STUDIES IN HEPTAPTERA (UMBELLIFERAE) II: TAXONOMIC REVISION

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ABSTRACT. *Heptaptera* (Umbelliferae) with 6 species, growing in the E Mediterranean and SW Asia, is formally revised. The delimitation of *Heptaptera* from *Prangos* is discussed and differential characters are described. *H. triquetra*, the only species with symmetrical fruits, is separated off into a new subgenus, *Isoptera*. It is suggested that Anatolia may have been the centre of speciation of *Heptaptera*.

INTRODUCTION

Heptaptera Marg. & Reut. is considered here as including 6 species. The genus, or a part of it, is usually known as *Colladonia* DC. It occurs in the NE and the E Mediterranean and through Iraq to W Iran.

Relatively little is known about the genus for a variety of reasons: the majority of species are confined to the Near East which, for the most part, has not been adequately studied floristically; *Heptaptera* usually occurs in small scattered populations; the fact that basal leaves and ripe fruit cannot be found simultaneously makes the collection and preservation of ideal material rather difficult; the seeds are short-lived and it is only with difficulty that plants can be grown experimentally.

H. anisoptera was the only species which we were able to study in some native habitats. Repeated attempts to grow plants of the other 5 species were all unsuccessful.

This study was therefore considerably handicapped by scarcity of available material. Though we obtained collections from many major European herbaria, most of this material proved to come from but a few localities. Moreover, in many instances, different collectors for some reason preferred certain chosen localities, such as the vicinity of Istanbul and Izmir.

Even Boissier (1872), who first described 6 out of the 8 species of *Colladonia*, had only very limited material at his disposal. In fact, for 7 out of his 8 species he cited 14 specimens altogether. Only *C. crenata* is accompanied by a list of 10 specimens.

Boissier (1844) originally included 3 species in *Meliocarpus* and only 2 in *Colladonia*. Subsequently Boissier (1872) extended the range of the genus and combined all previous 5 species together with 3 others in *Colladonia*, including 6 of these in section *Meliocarpus*. Boissier's specific criteria were mainly derived from inflorescences and fruit. At the same time he also pointed out the diversity of leaves between species.

Bornmueller, in his short monograph of *Colladonia* (1936), generally followed Boissier, but based the distinction between some of his species on the pattern and shape of the leaves. These characters also served him to separate his new species *C. macedonica* from *C. anatolica*.

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Greuter (1967) first noticed that *Colladonia* DC. was a later homonym and that the correct name for the genus was *Heptaptera*. All species listed in the *Flora Orientalis* were automatically transferred to *Heptaptera* by Tutin (1967).

The delimitation of *Heptaptera* from some related genera of Umbelliferae poses a number of problems. Drude (1898), following Bentham & Hooker (1867), included *Colladonia* sensu Boissier in *Prangos* Lindl., dividing the species of *Colladonia* into two subgenera: *Colladonia* and *Meliocarpus*. The character common to the three subgenera of *Prangos* in this sense is the presence of wings on the mericarps. At the same time, differences in characters of leaves and fruits between *Colladonia* and *Prangos* sens. strict. were ignored.

Bentham & Hooker's concept was accepted in some floras, while others followed Boissier and accepted *Colladonia* and *Prangos* as distinct genera.

Our studies of *Prangos* and *Heptaptera* left no doubt that these genera are clearly distinguished by differences in characters of leaves and fruits. These are tabulated below.

Character	*Prangos*	*Heptaptera*
Indumentum	Unbranched papillae (fig. 1A)	Branched papillae (fig. 1B)
Dissection of leaves	4–6-pinnatisect; lobes filiform	1–4-pinnatisect or 1–2-pinnatipartite; segments and lobes ovate-elliptic.
Arrangement of leaves	Whorled or decussate (alternate at the base).	Usually alternate throughout.
Inflorescence	Central umbels in a group, rarely single, with mainly hermaphrodite flowers; lateral umbels in whorls, opposite or alternate, with hermaphrodite or staminate flowers; umbels with staminate flowers branch off from the peduncles.	Central umbel single with hermaphrodite flowers; lateral umbels alternate, mainly with staminate flowers.
Flowers	Stylopodium narrower than fruit.	Stylopodium usually as wide as fruit.
Fruit	Slightly compressed laterally; winged or unwinged; wings equally developed in the mericarps of one schizocarp—fruit symmetrical.	± strongly compressed dorsiventrally; always winged; wings unequally developed in the mericarps of one schizocarp—fruit asymmetrical (except in *H. triquetra*).

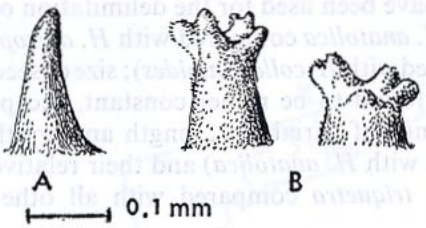

FIG. 1. Characteristic types of papillae in A, *Prangos* and B, *Heptaptera*.

As is shown above, one of the outstanding characters of the species of *Heptaptera* (except for *H. triquetra*) is the development of the asymmetrical fruit (see details on p. 84 and fig. 4 of the preceding study (Notes R.B.G. Edinb. 31: 81, 1971); *Heptaptera* = 7 wings). But, in *H. triquetra*, the mericarps are isomorphic (fig. 8), a fact which indicates the advantage of separating this species into a monotypic genus. This is further corroborated by the rather distinct shape of the leaves which differ considerably from those of the other species of *Heptaptera* (compare figs. 3–7 with fig. 8).

However, for want of satisfactory information on cytological, chemical and other characters, we do not, for the time being, propose to separate *H. triquetra* into a different genus. The species is here referred to a new subgenus of *Heptaptera*—subgen. *Isoptera*.

The genus apparently most closely related to *Heptaptera* is the small genus *Smyrniopsis*. Flowers and leaves of this genus, which includes 3 species, largely resemble those of *Heptaptera*. However, its fruits are symmetrical and ± laterally (not dorsiventrally) flattened. Boissier originally described *Smyrniopsis cachroides* (Boissier, 1872) as *Colladonia syriaca* (Boissier, 1844).

THE SUBDIVISION OF HEPTAPTERA

In Flora Orientalis (Boissier, 1872), *Colladonia* contained 2 sections distinguished by the length of the seed in relation to the length of the fruit. In Sect. *Eucolladonia* (*C. triquetra* and *C. heptaptera*) the seeds are as long as the fruit and in Sect. *Meliocarpus* (*C. anatolica*, *C. alata*, *C. anisoptera*, *C. crenata*, *C. microcarpa*, *C. cilicica*) the seeds are shorter.

