800 m, in Anatolia to 900 m and in Greece on Mt. Pilion up to 1200 m.

In Africa the branches of *E. arborea* serve as firewood. In southern Europe, particularly in France from the wood of this heath, particularly from the basal part of the stem, pipes are made which enjoy considerable renown.

References: 64(6), 103(7), 198(1), 310, 316, 317, 326, 330.

12. *Erica bocquetii* (Peşmen) P. F. Stevens

Syn.: *Pentapera bocquetii* Peşmen

A small, evergreen, irregularly branched shrub 25 - 40 cm tall with one-year-old shoots having a short canescent pubescence.

This is a species endemic for Anatolia. It occurs only in the southwestern part of the country in Antalya province, district of Elmali in the mountains of western Taurus in sparse *Cedrus libani* A. Richard forests at 1600 - 1850 m elevation. It grows in clumps on limestone rocks, on slopes with a northwestern exposition.

*E. bocquetii* has been only discovered in 1963 and described in 1968. As distinct from a closely related species *Erica sicula* Guss. (also in the Antalya province) it has smaller flowers and smaller leaves in whorls

of 3 and not in whorls of 4. It is characterized by poorer growth and a vertical distribution growing well inland in the mountains and not along the coast.

References: 55, 64(6), 325, 355.

**13. *Erica manipuliflora* Salisb.**

Syn.: *E. verticillata* Forsskal

An evergreen, erect shrub forming dense compact clumps, up to 4 m tall but usually not taller than 1 to 1.5 m. It flowers to a greater or lesser degree almost throughout the year, most abundantly, however, in autumn months, from September to November.

This is an eastern Mediterranean species. In the west it occurs only in Italy. Its continuous range extends from the Balkan peninsula – western Jugoslavia, western Albania, Greece and European Turkey, to southwestern Asia – western and southern Anatolia, western Syria and Lebanon. It has been also reported from northwestern Israel, but it is absent from Cyprus and northeastern Africa. The center of its range falls in the regions around the Aegean Sea, including Crete and the Aegean Isles.

*E. manipuliflora* is one of the basic components of the phrygana and of maquis. Besides it can be found in sparse pinewoods (*Pinus halepensis* Miller, *P. brutia* Ten. and *P. pinea* L.) and in upper parts of the mountains on meadows (e.g. on Crete). When growing on open, dry, windy and insolated mountain ridges it forms in places (e.g. in southern Peloponnisos), compact, almost uniform heaths. Here it is accompanied at best by such species as *Genista acanthoclada* DC., *Globularia alypum* L., *Hypericum empetrifolium* Willd., *Anthyllis hermanniae* L., *Calicotome villosa* (Poir.) Link or *Osyris alba* L. *E. manipuliflora* will grow on very diverse substrata, more commonly, however, on schistose and serpentine than on limestone ones.

The vertical distribution of *E. manipuliflora* covers regions located almost from the sea level to more or less 600 - 800 m, less commonly up to 1000 - 1200 m. The most elevated stands have been reported from Crete up to 2000 m.

References: 64(6), 163, 310, 326.

**14. *Erica sicula* Guss.**

Syn.: *Pentapera sicula* (Guss.) Klotzsch

An erect, evergreen bushy shrub up to 60 - 100 (150) cm tall. It is a Mediterranean species with a very disjointed range, the different parts of which are very far removed. It has been divided into three subspecies and the differences between them concern primarily the length and width of leaves and sepals and the colour of flowers.

The type subsp. *sicula* grows in western Sicilia (Monte Cofano and Marettimo), while subsp. *cyrenaica* Brullo et Furnari occurs in Libya in northern Cyrenaica on calcareous rocks of the wadis, between 350 and 500 m elevation. The third subsp. *libanotica* (C. et W. Barbey) P. F. Stevens is known from southwestern Asia, from three countries only.

*E. sicula* subsp. *libanotica* has been described from central Lebanon, where it grows on limestone rocks in the eastern part of the Nahr Ibrahim river valley at 1100 - 1300 m elevation, more or less in the region between Ehmej, Aqoura, Qartaba and Afqa. It is also known from northern Cyprus, from the Kyrenia Mountains, near Kyrenia itself where it appears on northern slopes, between 450 and 1000 m, forming at times clumps 1.5 m in diameter. It is less common in southwestern Anatolia, in province of Antalya, and here it occurs on very low locations (60 - 100 m) on shady limestone cliffs near Kemer.

References: 57, 64(6), 163(3), 244, 264, 279, 355.



**15. *Rhododendron afghanicum* Aitch. et Hemsl.**

An evergreen, rather straggly shrub about 30 - 50 cm tall with prostrate branches up to 1 m long. Besides *Rhododendron colletianum* Aitch. et Hemsl. it belongs to the most westerly occurring species in the main *Rhododendron* belt of the Sino-Himalayas. Within section *Rhododendron* it is included in the monotypic subsection *Afghanica* Cullen, which demonstrates its greatest affinity to subsection *Boothia* (Hutchinson) Sleumer and subsection *Camelliflora* (Hutchinson) Sleumer — species occurring in central and eastern Himalayas, in Burma and southern China.

*R. afghanicum* is characterized by a very restricted range and so far it is known only from two regions isolated from each other: 1. Mt. Sikaram in the Safed Kuh mountain belt along the Afghan-Pakistani border on the northern side of the Kurram Valley and 2. from eastern Afghanistan in Nuristan, province Laghman.

In the first region on the Afghan side of the border (province Paktivia) it grows in a relatively dense forest of *Abies spectabilis* (D. Don) Spach together with such species as *Pinus griffithii* McClelland, *Cedrus deodara* (D. Don) G. Don, *Syringa afghanica* C. K. Schneider, *Viburnum cotinifolium* D. Don and from the genera *Spiraea* and *Berberis*. It appears on shaded north-facing limestone cliffs and rocks covered with a considerable layer of humus, at an elevation of about 3000 m. On the Pakistani side it grows between 2100 and 2700 m.

The second stand occurs about 180 km north of the first one, in middle parts of Darrah Rastyon, in Ali-shang valley, north-east of Kabul, at an elevation of 2900 m. Here *R. afghanicum* has been found in a forest of *Pinus gerardiana* Wall. and *P. griffithii* McClelland "on ledges and cervices on steep and rather inaccessible cliffs, south-east facing".

*R. afghanicum* is a poisonous shrub, dangerous to sheep.

References: 264, 268, 269, 281, 304, 305, 306, 353.

**16. *Rhododendron caucasicum* Pallas**

An evergreen, dense shrub 1 - 1.5 m tall, with elastic, procumbent and arching upwards shoots up to 2 (2.5) m long. The flowers are white or creamy with characteristic green spots on the ventral side of the corolla.

This is a Caucasian species having a range composed as it were of two parts close to each other. The first extends along the Greater Caucasus massif, starting from the northwestern end of the mountain belt all the way to the upper course of the river Samur in Dagestan and in western Azerbaydzhan S.S.R. The other part covers the belt of the Lesser Caucasus and the directly connected with it the Pontian Mts. (Anadolu Dağları) in north-eastern Anatolia. *R. caucasicum* is known here primarily from provinces of Çoruh, Kars, Erzurum and Rize, and furthest to the west it reaches Soğanlı pass in the eastern part of Trabzon and Kara-Kaya dağ near Bayburt in province of Gümüşane.

This is a high-mountain species, thermophillic but at the same time shade tolerant. It occurs in the understorey of the upper zones of beech-fir and beech-spruce forests, however, the best conditions are to be found in the subalpine stratum, in small crooked and open beech and birch forests. Further up, in the Alpine zone it forms a compact scrub and near the upper limit of its distribution at 2900 m it does not flower. It grows on acid (pH 3 - 4) peaty and moist soils, on various types of slopes, from precipitous to smooth ones, at almost all expositions, most commonly, however, on the northern one. It is rarely found on the southern exposition, since here the snow cover disappears quickly and the shrub gets frost bitten.

On the Caucasus, particularly on its western and central part it occurs massively over wide areas, and the total area of its thickets is estimated to be about 240,000 ha. Here the lowest located stands are at 1600 m and the highest ones at 3100 m. It behaves similarly in Anatolia, where as a rule it is distributed above 2000 m. Lowest stands were observed at 1800 m and the highest ones at 3000 m.

This is an ornamental shrub. In cultivation hybrid forms of it are in great use, particularly cv. 'Cunningham's White', used as stock for grafting.

References: 64(6), 103(7), 263, 310, 343, 347.

**17. *Rhododendron colletianum* Aitch. et Hemsl.**

An evergreen aromatic shrub, 1 - 2 (2.5) m tall, included in section *Polygonanthum* G. Don, closely related to the Himalayan species *R. anthopogon* D. Don.

