

FRITILLARIA L. (LILIACEAE) IN IRAN

E. M. Rix



Rix, E. M. 1977 05 31: *Fritillaria* L. (Liliaceae) in Iran. *Iran. Journ. Bot.* 1(2): 75-95. Tehran.

A revision of the genus *Fritillaria* in Iran is presented, including a key, synonyms, descriptions, citation of specimens seen, taxonomic comments, distribution maps, and illustrations (partly in colour). The following taxa are recognized in Iran: *F. imperialis*, *F. raddeana*, *F. persica*, *F. gibbosa*, *F. ariana*, *F. reuteri*, *F. crassifolia* ssp. *kurdica*, *F. straussii*, *F. kotschyana* ssp. *kotschyana*, *F. olivieri*, *F. caucasica*, *F. zagrica*, *F. chlorantha*, *F. assyriaca*, and *F. uva-vulpis*. A new combination, *F. ariana* (Loz.-Lozinsk. & Vved.) Rix, based on *Rhinopetalum arianum* Loz.-Lozinsk. & Vved., is published.

E. Martyn Rix, Royal Horticultural Society's Garden, Wisley, Ripley, Woking, Surrey, England.

جنس *Fritillaria* L. (Liliaceae) در ایران

از ، ریکس

مروری از جنس *Fritillaria* شامل مطالب زیر ذکر میگردد . کلید شناسایی ،
همنامی ها ، توضیحات ، ایستگاه رویش نمونه های دیده شده ، نظریات رده بندی گونه ها ،
نقشه گسترش جغرافیایی و تصاویر (قسمتی رنگی).

از این جنس واحدهای گیاهی زیر در ایران تشخیص داده شده است .

F. imperialis, *F. raddeana*, *F. persica*, *F. gibbosa*, *F. ariana*, *F. reuteri*,
F. crassifolia ssp. *kurdica*, *F. straussii*, *F. kotschyana* ssp. *kotschyana*,
F. olivieri, *F. caucasica*, *F. zagrica*, *F. chlorantha*, *F. assyriaca*, *F. uva-vulpis*

ترکیب جدیدی از این جنس نیز بنام Rix (Loz.-Lozinsk. & Vved.) بر اساس
گونه *Rhinopetalum arianum* Loz.-Lozinsk. & Vved. قید میگردد .

Introduction

Above the species level, Iran is the centre of diversity of the genus *Fritillaria*. Here the subgenera from central Asia, the Mediterranean and the Caucasus meet, and in the Zagros Mountains around Hamadan and Esfahan, Bornmüller (1930) recorded no less than 10 species. These belong to the following subgenera – *Fritillaria*, *Rhinopetalum*, *Petilium* and *Theresia*. Of the three main groups within subgenus *Fritillaria* in Western Asia and Europe, two occur in Iran. No member of the *meleagris* group has yet been recorded, but the representative of the group in this area (*F. latifolia*) is found in neighbouring areas of Turkey and the Caucasus, and is likely to be found in northern Azerbaijan.

Iran is, however, relatively poor in species (15) compared with Turkey (ca 25) and fewer intermediates have been recorded. This is particularly so in the *F. caucasica* group: in Iran five species are found, *F. caucasica* Adams, *F. chlorantha* Hausskn. & Bornm., *F. zagrica* Stapf, *F. assyriaca* Baker and *F. uva-vulpis* Rix. These remain distinct in Iran and only one intermediate collection is known (BSBE 1433, see under *F. assyriaca*). In Turkey intermediates are frequent between *F. caucasica*, *F. assyriaca* and other members of this group. Only one of the four subspecies of *F. crassifolia* has so far been found in Iran (Rix 1973). This is the very variable subsp. *kurdica*, also known in Turkey and Iraq; one form from Kuh-e Sahand near Tabriz (*F. grossheimiana*) is possibly of hybrid origin. It is discussed further under subsp. *kurdica*. These intermediates and possible hybrids are found in northern Iran, where there is evidence of relatively recent destruction of forest cover and they are more common in those parts of Turkey which have undergone similar changes (Walter 1956).

Key

1. Flowers in an umbel, surmounted by a group of many leaves (subgenus *Petilium*) 2
 Flowers in a raceme or solitary, not surmounted by a group of many leaves 3
2. Flowers red; nectary ca 5 mm in diameter 1. *F. imperialis*
 Flowers yellow; nectary 2–3 mm in diameter 2. *F. raddeana*
3. Flowers zygomorphic; the nectary of the upper perianth segment larger than that of the rest, forming a curved protuberance on the back of the segment (subgenus *Rhinopetalum*) 4
 Flowers actinomorphic; the nectaries all equal, not forming protuberances on the back of the perianth segments 5
4. Flowers tessellated; stem papillose throughout 4. *F. gibbosa*
 Flowers not tessellated; stem papillose only at the leaf bases 5. *F. ariana*
5. Flowers arranged in a 7–20-flowered raceme; style glabrous, undivided (subgenus *Theresia*) 3. *F. persica*
 Flowers usually solitary or 2 per stem (rarely up to 8); style papillose or bifid (subgenus *Fritillaria*) 6
6. Perianth broadly campanulate; the nectary at the point of inflection of the segment, ca 5 mm above its base; style glabrous, usually divided for 1/4–1/2 7
 Perianth narrowly campanulate; the nectary at the base or up to 2 mm above the base of the perianth segment (*caucasica* group) 11
7. Nectary ovate to lanceolate, less than half as long as the limb of the perianth segment (*kotschyana* group) 8
 Nectary linear, more than half as long as the limb of the perianth segment (*crassifolia* group) 9
8. Perianth not or faintly tessellated; stem usually papillose at ground level; leaves 7–10 times as long as wide 10. *F. olivieri*
 Perianth clearly tessellated; stem glabrous;

leaves 2-4 times as long as wide

9. *F. kotschyana*

stem with 2 leaves at the base of each pedicel

6. *F. reuteri*

stem with one leaf at the base of each pedicel, or leaves in a whorl of three below the lower

10

lower leaves usually ternate or opposite, upper usually ternate; perianth segments sessile, without fascia

8. *F. straussii*

all leaves alternate (the lower rarely opposite); perianth segments with fascia

7. *F. crassifolia* ssp. *kurdica*

style stout, undivided

12

style slender, sometimes 3-lobed at apex

13

leaves usually 5-6 per stem, glaucous, linear, canaliculate; stem often papillose at ground level

14. *F. assyriaca*

leaves usually 4 per stem, green, not glaucous, lanceolate, flat; stem smooth

15. *F. uva-vulpis*

leaves 3-4; style 9-17 mm

11. *F. caucasica*

leaves 4-10; style 5-10 mm

14

leaves green, not glaucous; perianth segments usually green

13. *F. chlorantha*

leaves usually glaucous; perianth segments purple, with a bright yellow apex

12. *F. zagrica*

Fritillaria imperialis L.

Linnaeus, Sp. Pl. 303 (1753). — Type: Habitat Persia? e Constantinopoli venit in Europam 1570. Herb. Linn. (non vidi).

Redouté, Liliac. iii: t. 131 (1807). —

Bl. Roy. Hort. Soc. 88: Fig. 65 (1963). —

Delbo, Tulips and Irises of Iran, Fig. 23 (1977).

up to 8 cm diameter; bulbils or stolons uncommon. Stem 50-100 cm; papillae absent.

Leaves lanceolate, many, not glaucous, arranged in 4 whorls of 4-8; the lowest 7-18 x 5-10 cm.

The bract leaves 6-12 x 0.5-1.5 cm, in a whorl of 10-20. Flowers 1-5, broadly cam-

panulate, whorled. Perianth segments 4-5.5 cm, all alike, broadly lanceolate, acute, orange or rarely yellow. Nectaries 5 mm diameter, circular, white, at the base of the perianth segment. Filaments 25-45 mm, glabrous; anthers 8-12 mm after dehiscence. Style 30-45 mm, 3-fid to 1-4 mm, papillose towards apex. Capsule up to 20 mm high, 30 mm diameter, with 2 mm wide wings. — Flowers April to May.

Open woods, scrub, cliff ledges and rocky slopes. 1000-3000 m. Map 1. — Also known from Turkey (vilayets Siirt and Hakkari), Iraq, Afghanistan, Pakistan and Kashmir.