This character is, however, not entirely reliable and especially in *H. anisoptera* it varies within wide limits. The relative size of the seed increases from *H. anatolica* (1/3 the length of fruit) through *H. anisoptera* (1/2—2/3), to *H. cilicica* (all included by Boissier in Sect. *Meliocarpus*) and *H. colladonioides* (= *Colladonia heptaptera* included by Boissier in Sect. *Eucolladonia*). In the latter two species, the seed is nearly as long as the fruit. In no case does the seed reach the base of the fruit and Boissier's statement "Pericarpium ultra seminis basin non productum" is inaccurate. All things considered, Boissier's sections cannot be accepted.

With the exception of *H. triquetra*, the species of *Heptaptera* proved to be rather uniform. They are included in this study in subgenus *Heptaptera*, with *H. triquetra* alone separated in subgenus *Isoptera*.

In the present paper, the delimitation of the species is based on the preceding study of populations in *H. anisoptera*, which was intended to provide a measure of reliability of accepted diagnostic characters.

It was found that, with a few exceptions, certain fruit characters can be considered as constant within a given population. Therefore, in the present

revision, the following fruit characters have been used for the delimitation of the species: general shape of mericarp (*H. anatolica* compared with *H. anisoptera*); size of mericarp (*H. cilicica* compared with *H. colladonioides*); size of seed in relation to that of the mericarp was found to be rather constant, except in *H. anisoptera* where it has a wide range of variability; length and width of dorsal wings (*H. anisoptera* compared with *H. anatolica*) and their relative development in the two mericarps (*H. triquetra* compared with all other species).

The only reliable differential character afforded by a vegetative organ relates to the stem which is either triquetrous or terete. By this character, the species fall into two groups: *H. colladonioides*, *H. angustifolia*, *H. cilicica* and *H. triquetra* with triquetrous stems; *H. anisoptera* and *H. anatolica* with terete stems.

The extent of dissection of the leaves and the shape of the lobes do not seem to be good specific characters, as proved by the preceding study of *H. anisoptera*. We have used this character—although with some hesitation—only for the delimitation of *H. angustifolia* from *H. colladonioides* (see p. 96). Neither bracts and bracteoles, nor the size of rays and pedicels proved to be reliable taxonomic characters.

Distribution of species

The distribution patterns of the 6 species of *Heptaptera* raise some interesting points (fig. 2). All, except *H. anisoptera* (as interpreted here), appear to be endemic to narrow areas within the region extending from S Italy and Macedonia through S Greece and NW and SE Anatolia.

H. colladonioides and *H. angustifolia*, two rather similar species, are the westernmost representatives of the genus, reaching as far as Italy. *H. cilicica*, a species closely related to these two, is endemic to a small part of S Anatolia. Whereas *H. anatolica* grows only in Anatolia and S Jugoslavia, *H. anisoptera*, to which it is closely related, extends to the south as far as Israel and eastwards to Iraq and Iran. *H. triquetra*, which is taxonomically in an isolated position, is confined to rocky slopes on the sea coast of Bulgaria and Turkey.

In view of the absence of genetical data and our difficulty in pointing out characters which could be considered as primitive or derived, any suggestion of evolutionary relations between the species would be speculative. However, the fact that 4 of the 6 species grow in Anatolia and one of these—*H. anisoptera*—is the only widespread species, suggests that this region might be the centre of speciation.

Taxonomic account

Heptaptera Marg. & Reut. in Mem. Soc. Phys. Genève 8: 302 (1839).

Syn.: *Colladonia* DC., Prodr. 240 (1830) non Spreng. (1825).
Perlebia DC., Coll. Mém. 5: 67 (1829) non Mart. (1828). *Anisopleura* Fenzl in Flora 26: 459 (1843) et in Endl., Gen. Suppl. 3: 82 (1843)! *Meliocarpus* Boiss. in Ann. Sci. Nat. Bot. ser. 3, 2: 84 (1844)! *Prangos* Lindl. sensu Benth. & Hook. f., Genera Plantarum 1: 904 (1867) p.p.

