
THE OAKS OF TURKEY

by I.C. Hedge and F. Yaltirik

The oaks are deciduous or evergreen trees, rarely shrubs; buds are spirally arranged, with imbricate scales, clustered at shoot apices. Leaves are subsessile or petiolate, penni-nerved, serrate, dentate, pinnatifid or lobed, lobes rounded without bristles at their tips or sharply pointed with aristate tips, rarely entire. Staminate flowers are borne in long slender pendulous catkins; calyx 4 - 7 partite; stamens 4 - 12. Pistillate flowers solitary or several on a very short to fairly elongate peduncle; ovary 3-4 celled. Fruit a nut (acorn), subglobose to oblong or cylindrical, surrounded at base or sometimes nearly enclosed by cup-shaped cupule covered outside with numerous imbricate scales; pericarp thin or thick, endocarp glabrous or pubescent; acorn maturing in one season or two years, sweet or bitter to taste.

For the phytogeographer, forester and ecologist, *Quercus* is an extremely important genus. It is one of the most problematical woody groups in the Turkish flora; widespread hybridization and introgression have much obscured specific limits. In the past, far too narrow a view was taken as to what constituted a species of oak; likewise, far too many ill-defined infra-specific taxa were recognized. It is only in recent years that a much broader specific concept has emerged and the futility realized of trying to attach formal names to the unending multiplicity of local variants, modifications and hybrids.

Many of the Turkish oak species are heavily grazed, cut for fuel or otherwise represented by deformed specimens. In some areas, especially the east, it is often difficult to find a fruiting specimen in anthropogenic steppe where *Quercus* scrub may be dominant. Original descriptions and type specimens (if they exist at all) are often far from ideal. Several problems of nomenclature and typification are still unresolved, particularly in the wide-ranging groups (e.g. the *petraea*, *robur* and *ithaburensis* complexes).

The indumentum in Turkish species of oak consists of simple and/or apparently stellate or dendroid hairs. The latter, however, are 'pseudo-' stellate or dendroid in that they comprise closely fasciculate simple hairs; to the best of our knowledge, truly stellate hairs, with a common basal stalk, are absent in our species. It requires careful anatomical examination to recognize the real structure of these hairs. Because of this, we have used the terms stellate and dendroid - as indeed they appear under low magnification - in our account.

The distribution maps are based on specimens we have seen; additional Turkish records are, in some species, given by Browicz (1978) whose very useful maps also cover adjacent countries.

In the species descriptions, the number of leaf veins and lobes refers to half leaves unless otherwise state; leaf dimensions and indumentum refer to leaves on non-sucker shoots.



***Quercus cerris* bark detail**-Spring Grove Cemetary, Cincinnati, Ohio
Photograph © Guy & Edith Sternberg



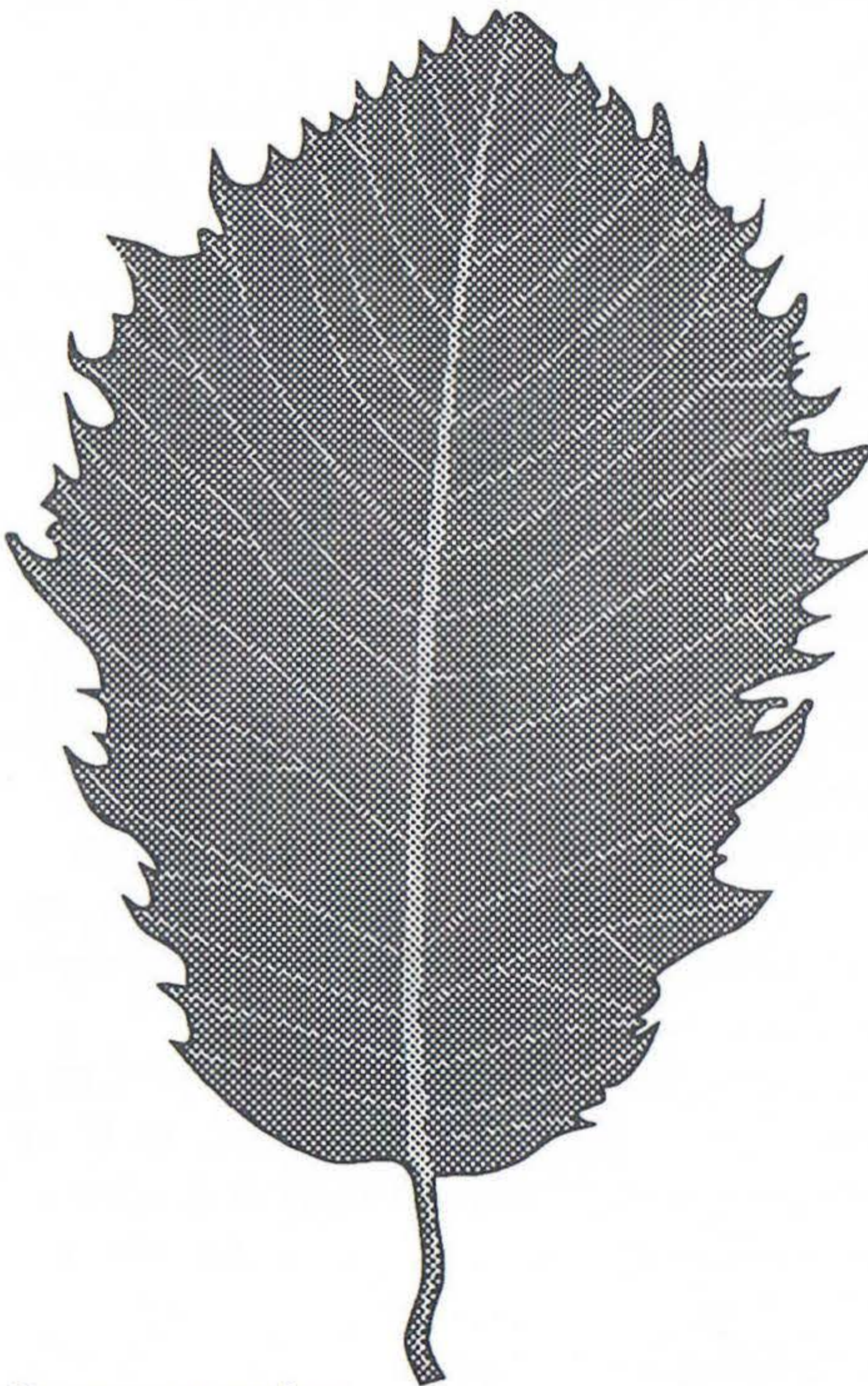
Guy Sternberg with *Quercus frainetto* -Spring Grove Cemetary, Cincinnati, Ohio
Photograph © Guy & Edith Sternberg

KEY TO TURKISH OAKS

1. Leaves thickly coriaceous, evergreen (Sect. *Ilex*)
 2. Leaves glabrous beneath when adult, usually spiny18. *Q. coccifera*
 2. Leaves tomentose beneath when adult, entire to spiny-serrate
 3. Fruit maturing in second year; cupule to c. 25 mm diameter; leaves waxy tomentose beneath; acorns sweet17. *Q. aucheri*
 3. Fruit maturing in one year; cupule 15 mm diameter; leaves not waxy tomentose beneath; acorns bitter16. *Q. ilex*
1. Leaves herbaceous, sometimes slightly coriaceous, deciduous or persisting over winter till spring
 4. Fruit maturing in second year; peduncle of mature fruit very sturdy (2.5 - 5 mm diameter); at least some cupule scales clearly spreading or deflexed (Sect. *Cerris*)
 5. Leaves mostly glabrous beneath, oblong to oblong-lanceolate
 6. Petioles 8 - 15 mm; leaves c. 7 - 12 x 2 - 3 cm14. *Q. libani*
 6. Petioles 2 - 6 mm; leaves 3 - 8 x 1.5 - 3 cm15. *Q. trojana*
 5. Leaves mostly densely tomentose beneath, ovate, ovate-oblong to oblong elliptic
 7. Leaf lobes mucronulate or scarcely so; buds usually with persistent stipules; cupule scales linear-subulate11. *Q. cerris*
 7. Leaf lobes aristate or mucronate; stipules deciduous; cupule scales linear-oblong or rhomboid
 8. Leaves mostly regularly serrate; cupule scales broadly rhomboid (S.E. Anatolia)13. *Q. brantii*
 8. Leaves with mostly irregular triangular acute lobes; cupule scales linear-oblong, woody at maturity (W. & S. Anatolia).....
.....12. *Q. ithaburensis* subsp. *macrolepis*
 4. Fruit maturing in one year; peduncle of mature fruit slender (1 - 3 mm diameter); cupule scales adpressed or spreading only near apex (Sect. *Quercus*)
 9. Leaves regularly serrate with up to 30 teeth1. *Q. pontica*
 9. Leaves lobed to entire, never serrate
 10. Leaves semi-evergreen, narrowly oblong to ovate, entire to crenate serrate8. *Q. infectoria*
 10. Leaves deciduous, mostly obovate, usually somewhat deeply lobed
 11. Peduncle prominent, to 12 cm
 12. Intercalary veins present; leaves usually deeply lobed; young shoots light brown to reddish brown2. *Q. robur*
 12. Intercalary veins absent; leaves with mostly shallow lobes; young shoots dark reddish brown3. *Q. hartwissiana*
 11. Peduncle absent, or to 5 mm
 13. Leaves densely stellate-pubescent beneath
 14. Stipules persistent on terminal buds; cupule scales loosely adpressed to somewhat spreading.....
.....4. *Q. macranthera* subsp. *sypirensis*
 14. Stipules deciduous; cupule scales adpressed
 15. Petiole 5 - 10 mm; leaf margin strongly undulate.....
.....9. *Q. pubescens*

- 15. Petiole 6 - 20 mm; leaf margin flat10. *Q. virgiliana*
- 13. Leaves with a relatively thin indumentum beneath
 - 16. Leaves sessile, auriculate, clustered at shoot apices.....5. *Q. frainetto*
 - 16. Leaves petiolate, distributed over shoots
 - 17. Intercalary veins well-developed; secondary leaf lobes present.....7. *Q. vulcanica*
 - 17. Intercalary veins absent or nearly so; secondary leaf lobes absent or present6. *Q. petraea*

Section *Quercus* -- White Oaks -- Leaves deciduous, or semi-evergreen, lobed, dentate or pinnatifid, lobes obtuse or acuminate. Fruit maturing in one year. Cupule scales short, imbricate, adpressed.



Quercus pontica

1. *Q. pontica*

Deciduous tall shrub, 3 - 5 m, with lax habit; young shoots glabrous, reddish-brown; buds ovoid, c. 1 cm, pubescent, scales with dark margins. Leaves mostly at ends of branches, elliptic to broadly elliptic, 10 - 26 x 5 - 13 cm, regularly serrate with 20 - 30 acute teeth, acute at apex, cuneate below; primary veins to c. 30, parallel, prominent; intercalary veins absent; upper surface glabrous, dark green, lower surface paler with scattered hairs on veins; petiole 1 - 2 cm. Fruits clustered on short stout peduncles at ends of branches. Cupule hemispherical, 15 - 20 mm diameter, brownish; scales triangular-ovate, acuminate with adpressed tips, pubescent; acorn 3/4 exserted.

Found in *Fagus orientalis*, *Picea orientalis*, *Rhododendron* forest, 800 - 1200 m.

Georgia, Euxine element. A relict species, varying little in its characteristics and quite distinct among all the other Turkish oaks on account of the very large, regularly serrate leaves with numerous prominent parallel veins.

2. *Q. robur*

Deciduous tree to c. 25 m, widespreading at top; young shoots glabrous or pubescent, light brown to reddish-brown; buds to 4 mm, glabrous, ciliate-margined or tomentose, reddish-brown. Leaves usually crowded at apex of shoots, obovate, to 20 x 9 cm, sessile and auriculate or stalked, with 5 - 8 entire, irregularly rounded, deep lobes, occasionally with secondary lobes; primary veins 5 - 9, intercalary veins also present; indumentum of dendroid-stellate hairs, dense beneath or occasionally sparse, greyish or yellowish-green, glabrous above or with some stellate hairs, rarely glabrous on both surfaces. Peduncle 4 - 12 cm. Cupule hemispherical, rarely cyathiform, 15 - 20 mm diameter, greyish-brown; scales concentric, concrescent except for triangular reddish apices, flat or convex; acorn 1/2 - 2/3 exserted.