Specimens seen:

Lorestan: Ilam, open forest on calcareous soil, 1200-1300 m, 19.4 1963, M. Jacobs 6322 (K); Khorramabad, inter Dorud et Azna, ca 2500 m, 30.5 1960, Wright & Benç 530-501 (K); foothills of Shuturun Kuh (Kuh-e Ushtaran), 2000 m, 7.4 1963, Mathew in BSBE 709 (K). —

Esfahan: Kuh-e Darabshah, above Damaneh, deep moist earth among rocks, north-facing, 3000 m, 15.4 1962, Furse 1430 (K); in valley leading to Kuh-e Darabshah, 2500 m, 26.5 1973, Hewer 2083 (K). —

Bakhtiari: Kellar Kuh near Cheagh Kuh, 2.6 1852, Loftus (BM, K). —

Fars: in declivibus in orientam spect. M. Kuh-Barfi prope urbem Schiras, 3.5 1842, Kotschy 326 (BM, K, P); Tang-e Abdui, about 16 km east of Kazarun, 17.5 1885, O. Stapf 1257 (K); in dumetis Kotel-Pirasan inter Schiras et Dalaki, April 1868, Haussknecht (BM, K, P); west of Dasht-e Arjan, SW. of Schiraz, in open oak woods on hard limestone, north-facing slopes among scrub, 27.4 1959, L. F. H. Morton 3836 (K); Fars, rounded clay hills among *Berberis* scrub, 1770 m, 14.4 1965, Archibald 1370 (K); Kuh-e Sabzpushon above Kushk-e Bidak, N. & NW. facing slopes, 2070 m, 19.4 1965, Archibald 1444 (K). —

District unknown. In vallibus. Koni Kochki, Aucher 5388 (BM, K, P).

This species is relatively invariable in Iran. Other species have been described from S. Turkey (*F. aintabensis* Post), and Central Asia (*F. eduardii* Regel), but though they do not seem to be worthy of specific rank, they merit further investigation.

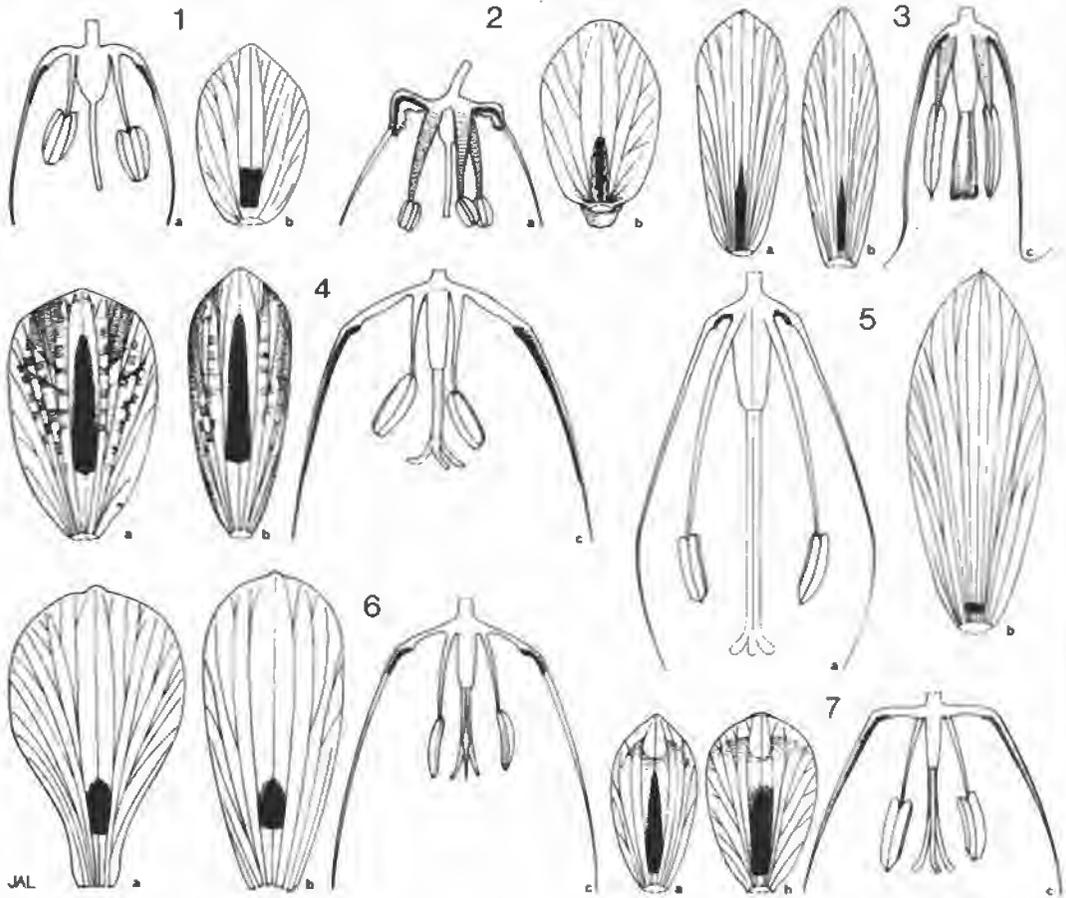


Fig. 1. 1. *F. persica* (a section, b outer tepal). — 2. *F. gibbosa* (a section, b outer tepal). — 3. *F. chlorantha* (a inner tepal, b outer tepal, c section). — 4. *F. crassifolia* ssp. *kurdica* (a inner tepal, b outer tepal, c section). — 5. *F. raddeana* (a section, b outer tepal). — 6. *F. olivieri* (a inner tepal, b outer tepal, c section). — 7. *F. reuteri* (a outer tepal, b inner tepal, c section).

2. *Fritillaria raddeana* Regel

Regel, Act. Hort. Petrop. 10: 365 (1887). — Type: Prope Chodscha-Kali-barni, 11 Majo 1886, Radde specimina deflorata legit (non vidi).

F. askabadensis M. Michel, Journ. Soc. Hort. Fr. 4(3): 144 (1902). — Type: Perse, Askabad, près de Karabeala, 1000 m, coll. Sintenis 1901.

Icon. Bot. Mag. 7850 (1902). — Journ. Roy. Hort. Soc. 90: Fig. 210, 215 (1965).

Bulb up to 5 cm diameter; bulbils and stolons unknown. *Stem* 50–80 cm, smooth. *Leaves* many, arranged in loose whorls; the lowest up to 12 x 7 cm, lanceolate, acuminate; the bract leaves 6 x 0.5 cm, linear-lanceolate, in a group of 8–25, 1 per flower. *Flowers* 6–20, campan-



Fig. 2. *F. raddeana*

ulate, whorled. Perianth segments 3–3.7 cm, broadly lanceolate, acute, yellowish to greenish; the outer 1.2 cm wide, the inner 1.5 cm wide. Nectaries 2 mm diameter, circular, at the base of the perianth segment. Filaments 22 mm, glabrous; anthers 8 mm after dehiscence. Style 25 mm, trifid for 2 mm, papillose towards apex. Capsule 20–30 mm high, 20–30 mm diameter, with 4 mm wide wings. Flowers March to April.