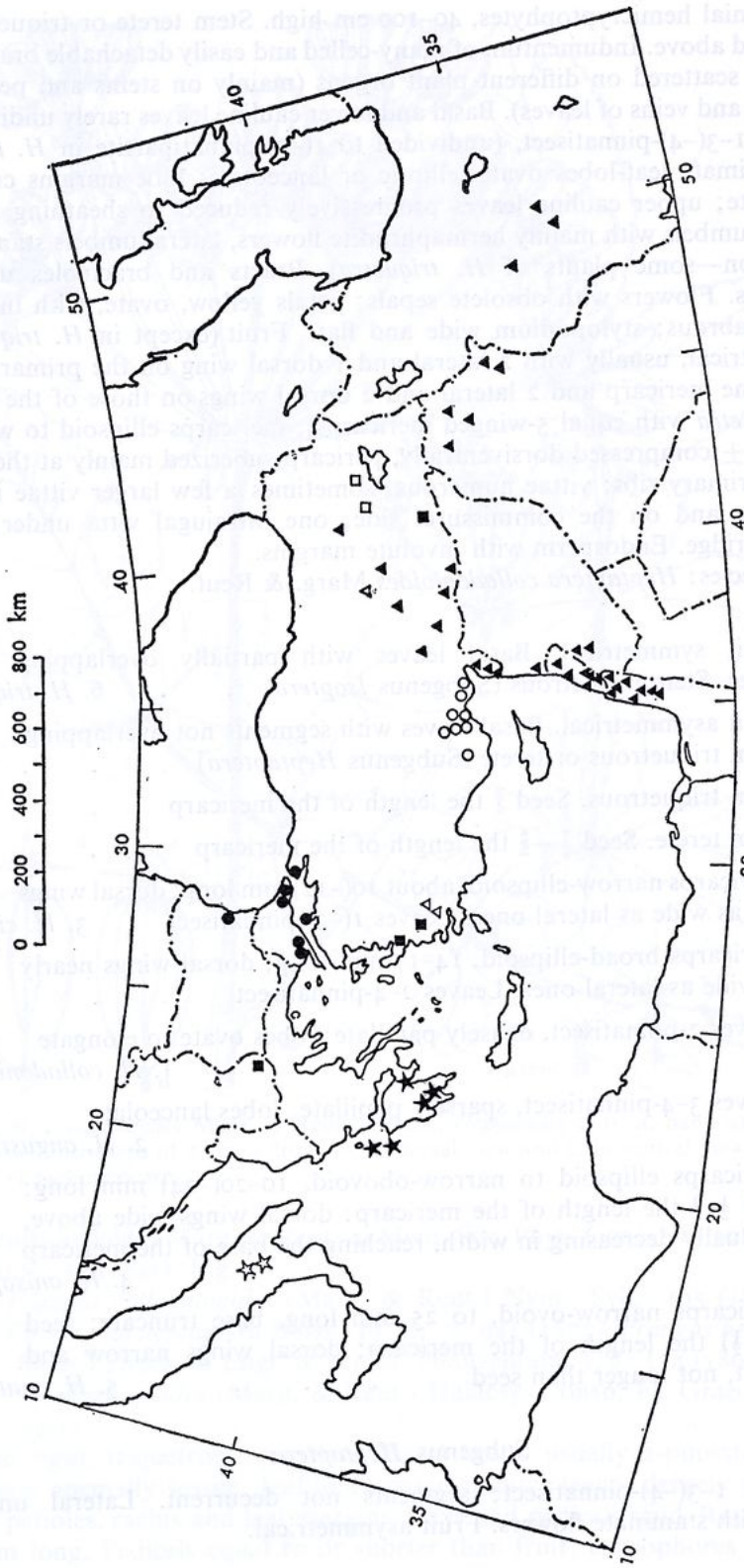

FIG. 2. The distribution of *Heptaptera* (based on specimens seen): ★ *H. colladonioides*; ☆ *H. angustifolia*; ○ *H. cilicica*; ▲ *H. anisoptera*; △ *H. anisoptera*?; ■ *H. anatolica*; □ *H. anatolica*?; ● *H. triquetra*.

Perennial hemicryptophytes, 40–100 cm high. Stem terete or triquetrous, branched above. Indumentum of many-celled and easily detachable branched papillae scattered on different plant organs (mainly on stems and petioles, margins and veins of leaves). Basal and lower cauline leaves rarely undivided, usually 1–3(–4)-pinnatisect, (undivided to 1(–2)-pinnatipartite in *H. triquetra*); ultimate leaf-lobes ovate, elliptic or lanceolate; lobe margins crenate to serrate; upper cauline leaves progressively reduced to sheathing bases. Central umbels with mainly hermaphrodite flowers, lateral umbels staminate (exception—some plants of *H. triquetra*). Bracts and bracteoles usually caducous. Flowers with obsolete sepals; petals yellow, ovate, with inflexed apex, glabrous; stylopodium wide and flat. Fruit (except in *H. triquetra*) asymmetrical, usually with 2 lateral and 1 dorsal wing on the primary ribs of the one mericarp and 2 lateral and 2 dorsal wings on those of the other (*H. triquetra* with equal 5-winged mericarps); mericarps ellipsoid to wedge-shaped, ± compressed dorsiventrally, pericarp suberized mainly at the base of the primary ribs; vittae numerous; sometimes a few larger vittae in the valleculae and on the commissural side; one intrajugal vitta under each primary ridge. Endosperm with involute margins.
Type species: *Heptaptera colladonioides* Marg. & Reut.

1. Fruit symmetrical. Basal leaves with partially overlapping lobes. Stem triquetrous (Subgenus *Isoptera*) . . 6. *H. triquetra*

\+ Fruit asymmetrical. Basal leaves with segments not overlapping. Stem triquetrous or terete (Subgenus *Heptaptera*) . . . 2

2. Stem triquetrous. Seed ¾ the length of the mericarp . . 3

\+ Stem terete. Seed ⅓—⅔ the length of the mericarp . . 5

3. Mericarps narrow-ellipsoid, about 10(–12) mm long; dorsal wings not as wide as lateral ones. Leaves 1(–2)-pinnatisect 3. *H. cilicica*

\+ Mericarps broad-ellipsoid, 14–17 mm long; dorsal wings nearly as wide as lateral ones. Leaves 2–4-pinnatisect . . . 4

4. Leaves 2-pinnatisect, densely papillate; lobes ovate to elongate 1. *H. colladonioides*

\+ Leaves 3–4-pinnatisect, sparsely papillate; lobes lanceolate 2. *H. angustifolia*

5. Mericarps ellipsoid to narrow-obovoid, 10–20(–24) mm long; seed ½–⅔ the length of the mericarp; dorsal wings wide above, gradually decreasing in width, reaching the base of the mericarp 4. *H. anisoptera*

\+ Mericarps narrow-ovoid, to 25 mm long, base truncate; seed ⅓ (–½) the length of the mericarp; dorsal wings narrow and short, not longer than seed . . . 5. *H. anatolica*

Subgenus *Heptaptera*

Leaves 1–3(–4)-pinnatisect; segments not decurrent. Lateral umbels mainly with staminate flowers. Fruit asymmetrical.