A widespread and frequent species throughout Europe, Turkey and Caucasia whose taxonomy is still far from clear. We have provisionally recognized two subspecies in Turkey; the type subspecies in N.W. and central Anatolia and subsp. *pedunculiflora* in S.E. Anatolia. Menitsky used the latter name for all the Turkish material, but the fairly ample material available to us suggests that the S.E. Anatolian plant deserves some kind of recognition. We have also disagreed with Menitsky in that we interpret the range of the type subspecies as extending far beyond his limit of the Balkans.

1. Leaves subsessile, with a broad sinus; peduncle 4 - 10 cm, slender ...subsp. *robur*
1. Leaves with a distinct petiole to 2 cm, and with a narrow sinus; peduncle 2 - 6 cm, stoutsubsp. *pedunculiflora*

subsp. *robur* - Throughout most of Europe; Caucasia/Euro-Sib. element. Although most of the European trees of this taxon have almost glabrous adult leaves beneath, and most of the Balkan and Turkish ones have pubescent lower leaf surfaces, there are exceptions and the difference (apparently the only one) seems not to merit the subspecific or specific separation that has usually been accorded to them in the past. The status of subsp. *imeretina* and its relationship to the Turkish specimens needs further investigation.

subsp. *pedunculiflora* - Transcaucasus; Iran-Turkey element. Although we have circumscribed this subspecies as being restricted to east Anatolia and adjacent parts of the USSR, there are occasional specimens from within the range of the widespread subsp. *robur* (e.g. from Bulgaria) that have the longer petioles and leaf characters of subsp. *pedunculiflora*. Within Turkey, the two subspecies are generally easily distinguished on morphology and geography.

3. *Q. hartwissiana*

Deciduous columnar tree to 10 - 25 m, with narrow branching habit; young shoots glabrous, dark reddish-brown; buds 4 mm, ciliate-margined, reddish-brown. Leaves usually obovate, sometimes oblong-obovate, to 12 x 7 cm, subcordate, with 7 - 10 pairs of regular, shallowly rounded to acute lobes; primary veins 7 - 10, parallel, intercalary veins absent, rarely present; indumentum below of very small simple or stellate hairs when young, becoming glabrous or with hairs only on veins, pale green,



Quercus bartwissiana

glabrous above and dark green; petiole to 2 - 3 cm, glabrous. Peduncle to 7 cm,

glabrous. Cupule hemispherical, 15 - 20 mm diameter, greyish-brown; scales concentric, concrescent except for adpressed apices, convex; acorn 2/3 exserted. In broad-leaved deciduous (*Carpinus*, *Fagus*, *Fraxinus*, *Quercus*, *Alnus*) and mixed (*Pinus*, *Abies*) forest in damp places, 20 - 1300 m.

Bulgaria, W. Transcaucasia. A fairly distinctive Euxine species on account of the dark reddish, glabrous young shoots, obovate leaves with long petioles, and elongated fruiting peduncles. Related to *Q. robur* and *Q. petraea*.

4. *Q. macranthera* subsp. *sypirensis*

Deciduous small tree to 7 m; young shoots tomentose to becoming glabrous; buds 4 to 6 mm, pubescent; stipules filiform, villous, 1 - 1.5 cm, persistent on terminal bud. Leaves often crowded at tops of shoots, obovate, 5 - 10 x 3 - 5 cm, thick-textured, with 5 - 9 regular short lobes, secondary lobes absent; primary veins 6 - 10, parallel, intercalary veins absent or 1 - 2, indumentum of lower surface densely pubescent, yellowish-brown, stellate, upper surface dark green, sparsely stellate or glabrous; petiole 5 - 20 mm, usually tomentose. Peduncle absent or 6 mm, sturdy. Fruit maturing in one year. Cupule hemispherical, 15 mm diameter, light brown, scales ovate-lanceolate, thin-textured, loosely adpressed or spreading, obtuse at apex, pubescent; acorn 1/2 - 2/3 exserted. Found in dry slopes with *Quercus pubescens*, *Pinus nigra*, *P. sylvestris*, *Populus tremula*, *Juniperus communis* subsp. *nana*, 1000 - 1900 m.

An endemic subspecies. Although we have recognized the Turkish tree at subspecific rank, it is doubtful if it can be satisfactorily differentiated from the type subspecies from northern Iran and the Caucasus. The latter is generally larger in all its parts, with persistent stipules on all buds; it varies considerably less in its characters than does the Turkish tree. Hybrids occur with *Q. pubescens* and *Q. petraea*.

5. *Q. frainetto*

Deciduous tree to 25 m, round-topped; younger shoots tomentose, pale brown; buds to 1 cm, angled, tomentose. Leaves crowded at tops of shoots, obovate, to 20 x 13 cm, sessile and auriculate, thick-textured, with 6-9 rounded primary lobes and 1 - 3 secondary lobes usually present; primary veins 6 - 9, intercalary veins few; indumentum of tufted stellate hairs, denser beneath, rarely glabrous above. Peduncle absent. Cupule hemispherical, about 15 mm diameter, brownish; scales loosely adpressed, pubescent, narrowly oblong; acorn 1/2 exerted. Found usually in broad-leaved deciduous (*Castanea*, *Fagus*, *Quercus*) and mixed (*Pinus*) forest, sometimes forming pure stands, 20 - 1000 m.

S.E. Central Europe, southern Italy, Balkans. Euro-Siberian element. An oligomorphic species generally recognized by the leaves being clustered, sessile, obovate and auriculate.

6. *Q. petraea*

Deciduous tree to 30 m, narrow at top; young shoots glabrous, usually reddish-brown; buds to 7mm, glabrous or ciliate-margined. Stipules deciduous around terminal bud or somewhat persistent. Leaves distributed over shoots, elliptic, obovate to oblong, 6-17 x 3-9 cm, cuneate or obliquely rounded, usually glabrous, with 5-9 shallow or deep lobes, regular, with or without secondary lobes, primary veins 5 - 11, parallel, intercalary veins absent or rarely 1 - 2 near leaf base; indumentum absent to adpressed stellate-tomentose beneath with long simple hairs on veins, pale green or glaucous, glabrous and bright green above. Petiole 1 - 3.5 cm. Peduncle absent or almost so. Cupule 10 - 20 mm diameter, hemispherical or cyathiform, greyish-brown to brown; scales ovate-lanceolate, strongly tuberculate at base or flat, adpressed or loosely so, with a brownish tip, tomentose; acorn 1/2 - 2/3 exerted.

One of the most important forest trees in Turkey, often forming pure stands. A very large number of specific and infra-specific names have been used for what we consider one variable species with three intergrading subspecies.

1. Scales of cupule flat; adult leaves densely adpressed-hairy beneath, often with tufts of hairs in lower vein axilssubsp. *petraea*
1. Scales of cupule tuberculate; adult leaves glabrous or finely pubescent beneath
 2. Leaves glabrous beneath, shallowly lobed, to 12 cm; intercalary veins usually presentsubsp. *iberica*
 2. Leaves glabrous or pubescent beneath, glaucous and deeply lobed, to 17 cm; intercalary veins absentsubsp. *pinnatiloba*

subsp. *petraea*. Throughout most of Europe. Restricted to the Northwest of Turkey, it intergrades and introgresses there with the following subspecies.

subsp. *iberica*. Balkans, Caucasia, northern Iran. Found in *Quercus*, *Carpinus*, *Castanea*, *Fagus*, *Pinus*, *Picea* forest, near sea level to 1300 m, sometimes 1600 m. Known from a very large number of collections, this is by far the most common subspecies in Turkey. We have been unable to recognize infra-taxa within it, although there are many apparently distinct local forms.

subsp. *pinnatiloba*. Found on dry slopes with *Quercus libani*, *Q. infectoria* subsp. *boissieri*, *Q. cerris* scrub, *Cedrus libani*, *Abies cilicica*, *Pinus nigra*, 1200 - 2200 m. Endemic. A distinctive subspecies growing at higher altitudes in less mesophytic habitats than the other subspecies. As a result of centuries of cutting and grazing in eastern Anatolia, it usually occurs as a tall shrub, rarely fruiting.

7. *Q. vulcanica*

Deciduous tree 25 to 30 m high, with a trunk at breast height of up to 1.6 m in diameter, widespreading at top, young shoots yellowish to reddish-brown, pubescent, becoming glabrous; buds large (to 5 mm or more), ciliate-margined or pubescent. Stipules to 12 mm, persistent. Leaves evenly distributed over shoots, obovate, 9-17 x 5-10 cm, with 4-7 deep parallel and sometimes overlapping regular acute or rounded lobes, with secondary lobes, primary veins 7-8, arching, intercalary veins well-developed, indumentum adpressed stellate-tomentose beneath, yellowish-green or grey, glabrous above or with some stellate hairs, dark green. Petiole 0.8 - 3.5 cm, glabrescent. Peduncle absent or almost so. Cupule 15 mm diameter, hemispherical to cyathiform, greyish-brown, scales ovate-lanceolate, flat, adpressed, tomentose; acorn 1/2 - 2/3 exserted. Found with *Cedrus libani*, *Acer hyrcanum*, *Quercus cerris*, *Pinus nigra*, 1300 - 1800 m. Similar to *Q. petraea* subsp. *pinnatiloba* but also with affinities to *Q. frainetto*. It differs from the former in the flat scales of the cupule, the secondary leaf lobes and intercalary veins. From the latter it differs in the longer petioles and the leaves evenly distributed over the shoots.

8. *Q. infectoria*

Semi-evergreen small tree or shrub, 1 - 4 m; young shoots finely pubescent, glabrescent, reddish- or yellowish-brown; buds reddish-brown, 3 mm, ciliate. Leaves often overwintering till new leaves appear, very variable in size and color, 40 - 70 x 10-45 mm, coriaceous, ovate to narrowly oblong, rounded or cuneate at base, margins often undulate with 4 - 8 crenate to serrate lobes, or entire, primary veins 6 - 11, indumentum of few floccose stellate-dendroid hairs beneath and sometimes above, usually glabrous later; petiole 1 - 15 mm (absent on summer shoots). Peduncle absent or to about 10 mm. Cupules solitary or in pairs, hemispherical or cyathiform, 10 - 18 mm diameter, scales strongly adpressed, greyish pubescent; acorn up to 2/3 exserted.

1. Petiole 1 - 5 mm; leaves broadly obovate, 50 x 20 mm, margins prominently crenate or serratesubsp. *infectoria*

1. Petiole 10 - 25 mm; leaves obovate to narrowly oblong, to 100 mm, margins crenate-serrate to entiresubsp. *boissieri*

subsp. *infectoria*. Greece, Euro-Sib. element. Found scattered with other *Quercus* species and *Pinus brutia*, in scrub, 150 - 850 m. It can generally be recognized by its short petioles and small leaves; usually a smaller shrub than the following subspecies.

subsp. *boissieri*. Cyprus, Palestine, Transcaucasia, northern Iraq, northern and north-western Iran. Found forming pure communities; with other *Quercus* species (*Q. brantii*, *Q. cerris*, *Q. coccifera*, *Q. ithaburensis* subsp. *macrolepis*, *Q. libani*, *Q. pubescens*), *Paliurus*, *Pinus brutia*; in macchie and anthropogenic steppe, 200 - 1850 m. When ungrazed, taller than the type subspecies, and much more widely distributed and frequent. The leaves of subsp. *boissieri* often have a characteristic bluish-green color, but in color, size, margin and shape they are very variable; specimens from southeastern Anatolia usually have larger leaves. Areas where the two subspecies can be confused are in the Northwest and in the Cilician Taurus, where there are forms with leaves very similar to subsp. *infectoria*. Otherwise, on morphology and geography, these two subspecies are not likely to present identification difficulties.

Q. araxina is treated here with some doubt as a synonym of subsp. *boissieri*; previously it has been regarded as an independent species or included within the *Q. petraea* complex.