A rare species though locally abundant and dominant. It grows only in eastern Afghanistan, in Nuristan and province Paktiva and in western Pakistan, in province of Chitral and in the northern part of Kurram Valley. It occurs in higher parts of the mountains, about the upper limit of the tree line, forming impenetrable thickets, either pure or mixed with *Juniperus communis* L. subsp. *nana* Syme with the participation of *Juniperus squamata* Buch.-Ham., *Lonicera asperifolia* (Decne.) Hook. f. et Thoms. and single individuals of *Picea smithiana* (Wall.) Boiss. Stands of *R. colletianum* are located in Afghanistan at elevations between 2500 and 3600 m, and in Pakistan between 3300 and 4000 (4300) m.

References: 264, 268, 269, 281, 304, 305, 306, 353.

**18. *Rhododendron luteum* Sweet**

Syn.: *R. flavum* G. Don, *Azalea pontica* L.

A strong erect suckering shrub 2.- 4 m tall, spreading widely and forming large clumps up to 6 m in diameter. It is a species very variable in shape, pubescence and colour of leaves. In Europe and in southwestern Asia it is the only deciduous *Rhododendron*. It is characterized by large, yellow or yellow-orange, very fragrant flowers, which develop before or simultaneously with the leaves.

The range of *R. luteum* is composed of two basic parts, a lowland one and a montane one. The former is in European U.S.S.R., in the Belorussian and Ukrainian Polese and the other in the Caucasus and northern Anatolia.

In Polese *R. luteum* grows primarily in pinewoods (*Pinus sylvestris* L.) or else in mixed forests or at its edges, and also in forest gaps and edges of peat. The single isolated stands of this species known in Poland, in southeast of the country, is associated with this part of the range. Besides *R. luteum* is known also from a few stands in Austria, in Jugoslavia, from the southeastern tip of the Alps.

The second part of the range corresponds to a large degree with the Euxine Province. Here *R. luteum* is a common species, particularly in western Caucasus. In the north, on the Black Sea, it reaches as far north as Novorossiysk and eastwards along the range of the Greater Caucasus to eastern Dagestan. In Anatolia *R. luteum* is relatively common in the east, and in the westerly direction becomes progressively less abundant. The continuous range reaches the western part of Kastamonu province. In the region of the Aegean Sea it occurs also in Çanakkale province and in Balikesir, and further westwards there is the only Greek stand of the species on Lésvos Island.

In the latter part of the range *R. luteum* occurs in the understorey and on edges of various types of forests (fir with spruce, pine with fir, pine with beech, pine), in sparse oak thickets (*Quercus petraea* (Mattuschka) Liebl. subsp. *iberica* (Stev.) Krassiln.) and in open meadows. In places the shrubs are strongly intertwined, dense and compact, and form thickets very difficult to penetrate.

*R. flavum* is a light requiring species but at the same time it is shade tolerant, having a large scale of ecological adaptability. It occurs on sandy as well as on clayey and peat soils (avoiding limestone soils), both dry and moist, but not in bogs. It is distributed almost from the sea shore itself (e.g. in Rize province) of Anatolia to an elevation of 2000 - 2200 m, but most commonly between 400 and 1800 m.

It is a valuable hardy ornamental shrub, cultivated since the end of the 18-th c. It is used extensively in breeding work. Its hybrids with North American species are known under the general name "Ghent Azaleas". These are represented by numerous forms of various flower colour, some also with double flowers.

References: 61, 64(6), 103(7), 198(1), 263, 280, 310, 313, 314, 316, 326, 347.

## 19. *Rhododendron ponticum* L.

This is a strong erect shrub or a small tree attaining a height of 6 - 8(10) m and a stem diameter of 30 - 40 cm. It blooms from the spring to the summer with purplish-pink flowers.

*R. ponticum* is differentiated into two subspecies. The type subsp. *ponticum* is considered belonging to the Euxine element and occurs along the Black Sea in western Caucasus, northern Anatolia, European Turkey and southwestern Bulgaria (only in the Strandsha Mts.). Besides, after a considerable disjunction, it is represented in central Lebanon from where a separate variety, var. *brachycarpum* Boiss., has been described. The range of the other subspecies, subsp. *baeticum* (Boiss. et Reuter) Hand.-Mazz. covers central and southern Portugal and southern Spain. Differences between these subspecies concern leaf dimensions and the degree of pubescence of the inflorescence axis. That these two parts of the range have been linked in the past is indicated by the discovery of fossil *R. ponticum* in Central Europe.

Being a mesophyllic species it grows best on fertile, limestone free, fresh or even moist soils, in conditions of moderate shade. In these conditions it attains largest dimensions and flowers abundantly. In the Black Sea region of its occurrence it is most common in the understorey of beech woods (*Fagetum orientale rhododendrosium*) together with such evergreen shrubs as *Laurocerasus officinalis* Roem., *Ilex colchica* Pojark., *Daphne pontica* L., *Ruscus aculeatus* L. and *Hedera helix* L. Sometimes it forms almost pure, impenetrable thickets together with various species of ferns. It occurs also in alder, hornbeam and chestnut forests and also in coniferous forests (*Abies nordmanniana* (Stev.) Spach, *Picea orientalis* (L.) Link) in which another species of *Rhododendron* (*R. luteum* Sweet) also participates (e.g. Merymana Forest in Trabzon province of Anatolia). Close to the upper limit of its vertical distribution (above 2000 m) it grows in the form of a low shrub with leaves almost half the size of those on lower locations.

*R. ponticum* forms hybrids with *Rhododendron caucasicum* Pall., referred to as *R x sochadze* Charadze et Davilianidze, known in Anatolia from Çoruh province and from Gruziya on the Caucasus above 1700 m elevation, usually in the upper subalpine zone. This hybrid forms sometimes a distinct narrow belt between thickets of the parental species.

In its vertical distribution *R. ponticum* is distributed from the sea shore (in practice from about 10 m) all the way to 2000 - 2100 m in Anatolia and 2200 m in the Caucasus, however, the optimal conditions for its growth are more or less between 300 and 1500 m. In Bulgaria, also in beech woods, it grows between 100 and 300 m and in Lebanon between 700 and 1500 m, here in pine woods (*Pinus pinea* L.).

*R. ponticum* was introduced into cultivation in the year 1763 and is used as an ornamental shrub. In some countries, as for example on the British Isles it is very common and goes wild readily.

References: 61, 64(6), 103(7), 163(3), 198(1), 263, 310, 314, 316, 347.

## 20. *Rhododendron smirnowii* Trautv.

This is a strong evergreen shrub with a rather loose habit, up to 4 m tall, and sometimes even taller. When in tree form it can even attain a height of 6 (8) m. It is characterized by brightly pink flowers and scarcely discernible calyx teeth about 1 mm long.

It is an Euxine species of a very limited range. Until recently it was considered to be an Anatolian endemic, where it grows in the mountains, particularly in Çoruh province and to a lesser extent in Rize province, primarily on Tiryal Dâgi and Şavval Tepe and near Artvin. However, in 1962 it was also discovered on the Caucasus, on several closely adjacent stands in southwestern Adzhariya.

*R. smirnowii* grows in moist, rocky mountain gorges, on igneous substratum, but also on limestone outcrops, on spruce (*Picea orientalis* (L.) Link) forest edges and even in beechwoods (e.g. in Adzhariya) forming thickets of its own or mixed with *Rhododendron ponticum* L. and *R. ungerii* Trautv. In Anatolia it occurs from an elevation of 850 m, reaching even 2300 m, but most commonly between 1600 and 2200 m, while at the northern limit of its range, in Adzhariya it has been found between 1050 and 1600 m. It probably forms hybrids with *R. ponticum* L.

It is an ornamental shrub introduced into cultivation in 1886 that is one year after it was discovered, but it proved of little horticultural value. It has been used in breeding work, where its considerable resistance to low temperature has been utilized.

References: 64(6), 103(7), 262, 263, 287.

### 21. *Rhododendron ungerii* Trautv.

An evergreen shrub or a small tree 6–7 m tall. This is a species closely related to *Rhododendron smirnowii* Trautv., with which it is frequently confused. It differs in having white to pale rose flowers and lanceolate sepals, up to 8 mm long.

*R. ungerii*, similarly as *R. smirnowii* Trautv. is a representative of the Euxine flora and its range coincides almost exactly with that of the other species. Only on the Caucasus, in Adzhariya *R. ungerii* extends somewhat further north. It grows in shady and moist mountain valleys, on slopes of various exposition, but particularly on northern and eastern ones (avoiding the southern one), in beech and spruce forests, and also in mixed forests together with other species of rhododendrons such as *R. ponticum* L., and *R. smirnowii* Trautv., with which it forms a common scrub. In Anatolia it occurs usually from 1000 to 2000 m and in Adzhariya it has been observed already from 600–700 m up to 1900 m. Compared to *R. smirnowii* Trautv. it is less mesophyllic.