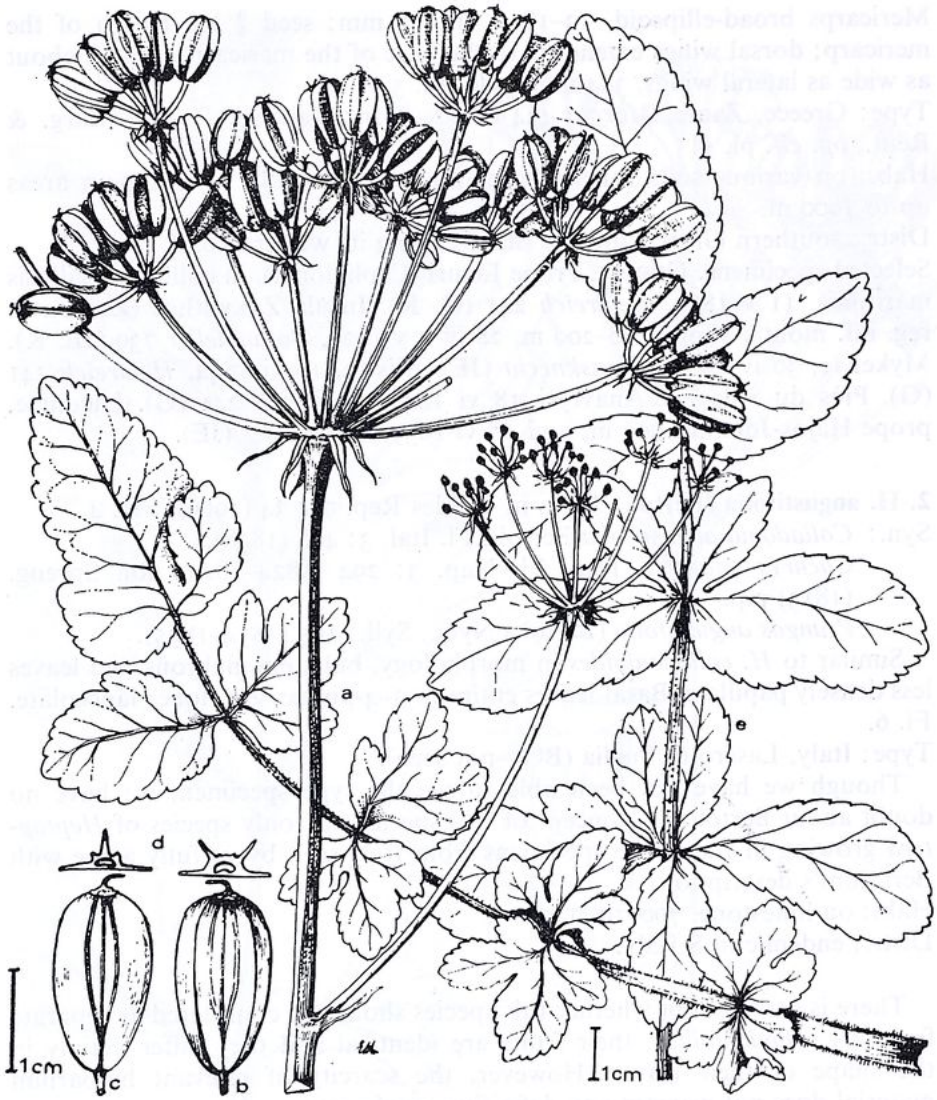

FIG. 3. *H. colladonioides* Marg. & Reut. (Greece, *Orphanides* 910): a, habit and leaves; b & c, two mericarps of a single fruit—b, in dorsal view and c, in ventral view; d, cross section of each mericarp.

1. H. colladonioides Marg. & Reut. in Mém. Soc. Phys. Genève 8: 302 (1839); Fl. Zante: 52 (1841). Fig. 3.

Syn.: *Prangos colladonioides* (Marg. & Reut.) Nym., Syll.: 165 (1854–55)! *Colladonia heptaptera* Boiss., Fl. Or. 2: 945 (1872). *Prangos heptaptera* (Boiss.) Drude in Engl. & Prantl, Pflanzenfam. 3, 8: 174 (1898). *C. colladonioides* (Marg. & Reut.) Halácsy, Consp. Fl. Graec. 1: 661 (1901).

Stem rigid, triquetrous, papillate. Basal leaves usually 2-pinnatisect, all segments normally sessile; leaf-lobes ovate-elliptic; leaves densely papillate along petioles, rachis and leaf margins. Rays and pedicels rigid. Rays 10–13, 5–8 cm long. Pedicels equal to or shorter than fruit; carpophores filiform.

Mericarps broad-ellipsoid, 13–18 × 10–12 mm; seed ¾ the length of the mericarp; dorsal wings extending to the base of the mericarp, usually about as wide as lateral wings, 3–4 mm wide. Fl. 5.
Type: Greece, Zante, *Margot* 434 (holo—G!). Drawing of type: Marg. & Reut., *op. cit.* pl. 5!
Hab.: on various soils usually containing clay; mainly in mountain areas up to 1000 m.
Distr.: southern Greece and the islands along its western coast.
Selected specimens. GREECE. Prope Lixuri (Cephalonia), in collibus argillosis maritimis, 11 v 1861, *Heldreich* 241 (G, K). Insula Zakynthos (Zante), in reg. inf. montis Skopis, 10–200 m, 28 iv–4 v 1926, *Bornmueller* 739 (JE, K). Mykenae, 30 iv 1885, *Haussknecht* (JE). Mistra, 16 vi 1844, *Heldreich* 241 (G). Près du village d'Anavryti, 18 vi 1844, *Heldreich* 241 (G). Laconiae, prope Hajos-Joannis, 900 m, 5 vi–17 vi 1857, *Orphanides* (JE).

2. H. angustifolia (Bertol.) Tutin in Feddes Rep. 74: 34 (1966). Fig. 4.
Syn.: *Colladonia angustifolia* Bertol., Fl. Ital. 3: 408 (1838).
Cachrys triquetra Ten., Fl. Nap. 3: 294 (1824–1829) non Spreng. (1813) p.p.
Prangos angustifolia (Bertol.) Nym., Syll.: 165 (1854–1855).
Similar to *H. colladonioides* in morphology, but stem glabrous and leaves less densely papillate. Basal leaves entire to 3–4-pinnatisect, lobes lanceolate. Fl. 6.
Type: Italy, Lasero di Puglia (BO—not seen).
Though we have not been able to see the type specimen, we have no doubt about Bertoloni's concept of this species, the only species of *Heptaptera* growing in Italy. The specimens from Italy seen by us fully agree with Bertoloni's description.
Hab.: on limestone, 700–1000 m.
Distr.: endemic in S Italy.

There is some doubt whether this species should be considered as separate from *H. colladonioides*; their fruits are identical and they differ mainly in the shape of their leaves. However, the scarcity of relevant herbarium material does not warrant any definitive conclusion.
Specimens seen. ITALY. Lucania, Potenza, 1000 m, fl. 4 vi 1924, fr. 3 viii 1925, *Cavioli* (GB). Lucania, in silva domaniali, Gallipoli–Cognato, 700–800 m, 25 vii 1918, *Fiori* 2485 (K, B).