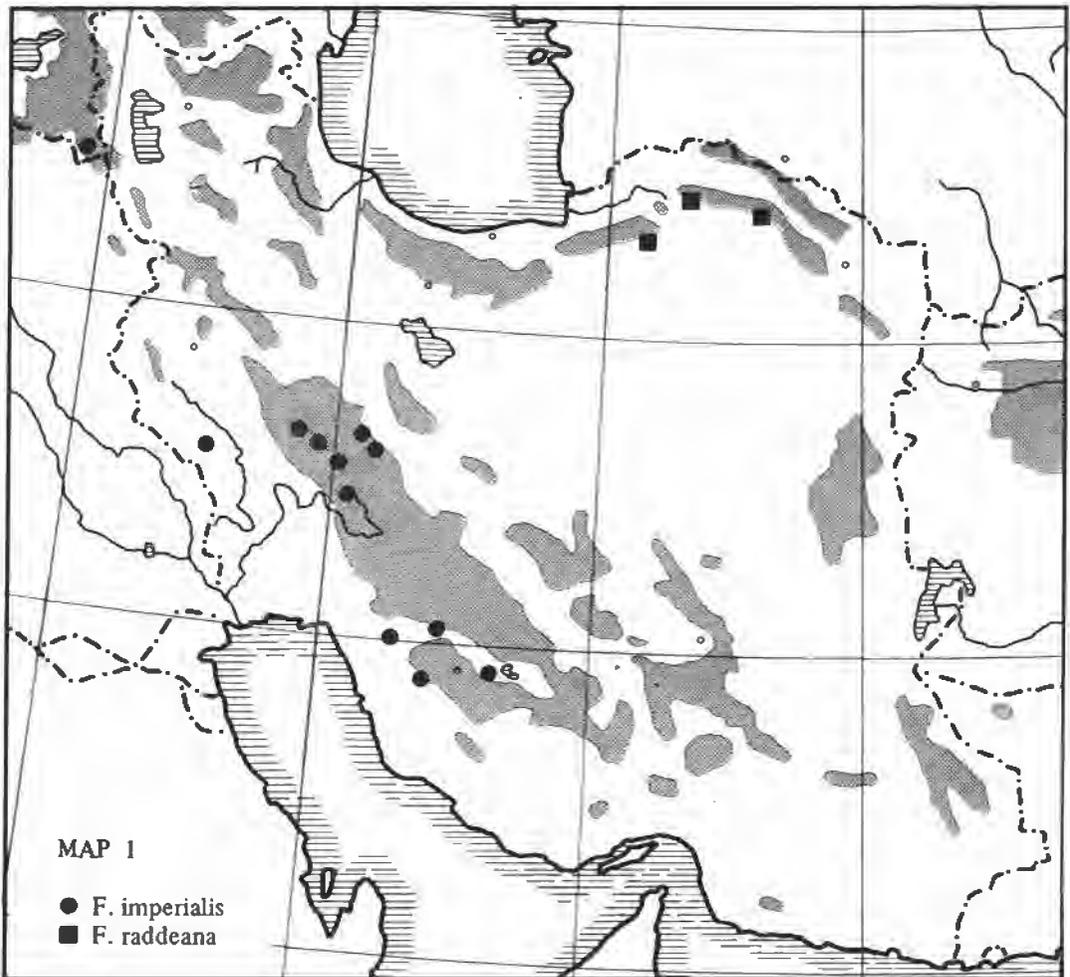
In scrub, on scree and cliffledges. Map 1. – Recorded also from U.S.S.R.

Specimens seen:

Gorgan: pass between Shahpasand and Shahrud, steep unstable scree slopes facing west, 1500 m, 15.4 1971, R. & L. Gibbons 11 (K). Golestan forest, 70 km ENE of Gornpad-e Cavus, 31.3 1964, Furse 5128 (K), 60 km west of Bojnurd, in roots of spiny bushes on N. slopes,

as 5128 but liable to grazing so much smaller, 2.4 1964, Furse 5162 (K).

This species replaces *F. imperialis* in NE. Iran (see Map 1). It may be distinguished from yellow forms of *F. imperialis* by the very much smaller nectaries and so more narrowly campanulate flower, and by the larger number of flowers in the umbel. Plants from Chitral (K, collector unknown) which have been called *F. imperialis* var. *chitralensis* Hort. [Gard. Chron. Ser. III, 47: 171 (1910)] seem closer to *F. raddeana* than to *F. imperialis*. They have fewer, somewhat larger flowers than the Iranian form and very broadly ovate leaves. Similar forms have been found in Afghanistan between Banikot and Kano [Carter 762 (K)] further down the same valley. Both require further study before their status can be determined with confidence.



3. *Fritillaria persica* L.

Linnaeus, Sp. Pl. 304 (1753). — Type: Habitat in Persia? e Susis venit in Europam 1573, Herb. Linn. (non vidi).

F. libanotica (Boiss.) Baker, Journ. Linn. Soc. 14: 270 (1874). — Type: Palaestina in lapidosis umbrosis regionis mediae Libani, Boissier (non vidi).

F. eggeri Bornm., Fedde Repert. 27: 340 (1930). — Type: Azerbaijan, Rezaiyeh: Westlich von Diliman bei Salamas und No-deh; auch

zwischen Mianeh und Haran der Route Tebris-Rescht, Eggar (non vidi).

F. arabica Gandoger, Bull. Soc. Bot. Fr. 1919, 66: 291 (1920). — Type: Arabia Petraea, ad Petra et Moab, Planes (non vidi).

Icon. Redouté, Liliac. ii: t. 67 (1805). — Bot. Mag. 1537 (1813), 9108 (1925). — Wendelbo, Tulips and Irises of Iran, Fig. 24 (1977).

Bulb up to 6 cm high, 3–5 cm diameter, spindle-shaped. *Stem* 20–100 cm, smooth. *Leaves* 9–25, up to 15 x 3 cm, lanceolate, acute, all

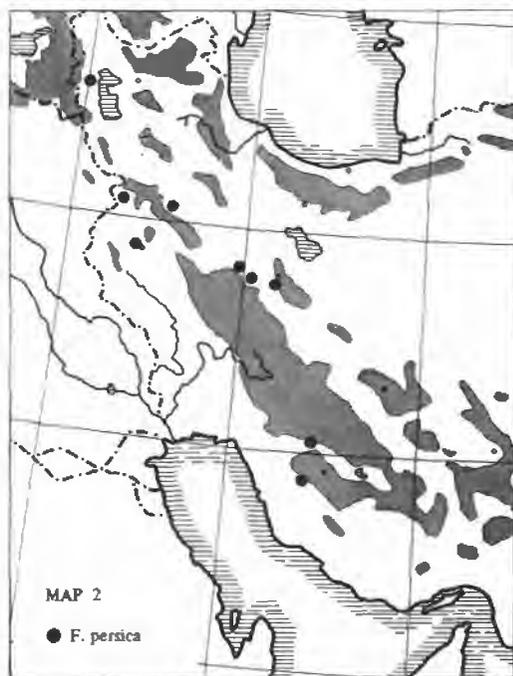
alternate. *Flowers* 7–20, campanulate, purplish, greenish, grey or yellowish, usually yellowish inside. *Perianth segments* 15–20 x 6–7 mm, oblanceolate, obtuse or emarginate, outer and inner similar. *Nectaries* triangular, 1.5 mm wide, 2 mm above the base of the segment. *Filaments* 5–6 mm, glabrous, at first pressed back against the perianth segment, coming forward at dehiscence; anthers 4 mm. *Style* 6–8 mm, slender, glabrous. *Capsule* 1–3 cm, 1.2 cm in diameter, with 2 mm wide wings. – Flowers April to May.

Rocky slopes, edges of arable fields, 1500–2800 m. Map 2. – Known also from Turkey, Syria, Lebanon, Iraq and Jordan.

Specimens seen:

Azerbaijan: Rezaieyeh, Hills of Sir, 2100 m, 16.5 1929, Cowan and Darlington 2193 (K). – *Kordestan*: Sanandaj, Marivan, mixed deciduous forest, 1800 m, Jacobs 6537 (K); Sanandaj to Hamadan, 30 km east of Sanandaj, cornfield and fallow, 1700 m, 15.5 1962 (fruit), Furse 2032 (K). – ? *Kermanshah*: Nawa Kuh, 24 km north-west of Kavind, steep N-facing slope, 2200 m, 14.5 1966 (fruit), Archibald 1903 (K). – *Lorestan*: Khorramabad, 40 km south of Arak, 22 km north-east of Azna, rocky mountain slopes below cliffs, 22–2800 m, 18.4 1962, Furse 1496 (K), near Azna, north-east facing, 1900 m, 4.4 1963, Mathew in BSBE 679 (K); Ustaran Kuh, south of Thuin, hollows on north-east facing slopes among stones, 2130 m, 27.4 1966, Archibald 1596 (K). – *Esfahan*: Road between Damaneh and Khounsar, stony limestone ground, 12.6 1973 (fruit), Hewer 2139 (K); 15 km S. of Khounsar, Golestan Kuh, stony slopes below mountains, 2800 m, 3.5 1975, Ingham 147 (K). – *Fars*: Kuh Shah Salmon and Kuh Ischeng, near Daesht-Uerdschin, between Kazerun and Shiraz, ca 35 km from Kaserun, 22.5 1885, Stapf (K); 8 km north of Yasuj, up valley towards Ardakan, 2200 m, 1.5 1973, Hewer 1958 (K); east of Ardakan, amongst limestone boulders on west slope of mountain, 2438 m, 7.4 1969, Hewer 924 (K); mountain south-west of road from Yasuj to Ardakan, about 24 km from Yasuj, 2600 m, 29.4 1973, Hewer 1938 (K).

F. persica is very variable, especially in flower colour, leaf width and in the presence or ab-



sence of bract leaves on the inflorescence.

