Notes RBG Edinb. 45(2): 225–286 (1988)

A REVISION OF PAPAVER L. SECTION RHOEADIUM SPACH

J. W. KADEREIT*

ABSTRACT. *Papaver* L. sect. *Rhoeadium* Spach (Papaveraceae) is considered to contain sixteen species: *P. pinnatifidum* Moris; *P. purpureomarginatum* Kadereit, *sp.nov.* from the Aegean, adjacent mainland Greece and Turkey and Cyprus; *P. dubium* L. with five subspecies including subsp. *laevigatum* (M.Bieb.)Kadereit, *comb. et stat.nov.*, subsp. *erosum* (Litv.)Kadereit, *comb. et stat.nov.* and subsp. *glabrum* (Royle)Kadereit, *comb. et stat.nov.*; *P. rechingeri* Kadereit, *sp.nov.* from SW Iran and adjacent Iraq; *P. arachnoideum* Kadereit, *sp.nov.* from Turkey; *P. arenarium* M.Bieb.; P. *tenuifolium* Boiss. & Hohen. ex Boiss.; *P. commutatum* Fischer & C. Meyer with two subspecies, including subsp. *euxinum* Kadereit, *subsp.nov.* from N Turkey; *P. chelidoniifolium* Boiss. & Buhse; *P. guerlekense* Stapf; *P. stylatum* Boiss. & Bal. ex Boiss.; *P. clavatum* Boiss. & Hausskn. ex Boiss.; *P. umbonatum* Boiss.; *P. carmeli* Feinbrun; *P. humile* Fedde and *P. rhoeas* L. Distribution maps are provided for all taxa except *P. dubium* subsp. *dubium* and *P. rhoeas* outside SW Asia, and chromosome numbers are given for most taxa. The relationships between the various taxa are discussed and hypotheses are made on the origin of the widespread *P. dubium* subsp. *dubium* and P. *rhoeas*.

INTRODUCTION

Among the annual sections of the genus *Papaver* L., sect. *Rhoeadium* Spach is by far the largest. In the genus only sect. *Meconella* Spach, a group of largely arctic-alpine perennials, contains more species. Apart from the treatment of sect. *Rhoeadium,* or the species known of it, in systematic works of a general nature (e.g. De Candolle, 1821; Spach, 1839) it was dealt with monographically by Viguier (1814) in his *Histoire Naturelles, Médicale et Économique, des Pavots et des Argémones,* by Elkan (1839) in his *Tentamen Monographiae Generis Papaver,* by Kuntze (1887) in *Plantae Orientali-Rossicae* and by Fedde (1909) in *Das Pflanzenreich.* In these works rather different approaches were taken. On the one hand, Elkan (1839) and Kuntze (1887) accommodated all taxa known at their time in two (*P. rhoeas* L. and *P. dubium* L.) or one (*P. rhoeas*) species respectively. On the other hand, a large number of new species were described by Fedde (1909), often from single herbarium specimens only or including obvious monstrosities, and by Timbal-Lagrave (1870, 1892), Jordan (1861, 1864) and Wein (1911 a–c), who worked on a regional scale. Both these attitudes result from the predominance in this section of closely similar and highly variable species. In the present account no taxon is accepted of which only one herbarium specimen has been seen, and a more or less continuous distribution area, except for disjunctions known from many other examples, has been demanded from all species and subspecies recognized. This approach has led to the acceptance of 16 species with nine subspecies and three varieties.

MATERIAL & METHODS

For the SEM-photographs, seeds were stuck on aluminium stubs with double-sided adhesive tape and sputtered with gold in a Balzers Union

*Institut für Systematische Botanik und Pflanzengeographie, Im Neuenheimer Feld 328, 6900 Heidelberg, W Germany.

AG sputter. The photographs were taken on a Leitz AMR 1200 microscope.

For the counting of chromosome numbers, root tips were pretreated in a solution of 0·4% 8-hydroxyquinoline for 2–3 hours, followed by fixation in 3:1 ethanol : acetic acid. After hydrolysis in 1N HCl at 60°C for 6 minutes, they were stained in leucobasic fuchsin for 2–3 hours and squashed in a drop of proprionic orcein.

Origin of material: *P. pinnatifidum*: 30km E of Tiznit on road to Tafraout, Morocco, 12 v 1982, *Davis & King* 68238 (E; seeds and chromosome number); *P. purpureomarginatum*: Ep. Kidhonia: peninsula Akrotiri, Crete, 24 iv 1976, *Greuter & Charpin* 13348 (W; seeds and chromosome number); *P. dubium* subsp. *dubium*: Haan, W Germany, viii 1983, *Kadereit* s.n. (seeds and chromosome number); *P. dubium* subsp. *lecoqii*: Grantchester, England, 11 vii 1983, *Kadereit* s.n. (seeds and chromosome number); *P. dubium* subsp. *laevigatum*: Crimea: distr. Simferopol, 9km S of Simferopol, U.S.S.R., 5 vi 1953, *Davis* 33546 (E; seeds); *P. dubium* subsp. *erosum*: Gorgan: Shahpassand to Bodjnourd, Almeh, Iran, 10 vi 1975, *Herb.Min.Ir. Agric.* 34154 (E; seeds); unknown origin, *Hort.Centr.Cult. Herb. Medic.Brno* no. 100, sub. *P. litwinowii*; Ashkhabad, U.S.S.R. (chromosome number: 2n = 28); Echegradsorsk bei Chatschik, U.S.S.R., 10 vii 1976, *Avetisjan & Manakjan* s.n. (WU; chromosome number: 2n = 42); *P. dubium* subsp. *glabrum*: Bamian: inter Bamian et Bandiamir, Afghanistan, 13 vii 1962, *Rechinger* 18121 (W; seeds); *P. rechingeri*: Distr. Kut Al-Imara: Badra, Iraq, 12–13 iv 1957, *Rechinger* 9203 (W; seeds); *P. arachnoideum*: Sinop A 5, after Kargi, Turkey, 1 vi 1969, *Tobey* 2816 (E; seeds); *P. arenarium*: Megrinsk bei Agarak, U.S.S.R., 27 v 1977, *Avetisjan et al.* s.n. (WU; seeds and chromosome number); *P. tenuifolium*: Schir-Dere in m. Elbrus pr. Derbend, Iran, *Kotschy* 247 (W; seeds); *P. commutatum* subsp. *commutatum*: unknown origin, *Hort.Bot. Hauniensis* s.n. (seeds and chromosome number); *P. chelidoniifolium*: Gilan: 7km W Bandar-E Pahlavi, Iran, 14 v 1971, *Rechinger* 39623 (W; seeds); *P. guerlekense*: Karpathos: in oropedio Katolastos, Greece, 23 v 1963, *Greuter* 5490 (W; seeds); Mugla, 13km S of Fethiye, Turkey, 16–28 v 1976, *Polunin* 13977 (E); Kemer, Turkey, 11 viii 1984, *Kadereit* 84/72; near Termessos, roadside, Turkey, 19 viii 1984, *Kadereit* 84/147 (chromosome number); *P. stylatum*: Prov. Adana: distr. Misis: Nur Dag above Kizildere, Turkey, 17 iv 1957, *Davis & Hedge* 26751 (E; seeds); *P. clavatum*: Mardin: Mardin–Nusaybin, 10–20km from Nusaybin, Turkey, 22 v 1957, *Davis & Hedge* 28425 (BM; seeds); *P. umbonatum*: Jerusalem, Israel, 28 v 1983, *Liston* s.n. (seeds and chromosome number); *P. humile*: Tel Yizhak, Israel, 17 vi 1983, *Liston* s.n. (seeds and chromosome number); *P. rhoeas* var. *rhoeas*: Grantchester, England, vii 1983, *Kadereit* s.n. (seeds and chromosome number).

KEY TO THE SPECIES

1a. Mature capsules twice to more than twice as long as broad 2

1b. Mature capsules less than twice as long as broad 19

2a. Plants with setose and arachnoid hairs 3
2b. Plants with few to many setose hairs only 4
3a. Leaves and axis with arachnoid indumentum; terminal setae on leaf lobes almost always longer than 1·5mm and up to 5mm long. (N and C Turkey W of line Trabzon to Adana) . . . . . **5. P. arachnoideum**
3b. Only axis with mostly few arachnoid hairs; terminal setae on leaf lobes never longer than 1·5mm. (SE Turkey E of Adana towards N Iraq) . . . . . **12. P. clavatum**
4a. Sepals with ± conspicuous subapical processes; leaves often up to 2-pinnatipartite, ultimate segments at least of upper leaves often less than 1mm broad. (Iranian Azerbaijan, Caucasia, Caucasus and E coast of Caspian Sea) . . . . . **6. P. arenarium**
4b. Sepals very rarely with mostly inconspicuous subapical processes; if present, ultimate leaf segments of upper leaves rarely narrower than 1mm 5
5a. Anthers almost always light yellow 6
5b. Anthers never light yellow, but dull yellow-brown, greenish or purplish 8
6a. Setose hairs rather thin-walled and soft, flat in dry material; ultimate leaf segments at least of upper leaves rarely broader than 2mm; pedicel with patent setae. (WC Iran S of Elburz Mts) . . . . . **7. P. tenuifolium**
6b. Setose hairs rather stiff; ultimate leaf segments mostly broader than 2mm; pedicel almost always with appressed setae. (Atlantic Islands, W and C Mediterranean or the Aegean, adjacent mainland Greece and Turkey or Cyprus) 7
7a. Sepal margin almost always dark violet; upper stem leaves often entire or with one basal pair of ± distinctly recurved lobes, rarely with more lobes. (Aegean, adjacent mainland Greece and Turkey or Cyprus) . . . . . **2. P. purpureomarginatum**
7b. Sepal margin never dark violet; upper stem leaves very rarely entire, mostly with many strongly antrorse lobes or teeth. (Atlantic Islands or the W or C Mediterranean) . . . **1. P. pinnatifidum**
8a. Stigmatic disc flat or slightly vaulted at maturity or free lobes of stigmatic disc curved upwards at maturity 9
8b. Stigmatic disc ± distinctly umbonate at maturity 16
9a. Free lobes of stigmatic disc conspicuously curved upwards at maturity; lobes often longer than broad; upper stem leaves with winged petiole mostly clasping axis. (Mt Carmel area in N Israel) . . . . . **14. P. carmeli**
9b. Free lobes of stigmatic disc not or little curved upwards at maturity; lobes mostly about as long as broad or broader 10
10a. Stigmatic disc broader than capsule diameter at maturity 11
10b. Stigmatic disc narrower to as broad as capsule diameter at maturity 13
11a. Capsules gradually narrowing into clavate base; terminal segment of lower leaves mostly less than twice as long as broad; plants almost always with red tinge on leaves, axis or at least some setae. (SW

Turkey E to Cape Anamur, the NW (N Sporades) or SE Aegean or Cyprus) . . . . . **10. P. guerlekense**

11b. Capsules mostly ± strongly contracted at base; if narrowing gradually, terminal segment of lower leaves mostly more than twice as long as broad or upper stem leaves clasping axis with winged petiole 12

12a. Upper stem leaves with winged petiole mostly clasping axis; plants often of ascending habit, mostly with few leaves on primary axis above basal rosette. (Israel, Jordan, Egypt or Libya) . . . . . **15. P. humile**

12b. Upper stem leaves very rarely with winged petiole; if present, very rarely clasping axis; plants mostly of erect habit with mostly many leaves on primary axis above basal rosette. (Widespread weed) . . . . . **16. P. rhoeas**

13a. Ultimate segments of lower leaves very rarely broader than 3mm. (SE Turkey E of Adana towards N Iraq) . . **12. P. clavatum**

13b. Ultimate segments of at least some lower leaves broader than 3mm 14

14a. Capsules often rather strongly contracted below pores; terminal segment of lower leaves mostly less than twice as long as broad; plants almost always with red tinge on leaves, axis or at least some setae. (SW Turkey E to Cape Anamur, the NW (N Sporades) and SE Aegean or Cyprus) . . . . . **10. P. guerlekense**

14b. Capsules ± weakly contracted below pores; plants never with red tinge 15

15a. Pedicel with few patent to half-appressed setae; stigmatic disc always with dark violet marks on margin. (SW Iran or adjacent Iraq) . . . . . **4. P. rechingeri**

15b. Pedicel almost always with ± dense indumentum of appressed setae; stigmatic disc without dark violet marks. (Widespread weed) . . . . . **3. P. dubium**

16a. Plants of ± subscapose habit; capsules below pores 4·5–10mm long, narrowing ± gradually towards base. (SE Turkey around Adana) . . . . . **11. P. stylatum**

16b. Plants ± regularly leafy; if capsules below pores shorter than 10mm, capsules ± strongly contracted at base 17

17a. Ultimate segments of lower leaves very rarely broader than 3mm. (SE Turkey E of Adana towards N Iraq) . **12. P. clavatum**

17b. Ultimate segments of at least some lower leaves broader than 3mm 18

18a. Terminal segment of lower leaves mostly less than twice as long as broad; basal lobes of uppermost stem leaves often little longer or shorter than basal pair of lobes of terminal segment; umbo mostly distinct. (Syria, Lebanon, Israel or Jordan) . . . . . **13. P. umbonatum**

18b. Terminal segment of lower leaves mostly more than twice as long as broad; basal lobes of uppermost stem leaves mostly distinctly longer than basal pair of lobes of terminal segment; umbo mostly indistinct. (Widespread weed) . . . . . **16. P. rhoeas**

19a. Setose hairs rather thin walled and soft, flat in dry material; ultimate leaf segments at least of upper leaves rarely broader than 2mm. (WC Iran S of Elburz Mts) . . . . **7. P. tenuifolium**

19b. Setose hairs rather stiff; ultimate segments of leaves mostly broader than 2mm 20

20a. Upper leaves trifid with large mostly incised terminal and much smaller lateral almost patent lobes; petals mostly gradually darkening towards their base, rarely with distinct spots; sepals mostly subglabrous; capsules up to 7mm long. (N Iran) . . . . . **9. P. chelidoniifolium**

20b. Petals either uniformly red or with distinct basal or subbasal spots; sepals mostly with ± dense setose indumentum; capsules mostly longer than 7mm 21

21a. Pedicel with mostly very dense indumentum of short (0·4–1·4mm) densely appressed setae; capsules often slightly stipitate. (Caucasia or Iranian Azerbaijan) . . . . . **8. P. commutatum**

21b. Pedicel with patent or with longer appressed setae 22

22a. Free lobes of stigmatic disc conspicuously curved upwards at maturity; lobes often longer than broad. (Mt Carmel area in N Israel) . . . . . **14. P. carmeli**

22b. Free lobes of sitgmatic disc not or little curved upwards at maturity; lobes mostly about as long as broad or broader 23

23a. Upper stem leaves with winged petiole mostly clasping axis; plants often of ascending habit, mostly with few leaves on primary axis above basal rosette. (Israel, Jordan, Egypt or Libya) . . . . . **15. P. humile**

23b. Upper stem leaves very rarely with winged petiole and if present, very rarely clasping axis; plants mostly regularly leafy, mostly of erect habit 24

24a. Terminal segment of lower leaves mostly less than twice as long as broad; capsule base narrowing gradually; plants almost always with red tinge on leaves, axis or at least some setae. (SW Turkey E to Cape Anamur, the NW (N Sporades) and SE Aegean or Cyprus) . . . . . **10. P. guerlekense**

24b. Terminal segment of lower leaves mostly more than twice as long as broad 25

25a. Stigmatic disc as broad as to narrower than capsule diameter, always with dark violet marks on margin; pedicel with few patent to half-appressed setae. (SW Iran and adjacent Iraq) . . . . . **4. P. rechingeri**

25b. Stigmatic disc mostly broader than capsule diameter; if narrower, capsules broadly obovoid, cylindrical or almost globose; pedicel with mostly ± dense indumentum of patent or loosely appressed setae. (Widespread weed) . . . . . **16. P. rhoeas**

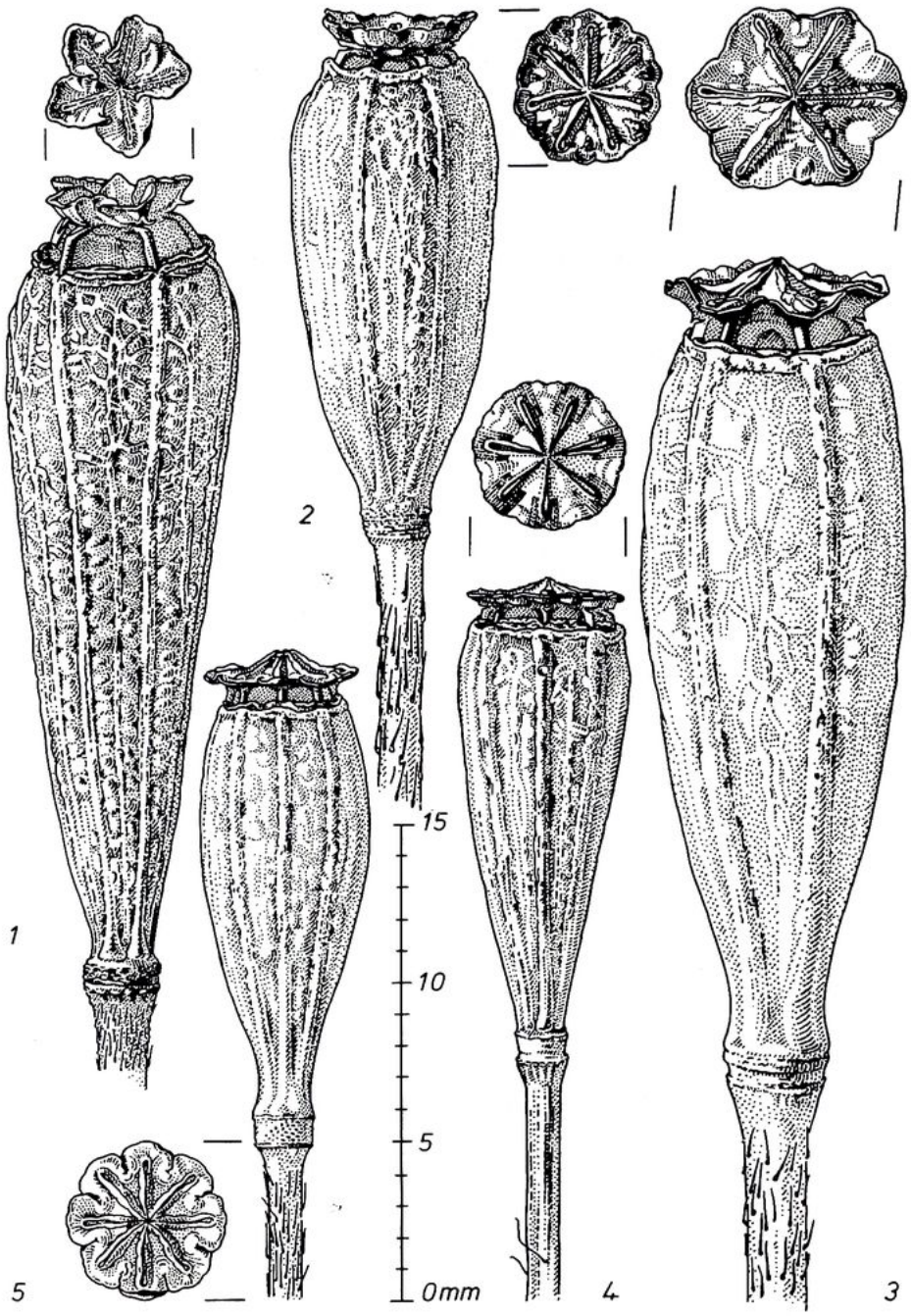

FIG. 1. Capsules of 1, *P. pinnatifidum*; 2, *P. purpureomarginatum*; 3, *P. dubium* subsp. *dubium*; 4, *P. rechingeri*; 5, *P. arachnoideum*.

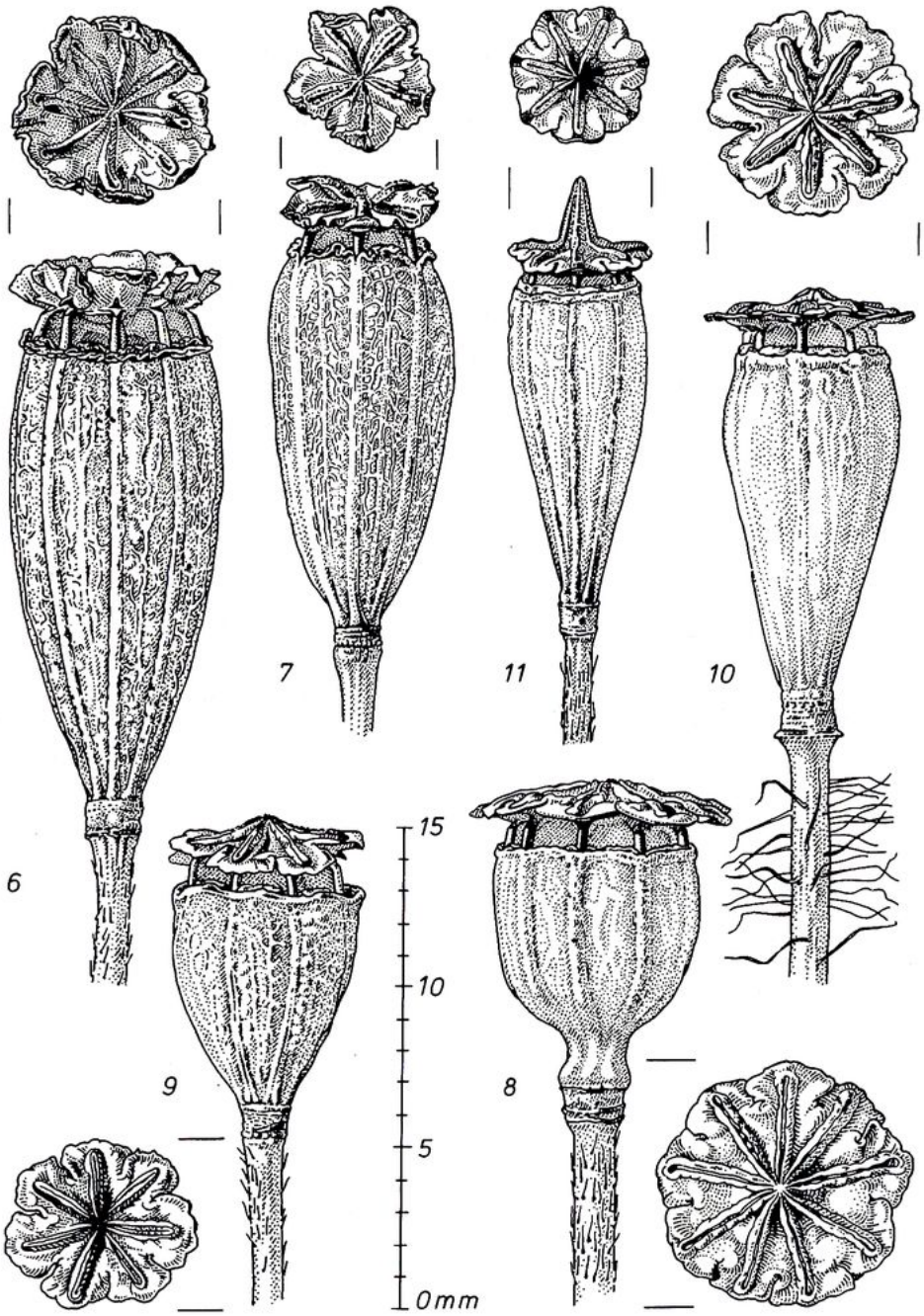

FIG. 2. Capsules of 6, *P. arenarium*; 7, *P. tenuifolium*; 8, *P. commutatum* subsp. *commutatum*; 9, *P. chelidoniifolium*; 10, *P. guerlekense*; 11, *P. stylatum*.

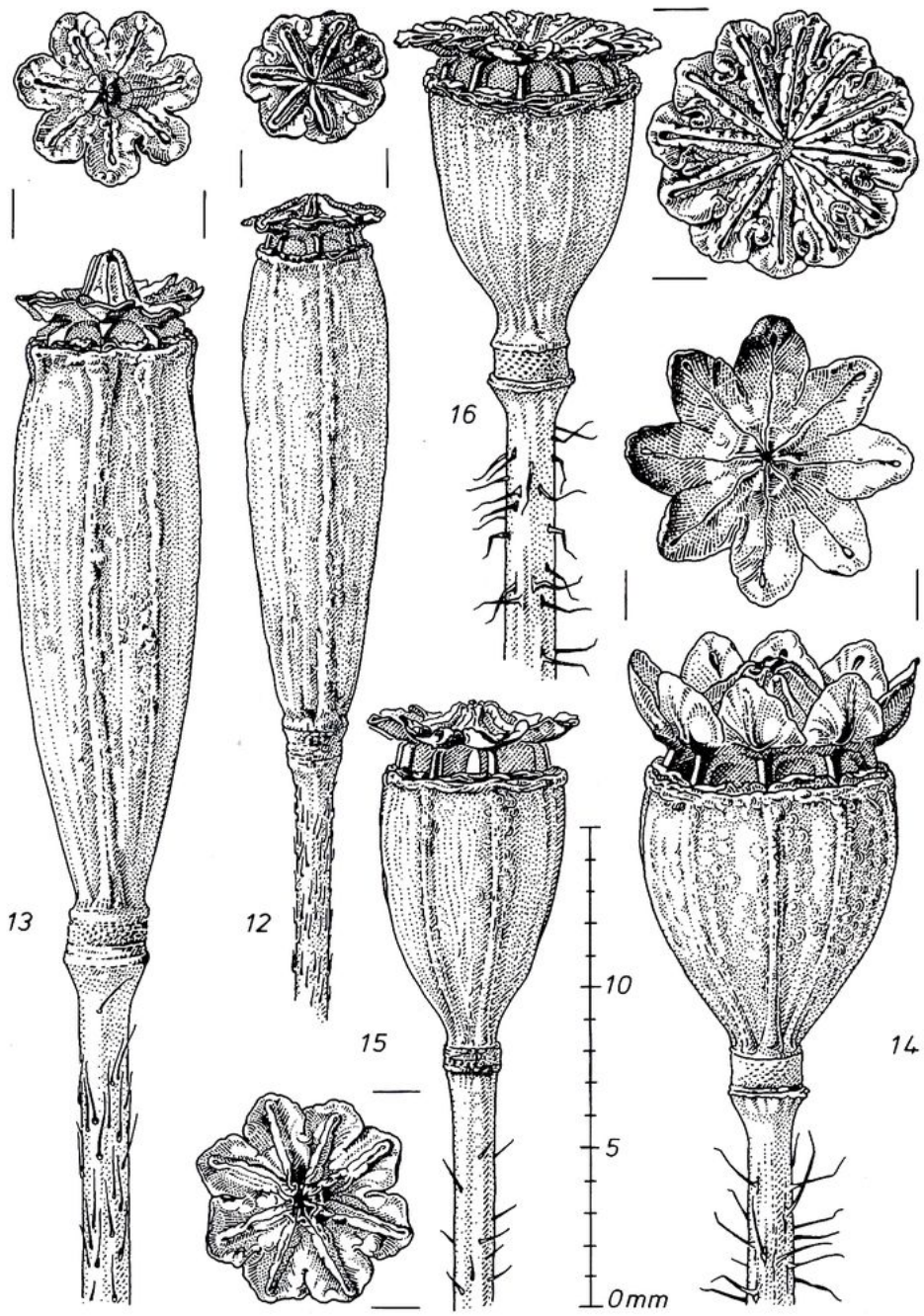

FIG. 3. Capsules of 12, *P. clavatum*; 13, *P. umbonatum*; 14, *P. carmeli*; 15, *P. humile*; 16, *P. rhoeas* var. *rhoeas*.