3. H. cilicica (Boiss. & Bal.) Tutin in Feddes Rep. 74: 34 (1966). Fig. 5.
Syn.: *Meliocarpus cilicicus* Boiss. & Bal. in Boiss., Diagn. ser. 2, 5: 102 (1856)! *Colladonia cilicica* (Boiss. & Bal.) Boiss., Fl. Or. 2: 947 (1872).
Prangos cilicica (Boiss. & Bal.) Benth. & Hook. ex Drude in Engl. & Prantl, Pflanzenfam. 3, 8: 174 (1898).
Plants comparatively slender. Stem triquetrous, glabrous. Basal leaves 1–2(–3)-pinnatisect; proximal leaf-segments sessile or petiolulate, all others sessile; leaf-lobes ovate to elliptic; leaves papillate, mainly along rachis. Rays 13–19, 6–9 cm long. Pedicels 1–1½ times as long as fruit. Mericarps small, broad-ellipsoid, 10–12 × 7–8 mm; seed ¾ the length of the mericarp;

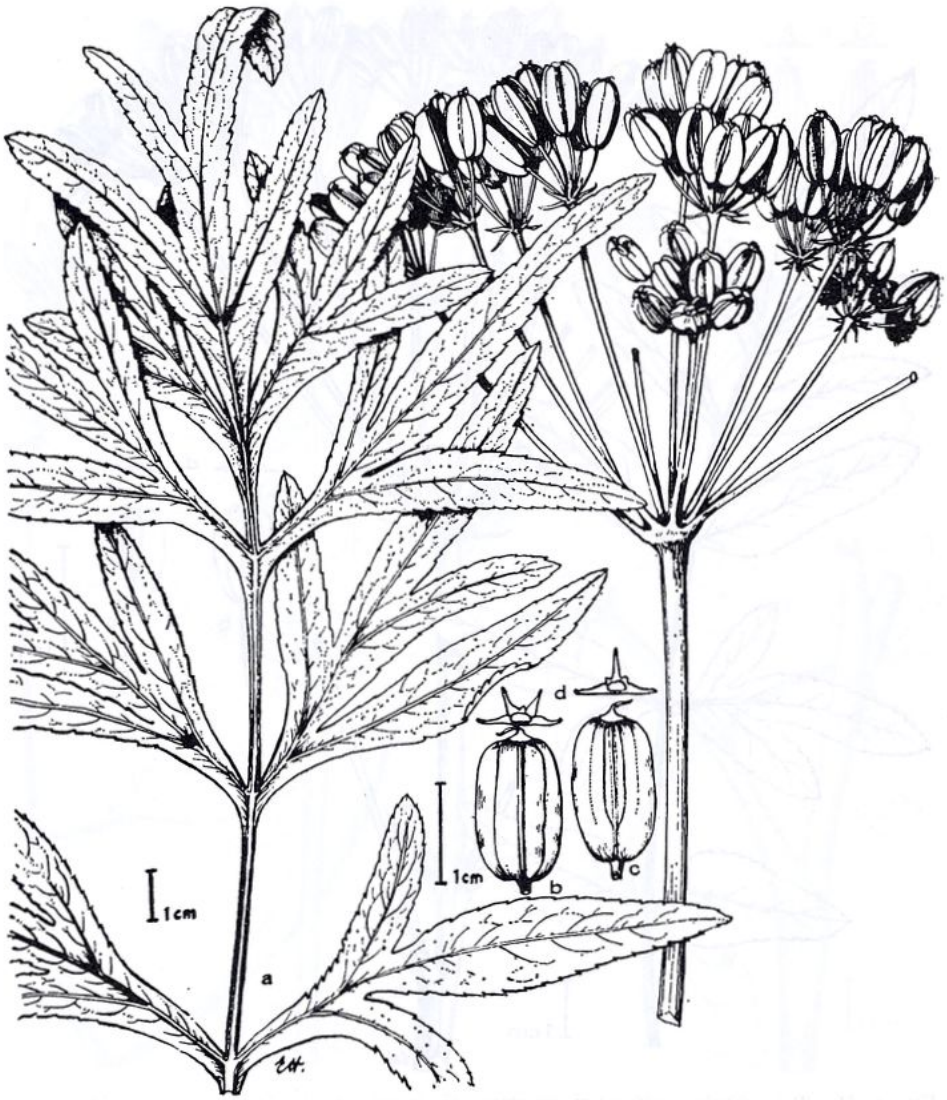

FIG. 4. *H. angustifolia* (Bertol.) Tutin (Italy, *Cavioli*); letters as in fig. 3.

dorsal wings extended to the base of the mericarp, slightly narrower than lateral wings; lateral wings about 2 mm wide. Fl. 5(–6).

Type: (Turkey) Village de Tchaousli, près de Mersina (Cilicia), *Balansa* 568 (holo—G! iso—E! L! JE!).

Hab.: foothills, not above 500 m.

Distr.: endemic to S Anatolia (Cilician Plain).

Selected specimens. TURKEY. Seyhan: Adana to Misis, 2 vii 1906, *Post* 412 (E); 30 km S of Adana (along the road to Tuzla), waste places, 5 m, 17 v 1959, *Hennipman & al.* 1189 (L). Içel: ad cataractas Cydni prope Tarsus, 8 vi 1859, *Kotschy* 250 (L, JE); Tarsus–Gülek, Wegrand, 12 km N of Tarsus, 130 m, 11 vi 1953, *Huber-Morath* 12019; Mersina, 4 vi 1853, *Cadet de Fontenay* 2832 (G); Mersin–Kuzucubelan, 18 km ob Mersin, 470 m, 18 vi

FIG. 5. *H. cilicica* (Boiss. & Bal.) Tutin (Type specimen); letters as in fig. 3.

1960, *Huber-Morath* 9786; env. of Jemele, between Mersin and Findikpinar, 500 m, 17 viii 1931, *Eig & Zohary* (HUJ).

The fruits of *H. cilicica* resemble those of *H. colladonioides* in their morphology, but are considerably smaller. No fruits of intermediate size have been found. As, moreover, this form has a limited distribution, we consider it as a separate species.