It is an ornamental shrub. It has been introduced into cultivation at the same time as *R. smirnowii* Trautv., however, it is much less common in use. Similarly to *R. smirnowii* Trautv. it is resistant to low temperature.

References: 64(6), 103(7), 262, 263, 286.

## *Rhodothamnus* Reichb.

### 22. *Rhodothamnus sessilifolius* P. H. Davis

An evergreen shrublet up to 10 cm tall with thin twigs projecting upwards from the base itself of a stolon. It is one of the rarest species in the woody flora of southwestern Asia, known so far from only two stands near Murgul (province of Çoruh) in the mountains on northeastern Anatolia. It grows there above the tree line, on steep moist banks and on ledges of shady igneous cliffs, at an elevation of 2150–2400 m. It has been discovered only in 1957 and described in 1962.

The genus *Rhodothamnus* is represented by only two species. The other species, *Rhodothamnus chamaecistus* (L.) Reichb. occurs about 2000 km from the stands of *R. sessilifolius* in Europe, in the eastern Alps in Austria, West Germany, Italia and Jugoslavia. As distinct from *R. sessilifolius* it grows in crevices of calcareous rocks between 1000 and 2000 m elevation.

References: 64(6), 284, 355.

## *Vaccinium* L.

### 23. *Vaccinium arctostaphylos* L.

An erect shrub 4 m tall, usually, however, no taller than 1.5–2 m. It is characterized by large, 9 cm long leaves, which in the autumn period become bright red in colour.

It is an Euxine species with a range composed of two parts. The major part of the range extends along

the Black Sea from the southwestern Bulgaria (Strandsha Mts.), through European and Asiatic Turkey to the Caucasus, where in the north it attains 44° Latitude N. In western Anatolia *V. arctostaphylos* occurs also in province of Balıkesir (Erdek) and in province of Bursa (Ulu Dağ), and in the south it only sporadically extends below 40° Lat. N. On the Caucasus it enters well inland along the Greater Caucasus to western Azerbaydzhan. The other, much smaller, part of the range is located on the Caspian Sea covering Lenkoran (USSR) and the Iranian province Gilan. In that region stands are much less common. Here *V. arctostaphylos* attains the southern limit of its distribution at about 38°40' Lat. N.

It is a mesophyllic species, in the Euxine part of its range growing in the understorey of open beechwoods (*Fagus orientalis* Lipsky), fir (*Abies nordmanniana* (Stev.) Spach), spruce (*Picea orientalis* (L.) Link) or mixed forests, and less commonly in oak and chestnut forests. At higher elevations, particularly in the Caucasus, *V. arctostaphylos* enters also birch and pine forests, and above the tree limit it can form its own extensive thickets. In its vertical distribution it occurs from the sea coast to about 2400 m, most commonly, however, between 500 and 2000 m. In the Hyrcanian part of its range, in the Caspian Sea it is known primarily from beechwoods between 750 and 1300 m, sometimes entering thickets together with *Ilex spinigera* (Loes.) Loes.

Black berries of *V. arctostaphylos* are edible and in taste resemble those of *V. myrtillus* L. Leaves contain about 12–13% of tannins, and can be used for tanning skins and also as a tea substitute.

References: 9, 64(6), 103(7), 310, 353.

#### 24. *Vaccinium myrtillus* L.

A small shrub, 50–60 cm tall, occasionally taller (up to 1 m), with sharply-angled bright-green shoots.

This is a Boreal, Euro-Asiatic species with a range largely concurrent with that of *Pinus sylvestris* L. In the north it attains the Arctic Tundra. It is common in western Siberia and almost throughout Europe except for its most southerly parts. On the Balkan peninsula, the southernmost stands reach Greece where they are infrequent and widely scattered. It reaches here southern Thessalia to Mt. Pilion.

In southwestern Asia *V. myrtillus* grows only in northern Anatolia and on the Caucasus. In Anatolia it is more common only in the east from Ordu province to the USSR border. Besides isolated stands are also known from such mountains as Kaz Dāgi in Balıkesir province, Ulu Dağ in Bursa province and Ilgaz Dağları in Kastamonu province. On the other hand, on the Caucasus it is widely distributed almost throughout the belt of the Greater and Lesser Caucasus.

*V. myrtillus* is a typical component of the understorey in coniferous forests, particularly of pine and of mixed pine-oak forests, as well as in acidophyllic deciduous forest. It has very small trophic requirements and grows on acidic sandy and sandy-clayey soils. In the northern part of its range it occurs primarily in the lowlands, however, the further one moves in the southerly direction it appears in the mountains, even at quite high elevations. In Europe, in the Alps it attains up to 2960 m, and in Greece up to 2100–2200 m. In Anatolia the lowest located stands are found in the west at 1100 m and the highest in the east at 2700 m. Vertical range of *V. myrtillus* in the Caucasus covers elevations from 1800 m to 2750 m.

Fruit of *V. myrtillus*, juicy blue berries, about 8 mm in diameter are edible, very tasty and rich in vitamins. In countries where the species is common, they are used for consumption, both fresh and in the form of confitures or juices. They are also used in medicine.

References: 64(6), 103(7), 222, 316.

#### 25. *Vaccinium uliginosum* L.

An erect rhizomatous shrub 50–100 cm tall with bluish-green coriaceous leaves 5–38 mm long with entire margins.

This is a circumpolar species widely distributed in the Arctic, Boreal and Temperate regions of Eurasia

and North America. The most northerly stands attain 75–78° Lat. N., and the most southerly stands about 40° Lat. N. It grows in the lowlands as well as high in the mountains, on peats, in mossy and boggy coniferous forests and on moist Alpine meadows, on mountain rubbles and on rocks.

On the Balkan peninsula, in the south, *V. uliginosum* is known also from southwestern Bulgaria (Pirin), from Yugoslav and Greek Macedonia, and from northwestern Albania; it is absent from European Turkey. On the other hand, in southwestern Asia greater agglomerations of stands are to be found in southwestern Transcaucasus (2000–2400 m) and in northeastern Anatolia (1700–3000 m). The most westerly stands have been reported from Giresun province. Completely isolated from this centre of occurrence, as well as from the nearest European stands *V. uliginosum* can also be found in the upper reaches of Ulu Dağ mountain massif in province Bursa (NW Anatolia).

*V. uliginosum* is a polymorphic species and as result several subspecies have been recognized within it, which are sometimes treated as independent taxa. Specimens from the Caucasus and Anatolia high mountain stands are characterized by small height (ca 20 cm) and small leaves, which characters make it look similar to subsp. *microphylla* Lange, a subspecies occurring in the Arctic and in the mountains of Europe.

Fruit of *V. uliginosum* are edible and willingly collected by the local population for consumption, particularly in the northern and eastern parts of the range.

References: 64(6), 103(7), 222, 312, 316.

## *Hamamelidaceae*

### *Parrotiopsis* C. K. Schneider (monotypic genus)

#### 26. *Parrotiopsis jacquemontiana* (Decne.) Rehd.

Syn.: *Parrotia jacquemontiana* Decne.

A strong erect shrub, resembling hazel in habit or sometimes a small tree 5–6 m tall. *Parrotiopsis* is a monotypic genus, which frequently, particularly in older works, was included in the genus *Parrotia* C. A. Mey. Differences between these two genera are small. They concern primarily the number of stamens, length of filaments and the method of anther dehiscence. On the other hand, *Parrotiopsis* is closely related to the North American genus *Fothergilla* L.

The range of *P. jacquemontiana* covers almost the whole Kashmir and northern Pakistan. Beyond that region it is also found in eastern Afghanistan (Nuristan) where it is, however, very rare, and in northwestern India, in Chamba province. In the north, in the Pakistani province of Swat it attains Latitude 36° N, while in the south the limit of its occurrence is marked by the Riva valley in Chamba, more or less at 32°30' N. The range is a compact one, outliers occurring only in the western part of the Kurram Valley near the Pakistan–Afghanistan border.

*P. jacquemontiana* occurs in open dry regions, on lower reaches of mountain slopes, in thicket communities but also as an understorey in sparse degraded *Cedrus deodara* (D. Don) G. Don forests. As a rule it grows gregariously to a large extent restricting the growth of other shrubs and also of herbaceous plant. It can also hinder the natural regeneration of cedars. Altitudinally it can be found between 1100 and 2900 m, though more between 1600 and 2500 m.