Papaver Sect. **Rhoeadium** Spach, Hist.nat.vég. phan. 7:16 (1839).
Syn.: *Rhoeades* Bernh., Linnaea 8:463 (1833).
Sect. *Rhoeades* (Bernh.)Elkan, Tent.Monogr.Gen. Papaver: 23 (1839).
Sect. *Orthorhoeades* Fedde in Engler, Pflanzenr. 4, 104:326 (1909).
Type: *P. rhoeas* L., Sp.Pl. 1:507 (1753).

Erect to ascending, very rarely almost decumbent, branched or rarely unbranched annual herbs; leaves variously dissected; lower leaves petiolate; upper leaves shortly petiolate to mostly sessile with narrowly to broadly cuneate to rounded base; plants sometimes glaucous, with few to many patent to appressed setae on all green parts, or sometimes with additional arachnoid hairs; sepals with or mostly without ± conspicuous subapical processes; petals obovate to rotund to flabelliform, variously red, sometimes white or pale violet, with or without black spots of varying size and position; filaments filiform; capsules clavate to cylindrical, obovoid, ellipsoid or almost globose, shortly stipitate or not; stigmatic disc flat, sometimes with distinct central umbo or free lobes of disc curved upwards; seeds reniform.

1. P. pinnatifidum Moris, Fl.Sardoa 1:74 (1837). Figs 1, 4, 13, 17.
Syn.: *P. dubium* L. var. *pinnatifidum* (Moris)Battand. & Trabut, Fl. Algérie 1:21 (1888).
P. dubium L. var. *maroccanum* Ball, J.Bot. 16:311 (1877). Type: Tanger! (G), Casa Blanca! (B).
P. simoni Fouc., Bull.Soc.Sci.Nat. Charente-Inférieure: 164 (1897). Type: Corse: Calvi, lieux vagues, Soc. Roch. 1896 no. 3856 (MPU).
P. teneriffae Fedde, Bull.Herb. Boissier, Sér.5,2:171(1905). Type: Bourgeau Pl.Canar.Exs., 1846, no. 519 (BM, G).
P. tunetanum Fedde in Engler, Pflanzenr. 4, 104:321 (1909). Type: Schweinfurth no. 563, Belvedère bei Tunis (n.v.).
Type: Soleirol! Pl. siccat. e Corsica (n.v.).

Erect annual herb, 10–85cm high, mostly branched from the base. *Leaves* 2–19 × 1–5·5cm, obovate to lanceolate to elliptical or ovate in outline, incised to pinnatifid to pinnatipartite, lower leaves sometimes pinnatisect, upper leaves rarely entire; lower leaves petiolate, petiole 1–8cm long; upper leaves sessile with cuneate to rounded base, with large pair of basal lobes (Fig. 13); lobes acute, incised or sometimes entire, strongly antrorse; leaves with ± dense indumentum of ± appressed setae on both surfaces.

Axis with patent setae, pedicel with patent setae below and appressed setae above, very rarely with patent setae throughout. *Flower buds* shortly before anthesis 7–15 × 5–11mm, broadly ovoid to ellipsoid to almost globose; sepals with dense indumentum of mostly appressed, rarely half-appressed setae. *Petals* 1·4–3 × 1·3–3cm, obovate, orange-red, with or without darker base, always without distinct basal spot. *Stamens* many, 5·5–10mm long, shorter to as long as ovary or rarely slightly longer than ovary; filaments filiform, black; anthers 1–1·5mm long, oblong, mostly yellow, rarely purplish. *Capsule* 10–27 × 3·5–8mm, 2·5 to almost 4 times as long as broad, clavate, mostly distinctly contracted below pores

(Fig. 1), very rarely abruptly contracted at base; stigmatic disc with 4–9 stigmatic rays, 3·5–6·5mm broad, narrower than capsule diameter; free lobes of stigmatic disc mostly broadening towards their tips, overlapping; lateral margin of lobes often dark violet to black. *Seeds* 0·5–0·7mm long, brown (Fig. 17).

2n = 28 (mihi).

Flowering 2–6. A weed in fields, by roadsides, or in open vegetation on sandstone or limestone.

The distribution of *P. pinnatifidum* is shown in Fig. 4.

AZORES: Graciosa, 25 vii 1972, *Goncalves* 4347 (BM); Faial, 5 viii 1972, *Goncalves* 4542, 4544 (BM).

MADEIRA: above the Mount, 8 vi 1831, *Lowe* 510 (BM).

CANARY ISLANDS: Gran Canaria: Tafira, 1 iv 1901, *Bornmüller* 2019 (G, W, WU); Lancerotta: in arvis, 1845, *Bourgeau* 325 (BM); Tenerife, near Taganana, 10 iv 1975, *Cannon* 4683 (BM); Gran Canaria, Tejeda, 23 v 1897, *Gelert* s.n. (C); Gran Canaria, San Mateo, 23 iv 1896, *Kuegler* s.n. (B); Gran Canaria, Monte Tafira, 15 ii 1966, *Kunkel* 8550 (B); Gran Canaria, Tafira Alta, 29 i 1967, *Kunkel* 10012 (M); La Graciosa, 7 iv 1970, *Kunkel* 13143 (G); Alegranza, 8 v 1970, *Kunkel* 13465 (G); Tenerife, 6 vi 1894, *Murray* s.n. (BM).

SPAIN: pr. Almeria, 5 iv 1879, Huter, Porta, *Rigo* 846 (E, W); Mallorca, Mirador de R.Roca, 4 iv 1969, *Friis* 1064 (C); Mallorca, Binisalem, 2 iv 1968, *Thornberg* s.n. (C); Mallorca, Terreno, 30 i 1972, *Vollesen & Jacobsen* 2122 (C).

FRANCE: Menton, 1 v 1895, *Bicknell* 3301 (E, G, JE, M, W, WU); Menton, 18 iv 1889 & 22 iv 1891, *Bicknell* s.n. (B, M, W, WU); St Tropez, 13 iv 1861, *Bourgeau* s.n. (G); Corse, Cap Corse, 27 iv 1907, *Briquet* s.n. (G); Menton, 17 iv 1876, *Burnat* s.n. (G, W); Corse, Bonifacio, 16 iv 1909, *Houard* s.n. (G); Corbara, 25 iv 1916, *Kükenthal* 1341 (G); Bastia, 25 v 1907, *Rotgès* s.n. (G); Ajaccio, 25 v 1901, *Roux* s.n. (G); Bastia, 4 ix 1913, *Spencer* s.n. (W); Menton, vi 1877, *Vetter* s.n. (E, G); audessus d'Hyères, iv 1858, ? (G).

ITALY: Bordighera, 30 iv 1911, *Bicknell* 2442 (B, G, WU); Pied de Saline, vi 1862, *Bernet* s.n. (G); Palermo, 1860, *Citarda* s.n. (JE); Bordighera, 25 iv 1893, *Haussknecht* s.n. (JE); Sicilia, *Hb. Jacq.* (W); Sardin, 1839, *Moris* s.n. (G); Marettimo, iv 1905, *Ross* 504 (B, E, G, M, WU); Cagliari, 1835, *Herb. Zuccarinii* s.n. (M).

MOROCCO: 30km E of Tiznit, 12 v 1982, *Davis & King* 68238 (E); Ras Sidi-el-Ahbed, 16 iv 1929, *Font Quer* 161 (BM, G); Chaouia: Boulhaut, 22 iv 1924, *Jahandiez* 199 (BM, G); Tanger, iii 1883, *Kersten* 74 (B, JE); Tangier, 18 iii 1916, *Roffey* s.n. (BM); Gurugu, 16 vi 1931, *Sennen & Mauricio* s.n. (BM); Zeluan, 5 vi 1932. *Sennen & Mauricio* s.n. (BM); Tanger, 29 iii 1910, *Vaucher* 32 (G).

ALGERIA: Tipasi, 29 v 1975, *Davis* 58324b (BM); Prov. d'Oran, Plainejet Coteaux, *Durando* s.n. (W); Oran, 21 iii 1915, *Faure* s.n. (M); Beni-Mansour, 6 iv 1861, *Lefebvre* s.n. (W); Mostaganem, iv 1848, ? (W).

TUNISIA: Gabes, iv 1938, *Boulenger* 38484 (JE); Tunis, v 1916, *Cuénod* s.n. (G).

P. pinnatifidum is a distinct species recognizable in the first instance by the shape of its upper leaves. These are sessile with a mostly rounded and sometimes cuneate base which continues into the basal pair of lobes, which are triangular in outline and acute. Most specimens I have seen of this taxon have light yellow anthers, and the capsules are characteristically clavate. The distribution of *P. pinnatifidum* is virtually identical with that of *P. somniferum* L. subsp. *setigerum* (DC.) Corbière (Kadereit, 1986a), except for the presence of the latter on Cyprus. The presence of *P. pinnatifidum* in Bulgaria, Thrace and Greece had been reported by Hayek (1927), and *P. pinnatifidum* var. *tenuifidum* had been described by Fedde (1909) from Attica. Although the type specimen of the latter has some similarity with *P. pinnatifidum* in its clavate capsules, its leaves are much more finely dissected and the seeds are larger than in

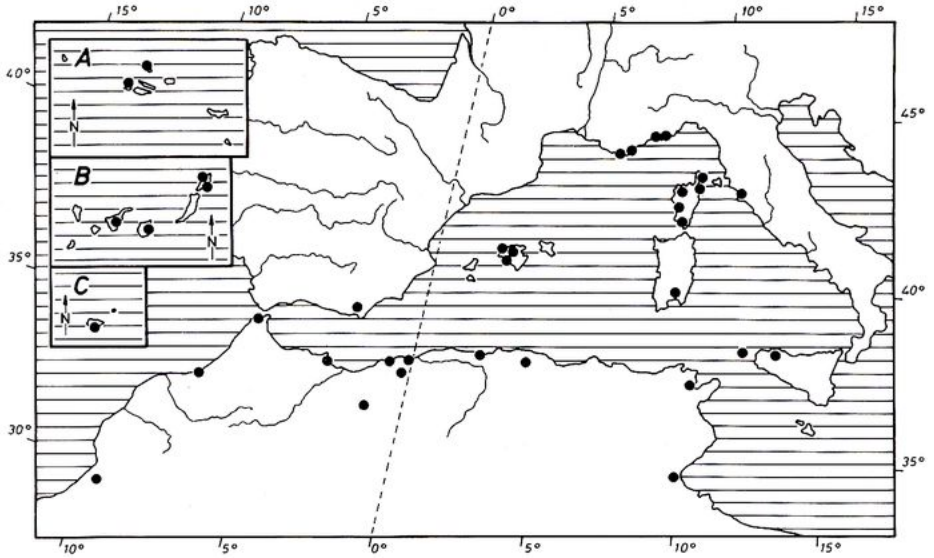

FIG. 4. Geographical distribution of *P. pinnatifidum* (•).

this species. In my opinion it does not belong to *P. pinnatifidum*, but rather to *P. dubium* subsp. *lecoqii* (Lamotte) Syme (q.v.). I have not seen any specimens of *P. pinnatifidum* from east of Sicily. The structure of the seed surface of this species (Fig. 17), in being somewhat porous, perhaps underlines its distinctness.

Although I have not seen the type specimen of *P. pinnatifidum*, I have seen authentic material from TO (*Herb. Moris* no. 46).

2. P. purpureomarginatum Kadereit, **sp.nov.** Figs 1, 5, 7, 13, 17.
Species affinis *P. dubio*, sed plerumque foliis supremis vel integris vel basaliter lobis binatis recurvatis; sepala purpureomarginata; antherae flavae; capsulae maturae ellipsoideae ad obovoideae, discis concavis et marginaliter repandis, purpureonotatis inter lobos.
Type: Türkei: Izmir: Halbinsel von Karaborun, Ildir (N von Cesme), 14 iv 1969, *Fitz & Spitzenberger* 117 (holo. W).

Erect to ascending annual herb, 8–45cm high, unbranched below to mostly branched from base. *Leaves* 2–9 × 0·8–4cm, obovate to ovate or lanceolate in outline, 1–2-pinnatipartite to entire; lower leaves petiolate, petiole up to 5cm long, pinnatipartite to bipinnatipartite (Fig. 13); upper leaves sessile, often entire or with one basal pair of entire recurved lobes (Fig. 13), sometimes with more than one pair of entire more or less recurved lobes; leaves with more or less dense indumentum of ± patent setae on both surfaces, indumentum of lower surface denser than on upper surface.

Axis with patent setae, pedicel with sparse indumentum of appressed setae. *Flower buds* shortly before anthesis 10–16 × 7–10mm, ovoid, sepals mostly with narrow dark violet margin, almost glabrous to moderately covered with patent setae. *Petals* 1·1–2·1 × 0·7–1·9cm, obovate, pale red

FIG. 5. Holotype of *P. purpureomarginatum* Kadereit, sp.nov.

without basal spots. *Stamens* many, 6–10mm long, shorter than ovary; filaments filiform, black; anthers 0·7–1·6mm long, oblong, mostly light yellow, sometimes brownish. *Capsule* 10–18 × 4·5–7mm, 2 to 2·5 times as long as broad, ellipsoid to obovoid, distinctly contracted below pores (Fig. 1); stigmatic disc with 4–7 stigmatic rays, 3·5–6mm broad, narrower

than capsule diameter; stigmatic disc mostly shallowly lobed, lobes not overlapping; margin of disc mostly curved upwards at maturity, mostly with dark violet marks between lobes. *Seeds* 0·5–0·7mm long, brown, glaucous (Fig. 17).

2n = 28 (mihi).

Flowering 4–5. A weed by roadsides, or in open vegetation on calcareous substrata, often in somewhat humid habitats.

The distribution of *P. purpureomarginatum* is shown in Fig. 7.

GREECE: Karpathos, 28 v 1886, *Forsyth Major* 199 (G); Kalymnos, 24 iv 1963, *Gathorne-Hardy* 336 (E); Schlucht zwischen Perivolia und Thèrisso, 15 iv 1962, *Greuter* 4157 (G, W); Peninsula Akrotiri, 24 iv 1976, *Greuter & Charpin* 13348 (W); in insula Cea, 21–24 v 1898, *Heldreich* s.n. (WU); Thimena, 25–26 iv 1934, *Rechinger* 4725 (BM, W); Creta, peninsula Korykos, 20 iv 1942, *Rechinger* 12129 (W); Creta, peninsula Titiron, 22 iv 1942, *Rechinger* 12242 (W); Kythera, 4 v 1964, *Rechinger* 24234 (W); Ikaria, 3 v 1976, *Rechinger* 54109 (B, W); Epidauros, iii 1830, *Herb. Zuccarini* s.n. (M).

TURKEY: Mugla: Törgut to Bayir, 15 iv 1965, *Davis* 41135.

CYPRUS: between Kambos and Stavros Tis Psokas, 23 iv 1962, *Meikle* 2644 (C).

Although clearly related to *P. dubium* and vicarious with some of the subspecies of it (Fig. 7), *P. purpureomarginatum* deserves to be given specific rank on account of a number of characters. These are: the upper and, above all, the uppermost stem leaves, which often are entire or have only one pair of narrow, entire and conspicuously recurved basal lobes, though sometimes there is more than one pair of still mostly entire and more or less recurved lobes; the sepals, of which the covering one usually has a narrow dark violet margin; the mostly light yellow anthers; and the often ellipsoid capsule with its concave disc and violet marks between the shallow lobes. In its uppermost leaves and yellow anthers *P. purpureomarginatum* somewhat resembles *P. pinnatifidum*. From *P. pinnatifidum*, apart from the shape of the capsules and the leaves, *P. purpureomarginatum* also differs in the surface structure of its seeds (Fig. 17), in which it resembles more *P. dubium* which, however, cannot be easily distinguished from many other species in the section.

The one specimen of *P. purpureomarginatum* I have seen from Cyprus (*Meikle* 2644), though clearly belonging to this species (on account of the dark violet margin of the covering sepal, the yellow anthers and the coloration of the stigmatic disc), differs from all other specimens in its obtuse flower buds, which are normally distinctly pointed, and in having upper leaves with a greater number of lateral lobes which are more divided. From the proportions of the ovary of this specimen it seems that the capsules are relatively broader. Meikle (1977) included the Cyprus specimen in *P. postii* Fedde, together with *Davis* 3491 and *Syngrassides* 1599. These were cited as *P. postii* also by Burtt (1949), who described them as having yellow anthers. I have not seen the last two specimens, which most likely also belong to *P. purpureomarginatum*. All three specimens were collected in NW Cyprus.

3. P. dubium L., Sp.Pl. Appendix: 1196 (1753).

Erect annual herb, 8–90cm high, unbranched below to mostly branched from base. Green parts of plant glaucous or not. *Leaves* 1–19 × 0·5–

8·5cm, obovate to ovate in outline, 1–2-pinnatipartite; lower leaves petiolate, petiole up to 7cm long; upper leaves shortly petiolate to sessile with cuneate to rounded base; lobes antrorse to sometimes almost patent, pinnatipartite to incised to distantly serrate or entire; leaves with more or less dense indumentum of ± patent setae to sometimes glabrous on upper surface and with very few setae on major veins of lower surface.

Axis with few to many patent setae, pedicel with few to many appressed setae. *Flower buds* shortly before anthesis 9–18 × 5–12mm, ovoid to ellipsoid, with sparse to dense indumentum of more or less appressed setae or sometimes glabrous. *Petals* 1–4 × 0·5–3·6cm, narrowly to broadly obovate, with entire or somewhat laciniate apical margin, white, rarely pink, pale violet or mostly orange-red without or with black spots of variable size and position, rarely petals entirely black. *Stamens* more or less many, 4–10mm long, shorter to longer than ovary; filaments filiform, light violet to black; anthers 0·3–1·9mm long, oblong, brownish to greenish, sometimes with small apical appendage. *Capsule* 8–26 × 4–11mm, 2 to 4·3 times as long as broad, very rarely just under 2 times as long as broad, narrowly obovoid to sometimes clavate (Fig. 1); stigmatic disc with 4–11 stigmatic rays, 3–8mm broad, narrower to sometimes as broad as capsule diameter; free lobes of stigmatic disc mostly broadening towards their tips, overlapping or not, sometimes disc very shallowly lobed. Latex white, cream, colourless or yellow. *Seeds* 0·5–1mm long, brown, glaucous.

1a. Plants mostly with very sparse indumentum to almost glabrous, mostly strongly glaucous. (Turkey, rarely Greece or Iran, around Black Sea, or Afghanistan) 2

1b. Plants mostly with ± dense indumentum, glaucous or not. (N Africa, Europe, West Turkey, Caucasia, Azerbaijan or Iran, rarely Afghanistan) 3

2a. Lobes of upper leaves often conspicuously wavy; apical margin of petals entire, petals with small to large basal black spot, sometimes spot leaving only narrow red margin or rarely petals entirely black. (Turkey, rarely Greece or Iran, or around Black Sea) . . . . . **iii.** subsp. **laevigatum**

2b. Lobes of upper leaves straight; apical margin of petals entire or eroded to laciniate, petals without or with mostly small black spot removed from base. (Afghanistan to Nepal) . . . . . **v.** subsp. **glabrum**

3a. Lobes of uppermost leaves mostly few, entire; basal pair of lobes mostly broadly triangular, continuing into mostly rounded leaf base; apical margin of petals entire or eroded to laciniate, petals without or with mostly small black spot removed from base. (Caucasia, Azerbaijan or Iran, rarely Afghanistan) . . . . . **iv.** subsp. **erosum**

3b. Lobes of uppermost leaves mostly dissected; basal pair of lobes mostly ovate in outline; apical margin of petals entire, petals without or with black basal spots 4

4a. Latex white or cream, brown to black when dry; petals red, mostly without basal spots; capsules mostly gradually narrowing towards base. (Europe) . . . . . **i.** subsp. **dubium**

4b. Latex yellow or turning yellow, red when dry; if latex colourless, petals white; if latex white (SE Europe or W Turkey) plants with rather dense indumentum and upper leaves dissected into very narrow lobes, lobes rarely more than 1·5mm broad; petals red or white, rarely pink or pale violet without or with (SE Europe or W Turkey) black basal spots; capsules often somewhat abruptly narrowing at base. (Europe or W Turkey) . . . . . **ii.** subsp. **lecoqii**

i. subsp. **dubium.** Figs. 1, 13, 17.

Syn.: *P. obtusifolium* Desf., Fl.Atlant. 1:407 (1798). Type: Habitat in Atlante prope Belide (P).

P. lamottei Boreau, Fl.Centre France (Ed. 3) 2:30 (1857). Type: Base des Monts-Domes.-Creuse.-Allier.-Cher (type material unknown).

'Habitat inter Sueciae, Angliae segetes'.

Upper leaves (Fig. 13) sessile with cuneate base, rarely shortly petiolate. *Petals* orange red, mostly without basal spot. *Capsule* mostly narrowing gradually towards its base. *Latex* white or cream when fresh, brown to black when dry.

2n = 42 (mihi).

Flowering 3–8. Mostly occurring as a ruderal or segetal weed on various substrata.

GREAT BRITAIN: Wolverhampton, vi 1878, *Fraser* s.n. (WU); Yorkshire, near Thirsk, *Baker* s.n. (G).

FRANCE: La Flotte, Ile de Re, 13 vi 1858, *Letourneux* 2610 (G); Savoie: Macot, 20 v 1861, *Perrier* s.n. (G).

SPAIN: Prov. Valencia: Sagunto, 31 iii 1953, *Merxmüller & Wiedmann* 146b/53 (M); Catalogne: Vilajuiga, 24 iv 1908, *Sennen* 527 (W).

PORTUGAL: Coimbra, v 1887, *d'Araujo e Castro* s.n. (W).

BELGIUM: Rometenne—Rochefort, 15 vi 1934, *Stomer-Masseroy* 110 (W).

NETHERLANDS: Overveen, 12 vii 1888, *Raunkjaer* s.n. (C).

SWEDEN: Torö, Braten, 23 viii 1929, *Asplund* 845 (G); Båstad, vii 1864, *Strandmark* s.n. (W).

DENMARK: Ebeltoft, Djursland, 14 vii 1970, *Holm-Nielsen & Pedersen* 643 (G); Zealand: N of Ringsted, 19 vii 1972, *Svendsen* 580 (M).

GERMANY: Oberelchingen, 30 vi 1961, *Doppelbaur* 401 (M); Berlin, 10 vi 1967, *Hertel* 7213 (M).

POLAND: Posen, bei Schlichtlingsheim, vi 1863, ? (W).

SWITZERLAND: Valais: Simplon, 22 vii 1888, *Chenerard* s.n. (G); Tessin: entre Agno et Bioggio, 2 vi 1906, *Braun* s.n. (G).

AUSTRIA: Gmünd-Neustadt, 17 vii 1969, *Forstner* s.n. (W); Nordtirol: Wipptal, 24 vii 1971, *Polatschek* s.n. (W).

CZECHOSLOVAKIA: Brno, 15 vi 1927, *Jirasek* 319 (WU).

ITALY: Prov. Sondrio: Dazio, 6 vi 1965, *Buttler* 6905 (M); Messina, 2 v 1923, *Béguinot* 2677 (WU).

AZORES: Sao Miguel, 14 v 1978, *Rechinger* 57743 (M).

CANARY ISLANDS: Tenerifa, v 1879, *Hillebrand* s.n. (WU); Gran Canaria, 30 iii 1966, *Kunkel* 8996 (G).

MOROCCO: Djebel Afougueur, 3 vii 1876, *Ibrahim* s.n. (G); in convalle fl. Ait Messane, 3 vi 1926, *Lindberg* 3505 (B).

ALGERIA: Cherchell, 18 iii 1962, *Charpin* s.n. (G); half way between Tikjda and Tizi-N'Kouilal, 23 vi 1975, *Davis* 59475 (BM).

TUNISIA: Oued Gabes, 1 v 1854, *Kralik* 26 (G); Djebel Bou Hedma, iv 1968, *Young* 22 (BM).

Apart from the countries listed above, subsp. *dubium* can also be found in SE Europe and Turkey as well as the south western USSR and also Egypt and Libya. In all these countries it seems to be extremely rare. This subspecies has its northern limit in S Scandinavia, and, as far as I have seen, its eastern limit in Poland. As an introduction *P. dubium* subsp. *dubium* is also known from other continents.

ii. subsp. **lecoqii** (Lamotte)Syme, Engl.Bot. (Ed. 3) 1:30 (1863). Figs 6, 13, 17.

Syn.: *P. lecoqii* Lamotte, Ann.Sci.Auvergne 23:429 (1851).

Type: Auvergne, 1853, ex herb. Jordan (neo. BM; Kubat, 1980).

Upper leaves (Fig.13) sessile with cuneate base or often shortly petiolate. *Petals* orange red or white (yellow when dry), rarely pink or pale violet, without or with black basal spots. *Capsule* often abruptly narrowing at base. *Latex* yellow or turning yellow when fresh, red when dry, or sometimes latex colourless when fresh, brown to black when dry.

1a. Petals orange-red, pink or pale violet . . . var. **lecoqii**
1b. Petals white (yellow when dry) . . . var. **albiflorum**

var. **lecoqii**

Syn.: *P. tenue* Ball, J.Bot. 11:296 (1873). Type: in jugo Tagherot, 15 v 1871, *Ball* s.n. (G).

P. dubium L. var. *cassandrinum* Charrel, Österr.Bot.Z. 41:374 (1891). Type: Cassandra, 5 v 1891, *Abd-Ur-Rahman Nadji* s.n. (B).

P. subadpressiusculo-setosum Fedde, Bull.Herb.Boissier, Sér. 5, 2:171 (1905). Type: Algier: champs cultivé de la colline des Hammah-Les-Platanes près Alger, 2 v 1851, *Jamin* 121 (B, G, W).

P. pinnatifidum Moris var. *tenuifidum* Fedde in Engler, Pflanzenr. 4, 104:321 (1909). Type: Pentelikon, 1885, *Haussknecht* s.n. (JE).

P. tumidulum Klokov in Klokov & Wissjul., Fl.RSS Ucr. 5:502 (1953). Type: RSS Ucr., insula Kojuv-Tuk, in declivio ad marum, 16 v 1928, *Prjanischnikov* s.n. (KW).

2n = 28 (mihi).

Flowering 3–9. Mostly occurring as a ruderal weed or in vineyards etc., on various substrata.

GREAT BRITAIN: Charlton, Hitchin, 20 vii 1914, *Little* s.n. (BM); Middleton, *Wilmott* 410624A (BM).

FRANCE: Charance, 31 v 1896, *Faure* 5b (G); Weissenburg i/Elsass, vi 1898, *Spindler* s.n. (B).

SPAIN: El Arenal, 16 vii 1956, *Deverall & Flannigan* 101 (E); Cerdagne, Villeneuve, 25 vi 1926, *Sennen* 5666 (W).

BELGIUM: Rochefort, 15 vi 1934, *Stomer-Masseroy* 111 (W).

GERMANY: Kelheim, 14 vi 1900, *Vollmann* s.n. (M); Mülheim am Rhein, 3 vi 1894, *Wirth* s.n. (W).

SWITZERLAND: Neuchatel, *Godet* s.n. (G); Merishausen, 7 vii 1969, *Greuter* 8578 (G).