4. Heptaptera anisoptera (DC.) Tutin in Feddes Rep. 74: 33 (1966). Fig. 6.
Syn.: *Prangos anisopetala* DC., Prodr. 4: 240 (1830)—laps. calami pro *P. anisoptera*! *Anisopleura crenata* Fenzl in Flora 26: 459 (1843) et in Endl., Gen. Suppl. 3: 82 (1843)! *Meliocarpus alatus* Boiss. in Ann. Sci. Nat. Bot. ser. 3, 2: 84 (1844)! *M. anisopterus* (DC.) Boiss.,

FIG. 6. *H. anisoptera* (DC.) Tutin (Israel, *Herrnstadt*); letters as in fig. 3.

l.c. 85 (1844). *M. peduncularis* Boiss. in Diagn. ser. 1, 10: 52 (1849)! *M. microcarpus* Boiss., *l.c.* 53 (1849)! *Colladonia crenata* (Fenzl) Boiss., Fl. Or. 2: 945 (1872). *C. alata* (Boiss.) Boiss., *l.c. C. anisoptera* (DC.) Boiss., *l.c.* 946. *C. microcarpa* Boiss., *l.c. P. crenata* (Fenzl) Benth. & Hook. ex Drude in Engl. & Prantl, Pflanzenfam. 3, 8: 174 (1898). *C. persica* Hausskn. ex Bornm. in Beih. Bot. Centralbl. 19: 261 (1906)—nom. nud. *P. microcarpa* (Boiss.) Benth. & Hook. ex Drude, *l.c. H. crenata* (Fenzl) Tutin in Feddes Rep. 74: 33 (1966). *H. microcarpa* (Boiss.) Tutin, *l.c.* 34 (1966). *C. anatolica* Boiss. var. *subalata* Zoh. in Pal. Journ. Bot. 2: 169 (1941)! *C. crenata* (Fenzl) Boiss. var. *carmeli* Zoh., *l.c.*! *C. crenata* (Fenzl) Boiss. var. *anisoptera* (Boiss.) Zoh. *l.c. C. crenata* (Fenzl) Boiss. var. *brachyptera* Zoh., *l.c.*! *C. microcarpa* Boiss. var. *amani* Zoh., *l.c.*!

Stem terete, papillate. Basal leaves 1–4-pinnatisect (rarely undivided); proximal leaf-segments sessile or petiolulate; leaf-lobes ovate, elliptic or lanceolate; leaf-margins and rachis papillate. Rays 5–22, 5–19 cm long. Length of pedicels very variable. Mericarps ellipsoid to wedge-shaped, 10–20(–24) × 5–7 mm; seed ½–⅔ the length of the mericarp; dorsal wings slightly narrower than lateral wings, wide above, gradually decreasing in width, reaching the base of the mericarp; lateral wings about 2 mm wide. 2n = 22. Fl. 4–5(–6).

Type*: (Israel) "In Tiberiade prope Nazareth . . . *Labillardière*" (G—DC; photo HUJ!).

The specimen named *Prangos anisoptera* in the de Candolle Herbarium (G—DC) is from the type locality as recorded by de Candolle (1830). There is, however, no indication whether the collector of this specimen is Labillardière. It seems that, nevertheless, the specimen may be accepted at least as the isotype, without excluding the possibility that another Labillardière specimen, clearly designated as such, may be deposited in Florence or Paris.

The assumption that de Candolle described *Prangos anisoptera* from the above specimen in Geneva is corroborated by the fact that it comprises some leaves which are doubtless not of *Heptaptera*, together with inflorescences of *Heptaptera*. The leaves resemble to some extent those of *Prangos*, and Boissier (1844) assumed they were from a specimen of *Silaus pratensis*. If de Candolle had described the species from another specimen with its own leaves, he would have included it in his *Colladonia* not in *Prangos*.

The specimen in the de Candolle Herbarium bears the epithet "*anisoptera*". However, in the Prodromus (de Candolle, 1830), the epithet is printed as "*anisopetala*". There is no doubt that this is a *lapsus calami* as already pointed out by Boissier (1844). We have applied here Art. 73 of the *International Code*, which permits the correction of *anisopetala*, being a typographic error, to *anisoptera*, as was doubtless intended originally by de Candolle.

Hab.: among rocks, at widely varying altitudes, 100–1900 m.

Distr.: Turkey (SE and E Anatolia), N Iraq, W Iran, W Syria, Lebanon, Israel.

Selected specimens. TURKEY. Malatya: Malatya–Euphrates, 21 vi 1954, *Davis* 22028 (E). Bingöl: 43 km W of Bingöl, 4 vii 1963, *Zohary* 47219 (HUJ). Erzurum: Ilica–Tercan, 1900 m, 10 vii 1957, *Davis & Hedge* 30835 (HUJ). Gaziantep: Montis Ssoffdagh, supra Aintab, 900 m, 24 vi 1865, *Haussknecht* (G). Maraş: Maras–Göksun, 24 km from Maraş, 1300 m, 14 vi 1960, *Stainton & Henderson* 5518 (E). Hatay: Amanus mts., from Akil-yeh to Karakisie, 30 vi 1932, *Eig & Zohary* (HUJ); Kessab, 9 vi 1884, *Post* (HUJ); betw. Bellede Scheikh and El-Ourdu, 4 vii 1932, *Eig & Zohary* (HUJ). Urfa: inter Orpha (Urfa) et Suerek (Sürüc), vi 1841, *Kotschy* (W—type of *Anisopleura crenata* Fenzl).

IRAN. Ad Chomëin, vii 1896, *Strauss* (JE). Schuturunkuh, 19 vi 1889, *Strauss* (JE). Hamadan, in monte Elwend, v 1897, *Strauss* (JE)—the last two specimens are syntypes of *Colladonia persica* Hausskn.

* Thanks are due to Mr W. Greuter (Geneva) for providing photographs of the specimen in the de Candolle herbarium as well as additional valuable information.