Three forms have been described as separate species, but there is much overlap between them and none seem to merit recognition at even subspecific level.

F. eggeri was described from Azerbaijan, the northernmost end of the species range. It has greener flowers than most of the collections from further south and west, but otherwise falls within the range of *F. persica*.

F. libanotica was described from Lebanon as having more open, paler flowers, but there does not seem to be any geographical distinction, at least in flower colour; indeed, pale flowers are more common in Iran than dark ones.

F. arabica is the most distinct of the three. It was described from Jordan, as having broadly lanceolate leaves, narrow at the base, and a completely ebracteate inflorescence; the flowers are lilac with very obtuse perianth segments.

4. *Fritillaria gibbosa* Boiss.

Boissier, Diagn. Pl. Or. Nov. 1 (7): 107 (1846).

— Type: Schiraz: in declivibus prope ruinas Persepolis, April 1842, Kotschy 827 (holotype GE, non vidi, isotype P!, BM!).

Icon. Bot. Mag. 6406 (1879) (sub *F. karelinii*).

— Journ. Roy. Hort. Soc. 90: Fig. 11, 216 (1965). — Wendelbo, Tulips and Irises of Iran Fig. 26 (1977).

Bulb up to 3 cm diameter; bulbils or stolons unknown. *Stem* 6–16 cm, densely papillose, especially below. *Leaves* 4–10, the lower 30–70 x 13–18 mm, lanceolate to ovate, usually opposite, the rest linear. *Bract* leaves linear, 2 at the base of each pedicel. *Flowers* 1–7(–10), flat, horizontal at maturity; perianth segments ca 15 x 10 mm, the outer somewhat narrower than the inner, all pinkish spotted and marked towards the apex, dark towards the base. *Nectaries* ca 4 mm, deeply impressed, the upper larger than the others, with a papillose ridge inside. *Filaments* 9–10 mm, papillose, especially below, sometimes purple; anthers ca 2 mm, spherical after dehiscence. *Style* 8–10 mm, entire, slender, glabrous. *Capsule* 14 mm high, with 6 ca 4 mm long teeth; perianth segments and style persistent in fruit. — Flowers March to May.

Steppe 1000–2000 m. Map 3.

Specimens seen:

Azerbaijan: Rezaiyeh, Khoi, rocky hillside in full sun. 1100 m, April 1963, Mathew in BSBE 519 (K); Tabriz, hills south-east of Tabriz, 19.4 1928, Gilliat-Smith 2122 (K), and 1929, Gilliat-Smith 2494 (K); Shibli pass, Ingham s. n. (K); Khamseh, 70 km NW. of Zinjan, 1600 m, 6.5 1929, Cowan & Darlington 739 (K). — *Tehran*: Elburz, S. side of watershed, between Kasvin and Rasht, 1000 m, 18.3 1962, Furse 1100 (K); Kazvin, Ravandeh prope Keredj, Gauba 1565 (GB); Karadj, in monte ad pagum Kalak, 1600 m, 13.4 1948, Rechinger 2746 (GB); W. side of road from Tehran to Qum, 5 km north of Kushk-e Nusrat, 1219 m, 31.3 1969, Hewer 905 (K); Arak to Golpaigan, 25' SE. of Arak, shaley slopes, 2000 m, 23.4 1962 (fruit), Furse 1571 (K). — *Kordestan*: Ostan S, Aghbolagh

Morched, 60 km east of Bisar (? = Bijar), 30.4 1956, Misonne 6706 (GB); Aq Bulaq, 100 km north of Hamadan, Roux & al., 1960 (GB); Hamadan, ESE. of Razan, NE. of Hamadan, low rounded clay hill in *Hulthemia* steppe, 11.5 1966, Archibald 1792 (K). — *Lorestan*: Khorramabad, mountains south-west of Dorud, 2000–2500 m, 18.6 1945, Trott 1174 (K). — *Fars*: Niz, on limestone, 29.3 1940, W. Koelz 14713 (GB). — *Khorassan*: 17 km north of Torbat-e Heydariyeh, on road to Mashad, steep rocky scree, 8.4 1971, Grey-Wilson & Hewer 418 (K); 24 km north of Quachan, Kopet Da, 2000 m, 19.5 1966 (fruit), Furse 7520 (K); 80 km west of Bojnurd, arid plains, yellow fine soil with stones and scattered *Artemisia* scrub, 1800 m, 31.5 1964, Furse 5146 (K); Kopet Da, 50 km west of Darreh Gaz and 60 km north-east of Quchan, bare slope, N-facing, 1700 m, 21.4 1971, R. & L. Gibbons 56 (K); Quchan to Sulatanabad, stony slope, below igneous cliffs, 8.4 1964, Furse 5218 (K); Mt. Kuh-e Nisapur, Derreh Abshar supra Akhlomet, 1600–1800 m, 30.5 1948 (fruit), Rechinger 7324 (GB); in monte serpentine ditionis Robat Safid, 1800–2000 m, 27.5 1948 (fruit), Rechinger 4459 (GB).

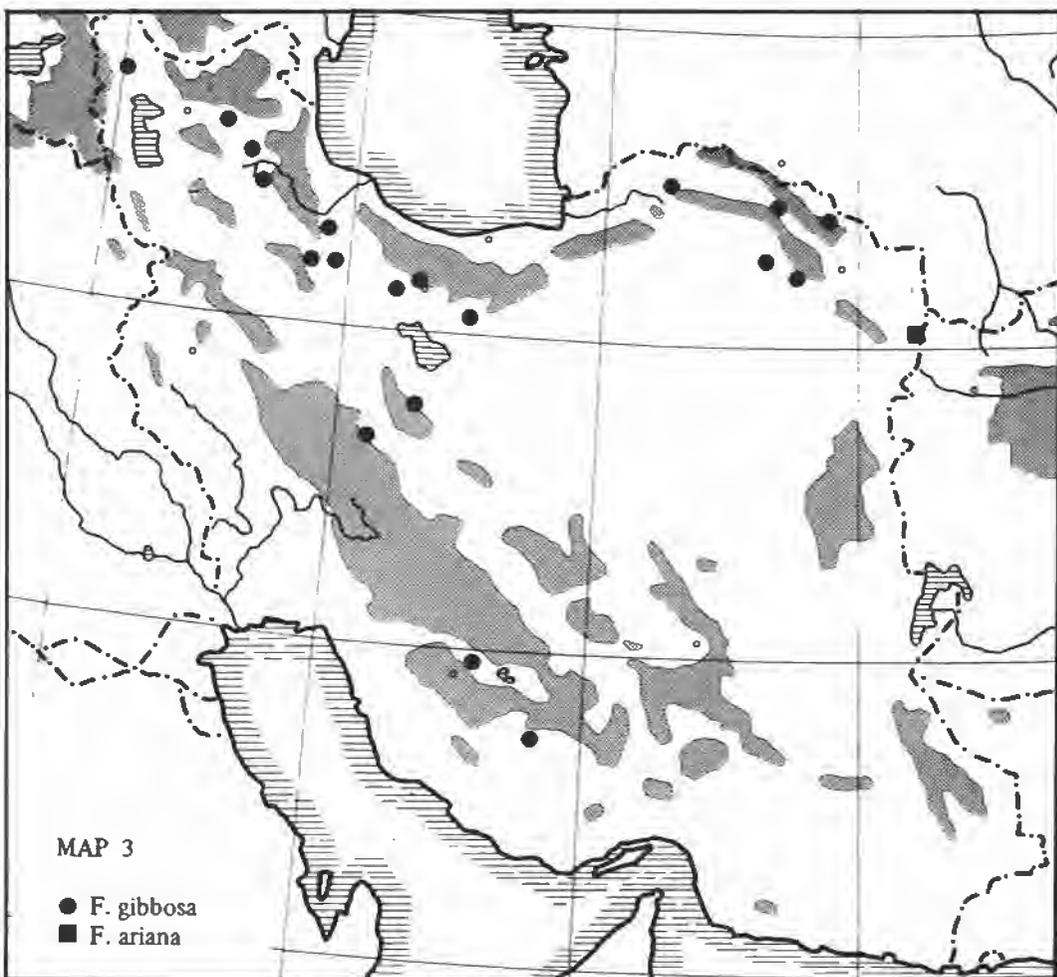
F. gibbosa is the most widespread species of the genus in Iran (see Map 3). It is very variable, especially in number of flowers per stem and in the colour of the flower. There is some doubt as to the distinctness of this species from *F. karelinii*, which was described from steppe in the southern Urals north of the Caspian Sea, but is recorded as far south as Kopet Da in Komarov (1935).