AUSTRIA: Wien XVI, 7 vi 1968, *Forstner* s.n. (W); Hainburg, 28 iv 1920, *Zerny* s.n. (W).

ITALY: Sardinia: Sassari, x 1923, *Béguinot* 2677 (G); Ischia, 1857, *Gussone* s.n. (G).

CZECHOSLOVAKIA: Jungbrunzlau, 20 v 1920, *Korb* s.n. (W); Znojmo, 16 v 1948, *Švestka* 1310 (G).

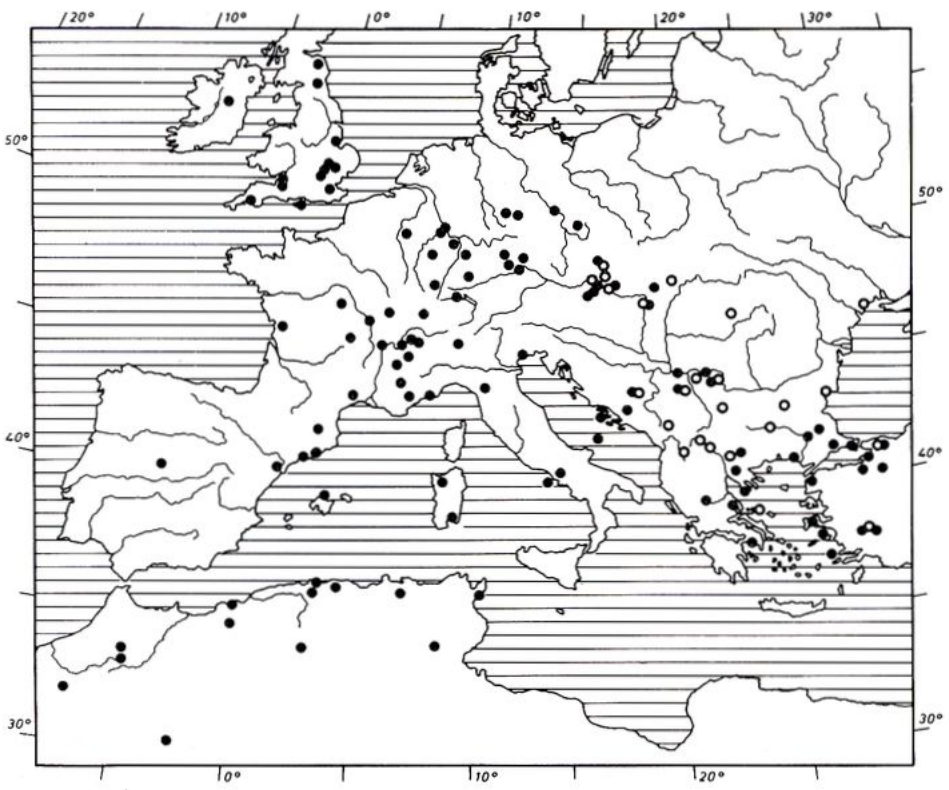

FIG. 6. Geographical distribution of *P. dubium* subsp. *lecoqii* var. *lecoqii* (•) and var. *albiflorum* (○).

HUNGARY: zwischen Drenkova und Svinicza a.d. Donau, 1 vi 1909, *Watzl* s.n. (WU).
YUGOSLAVIA: Mostar, 16 v 1906, *Janchen* s.n. (WU); Avala prope Beograd, 5 v 1967, *Mayer* 61308 (M).
ALBANIA: Plostan, 28 vi 1918, *Dörfler* 814 (WU).
BULGARIA: Distr. Goce Delcev: Paril, 7 vi 1980, *Kuzmanov* 80532 (B).
GREECE: prope Volos, 4 v 1961, *Rechinger* 22649 (B); Kalampaka, 20 v 1896, *Sintenis* 333 (WU).
TURKEY: Edirne, 27 iv 1970, *Rix* 1501 (E); Izmit, 11 iv 1972, *Uotila* 15509 (E).
MOROCCO: Djebel Ghat, 29 vi 1881, *Ibrahim* s.n. (G); Daiet Achlef, 11 vi 1923, *Jahandiez* 518 (G).
ALGERIA: 10km from Guelma to Constantine, 13 v 1971, *Davis* 52301 (E); Chanzy (près Oran), 18 v 1924, *Faure* (W).
TUNISIA: Hammamet, v 1944, *Cuénot* s.n. (G); Gafsa, 4 iv 1938, *Simpson* 38139 (BM).

var. **albiflorum** Besser, Enum.Pl. (Ed. 2):47 (1822)

Syn.: *P. albiflorum* (Besser)Pacz., Acta Horti Bot. Univ. Jurjev 6:147 (1906).

P. dubium L. var. *albiflorum* Boiss., Fl.Orient. 1:115 (1867). Type: in regione media montis Korthiati Macedoniae, *Orphanides* 3605 (G-Boiss.).

P. maculosum Schur, Verh.Naturf.Vereins Brünn 15:67 (1877). Type: Zackelsberg bei Groβscheuren, Heuwiese bei Klausenburg (n.v.).

P. albiflorum (Besser)Pacz. subsp. *austromoravicum* Kubát, Preslia 52:111 (1980). Type: Moravia australis: Pouzdřany, 22 v 1977, *Kubát* s.n. (n.v.).

Type: legit Andrz. in Podoliam austr. (n.v.).

2n = 28 (Koopmans, 1970; Kubát, 1980).

Flowering 4–7. Mostly occurring as a ruderal weed or in vineyards etc., on various substrata.

AUSTRIA: Wien, 9 v 1866, *Dörfler* s.n. (E); Achau, 6 v 1915, *Vetter* (W).

CZECHOSLOVAKIA: Pollauer Berge, 28–29 v 1939, *Neumayer* s.n. (WU); Kl.Karpaten, Ruine Ballenstein, 13 v 1913, *Ronniger* s.n. (W).

HUNGARY: Adlersberg bei Budapest, 12 v 1906, *Janchen* s.n. (W); Theben, 20 v 1909, *Vetter* s.n. (W).

YUGOSLAVIA: Dojran See Gebiet, Nicolic, v 1917, *Burgeff* 1476 (M).

ROMANIA: prope oppid. Cluj, 23 v 1921, *Borza & Peterfi* 782 (W); Insel bei Brzapalanka, 1892, *Lorenz* s.n. (W).

BULGARIA: prope Varna, 25 v 1907, *Schneider* s.n. (W); Ladovo, 24 vi 1898, *Stribrny* s.n. (E).

GREECE: Ins. Alonnisos, 15 v 1965, *Phitos* 2342 (M); Thessalia: Mons Olympos, 26 vii 1970, *Rechinger* 38755 (B).

TURKEY: Constantinople: Touzla, 25 iv 1897, *Nemetz* s.n. (WU); Pascha-Kissla, 25 v 1875, *Sintenis* 556 (B).

To distinguish between subsp. *dubium* and subsp. *lecoqii* is certainly meaningful, but not always very easy. Most important for this is the colour of the latex and the breadth of the lobes of the upper leaves. In subsp. *dubium* the latex is white to cream when fresh and turns light to dark brown or black when dry. In Europe west of Lower Austria subsp. *lecoqii* seems to have either yellow to orange latex, or white to cream latex which turns yellow after some time on exposure to air; when dry the latex is red in both cases. In SE Europe and W Turkey latex of subsp. *lecoqii* can be either yellow (it then turns red when dry), or colourless when fresh and brown to black when dry. In white-flowered material both forms of latex can be found. White-flowered plants with yellow latex cannot be meaningfully separated from red-flowered subsp. *lecoqii* on account of their latex, the shape of the capsules which, as often, but not always, in red-flowered subsp. *lecoqii* are narrowing rather abruptly at their base, and the lobes of the upper leaves, which rarely are more than 2mm broad. In addition, white- and red-flowered material can often be found in mixed populations. Equally, it is meaningless to separate white-flowered material with colourless latex from such with yellow latex, as both are very similar in capsule and leaf shape. In the south east of SE Europe and in W Turkey white-flowered specimens are rather rare, and most specimens have red flowers. These either have yellow latex which turns red when dry, or colourless latex which becomes brown. The separation of the latter group with colourless latex from subsp. *lecoqii* is not justified in my opinion, as this south eastern red-flowered material is very similar to the white-flowered material in having upper leaves with very narrow lobes (these are often only about 1mm broad), which often are entire and have a rather dense indumentum. Like most white-flowered specimens these red-flowered ones mostly have black basal spots on their petals, which is far less common in red-flowered specimens from further north or west.

Thus, apart from latex colour, which is not a straightforward character

in part of the distribution area of subsp. *lecoqii*, the narrow lobes of the upper leaves in plants from the south east are important for their recognition as subsp. *lecoqii*. The distribution of subsp. *lecoqii* thus defined is shown in Fig. 6.

Generally the lobes of the upper leaves of subsp. *lecoqii* tend to be narrower than in subsp. *dubium*, and the leaves tend to be more densely hairy. It is not possible, however, to quantify these differences for the purpose of identification. The same applies to the shape of the capsules, which narrow rather gradually towards their base in subsp. *dubium*, but more abruptly in subsp. *lecoqii*. This difference seems to be related to the quantity of fertilized ovules in the lower part of the ovary (McNaughton & Harper, 1960c). As regards the length of the stamens in relation to the ovary, McNaughton & Harper (1960c) observed that the stamens are shorter than the ovary in subsp. *dubium*, but that some of the stamens are as long as the ovary in subsp. *lecoqii*. Although I can confirm this from my own observations in Great Britain, this character is very difficult to observe in herbarium material. It is often problematical whether in these highly self-fertilizing forms the growth of the ovary after fertilization has already started, in which case the stamens will very quickly be shorter than the ovary in subsp. *lecoqii* also. Accordingly, I am not able to say whether this character works within the entire distribution area of subsp. *lecoqii*. From my knowledge of the herbarium material I cannot confirm another diagnostic character for the two subspecies described by McNaughton & Harper (1960c): they observed glaucous seeds in subsp. *dubium*, but chocolate-brown seeds in subsp. *lecoqii*.

As judged from the crossability of the two subspecies and the pattern of bivalent formation in their hybrid (Koopmans, 1970; Humphreys, 1975a, b) subsp. *dubium* and subsp. *lecoqii* are very similar to each other genomically, as are red- and white-flowered forms of subsp. *lecoqii*, in which regular meiosis was observed by Koopmans (1970). While subsp. *dubium* is very widespread, most certainly through human influence, subsp. *lecoqii* is more limited in distribution (Fig. 6). Its distribution area is perhaps best characterized as submediterranean-subatlantic. More than subsp. *dubium* it seems to prefer calcareous substrata (Clapham et al., 1962; Heß et al., 1970). It is difficult to say to what extent the distribution of subsp. *lecoqii* has been influenced by man, but its presence in the British Isles, at least, seems to be due to synanthropic spread. The eastern limit of its distribution in W Turkey more or less coincides with the western limit of subsp. *laevigatum* (M.Bieb.) Kadereit (Fig. 7). The approach to European *P. dubium* chosen here, namely the recognition of two subspecies, differs from that used by Kubát (1980) for the forms occurring in Czechoslovakia. In what I regard as *P. dubium* subsp. *lecoqii* Kubát distinguished four taxa: *P. lecoqii*, *P. confine* Jordan, *P. albiflorum* subsp. *albiflorum* and *P. albiflorum* subsp. *austromoravicum*. With the exception of *P. albiflorum* subsp. *albiflorum* as far as I can gather from Kubát (1980), the dry latex of all these taxa is red, and is either yellow (*P. lecoqii*, *P. albiflorum* subsp. *austromoravicum*), turns yellow when exposed to air (*P. confine*) after being white to cream, or is colourless (*P. albiflorum* subsp. *albiflorum*) when fresh. All these taxa are tetraploids with $2n = 28$ chromosomes. Although I include all these

different forms in subsp. *lecoqii* for the reasons given above, it should be noted that Kubát's (1980) classification corresponds to the one presented here insofar as the distinction between hexaploids and tetraploids is the same. The work of Kubát (1980) also clearly demonstrates the variability of subsp. *lecoqii*.

I have not seen the type material of *P. schweinfurthii* Fedde (in Engler, *Pflanzenr.* 4, 104:307, 1909), described from Tunis, which from its description clearly belongs to *P. dubium*. I am not able to say, however, whether it must be referred to subsp. *dubium* or subsp. *lecoqii*. The same applies to *P. collinum* Bogenh. (in Boreau, *Fl. Centre France* (Ed. 3) 2:29, 1857) and probably also to *P. malvaeflorum* Doumergue (Assoc.Franc. Avancem.Sci.Conf. 455, 1896). I have not made an effort to allocate to either subsp. *dubium* or subsp. *lecoqii* the species described and explicitly related to *P. dubium* by Jordan (1852, 1861). These are *P. modestum, P. confine, P. erosulum, P. vagum, P. erroneum, P. luteo-rubrum* and *P. errabundum*.

iii. subsp. **laevigatum** (M.Bieb.)Kadereit, **comb. et stat. nov.** Figs 7, 13, 17.

Syn.: *P. laevigatum* M.Bieb., Fl.Taur.–Caucas. 3:364 (1819).
P. rhodopeum Velen., Sitzungsb.Königl.Boehm.Ges.Wiss. Prag, Math.-Naturwiss.Cl. 37:5 (1893). Type: Infra saxa locis calidis supra Stanimaka (n.v.).
P. lacerum Popov in Komarov, Fl. URSS 7:641, 749 (1937). Type: Paphlagonia Wilayet Kostambuli, 1892, *Sintenis* 3702 (G); Marsifoun, *Manissajian* 451b (LE).
P. maeoticum Klokov in Klokov & Wissjul., Fl. RSS Ucr. 5:503 (1953). Type: Distr. Staliniensis, prope opp. Zhdanov (Mariupol), 2 vii 1925 (KW).

Type: Hab. in collibus circa Odessam, nec non in rupibus circa thermos Constantinomontanus (LE).

Plants mostly with sparse indumentum, glaucous. *Upper leaves* (Fig. 13) sessile with cuneate to rounded base, lobes antrorse, narrow, serrate to entire, often conspicuously wavy, upper surface often glabrous. *Petals* with small to large black basal spot, often leaving only narrow red margin, rarely petals entirely black; anthers sometimes with small apical appendage.

Flowering 4–7. A weed in fields, or in open vegetation on calcareous rocks, serpentine or conglomerate. The distribution of subsp. *laevigatum* is shown in Fig. 7.

GREECE: Distr. Kozani, in monte Vourinon, 5–7 vii 1956, *Rechinger* 17723 (B).
BULGARIA: Veles, *Burgeff & Herzog* 127 (M); Bulgaria, vii 1910, *Stribrny* s.n. (WU); Distr. Varna, Adjeniler, ? (WU).
USSR: Odessa, vi 1874, *Blau* s.n. (B); Distr. Simferopl: 9km S Simferopl, 5 vi 1959, *Davis* 33546 (E); Caucasus, *Fischer* s.n. (E); Odessa, *Frivaldsky* s.n. (WU); Odessam, *Lang & Szovits* 63 (G, M, W).
TURKEY: Angora, 7 v 1933, *Balls* 224 (E); Ak Dagh, Erzingan, 26 vii 1934, *Balls* 1509 (BM); Taşköprü (Kastamonu), *Baytop* 11317 (E); Amasia, 29 iv 1889, *Bornmüller* 145 (W, WU); Galatia: in valle Kawakli-Dere, 31 v 1929, *Bornmüller* 13718 (G, W); Galatia: ad pagum Kajaš, *Bornmüller* 13719 (BM); Paphlagonia: ad oppidum Čankri, 29 v 1929, *Bornmüller* 13721 (BM, G, W); Iskilip, *Coode & Jones* 1816 (E); Baba Dag above Seki, 22 iv 1965, *Davis* 41536 (E); Karacasu, *Davis* 41669 (E); Amassia, 2 v 1891, *Manissadjian* 119

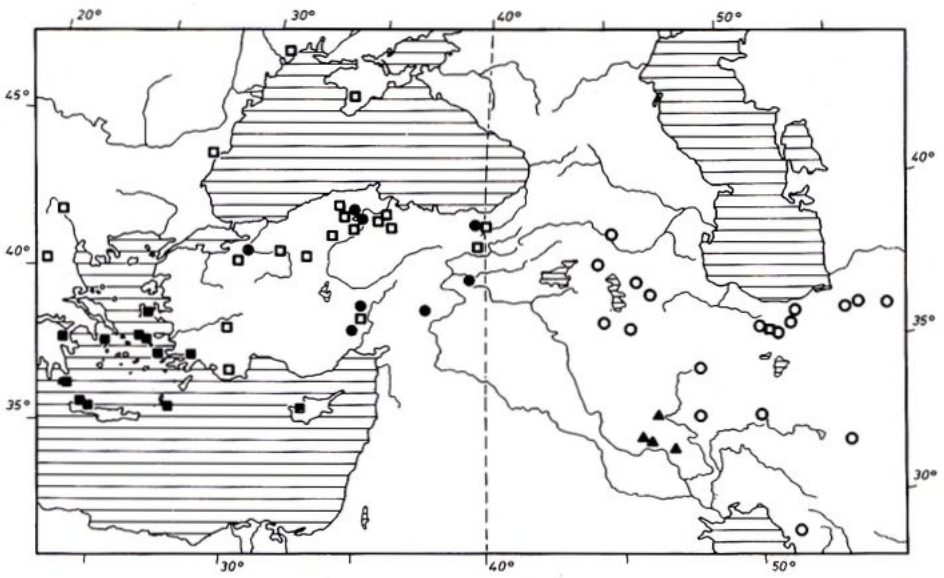

FIG. 7. Geographical distribution of *P. purpureomarginatum* (■), *P. dubium* subsp. *laevigatum* (□), *P. dubium* subsp. *erosum* (○), *P. rechingeri* (▲) and *P. arachnoideum* (●).

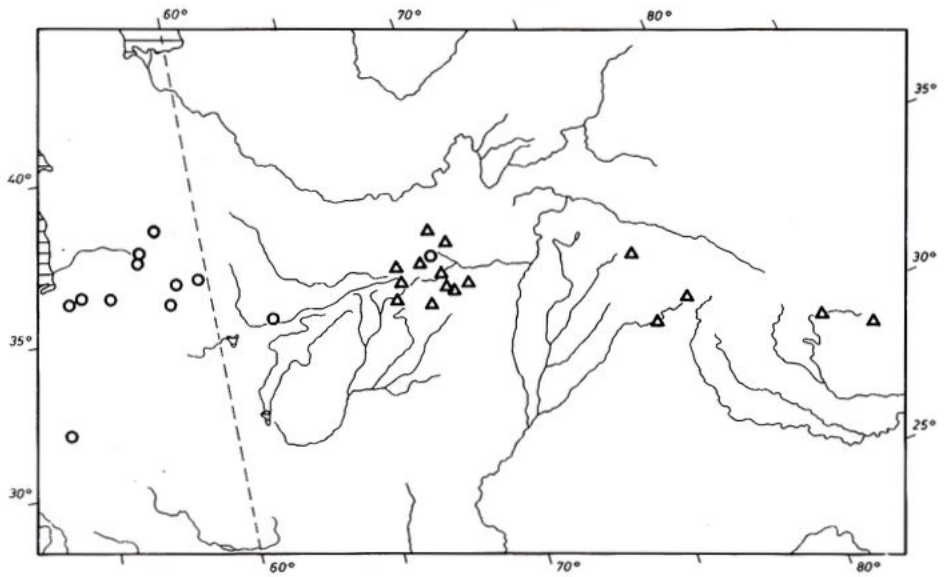

FIG. 8. Geographical distribution of *P. dubium* subsp. *erosum* (○) and subsp. *glabrum* (△).

(M); Asia Minor, 22 v 1913, *Papazoghlov* s.n. (BM); Prov. Nigde, Ala Dağ, *Parry* 109 (E); Szanschak Gümüschkhane, 18 vi 1894, *Sintenis* 5902 (G); Vil. Samsun, Hauza, *Tobey* 938 (E); Merzfun–Haciköy, 11 v 1969, *Tobey* 2514 (E); Ankara, 20 v 1955, *Walter* 1209 (B); Sariyar, 28 iv 1955, *Walter* 1443 (B).
IRAN: pr. Teheran, *Kotschy* s.n. (BM).

The distribution of this taxon (mainly in Turkey and around the Black Sea with rare and isolated occurrences in Greece and Iran), in combination with the glaucidity of the plants, their mostly sparse indumentum,

the characteristic shape of the upper leaves and the often conspicuously large black basal spots of the petals makes it a good subspecies of *P. dubium*. In its upper leaves, which often have somewhat recurved basal lobes, subsp. *laevigatum* sometimes resembles *P. purpureomarginatum*. From this it is distinguished by the mostly greater number of lobes of the upper leaves, anther colour, which is yellow in *P. purpureomarginatum*, and the absence of the dark violet sepal margin. Also, *P. purpureomarginatum* usually has a denser indumentum. With its basal black spots on the petals, subsp. *laevigatum* is similar to the SE European and W Turkish material of subsp. *lecoqii*.

It seems that two more names, which, as far as I can ascertain have never been validly published, must be regarded to belong to subsp. *laevigatum*. These are *P. glabellum* Steven ex DC. (*Syst.Nat.* 2:78, 1821) and *P. nothum* Steven ex Nyman (*Consp.Fl.Eur.*: 24, 1878–82). Of the latter name I have seen the type specimen from H. As regards *P. glabellum*, De Candolle quotes that name as '*glabellum* Steven ! ined.' under *P. laevigatum* without giving a description, and equally Nyman quotes *P. nothum* as a synonym without giving a description. Although I have not perused the possible places of publication of these names by Steven himself, I think it is justified to regard them as nomina nuda. In Jackson (1895) they are also listed as *P. glabellum* Stev. ex DC. and *P. nothum* Stev. ex Nym. As both these names have no priority at subspecific rank, an overlooked valid publication of one or both would be of no nomenclatural consequence here.

iv. subsp. **erosum** (Litv.)Kadereit, **comb. et stat. nov.** Figs 7, 8, 13, 17.

Syn.: *P. turbinatum* DC., Syst.Nat. 2:84 (1821). Type: Hab. in Oriente inter Bagdad et Kermancha, *Olivier* s.n. (G-DC).
P. laevigatum M.Bieb. var. *erosum* Litv., Trav.Mus.Bot.Acad. Imp.Sci.St. Pétersbourg 1:29 (1902).
P. dubium L. var. *laevigatum* (M.Bieb.)Elkan subvar. *erosum* (Litv.)Fedde in Engler, Pflanzenr.4, 104:319 (1909).
P. litwinowii Fedde in Bornm., Beih.Bot.Centralbl. 19:202 (1906), nom.nud. Type: Sultanabad, in argillosis, 1890 (JE).
P. tenuifolium Boiss. & Hohen. ex Boiss. var. *pentecostale* Fedde in Engler, Pflanzenr. 4, 104:323 (1909). Type: Inter Jesd et Isfahan, *Bunge* (B).

Type: Turcomania. In glareosis ad rivulos exsiccatos pr. Suokly, 19 iv 1898, *Litwinow* 453 (lecto. G, isolecto. W).

Plants mostly with ± dense indumentum, rarely almost glabrous, glaucous. *Upper leaves* (Fig. 13) sessile with cuneate to rounded base, basal pair of lobes broadly triangular, antrorse, mostly entire, rarely incised. *Petals* pale orange-red without or with mostly small black spots removed from base; apical margin often eroded to laciniate; anthers sometimes with small apical appendage.

2n = 28, 42 (mihi).

Flowering 4–7. Found as a weed in waste ground, by roadsides, or in open vegetation on serpentine, schist or conglomerate.

IRAN: S of Damaneh, *Archibald* 1486 (E); SE of Shirkuh, *Aryavand et al.* 1454 (E); Aberbidjan, *Aucher-Eloy* 4046 (BM, G); Bushire—Shiraz Rd., v 1935, *Biggs* 13179 (BM);

In valle Scheheristanek, 1 vi 1902, *Bornmüller* 6099 (W); Foothills of Kuh-E-Rezah, 27 iv 1978, *Freitag* 14875 (B); 30km E of Tabriz, 31 v 1962, *Furse* 2359 (W); Kuh-I-Baba, 11 v 1964, *Furse* 5769 (M); Demavend prope Ask, *Gauba* 68 (W); Hazar Djarib, 27 v 1948, *Herb.Min.Ir.Agric.* 252 (W); Bahar, 22 v 1965, *Herb.Min.Ir.Agric.* 6675E (W); Bakhtiari, 6 vi 1974, *Herb.Min.Ir.Agric.* 34153E (E); Almeh, 10 vi 1975, *Herb.Min.Ir.Agric.* 34154E (E); 12km N Kashmar, 4 v 1975, *Herb.Min.Ir.Agric.* 34168E (E); Ghotour to Khoy, 10 vi 1971, *Herb.Min.Ir.Agric.* 34171E (E); War, 29 v 1884, *Knapp* s.n. (WU); Safed Kuh, 12 v 1941, *Koelz* 17509 (W); Karaj, 2 v 1945, *Koelz* 33448 (W); Keredj, v–vi 1937, *Rechinger* 712c (W); Rubat-Safid, 10–11 vii 1937, *Rechinger* 1544a (W); supra Akhlomat, 30 v 1948, *Rechinger* 4520b (E, G, W); Shahrud, 16 vi 1948, *Rechinger* 5404 (W); Khvoy, 10 vi 1971, *Rechinger* 41616 (W); Biarjmand, 26 iv 1975, *Rechinger* 50320 (W); inter Mashhad et Torbat-E Heydariyeh, 29 v 1977, *Rechinger* 55907 (W); Toweh, 7 vi 1977, *Rechinger* 56447 (W); Kandavan, 20 vi 1977, *Rechinger* 57103 (W); Teheran, 19–20 iv 1956, *Schmid* 5078 (G); entre Teheran et Dilijan, 23 iv 1956, *Schmid* 5182 (G); Kuh-I-Demavend, 9–10 v 1956, *Schmid* 5565 (E, G, W); Ab-Ali, 9–10 v 1956, *Schmid* 5624 (G); Kiraj, 10 v 1961, *Stutz* 1073 (W); Rayat, 24 v 1951, *Thesiger* 1049 (BM); Siah Bisheh, 26 iv 1959, *Wendelbo* 366 (W); Lar valley, 2 vii 1974, *Wendelbo & Assadi* 13283 (W); 40km NW from Tabriz, 16 v 1975, *Wendelbo & Assadi* 17126 (W).

USSR: Chatschik, 10 vii 1976, *Avetisjan & Manakjan* s.n. (WU); 10km N Akbash, 26 iv 1978, *Botshanzev & Michailova* 574 (W); Dzhambul, *Goloskokov* 4456 (BM, M); pr. Gaudan, 29 v 1898, *Litwinow* 455 (G, W); Karanky pr. Ashabad, 5 v 1898, *Litwinow* 456 (E); pr. Jablonka, 27 iv 1897, *Litwinow* 457 (E, W); Ashkabad, 2 v 1976, *Nikitin & Krasikova* s.n. (BM, M, W).

AFGHANISTAN: Afghanistan, *Aitchison* 271 (BM); Herat–Sauzak, 5 v 1949, *Køie* 3956 (C).

In combination with the distribution of these plants (mainly in Iran) the following characteristics make this taxon a good subspecies of *P. dubium*: the shape of the upper leaves, in which the rounded base is formed by the basal part of the broadly triangular basal pair of lobes; the mostly more or less dense indumentum of the plants; and the coloration of the petals, with often a black spot in about their middle, as well as the often eroded to laciniate apical margin of the petals.