Flexible twigs of *P. jacquemontiana* are used by natives for basket weaving and are employed in the construction of rope bridges hanging over mountain rivers. Its strong wood has various household uses.

References: 30, 31, 135, 239.

## Leguminosae

### *Adenocarpus* DC.

#### 27. *Adenocarpus complicatus* (L.) Gay

Syn.: *A. graecus* Grisebach, *A. divaricatus* (L'Hérit) Bolss.

This is an erect shrub, usually not taller than 2 m, more rarely attaining 4 m, very variable in the degree of pubescence of shoots, leaves and flowers; on the basis of this character 3 subspecies have been recognized within it, the geographic distribution of which is insufficiently clear, yet.

The range of *A. complicatus* is split into two parts. It is more common in southwestern Europe, where it occurs in Portugal, western Spain, in western and southern France and also in central and southern Italy including Sicilia. With this part of the range are associated stands in Madeira and in northwestern Africa (Morocco, Algeria). The second part of the range, after a considerable gap, occurs in the eastern Mediterranean. On the Balkan peninsula *A. complicatus* is known only from northeastern Greece, from southern Macedonia. It grows also on some Greek islands such as Euboea, Lesbos, Chios and Ikaria. On the other hand, in southwestern Asia it is scattered in western and southern Anatolia, in western Syria and also in Lebanon.

*A. complicatus* occurs in open communities of shrubs along roadside escarpments, in valleys of dried out streams and also in sparse forests, at lower elevations in oak woods and at higher ones in pine woods (particularly *Pinus nigra* Arn. subsp. *pallasiana* (Lamb.) Holmboe), both under full insolation and in moderate shade. In the mountains, as the case for example in Kaz Daği (northwestern Anatolia) on the boundary between *Pinus nigra* Arn. and *Abies nordmanniana* (Stev.) Spach subsp. *equi-trojani* (Aschers. et Sint.) Coode et Cullen forests it grows sometimes in larger numbers, however, it does not attain larger dimensions and has its shoots prostrate along the slope. In its vertical distribution it occurs in Greece between 150 and 700 m elevation, and in Anatolia between 200 and 1400 m. In Lebanon it attains even 1500 m and in Morocco 1600 m.

References: 64(3), 163(2), 296.

### *Anagyris* L.

#### 28. *Anagyris foetida* L.

An erect, broadly bushy shrub, 1–3 m tall having a characteristically unpleasant odour (of leaves and shoots after squashing) and large, flat, pendulous pods up to 20 cm long and 2 cm wide with 2–6 violet seeds.

This is a circum-Mediterranean species, entering in the east deeply inland into southeastern Anatolia, northern Iraq and western Iran. In Europe its range extends from Portugal and Spain through France, Italy, Yugoslavia and Albania to Greece, the Aegean Islands and European Turkey (Gelibolu peninsula). Further eastwards it occurs along the western and southern coast of Anatolia, on Cyprus and in western Syria, Lebanon, Israel and Jordan. Single isolated stands are known also from the Sinai peninsula, from western Saudi Arabia and from Yemen. In North Africa the range of *A. foetida* includes Morocco, Algeria and Libya. A second species from the genus *Anagyris*, *A. latifolia* Brouss originates from the Canary Islands (Tenerife, Gran Canaria).

*A. foetida* occurs primarily singly in thickets or sparse deciduous forests, particularly in oakwoods on devastated land, on mountain slopes and on various types of marginal land, frequently on limestone rocks but also on clayey substratum, sand and even on coastal dunes. Generally speaking, it never forms larger agglomera-

tions. However, in Iraq (near Dohuk) as a result of destruction of natural communities by man *A. foetida* occurs in larger numbers forming a special association *Anagyretum foetidae*. This association is only of secondary character.

As regards the vertical distribution *A. foetida* grows in Anatolia almost from the very sea shores up to about 1000 m, usually, however, no further up than 500–600 m. On Cyprus, where it occurs quite often, particularly in the western part of the island in hedges on border of fields, it attains an elevation of 800–1000 m, while in Syria, on the Golan Heights it grows only up to 250 m. On the other hand, in Iran where *A. foetida* attains the southeastern limit of its range, more or less at 34° Lat. N and 46°20' Long. E., in the northern part of Zagros mountains (Kermanshah province) the species grows between 1000 and 1800 m elevation and in neighbouring Iraq between 500 and 1200 m (700–1300 m in the Jabal Sinjar). The most elevated stand has been reported from Yemen from 2800 m.

In view of the unpleasant smell and the toxic properties of the legumes and leaves, the shrub is unpalatable for animals and therefore can survive in intensively grazed regions where other species of shrubs have been eradicated. *A. foetida* proved useful in folk medicine and its medicinal properties have been known for centuries. Seeds are used as purgative and emetic.

References: 64(3), 151(1), 163(2), 228(3), 259(2), 275.

### *Anthyllis* L.

#### 29. *Anthyllis hermanniae* L.

A small, erect shrub, slender in habit, 50–80 cm tall, with thin, tortuose branches, the tips of which are somewhat spiny.

This is a Mediterranean species, which occurs most commonly in the east, on region adjacent to the Aegean Sea and Crete, southern Italy, Sicilia, Malta, Sardegna, Corse and even the Balearic Islands. On the Balkan peninsula it is known primarily from Greece and also from southern Albania, southwestern Jugoslavia (only in Montenegro near Cetinje) and from the Gelibolu peninsula in European Turkey. Furthest to the east it has been reported from the vicinity of Istanbul and Rodhos Is.

In southwestern Asia *A. hermanniae* is known only from western Anatolia, almost from the sea shore to an elevation of about 400 m. It grows commonly on almost all islands of the Aegean Sea where it has been found on Euboea at elevations up to 550 m and on Crete up to 600 m. Even higher up it has been found in Greece, in Attiki on Mt. Parnis up to 720 m, and the most elevated stands occur on Corse at 1600–1700 m.

*A. hermanniae* enters the phrygana and sparse maquis communities, where it accompanies such species as *Genista acanthoclada* DC., *Calicotome villosa* (Poir.) Link, *Globularia alypum* L., *Hypericum empetrifolium* Willd., and also *Thymelaea tartonraira* (L.) All. It enters also sparse pinewoods (*Pinus halepensis* Mill., *P. brutia* Ten.). It grows on very dry and insolated sites, on a stony or rocky substratum, and also in fissures of limestone rocks, on mountain slopes, on roadside escarpments and on devastated terrain near settlements.

References: 64(3), 198(1), 275, 341.

### *Calicotome* Link

#### 30. *Calicotome villosa* (Poiret) Link

Divaricately branched, very spiny shrub up to 3 m tall, with young twigs, leaves and pods densely villous.

This is a circum-Mediterranean species distributed throughout the coastal regions of countries of southern Europe (with the exception of Portugal), in North Africa – Morocco, Algeria, Tunisia and Libya, in western



and southern Anatolia, in Syria, Lebanon and Israel and also in the islands of the Mediterranean and Aegean Seas. In the eastern Mediterranean it reaches as far north as Kilyos in European Turkey, north of Istanbul at 41°15' N, and as far south as Jebel Sarab around Reshadiye in Jordan at 30°42' N.

*C. villosa* is a characteristic component of maquis and phrygana, and besides occurs also in sparse pine-woods (*Pinus halepensis* Mill. and *P. brutia* Ten.) and in semisteppe. It easily spreads after such communities are destroyed and it plays an important role in the succession leading to the regeneration of woody vegetation. Thanks to the very spiny shoots the shrub is eaten less by animals and therefore remains longer in regions that are intensively grazed.

It grows in dry and insolated places, usually on rocky ground. Basically it occurs as scattered single individuals, however, in places it occurs more abundantly. Such is the case on the Peloponnisos, near Izmir in Anatolia and also in Mediterranean Palestine. In the latter region it is the most common shrub, dominating in some communities.

*C. villosa* occurs almost from the sea shore itself and usually attains in Anatolia an elevation of 600–700 m though in the Amanus Mts. even up to 1120 m, on Cyprus to 1100 m, in Syria on the Golan Heights to 800–900 m and the most elevated stands are recorded from Lebanon at 1740 m.

References: 64(3), 151(1), 163(2), 259(2), 275, 297.

### *Ceratonia* L.

Until recently this genus was considered to be monotypic, however, in 1980 a second, new, species has been described, *Ceratonia oreothauma* Hillcoat, Lewis et Verdc. from the Arabian peninsula (Oman) and from the Somali Republic.

### 31. *Ceratonia siliqua* L.

This is a dioecious or polygamous, evergreen tree, 4–8 m tall, attaining in favourable conditions even 12 m and a stem diameter of 1 m. The crown of free standing trees is hemispherical up to 14 m in diameter, giving much shade due to a dense foliage. The flowering time is late summer and autumn (August – November) and fruits mature in September.