F. karelinii has much narrower perianth segments than *F. gibbosa*, and is reputed to have a wingless capsule, but the distinction in the descriptions in Komarov (l. c.) is not at all clear. A few specimens from Iran have much narrower perianth segments than is usual for *F. gibbosa* (e. g. Furse 5146, Grey-Wilson & Hewer 415) and may belong to *F. karelinii*.

5. *Fritillaria ariana* (Loz.—Lozinsk. & Vved.)

Rix, comb. nov.

Rhinopetalum arianum Loz.—Lozinsk. & Vved., in Komarov, Fl. U.R.S.S. 4 (addendum 3): 738



(1935). — Type: In arena mobili, in declivibus arenosis. Asiae Mediae. Type in Tashkent (non vidi).

Icon. The Lily Year Book, 1966 Fig. 20, left hand plant (1965). — Fl. U.R.S.S. 4: 299 (1935).

Bulb up to 3 cm diameter; bulbils or stolons unknown. **Stem** 10–20 cm (–30 cm in fruit), glabrous or papillose only below the lowest leaves and at the nodes. **Leaves** 8–10; the lower up to

120 x 12 mm, linear-lanceolate, opposite, the rest linear. **Bract leaves** 20–40 x 2 mm, linear, 2 at the base of each pedicel. **Flowers** 2–14, usually ca 6, flat, horizontal at maturity; perianth segments unspotted, with a dark line above the nectary; the outer 25 x 10 mm, obovate, acute; the inner somewhat wider. **Nectaries** ca 4 mm, deeply impressed, the upper larger than the rest. **Filaments** 6–7 mm, slender, papillose below; anthers ca 2 mm, spherical after dehis-

cence. *Style* 5–7 mm, entire, slender, glabrous. *Capsule* 15 mm high, toothed at the corners. — Flowers March.

Mobile sand-dunes 500–1000 m. Map 3.

Khorassan: Mashhad: Hari Rud, on Iranian side of frontier, 15.4 1964 (fruit), Furse 5239 in Lily Year Book 1966: 115–119. [Afghanistan delimitation commission 1884–5: Badghis region, 19.3 1885, Hari Rud valley, 3.4 and 7.4 1885, common in sandy soil, Aitcheson 137 (BM)].

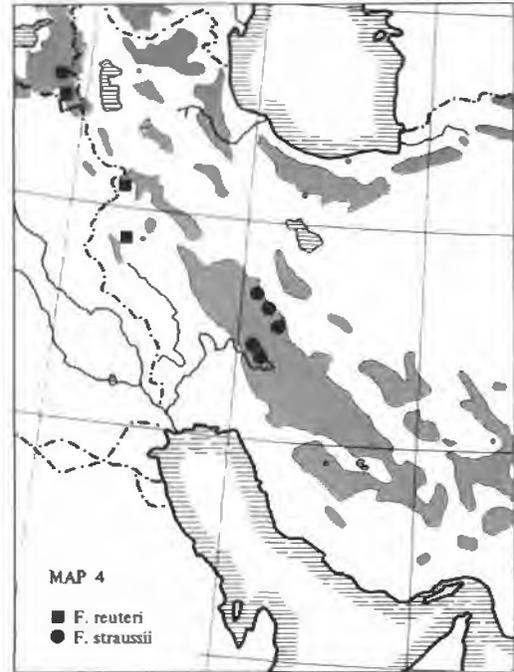
F. ariana is known only from one collection in Iran from the Hari Rud Valley, its main area of distribution being further north in the sandy steppes around Aschabad. It is distinguished from *F. gibbosa* by its unspotted flowers and narrower basal leaves. The stems of *F. gibbosa* are usually papillose all over, while those of *F. ariana* are glabrous, or papillose only below the lowest leaves and on the leaf bases.

I have not seen an herbarium specimen of Furse's collection, but the characters are shown clearly in the plate cited. The specimens collected by Aitcheson were from Afghanistan, but provide confirmation that the species occurs in this area.

6. *Fritillaria reuteri* Boiss.

Boissier Diagn. Pl. Or. Nov. 1 (5): 57 (1844). — Type: Iran, in Persia circa Isfahan, Aucher 5379 (holotype G!, isotype BM!, K!, P!, TCD!). *Icon. Bot. Mag.* 179, 4: 658 (1973). — *Journ. Roy. Hort. Soc.* 94: Figs. 61, 62 (1969). — *Wendelbo, Tulips and Irises of Iran* Fig. 25 (1977).

Bulb up to 2 cm diameter; bulbils or stolons unknown. *Stem* 15–25 cm, papillae absent. *Leaves* 3–8, all alternate; the lower 6–10 cm, linear lanceolate, at the base of the stem; the upper 3–7 cm, linear, 2 at the base of each pedicel, the intervening stem usually leafless. *Flowers* 1–8, usually 2, broadly campanulate, nodding at maturity; perianth segments reddish-purple with a glaucous bloom, the apicel 1/3 to 1/4 yellow, and often yellow inside, not tessellated; the outer 16–28 x 5–8 mm, oblanceolate, acute; the inner 8–13 mm wide, often obtuse. *Nectaries* ca 10 mm, linear, green,



5 mm above the base of the segment. *Filaments* ca 10 mm, slender, sparsely papillose; anthers 8 mm after dehiscence. *Style* 1.3 cm, minutely papillose, trifid for 3 mm. *Capsule* cylindrical, not winged. — Flowers May to June.

Rocky meadows, usually very wet at flowering time, 2500–3000 m. Map 4.

Specimens seen:

Esfahan: Bakhtiari country, west of Isfahan, La Daraz, 2700 m, 26.5 1890, Sawyer 13181 & 13182 (E); Chehel Dokhtaran Kuh, south-east of Damaneh, 3000 m, wet ground by rivulet, 2.6 1959, *Wendelbo* 1778 (GB, W); 10–15 km north-west of Daran along road to Arak, in boggy ground, 25.5 1975, J. S. Ingham 143 (K); boggy banks of stream near "Golestani Kuh", 15 km south of Khounsar, 2600 m, 30.5 1975, Ingham 145 (K); Chesme Kuh Rang, 2500 m, *Wendelbo* 964 (GB); Shah-Kord, valley at foot of Zardeh-Kuh gorge, in very wet gravelly soil alongside stream, 2200 m, 30.5 1973, *Hewer*

2090 (K).

F. reuteri appears to be restricted to the mountains north and west of Esfahan, where it occurs in a few places, often in great quantity. A pure yellow-flowered form has been recorded on several occasions [e. g., Freedman & Jones, Journ. Roy. Hort. Soc. 94: 133 (1969)], but otherwise the species is relatively invariable.

It is not closely related to any other species. In flower it is similar to *F. michailovskyi* from north-eastern Turkey, but the arrangement of the bract leaves, 2 at the base of each pedicel, is unique in subgenus *Fritillaria*, though it is the normal arrangement in subgenus *Rhinopetalum*.

7. *Fritillaria crassifolia* Boiss. & Huet
ssp. *kurdica* (Boiss. & Noë) Rix

Rix Kew Bull. 29(4): 638 (1974). — *F. kurdica* Boiss. & Noë in Boissier, Diagn. Pl. Or. Nov. 2 (4): 103 (1859). — Type: Turkey (B9), Van, in subalpinis prope Van, Noë 5 (holotype G!).
F. wanensis Freyn, Bull. Herb. Boiss. II, 1: 287 (1901). — Type: Turkey (B9), Van, in tractu Warack (= Ereğ) Dag, locis saxosis, 1 June 1899, Kronenburg 61 (holotype W!, isotype G!).
F. karadaghensis Turrill, Gard. Chron. III, 85: 242 (1929). — Type: Iran, Tabriz, cult., bulbs from Karadagh, coll. Egger 1927, Gilliat-Smith 2213 (holotype K!).

F. foliosa Bornm., Feddes Repert. 27: 338 (1930). — Type: Iran, Tabriz, Karadagh-gebirge nördlich von Tebris, 1800 m, G. Egger (holotype, non vidi).

F. grossheimiana Loz.-Lozinsk. in Komarov, Fl. U.R.S.S. 4(addendum 3): 739 (1935). — Type: Iran, Tabriz, declivis australibus montis Sechend, 18 May 1916, Schelkownikow & Schiptschinsky (holotype LE, non vidi).