As in subsp. *laevigatum*, the anthers of subsp. *erosum* sometimes have a small apical appendage.

As regards the name *P. litwinowii* Fedde ex Bornm., Fedde used it on the label of a herbarium specimen collected by Th.Strauss at Sultanabad, but in his revision (Fedde, 1909) did not describe it as a species. It is only mentioned in a footnote under *P. somniferum* L., where Fedde states that he has hesitated for a long time over whether he should treat such material as an independent species close to *P. decaisnei* Hochst. & Steudel ex Elkan of sect. *Papaver*. I could not find where Fedde finally included this particular specimen, but similar specimens are cited by him under *P. dubium* var. *laevigatum* subvar. *erosum*. Bornmüller, who took up the name in 1906, did not give a description of it either. As I am not aware of any later valid publication of this name, it must be regarded as a nomen nudum.

v. subsp. **glabrum** (Royle)Kadereit, **comb. et stat. nov.** Figs 8, 13, 17.

Syn.: *P. glabrum* Royle, Ill.Bot.Him.Mts. 67 (1839).

Type: In the terraced mountain sides of the Himalaya, 5000–7000ft (LIV).

Plants mostly with sparse indumentum to almost glabrous, mostly glaucous. *Branches* often diverging little from primary axis. *Upper leaves* (Fig. 13) sessile with cuneate to rounded base, lobes narrowly triangular to linear, antrorse, incised to distantly serrate to entire. *Petals* pale

orange-red without or with mostly small black spots removed from base; apical margin of petals often eroded to laciniate.
2n = 28 (Podlech & Dieterle, 1969).
Flowering 4–7. Occurring as a weed in cereal fields, or in open vegetation on sand, gneiss or calcareous schist.

AFGHANISTAN: Parachinar, 1965, *Afendi* 243 (W); Band-E-Paneer, 1 vii 1970, *Dieterle* 610 (M); Kabul, 6 vii 1949, *Gilli* 858b (W); Lataband Pass, 28 v 1951, *Gilli* 858c (W); Afghanistan, *Griffith* 138A (E); Kabul, Sher Darwasa, 13 v 1962, *Hedge & Wendelbo* 3181 (E); near Shanez, 27 vii 1962, *Hedge & Wendelbo* 5523 (W, E); Ferajghan Pass, 6 vi 1937, *Koelz* 11743 (W); Kabul, Berg Scher Darwasa, 4 v 1950, *Neubauer* 423 (W); Kabul, 26 v 1965, *Podlech* 10840 (M); Kapisa, oberes Panjir-Tal, *Podlech* 12828 (M); Kabul, 6 v 1970, *Podlech* 17809 (M); Bamian, 12 v 1970, *Podlech* 17935 (M); zwischen Qalatak u. Sameda, 25 v 1970, *Podlech* 18085 (M); inter Doab et Bulula, *Rechinger* 16712 (G, M, W); in valle Paghman, *Rechinger* 17167 (G, M, W); inter Okak et Behzud, 6 vii 1962, *Rechinger* 17893 (W); inter Bamian et Bandiamir, 13 vii 1962, *Rechinger* 18121 (B, G, M, W); Band-I-Amir, 13–14 vii 1962, *Rechinger* 18248 (M, W); ad lacum Band-I-Panir, 14 vii 1962, *Rechinger* 18402 (M, W); prope pagum Mandigak, 23 vii 1962, *Rechinger* 18668 (G, M, W); inter Chakmanni et Ahmad Khel, 6 vi 1967, *Rechinger* 35659 (W); Kabul, in valle Maidan, 26 vi 1967, *Rechinger* 35983 (W); inter Behzud et Panjao, 21 vi 1967, *Rechinger* 36122 (W); 12km W Panjao, *Rechinger* 36229 (W); versus jugum Sad Bark, 23 vi 1967, *Rechinger* 36408 (W); 3–30km NE Sharestan, *Rechinger* 36793 (W); prope Mianeh, 21 vii 1967, *Rechinger* 37411 (W); Wasirabad bei Kabul, iv 1958, *Regel* s.n. (W); 23km W of Bamiyan, *Uotila* 18625 (E, M, W); Surkhab–Danim, 21 v 1950, *Volk* 106 (W).
PAKISTAN: Mingora, 11 iii 1954, *Ali* 26001 (W).
INDIA: Soongree to Bowlee, *Cleghorn* s.n. (E); inter Tangsal et Kataha Ghat, 5 iv 1885, *Drummond* 1326 (BM); Lambatach, 18 v 1897, *Duthie* 19825 (E, WU); near Korgash, 23 iv 1891, *Lace* 806 (E); above Silla Grat, 28 v 1896, *Lace* 1397 (E); Josnal village, 4 vi 1934, *Parkinson* 4052 (E); Sach village, 5 vi 1878, *Watt* 926 (E); Sach village, 6 vi 1878, *Watt* 939 (E); Bankipore, 22 iii 1879, *Watt* 1111 (E); Dhami State, Dhohni, 24 iii 1889, *Watt* 9706 (E).
NEPAL: Chakure Sekh, 8 iv 1952, *Polunin et al.* 1871 (E); NE of Jumla, 12 v 1952, *Polunin et al.* 4057 (E); Kali Gandaki, 5 vi 1954, *Stainton et al.* 939 (E).

In its petals, which often have an eroded to laciniate apical margin and a central black spot, subsp. *glabrum* is very similar to subsp. *erosum*. From this, however, it differs in habit, indumentum, and the texture and shape of the leaves. In subsp. *glabrum* branching occurs mainly above the base and the branches diverge little from the primary axis, whilst branching is mostly from the base in subsp. *erosum* and the branches diverge more. In many specimens, though by no means all, the indumentum is far less dense in subsp. *glabrum* than in subsp. *erosum*. In subsp. *erosum*, the leaves are rather thin and soft, but much more xeric in subsp. *glabrum*. The base of the upper leaves of subsp. *glabrum* is more often cuneate than rounded than in subsp. *erosum*, and the lobes, especially the basal pair of the uppermost leaves, are mostly narrowly triangular to linear in subsp. *glabrum* as opposed to broadly triangular in subsp. *erosum*, and more often are incised or serrate. As is obvious from this comparison, the distinction between the two forms is not always very easy. However, in view of their geographical separation, I think that the use of subspecific rank for both is justified. Sometimes the upper leaves of subsp. *glabrum* can be similar to those of subsp. *laevigatum* from which, however, it is distinguished by the coloration of the petals. In subsp. *laevigatum* there are always basal black spots, whilst spots, if present, are removed from the base in subsp. *glabrum*.

Apart from members of the perennial sect. *Meconella* Spach *P. dubium* subsp. *glabrum* is the easternmost representative of the genus.

Papaver dubium subsp. *laevigatum*, subsp. *erosum* and subsp. *glabrum* all show some similarity to *P. decaisnei* of sect. *Papaver*. As regards subsp. *laevigatum* and subsp. *erosum*, which do not overlap in distribution with *P. decaisnei* (which is found mainly in S Iran and Afghanistan), they sometimes have an apical anther appendage as does *P. decaisnei* and also *P. glaucum* Boiss. & Hausskn. of sect. *Papaver*. When only entirely glabrous material is regarded as belonging to *P. decaisnei*, the distinction of this species from subsp. *glabrum* in Afghanistan, where these two taxa overlap in distribution, is also possible. However, intermediate forms exist (Kadereit, 1986b).

4. P. rechingeri Kadereit, **sp. nov.** Figs 1, 7, 9, 13, 17.

Species affinis *P. dubio*, sed planta humilior; pedicelli glabri vel patenter setosi; petala carmesina; capsulae clavatae, marginibus discorum omnino vel tantum circa extremitates radiorum stigmatum purpureonotatis.

Type: Iraq: Distr. Kut Al-Imara. Ad confine persiae in ditione oppidi Badra, in collibus saxosis, c.33°N46°E, 16km SE Badra, 12–13 iv 1957, *Rechinger* 9209 (holo. W).

Erect to ascending annual herb, 10–45cm high, branched from the base. *Leaves* 1·8–8·5 × 0·5–2·5cm, obovate to ovate in outline, pinnatifid to pinnatisect; lower leaves mostly petiolate, petiole up to 5cm long, sometimes lower leaves gradually narrowing towards base; lobes antrorse, incised to entire; upper leaves shortly petiolate to sessile, pinnatipartite, often with only one pair of entire basal lobes (Fig. 13); leaves very sparsely more or less patently setose to glabrous on upper surface, sparsely to moderately setose on lower surface.

Axis with sparse indumentum of patent setae to glabrous, pedicel with few patent to half-appressed setae to glabrous. *Flower buds* shortly before anthesis 8–16 × 6–9mm, ellipsoid to ovoid, with sparse indumentum of patent setae; sepals mostly with short subapical processes. *Petals* 1·5–2·7 × 1·4–3cm, broadly obovate, crimson, darkening towards base, without basal spots. *Stamens* many, 4·5–10mm long, shorter to longer than ovary; filaments filiform, black; anthers 0·5–1·2mm long, oblong, brownish. *Capsule* 6·5–15 × 4–6mm, 1·5 to 3 times as long as broad, clavate (Fig. 1); stigmatic disc with 5–6 stigmatic rays, 4–5mm broad, as broad as to narrower than capsule diameter; stigmatic disc shallowly lobed, lobes not overlapping; disc with dark violet marks at end of stigmatic rays or around margin. *Seeds* 0·5–0·6mm long, brown (Fig. 17).

Flowering 3–4. As a weed in fields or in open vegetation.

The distribution of *P. rechingerii* is shown in Fig. 7.

IRAQ: ab Amara 70km septentrionem, 27–28 iii 1957, *Rechinger* 8889 (W); Distr. Kut Al-Imara, 30km SE Badra, 12–13 iv 1957, *Rechinger* 9144 (W); 3km SE Badra, 12–13 iv 1957, *Rechinger* 9203 (W).

IRAN: Kermanshah: Mehran, Yara-Bur, 31 iii 1960, *Herb. Min. Ir.Agric.* 5073E (W); W Lorestan: Ilam, 18 iv 1963, *Jacobs* 6317 (W).

From *P. dubium*, to which *P. rechingeri* is most similar, it differs in several respects. It mostly is rather small, only one specimen exceeds 20cm in height, but profusely branched from the base. The pedicel is either glabrous or has few patent setae (in one specimen these setae are half-appressed) and the petals are crimson as opposed to mostly orange-

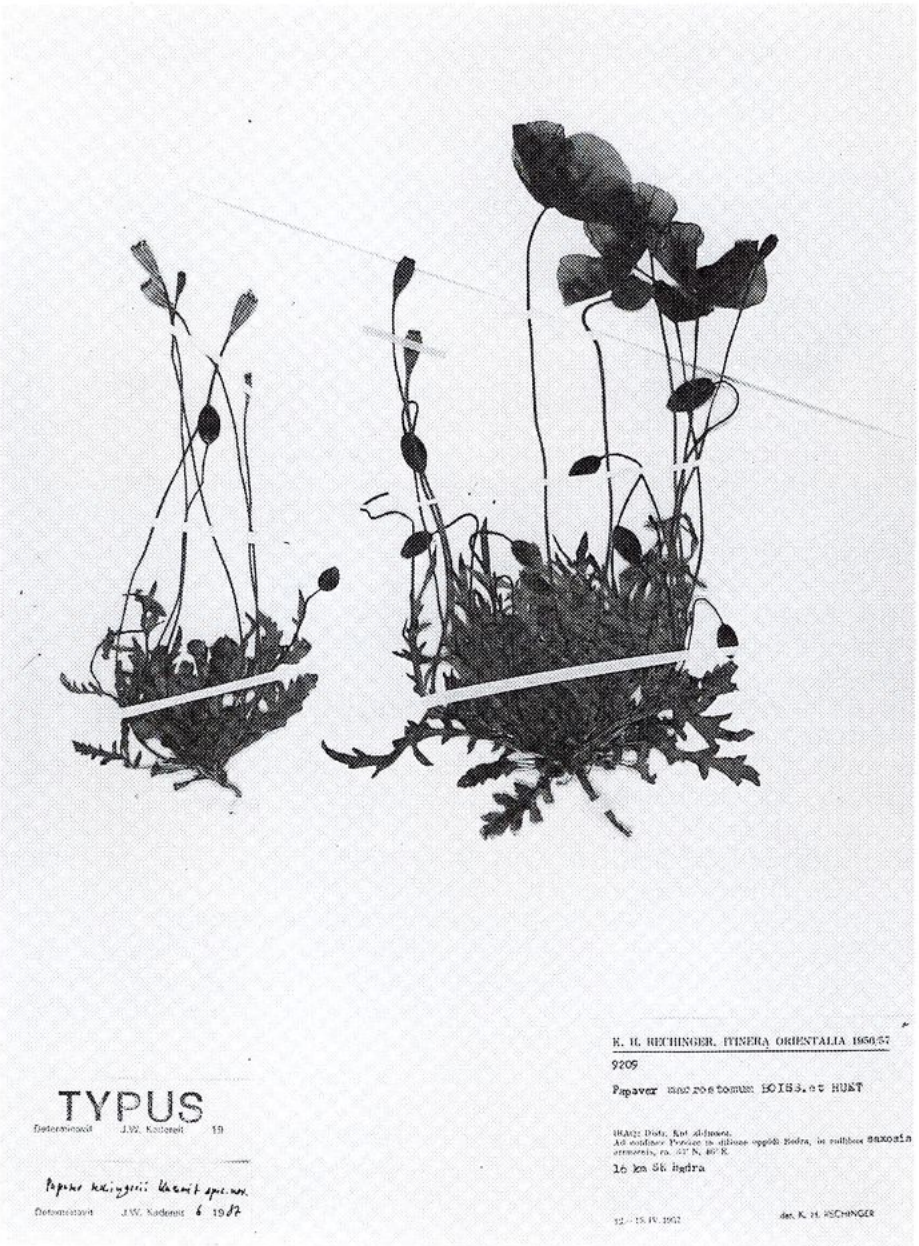

FIG. 9. Holotype of *P. rechingeri* Kadereit, sp.nov.

red in colour. The distinctly clavate capsules are distinguished by the dark violet coloration of the stigmatic disc. The leaves of *P. rechingeri* are far less dissected than those of *P. dubium*. In its distribution *P. rechingeri* is vicarious with *P. dubium* subsp. *erosum* and, in comparison with most other taxa in the section, is distributed rather narrowly (Fig. 7).

5. P. arachnoideum Kadereit, **sp.nov.** Figs 1, 7, 10, 14, 18.
Species annua erecta, axibus foliisque dense et molliter arachnoideis; folia lobis apice setis usque ad 5mm longis ornatis; pedicelli adpresse

FIG. 10. Holotype of *P. arachnoideum* Kadereit, sp.nov.

setosi; petala subbasaliter atromaculata; capsulae plus minusve anguste obovoideae, lobis discorum proximis imbricatis.

Type: Turkey. Prov.Gümüşane: Gümüşane, 1300m, stony slopes, 4 v 1960, *Stainton* 8335 (holo. W, iso. E).

Erect annual herb, 7–45cm high, unbranched or branching from base.

Leaves 1–8·5 × 0·5–2·4cm, obovate to ovate in outline, pinnatifid to pinnatipartite; lower leaves petiolate, petiole up to 4cm long; upper leaves shortly petiolate or sessile; lobes antrorse, entire to incised (Fig. 14); leaves with dense indumentum of arachnoid hairs on both surfaces, all lobes ending in long slender setae, setae up to 5mm long.

Axis densely covered with soft arachnoid hairs, rarely with additional setae, pedicel with slender appressed setae, rarely setae patent. *Flower buds* shortly before anthesis 9–15 × 5–9mm, ellipsoid to obovoid, with dense indumentum of arachnoid hairs and/or slender more or less appressed setae. *Petals* 1·5–2·8 × 1·2–3·4cm, broadly obovate, orange-red, black spots removed from base. *Stamens* many, 5–8mm long, shorter to slightly longer than ovary; filaments filiform, black; anthers 0·7–1mm long, oblong, brownish. *Capsule* 6–14 × 3–6mm, 2 to 3·5 times as long as broad, narrowly obovoid (Fig. 1); stigmatic disc with 5–11 stigmatic rays, 3–6mm broad, as broad as to narrower than capsule diameter; free lobes of stigmatic disc broadening towards their tips, overlapping. *Seeds* 0·7–0·8mm long, brown (Fig. 18).

Flowering 4–6. In open vegetation on igneous rocks, shale or sand.

TURKEY: between Gumush Hane and Zigane, 20 v 1933, *Balls* 286 (E); Pozanti supra Adana, 1917, *Christian* s.n. (W); 2km S of Bilecik station, 23 iv 1966, *Davis* 42093 (E); between Doğanşehir and Pazarcik, 10 v 1957, *Davis & Hedge* 27737 (BM, E); above Elazig, W of Harput, 6 vi 1957, *Davis & Hedge* 29178 (BM, E, W); Angora, *Rochel* 57 (W); zwischen Ovadjik und Thyana, *Siehe* 323 (BM, E, W); Osmancik to Kargi, 1 vi 1969, *Tobey* 2668 (E); after Kargi, 1 vi 1969, *Tobey* 2810 (E).

P. arachnoideum is a distinct species on account of the mostly dense and soft arachnoid indumentum of the leaves and axis, the relatively large petals with their black spots removed from the base and the obovoid capsules, which are at least twice as long as broad and have a flat stigmatic disc with overlapping free lobes. Some of the material I have seen (*Davis & Hedge* 27737; *Stainton* 8335) of this new species was treated as *P. commutatum* Fischer & C. Meyer by Cullen (1965). However, *P. arachnoideum* differs from that species in its indumentum, and in leaf and capsule shape. The eastern representatives of *P. arachnoideum* somewhat mark the 'anatolian diagonal' (Davis, 1971; Ekim & Güner, 1986) in their distribution, but the species can also be found west of that in North Anatolia (Fig. 7). It is perhaps noteworthy that *P. arachnoideum* is quite often found on igneous rocks.

6. P. arenarium M.Bieb., Fl.Taur.-Caucas. 3:364 (1819). Figs 2, 11, 14, 18.

Syn.: *P. bipinnatum* C. Meyer, Verz.Caucasus Pfl. 175 (1831). Type: In montibus Talüsch prope pagum Swant (LE).

Type: Habitat in arena mobili camporum fluvio Terek vicinorum (LE).

Erect to sometimes ascending annual herb, 8–70cm high, mostly branched from the base. *Leaves* 1–18 × 0·6–4·5cm, obovate to ovate in outline, 1–3-pinnatipartite; lower leaves petiolate, petiole up to 9cm long; upper leaves mostly very shortly petiolate; lobes ovate to linear in outline, antrorse, 1–2-pinnatipartite, ultimate segments of leaves lanceolate to linear, often less than 1mm broad (Fig. 14); leaves with sparse to dense indumentum of more or less patent setae on both surfaces, upper surface with fewer setae, often almost glabrous.

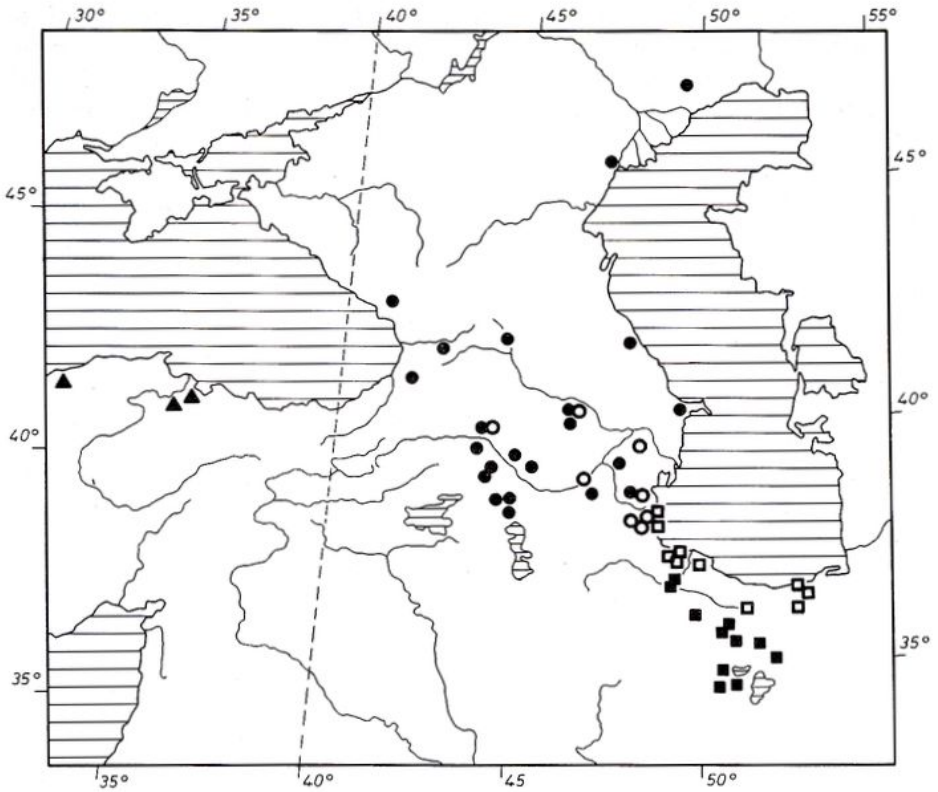

FIG. 11. Geographical distribution of *P. arenarium* (●), *P. tenuifolium* (■), *P. commutatum* subsp. *commutatum* (○), *P. commutatum* subsp. *euxinum* (▲) and *P. chelidoniifolium* (□).

Axis with patent setae, pedicel with few to many appressed or sometimes with patent or slightly retrorse setae. *Flower buds* shortly before anthesis 8–24 × 5–14mm, ovoid to ellipsoid, with few to many more or less patent to sometimes slightly retrorse setae; sepals with more or less conspicuous subapical processes, processes up to 1·5mm long. *Petals* 1·8–4·5 × 1·5–4·5cm, broadly obovate, dark red with mostly very big basal spots, spots extending to up to ⅔ of petal length. *Stamens* many, 4–11mm long, shorter to slightly longer than ovary; filaments filiform, black; anthers 0·6–1·8mm long, oblong, greenish. *Capsule* 10–18 × 4·5–8mm, 2 to 2·8 times as long as broad, obovoid (Fig. 2); stigmatic disc with 7–9 stigmatic rays, 4·5–8mm broad, as broad as to slightly broader than capsule diameter; free lobes of stigmatic disc broadening towards their tips or square to oblong, mostly overlapping, sometimes bent upwards at maturity. *Seeds* 0·6–0·7mm long, brown, glaucous (Fig. 18).

2n = 14 (mihi).

Flowering 4–7. As a ruderal or weed in fields or in open vegetation on various substrata, often in very large populations.

The distribution of *P. arenarium* is shown in Fig. 11.

TURKEY: Prov. Çoruh: Ardanuç, 27 vi 1957, *Davis & Hedge* 30176 (BM, E, W); Kars: 9km S of Igdir, 30 v 1966, *Davis* 43894 (E); Ararat, 1961, *Hewitt* 41 (E); Prov. Agri: prope Karabulagh, 3 vii 1977, *Rechinger* 57335 (W).

USSR: Aschtarak, 21 v 1976, *Avetisjan et al.* s.n. (BM, E, W); Megrinsk bei Schwanidsor, 27 v 1977, *Avetisjan et al.* s.n. (E, WU); Echegnadsorsk, 31 v 1977, *Avetisjan et al.* s.n. (WU);

Iberia, *Besser* s.n. (W); Atskuri, 12 vi 1881, *Brothers* 48 (G); Tbilisi, hillside near the Dabahane gorge, 29 vi 1959, *Davis* 33787 (E); Tbilissi, 28 v, 31 v, 9 vi 1968, *Fritsch* s.n. (JE); Gutscharsk bei Artschut, 2 vi 1975, *Gabrieljan* s.n. (WU); Derbant, vi 1828, *Godet* s.n. (G); Bukejewsche Kirgisen-Horde, 5 iii 1855, *Gremiatschensky* s.n. (WU); Sappoia, *Gremiatschensky* s.n. (WU); Tiflis, 17 iv 1919, *Grossheim* s.n. (B); Shach-Buz, 21 v 1934, *Grossheim & Gurvitsh* s.n. (G); inter Shona-Tschola et Zaringa, 1935, *Grossheim & Gurvitsh* s.n. (G); Schirvan prope Zangana, 18 iv 1930, *Hejdeman* s.n. (BM); Elisabetho polensis, 5 vi 1838, *Hohenacker* s.n. (B, BM, E, G, M, W); Megrinsk bei Schwanidsor, 9 v 1953, *Karapetjan & Ashanjan* s.n. (BM, W); ad ostia Wolga, *Karelis* s.n. (G); Ashtarak, 19 v 1937, *Koch* s.n. Turcomania, *Ledebour* s.n. (M); Tbilissi, Lisi See, 30 vi 1969, *Lepper et al.* s.n. (JE); zwischen Agdan und Usuntal, 8 vi 1973, *Muschkidschanjan* s.n. (E); Cauc. pr. Baku, 1867, *Seidlitz* s.n. (G); Armenia ross., *Szovits* s.n. (E, M, W, WU); Tiflis, *Smirnoff* s.n. (WU); Dzhvari, 22 v 1973, *Vašák* s.n. (M); Samgori, 27 v 1973, *Vašák* s.n. (W); prope Tiflis, montes Sololaki, 18 iv 1907, *Woronow* 262 (C, E, W, WU).
IRAN: 95km from Maku on road to Marand, 5 v 1971, *Lamond* 2696 (E); 10km from Khvoy to Qareh Zia'oddin, 8 vi 1971, *Lamond* 3860 (E); Moghan, Kangarlou, 16 v 1966, *Herb.Min.Ir.Agric.* 6860E (W); Khvoy to Ghara-Zeyadin, 8 vi 1971, *Herb.Min.Ir. Agric.* 34159 (E); 95km SE Maku versus Marand, 5 v 1971, *Rechinger* 39282 (W); Sarband, 23 v 1971, *Rechinger* 40235 (W); 14km SE Alirezaabad, 21 v 1971, *Rechinger* 40141 (W); 45km S Alirezaabad, 23 v 1971, *Rechinger* 40249 (W); 20km NE Khvoy, 8 vi 1971, *Rechinger* 41426 (W); 10km N Khvoy, 8 vi 1971, *Rechinger* 41445 (W); Persia bor., *Szovits* s.n. (W); near Ghaghali, 15 v 1975, *Wendelbo & Assadi* 17118 (W); Persia, *Zablotsky* s.n. (C).

P. arenarium is mostly well characterized by its very finely dissected leaves with often linear ultimate segments of less than 1mm breadth, the mostly appressedly setose indumentum of the pedicel, the very distinct thin subapical processes of the sepals (which can be up to 1·5mm long), the often distinctly pointed and drop-shaped flower buds, and the obovoid capsules. What has been described as *P. bipinnatum* differs from most material of *P. arenarium* in being somewhat more robust, in having a denser indumentum of longer setae and patently to slightly retrorsely setose pedicels, and in having more ellipsoid than ovoid flower buds which mostly have hardly noticeable short and obtuse subapical processes. The capsules are the same as in most other specimens. As I have seen specimens with distinct subapical processes on the sepals but with patently setose pedicels, and such with finely dissected leaves but with inconspicuous processes only, I think that the separation of *P. bipinnatum* from *P. arenarium* at specific rank, as adopted by Komarov (1937) and Cullen (1966), cannot be justified. The inclusion of *P. bipinnatum* into *P. arenarium* may be supported by the sympatric occurrence of specimens assigned to the two forms.