IRAQ. Darbandi Khan, 7 v 1958, *Poore* 602 (K). Jebel Baradost, near Diana Rowandiz, 1934, *Field & Lazar* 879 (K). Arbil, 1893, *Bornmueller* 1269 (K). Sundur near Dihok, 19 viii 1959, *Wheeler-Haines* 1571 (K). Sundur near Dihok, 5 vi 1960, *Wheeler-Haines* 1710 (K). Molla Khort mountain, 1700 m, 22 vi 1960, *Rawi, Hoshan & Luri* 29479 (K).
SYRIA. Safita, 1881, *Post* 14 (HUJ). Duma, 3 vii 1865, *Post*? (HUJ). Mt. Harran, 12 v 1865, *Haussknecht* 698 (G). Cassius in regione inferiori, v–vii 1846, *Boissier* (G—type of *Meliocarpus peduncularis* Boiss.)
LEBANON. Between Hawara and Kefar Damine (Benine), E of Sir, 1030–1100 m, 10 vii 1934, *Bot. Dept.* (HUJ). Inter Bukfasii et Branmmanor, 1 vii 1849, *Blanche* 730 (G). In collinis prope Bludan, 1370 m, 14 vi 1855, *Kotschy* 125 (G, K). Entre Baderûne et le Loghra, route de Saïda à Dama, 14 vi 1853, *Gaillardot* (JE). Près du pont de Barghout, Saïda, 26 iii 1853, *Blanche* (JE). Antilebanon, entre Racheiya et Hasbaya, 21 v 1817, *Gaillardot* 1846 (G, JE). Mt. Hermon, Qal'ath et Shaqif, 16 v 1925, *Smoly* (HUJ).
SYRIA. Loco non notato, *Aucher* 3667 (G—type of *Meliocarpus alatus* Boiss.). Loco non notato, 1846, *Boissier* (G—type of *Meliocarpus microcarpus* Boiss.)
ISRAEL. Hulla Valley, Amir, at foot of Golan Mts., 7 iv 1941, *Weissman* (HUJ). Upper Galilee, Jebel el Arus, 4 vi 1926, *Eig* (HUJ). Upper Galilee, Wadi Qarn, near Montfort, 10 v 1945, *Zohary* (HUJ). Upper Jordan Valley, Tiberias, 28 iv 1933, *Olami* (HUJ). Mt. Carmel, Jazur, 28 v 1926, *Eig & Zohary* 57396 (HUJ). Palaestinae in collibus Samariae, iv–v 1846, *Boissier* (G). Judaea, ad Bab-el-Wad ditionis Latrun, 16 v 1897, *Bornmueller* 655 (JE). Judean Mts., Kefar Ezion, 6 v 1935, *Grizi* (HUJ).

H. anisoptera and the following species, *H. anatolica*, show a considerable morphological likeness. They are, however, easily distinguished by the mericarps in ripe fruit. These differ in their general shape as well as in the length of the seed and the dorsal wings as compared with the length of the mericarp. However, in specimens with young fruits it is often impossible to decide whether they are *H. anisoptera* or *H. anatolica*. This made it difficult to understand the exact range of distribution of *H. anisoptera* and *H. anatolica* in Anatolia.

Sometimes specimens with young fruits can provisionally be determined. The following seem to belong to *H. anisoptera*. Tunçeli: Hozat, 1700 m, rocky limestone slopes, 14 vii 1957, *Davis & Hedge*, *D* 31131 (E). Muğla: Milaş, Milaş–Yatagan, 90 m, 26 v 1962, *Hub.-Mor.* 16863. Muğla: Milaş to Muğla, 6 km from Milaş, 100 m, 26 v 1962, *Dudley*, *D*. 35017 (E).

We consider *H. anisoptera* as a species in which many previously described species are included. Though some extreme forms differ widely and were described under different names, they are all connected by intermediate forms and their various names are considered here as synonymous with *H. anisoptera*. This view is based on the preceding study of variation in natural populations of *H. anisoptera* (Notes R.B.G. 31: 81–89, 1971): the variation found in the size of the mericarps and in the relative length of the seeds is the cause for the inclusion of *H. microcarpa* in *H. anisoptera*; the differences in the development of the dorsal wings of the mericarps for the inclusion of *H. alata*; the variation in the extent of dissection of leaves,

in the number and length of rays, the length of pedicels, as well as in the relative size of mericarp wings—all together for the inclusion of *H. crenata*.

Thus, in the present study, *H. anisoptera* is interpreted in a much wider sense than that accepted by Boissier and later authors, and includes 3 other species of the *Flora Orientalis* (Boissier, 1872): *C. crenata*, *C. alata* and *C. microcarpa*.

5. H. anatolica (Boiss.) Tutin in Feddes Rep. 74: 33 (1966). Fig. 7.

Syn.: *Meliocarpus anatolicus* Boiss., in Ann. Sci. Nat. Bot. ser. 3, 2: 84 (1844)! quoad typ., non quoad descr. *Colladonia anatolica* (Boiss.) Boiss., Fl. Or. 2: 945 (1872). *Prangos anatolica* (Boiss.) Benth. & Hook. ex Drude in Engl. & Prantl, Pflanzenfam. 3, 8: 174 (1898). *C. macedonica* Bornm. in Bot. Jahrb. 67: 291 (1936)! *C. longiradiata* Wolff ex Bornm., *l.c.* 293 (1936). nom. nud.! *H. macedonica* (Bornm.) Tutin in Feddes Rep., *l.c.*

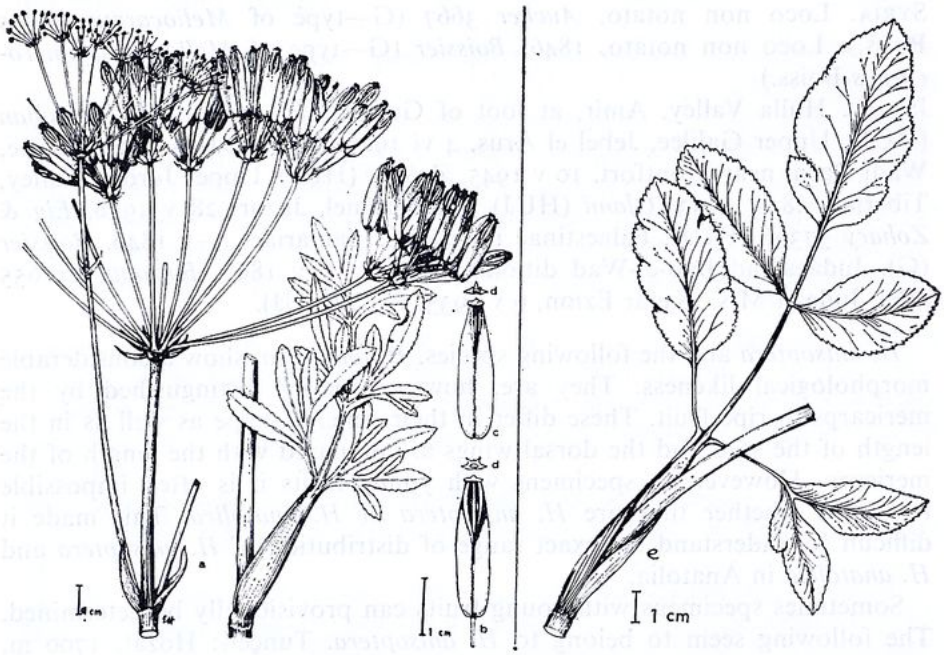

FIG. 7. *H. anatolica* (Boiss.) Tutin (Turkey, *Balansa* 57); letters as in fig. 3; e, leaf (Turkey, *Sintenis* 898).