Icon. Bot. Mag. 9303 (1933).

Bulb up to 3 cm diameter; bulbils few, stolons unknown. *Stem* 3–10 cm high, papillae absent. *Leaves* usually 5–6, glaucous, all alternate, the lowest 3 x 0.6 to 5 x 1.5 cm (or 8 x 1.2 cm), usually 3–5 times as long as wide; the rest narrower. *Flowers* 1–2(–4), nodding at maturity, broadly campanulate, stippled and tessellated inside and out, sometimes very heavily, on a

greenish or yellowish ground, often with green fascia; perianth segments 1.7–2(–2.6) cm long; the outer 5–8 mm wide; the inner obtuse, 8–12 mm wide. *Nectaries* linear, tapering from a blunt base, often blackish especially at the base, with a swollen ridge down the inside centre of the perianth segment, 8–10 x 1 mm, 3–5 mm from base of segment. *Filaments* papillose 5–7 mm; anthers 2–5 mm after, up to 11 mm before, dehiscence. *Style* glabrous, 5–8 mm, trifid to about half its length. *Capsule* cylindrical, up to 3.5 cm long, tapering at base, truncate at apex. — Flowers April to July.

Scree, mountain steppe, and rock ledges, 1500–3500 m, Map 5. — Also known from Turkey; Vilayets Mus, Tatvan, Van, Hakkari; Iraq, distr. Rowanduz; U.S.S.R., distr. Baku.

Specimens seen:

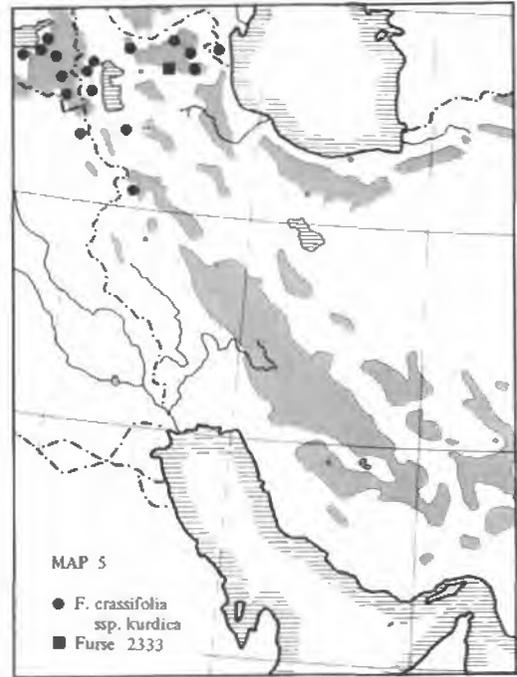
Azerbaijan: Marand, Khoi to Tabriz road, 2000 m, stony banks near river, 11.5 1963, Mathew et al. in BSBE 1509 (K); NE. foot-hills of Aghvan Dag, 64 km N. of Rezaiyeh, 2000 m, rocky slopes and granite scree, 24.5 1962 (fruit), Furse 2253 (K); in convallibus montium districtus Salma (= Shahpur), Szovits (G).
Tabris: Kuh-e Sahand, stony slopes among grass and *Medicago* ssp., 3050 m, 31.5 1962, Furse 2333 (K); pass between Ahar and Tabris, SW. of Ahar, cliffs and rocks facing E. & W., 1700 m, 3.7 1968 (fruit), Rix 978 (cult.); S. foothills of Kuh-e Savalan, 32 km W. of Ardabil, outcrops of igneous rock with stabilized scree, 6.5 1962 (fruit), Furse 2423 (K). — *Kordestan*: Tiz-tiz, between Marivan and Sanandaj, Furse 3392 (cult.). — *Also examined*: Mathew et al. in BSBE 1281; Furse & Synge 247, 2173; Rechinger 39321, 40614.

This subspecies occurs throughout Azerbaijan from near Baku south to Kordestan near Marivan. It is very variable in overall size and in flower colour, but the difference between the forms which have been described as species do not seem worthy of taxonomic recognition. *F. foliosa* Bornm. is the same as *F. karadaghensis* Turrill. Both came from the same area (and probably from the same Egger bulb collection) north of Tabriz. Plants from this area are usu-

ally larger than those from further south, and their perianth segments have a yellowish rather than greenish ground colour.

F. grossheimiana Loz.-Lozinsk. was described from Kuh-e Sahand south of Tabriz. It approaches *F. michailovskyi* in flower colour, being partly yellow on the outsides of the perianth segments, and partly purplish-brown, but in all other characters is typical of subspecies *kurdica*. Artificial hybrids between subspecies *kurdica* from south Van vilayet and *F. michailovskyi* have strikingly similar colouring to some collections from Kuh-e Sahand (e. g. P. Furse 2333). These collections may be indicative of the presence (either former or undetected) of *F. michailovskyi* in this area, and of natural hybridization between the two species.

F. crassifolia ssp. *kurdica* is usually a dwarf plant with a linear nectary. This distinguishes it from *F. kotschyana* and its allies. From *F. straussii* it differs in having all the leaves alternate, and from *F. reuteri* in its short stem, regularly spaced leaves and flower colour.



8. *Fritillaria straussii* Bornm.

Bornmüller Mitt. Thur. Bot. Ver. 20: 45 (1904).
— Type: Iran, Kermanshah, in monte Kuh-Sefid, 2 May 1903, Th. Strauss (holotype JE, non vidi; photograph K!).

Icon. The Lily Year Book 1964: Fig: 43 (1963).
— Wendelbo, Tulips and Irises of Iran Fig. 29 (1977).

Bulb up to 2.5 cm diameter; bulbils or stolons unknown. *Stem* ca 10 cm, papillae absent. *Leaves* 5–10, not glaucous; the lower 40–80 x 10–35 mm, broadly lanceolate to ovate, opposite or in a whorl of 3; the middle usually opposite; the upper up to 5 cm, linear, in a whorl of three or opposite. *Flowers* 1–2(–4), broadly campanulate, perianth segments greenish when young, often maturing to dark reddish-brown, tessellated all over, fascia obscure; the outer

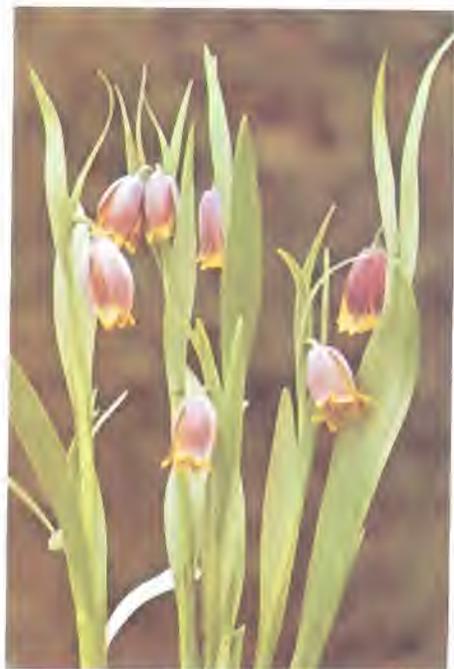
25–27 x 8–9 mm; the inner 9–12 mm wide, obtuse. *Nectaries* 10 x 2 mm, linear, greenish, ca 5 mm above the base of the segment. *Filaments* ca 10 mm, slender, papillose; anthers 3–4 mm after dehiscence. *Style* ca 8 mm, papillose, trifid to half or 3/4 of its length; style arms slender, reflexed. *Capsule* not winged. — Flowers May to June.

Loose slopes dominated by large *Umbelliferae* and *Astragalus*, and upper part of deciduous *Quercus* scrub, 1500–2500 m. Map 4. — Also recorded from Turkey, vilayet Hakkari (Watson et al. 1556, 1588, — cult.).

Specimens seen:

Kordestan: Marivan, 2000–2100 m, shaly slopes

Fig. 3 (above). *F. crassifolia* (Furse 3392). — Fig. 4 (below, left). *F. crassifolia* "grossheimiana" (Furse 2333). — Fig. 5 (below, right). *F. assyriaca* (Furse 2173).



lated, the leaves are narrowly lanceolate, and the stem is papillose at ground level. It appears to be almost restricted to the area around Hamadan, being frequent on Kuh-e Alwand where it grows in damp ground by streams. Gilliat-Smith 2493 from Tabriz district is smaller and has narrower leaves than the specimens from around Hamadan; it is also atypical in having the stem papillae very poorly developed, and present on only one specimen out of the seven examined.