It is interesting to observe that the subapical processes found here were also observed in *P. pavoninum* Fischer & C. Meyer of sect. *Argemonidium* Spach (Kadereit, 1986c), in which they also are subject to some variability in length.

7. P. tenuifolium Boiss. & Hohen. ex Boiss., Diagn.Sér. 1, 8:10 (1849). Figs 2, 11, 14, 18.

Syn.: *P. oligactis* Bornm. & Fedde, Repert Spec.Nov.Regni Veg. 12:90 (1913). Type: West-Persien: In monte Kuh-Amtschek, 2 vii 1909, *Th.Strauss* (JE).

Type: Hab. in schistosis faucis Schir Dere montis Elbrus prope Derbend, *Kotschy* 247 (lecto. G-Boiss.; isolecto. BM, E, G).

Erect to sometimes ascending annual herb, 6–28cm high, mostly branched from the base. *Leaves* 1–12 × 0·5–3cm, obovate to ovate in outline, 1–2-pinnatisect, lower leaves petiolate, petiole 1–5cm long; upper leaves mostly very shortly petiolate, rarely sessile; lobes antrorse, ovate to linear in outline, pinnatipartite to pinnatifid or incised to entire; ultimate segments rarely broader than 2mm (Fig. 14); leaves restricted to up to ½ of height of plant. Leaves with more or less dense indumentum of soft patent hairs on both surfaces, hairs flattened in dry material, conspicuously broadening at base.

Axis with patent hairs, pedicel with few patent hairs to almost glabrous. *Flower buds* shortly before anthesis 7–17 × 6–11mm, broadly ovoid to almost globose, with few to many patent soft hairs. *Petals* 1–3·1 × 1–3·5cm, broadly obovate, pale red to orange-red with or without darker base or sometimes with distinct black basal spots of varying size. *Stamens* many, 3–5mm long, shorter to as long as ovary; filaments filiform, black; anthers 0·8–1mm long, oblong, mostly light yellow, rarely brownish. *Capsule* 6–15 × 3·5–7mm, 1·5 to 2·7 times as long as broad, obovoid, distinctly contracted below pores (Fig. 2), sometimes capsules almost cylindrical with abruptly narrowing base; stigmatic disc with 4–6 stigmatic rays, 3–5mm broad, narrower than capsule diameter; free lobes of stigmatic disc more or less half-circular, not overlapping. *Seeds* 0·7–0·8mm long, brown, glaucous (Fig. 18).

2n = 14 (Aryavand, 1975).

Flowering 4–7. As a weed in cornfields or in open vegetation on mostly stony ground.

The distribution of *P. tenuifolium* is shown in Fig. 11.

IRAN: Tehran: Bijin, 20 v 1974, *Ariamehr Bot.Gard.* 11570 (E, W); Kurgd, 20 v 1932, *Balls* 75 (E); Herbier de Perse, 1825, *Bélanger* s.n. (G); in valle fluvii Sefidrud prope Rudbar, 4 v 1902, *Bornmüller* 6104, 6105 (B, BM, G, JE, WU); in valle fluvii Sefidrud prope Mendsrhil, 10 v 1902, *Bornmüller* 6106 (B); Tehran: Darband, 18 v 1947, *Esfandiari* s.n. (W); in montibus supra Rudbar, 20 v 1935, *Gauba* 72 (W); Ravandeh prope Mardabad, *Gauba* 74 (W); Keredj, 15 v 1934, *Gauba* 184 (B); Keredj: Berge bei Kalak, 31 v–1 vii 1934, *Gauba* 185 (B); Keredj, 9 vi 1936, *Gauba* 1346 (B); Jusbashichal prope Rudbar, *Gauba & Mirdamadi* 73 (W); Tehran: Varamine, 22 v 1974, *Herb.Min.Ir.Agric.* 34157 (E); Tehran: Kavir, 23 v 1974, *Herb.Min.Ir.Agric.* 34177 (E); Tehran: Karaj, 15 v 1945, *Koelz* 33454 (W); Sultanabad near Kastin, v 1935, *Lindsay* 203 (BM); im Bachgerölle bei Patschinar, 1882, *Pichler* s.n. (WU); Keredj: in monte Pic Kuh, 30 v 1937, *Rechinger* 604 (BM, W); Keredj: Darreh Wardi, 7 vi 1937, *Rechinger* 785 (W); Mobarakiyeh 40km a Veramin, 22 v 1974, *Rechinger* 46111 (G, M, W); Karavan-Sarai Shah Abbas, 23 v 1974, *Rechinger* 46191 (G, W); Siah Kuh, 24 v 1974, *Rechinger* 46285 (G, W); Siah Kuh: prope cisternam Howz-E Agha Mohammed, 25 v 1974, *Rechinger* 46363 (W); 36km S Tehran versus Qom, 4 v 1974, *Riedl & Iranshahir* s.n. (W); Hügel bei Mollah-Ali, 29 iii 1908, *Strauss* s.n. (JE); 20km N Ghom, 26 iv 1961, *Stutz* 738 (W); 20 miles W Qom, 5 v 1961, *Stutz* 1045 (W).

P. tenuifolium is characterized by its subscapose habit, the colour of the petals, which are pale to orange-red and mostly darkening towards their bases without having distinct basal spots, the mostly light yellow anthers, and above all by its indumentum. As in most other species in this section the hairs are multicellular. Normally, the individual cells have rather thick walls, resulting in rather stiff setae, but in *P. tenuifolium* the cells have comparatively thin walls, so that the hairs are softer and conspicuously collapsed and flattened in herbarium material. It is mainly by this character that tall specimens of this species (e.g. *Bornmüller* 6104)

can be distinguished from *P. arenarium*, to which they show great similarity in leaf and capsule shape and sometimes in the colour of the petals.

P. tenuifolium var. *pentecostale* Fedde does not belong to this species, but to *P. dubium* subsp. *erosum*.

8. P. commutatum Fischer & C.Meyer, Ind.Sem.Hort. Petrop. 4:41 (1837).
Type: Hab. in Iberia et prope Baku (LE).

Erect annual herb, 10–70cm high, mostly branched from the base. *Leaves* 1·5–14 × 0·5–5·5cm, obovate to ovate in outline, pinnatisect to pinnatipartite; lower leaves petiolate, petiole up to 5cm long; upper leaves sessile; lobes of lower leaves ovate, incised to pinnatifid, antrorse; lobes of upper leaves mostly oblong to linear, mostly entire, rarely with distant incisions (Fig. 14); size of lobes of upper leaves decreasing more or less gradually towards leaf tip, sometimes basal pair shorter than following pair; leaves with sparse indumentum of more or less patent setae on both surfaces, upper surface with fewer hairs.

Axis with patent setae, pedicel with dense indumentum of short appressed setae. *Flower buds* shortly before anthesis 14–24 × 8–14mm, obovoid to ellipsoid, more or less densely covered with more or less patent setae. *Petals* 1·5–4·7 × 1·1–5·5cm, broadly obovate to sometimes (outer pair) flabelliform, dark red with mostly basal black spots or spots removed from base. *Stamens* many, 5–12mm long, shorter to longer than ovary; filaments filiform, black; anthers 0·6–1·5mm long, oblong, greenish to brownish. *Capsule* 6–13 × 4·5–11mm, 1·1 to 1·6 times as long as broad, broadly cylindrical to broadly ovoid or sometimes almost globose, mostly distinctly stipitate (Fig. 2); stigmatic disc with 5–10 stigmatic rays, 4–11mm broad, as broad as to broader than capsule diameter, if narrower, then capsules almost globose; free lobes of stigmatic disc broadening towards their tips, overlapping. *Seeds* 0·9–1mm long, brown, glaucous (Fig. 18).

1a. Lobes of upper leaves mostly more than 1mm broad. (Caucasia or further east) . . . . . **i.** subsp. **commutatum**
1b. Lobes of upper leaves always less than 1mm broad. (N Turkey) . . . . . **ii.** subsp. **euxinum**

i. subsp. **commutatum.** Figs 2, 11, 14, 18.
Syn.: *P. ambiguum* Popov in Komarov, Fl.URSS 7:638, 749 (1937). Type: Transcaucasia, prope Kodzhori, 1878, *M. Smirnow* s.n. (LE).
2n = 14 (mihi).
Flowering 5–6. A weed in cornfields, vineyards etc., in open meadows or other open vegetation, rarely in open forests.
The distribution of subsp. *commutatum* is shown in Fig. 11.

USSR: Tbilissi, 31 v 1968, *Fritsch* s.n. (JE); prope pagum Lerik, *Grossheim et al.* s.n. (BM); Elisabethpol., 1838, *Hohenacker* s.n. (G, BM); Armenia, *Koch* s.n. (B); Turcomania, 1845, *Ledebour* s.n. (M); Briesk bei Svarants, 11 vii 1967, *Manakjan & Pogosjan* s.n. (W);

Ossetia, prope Nåsal, 24 vi 1901, *Marcowicz* s.n. (G, JE); Erevan bei Sansch, 25 v 1967, *Mchibarjan & Babajan* s.n. (W); Megrinsk, 10 vi 1978, *Oganesova & Nikischenko* s.n. (E); Caucasus, Magan, *Rodde* s.n. (WU); Armenia ross., *Szovits* s.n. (E, WU); 5km von Schwanidsor, 16 v 1979, *Tamanjan* s.n. (WU); inter pagum Saguramo et ecclesiam Dzhvari, 26 v 1973, *Vašák* s.n. (G); Samgori, 27 v 1973, *Vašák* s.n. (G); 'Tus Tba', 28 v 1973, *Vašák* s.n. (G); Parpi, 31 v 1973, *Vašák* s.n. (B, M).

IRAN: 5 miles E of Ardabil, 6 vi 1962, *Furse* 2465 (W); Pass above Heyran, 18 v 1971, *Lamond* 3053 (E); Azerbaidjan: Moghan, 5 v 1960, *Mirzagan* 5872E (W); inter Heyran et Ardabil, *Rechinger* 39937 (W).

ii. subsp. **euxinum** Kadereit, **subsp. nov.** Figs 11, 12.

Differt a subsp. *commutato* foliorum lobis angustioribus.

Type: Vilayet Samsun, Buroboy, 800m, rocky valley floor, sandy, hot, 10 vi 1964, *Tobey* 743 (holo. E).

Flowering 5–7. A weed in fields, or in open vegetation on sandy or limestone scree.

The distribution of subsp. *euxinum* is shown in Fig. 11.

TURKEY: Keltepe above Sorgun Yagla, 20 vii 1962, *Davis et al.* 37850 (E); bei Amassia, 7 v 1892, *Manissadjian* 753 (M).

P. commutatum subsp. *euxinum* is distinguished from subsp. *commutatum* by its always small size (the three specimens I have seen of this new subspecies are all smaller than 25cm). its small capsules, which at the most measure 7 × 5mm, and above all the very fine dissection mainly of the upper leaves, resulting in lobes less than 1mm broad. Although lobes with this breadth can occasionally be found in subsp. *commutatum*, this is always in obviously depauperate specimens with very small and little dissected leaves. In view of the geographical separation of the specimens of subsp. *euxinum* from the main distribution area of *P. commutatum* I believe that the attribution of subspecific rank is justified. I have not seen the type material of *P. commutatum* var. *minimum* K. Koch and var. *angustilobum* Fedde & Bornm. As regards the latter, described from the Aegean (Thasos), this, if belonging to *P. commutatum* at all, which seems doubtful in view of its distribution and was doubted by Fedde (1909) himself, might belong to subsp. *euxinum*.

P. commutatum is recognizable by the shape of its leaves, the dense indumentum of very short appressed setae on the pedicel, and its mostly stipitate, cylindrical to globose capsules. From *P. rhoeas*, to which this species bears some similarity in its relatively broad capsules, and particularly from *P. rhoeas* var. *strigosum* Boenn. with appressedly setose pedicels, *P. commutatum* can be distinguished in the first place by the shape of its upper leaves. Whilst in *P. rhoeas* the basal pair of lobes of these is almost always substantially bigger than, if present, the lobes of the terminal segment, so that the leaves are mostly distinctly trifid, the size of the lobes decreases more or less gradually towards the leaf tip in *P. commutatum*. As regards the indumentum of the pedicel, the setae are shorter (0·4–1·4mm) in *P. commutatum* than in *P. rhoeas* var. *strigosum* (1·2–3mm, rarely shorter), and mostly more densely arranged and more firmly appressed in the former species. In leaf shape, the similarity of *P. commutatum* is stronger to *P. arenarium* than to *P. rhoeas*.

Similar to *P. pinnatifidum* also *P. commutatum* has a somewhat porous seed surface (Fig. 18).

FIG. 12. Holotype of *P. commutatum* Fischer & C. Meyer subsp. *euxinum* Kadereit, subsp.nov.

9. P. chelidoniifolium Boiss. & Buhse, Nouv.Mém. Soc.Nat. Mosc. 12:11 (1860). Figs 2, 11, 14, 18.

Syn.: *P. chelidoniifolium* Boiss. & Buhse var. *tenuisectum* Fedde & Bornm. in Engler, Pflanzenr. 4, 104:311 (1909). Type: Pirebasar, 1902, *Bornmüller* 6103b (B).

Type: prov. Ghilan, 1847, *Buhse* 921/2 (lecto. G-Boiss.).

Erect to ascending annual herb, 13–65cm high, mostly branched from the base. *Leaves* 1–7 × 0·7–4cm, obovate to ovate in outline, pinnate to pinnatisect; lower leaves petiolate, petiole up to 3cm long; upper leaves mostly sessile; lower leaves mostly pinnate with mostly large tripartite terminal lobe and 1–2 pairs of smaller incised lateral lobes; upper leaves trifid with large, pinnatipartite to incised terminal lobe, and smaller, antrorse or patent and mostly incised lateral lobes (Fig. 14); leaves with mostly sparse indumentum of patent setae on both surfaces, upper surface with fewer setae.

Axis with patent setae, pedicel with mostly sparse indumentum of appressed setae. *Flower buds* shortly before anthesis 7·5–12 × 5–8mm, broadly ovoid, with mostly few more or less patent setae. *Petals* 1·5–2·1 × 1·3–2cm, broadly obovate, dull crimson to orange-red, darkening towards the base or with distinct basal black spots. *Stamens* many, 4–5mm long, shorter to longer than ovary; filaments filiform, black, anthers 0·7–0·8mm long, oblong, mostly greenish, rarely light yellow. *Capsule* 6–7 × 4–5mm, 1·3 to 1·5 as long as broad, broadly obovoid (Fig. 2); stigmatic disc with 5–7 stigmatic rays, 3·5–5mm broad, as broad as to narrower than capsule diameter, rarely broader than capsule diameter; free lobes of stigmatic disc broadening towards their tips, mostly overlapping. *Seeds* 0·6–0·8mm long, brown (Fig. 18).

2n = 14 (Goldblatt, 1974).

Flowering 4–6. Mostly in open vegetation on sandy or sometimes rocky ground.

The distribution of *P. chelidoniifolium* is shown in Fig. 11.

IRAN: Pirebazar, 26 iv 1902, *Bornmüller* 6101 (JE); Rescht, 27 iv 1902, *Bornmüller* 6102 (WU); Kalardasht, Roudbarek, 2 v 1966, *Esfandiari* 6730E (W); 40′ S of Cahlus, 8 vi 1962, *Furse* 2520 (E, W); Babol, *Gauba* 71 (W); Talysch, Assalem, *Herb.Min.Ir.Agric.* 6470E (W); Astara, Heyran, 17 v 1971, *Herb.Min.Ir.Agric.* 34162E (E); Pahlavi, Bashme, 14 v 1971, *Herb.Min.Ir.Agric.* 34163E (E); Caspian, 37°15′N 49°30′E, *Jacobs* 6163 (E, W); 2km E of Mahmudabad, 28 iv 1972, *Kukkonen* 5557 (E, W); c.7km NW Bandar-E-Pahlavi, 14 v 1971, *Lamond* 2924 (E); Hashtpar to Astara, 16 v 1971, *Lamond* 3016 (E); Guilan, v 1936, *Lindsay* 742, 742a (BM); near Babolsar, 9 v 1955, *Mooney* 6546 (W); Lahidjan, 13–14 v 1937, *Rechinger* 80 (W); 7km W Bandar-E-Pahlavi, 14 v 1971, *Rechinger* 39623 (W); 10–20km W of Astara, 17 v 1971, *Rechinger* 39928 (W); Siah Bisheh, 26 iv 1959, *Wendelbo* 376 (W).

P. chelidoniifolium is normally easy to recognize on account of: its distinct leaf shape, the lower leaves mostly are pinnate with a large trifid terminal lobe and the upper leaves are distinctly trifid; its mostly subglabrous sepals; and its small capsules. In capsule shape and indumentum of the pedicel it is similar to *P. commutatum*, from which, however, it is distinguished by its leaf shape. The colour of the petals, which mostly darken gradually towards the base (though sometimes have a distinct basal spot), and the occasionally light yellow anthers make *P. chelidonii-*

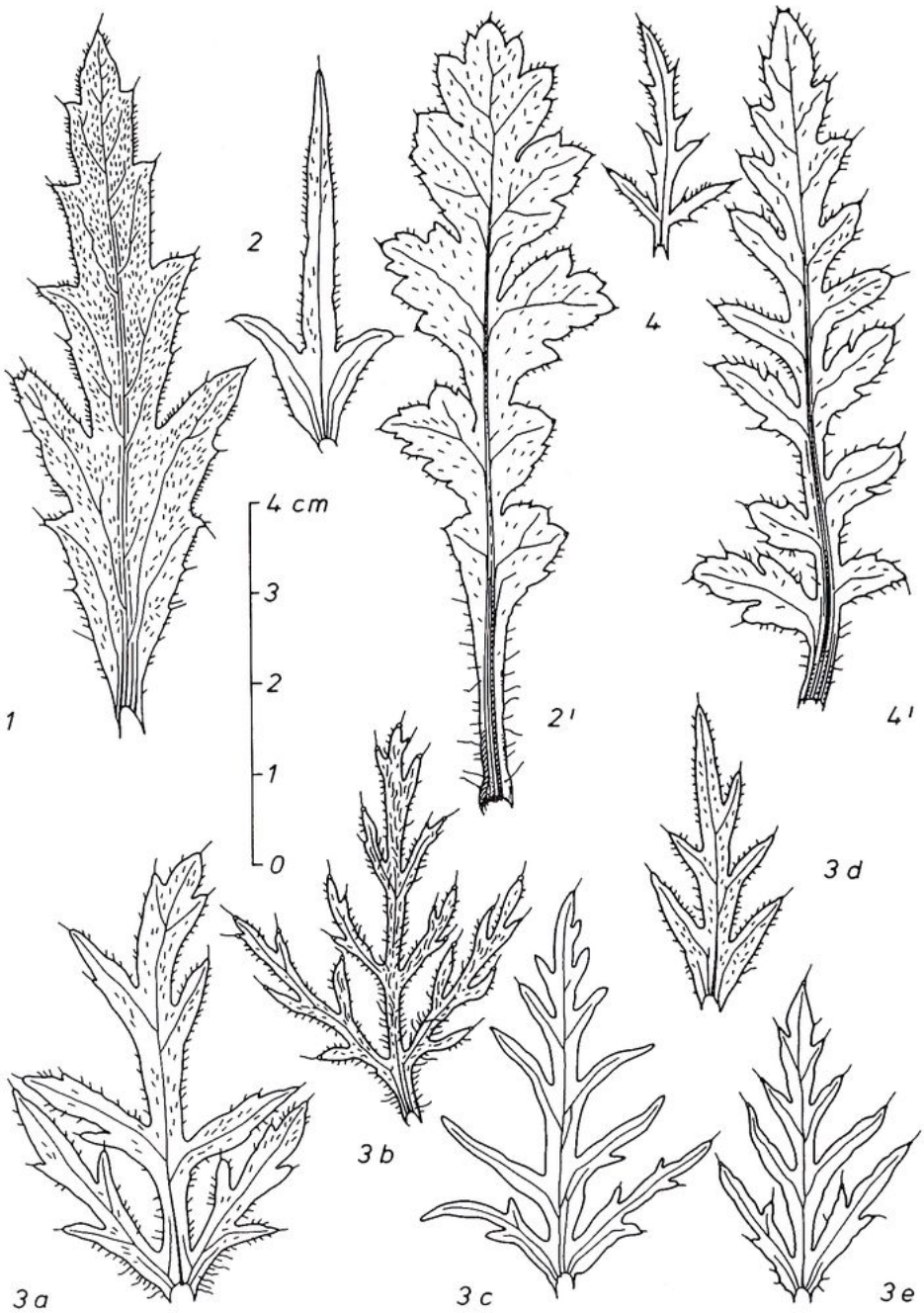

FIG. 13. Upper cauline leaves of 1, *P. pinnatifidum*; 2, *P. purpureomarginatum* (2′, basal leaf); 3a, *P. dubium* subsp. *dubium*; 3b, subsp. *lecoqii* var. *lecoqii*; 3c, subsp. *laevigatum*; 3d, subsp. *erosum*; 3e, subsp. *glabrum*; 4, *P. rechingeri* (4′, basal leaf).

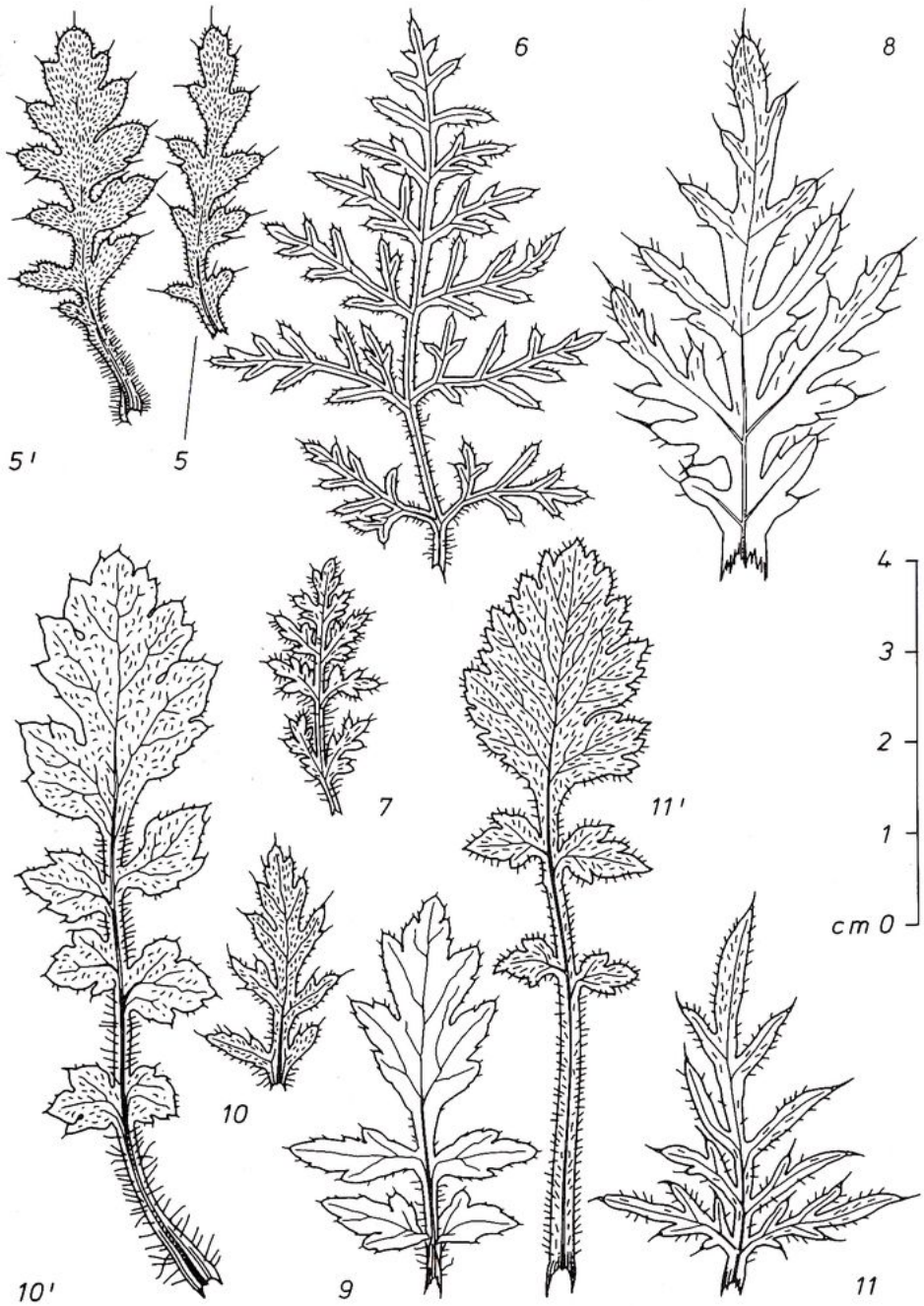

FIG. 14. Upper cauline leaves of 5, *P. arachnoideum* (5′, basal leaf); 6, *P. arenarium*; 7, *P. tenuifolium*; 8, *P. commutatum* subsp. *commutatum*; 9, *P. chelidoniifolium*; 10, *P. guerlekense* (10′, basal leaf); 11, *P. stylatum* (11′, basal leaf).

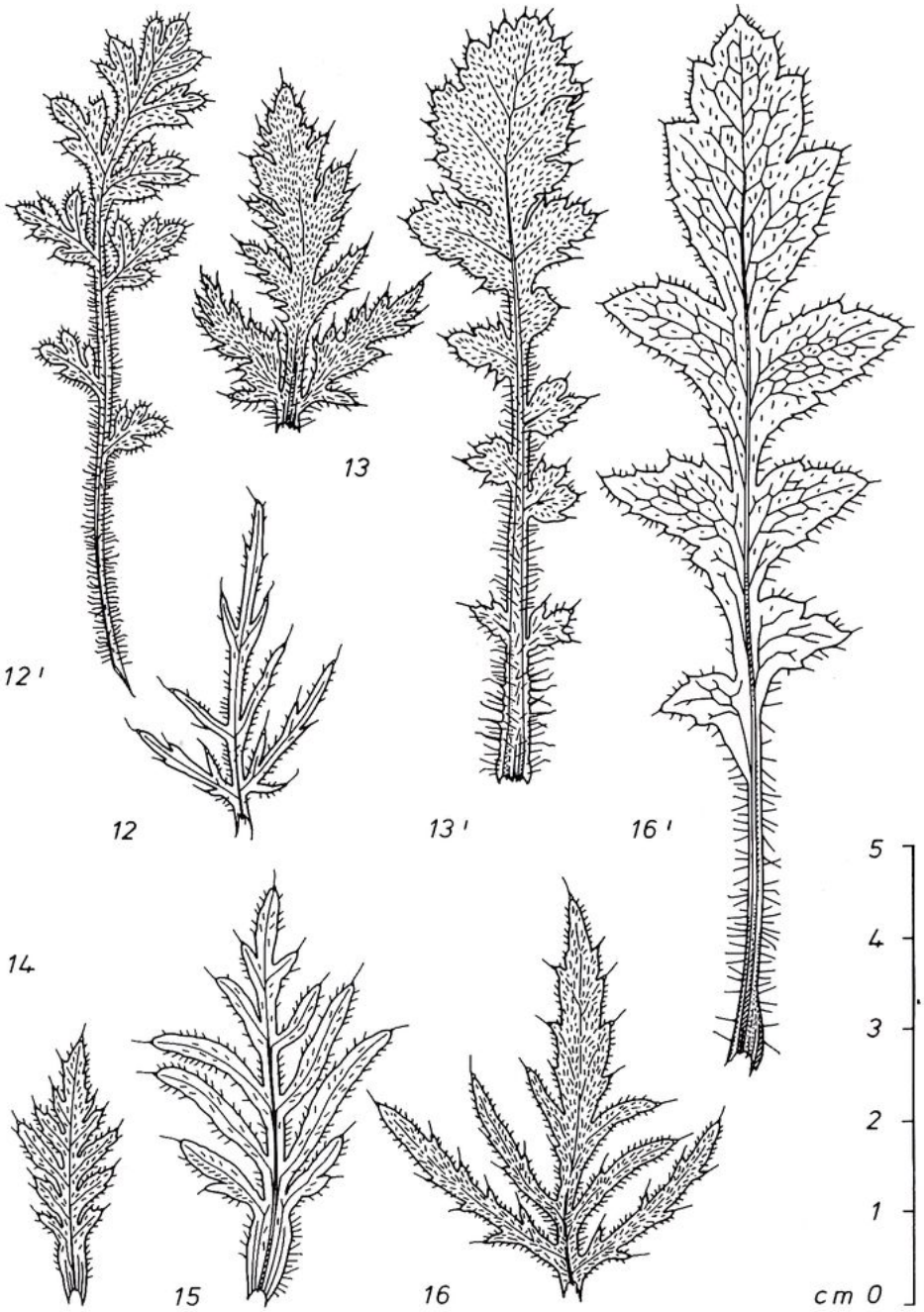

FIG. 15. Upper cauline leaves of 12, *P. clavatum* (12′, basal leaf); 13, *P. umbonatum* (13′, basal leaf); 14, *P. carmeli*; 15, *P. humile*; 16, *P. rhoeas* var. *rhoeas* (16′, basal leaf).

folium somewhat similar to *P. tenuifolium*. From this it differs in leaf shape, capsule shape and indumentum.