In habit and leaves similar to *H. anisoptera*. Rays 8–13, 8–13 cm long. Pedicels as long as fruit or to 1½ times as long. Mericarps narrow-ovoid, 20–25 × 6–8 mm, with truncate base; seed ⅓(–½) the length of the mericarp; dorsal wings not longer than seed, poorly developed, much narrower than lateral wings; lateral wings up to 2 mm wide; mericarps often falsely appearing isomorphic.

Type: (Turkey) "prope Smyrnam ad viam quae versus pagum Budja ducit", v–vi *Boissier* (G!).

Hab.: mountain slopes, 600–1600 m.

Distr.: Yugoslavia (Macedonia), Turkey (W and E Anatolia).

Selected specimens. YUGOSLAVIA. Makedoniya, Demir-Kapu: 600–800 m, 26 vi 1917, *Bornmueller* 995 (JE—type of *Colladonia macedonica* Bornm.); 600 m, 4 vi 1918, *Bornmueller* 4179 (JE).
TURKEY. Izmir: Smyrne, sur les coteaux incultés, 25 vi 1854, *Balansa* 57 (E, JE). Mardin: Mardin, declivis montium, 1 vi–2 vii 1888, *Sintenis* 898 (E, HUJ, JE, K—as *Colladonia longiradiata* Wolff *nom. nud.*).

As in the case of *H. anisoptera*, at least some specimens with young fruit may be included with some reservation in *H. anatolica*. These are: Muş, Patnos to Malazgirt, 24 km W of Patnos, 1660 m, 13 vii 1951, *Hub.-Mor.* 10929; Muş, 26 km from Muş to Varto, 1420 m, 9 vii 1966, *Davis* 46114 (E); Muğla: Aydin to Milaş, 103 km from Aydin, 530 m, 18 vi 1954, *Hub.-Mor.* 13683.

This species might be much more widespread in Anatolia than it appears from the cited specimens. However, as stated above, many specimens with immature fruit remained undetermined because of the difficulty to distinguish between *H. anatolica* and *H. anisoptera*.

Subgenus **Isoptera** Herrnstadt & Heyn, **subgen. nov.**

Folia integra usque ad 1(–2)-pinnatipartita, lobi decurrentes secundum rhachidem. Dimidia fere pars florum umbellarum lateralium hermaphroditi. Fructus symmetricus.

6. H. triquetra (Vent.) Tutin in Feddes Rep. 74: 34 (1966). Fig. 8.
Syn.: *Laserpitium triquetrum* Vent., Descr. Pl. Jard. Cels. t. 97 (1803)! *Colladonia triquetra* (Vent.) DC., Prodr. 4: 240 (1830). *Prangos triquetra* (Vent.) Nym., Syll. 165 (1854–1855).

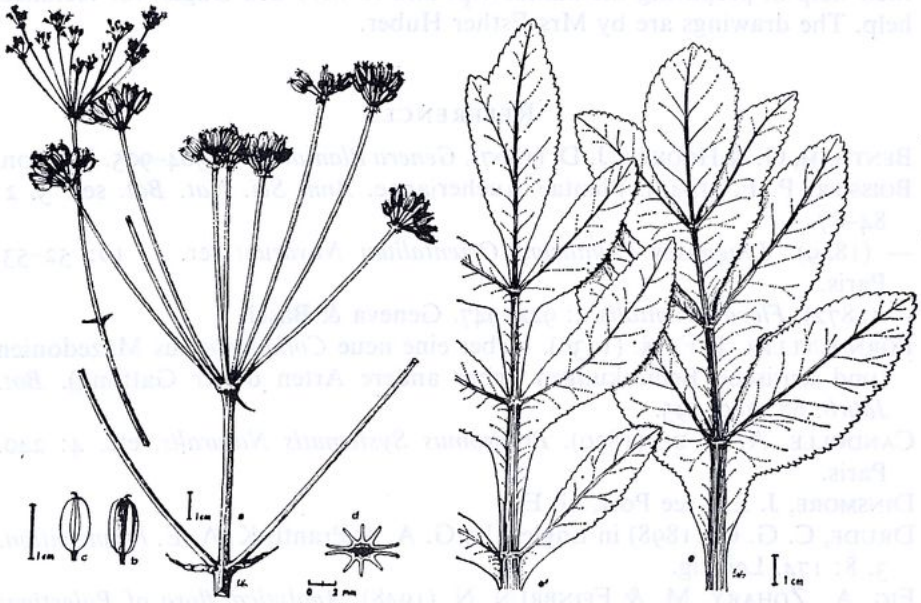

FIG. 8. *H. triquetra* (Vent.) Tutin (Turkey, *Degen*); letters as in fig. 3; e, first leaves.

Stem triquetrous, glabrous. Basal leaves entire to 1(–2)-pinnatipartite; leaf-lobes wide, ovate-elliptic, decurrent, partially overlapping; rachis sparsely papillate. Rays 10, 8–12 cm long. Pedicels as long as fruits, usually not rigid. Mericarps broad-ellipsoid, 8–9(–10) × 5–7 mm; seed ¾ the length of the mericarp, the 3 dorsal wings extended to the base of the mericarp, nearly as wide as lateral wings, about 1·5–2 mm wide. Fl. (5–)6(–7).

Type: (Turkey) "Constantinople, sur les bords du Canal", *Bruguière & Olivier* (iso—G!). Drawing of type: Ventenat, Descr. Pl. Jard. Cels. t. 97 (1803)!

Hab.: rocky slopes near the coast.

Distr.: SE Bulgaria, Turkey (Turkey in Europe and NW Anatolia).

Selected specimens. BULGARIA. Inter Burgas et Monastir Kioj, 10 vii 1893, *Wagner* (JE); illeg., *Friwaldszky* (G).

TURKEY. Thracia, *Pers.* (L). Istanbul: Constantinople, *Auch.* 3671 (K); Byzantium ad Bosphorum, inter Boüyouk–Liman et Karibieh, 4 vi 1890, *Degen* (JE, K); Balta Liman, N of Rumeli-Hissari, collines maritimes, 10 vi 1892, *Aznavour* 998 (E); Halim Pasa—Rumeli-Hissar, 7 vi 1936, *Aznavour* (E); Rumeli Karak—Otouzbirson, 6 vii 1892, *Aznavour* 998 (E); Boüyuk-Liman -Karibdjé Burun, 30 vii 1900, *Aznavour* (E).

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