9. *Q. pubescens*

Deciduous small tree to 10 m, round-topped; young shoots densely pubescent (sometimes glabrous); buds around 5 mm, reddish-brown, pubescent. Leaves most variable but generally oblong-obovate, around 4.5-8.5 x 2.5-5 cm, greyish-green above, brownish-grey beneath, asymmetrically subcordate or rounded, thick-textured, with 3-6 strongly undulate forwardly-pointing irregular acute lobes with revolute margins; primary veins 4-8, intercalary veins present; indumentum densely to thinly stellate-tomentose beneath, with many scattered minute stellate hairs above; petiole 5 - 10 mm. Peduncle absent. Cupule shallow, to 15 mm diameter; scales adpressed, lanceolate, pubescent, brownish-grey; acorn 2/3 exserted. Found usually associated with *Pinus nigra*, *Quercus cerris*, *Fagus*, *Castanea*, *Pyrus elaeagnifolia*, *Cistus laurifolius*, *Paliurus spinachristi* in anthropogenic steppe or semi-steppe; rarely in macchie, near sea level to 1700 m.

Western, central and southern Europe, Crimea. We have taken a broad view of this species. Hybrids are evidently common, particularly with *Q. infectoria*, *Q. petraea*, and *Q. macranthera* subsp. *sypirensis*. Typical *Q. pubescens* is characterized by short petioles and undulate-margined, lobed, greyish leaves. The leaves persist on the trees in the dried state over winter.

10. *Q. virgiliana*

Differs from *Q. pubescens* in the longer petioles (6 - 20 mm), generally larger flat leaves (5-14 x 4-7 cm) often with rounded lobes and rounded at base, and often shortly pedunculate fruits (scales loosely adpressed). Found in dry slopes in *Quercus* scrub, 100 - 1150 m. Southern Europe from Corsica to the Black Sea. A problematical species of doubtful status, to which we have tentatively assigned the cited specimens.

Section *Cerris* -- Turkey Oaks -- Leaves deciduous, lobed, dentate or pinnatipartite, lobes acuminate or mucronate. Fruit matures in two years. Cupule scales elongate, rigid, some or all spreading or reflexed, rarely short and adpressed.

11. *Q. cerris*

Deciduous tree to 25 m, usually round-topped; bark on old trees deeply fissured, greyish-white; young shoots densely tomentose to glabrescent, light brownish to reddish-brown; buds around 4 mm, tomentose or glabrescent, surrounded by persistent 1 cm stipules, rarely deciduous. Leaves distributed over shoots, oblong-elliptic in outline, very variable, 5.5-14 x 2.5-9 cm, from simple with entire small shallow lobes to deeply pinnatilobed with or without secondary lobes; lobes 4 - 9, mucronulate, veins conspicuous, intercalary veins often present; indumentum beneath usually densely stellate-pubescent, pale green to greenish-white above with many stellate hairs regularly dispersed over surface, rarely subglabrous, dark green; petiole 3 - 20 mm. Peduncle stout, to 8 mm. Fruit maturing in second year. Cupule hemispherical or cyathiform, inside diameter, 20 mm, yellowish-brown; scales linear subulate, irregularly spreading to reflexed, to 12 mm, pubescent. Acorn enclosed to 1/2 exerted, flat-topped, apically pubescent. Found in mixed and deciduous forest with other *Quercus* spp. (e.g. *Q. frainetto*, *Q. pubescens*, *Q. infectoria*, *Q. petraea*), *Carpinus*, *Fagus*, *Castanea*, *Pinus nigra*, *P. brutia*, *P. pinea*, or forming pure stands, near sea level to 1900 m.

- 1. Leaves pinnatilobed with or without secondary lobesvar. *cerris*
- 1. Leaves simple with shallow lobesvar. *austriaca*

var. *cerris*. Scattered throughout the southern parts of the species' range in Europe and in Syria and Lebanon, Mediterranean element. By far the more common variety in Turkey, with a wide range in leaf shape, even on the same tree. Some species from south Anatolia closely approach the following variety.

var. *austriaca*. Central and southeastern Europe, Euro-Sib. element. This is the more frequent variety in Central Europe, reaching its eastern limit in northwest Turkey.

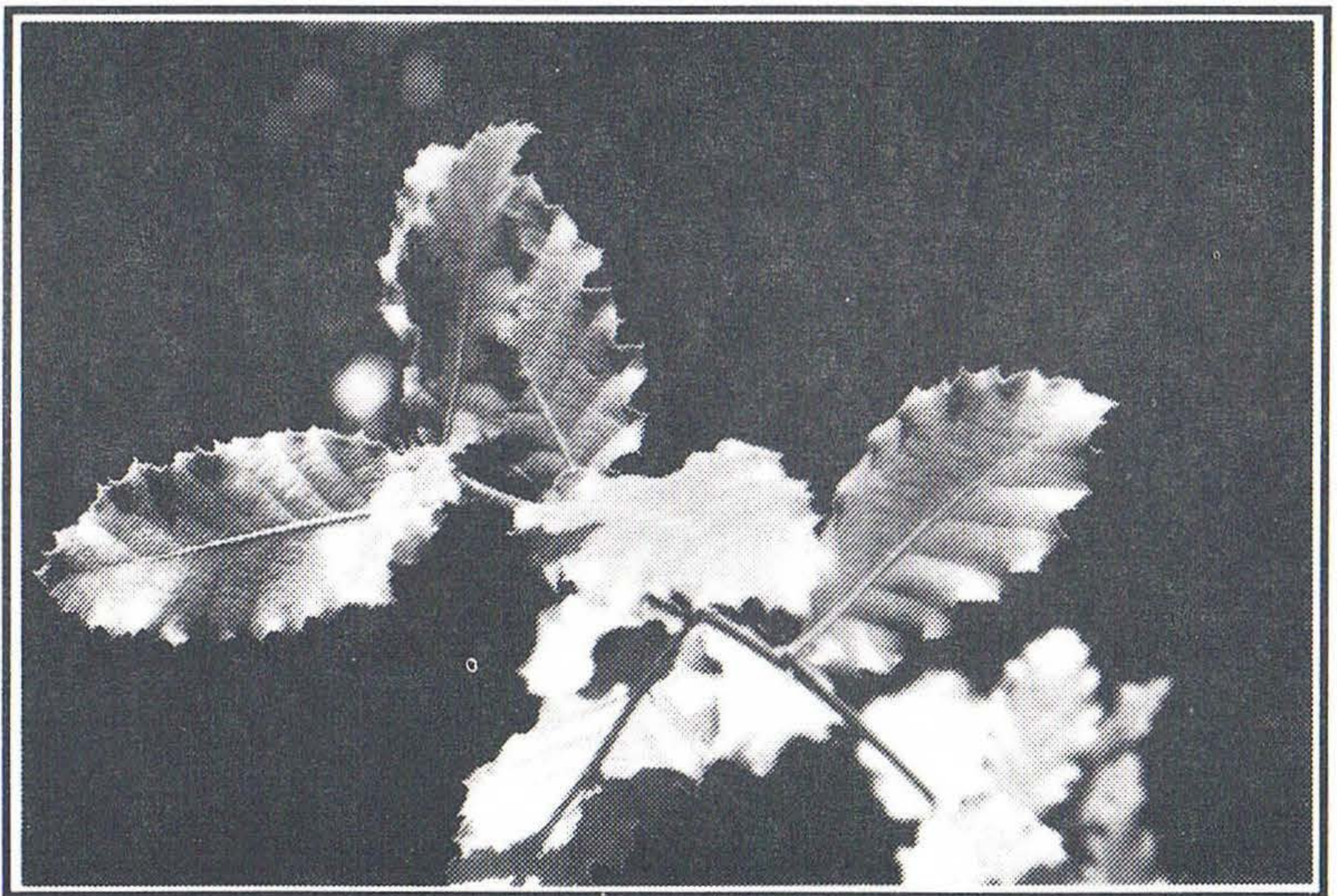
The "Turkey Oak" is widespread and variable; the two varieties recognized here occur throughout the total range of the species, but there are also numerous local forms. The species hybridizes with *Q. pubescens*, *Q. libani* and *Q. ithaburensis* subsp. *macrolepis*.

12. *Q. ithaburensis* subsp. *macrolepis*

Deciduous tree to 10 - 15 m, with a broad crown, sometimes in old specimens with a massive trunk; young shoots densely tomentose; greyish or yellowish-brown. Buds ovoid, 3 mm, tomentose. Leaves distributed over stem, very variable, usually ovate, sometime oblong, 5-9 x 3-5 cm, base cordate or rounded, with 5 - 9 subtriangular irregular lobes with aristate or mucronate teeth; intercalary veins absent; upper surface dull green, finely stellate-pilose, lower surface greyish-green, densely stellate-pilose, petiole 1 - 3.5 cm. Peduncle almost absent, sturdy. Fruit maturing in second year, very variable. Cupule hemispherical to cyathiform 20 - 40 mm diameter, densely



Quercus pubescens-Starhill Forest Arboretum, Petersburg, Illinois
Photograph © Guy & Edith Sternberg



Quercus ithaburensis- Starhill Forest Arboretum, Petersburg, Illinois
Photograph © Guy & Edith Sternberg

pubescent; scales linear-oblong, adpressed to spreading, becoming woody, uppermost often elongated, variously arranged; acorn included to 1/3 exserted, apically convex to obtuse. Found with other *Quercus* species, forming park-like forests, in scrub, with *Pinus brutia*, *P. pinea*, *Juniperus*; 50 - 1700 m.

Balkans, southeast Italy, eastern Mediterranean element. Very variable in leaf shape and cupule size and shape. The cupules of this, the 'Vallonea' oak, are much used commercially for tanning and it is possible that some cultivated forms have added to the difficulties of classification. Despite Menitsky's selection of a 1650 Bauhin woodcut in an attempt to retain the name *Q. aegilops*, it seems necessary to reject this well-known name both because of Linnaeus' confused original description and the absence of any suitable type specimen. The Palestinian *Q. ithaburensis* subsp. *ithaburensis* only differs from the more northern subspecies in the less deeply incised leaf margins.

Q. ithaburensis subsp. *macrolepis* hybridizes not infrequently with *Q. cerris* (such hybrids can be recognized by the pinnatifid leaves of the latter and convex acorns of the former), and with *Q. pubescens*. It may also hybridize with *Q. trojana* but no definite instances have been reported.