This is a species growing throughout the Mediterranean region, in many places, however, it is probably only under age long cultivation and naturalized, and this to such an extent that a discrimination between wild and introduced stands is today practically impossible. It is sometimes believed that its proper origin is in the eastern Mediterranean or possibly on the Arabian peninsula, where in the highlands of Yemen exceptionally old and large trees have been found.

The range of *C. siliqua* in southwestern Asia is restricted primarily to a relatively narrow, coastal belt in southern and western Anatolia, in western Syria, Lebanon and Israel. In this latter country, similarly as in neighbouring Jordan, isolated stands are known also from further inland and *C. siliqua* reaches here in the south to the driest regions of central Negev and Edom, more or less up to 29°41' of Latitude N.

Carob tree is common on Cyprus, Crete, and in southern Greece (Peloponnisos). It is also reported from some of the Aegean Islands. On the Balkan peninsula it reaches as far north as southern Albania. In northeast Africa it is known only from northern Cyrenaica. As a rule it occurs at low elevations, primarily up to 300–500 m, more rarely higher as in Turkey up to 600 m, on Cyprus up to 850 m and in Jordan (Petra) up to 1000 m.

*C. siliqua* belongs to the most termophyllic trees in the Mediterranean. It grows on dry, open, insolated locations, on a stony, calcareous substratum, in rock fissures, on poor soils and also on terra rosa and on sand dunes. Besides such evergreen species as *Olea europaea* L., *Pistacia lentiscus* L., *Quercus coccifera* L.,

*Myrtus communis* L. or *Juniperus phoenicea* L. it is a characteristic component of maritime maquis or phrygana associations from the alliance *Oleo-Ceratonion* (in the west) or *Ceratonio-Pistacion lentisci* (in the east). As a rule it does not form greater aggregations, but grows singly, much dispersed, though in places, as for example in Palestine and on Cyprus it is one of the most abundant components of forests and Mediterranean thickets. Single trees in the form of larger or smaller components are frequently found in coastal olive groves, where preserved by man they are probably the last remnant of the forests taken over for cultivation or else they were deliberately planted there. In either case the utilitarian value of this species is responsible for its continued presence.

Ripe, brown pods of *C. siliqua* constitute an excellent fodder for cattle, pigs and even for horses. In periods of famine (during wars) they were used as food for people. They were also used in medicine. In the dry state they contain 15% of water, up to 70% carbohydrates (including 50% of sugars), and about 6% of protein. A juice is being extracted from it and used for the preparation of alcoholic beverages. Roasted and powdered they can be used as a coffee substitute. Imported into the temperate zone they became a delicacy for children. From the seeds a valuable glue is being made for the paper and textile industries. Dry seeds used to serve as weights in the diamond trade – carat-weight (keration in Greek) corresponds to the weight of one seed. Bark of *C. siliqua* is rich in tannins and dyes, and the hard wood finds a use in the household and is also used as fuel. Furthermore, the carob tree has a honey producing and an ornamental value.

The cultivation of *C. siliqua* dates back to ancient times and in some countries it is still important. For example, on Cyprus the production of pods in the years 1945–1957 was 34–70,000 tons per annum. Most of this crop is exported to such countries as Great Britain, Italy, West Germany, the Netherlands or Japan. In cultivation varieties more valuable than the wild ones are used, characterized by larger pods and a greater sugar content, or else by more abundant fructification.

References: 64(3), 151(1), 163(2), 254, 283, 308, 309, 318, 345.

### *Cytisopsis* Jaub. et Spach

#### 32. *Cytisopsis pseudocytisus* (Boiss.) Fertig

Syn.: *C. dorycnifolia* Jaub. et Spach.

This is a small, diffuse shrub, 60–100 cm tall, with a silky-silvery indumentum (shoots, leaves, pods), ascending or procumbent.

This is an endemic species for southwestern Asia, belonging to the eastern Mediterranean floristic element. It is represented by two subspecies: subsp. *pseudocytisus* and subsp. *reeseana* (Guyot) Browicz.

The range of *C. pseudocytisus* has a disjunctive character, being composed of two parts separated from each other by about 400 km. The eastern part of the range where only subsp. *pseudocytisus* grows extends as a relatively narrow belt along the sea shore from northern Israel, through Lebanon and Syria to southern Anatolia (provinces of Hatay, Adana and İçel). The latter western part of the range covers four provinces of southwestern Anatolia: Uşak, Denizli, Muğla, Burdur. Here both subspecies occur.

*C. pseudocytisus* occurs in exposed areas, dry and insolated, both on limestone and sandstone substratum, on rocks and heavy clays, in steppe communities with *Juniperus*, in various types of scrub, in oak thickets and in sparse pine forests (*Pinus brutia* Ten., *P. halepensis* Mill.).

It appears that subsp. *reeseana* attains in the vertical distribution much higher elevations, up to 1900 - 2000 m., though it has been also found very low, even at 200 m (Anatolia – Marmaris district). This subspecies is characterized by smaller flowers and probably with poorer growth. In the eastern part of the range of *C. pseudocytisus* it is reported from the highest elevation on Mts. Amanus at 1350 m, up to 700 m in Lebanon and up to 600 m in Syria. In Israel it grows on Mt. Carmel at 100 m.

References: 64(3), 163(2), 259(2), 275.

## *Genista* L.

### 33. *Genista acanthoclada* DC.

An erect or sprawling, spiny shrub, 30 - 100 cm tall with a very variable habit, usually cushion-like. During flowering, which occurs in April and May, it is covered with such a multitude of brightly yellow flowers that they completely conceal the small leaves and numerous densely set shoots.

This is the most common species from the genus *Genista* in eastern Mediterranean, a characteristic component of phrygana and low, sparse maquis, particularly on rocky limestone slopes. It occurs also in sparse pinewoods (*Pinus nigra* Arn., *P. halepensis* Mill., *P. brutia* Ten.). In Europe it is known only from Greece, and particularly from its southeastern part, from Crete, and the Aegean Islands. The range of *G. acanthoclada* in southwestern Asia is restricted to western and southern Anatolia, western Syria and Lebanon, but it is absent from Cyprus. The most northerly stands occur in Greek Macedonia on Khalkidhiki peninsula and the southerly ones in Cyrenaica (Libya) in North Africa.

*G. acanthoclada* grows primarily on dry, exposed and strongly insolated sites, sometimes forming dense, spiny thickets. It usually occurs on lower elevations, almost from the sea shore to 500 - 600 m and sometimes even to 800 (1000) m.

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

## *Podocytisus* Boiss. et Heldr. (monotypic genus)

### 34. *Podocytisus caramanicus* Boiss. et Heldr.

An erect, diffuse shrub up to 2 m tall with virgate branches. It is characterized by original, flat, winged pods, with the valves thin and papery.

This is an eastern Mediterranean species with a disjunctive range composed of two basic parts. The first one lies in Europe on the Balkan peninsula, where *P. caramanicus* occurs in Greece, southern Albania and in Yugoslav Macedonia\*. In the latter country it is scattered in the valley of the river Vardar and in the valleys of its tributaries, reaching in the north as far as 42°12' Lat. N. The second part of the range is in southwestern Asia, covering the southern provinces of Anatolia - Konya, Içel, Adana and Hatay.

*P. caramanicus* is a thermo-, xero- and heliophyllic species occurring in sparse oakwoods or in thickets of the shiblyak type and in abandoned vineyards, on dry slopes, particularly in river valleys. In Yugoslavia it grows between 100 and 500 (700) m, in Anatolia between 300 and 1000 m, in Greece between 400 and 1300 m. The most elevated stand has been found in northern Greece, in Ipiros on Mt. Smolika at 1300 - 1600 m.

References: 64(3), 78, 275, 290, 294.

## *Sapindaceae*

### *Dodonea* Miller

### 35. *Dodonea viscosa* (L.) Jacq.

This is a fast growing erect evergreen shrub, 3 - 5 m tall and in favourable conditions occasionally even taller. As a tropic species it is widely distributed in Australia, Southern and Central America, Africa, and in

\* Recently it has been found in southern Serbia, on a most northern stand for the whole range (E. Mayer, Acta Bot. Croat. 40: 233 - 238, 1981).

southeastern and eastern Asia. Most northern stands of it are to be found in USA, in Florida and central Arizona. It occurs also in Japan and in China.