11. *Fritillaria caucasica* Adams

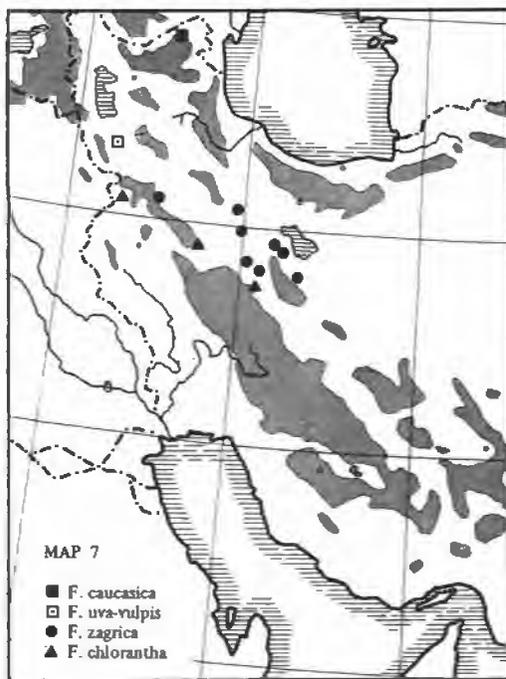
Adams in Weber & Mohr., Beitr. 1: 50 (1805). — Type: Hab. ad thermas Constantinomontanas (non vidi).

F. tulipifolia M. Bieb., Fl. Taur — Cauc. 1: 270 (1808). — Type: Circa thermas Constantinomontanas freq. (non vidi).

F. armena var. *lucida* Hausskn. & Bornm., Mitt. Thur. Bot. Ver. 20: 47 (1904). — Type: Turkey, Amasia, in rupestris alpestris montis Sanadagh, 14 May 1890, Bornm. 2550 (isotype K!). *Icon. Bot. Mag.* 5969 (1872).

Bulb up to 2 cm diameter; usually without bulbils, stolons unknown. *Stem* 10–30 cm, papillae absent. *Leaves* 3–4(–6), all alternate, broadly lanceolate to lanceolate, the lowest 3–10 x 0.8–2.0 cm. *Flowers* 1(–2), narrowly campanulate, sometimes constricted at the mouth; perianth segments 22–30 mm, dark purplish-brown, usually with a waxy bloom outside, sometimes paler inside, not tessellated; the outer 5–12 mm wide, usually acute; the inner 6–14 mm wide, acute or obtuse. *Nectaries* 4–5 mm, linear-lanceolate, greenish, at the base of the segment. *Filaments* 10–18 mm, slender, glabrous or papillose; anthers 4–8 mm. *Style* 9–17 mm, slender, undivided, glabrous or papillose. *Capsule* up to 3 cm, not winged, cylindrical, tapering towards the base. — Flowers April to June.

Alpine pastures, openings in coniferous forest, shady rock ledges, 1700–2900 m. Map 7 & 8. — Also known from Soviet Georgia and Turkey, vilayets Amasya, Erzurum, Kars, Ağrı.



Specimens seen:

Azerbaijan: Mont. Quareh Da, near Aliabad, 20 km SW. of Kaleybar, 2300–2500 m, steep rocks at head of enclosed mountain valley. 20. 7 1971 (fruit), Rechinger 44325, Lamond 4934 (W, E).

F. caucasica is only known from one locality in Iran. It is usually a plant of clearings in coniferous forest or closed grassland, and is frequent in the southern Caucasus and in north-east Turkey. The Iranian locality represents the southernmost extension of its range; here, as in the westernmost localities near Amasya in Turkey, it is found in peaty soil on shady rock ledges. It differs from other Iranian species in its longer slender style and filaments.

Most of the collections of this species from the southern Caucasus have glabrous styles and filaments, but in the Turkish and Iranian spe-

cinens the styles and filaments are papillose. This may be a sign of introgression with other species in this group, probably *F. assyriaca*.

12. *Fritillaria zagrica* Stapf

Stapf, Ver. Zool. Bot. Ges. Wien 38: 551 (1888). — Type: Von Elwend, von Sultanabad und von Kuh-i-Barf bei Schiras, Polak (non vidi).

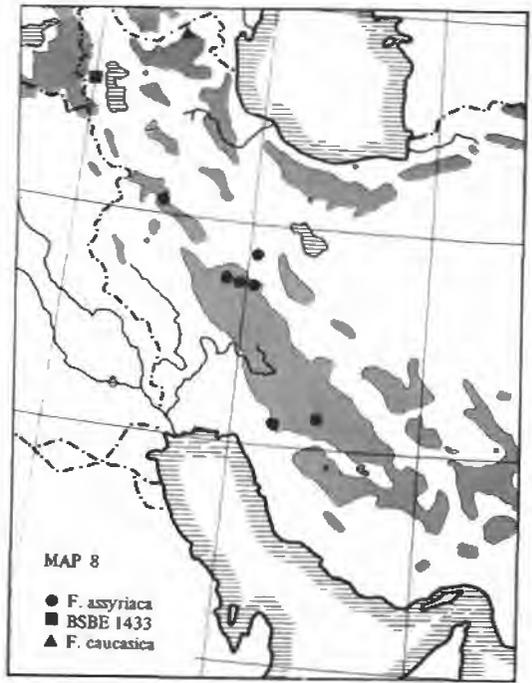
Icon. The Lily Year Book 1964: Fig. 41 (1963). — Wendelbo, Tulips and Irises of Iran; Fig. 27 (1977).

Bulb up to 2 cm diameter; bulbils few, stolons unknown. *Stem* 4–12 cm; papillae sometimes present; lowest leaves with a wavy edge. *Leaves* 4–7, usually 5–6, glaucous, all alternate or the lowest subopposite, lanceolate, 3–9 x 0.6–1.6 cm. *Flowers* 1–2, narrowly campanulate; perianth segments 12–18 mm, outside and inside dark purplish brown with a yellowish apex and a waxy bloom outside; the outer 4–6 mm wide, ovate-lanceolate, acute, the inner 6–8 mm wide, oblanceolate, obtuse. *Nectaries* 3 mm, lanceolate, 1 mm above the base of the segment. *Filaments* 8 mm, somewhat swollen, papillose; anthers 3–4 mm. *Style* 8–9 mm, slender, papillose or subglabrous. *Capsule* cylindrical, up to 3 cm, tapering towards base, not winged. — *Flowers* March to May.

Mountain steppe, often by late snow patches, 1800–3000 m. Map 7.

Specimens seen:

Tehran: Kuh-e Barfi, prope Sultanabad (Arak) 20.4 1895, Strauss (GE); Arak to Golpaigan, 25 miles SE. of Arak, shaley slopes, 2000 m, 23.4 1962, Furse 1572 (K). — *Hamadan*: Qasvin to Hamadan, 32 km from Hamadan, 1800 m, 20.4 1962, Furse 1108 (K); Assadabad pass 23 km W. of Hamadan, open slopes of high mountains, 2500 m, 31.3 1942, Trott 1041 (K). — *Lorestan*: Khorramabad, 40 km south of Arak, 23 km north-east of Azna, rocky mountain slopes below limestone, 18.4 1962 Furse 1497 (K). — *Kordestan*: Hamadan to Sanandaj, 12 km E. of Sanandaj, 2000 m, 16.5 1962 (fruit), Furse 2050 (K). — *Esfahan*: Kuh-e Dar-



reh, 2500 m, 22.4 1963, Mathew et al. in BSBE 949 (K); Golpaigan to Damaneh, Kuh-e Darebid, rocky slopes facing NE., 3000 m, 5.5 1962, Furse 1743 (K); Kuh-e Daralshar above Damaneh, 3000 m, 15.4 1962, Furse 1438 (K).

This species appears to be confined to Iran, although there is one doubtful record from Turkey near Van. It is characterized by the rather glaucous leaves, dark purple flower with a bright yellow apex, and somewhat slender style. Most collections have stem papillae present on about half the specimens.

13. *Fritillaria chlorantha* Hausskn. & Bornm.

Haussknecht & Bornmüller, Mitt. Thur. Bot. Ver. 20: 45 (1904). — Type: Iran, Hamadan, et Luristaniae in monte Schuturunkuh, May 1897; in monte Elwend agri Ecbatani, 15 May 1895, Th. Strauss (W, non vidi).
Icon. Journ. Roy. Hort. Soc. 90: Fig. 4 (1965).