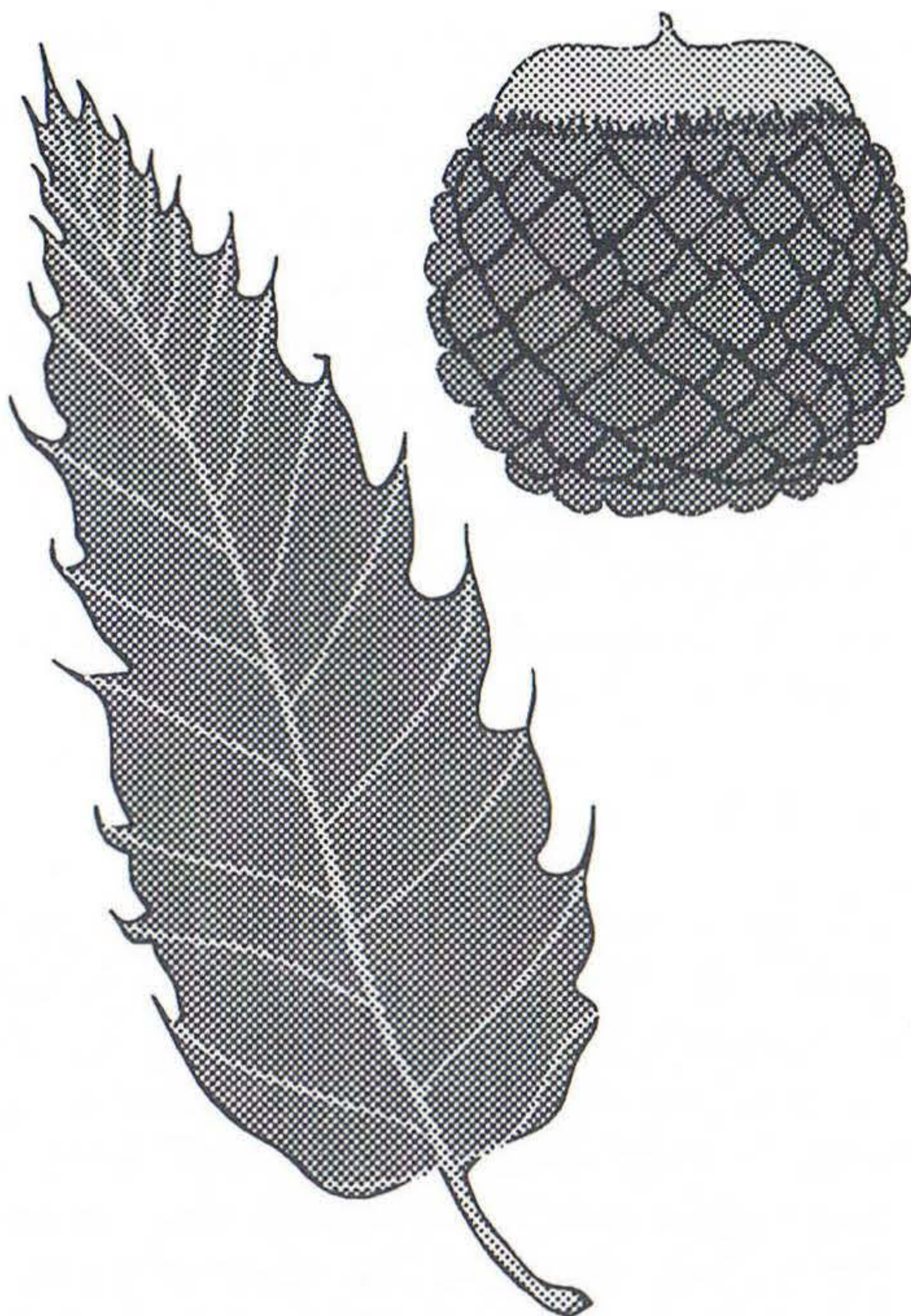
13. *Q. brantii*

Deciduous shrub or small tree to 6 - 10 m with greyish, rather smooth bark and rounded crown; young shoots densely yellowish-brown tomentose. Buds ovoid, around 4 mm, tomentose. Leaves distributed over shoots, regularly ovate-oblong, 6-10 x 3-6 cm, cordate, regularly serrate with 8-14 pairs of acuminate scarcely aristate (1-2 mm) teeth; intercalary veins absent; upper surface dull green with numerous small dendroid-stellate hairs, lower pale yellowish-brown, densely stellate-tomentose; petiole 0.5 - 2 cm. Peduncle nearly absent, to 5 mm, sturdy. Fruit maturing in second year. Cupule hemispherical, 25 - 30 mm diameter, densely pubescent; scales broadly rhomboid, uppermost much elongated, often filiform, spreading-recurved; acorn included to 1/3 exserted, apically convex. Found forming pure communities, with other *Quercus* species (*Q. infectoria* subsp. *boisieri*, *Q. libani*, *Q. cerris*, *Q. coccifera*), with *Pinus brutia*, *Styrax*, *Paliurus*, often on limestone slopes, 350 - 1700 m.

Syrian Desert, northern Iraq, western and southern Iran, Iran-Turkish element. Close to *Q. ithaburensis* subsp. *macrolepis* but usually distinguishable by the regularly serrate leaves. *Q. brantii* varies greatly in the size of the cupule and the size and posture of the cupular scales; several varieties have been recognized based on this, apparently completely intergrading, variation. It hybridizes, inter alia, with *Q. libani*, and some forms certainly appear to be what was described as *Q. oophora*, others as *Q. vesca*.

14. *Q. libani*

Deciduous or semi-evergreen shrub or tree to 6 m; young shoots tomentose, often reddish-brown and glabrescent; buds around 3 - 4 mm, reddish-brown, oblong, ciliate. Leaves distributed over shoots, oblong to oblong-lanceolate, 7-12 x 2-3 cm, rounded to subcordate at base, margins regularly serrate or irregularly so (occasionally pinnatifid -- var. *pinnata*) with 11 - 16 pairs of mucronate-aristate (to 3 mm) teeth, upper surface glossy green, duller beneath; intercalary veins absent; indumentum of few simple or stellate-dendroid hairs mostly on lower surface, glabrescent, rarely with a dense stellate-dendroid indumentum beneath; petiole 8 - 15 mm. Peduncle almost absent to 1 cm, sturdy. Fruit maturing in second year. Cupule hemispherical, 20



- 30 cm diameter, pubescent; scales broadly rhomboid, either all adpressed, medium recurved or uppermost elongate and spreading, acorn included or shortly exerted, often apically truncate-flattened. Found forming pure populations, or mixed with other *Quercus* spp. (*Q. infectoria*, *Q. brantii*, *Q. cerris*); 700 - 2000 m.

Latakia, Syrian Desert, northwestern Iraq, western Iran; not in Lebanon despite the specific epithet. Iran-Turkish element. Clearly related to the western Anatolian *Q. trojana*, but with longer petioles. *Q. libani* has fewer distinctive variants than most Turkish species of oak; *Q. regia* was the name given to an unusually broad-leaved variant, while there are some anomalous specimens with a dense stellate-dendroid indumentum on the lower leaf surface. It is possible that this latter type of indumentum derives from introgression with *Q. ithaburensis* subsp. *macrolepis*. Hybrids between the two species are certainly not infrequent; *Q. look* apparently applies to such a hybrid. Several additional synonyms to those cited above, based on Iranian material, are given by Menitsky.

15. *Q. trojana*

Deciduous or semi-evergreen tree to 18 m (usually less), round-headed, close to *Q. libani* but differing in the rather smaller leaves, 3-8 x 1.5-3 cm, with short mucronate teeth and shorter 2 - 6 mm petioles; cupular scales showing greater variation, being all adpressed, all recurved, or lowest adpressed or recurved, middle recurved and upper most elongated, spreading or incurved. Found in deciduous woodland with other *Quercus* species (*Q. ithaburensis* subsp. *macrolepis*, *Q. pubescens*, *Q. infectoria*, *Q. cerris*), in macchie with *Pinus brutia*, *Styrax*, *Phillyrea*, with *Juniperus excelsa*, in *Abies cilicica* forest; 300 - 1800 m.

Southeastern Italy, Balkans, Eastern Mediterranean element. Close to *Q. libani*, but worthy of specific separation. As in that species it varies little in its characters except for the cupular scales mentioned above. The most anomalous specimens come from the southeastern extremities of the species' range; they have a dense persistent stellate-dendroid indumentum on the lower leaf surface and the cupule scales are all adpressed. Apparently they are locally occurring sporadic variants but further observations are needed; the indumentum may (as in similar forms of *Q. libani*) be a result of introgression with *Q. ithaburensis* subsp. *macrolepis*.

Section *Ilex* -- Holly Oaks -- Leaves evergreen, rigidly coriaceous, tomentose or glabrous beneath, entire or serrate. Fruit maturing in one year or in two. Cupule scales rigid, adpressed.

16. *Q. ilex*

Evergreen tree to 12 - 15 m or tall shrub; young shoots densely stellate-tomentose, yellowish-brown; buds around 2 mm, tomentose; stipules prominent, deciduous. Leaves distributed over branches, narrowly oblong-elliptic to ovate-lanceolate, acute at apex, base cuneate to rounded, coriaceous, 3-7.5 x 1.5-4 cm, usually entire, occasionally sharply serrate; veins around 10, inconspicuous; glabrous or almost so above, yellowish or pale brown beneath, densely and tightly adpressed stellate-tomentose; petiole 3-10 mm. Peduncle stout, to 9 mm. Fruit maturing in one year. Cupule campanulate-hemispherical, 15 mm diameter, about 18 mm long, greyish-brown, scales narrowly lanceolate, loosely, adpressed, pubescent; acorn 1/2 - 2/3 exserted, narrowly conical towards apex. Found on slopes with *Laurus*, *Phillyrea*, *Carpinus*, etc.

Western Mediterranean area. Mediterranean element. Leaves on juvenile shoots are broader than those on adult shoots and are often sharply toothed and glabrous.



Quercus ilex-Ballard Locks, Seattle, Washington
Photograph © Guy & Edith Sternberg

17. *Q. aucheri*

Evergreen shrub or tree up to 10 m, ultimate branches pendulous; young shoots, densely stellate-tomentose, yellowish-brown; buds around 2 mm, pale reddish-brown, tomentose. Leaves distributed over branches, topmost serrate, lower entire, broadly oblong to ovate, rounded at apex or subapiculate, coriaceous, 0.9-4 x 0.9-2.5 cm, rounded or subcordate; veins 5-9, inconspicuous; glabrous or stellate above, tightly adpressed stellate-tomentose, waxy and greyish-white beneath; petiole absent or to 6 mm. Peduncle nearly absent. Fruit maturing in second year. Cupule cyathiform, to 25 mm diameter, to 18 mm long, light brown; scales ovate-lanceolate, adpressed, pubescent; acorn to 2/3 exserted, flattened to acute at apex, glabrescent. Found in limestone slopes in macchie, sea level to 400 m.

Endemic, eastern Mediterranean element. A long-neglected species, related to *Q. ilex* and *Q. coccifera* (with which it has been confused), but clearly distinct on characters of leaf shape, indumentum and cupule. Also related to the geographically distant Afghan and western Himalayan *Q. baloot*. Locally known as "Boz pinal." The acorns are often sweet and edible, in contrast to the bitter fruit of *Q. ilex*.

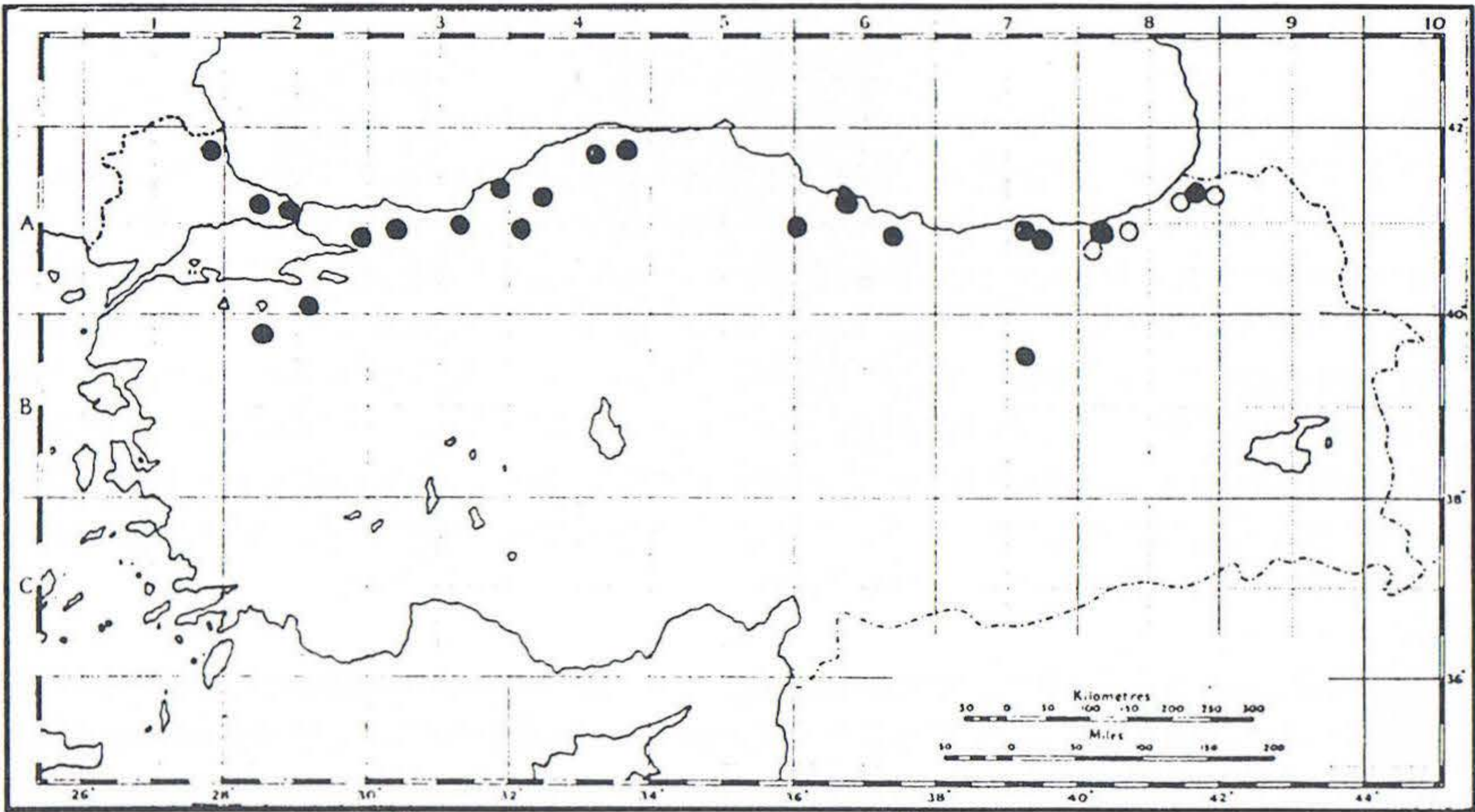
18. *Q. coccifera*

Evergreen shrub or rarely a small tree to 10 m; young shoots densely stellate-tomentose, brownish; buds around 3 - 4 mm, reddish-brown, ovoid, glabrous or tomentose, brownish. Leaves distributed over branches, broadly ovate to oblong-ovate to oblong-lanceolate, coriaceous, 1.5-5 x 1-3 cm, sharply serrate-spiny, rarely subentire, flat or undulate, cordate or rounded at base; veins 4 - 8; glabrous on both surfaces, rarely minutely stellate beneath, paler beneath; petiole 1 - 5 mm. Peduncle stout, subsessile to 12 mm. Fruit maturing in second year. Cupule hemispherical, broadly campanulate or cyathiform, 10 - 20 mm diameter, to 15 mm long, light brown; scales oblong to ovate, adpressed-ascending or recurved, pubescent; acorn 1/2 - 2/3 exserted, variable in shape. A dominant member of phrygana and macchie; found in *Pinus brutia* forest, sea level to 1500 m. Mediterranean area. Although a large number of infraspecific taxa (and occasionally independent species) have been recognized, we have preferred to take a broad view pending a more general review of this widespread and characteristic Mediterranean species. Specimens from areas protected from grazing, such as cemeteries and national parks, form trees which have longer, flatter leaves than the smaller undulate-margined leaves of shrubby individuals. Hybrids with *Q. infectoria* occur.