In southwestern Asia at the northern limit of its range *D. viscosa* only occurs commonly in Pakistan. It can also be found in northeastern Afghanistan where its most northern stands occur in central Nuristan. In Iran *D. viscosa* is known only from the most southern Saharo-Sindian Region particularly in Baluchistan and the province of Lar (near Bandar' Abbas and on Qeshm Is.) and also from the province of Fars (only in Bushehr). Probably this last stand, as well as the stand on Shatt al'Arab in Iraq (Sida) and Iran (Abadan), are of artificial origin. Further south *D. viscosa* is distributed in the southern part of the Arabian peninsula where, as in Oman in the higher altitudes of the Jebel Akdhar, it is a common co-dominant shrub.

The altitudinal range of *D. viscosa* occurs in Iran between 50 m (Qeshm Is.) and 1200 m, most commonly, however, not exceeding 600-700 m. In Afghanistan this shrub grows in the province of Khost as high up as 1400 m, while in Pakistan it has been known in Baluchistan from height of 1900 m, and in Makran province even at 2400 - 2900 m.

*D. viscosa* grows primarily in the warmest and driest regions, on bare soils being a component of scrub vegetation. In Iran it has been found in communities together with such species as *Amygdalus eburnea* Spach, *Pistacia atlantica* Desf. and *Periploca aphylla* Decne., and in Pakistan it occurs in forests of *Olea ferruginea* Royle. Locally, it is common and dominant.

The content of a viscid resin makes the shrub sensitive to fire. Local population value it as fire wood, and it is also used as an ornamental shrub for hedge planting.

References: 30, 179, 260, 338.

### *Stocksia* Benth. (monotypic genus)

#### 36. *Stocksia brahuica* Benth.

A strong, erect, spiny shrub, 2 - 4 m tall. Its fruits are characteristically inflated. The chartaceous capsules of 2.5 - 3 cm in diameter are reddish-pink in colour and remain on the branches long after leaf fall.

This is an endemic species for southwestern Asia, restricted in its distribution to southeastern Iran, southern Afghanistan and southwestern Pakistan. Its altitudinal range lies between 550 and 1900 m most commonly, however, it occurs between 900 and 1600 m. *S. brahuica* grows in dry regions, on edges of deserts, in degraded steppe, on banks of dried-out streams and in dry inner valleys, on sandy and gravelly plains, between hills. It represents a group of characteristically tropical species occurring on the borderline between Irano-Turanian and Nubo-Sindian vegetation.

In places *S. brahuica* occurs quite abundantly and sometimes as for example in Iranian Baludschistan it can even be dominating shrub forming its own association, *Stocksia brahuica* - *Gymnocarpos decandrum* (between Bam and Zahedan). Besides *S. brahuica* enters sometimes *Tamarix* and *Artemisia herba-alba* Assoc.

References: 260, 266, 307, 321, 338.

### *Styracaceae*

#### *Styrax* L.

#### 37. *Styrax officinalis* L.

A strong erect shrub 2 - 5 m tall, sometimes a small tree up to 7 m tall. It is the only representative of the genus *Styrax* and family *Styracaceae* in southwestern Asia and Europe.

It is an eastern Mediterranean species. The major part of its range covers western and southern Anatolia,

from Samsun province. *S. officinalis* occurs also in western Syria and in Lebanon, in northwestern Jordan and in Israel, reaching in the latter country as far south as the Judean Mts. It is common on Cyprus particularly in its western part, and also on Rodhos Is.

The stands in Europe are restricted primarily to Turkey (Gelibolu peninsula), Crete, some of the Aegean Islands and to Greece (Peloponnisos, Attiki, Fokis, Thessalia and Macedonia). Isolated stands are also known from southern France, central and western Italy, Jugoslavia (Dalmatia) and from Albania. However, whether the stands in France and Italy are native is questionable. Most probably the shrub was introduced there in Antiquity or during the Crusades.

Most surprising of all is the occurrence of *S. officinalis* in North America, where in California it has been represented by two varieties: var. *californica* (Torrey) Rehd. and var. *fulvescens* (Eastwood) Munz. They differ from the typical Mediterranean var. *officinalis* by their few-flowered racemes, thickened pedicels and longer staminal tube. A disjunction of such magnitude makes it still necessary to keep the question open as to whether these North American varieties belong to *S. officinalis*.

*S. officinalis* is a characteristic component of high maquis, a representative of the group of deciduous shrubs. Besides this it enters various thermophyllic and sparse forest associations of oaks and pines. Sometimes it can be a co-dominant species or even form monospecific communities as is the case on the Golan Heights in Syria. It grows on stony or rocky calcareous substratum (pH 6.8 - 8.5).

Altitudinally *S. officinalis* extends almost from the seashore to 1500 m in Turkey, although most frequently it can be found between 100 and 600 (1000) m. The most elevated stands occur in the Taurus and Amanus Mts. and the lowest on the Marmara and Aegean Seas. In Lebanon it occurs even higher than in Turkey attaining 1600 m in *Juniperus excelsa* Bieb. and *Abies cilicica* (Ant. et Kotschy) Carr. forests while on Cyprus, in the Troödos Mts. it has been found up to 1500 - 1600 m. On the other hand, in Europe it occurs primarily at 600 - 700 m and only above 1000 m on Mt. Olympus.

In Palestine *S. officinalis* has been treated as a holy tree (the staff of Moses). The resinous balsam used in Antiquity for the manufacture of perfumes and incense and referred to as "Storax" was, however, not from *S. officinalis* but from *Liquidambar orientalis* Mill.

References: 64(6), 163(3), 254, 259(3), 285, 298, 310, 320, 357.

## *Thymelaeaceae*

### *Daphne* L.

#### 38. *Daphne glomerata* Lam.

A small shrub, attaining 50 - 60 cm in height, but usually not taller than 25 cm, with hard persistent leaves agglomerated rosette-like on tips of vertically projecting shoots.

It is a Caucasian species. The shrub is widely distributed in the mountain regions throughout the Caucasus (it is absent from the Talish Mts.) and enters in the south to northeastern Anatolia, where along the Pontus Mts. it reaches in the westerly direction to province of Trabzon and Gümüşhane.

*D. glomerata* occurs primarily on subalpine or alpine meadows, on rocky slopes and on rocks. Frequently it grows together with *Vaccinium myrtillus* L. and also forms thickets of its own, as rule above 2000 m, up to 2700 m. Sometimes it occurs at lower elevations (down to 1750 m, rarely less), then usually occurring on edges of open pinewoods, in insolated places.

References: 103(6), 270.

### 39. *Daphne gnidioides* Jaub. et Spach.

An evergreen shrub up to 1.5 - 2 m tall with long stout branches uniformly leafy in the upper part. Being the vicariant species of the western Mediterranean *Daphne gnidium* L., which in the easterly directions enters Greece, it differs from it primarily in having clustered inflorescences while *D. gnidium* L. has paniculate. Besides it is closely related to *Daphne mucronata* Royle and *D. linearifolia* Hart.

In Europe *D. gnidioides* appears to be known from only one island, Astipalaia, belonging to the Kikladhes archipelago. The proper range, however, covers some islands of the southern Dodecanese and southwestern Anatolia, where it is most common in provinces of Aydin, Muğla and Antalya and is sporadic in province of İçel. Thus, the whole range lies in a narrow belt between 36° and 38° Lat. N.

*D. gnidioides* grows on very rocky, limestone sites on dry insolated places in communities of a sparse, low maquis, in which the dominating element is *Quercus coccifera* L., and besides it occurs in open *Pinus brutia* Ten. forests. The vertical distribution of this species extends from the seashore (e.g. on the Marmaris peninsula in province of Muğla, or in the vicinity of Kaş in province of Antalya) to about 1000 (1200) m, however, most of the stands are not above 600 - 700 m.

References: 270.

### 40. *Daphne linearifolia* Hart

Evergreen, erect, spindly shrub 1 - 2 m tall with very characteristic linear or lanceolate leaves up to 7 cm long and only up to 3 mm wide.

This is an endemic species for Jordan. It occurs here only in Edom, south of the Dead Sea, on a very restricted, mountain region, more or less between Tafila and Petra, where locally it is quite frequent. In that region annual precipitation is 200 to 300 mm. *D. linearifolia* grows on sandstone or limestone outcrops and on loose sand, in valley bottoms, in hilly canyons and on western slopes of mountain ranges at an elevation from 750 to 1500 (1600) m. It enters open forests of *Quercus coccifera* L., *Juniperus phoenicea* L. or *Cupressus sempervirens* L., together with such species of trees and shrubs as *Pistacia atlantica* Desf., *Rhamnus palaestinus* Boiss., *Osyris alba* L., *Sarcopoterium spinosum* (L.) Spach, *Lonicera etrusca* Santi, *Ephedra fragilis* Desf. subsp. *campylopoda* (C. A. Mey.) Aschers. et Graebn., *Calicotome villosa* (Poir.) Link and *Crataegus aronia* (L.) Bosc.