P. chelidoniifolium var. *tenuisectum* has somewhat more finely dissected leaves than most other material, but I prefer not to recognize this entity formally.

10. P. guerlekense Stapf, Denkschr.Kaiserl.Akad.Wiss. Math.-Naturwiss. Kl. 51:359 (1886). Figs 2, 14, 16, 18.

Syn.: *P. rhopalothece* Stapf, Denkschr.Kaiserl.Akad. Wiss.Math.-Naturwiss.Kl. 51:359 (1886). Type: Lycia: Ad Gjölbaschi, 29 v 1882, *Luschan* 4823 (lecto. WU, isolecto. B).

P. apicigemmatum Fedde, Bull. Herb. Boissier, Sér. 5, 2:448 (1905). Type: Ag-Dhag, base de la montagne, 5 vii 1860, *Bourgeau* s.n. (G).

P. stipitatum Fedde in Engler, Pflanzenr. 4, 104:322 (1909). Type: In insula Scopelo, i 1873, *Herb.Heldreich* s.n. (B).

Type: Lycia: Ad Gürlek, 7 vi 1882, *Luschan* s.n. (B).

Erect annual herb, 20–40cm high, mostly branched from the base. *Leaves* 1–11·5 × 0·5–2·5cm, obovate to ovate in outline, pinnatipartite to pinnatisect; lower leaves petiolate, petiole up to 2·5cm long, mostly with large terminal incised segment and 1–3 pairs of much smaller lateral lobes (Fig. 14); upper leaves sessile, pinnatipartite with several incised to entire lateral lobes, lobes often decreasing gradually in size towards leaf tip (Fig. 14); leaves with more or less dense indumentum of patent setae on both surfaces.

Axis and leaves almost always with red tinge or at least some setae red. *Axis* with patent, pedicel with patent or appressed setae. *Flower buds* shortly before anthesis 12–19 × 5·5–10mm, ovoid, with more or less dense indumentum of more or less patent setae. *Petals* 3–3·8 × 2·5–3·5cm, broadly obovate, red with or without basal black spots or spots removed from base. *Stamens* many, 5·5–8mm long, shorter to longer than ovary; filaments filiform, black; anthers 0·7–1·1mm long, oblong, brownish. *Capsule* 8·5–17 × 3–7mm, 1·8 to 4 times as long as broad, more or less narrowly obovoid to obpyriform (Fig. 2), gradually narrowing into long narrow basal part; stigmatic disc with 5–9 stigmatic rays, 3–6·5mm broad, narrower to broader than capsule diameter; free lobes of stigmatic disc broadening towards their tip, overlapping or not. Seeds 0·7–0·8mm long, brown (Fig. 18).

2n = 14 (mihi).

Flowering 4–5. A weed in fallow fields, or in open vegetation on sand or rocky limestone, often in dunes.

The distribution of *P. guerlekense* is shown in Fig. 16.

GREECE: Karpathos: Katolastos, 23 v 1963, *Greuter* 5490 (M, W); Alonnisos: infra pagum Alonnisos, 15 v 1965, *Phitos* 2204 (M); Alonnisos: prope pagum Votsi, 15 v 1965, *Phitos* 2290a (M); Scarpanto, Pigadia, 17 iv 1883, *Pichler* 25 (WU); Rhodos: prope Salakos, 11 v 1935, *Rechinger* 7143 (BM, W); Rhodos: Monolithos, 17 v 1935, *Rechinger* 7415 (BM); Rhodos, 13 iv 1965, *Skovsted* s.n. (C).

TURKEY: near Fethiye, 5 v 1980, *Baytop* 44153 (WU); near Kas, 6 v 1980, *Baytop* 44171 (WU); Sögüt to Bozburun, 15 iv 1965, *Davis* 41208 (E); Türgut to Bayir, 15 iv 1965, *Davis* 41127 (E); Anamur, 14 iv 1956, *Davis & Polunin* 25961 (BM); Lycien: Sidyma, *Luschan* s.n. (WU); 13km S of Fethiye, 16–28 v 1976, *Polunin* 13977 (E); Alanya, 9 iv 1955, *Walter* 3797 (B).

CYPRUS: Lisso, 10–16 vi 1913, *Haradjian* 841 (G).

In this species the axis and/or the pedicel almost always show a distinct reddish tinge, which often is also shown by the leaves and at least some setae. Together with the large terminal lobe of the basal leaves, which is about as long as broad, and the shape of the capsules, which are obovoid to obpyriform with a clavately narrowing base, this feature makes *P. guerlekense* a distinct species. By the shape of the capsule base and the lower leaves, specimens with comparatively broad capsules can be distinguished from *P. rhoeas*, in which the capsule base contracts more or less abruptly.

P. rhopalothece clearly belongs here on account of its red coloration and the shape of capsules and leaves. The same applies to *P. apicigemmatum*. Although only one of the two specimens of the type gathering has red pedicels, the other one is green only, the shape of leaves and capsules clearly identify it as *P. guerlekense*. From the shape of the capsules and leaves *P. stipitatum*, described from Skopelos in the Northern Sporades, also belongs to *P. guerlekense*. The type specimen of this shows no red tinge. As plants clearly belonging to *P. guerlekense*, also on account of their red colour, have been collected twice from the neighbouring island of Alonnisos (*Phitos* 2204, 2290a), I do not doubt the identity of *P. stipitatum* with *P. guerlekense*. The disjunction thus shown by *P. guerlekense* seems to be quite uncommon.

11. P. stylatum Boiss. & Bal. ex Boiss., Diagn.Sér. 2, 5:13 (1856). Figs2, 14, 16, 18.

Syn.: *P. stylatum* Boiss. & Bal. ex Boiss. var. *psammophilum* Fedde, Bull.Herb.Boissier, Sér. 5, 2:448 (1905). Type: Mersina, Dünen, iv 1895, *Siehe* 138 (BM, E, JE, WU).

P. syriacum Boiss. & Blanche ex Boiss. var. *stylatoides* Fedde in Engler Pflanzenr. 4, 104:305 (1909). Type: ad Pyramum in monte Nur, 26 iv 1859, *Kotschy* s.n. (W).

Type: Plaine de Mersina (Cilicia), 17 iv 1855, *Balansa* 722 (lecto. G-Boiss.; isolecto. BM, C, G, JE, W).

Mostly ascending, sometimes erect annual herb, 10–40cm high, mostly branched from the base. *Leaves* 1·5–12 × 0·5–3cm, obovate to ovate in outline, pinnatipartite to pinnatisect; lower leaves petiolate, petiole up to 4·5cm long, with large terminal incised segment and 1–2 pairs of smaller lateral lobes (Fig. 14); upper leaves sessile, trifid, with narrowly ovate to linear segments, segments incised to pinnatipartite (Fig. 14); leaves with more or less dense indumentum of patent setae on both surfaces.

Axis with patent, pedicel with appressed setae. *Flower buds* shortly before anthesis 7·5–20 × 4–8mm, narrowly ovoid or ellipsoid, with dense indumentum of more or less patent setae. *Petals* 1·4–3 × 1·1–3cm, broadly obovate, red, with or without sometimes big basal black spots or spots removed from base. *Stamens* many, 6–8mm long, shorter to slightly longer than ovary; filaments filiform, black; anthers 0·5–0·9mm long, oblong, brownish. *Capsule* 6·5–15 × 3–5mm, 2·1 to 3 times as long as broad (including umbo), more or less narrowly obovoid (Fig. 2); stigmatic disc with 4–6 stigmatic rays, 4–5mm broad, as broad as to mostly broader than capsule diameter, more or less distinctly umbonate, umbo up to

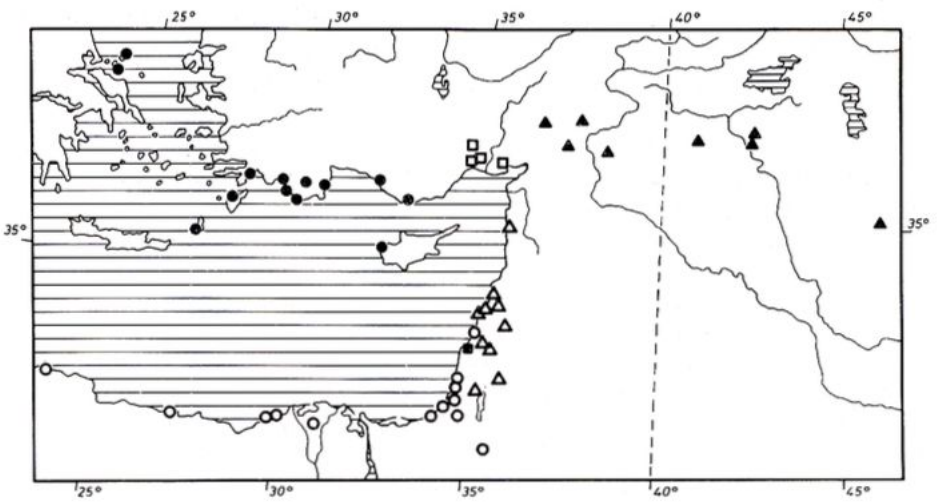

FIG. 16. Geographical distribution of *P. guerlekense* (●), *P. stylatum* (□), *P. clavatum* (▲), *P. umbonatum* (△), *P. carmeli* (■) and *P. humile* (○).

3mm long, free lobes of stigmatic disc broadening towards their tip, overlapping. *Seeds* 0·6–0·7mm long, brown (Fig. 18).
Flowering 3–4. As a weed in fields or by roadsides or in open vegetation on rocky limestone or in dunes.
The distribution of *P. stylatum* is shown in Fig. 16.

TURKEY: Cilicien, 1834, *Aucher* 1527 (W); between Tarsus and Ulas, 5 iv 1957, *Davis & Hedge* 26405 (BM, E); Nur Dag above Kizildere, 17 iv 1957, *Davis & Hedge* 26748, 26751 (BM, E); Cukurova, 20 iii 1966, *Deaver* T68 (E); 'Güllek Boghas', 1853, *Kotschy* s.n. (W); *Siehe* 41 (JE); Kakiragi, 1896, *Siehe* 96 (JE); bei Aladagh, Cilicia, iii 1912, *Siehe* 125 (E, JE, W); Hadschin Dagh, vi 1896, *Siehe* 481 (B, BM, E, JE, W).

P. stylatum is a distinct species on account of its mostly subscapose habit, the shape of the lower leaves with their large terminal segments and the rather finely divided upper leaves, and its capsules, which mostly are distinctly umbonate so that the length of the disc from its tip to its lower margin is at least ⅓ as long as the remainder of the capsule and can be up to 4·5mm long. The stigmatic disc shows various dark violet marks in most specimens, sometimes along its margin though more often parallel to the stigmatic rays, sometimes fusing into a continuous ring at the base of the free lobes. In leaf shape, particularly of the lower leaves, *P. stylatum* shows strong similarity to some specimens of *P. guerlekense* from which, however, it is easy to distinguish on account of its umbonate stigmatic disc. The separation from *P. umbonatum* Boiss. is more difficult and is discussed under that species.

P. stylatum var. *psammophilum* was described from a somewhat small specimen, and does not deserve to be recognized formally.

12. P. clavatum Boiss. & Hausskn. ex Boiss., Fl.Orient 1:112 (1867). Figs3, 15, 16, 18.
Type: in agris pr. Tscharmelik, 17 v 1865, *Hausskn.* s.n. (lecto. G-Boiss.; isolecto. B, JE, W).

Mostly erect, rarely ascending annual herb, 10–40cm high, mostly branched from the base. *Leaves* 1·2–12 × 0·5–4cm, obovate to ovate in outline, 1–2-pinnatipartite; all leaves petiolate; petiole of lower leaves up to 3cm long, upper leaves with very short petiole, up to 0·5cm long, lobes of leaves antrorse, entire to incised to pinnatipartite, ultimate segments rarely broader than 2mm (Fig. 15); leaves with more or less dense indumentum of more or less patent setae on both surfaces.

Axis with patent setae to sometimes somewhat arachnoid, pedicel with appressed setae. *Flower buds* shortly before anthesis 8–16 × 4–8mm, ovoid to ellipsoid, with ± dense indumentum of patent setae. *Petals* 1·6–3·5 × 1·4–3·4cm, obovate, red, without or with black spots, spots removed from base. *Stamens* many, 3·5–8mm long, shorter to slightly longer than ovary; filaments filiform, black; anthers 0·6–1·3mm long, oblong, brownish. *Capsule* 6·5–19 × 3–5·5mm, 3 to almost 6 times as long as broad, narrowly obovoid to ellipsoid or cylindrical (Fig. 3); stigmatic disc with 5–8 stigmatic rays, 3–4·5mm broad, as broad as to mostly narrower than capsule diameter, rarely umbonate, mostly flat; free lobes of stigmatic disc mostly broadening towards their tip, overlapping or not, or disc sometimes only very shallowly lobed. *Seeds* 0·6–0·8mm long, brown, glaucous (Fig. 18).

Flowering 4–5. A weed in fallow or cultivated fields, or in open vegetation on limestone or shale.

The distribution of *P. clavatum* is shown in Fig. 16.

TURKEY: Gaziantep, 26 iv 1935, *Balls* 2189 (E); Perveri to Surgu, 12 v 1935, *Balls* 2264 (BM); above Sirnak, 8 v 1966, *Davis* 42539 (E); 10–12km W of Savur, 5 v 1966, *Davis* 42439 (E); Cudi Dag above Messana, 11 v 1966, *Davis* 42849 (E); near Yemiş Dag, 3 v 1957, *Davis & Hedge* 27429 (BM, W); Mardin to Nusaybin, 10–20km from Nusaybin, 22 v 1957, *Davis & Hedge* 28425 (BM).

IRAQ: montes Avroman, in ditione pagi Tawilla, 15–18 vi 1957, *Rechinger* 10206, 10310a, b (G, M, W).

P. clavatum is distinguished by its long and narrow capsules, which in the material I have seen are at least three times as long as broad and never broader than 5·5mm, and the mode of dissection of its leaves. Both lower and upper leaves are more or less finely divided, and the terminal lobe of the lower leaves is not any bigger than their lateral lobes. The upper leaves are trifid with one large dissected middle lobe and two somewhat smaller lateral lobes. The ultimate segments of the leaves are mostly linear and rarely broader than 2mm.

All the type specimens of *P. clavatum* and another collection (*Balls* 2264) from about 120km north west of the type locality differ from the remaining material in having umbonate stigmatic discs. Although they resemble *P. umbonatum* in this respect, they clearly differ from it in leaf shape. Some specimens of *P. clavatum* (*Balls* 2264, *Davis* 42539, 42849) have a somewhat arachnoid indumentum on their axes, resembling *P. arachnoideum*. From this species *P. clavatum* again differs by the much finer dissection of the leaves. The name *P. clavatum* has been used before Boissier (1867) by Gilibert (1781) in his *Flora Lituanica Inchoata* as a heading for his description of *P. argemone* L. As Gilibert (1781) used such headings for all other species (*Papaver glabrum* for *P. somniferum* L., *P. atro-purpureum* for *P. rhoeas* etc.), I do not think that he intended these names as specific names. In case he did, a new name for Boissier's *P. clavatum* must be found.

13. P. umbonatum Boiss., Diagn.Sér. 1, 8:11 (1849). Figs 3, 15, 16, 19.

Syn.: *P. syriacum* Boiss. & Blanche ex Boiss., Diagn.Sér. 2, 6:8 (1859).

P. rhoeas L. var. *syriacum* (Boiss. & Blanche ex Boiss.) Boiss., Fl.Orient 1:113 (1867). Type: Beyrouth, dans les champs humides, 14 ii 1850, *Blanche* 282 (G-Boiss.).

P. subpiriforme Fedde, Bull.Herb.Boissier, Sér. 5, 2:169 (1905). Type: champs cultivés à l'Est de Saida, 14 v 1860, *Gaillardot* s.n. (JE).

Type: Libanus, Gebel Baruck, vii 1846, *Boissier* s.n. (holo. G-Boiss.).

Erect to ascending, sometimes almost decumbent annual herb, 12–43cm high, mostly branched from the base. *Leaves* 2–14 × 1–5·5cm, obovate to ovate in outline, pinnatifid to pinnatipartite or pinnatisect; lower leaves petiolate, petiole up to 5cm long, mostly with large terminal incised segment and 1–3 pairs of much smaller lateral lobes (Fig. 15); upper leaves mostly sessile, sometimes shortly petiolate; middle lobe of upper leaves mostly lanceolate to elliptical in outline, incised to pinnatifid with mostly strongly antrorse acutely triangular teeth or lobes; leaves with more or less dense indumentum of patent setae on both surfaces.

Axis often with red tinge, with patent setae, pedicel with appressed or less often with patent setae. *Flower buds* shortly before anthesis 15–21 × 7–13mm, ellipsoid, with more or less dense indumentum of patent setae. *Petals* 1·9–3·4 × 2·2–3·6cm, broadly obovate, dark red with black or black and apically white basal or subbasal spots. *Stamens* many, 9–13mm long, shorter to longer than ovary; filaments filiform, black; anthers 0·8–1·9mm long, oblong, brownish to dark violet. *Capsule* 8–22 × 3–7mm, 2 to 4 times as long as broad, narrowly obovoid to ellipsoid (Fig. 3) or rarely somewhat clavate; stigmatic disc with 6–10 stigmatic rays, 3·5–7mm broad, as broad as to narrower or less often broader than capsule diameter, mostly slightly to distinctly umbonate, umbo up to 2·5mm long; free lobes of stigmatic disc broadening towards their tip, overlapping, sometimes with dark violet marks at end of rays. *Seeds* 0·6–0·8mm long, brown, glaucous (Fig. 19).

2n = 14 (mihi).

Flowering 3–6. Mostly as a weed in fields or by roadsides, or in open vegetation on terra rossa or basalt.

The distribution of *P. umbonatum* is shown in Fig. 16.

SYRIA: S de Bamias, 7 v 1954, *Pabot* s.n. (G); Hauran, 26 v 1957, *Rechinger* 13055 (G, M, W); Sug El Gharb, v 1955, *Robert College Herb.* s.n. (G).

LEBANON: Saida, 5 ii 1853, *Blanche* 644 (BM, W); Wadi Hammana, 6 vi 1910, *Bornmüller* 11351, 11352 (JE, W, WU); Beirut, in valle fluvii Nahr-El-Kalb, 6 v 1910, *Bornmüller* 11353c, 11355 (B, G, JE, W, WU); Beirut, 18 v 1855, *Kotschy* 1285 (W); Beyrouth, 1932/33, *Mouterde* 517 (G); Beyrouth, iv 1932, *Mouterde* 824 (G); Nahr Beyrouth, 19 iv 1934, *Mouterde* 2993 (G); Nahr El Kalb, 4 v 1954, *Pabot* s.n. (G); Beyrouth, 4 v 1881, *Peyron* 182 (G); Djebel Keneisse, 2 vi 1879, *Peyron* 620 (G); infra Araya, 2 iv 1880, *Peyron* s.n. (G); supra Yamhour, 24 v 1957, *Rechinger* 13319 (W); inter Beyrouth et Saida, 27 iv 1965, *Roessler* 5142 (M); inter Raifoun et Ajeltoun, 28 iv 1965, *Roessler* 5164 (M).

ISRAEL: Jerusalem, Mt Scopus, 20 iv 1930, *Amdursky* s.n. (BM); Arnoma bei Jerusalem, 4 iv 1936, *Bojko* s.n. (WU); Jerusalem, iv 1884, *Burdet* 69, 70 (G); Tiberias, 24 iv 1942, *Davis* 4617 (BM); Judaean Mts, 21 v 1930, *Eig* s.n. (E); Upper Galilee, Rosh Pinnah, 12 v 1956, *Feinbrun* s.n. (BM, E); Judaean Mts, Ein Kerem, 21 v 1958, *Feinbrun* s.n. (BM); Rosh Pinnah, 12 v 1956, *Grizi* s.n. (BM); Mont Sion, iii 1889, *Jouannet-Marie* s.n. (W); Jerusalem, Givat Ram, 6 iv 1982, *Liston & Monias* s.n. (M); Jerusalem, 19 vi 1913, *Meyers* 9432 (G); Jerusalem, 31 iii 1903, *Meyers & Dinsmore* 598 (E); Jerusalem, 23 v 1910, *Meyers*

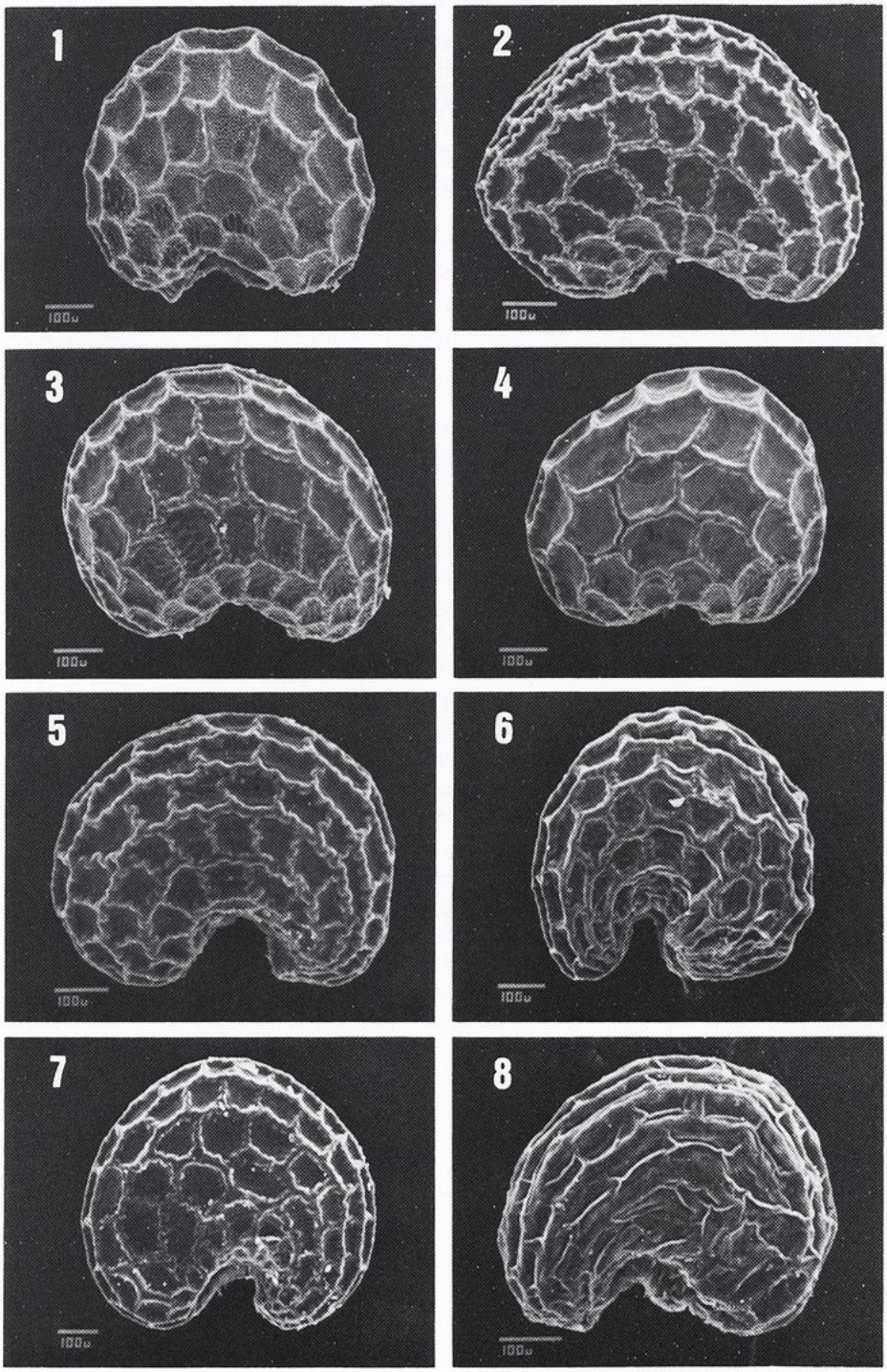

FIG. 17. Seeds of 1, *P. pinnatifidum*; 2, *P. purpureomarginatum*; 3, *P. dubium* subsp. *dubium*; 4, subsp. *lecoqii* var. *lecoqii*; 5, subsp. *laevigatum*; 6, subsp. *erosum*; 7, subsp. *glabrum*; 8, *P. rechingeri*.