Editor's note: Additional information on the oaks of Turkey will be presented at the International Oak Society Conference at The Morton Arboretum, Lisle, Illinois, on October 17-18, 1994.

The Oaks of Turkey has been reprinted with the permission of author, Dr. Faik Yaltirik. A complete translation, with specimen citations and other taxonomic notations, may be found in Flora of Turkey, Volume Seven, edited by P. H. Davis, D.Sc., Edinburgh University Press, 1982.

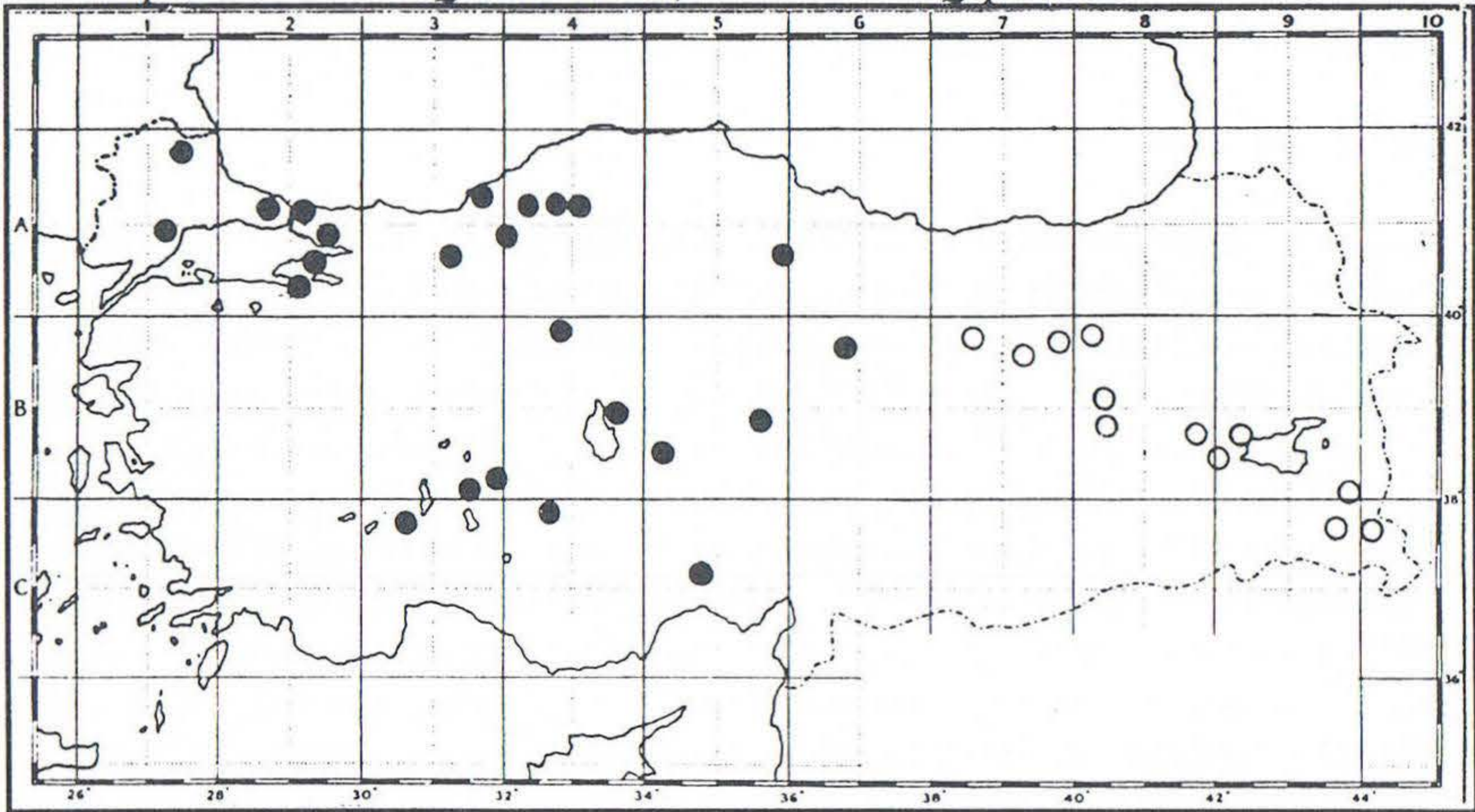
We have been considering supplementing technical papers such as the previous work with a separate glossary of terms. We would like our members to send a note as to their thoughts on the matter; whether or not, this would be helpful or an unnecessary burden upon editorial duties.



Map : 1

● *Q. hartwissiana*;

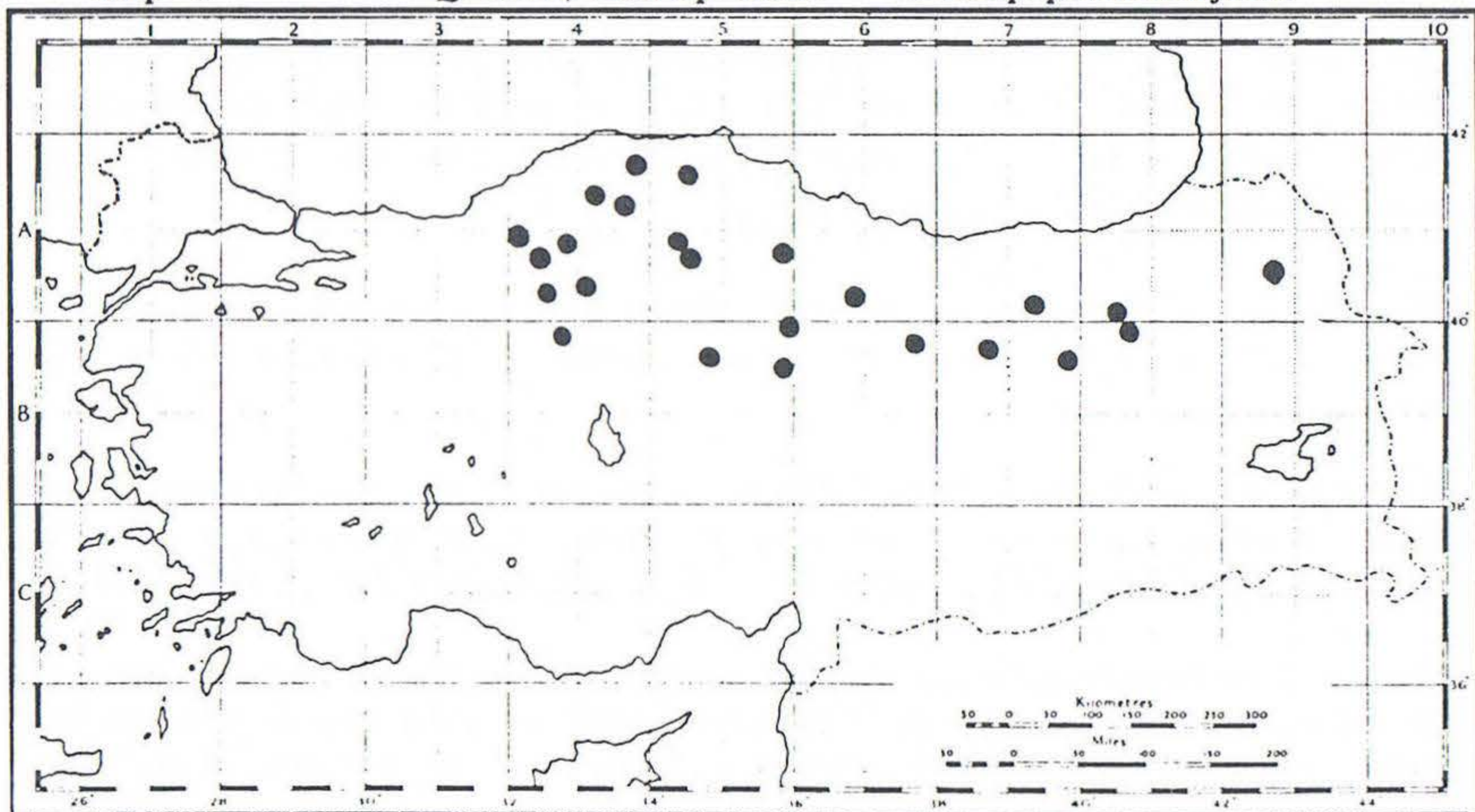
○ *Q. pontica*



Map : 2

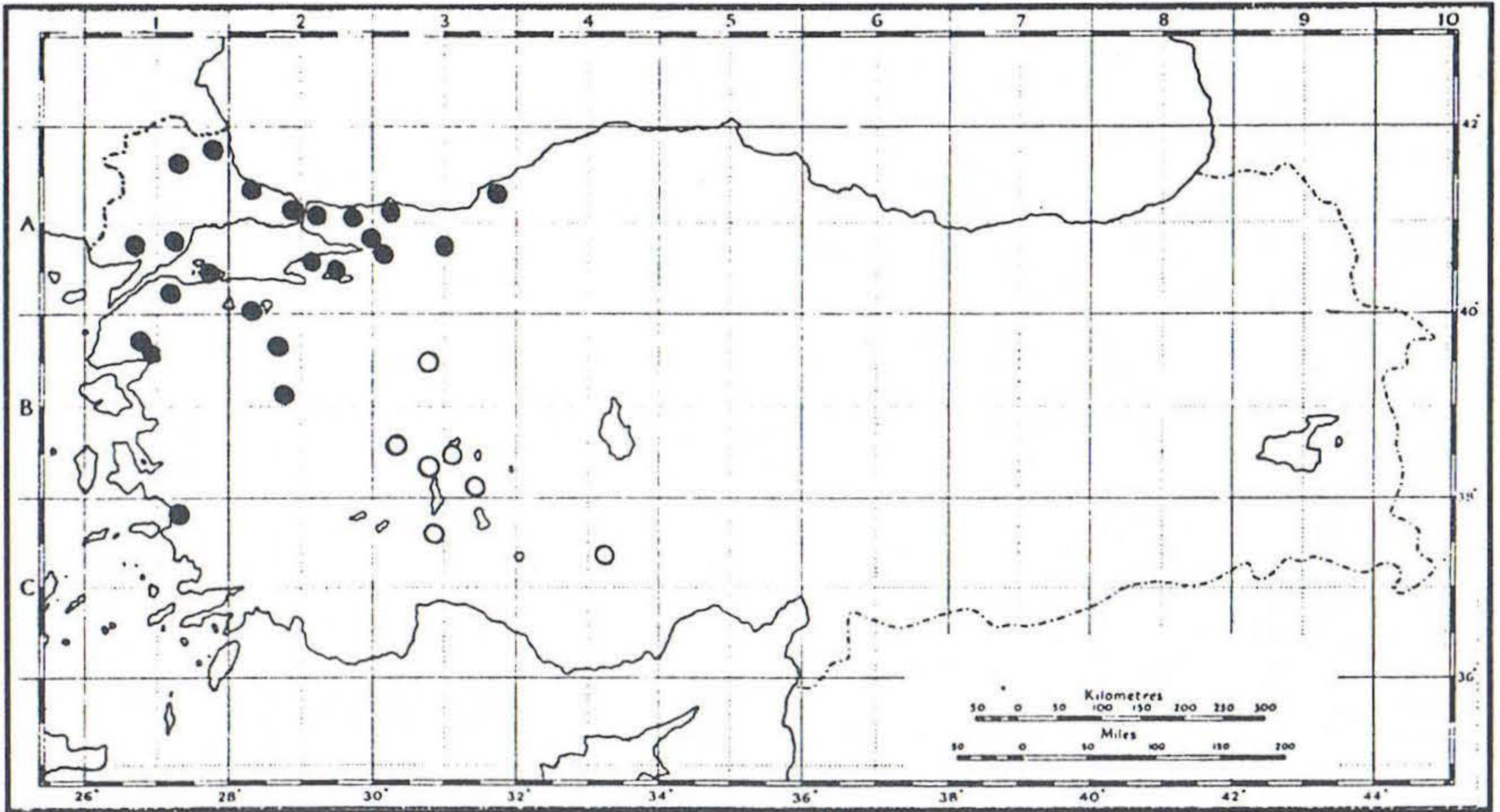
Q. robur; ● *subsp. robur*;