*D. linearifolia* is closely related to *Daphne gnidioides* Jaub. et Spach from southwestern Anatolia and also to *D. mucronata* Royle from southeastern Anatolia, Iraq, Iran, Afghanistan and Pakistan. Its range is located as it were at mid-point between these ranges of these two related species. It is considered to be a relict of the Mediterranean arboreal flora, which entered much further south to Palestine and further onto the Sinai peninsula during a humid period of the Pleistocene.

References: 259(2), 270.

### 41. *Daphne mezereum* L.

Incl. *D. rechingeri* Wendelbo

This is an erect, poorly branched shrub 1 - 1.5 (2) m tall with pinkish-purple, very fragrant flowers, blossoming before the development of leaves. This is the only representative of the genus *Daphne* in south-west Asia with deciduous leaves.

It is an European - West Siberian species. It covers with its range almost the whole Europe except for the most extremely northern and southern regions, and also western Siberia where isolated stands reach as far east as Lake Baikal. In the north, in Scandinavia, it reaches up to 70° Lat. N. Besides it occurs on the Caucasus, particularly in its western part, in northeastern Anatolia and in northern Iran. This shrub requires rich and moist soils and more or less shaded stands, particularly in the lowlands.

On the Balkan peninsula the stands of *D. mezereum* become increasingly scarce and located higher up as one moves in the southerly direction. From Greece the species is known only from a few stands, the southernmost one being on Mt. Olympus. *D. mezereum* has been reported from the Peloponnisos, however, accurate and reliable data on this is lacking.

In Anatolia *D. mezereum* grows in provinces of Giresun, Gümüşhane, Erzurum, Rize and Kars rather rarely and primarily in the subalpine stratum at 1600 to 2700 m, while in Iran it grows at elevation of 500–1500 m in beech and oak forests. On the Caucasus it appears in the upper zone of spruce and fir forests and in subalpine, crooked and low forests and thickets. In Europe, in Albania it occurs between 800 and 1800 m elevation, in Bulgaria between 1100 and 2000 m, in Yugoslav Macedonia it has been even found at 2200 to 2300 m. The most elevated stands are known from the Alps, from 2400 - 2750 m.

This is a strongly poisonous shrub, its fruits and bark being used in folk medicine. It is valued for its early flowering and therefore is planted in small gardens for decorative purposes.

References: 103(6), 270, 316, 327, 352.

#### 42. *Daphne mucronata* Royle

Syn.: *D. angustifolia* C. Koch, *D. acuminata* Boiss. et Hohen.

An evergreen erect shrub up to 2,5(3) m tall with numerous very wiry stems, with elliptic-oblong or lanceolate leaves 6 - 7 cm long and about 1 cm wide. Compared with other closely related species (*Daphne gnidioides* Jaub. et Spach) from southwestern Asia it is characterized by a more easterly and a more elongate range.

*D. mucronata* occurs in province of Bitlis on the western side of lake Van, about 42° Lat. E. (in southeastern Anatolia) and from northeastern Iraq almost throughout the western and southern Iran, all the way to northeastern Afghanistan, western and northern Pakistan, Kashmir and northwestern India, reaching probably not further than the valley of the river Yamuna at about 78° Lat. E. Furthest to the north there are stands in southern Caucasus, i.e. in the Nakhichevan A.S.S.R. Within that range there is only a small disjunction in the distinctly dry regions of Pakistani Makran province.

In Anatolia, on the extreme westerly stands, in severe climatic conditions *D. mucronata* attains usually no more than 1 m in height and grows in crevices of limestone rocks and on dry banks, more or less between 1000 and 2200 m (in Iraq between 900 and 2400 (2800) m). In Iran it is already a common shrub, particularly in forest-steppe communities, in which the main component is either *Quercus brantii* Lindl., *Juniperus excelsa* Bieb. or *Pistacia atlantica* Desf, and various species from the genus *Amygdalus*. It is known also in more eastern regions from steppe communities of *Artemisia herba-alba* Assoc. In strongly degraded forests or thickets it is avoided by grazing animal due to its poisonous properties and as a result becomes the dominant plant. In its vertical distribution it occurs in Iran between (1400) 1600 and 2800 m. The most elevated stand has been reported from province of Kerman, from Mt. Shah-Kuh at 3200 m (Iran). In Pakistan *D. mucronata* is a common shrub along river banks from 800 to 3000 m and in province Kurram even 3300 m.

*D. mucronata* is locally, particularly in the eastern part of its range, used by the local population. Leaves and the bark find a use in folk medicine, soft, white and mottled wood is used for charcoal for gunpowder and the fruits for the tanning of skins and production of alcohol.

References: 30, 103(6), 179, 270, 319, 327.

#### 43. *Daphne oleoides* Schreber

An evergreen much-branched dwarf shrub up to 50 cm tall, rarely somewhat taller, with tough and leathery leaves and white or creamy flowers in terminal clusters. This is a very variable species in terms of the degree of pubescence of stems, leaves and hypanthium, in the size and colour of leaves and in their density on the stems, as well as in the length of the hypanthium and the size and shape of the sepals. In connection with this several varieties and forms have been recognized the systematic value of which and chorology are insufficiently

known yet. Possibly these forms represent only smaller or greater populations of a local character, distributed in a mosaic fashion. They have been frequently treated as separate taxa such as *Daphne buxifolia* Vahl., *D. glandulosa* Bertol., *D. kurdica* Bornm., *D. euboica* Rech. f., *D. transcaucasica* Pobed. or *D. baksanica* Pobed.

*D. oleoides* is a Mediterranean montane species. It occurs almost throughout southern Europe (except for Portugal, France and Turkey) and also in northwestern Africa, in Anatolia and in western Syria, Lebanon, on the southern Caucasus and in western Iran. Besides it has also been reported from Cyprus, but newer reports are lacking which would confirm its occurrence on that island. From Iran, from province of Kermanshah a separate, geographically distinct subspecies is reported, subsp. *kurdica* (Bornm.) Bornm., the relation of which to the type species and the closely related and cohabiting species *Daphne stapfii* Bornm. et Kreissler requires a critical examination.

Stands of *D. oleoides* throughout the range are more or less widely scattered, which is associated with the occurrence of this species in major mountain massifs and particularly in their higher reaches. In Anatolia *D. oleoides* is the most common representative of the genus *Daphne*, however, its distribution here is irregular. A greater agglomeration of stands in the Taurus Mts. in the south is connected with northern stands in Anatoli Dağları (Pontus Mts.) through central parts of the country, along the so-called Anatolian Diagonal.

*D. oleoides* is usually a calcicole shrub which grows in exposed and insolated places (or else in moderate shaded ones) particularly in the subalpine and alpine zone, on a rocky substratum, singly or in small groups or even in the form of thickets. It appears also in the forest zone, as a rule, however, above 1000 m elevation.

Usually it occurs above 1600 m. In Greece and Lebanon it attains 2200 m, on Crete 2300 m and in Anatolia even 2400 m. However, the most elevated stands have been noted in Erciyas Dağı in Anatolian province of Kayseri and Ala Dağları in province of Niğde at 3000 - 3200 m.

It is an ornamental shrub suited for rock gardens but rather rare in cultivation.

References: 103(6), 270, 327, 331.

#### 44. *Daphne pontica* L.

Includ.: *D. albowiana* G. Woron. and *D. libanotica* Mouterde

Slightly branched, erect shrub up to 1 m tall, only occasionally taller, with black fruits and evergreen, lustrous leaves clustered near the apex of the branches. Forms with red fruits and thinner (perhaps non-persistent) leaves occurring on the Caucasus, usually at higher locations, are treated as a separate species *Daphne albowiana* G. Woron. (*D. pontica* L. subsp. *haematocarpa* G. Woron.).

*D. pontica* is an Euxine species, distributed along the southern shores of the Black Sea, from southeastern Bulgaria (Strandsha Mts.) to the Caucasus. Beyond that region, about 500 - 900 km in the easterly direction *D. pontica* has been found twice in northern Iran, in province Gilan and Mazandaran. It grows in the understorey of broadleaf forests (beech and oak), mixed forests and also in coniferous ones, on moist, humus-rich soils, in places moderately shaded and near the upper limit of its distribution also in the open ones, singly or in groups. It appears also in *Rhododendron ponticum* L. thickets.

In Anatolia stands of *D. pontica* are distributed from the coastline (from 20 - 50 m) up to 2100 - 2200 m elevation (Ala Däg in Bolu province or in Ilgaz Dağları in Kastamonu province). The highest stand was found in Iran on the northern slopes of Central Elburs at 2400 m.