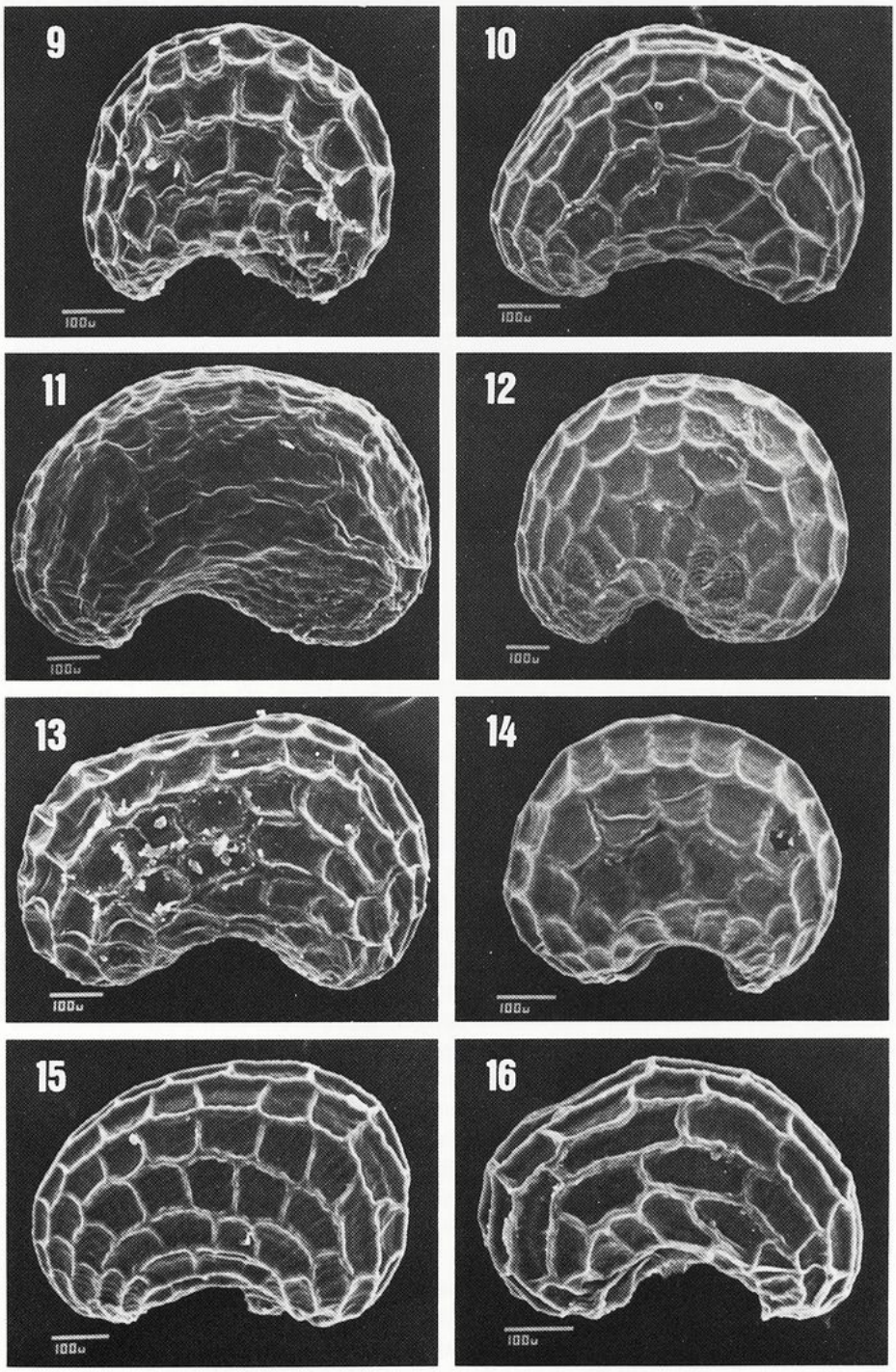

FIG. 18. Seeds of 9, *P. arachnoideum*; 10, *P. arenarium*; 11, *P. tenuifolium*; 12, *P. commutatum* subsp. *commutatum*; 13, *P. chelidoniifolium*; 14, *P. guerlekense*; 15, *P. stylatum*; 16, *P. clavatum*.

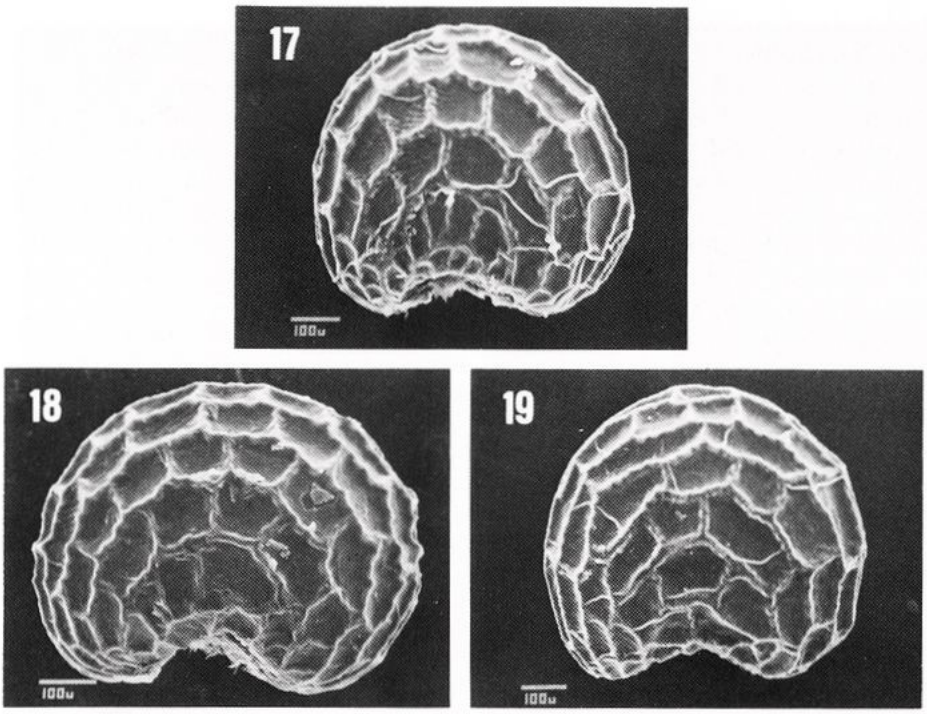

FIG. 19. Seeds of 17, *P. umbonatum*; 18, *P. humile*; 19, *P. rhoeas* var. *rhoeas*.

& Dinsmore 3516, 3517 (E, JE, WU); Jerusalem, 5 iv 1912, *Meyers & Dinsmore* 5432 (G); Har Kenaian to Ein Zeitim, 18 iv 1958, *Waisel* s.n. (E).
JORDAN: Al-Jubaiha, near Amman, 15 v 1973, *Dawud Al-Eisawi* 1500 (M).

The distinction of *P. umbonatum* particularly from *P. stylatum* is not very easy. In most cases it is possible by: the length of the capsule from its base to the lower margin of the pores, which is mostly longer in *P. umbonatum* (9–18mm) than in *P. stylatum* (4·5–10mm); the subscapose habit of *P. stylatum* as opposed to the more regularly leafy habit of *P. umbonatum*; and the upper leaves. In *P. stylatum* the basal pair of lateral lobes of these are mostly distinctly longer than the basal segments of the terminal lobe and linear. In *P. umbonatum* the basal pair of lobes is often not much bigger and sometimes even smaller than the basal segments of the terminal lobe, and mostly ovate in outline. The best argument for the distinction of the two species, however, is their geographical origin. The vicarious and geographically separate distribution of the two of course might also be used as an argument for the use of subspecific rank. Thiébaut (1937) included *P. stylatum* in *P. umbonatum* without formal rank.

Although the type of *P. umbonatum* is very poor in consisting of two grazed and regrown individuals, their umbonate capsules and their geographical origin clearly show their identity to *P. syriacum*. Unfortunately this latter name, which has been used much more frequently, must be regarded as a later synonym.

Fedde's *P. syriacum* var. *stylatoides* I have included in *P. stylatum*, and of his *P. syriacum* var. *hauranicum* (1909) I have seen no material.

14. P. carmeli Feinbrun, Israel J.Bot. 12:83 (1963). Figs 3, 15, 16.
Type: Mt Carmel, ca. Beniamina, 22 iii 1958, *Feinbrun* s.n. (HUJ).

Erect annual herb, 15–40cm high, often unbranched below or branching from base. *Leaves* 4–13 × 1–4cm, obovate to elliptical to ovate in outline, pinnatipartite; all leaves petiolate; petiole of lower leaves up to 6·5cm long, upper leaves with short, distinctly winged petiole, petiole up to 1·5cm long, mostly slightly clasping axis; lobes of all leaves antrorse, often terminal lobe much bigger than lateral lobes in both lower and upper leaves; leaves with mostly sparse indumentum of more or less patent setae mainly on lower surface (Fig. 15).

Plants often with red tinge. *Axis* with patent, pedicel with mostly patent or sometimes appressed setae. *Flower buds* shortly before anthesis 18–19 × 7–12mm, ovoid to ellipsoid, with mostly sparse indumentum of patent setae. *Petals* 2·5–3·5 × 4–5cm, broadly obovate to flabelliform, crimson, with large basal black spot or with black and apically white spots. *Stamens* many, 11–12mm long, shorter to much longer than ovary; filaments filiform, black; anthers 1·8–2·1mm long, oblong, brownish. *Capsule* 11–14 × 7–8·5mm, 1·3 to 2 times as long as broad, broadly obovoid (Fig. 3); stigmatic disc with 8–10 stigmatic rays, 8mm broad, as broad as to broader than capsule diameter; free lobes of stigmatic disc oblong to half circular, mostly longer than broad, mostly curved upwards at maturity (Fig. 3). *Seeds* 0·6–0·7mm long, brown.
2n = 14 (Feinbrun, 1963).
Flowering 2–5. Mostly found as a weed in fields on terra rossa or basalt (Feinbrun, 1963).
The distribution of *P. carmeli* is shown in Fig. 16.

ISRAEL: Mt Carmel, env. of Zikhron Ja'aqou, 24 ii 1956, *Feinbrun* s.n. (BM, E); Mt Carmel, field border, 11 v 1956, *Feinbrun* s.n. (BM); Mt Carmel, 7 iv 1911, *Meyers & Dinsmore* 4598 (E, G).

On account of the mostly oblong and non-overlapping free lobes of the stigmatic disc, which in the immature ovary can cover up to ⅔ of its entire length and mostly are curved upwards at capsule maturity, *P. carmeli* is a distinct species. Apart from these characters of the stigmatic disc, however, it is virtually indistinguishable from *P. humile* Fedde with which it shares the shape of the leaves and the often red tinge of axis and leaves. In its distribution *P. carmeli* is very restricted and can be found only in the Mt Carmel area of N Israel.

15. P. humile Fedde, Bull.Herb.Boissier, Sér. 5, 2:446 (1905). Figs 3, 15, 16, 19.
Type: Aegypten: El Mandarah, 1880, *Barbey* 29 (G).

Decumbent to ascending or erect annual herb, 7–50cm high, mostly branched from the base. *Leaves* 2·8–14 × 0·7–4cm, obovate to ovate in outline, pinnatipartite; all leaves petiolate; petiole of lower leaves up to 5cm long, petiole of upper leaves short, distinctly winged (Fig. 15), up to 1cm long, mostly slightly clasping axis; lobes of all leaves antrorse, incised to entire, often terminal lobe much bigger than lateral lobes in both lower and upper leaves; leaves with more or less dense indumentum of more or less patent setae on both surfaces.

Plants often with red tinge. *Axis* with patent, pedicel with patent or mostly appressed setae. *Flower buds* shortly before anthesis 14–22 × 7–12mm, ovoid to ellipsoid, with ± dense indumentum of ± patent setae. *Petals* 1·2–3·3 × 1–4cm, broadly obovate to flabelliform, crimson, mostly with large black basal spots or spot black and apically white. *Stamens* many, 6·5–10mm long, shorter to longer than ovary; filaments filiform, black; anthers 0·8–2·2mm long, oblong, brownish to violet. *Capsule* 7–13 × 4–8mm, 1·5 to 2·6 times as long as broad, obovoid (Fig. 3); stigmatic disc with 6–10 stigmatic rays, 4–7mm broad, as broad as to narrower or broader than capsule diameter; free lobes of stigmatic disc broadening towards their tip, mostly overlapping. *Seeds* 0·7mm long. brown, glaucous (Fig. 19).

2n = 14 (mihi).

Flowering 2–5. Mostly found as a weed in fields or often in sand dunes.

The distribution of *P. humile* is shown in Fig. 16.

ISRAEL: Palestine: Mars Saba, 6 iv 1880, *Barbey* 28 (G); Ascalon, 31 iii 1911, *Dinsmore* 2598 (E, JE); Tel-Aviv: Nahlat-Izhak, 7 iv 1936, *Eig et al.* s.n. (BM); Negev, Wadi Mshash, 17 iii 1956, *Feinbrun* s.n. (BM, E); Akhziv, 17 iv 1958, *Feinbrun* s.n. (E); Shefela, 28 iii 1963, *Feinbrun* s.n. (E); Turaibeh, 15 iii 1956, *Gruenberg* s.n. (BM); Beersheba, 12 iv 1946, *Lupton* s.n. (BM); Medaba, 24 iv 1911, *Meyers & Dinsmore* M598 (E); Jaffa, 3 iii 1911, *Meyers & Dinsmore* 1548 (E, JE); Jaffa, *Meyers & Dinsmore* B4598 (E).
JORDAN: between Petra and foot of Mt Hor, 17 iv 1945, *Davis* 9082 (E).
EGYPT: Abou Mazrouk, 24 iii 1880, *Barbey* 30 (G); Alexandria, 15 ii–15 iv 1909, *Blumencron* 63 (WU); Abu Sir, 14 iii 1944, *Davis* 6521, 6521B (BM, E); Burg El Arab, 14 iii 1944, *Davis* 6530, 6530B (BM, W); Amria, 15 iii 1944, *Davis* 8365 (BM, E); Alexandriae, *Ehrenberg* 3 (B); Marmaricae, *Gauba* 143 (W); S of Amria, 2 iv 1971, *Ibrahim & Mahdi* s.n. (G); circa Alexandriam, 14 iii 1836, *Kotschy* s.n. (W); ad lacum Mareotim, ii 1855, *Kotschy* 128b (W); Mersa Matruh, i 1928, *Meinertzhagen* s.n. (BM); Burg-El-Arab, 7 v 1949, *Shabetai* s.n. (G); Mariut: Abusir, 23 iii 1961, *Täckholm* s.n. (G); Ras El Hekma, 16 ii 1965, *Täckholm* s.n. (G); Amria, *Wilmott* 390322 (BM).

P. humile is a species with strong similarities to *P. rhoeas*. It can be distinguished from it mainly by the base of its upper leaves. Whilst the upper leaves are mostly sessile in *P. rhoeas*, they are distinctly petiolate in *P. humile* as well as in *P. carmeli*. The petioles are broadly winged in most cases and have a ciliate margin and mostly clasp the axis over their entire length. Different from *P. rhoeas*, in which the basal pair of lobes of the upper leaves is mostly much bigger than the basal pair of lobes of the middle lobe, the basal lobes are only slightly longer or even shorter than the basal lobes of the middle lobe in most material I have seen of *P. humile* and *P. carmeli*. In addition to these differences both *P. humile* and *P. carmeli* mostly have a red tinge on the axis and/or leaves, red setae, and sometimes, particularly in *P. carmeli*, a red-tinged stigmatic disc; such coloration of the plant is less common in *P. rhoeas*. From *P. rhoeas, P. humile* also usually differs in habit: it often is of decumbent to ascending growth, and the main axis often has only one or two leaves above a basal rosette. In the shape of the middle lobe of the upper leaves, which is often lanceolate to elliptical in outline and incised to pinnatipartite with strongly antrorse acutely triangular teeth or lobes, *P. humile* and *P. carmeli* can resemble *P. umbonatum*.

As regards the distinction of two subspecies of *P. humile* by Feinbrun (1963), subsp. *humile* with white latex from sandy and loess-sandy soils from the Negev and southern Shefela in Israel, and subsp. *sharonense*

Feinbrun with yellow latex from sandy clay in the Coastal Plain north of Ashgalon, I feel unable to form an opinion on the basis of the herbarium material available to me. In view of the geographical separation of forms with white and yellow latex respectively, which is not, as in *P. dubium*, recognizable in herbarium material, I think that the recognition of two subspecies is justified. In its distribution *P. humile* may extend further west in North Africa than shown in the distribution map (Fig. 16). I have seen one specimen (*Petrovich* 230, WU) from Benghasi which might belong to *P. humile*.

The combination at subspecific rank in *P. rhoeas* of *P. humile* was made by Holmboe (1941) for material from Cyprus. As I have not seen the material available to that author I cannot judge its identity. As I have seen no material of *P. humile* from Cyprus, I suspect that Holmboe (1914) was dealing with impoverished sand forms of *P. rhoeas*. Such forms from Cyprus were described by Chrtek & Slavik (1981) as *P. rhoeas* subsp. *cyprium* (see below), which I do not maintain as a separate taxon.

16. P. rhoeas L., Sp.Pl. 1:507 (1753). Figs 3, 15, 19, 20.
'Habitat in Europae arvis, agris'.

Syn.: *P. integrifolium* Viguier, Hist.Nat.Pavots: 38 (1814). Type: Bocc.Mus. p.77. tab. 65. ic. 1; Barrel. Icon. 1191 (illustrations, n.v.).

P. roubiaei Viguier, Hist.Nat.Pavots: 39 (1814). Type: Sur un terrain sablonneux près de Frontignan, 1813, *Roubieu* s.n. (MPU).

P. trilobum Wallr., Ann.Bot.: 149 (1815). Type: inter Viciam Fabam prope Osterhausen; inter Brassicam Napum ad Heringen (n.v.).

P. polytrichum Boiss. & Kotschy ex Boiss., Diagn. Sér. 2, 5:14 (1856). Type: circa Zebdaine prope Damascum, 2 vi 1855, *Kotschy* 11 (lecto. G-Boiss., Feinbrun, 1963).

P. rumelicum Velen., Sitzungsb.Königl. Boehm.Ges. Wiss. Prag, Math.-Naturwiss.Cl. 1889:29 (1890). Type: Prope Sliven, *Skorpil* s.n. (n.v.).

P. rapiferum Fedde, Bull.Herb.Boissier, Sér. 5, 2:170 (1905). Type: Balkis ad Euphratem, 30 iii 1865, *Haussknecht* s.n. (W).

P. tenuissimum Heldr. ex Fedde, Bull.Herb.Boissier, Sér. 5, 2:446 (1905). Type: Flora Attica in m. Parnethe pr. Dekeleiam, 28 vii 1880, *Heldreich* s.n. (B).

P. humifusum Fedde, Bull.Herb.Boissier, Sér. 5, 2:447 (1905). Type: antiliban près de Damas, 14 v 1856, *Gaillardot* 1516 (JE).

P. postii Fedde, Bull.Herb.Boissier, Sér. 5, 2:447 (1905). Type: Top of southern spur of Nusairy Mts, 4 viii 1890, *Post* 3 (lecto. G, isolecto. B).

P. caespitosum Fedde in Engler, Pflanzenr. 4, 104:302 (1909). Type: Loja, 12 vii 1876, *Winkler* s.n. (holo. B).

P. hirto-dubium Fedde in Engler, Pflanzenr. 4, 104:303 (1909). Type: Courroi, viii 1860, *Tueskievicz* s.n. (MPU).

P. pseudo-haussknechtii Fedde in Engler, Pflanzenr. 4, 104:304 (1909). Type: Attica: Athenae, in Lykabetto, v 1885, *Haussknecht* s.n. (JE).

P. thaumasiosepalum Fedde in Engler, Pflanzenr. 4, 104:307 (1909). Type: Esparsettefelder bei Kissingen, *Schweinfurth* s.n. (JE).

P. ameristophyllum Fedde in Engler, Pflanzenr. 4, 104:308 (1909). Type: inter segetes Mogliano, *Mayer* s.n. (B).

P. robertianella Fedde in Engler, Pflanzenr. 4, 104:323 (1909). Type: in ins. Lero, 23 iv 1877, *Heldreich* s.n. (B).

P. subumbilicatum Fedde in Engler, Pflanzenr. 4, 104:324 (1909). Type: Attica: Athenae, in m. Lykabetto, 1885, *Haussknecht* s.n. (JE).

P. expectatum Fedde in Engler, Pflanzenr. 4, 104:326 (1909). Type: Schleinitz b. Oderfeld, vii 1874, *Haussknecht* s.n. (B).

P. rhoeas L. subsp. *cyprium* Chrtek & B. Slavik, Preslia 53:48 (1981). Type: Cyprus, in arenosis maritimis 2km situ mer.-orient. ab opp. Paphos, 9 iv 1978, *Chrtek & Slavik* s.n. (holo. PR).

Erect to ascending or sometimes almost decumbent annual herb, 10–60cm high, mostly branched from the base. *Leaves* 1–24 × 0·5–6cm, obovate to ovate in outline, pinnatifid to pinnatipartite; lower leaves petiolate, petiole up to 7(–11)cm long, incised to pinnatifid; terminal segment mostly more than twice as long as broad, often much longer; upper leaves mostly sessile, sometimes very shortly petiolate, petiole shorter 0·5cm, broadly winged; uppermost leaves mostly trifid with one large middle lobe and two smaller basal lobes; basal lobes incised to pinnatifid, sometimes serrate, antrorse, mostly distinctly bigger than basal segments of middle lobe; middle lobe incised to pinnatifid or sometimes more or less regularly serrate; leaves with more or less dense indumentum of patent setae on both surfaces (Fig. 15).

Axis with patent, pedicel with patent or appressed setae; setae white, yellow or dark violet to red. *Flower buds* shortly before anthesis 9–28 × 5–18mm, ovoid to ellipsoid or obovoid, sometimes with ± distinct subapical processes, with ± dense indumentum of patent to appressed setae. *Petals* 1·3–5·1 × 0·8–10cm, broadly obovate to distinctly flabelliform, brick red to crimson or rarely white, without or with black spots or black and apically white basal spots; outer pair of petals mostly substantially bigger than inner pair. *Stamens* many, 4–10mm long, shorter to longer than ovary; filaments filiform, light red to black or rarely white to yellow; anthers 0·3–2·6mm long, oblong, brownish or rarely yellow. *Capsule* 5·5–16(–20) × 4·5–14mm, as long as broad to 2·1 times as long as broad or very rarely up to 3 times as long as broad, rarely narrowly to mostly broadly obovoid to cylindrical or almost globose, sometimes shortly stipitate (Fig. 3); stigmatic disc with 6–16 stigmatic rays, 3·5–12mm broad, mostly broader than capsule diameter, mostly flat, sometimes slightly umbonate; free lobes of stigmatic disc mostly broadening towards their tip, overlapping. *Seeds* 0·6–0·9mm long, brown, glaucous (Fig. 19).

2n = 14 (mihi).

Flowering 4–10. Usually a weed in cultivated or waste land.

1a. Pedicel with patent setae . . . . . var. **rhoeas**

1b. Pedicel with appressed setae . . . . . var. **strigosum**

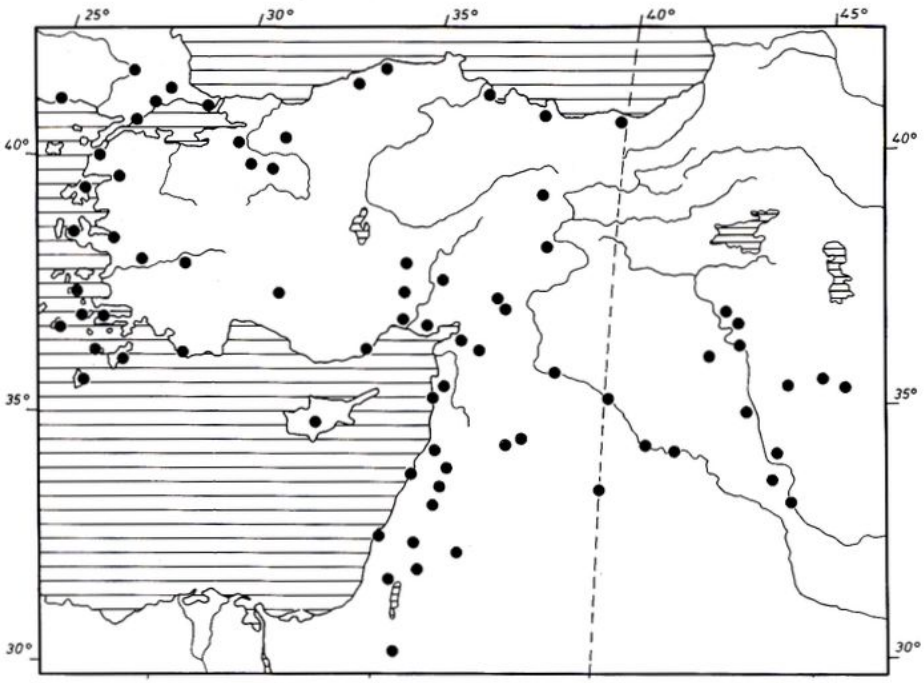

FIG. 20. Geographical distribution of *P. rhoeas* (•) in SW Asia.

var. **rhoeas**

GREAT BRITAIN: Lewes, 22 vi 1960, *Ball* s.n. (M).
FRANCE: Allues, Tarentaise, 11 viii 1978, *Meilleur* 490 (G).
SPAIN: Sierra de Alcaraz, 27 vi 1974, *Leadley & Petty* 116 (C).
PORTUGAL: Coimbra, *D'Araujo E Castro* s.n. (WU).
BELGIUM: Braine l'Alleud, 21 vii 1963, *Lucion* s.n. (G).
SWEDEN: Follinbo, 30 viii 1930, *Fries* s.n. (C).
DENMARK: N of Aarhus, 16 x 1964, *Pedersen* 76 (G).
GERMANY: Weimar, viii 1905, *Bornmüller* s.n. (B).
POLAND: Czernichow prope Krakow, 14 vi 1956, *Zarzycki* s.n. (C).
SWITZERLAND: Martigny, Branson, 12 vi 1967, *Burdet & Greuter* 617 (C).
AUSTRIA: Gösting bei Graz, 11 vii 1948, *Höpflinger* s.n. (C).
CZECHOSLOVAKIA: Ricmanice, 19 vi 1963, *Slavonovsky* s.n. (WU).
ITALY: Paestum, 6 vi 1968, *Albrecht* s.n. (M).
HUNGARY: Budapest, vii 1878, *Ronutiu* s.n. (G).
YUGOSLAVIA: Dalmatien: Murter, 15 vi 1977, *Ern* s.n. (B).
ROMANIA: Oltenia, 31 v 1971, *Cirtu & Teodorescu* s.n. (WU).
ALBANIA: Shkodra, 21 vi 1916, *Janchen* s.n. (WU).
BULGARIA: Tirnowo, 24 v 1894, *Urumoff* 146 (WU).
GREECE: montis Pelion prope Volos, 4 v 1961, *Rechinger* 22648 (W).
TURKEY: Arslanköy, 2 vii 1982, *Tarmann* s.n. (WU).
USSR: Simpheropol, 25 vii 1977, *Vasak* s.n. (W).
SYRIA: Est de Palmyra, 2 iv 1955, *Pabot* s.n. (G).
LEBANON: el Kaa, 17 iv 1957, *Pabot* s.n. (G).
IRAQ: Samarra, 4 v 1957, *Rechinger* 9452 (G).
JORDAN: Buseira, 29 iv 1955, *Hunting Aero Service* 136 (E).
AZORES: Sao Miguel, 30 v 1978, *Rechinger* 58115 (M).
MADEIRA: Garajau, 21 iii 1984, *Press & Short* 225 (BM).
CANARY ISLANDS: Gran Canaria, Las Palmas & Tejeda, 6 iv & 25 v 1897, *Gelert* s.n. (C).
MOROCCO: Fes, 2 vi 1981, *Alyafi* s.n. (G).
ALGERIA: **Bersekrane to Ain Temouchent, 26 iv 1971, *Davis* 51577 (E).**
TUNISIA: Sousse, 10 v 1896, *Murbeck* s.n. (WU).
LIBYA: Elabiar, 24 iii 1970, *Davis* 49877 (E).

P. rhoeas is widely distributed in Europe, North Africa and wide parts of South West Asia. Beyond the countries listed above *P. rhoeas* is comparatively rare. As an introduction *P. rhoeas* is also known from other continents. The distribution of *P. rhoeas* in SW Asia is shown in Fig. 20.

var. **strigosum** Boenn., Prodr.Fl.Monast.Westphal.: 157 (1824).
Type: ad ripes Rheni, nec non prope Münster! Velen! Coesfeld! (types unknown).
Syn.: *P. strigosum* (Boenn.)Schur, Verh.Naturf.Vereins Brünn 15:66 (1877).