○ *subsp. pendunculiflora*

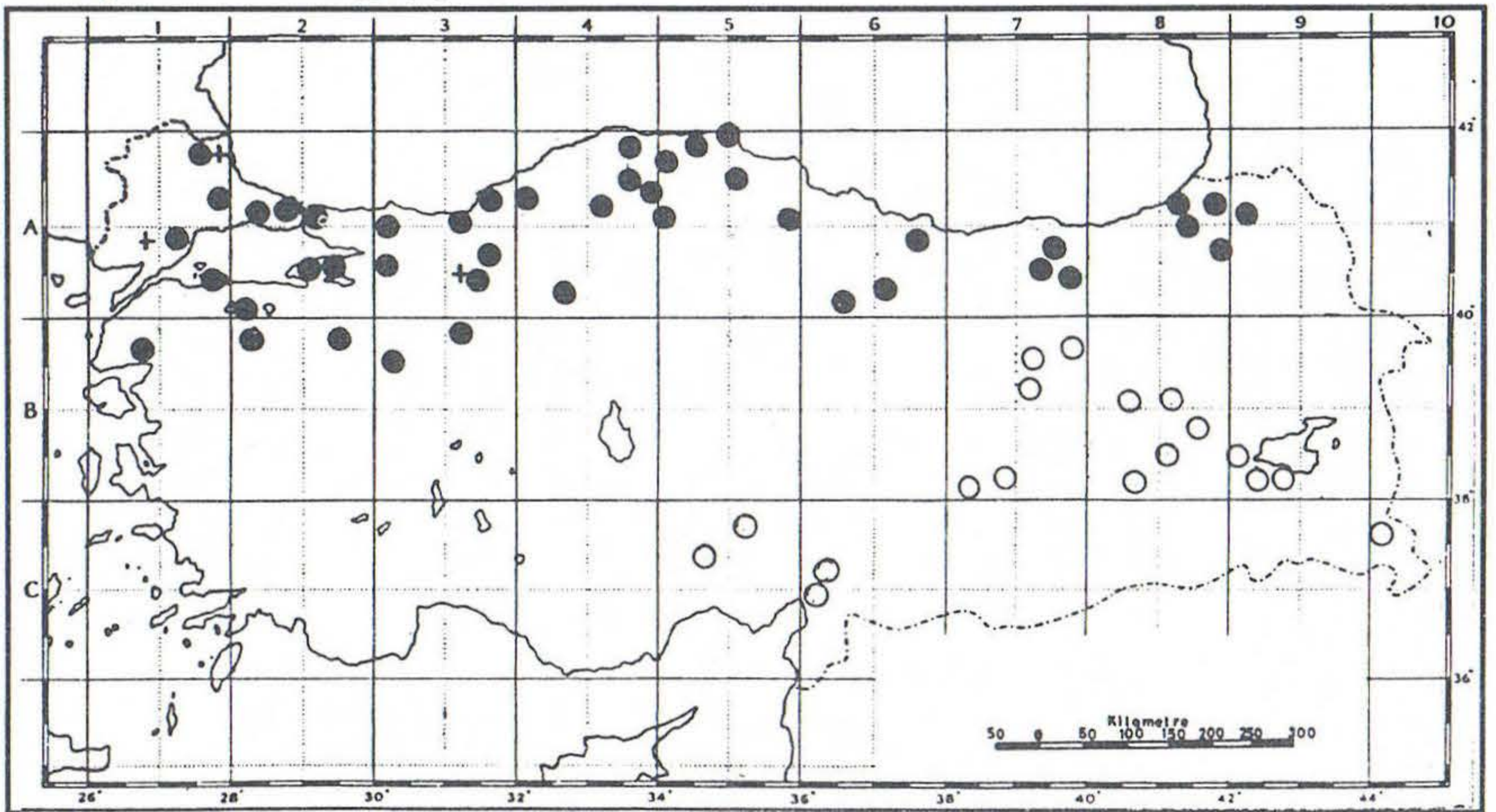


Map : 3

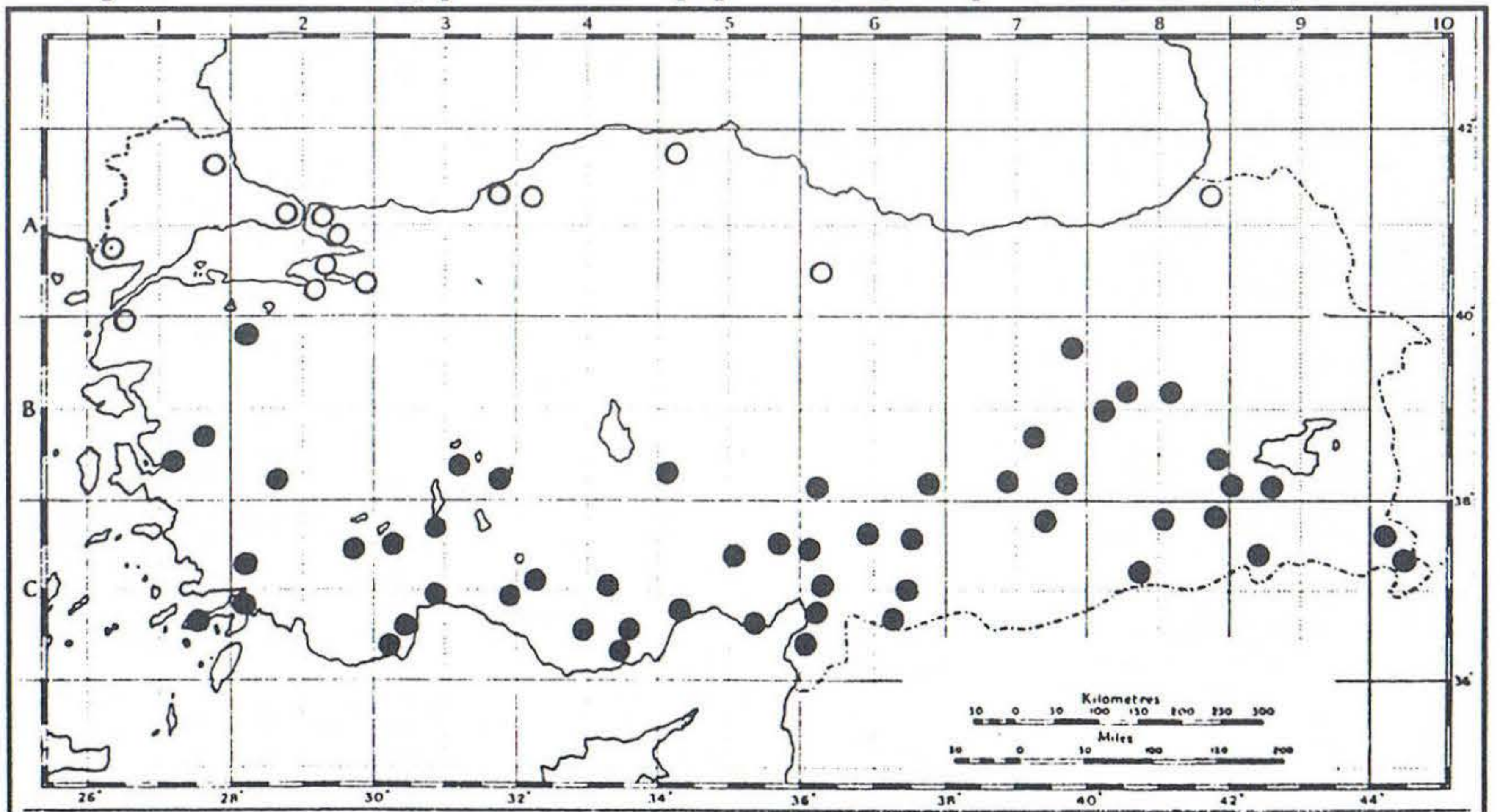
● *Q. macranthera subsp. sypsiensis*



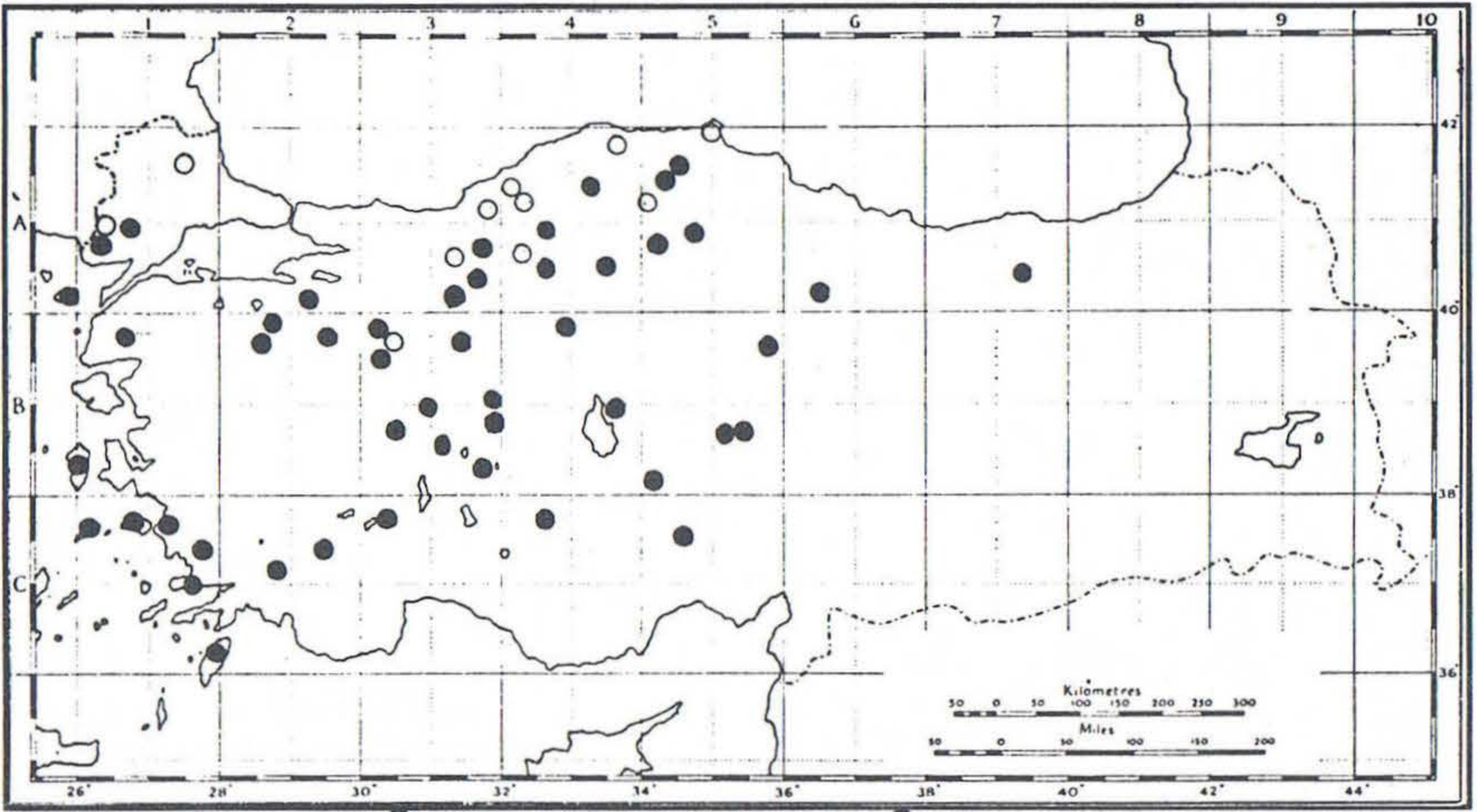
Map : 4 ● *Q. frainetto*; ○ *Q. vulcanica*