*Daphne libanotica* Mouterde described from Lebanon and occurring also in Syria is scarcely distinguishable from *D. pontica*, and thus it appears that it should be included in that species as a variety (shorter hypanthium, somewhat smaller leaves). Thus the disjunction which in this case would become manifest is of the same nature as the disjunction in the range of *Rhododendron ponticum* L. (var. *ponticum* on the Black Sea and var. *brachycarpum* Boiss. in Lebanon).

References: 61, 62, 103(6), 161, 163(2), 270, 328.



**45. *Daphne sericea* Vahl.**

Syn.: *D. collina* Sm., *D. vahlII* Keissler

An evergreen, erect, much-branched shrub, 60 - 100 cm tall, occasionally taller (1.5 m), widely outgrowing, sometimes suckering, with leaves up to 5 cm long, shiny green with appressed hairs beneath and with deep rose, very fragrant flowers. It is closely related to *Daphne pseudosericea* Pobed. occurring on the Caucasus which differs primarily by its white-dotted upper leaf surface, larger flowers with a narrow hypanthium and with anthers concealed in the throat. Possibly this taxon should be included in *D. sericea* in the rank of subspecies.

*D. sericea* is an eastern Mediterranean species. A major part of its range covers southern and northwestern Anatolia, northwestern Syria and Crete. Besides, isolated stands are known also from western Greece (Akarania), central Italy and Sicilia, but it is absent on the Aegean Islands, on Cyprus and in Lebanon. The shrub occurs primarily on dry and insolated places, on a rocky, friable, particularly limestone substratum, and also on terra rosa in a low scrub (an open maquis), singly or in clumps, sometimes, however, it is the dominant element of the community. Besides it appears on edges of open pinewoods (*Pinus brutia* Ten.).

*D. sericea* generally occupies lower located regions, usually from about 20 - 50 m to 800 - 1000 m. Higher stands are less common, up to about 1500 - 1600 m in the Taurus Mts. On the latter stands *D. sericea* is characterized by low growth and also by smaller leaves and in the vegetative condition it can be confused with *D. oleoides* Schreber. These two species as it were exclude each other in their vertical distribution.

References: 163(2), 270, 331.

**46. *Daphne stapfii* Bornm. et Keissler**

An erect, evergreen, much gnarled dwarf shrub, up to 1 m tall, loosely branched with very thick, glabrous, leaves, 1.5 to 3.5 cm long and 8-15 mm wide. This is a species closely related to *Daphne oleoides* Schreber and its range represents a sort of an extension of the range of the latter taxon in the easterly direction.

It is an Iranian endemite, so far relatively little known. It occurs in the mountains of southwestern and southern Iran. In the western part of its range it grows primarily in forest-steppe communities, the main component of which is *Quercus brantii* Lindl. together with *Cerasus microcarpa* (C. A. Mey.) Boiss., *Acer monspessulanum* L. subsp. *cinerascens* (Boiss.) Yalt. and *Rhamnus kurdicus* Boiss. et Hohen., while in the south in a steppe-scrub it grows together with the species from the genus *Pistacia* and *Amygdalus*. In its vertical distribution it occurs more or less from 1200 m to an elevation of 2900 m, the range of elevation increasing in the easterly direction.

References: 270, 327.

***Dendrostellera* Van Tiegh.**

**47. *Dendrostellera lessertii* (Wikstr.) Van Tiegh.**

Syn.: *Stellera lessertii* C. A. Mey., *Dendrostellera griffithii* (Meissn.) Van Tiegh., *D. persica* (Boiss.) Pobed., *D. ramoissima* Pobed., *D. glaucescens* Pobed.

A small delicate shrub 30-50 cm tall with thin, frail shoots, very variable in the degree of leaf pubescence and in the pigmentation of leaves and shoots.

It is an Irano-Turanian species of a wide range, the largest of all species from the genus *Dendrostellera*. The center of this range lies in Iran, where the greatest accumulation of stands has been reported. Both in westerly and in easterly direction from Iran the number of stands clearly declines. In the west, single

scattered stands are known from Syria and Iraq, but none from Anatolia. In the east *D. lessertii* enters Afghanistan and Pakistan, and in the north, Turkmeniya.

*D. lessertii* grows on dry exposed steppe regions, semi-deserts or deserts, on plains as well as on sandy and gravelly mountain slopes. In Iran it enters association from the class *Artemisietea herbae-albae*.

Altitudinal range of *D. lessertii* is reported to be from 100 m in northwestern Iran, Gilan province to above 2000 m in the mountains and even up to 3000 m in the Elburs Mts. In Afghanistan it grows between 700 and 2000 m. The lowest stands, below 100 m were found in Iraq and are probably also in Syria.

References: 277, 319, 327, 332.

### *Thymelaea* Miller

#### 48. *Thymelaea hirsuta* (L.) Endl.

An evergreen, erect shrub, 40–100 cm tall, under favourable conditions taller, up to 120–140 cm, and occasionally up to 2 m (Cyrenaica).

This is a circum-Mediterranean species, basically restricted to a relatively narrow coastal belt, more or less up to 50 km wide. In southern Portugal and in Morocco it occurs also along the Atlantic coast.

On the Balkan peninsula *T. hirsuta* is known only from Greece including Crete and the Aegean Islands. The only stand on the Black Sea was reported from European Turkey in mid-19-th century but this appears to be only of historical interest. In southwestern Asia *T. hirsuta* occurs on few stands in southern Anatolia, on Cyprus, in Lebanon, Jordan and Israel. In the latter country it is one of the most common shrubs scattered not only in Mediterranean lowlands but also in the Negev desert and in the Judean Mts. It is similarly common in northern Egypt and in Cyrenaica.

*T. hirsuta* grows in dry or hot regions, on steppe, semi-deserts or deserts. In view of its very small soil requirements, xeromorphic scaly, densely set leaves, a deep tap root about 150 cm long, resistance to dust in the air and salt in the soil and also extremely dry atmospheric and soil conditions it can occur on the most infertile and unfavourable for other woody plants conditions. Since it produces massive quantities of seeds, it disperses easily, forming both its own associations – *Thymelaeetum hirsutae* and entering other xerophytic, psammophytic and even semi-halophytic communities. Besides *T. hirsuta* easily enters ruderal communities along road-sides and fields.

This shrub occurs primarily in the coastal plains up to an elevation of 100–150 m, however, in southern Israel it appears at elevations up to 500–600 m and in southern Jordan (Wadi Musa) even up to 1470 m.

References: 163(2), 276, 349.

#### 49. *Thymelaea tartonraira* (L.) All.

This is an evergreen, polymorphic, erect or decumbent shrub up to 50 cm tall, with numerous short, densely ramifying shoots and a characteristic semi-globose habit.

It is a western Mediterranean species reaching in the east to southwestern Anatolia and Cyprus. It is absent from northeastern Africa. In Greece it is known primarily from the shores of the Aegean Islands and also from western Crete. In this part of the range the most northern stands are on Thasos and near Istanbul.

It appears in xerothermic, coastal thickets, particularly in phrygana but also in maquis and in sparse pine forests (*Pinus halepensis* Mill. and *P. brutia* Ten.), on stony, rocky (calcareous or serpentine), dry and sunny slopes.

In its vertical distribution *T. tartonraira* occurs in Anatolia between 10 and 300 m elevation, however,

in places it reaches much higher, above 500 m and even at 800–900 m (Samsun Dağı). On the Aegean Islands (Samos) it grows at an elevation of 700 m, on Euboea up to 800 m, on Crete up to 900 m and in Attiki usually below 500 m, but on Mt. Parnis up to 950–1100 m. In northwest Africa, Morocco, the most elevated stand is to be found at 1800 m.

References: 276, 349.

### *Wikstroemia* Endl.

#### 50. *Wikstroemia canescens* Meissn.

An erect, slender shrub, 30–100 cm tall, with small, yellowish-green flowers. In the region under investigation it is the only representative of the genus *Wikstroemia* numbering about 70 species occurring primarily in the subtropical and tropical regions of eastern and southeastern Asia, Australasia and the Hawaii Islands.

The range of *W. canescens* extends from southern China (provinces Kiangsi and Yunnan) in the east through Assam, Nepal and Kashmir to northern Pakistan and Afghanistan in the west. In the latter country it is a very rare species known only from Nuristan. Besides *W. canescens* has been reported also from Ceylon. In the western part of the range it grows in inner valleys, in the form of an understorey in fairly dry forests of *Cedrus deodara* (D. Don) G. Don, in places quite commonly, but is absent in more moist regions. Its altitudinal range lies between 1000 and 2750 m.

The bark of this shrub is fibrous and can be used for ropes and paper.

References: 319, 327.