P. rhoeas var. *strigosum* is distinguished from the type variety by its indumentum of appressed setae on the pedicel. It mostly occurs together with the type variety and can be found in its entire distribution area.

Among the species treated in the present account, *P. rhoeas* is the most problematical. Due to the variability found in leaf and capsule shape and indumentum of the pedicel its delimitation from some of the preceding species, notably *P. guerlekense*, *P. umbonatum*, *P. carmeli* and *P. humile*, presents some difficulties. By the mostly broadly obovoid shape of its capsules with their mostly flat stigmatic disc which in most cases is broader than the capsule diameter, and the mostly sessile and distinctly trifid uppermost leaves, however, it should be possible to recognize most material of this species. With the occasional presence of rather narrowly obovoid capsules, slightly umbonate stigmatic discs or petiolate upper leaves *P. rhoeas* seems to combine some of the characters of the species named above. This is probably the result of its origin from one or more of these species.

The variability of *P. rhoeas* perhaps is reflected in its very extensive synonymy. Of the 45 binomials accepted by Fedde (1909), 12 are recognized here. Of the remaining 33 names I regard 17 as synonyms of *P. rhoeas*, of these, 12 were newly described by Fedde (1905, 1909). It may be significant for the status of these 12 'species' that all of them were described from just one specimen each. In *P. rhoeas* Fedde (1909) recognized 20 varieties and 6 subvarieties, and in *P. strigosum*, which I here treat as a variety of *P. rhoeas*, 7 more varieties and 1 subvariety were recognized. Earlier authors diligent in the description of new segregate species of *P. rhoeas* were Timbal-Lagrave (1870, 1892), Jordan (1861, 1864) and Wein (1911a–c). The last author alone described 13 species (including one hybrid) from the southern Harz Mountains, claiming that even an anti-Jordanian requires more than 2 binomials (*P. rhoeas*, *P. strigosum*) to accommodate the variation of *P. rhoeas*, and claiming a better foundation for his than for Jordan's species. This reasoning I do not believe or follow. Although it must be admitted that *P. rhoeas* is very variable in size, indumentum, leaf and capsule size and shape, partly due to genetic variability and partly to a high degree of phenotypic plasticity, the abundance of names must surely be connected to the importance and conspicuity of the species as a weed. A historical component in the classification of plants and animals beyond their measurable structure of variability certainly cannot be denied and has been pointed out repeatedly by Walters (1986). A comparison of the

variability of different species of *Papaver* with that of *P. rhoeas* would be interesting in this respect. I do not believe that the relation of amount of variability to number of published names is proportionally as high in most other members of such a comparison as it is in *P. rhoeas*.

In the following discussion of the synonymy of *P. rhoeas* I will not consider further the binomials by Jordan (1861, 1864: *P. insignitum*, *P. arvaticum*, *P. erraticum*, *P. agrivagum*, *P. cereale*, *P. cruciatum*, *P. segetale*, *P. rusticum*), which by the author were explicitly connected with *P. rhoeas* and included in that species or *P. strigosum* by Fedde (1909); those by Timbal-Lagrave (1870, 1892: *P. dodonaei*, *P. erraticum* = *P. erucifolium*, *P. fuchsii*, *P. caudatifolium*), which again were connected with *P. rhoeas* by the author and included in it by Fedde (1909); and those by Wein (1911a–c): *P.* x *feddeanum*, *P. osswaldii*, *P. propinquum*, *P. commixtum*, *P. paucisetum*, *P. anisotrichum*, *P. omphalodeum*, *P. intricatum*, *P. cinerascens*, *P. fastidiosum*, *P. interjectum*, *P. balanocarpum*, *P. spurium*), which from the descriptions given all seem to belong to *P. rhoeas*. Instead, I restrict myself to those names recognized at specific rank by Fedde (1909) and relevant names from later publications.

P. rapiferum, although described as a perennial or biennial, without doubt belongs to *P. rhoeas*. Occasionally *P. rhoeas* seems to behave at least as a biennial, as was also stated for *P. rumelicum*, which was given varietal rank by Fedde (1909). *P. roubiaei*, *P. postii*, *P. caespitosum* and *P. pseudo-haussknechtii*, and also *P. rhoeas* subsp. *cyprium*, all represent rather small and somewhat tufted specimens which on account of the shape of the capsules and in most cases of the leaves—only the type specimen of *P. postii* has less than normally dissected leaves—must be referred to *P. rhoeas*. Part of the type collection of *P. roubiaei* and the type of *P. postii* have pedicels with appressed setae. Specimens with very small and somewhat stipitate and turbinate capsules matching the type of *P. postii* can be found in various parts of the range of *P. rhoeas*. As regards the amplified description of *P. postii* given by Burtt (1949), this most likely relates to *P. purpureomarginatum*, as already discussed above under that species. *P. trilobum*, of which I have not seen the type material but authentic specimens annotated by Wallroth (W), with three-lobed leaves and almost glabrous axes, leaves and sepals, and also *P. thaumasiosepalum* with large lacerate sepals both belong to *P. rhoeas* on account of the shape and size of their capsules and, in the case of *P. thaumasiosepalum*, leaf shape. They must be regarded as rare, freak mutants. The same seems to apply to *P. integrifolium* from the description and synonymy given by Viguier (1814). Also *P. ameristophyllum* with entire obovate leaves and a pedicel with appressed setae must be referred to *P. rhoeas*.

Papaver polytrichum, *P. tenuissimum*, *P. humifusum*, *P. hirto-dubium*, *P. robertianella*, *P. subumbilicatum* and *P. expectatum* are all specimens with unusually long capsules which otherwise, however, from indumentum, leaf shape and shape of the stigmatic disc and its free lobes, must be referred to *P. rhoeas*. Of these seven binomials *P. polytrichum* is the one which has been used most frequently. It was described by Boissier as being related to *P. rhoeas*, but differing in its smaller height, denser

indumentum of patent setae, smaller flowers, and by having yellow instead of violet pollen. Its capsules were described as 'turbinato-obconicis' and later (Boissier, 1867) as 'clavata obovata-oblonga', whereas those of *P. rhoeas* were described as 'obovata'. *P. polytrichum* was accepted as a species by Post (1932), Rechinger (1959), Feinbrun (1963), Zohary (1966) and Mouterde (1970), and treated as a subspecies of *P. rhoeas* by Thiébaut (1936). One of the type specimens named by Boissier (1856), 'Antilibani inter Rascheya et Damascum, *Boissier* s.n. G-Boiss.' belongs to *P. rhoeas* in every respect, while the other type collection named by him, 'circa Zebdaine prope Damascum, *Kotschy* 11, G-Boiss.' is distinguished by narrowly obovoid to clavate capsules which are about 3 times as long as broad. Among the numerous duplicates (B, JE, 4x W) of this latter collection, which was chosen as lectotype by Feinbrun (1963), capsule length varies to some extent so that in some specimens (W) the capsules cannot be distinguished from those of *P. rhoeas*. As rather long capsules thus represent only an extreme of a continuous variation, I do not wish to assign formal rank to such forms. It must be admitted, however, that specimens with capsules similar to the lectotype of *P. polytrichum* are quite frequent in the Antilebanon area; examples are *Gaillardot* 1515 (G), *Gaillardot* s.n., Antiliban près de Damas (JE), *Mouterde* 3685 (G), *Pabot* s.n., Rayak (G), *Pabot* s.n., Jebel Qassyoum (G) and *Peyron* 1776 (G). In capsule proportions and the fact that some of the synlectotype collections have slightly umbonate capsules, what has been named *P. polytrichum* also resembles *P. umbonatum*. On account of the shape of the leaves, however, I prefer to accommodate this material in *P. rhoeas*.

P. pasquieri Dubuis & Faurel, *Bull.Soc.Hist.Nat.Afrique N.* 54:102 (1964), described from Iran, of which I have seen no type material, probably belongs to *P. rhoeas*.

As regards specimens with yellow to white filaments and yellow anthers and without black spots on the petals otherwise referable to *P. rhoeas*, these are known in horticulture as Shirley Poppies (Cullen, 1969).

The preceding seven species which, with the exception of the widespread *P. rhoeas*, are distributed more or less vicariously in the East Mediterranean, form a very closely knit group. Particularly with respect to its distribution the situation found here resembles that in *P. dubium* with its five more or less vicarious subspecies and the Aegean *P. purpureomarginatum* as a close allopatric ally. There are, however, differences in the pattern of variation between the two groups which in my opinion justify the different formal treatment chosen. In *P. dubium* the differences between the subspecies are slight and can be found mainly in leaf shape and indumentum and, in some cases, also in petal shape and coloration and latex colour. Despite the fact that the differences thus are slight, most specimens, with the exception of those of *P. dubium* subsp. *dubium* and subsp. *lecoqii*, can be allocated more or less easily, and the number of intermediate specimens is small. In the group around *P. rhoeas* differences between most species are bigger and can be found in capsule and leaf characters. Intermediate specimens or specimens of different species approaching each other in many characters do exist, although again in small number. Thus *P. guerlekense* can be very similar

to *P. rhoeas* in capsule shape and to *P. stylatum* in leaf shape, *P. stylatum* to *P. umbonatum* in capsule shape, *P. umbonatum* to *P. rhoeas* and *P. clavatum* in capsule shape and to *P. carmeli* and *P. humile* in leaf shape, and *P. carmeli* and *P. humile* to *P. rhoeas* in capsule shape. From the similarities observed it might seem justified to regard *P. guerlekense*, *P. umbonatum*, *P. carmeli* and *P. humile* as subspecies of *P. rhoeas*. Such a treatment would exclude *P. stylatum* and *P. clavatum*, which both have some similarity to *P. umbonatum*, from this group, which seems unnatural particularly in the case of *P. stylatum*. If all these taxa were included into *P. rhoeas* at subspecific rank, with the possible exception of *P. clavatum*, often very distinct entities would be united in one species. In this situation, given the pattern of geographical distribution of the group, I have decided to regard the different entities as formally equivalent despite their differential degree of similarity to each other, and to give them, in view of the distinctive morphology of the majority of specimens, specific rank. I am aware that by choosing this treatment for the seven taxa in question I have cut the Gordian knot. The decision made is based primarily on the equivalency of the members of the group, and only secondarily on the differential similarities observed. Subsequent authors may hold a very different view on this.

General Discussion

Among the annual sections of *Papaver*, sect. *Rhoeadium* is most closely related to sects *Papaver* and *Carinatae* Fedde (Kadereit, 1988a). These three groups are characterized by their glabrous capsules with a flat stigmatic disc and the possession of (mostly) black filaments. Of the biennial and perennial sections of the genus sect. *Macrantha* Elkan shows this combination of characters. Sect. *Carinatae* is distinct on account of its rather strongly keeled stigmatic rays and the deciduous stigmatic disc at capsule maturity (Kadereit, 1987). The only character available for the separation of sects *Rhoeadium* and *Papaver* is the rounded to amplexicaulous base of the upper stem leaves in the latter group. Otherwise, as pointed out before (Kadereit, 1986b), the two groups are very similar to each other. Particularly the distinction of *P. decaisnei* of sect. *Papaver* from *P. dubium* subsp. *glabrum* is difficult. By the occasional possession of apical anther appendages *P. decaisnei* clearly shows its affinity to *P. dubium*, in which such appendages can be found in subsp. *laevigatum* and subsp. *erosum*. As in sect. *Papaver P. decaisnei* is obviously related to *P. glaucum* Boiss. & Hausskn., which also has anther appendages, an affinity of this otherwise distinct species and only representative of the genus in the Syrian Desert to *P. dubium* must be assumed. Equally, *P. gracile* Boiss. of sect. *Papaver* from SW Turkey and Cyprus shows similarities to *P. dubium* particularly in capsule characters. As earlier (Kadereit, 1986a) *P. somniferum* L. (incl. *P. setigerum* DC.) was postulated to be of hybrid origin from taxa similar to *P. glaucum* and *P. gracile*, it seems that sect. *Papaver* finds its closest ally in *P. dubium* of sect. *Rhoeadium*.

One species contained in Fedde's (1909) revision of the section, *P. californicum* A. Gray (incl. *P. lemmonii* Greene), has been accommo-

dated in a section on its own, and suggested to be more closely related to the perennial sect. *Meconella* and the biennial sect. *Meconidium* Spach. This was done on account of the yellow filaments, more or less pyramidal stigmatic disc and valvate capsule dehiscense of this species (Kadereit, 1988b).

In sect. *Rhoeadium*, three groups of species can be recognized. These are not easily characterized by one character, but rather by the coherence of the species contained in them. The first group consist of *P. pinnatifidum*, *P. purpureomarginatum*, *P. dubium* and *P. rechingeri*, the second of *P. arachnoideum*, *P. arenarium*, *P. tenuifolium*, *P. commutatum* and *P. chelidoniifolium*, and the third of *P. guerlekense*, *P. stylatum*, *P. clavatum*, *P. umbonatum*, *P. carmeli*, *P. humile* and *P. rhoeas*.

In the first group, which geographically is more or less continuous and stretches from the Atlantic Islands in the west towards Nepal in the east, only tetraploids (2n = 28) and hexaploids (2n = 42) seem to exist. The chromosome number of *P. rechingeri* is not known. From its leaf shape, *P. pinnatifidum* occupies a somewhat separate position, while *P. purpureomarginatum*, *P. dubium* and *P. rechingeri* are very similar to each other. All taxa of the group are distributed more or less allopatrically. In the case of *P. dubium* subsequent authors might decide to allocate specific rank to those taxa recognized as subspecies here. The reasons for this have already been discussed above. The hexaploid *P. dubium* subsp. *dubium*, which certainly is an introduction in most parts of Europe (Godwin, 1975) and probably arose only under human influence, is either related to forms similar to subsp. *erosum*, the only other subspecies in which hexaploid chromosome numbers are known, or, as is more likely from a morphological and geographical standpoint, to forms similar to subsp. *lecoqii*, from which it is difficult to distinguish and with which it hybridizes easily. Interestingly, subsp. *dubium* is virtually absent from the distribution area of the south west Asian subspecies of *P. dubium*.

Except for *P. arachnoideum*, for which no chromosome number is known, and if the literature records for *P. tenuifolium* and *P. chelidoniifolium* can be trusted, the second group of species consist of diploids (2n = 14) only. Relationships within the group are not as close as in the preceding group, but fairly obvious. Thus *P. tenuifolium* can be, except for its indumentum of very soft hairs, very similar to *P. arenarium*, and *P. chelidoniifolium* to *P. commutatum*, which in turn sometimes cannot be easily distinguished from *P. arenarium*. Except for the last two species, which occur sympatrically, the species of this group again are allopatric in distribution. This includes *P. arachnoideum* which is not obviously allied to any of the other four species, but is probably closest to *P. commutatum* on account of petal and capsule characters. In its overall distribution, this second group is more or less continuous.

The remaining group, with the exception of *P. stylatum* and *P. clavatum*, for which no chromosome numbers are known, again comprises diploids only. This group of very closely related species—only *P. clavatum* stands somewhat apart both morphologically and geographically—is distributed more or less allopatrically along the coastal belt of the East Mediterranean from the Aegean towards Egypt. Only *P. rhoeas* is widespread and overlaps with almost all its allies. It is

impossible to point out a natural distribution area of *P. rhoeas* which, like *P. dubium* subsp. *dubium*, probably originated only under human influence. From the pattern of morphological similarities, *P. rhoeas* is most closely related to *P. umbonatum*, *P. carmeli* and *P. humile*, and one might suspect the place of its origin within the distribution area of these three species, i.e., somewhere along the east coast of the Mediterranean. Like the two preceding groups, this third group of species is more or less continuous in its distribution, and most members are distributed allopatrically. As argued above, subsequent authors may prefer to give subspecific rank within *P. rhoeas* to some or all of the species recognized by me.

As regards the relations between these three groups of species, which for convenience can be named the *P. dubium*-, *P. arenarium*- and *P. rhoeas*-groups, I believe that the last two are more closely related to each other than either is to the *P. dubium*-group. These two groups, with the exception of the widespread *P. rhoeas*, are distributed allopatrically and share capsules in which the stigmatic disc is often broader than the capsule diameter at maturity. Also, both seem to contain diploids only. The latter character, as a primitive condition, may be of no great significance, and the diameter of the stigmatic disc in relation to capsule diameter might be argued to be rather unspecific. In contrast to these last two groups, the *P. dubium*-group contains only species in which the diameter of the stigmatic disc is narrower than or as broad as that of the capsule, and contains, as far as is known, tetraploids and hexaploids only. With the exception of *P. purpureomarginatum* and *P. dubium* subsp. *lecoqii* and subsp. *laevigatum* and *P. guerlekense* it is distributed allopatrically with the *P. rhoeas*-group, and also, with the exception of *P. dubium* subsp. *laevigatum*, subsp. *erosum* and *P. arachnoideum*, with the *P. arenarium*-group. The more distant relationship between the *P. dubium*- and *P. rhoeas*-groups may be reflected in the high sterility of hybrids between *P. dubium* and *P. rhoeas* and the low incidence of bivalent formation in their hybrid (Humphreys, 1975b; McNaughton & Harper, 1960b). In contrast, crossability seems to be good within the *P. rhoeas*-group (Snitzer-Pasternak & Galil, 1970), and Philp (1933) encountered no difficulties in crossing *P. commutatum* and *P. rhoeas*. However, in the absence of more experimental information concerning all three groups, and considering the involvement of genome size differences in the above inter-group crosses (hexaploid × diploid), this experimental evidence should not be overinterpreted. Still, experimental evidence from interspecific hybridizations in sect. *Rhoeadium* may be very helpful in illuminating affinities.

Characters of the seed surface (Figs. 17–19) do not seem to be suited for the easy recognition of groups or, in most cases, species.

As regards the mechanisms of reproductive isolation between sympatric species or subspecies in sect. *Rhoeadium*, pollinator behaviour seems to be of significance only where distantly related species are involved. Thus McNaughton & Harper (1960a) could show that honey bees distinguish between *P. dubium* and *P. rhoeas*, but not between *P. dubium* subsp. *dubium* and subsp. *lecoqii*, which they frequently confuse. Equally, honey bees only sometimes distinguish between *P. carmeli*, *P. humile* subsp. *sharonense* and *P. rhoeas*, and mostly pass several times from one species

to another in one flight (Snitzer-Pasternak & Galil, 1970). Moreover, *Papaver* is visited not only by bees, but also by many other insects such as beetles, which show little discriminatory ability. It thus seems that specific integrity, apart from reduced hybrid fertility or hybrid sterility, can be maintained only by allopatric distribution, which indeed is the prominent pattern of distribution in this and other sections of the genus.

According to the observations by Feinbrun (1963) on the Israelian representatives of sect. *Rhoeadium*, allopatric distribution seems to be linked to rather strong edaphic differentiation. This may also contribute to the reproductive isolation between the different species (Snitzer-Pasternak & Galil, 1970). Very little is known about the ecology of other taxa of this group except for the widespread weeds, but perhaps edaphic differentiation is a feature of general importance. Certainly this deserves further study.

Acknowledgements

I should like to express my thanks to the directors of all herbaria cited for the loan of material or photographs of type specimens, to Mr F. Rückert for the preparation of the drawings, to Miss S. Schwitalla for taking the SEM photographs, to Mr U. Wagenfeld for taking photographs of the type specimens and compiling the seed plates, to Mrs H. Emig for typing the manuscript and to Prof. Dr P. Leins for critically reading the manuscript.

References

ARYAVAND, A. (1975). Contribution à l'étude cytotaxonomique de quelques Angiosperms de l'Iran. *Bot.Not.* 128:299–311.

BOISSIER, E. (1856). *Diagnoses Plantarum Novarum*, Sér. 2, 5. Lipsiae.

—— (1867). *Flora Orientalis* 1. Basel.

BURTT, B. L. (1949). In BURTT, B. L. & DAVIS, P. H., On the Flora of the Nearer East: XXIII. Miscellaneous new species and records. *Kew Bull.* 1949:98.

CANDOLLE, A. P. DE (1821). *Regni Vegetabilis Systema Naturale* 2. Paris.

CHRTEK, J. & SLAVIK, B. (1981). Contribution to the Flora of Cyprus. *Preslia* 53:45–65.

CLAPHAM, A. R., TUTIN, T. G. & WARBURG, E. F. (1962). *Flora of the British Isles*. Cambridge.

CULLEN, J. (1965). In DAVIS, P. H. (ed.), *Flora of Turkey* 1:213–248. Edinburgh.

—— (1966). In RECHINGER, K. H. (ed.), *Flora Iranica*. Lfg. 34:1–27. Graz.

—— (1969). The genus Papaver in cultivation. 1. The wild species. *Baileya* 16:73–91.

DAVIS, P. H. (1971). Distribution patterns in Anatolia with particular reference to endemism. In DAVIS, P. H., HARPER, P. C. & HEDGE, I. C. (eds.), *Plant Life of South-West Asia*: 15–27. Edinburgh.

DOSTÁL, J. (1950). *Květena čSR*. Praha.

EKIM, T. & GÜNER, A. (1986). The Anatolian Diagonal: fact or fiction. In HEDGE, I. C. (ed.), Plant Life of South-West Asia. *Proc.Roy.Soc. Edinburgh* B, 89:69–77.

ELKAN, L. (1839). *Tentamen Monographiae Generis Papaver.* Berlin.
FEDDE, F. (1905). Papaveraceae novae vel notabiles. *Bull. Herb. Boissier*, Sér. 5, 2:165–171 & 438–448.
—— (1909). In ENGLER, A. (ed.), *Das Pflanzenreich* 4, 104:1–430. Leipzig.
FEINBRUN, N. (1963). Taxonomic studies on Papaver sect. Orthorhoeades of Palestine and of some other Mediterranean countries. *Israel J. Bot.* 12:74–96.
GILIBERT, J. E. (1781). *Flora lituanica inchoata.* Grodno.
GODWIN, H. (1975). *The history of the British Flora* (ed. 2). Cambridge.
GOLDBLATT, P. (1974). In Chromosome numbers of Phanerogams. 5. *Ann. Missouri Bot. Gard.* 61:902.
HAYEK, A. (1927). *Prodromus Florae peninsulae Balcanicae* 1. Berlin.
HEß, H. E., LANDOLT, E. & HIRZEL, R. (1970). *Flora der Schweiz* 2. Basel & Stuttgart.
HOLMBOE, J. (1914). *Studies on the vegetation of Cyprus.* Bergen.
HUMPHREYS, M. O. (1975a). The evolutionary relationships of British species of Papaver in section Orthorhoeades as shown by observations on interspecific hybrids. *New Phytol.* 74:485–493.
—— (1975b). Some observations on F2 and backcross plants derived from hybrids between Papaver dubium L. and P. lecoqii Lam. *New Phytol.* 74:495–499.
JACKSON, B. D. (1895). *Index Kewensis* 2. Oxford.
JORDAN, A. (1852). *Pugillus Plantarum Novarum.* Paris.
—— (1861). Diagnoses d'espèces Nouvelles ou Méconnues. *Ann. Soc. Linn. Lyon* 7:456–468.
—— (1864). *Diagnoses d'espèces Nouvelles ou Méconnues* 1. Paris.
KADEREIT, J. W. (1986a). Papaver somniferum L. (Papaveraceae): A triploid hybrid? *Bot. Jahrb. Syst.* 106:221–244.
—— (1986b). A revision of Papaver L. Section Papaver (Papaveraceae). *Bot. Jahrb. Syst.* 108:1–16.
—— (1986c). A revision of Papaver Section Argemonidium. *Notes RBG Edin.* 44:24–43.
—— (1987). A revision of Papaver L. sect. Carinatae Fedde (Papaveraceae). *Nord. J. Bot.* 7:501–504.
—— (1988a). Sectional affinities and geographical distribution in the genus Papaver L. (Papaveraceae). *Beitr. Biol. Pflanzen.* 63:139–156.
—— (1988b). Papaver L. sect. Californicum Kadereit, a new section of the genus Papaver. *Rhodora* 90:7–13.
KOMAROV, V. L. (1937). *Flora URSS* 7. Mosqua & Leningrad.
KOOPMANS, A. (1970). Species differentiation in Papaver dubium. *New Phytol.* 69:1121–1130.
KUBÁT, K. (1980). Bemerkungen zu einigen tschechoslowakischen Arten der Gattung Papaver. *Preslia* 52:103–115.
KUNTZE, O. (1887). Plantae Orientali-Rossicae. *Acta Horti Petrop.* 10:137–262.
MCNAUGHTON, I. H. & HARPER, J. L. (1960a). The comparative biology of closely related species living in the same area. 1. External breeding-barriers between Papaver species. *New Phytol.* 59:15–26.
—— (1960b). 2. Aberrant morphology and a virus-like syndrome in

hybrids between Papaver rhoeas L. and P. dubium L. *New Phytol.* 59:27–41.

—— (1960c). 3. The nature of barriers isolating sympatric populations of Papaver dubium and P. lecoqii. *New Phytol.* 59:129–137.

MEIKLE, R. D. (1977). *Flora of Cyprus* 1. Kew.

MOUTERDE, P. (1970). *Nouvelle Flore du Liban et de la Syrie* 2. Beyrouth.

PHILP, J. (1933). The genetics of Papaver commutatum and its hybrids with Papaver rhoeas. *J. Genet.* 28:169–174.

PODLECH, D. & DIETERLE, A. (1969). Chromosomenstudien an afghanischen Pflanzen. *Candollea* 24:185–243.

POST, G. E. (1932). *Flora of Syria, Palestine and Sinai* 1 (ed. 2). Beirut.

RECHINGER, K. H. (1959). Zur Flora von Syrien, Libanon und den angrenzenden türkischen Gebieten. *Ark. Bot.* 5(1):1–488.

SNITZER-PASTERNAK, Y. & GALIL, J. (1970). Barriers contributing to the isolation of Papaver spp. in Israel. *Israel J. Bot.* 19:121–136.

SPACH, E. (1839). *Histoire Naturelle des Végétaux Phanerogams* 7. Paris.

THIÉBAUT, J. (1936). *Flore Libano-Syriacum* 1. Le Caire.

—— (1937). Troisième note sur quelques plantes de la flore libano-syriacum. *Bull. Soc. Bot. France* 84:694–700.

TIMBALL-LAGRAVE, P. M. E. (1870). Précis des herborisations. *Bull. Soc. Hist. Nat. Toulouse* 4:156–165.

—— (1892). Florule des Corbières. *Rev. Bot. Bull. Mens.* 10:33–39.

VIGUIER, L. G. A. (1814). *Histoire Naturelle, Médicinale et Économique des Pavots et des Argémones.* Montpellier.

WALTERS, S. M. (1986). The Name of the Rose: A review of ideas on the European bias in angiosperm classification. *New Phytol.* 104:527–540.

WEIN, K. (1911a). Papaver rhoeas × strigosum (× P. feddeanum) K. Wein, nov.hybr. *Repert. Spec. Nov. Regni Veg.* 9:172.

—— (1911b). Papaver osswaldii K. Wein, nov.spec. *Repert. Spec. Nov. Regni Veg.* 9:173.

—— (1911c). Beiträge zur Kenntnis der deutschen Mohnarten. *Repert. Spec. Nov. Regni Veg.* 9:225–229 & 241–244.

ZOHARY, M. (1966). *Flora Palaestina* 1. Jerusalem.

INDEX