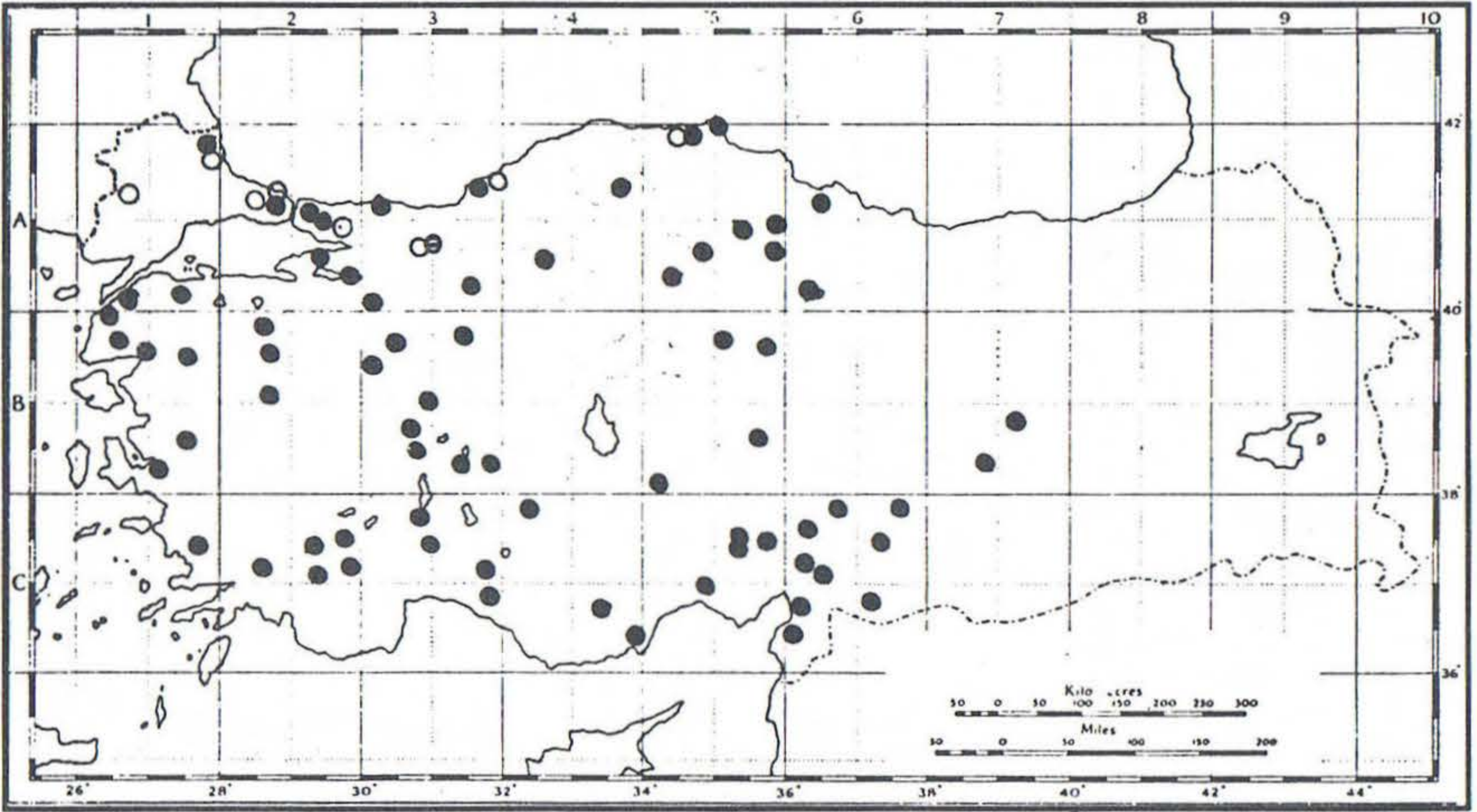
Map : 5 *Q. petraea* + subsp. *petraea*; ● subsp. *iberica*; ○ subsp. *pinnatiloba*



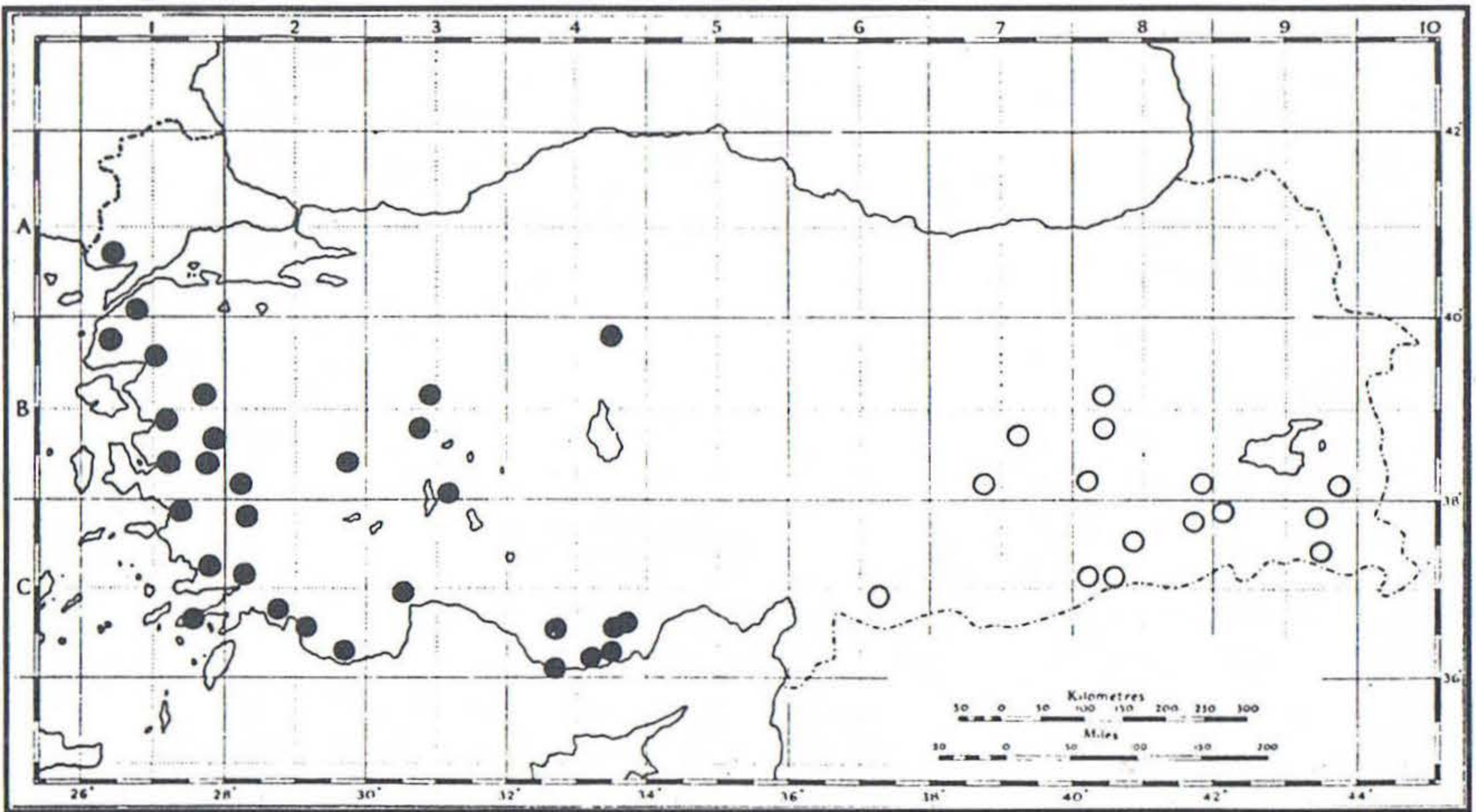
Map : 6 *Q. infectoria*; ● subsp. *infectoria*; ○ subsp. *boissieri*



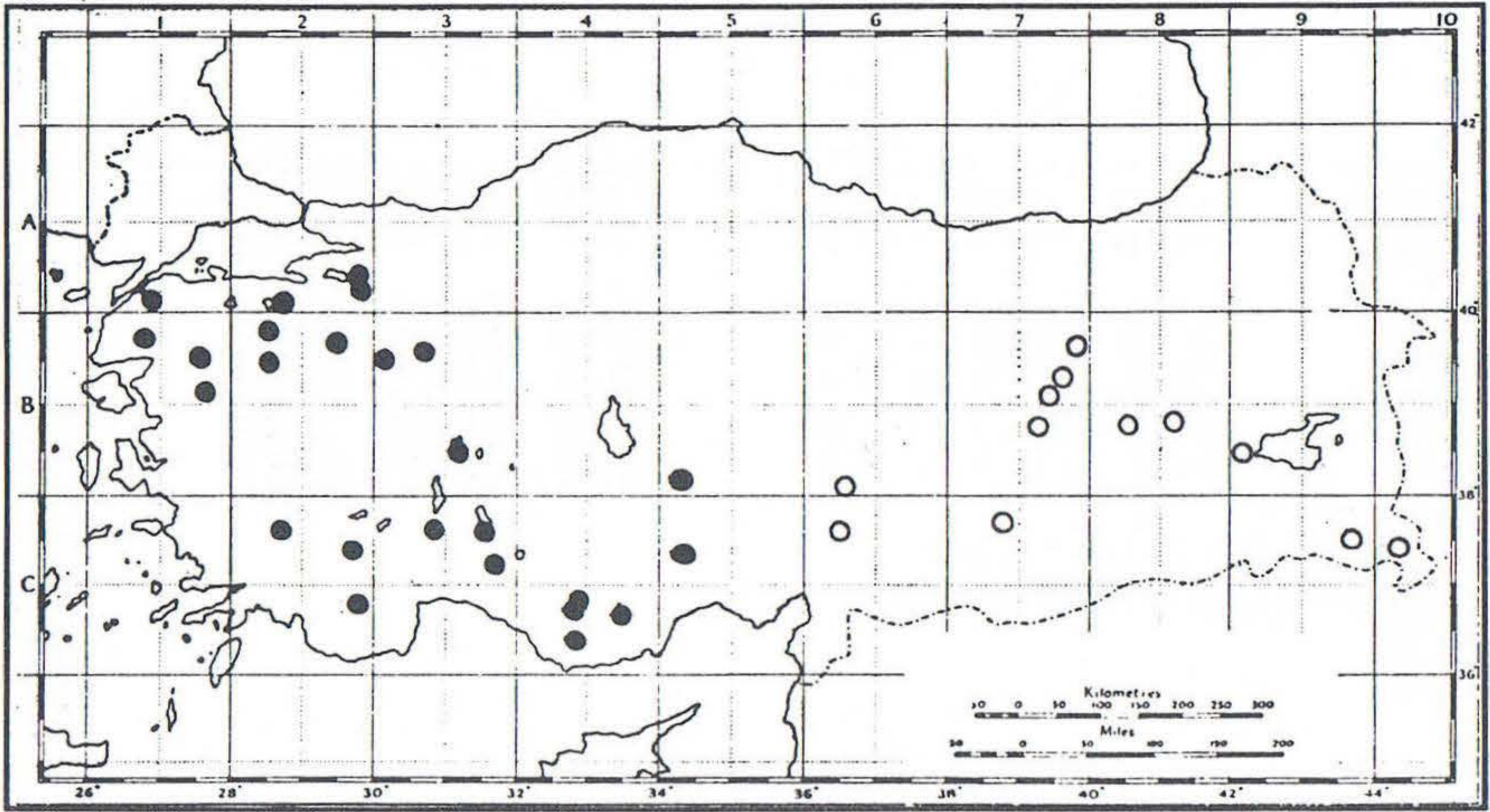
Map : 7 ● *Q. pubescens*; ○ *Q. virgiliana*



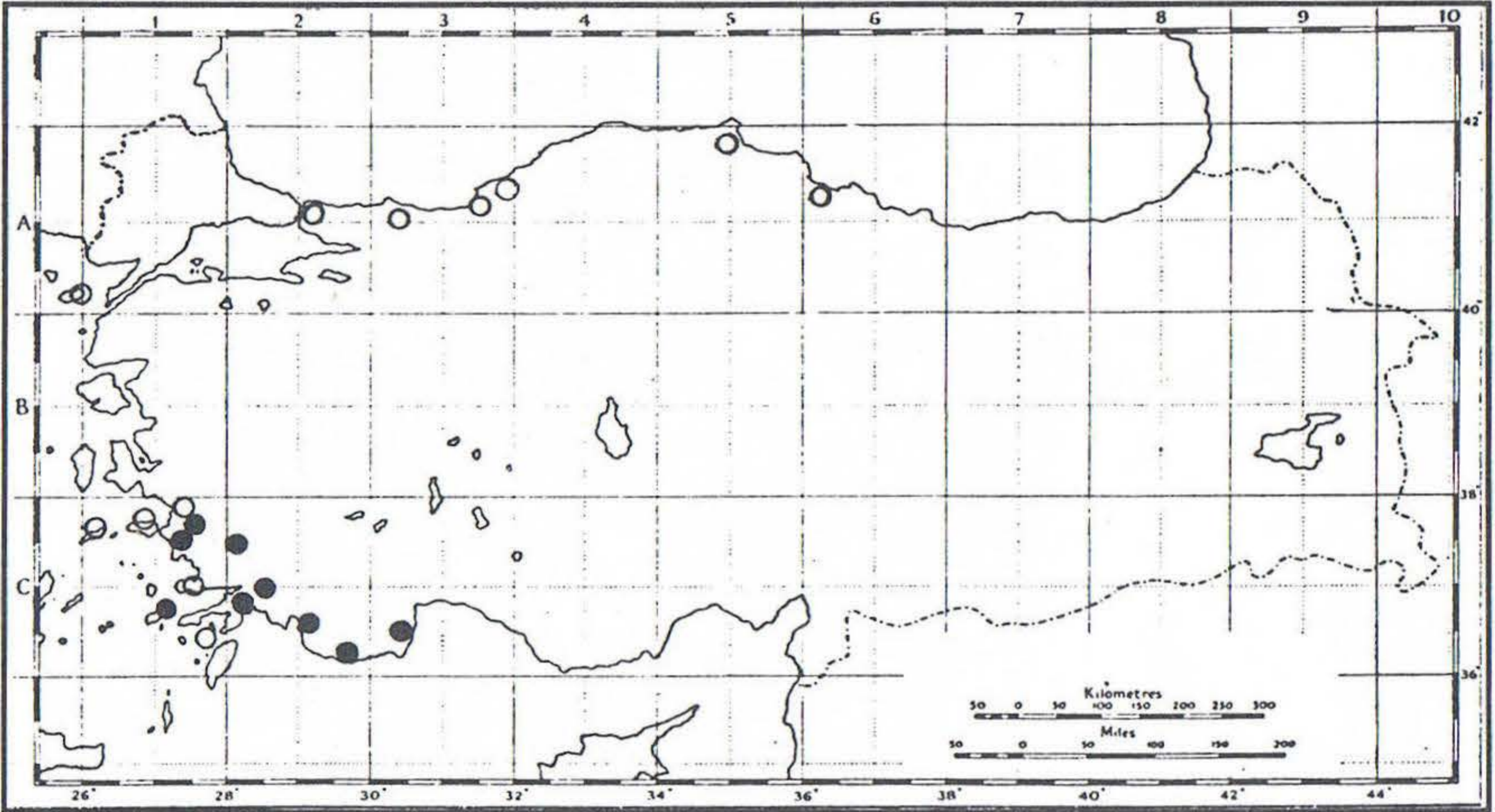
Map : 8 *Q. cerris*; ● *var. cerris*; ○ *var. austriaca*



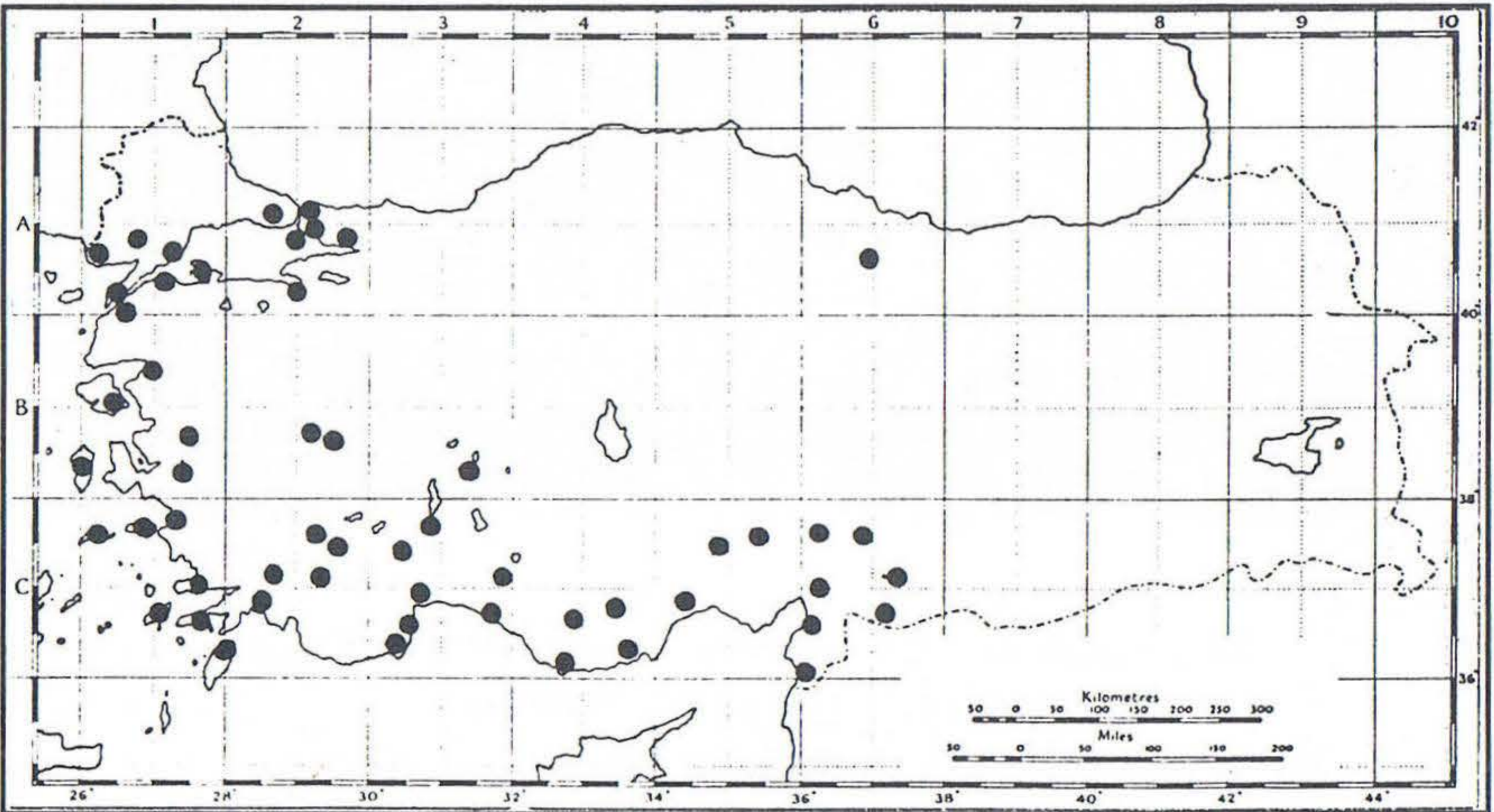
Map : 9 ● *Q. ithaburensis subsp. macrolepis*; ○ *Q. brantii*



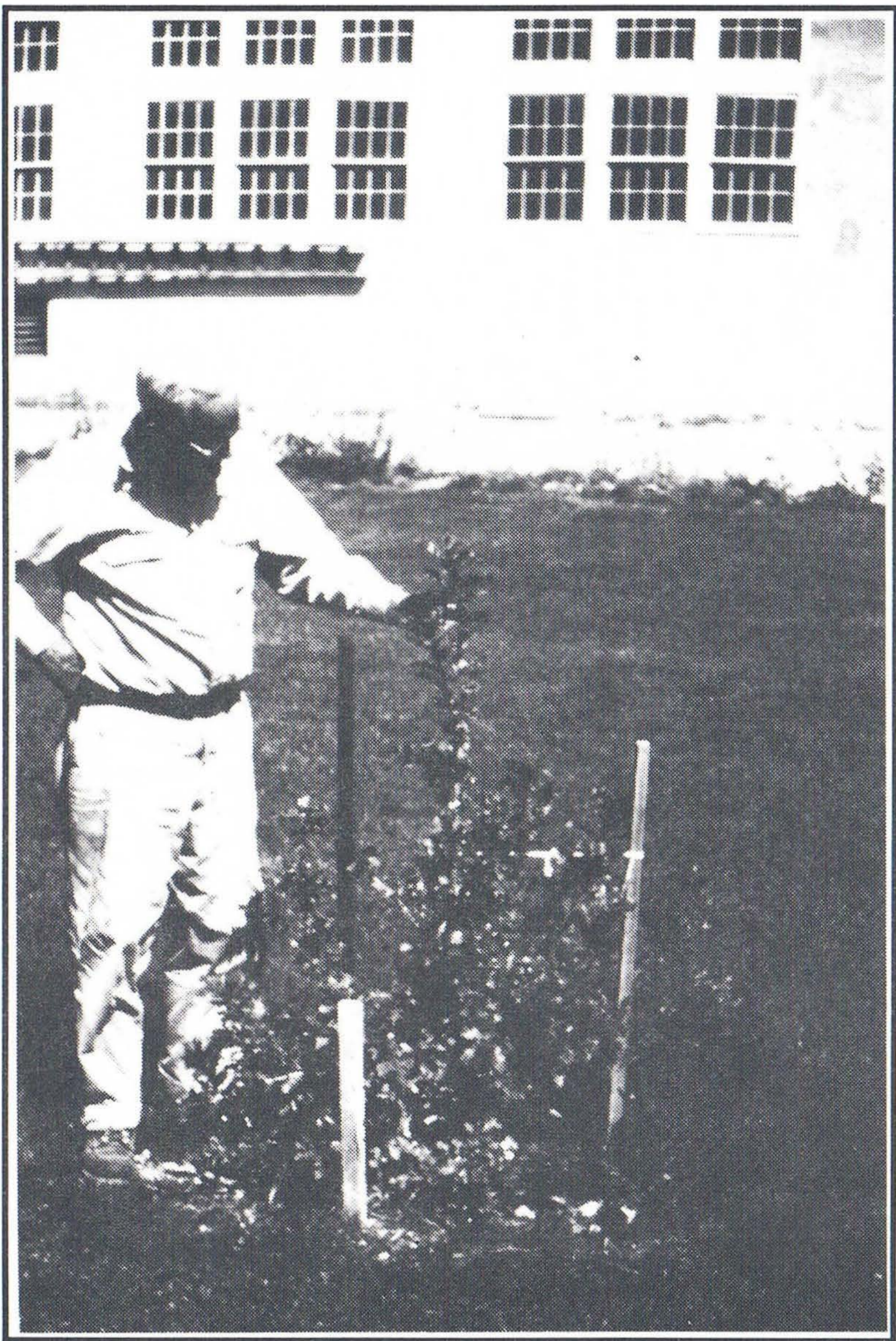
Map : 10 ● *Q. trojana*; ○ *Q. libani*



Map : 11 ○ *Q. ilex*; ● *Q. aucheri*



Map : 12 ● *Q. coccifera*



Walter Cottam with 33 month old *Q. macrocarpa X turbinella*
seedling, University of Utah Campus

Photograph by Rudy Drobnick (with permission from John Tucker)