Bulb up to 2 cm diameter; bulbils few; stolons unknown. *Stem* 4–10 cm; papillae absent. *Leaves* 4–10, usually 5, shining green, not glaucous, all alternate; the lowest broadly lanceolate to lanceolate 6–10 x 1.2–5 cm; the upper linear-lanceolate ca 5 cm long. *Flowers* 1–2, narrowly campanulate; perianth segments green outside, yellowish sometimes with purple markings inside and on the inner segments. rarely purple outside; the outer 15–25 x 3–4 mm, the inner somewhat wider. *Nectaries* 3 x 1 mm, lanceolate, green, 1 mm above the base of the segment. *Filaments* 6–7 mm, swollen, densely papillose; anthers 6–7 mm. *Style* 5–10 mm, usually 8 mm, rather stout, 3-fid at apex for 1–2 mm. *Capsule* cylindrical, without wings. — Flowers April to May.

Mountain steppe, 1800–2000 m. Map 7.

Specimens seen:

Lorestan: Khorramabad, Shuturunkuh, north-facing rocky and stony hillside, 1800 m, 7.4 1963, Mathew in BSBE 692, 694, 695 (K) and 1885 (cult.); Ushtaran-Kuh S. of Thuin, north- and east-facing slopes among stones, 2310 m, 27.4 1966, Archibald 1609 (K). — *Bakhtiari*: Gahar, 2800 m, 1.6 1941, Koelz 17992 (W). — Also recorded from Kordestan, Marivan, Furse 3397 (Furse, pers. comm.).

This species is characterized by its short stems, broad shining green leaves and, usually, a pure green flower. The style is rather stout and 3-fid at the apex. Two collections BSBE 694 and 695, have perianth segments marked with purple; this may be a sign of hybridization with *F. zagrica* or *F. assyriaca*, both of which occur in the same area. Furse 3397 was collected as fruiting material and included both *F. chlorantha* and *F. straussii*.

Bornmüller (l. c.) described this species as a member of section *Trichostylae* Boiss. on account of its divided style, but the habit of the plant, the shape of the flower and the posi-

tion of the nectaries show it to be related to *F. caucasica* and members of section *Olostylae* Boiss., and it is especially close to *F. armena* Boiss. from NE. Turkey.

14. *Fritillaria assyriaca* Baker

Baker, Journ. Linn. Soc. London (Bot.) 14: 265 (1874). — Type: Turkey, Mardin, Assyria, in dumetis supra Terek, March 1867, Haussknecht (holotype K!, isotype BM!, ZU!).

F. canaliculata Baker, Gard. Chron. 3, 7: 288 (1890). — Type: Turkey, Diyarbakir, Senar (= Cinar), spec. ex cult., Sintenis (K!).

Icon. The Lily Year Book 1964: Fig. 44 (1903).

Bulb up to 3 cm diameter; stolons or bulbils often present. *Stem* 4–20 cm (elongating to ca 35 cm in fruit); papillae often present at ground level. *Leaves* 4–6(–12), the lowest 3–9 x 0.4–1.2 cm, sometimes opposite; the rest shorter, alternate, usually canaliculate, especially when young, linear, glaucous. Radical leaves ovate-lanceolate. *Flowers* 1–2(–5), narrowly campanulate; perianth segments greenish, reddish or purplish-brown, often with green fascia, yellowish inside, sometimes recurved towards the tip; the outer 15–25 x 4–5 mm, narrowly oblong; the inner 5–10 mm wide, usually obtuse. *Nectaries* 2–4 x 1 mm, linear-lanceolate, ca 1 mm above the base of the segment. *Filaments* 5–9 mm, swollen, papillose; anthers 4–6 mm. *Style* 5–10 mm, usually 7–8 mm long, 1.5–2 mm in diameter, not or slightly lobed at apex. *Capsule* cylindrical, ca 2.6 cm long, not winged. — Flowers March to May.

Cultivated fields, mountain steppe, rocky slopes, 1000–2500 m. Map 8. — Also recorded from Turkey (W. to Ankara) and Iraq.

Specimens seen:

Azerbaijan: Rezaiyeh; Sir Kuh, near Rezaiyeh, grassy slopes, 1800 m, 8.5 1963, Mathew in BSBE 1433 (K). — *Tehran*: Kuh Arak, rough cultivated stony ground, south-west slope, 1800



m, 4.4 1963, Mathew in BSBE 657 (K). — *Kordestan*: 32 km E. of Sanandaj towards Hamadan, fallow field, 1600 m, 15.5 1962 (fruit), Furse 2016 (K); *ibid.*, 1800 m, 16.5 1962 (fruit), Furse 2049 (K). — *Lorestan*: Khorramabad: 48 km west of Azna, edge of cornfield, 1800 m, 21.4 1962 (fruit), Furse 1524 (K); Dorud, 2400 m, 10.3 1941, Koelz 17125 (W); Shuturunku, north-facing rocky and stony hillside, 1800 m, 7.3 1963, Mathew in BSBE 693 and 696 (K). — *Fars*: Bebahan to Kaiserun, 120 km from Bebahan, stony slopes at foot of N-facing cliff, 1200 m, 28.3 1962 (fruit), Furse 1244 (K); in valley east of Ardekan, open ground in full sun, 7.4 1969, Hewer 918 (K).

This species is characterized by the narrow canaliculate leaves and the short, stout undivided style. It is widespread and very variable, especially in width of leaf.

BSBE 1433 is included here under *F. assyriaca* but differs from typical specimens in its broader leaves and longer styles. It is intermediate between *F. assyriaca* and *F. caucasica*; similar plants are widespread and common in Turkey, where there is much introgression between the species of this group. Furse 2049 also has broader leaves than usual.

Vegetative reproduction is common in this species, either by bulbils or stolons. It is usually found in open habitats, often as a weed of cultivation.

The name *F. assyriaca* has often been used for *F. uva-vulpis* (q. v.). The two species are found growing together in cornfields in N. Iraq.

15. *Fritillaria uva-vulpis* Rix

Rix, Kew Bull. 29(4): 651 (1975). — Type: Iraq; Rowanduz; Haji Omran, 2100 m, 14 April 1958, Polunin 5059 (holotype E!; isotype K). *Icon.* Kew Bull. 1. c.

Bulb up to 3 cm diameter, usually with few bulbils; stolons unknown. *Stem* 10–20 cm, papillae absent. *Leaves* 3–5, usually 4, green, not glaucous, shining, all alternate; the lowest 8–12 x 1–2 cm, narrowly lanceolate, acute. Radical

leaves narrowly lanceolate. *Flowers* solitary, narrowly campanulate, usually rounded, narrowed at the mouth; perianth segments outside purplish-grey, glaucous, edged with yellow, inside yellowish, the outer 20–28 x 6–7 mm; ovate or ovate-lanceolate, obtuse or acute; the inner 6–12 mm wide, obovate, obtuse. *Nectaries* ca 4 mm long, 1.3 mm wide, narrowly ovate, 1 mm above the base of the segment. *Filaments* 6–9 mm, papillose, swollen; anthers 7–9 mm before dehiscence. *Style* 5–7 mm, thick, papillose, undivided. *Capsule* not winged. — Flowers March to April.

In cornfields and hay meadows, 1000–2500 m. Map 7. — Known also from Iraq and Turkey, vilayet Siirt.

Specimens seen:

Azerbaijan: Rezaiyeh, 20 km SE. of Mahabad, 1700 m, marshy hay meadows and in corn, 20.3 1962 (fruit), Furse 2173 (K).

Fritillaria uva-vulpis has usually been called *F. assyriaca* in horticulture. Examination of the type specimens showed the two to be distinct. *F. uva-vulpis* has usually 4 widely spaced green lanceolate leaves, whereas *F. assyriaca* has 4–6 glaucous, linear, canaliculate leaves. The flowers of *F. uva-vulpis* are usually very rounded — those of *F. assyriaca* narrowly tubular-campanulate. *F. uva-vulpis* is found in a small area of S. Turkey, NE. Iraq and W. Iran, within the *Quercus* forest zone, often in cornfields or haymeadows.

Acknowledgements

I should like to thank Mrs Joanna Lowe for the drawings and the staff of the following herbaria, which I visited, for their help and kindness: BM, E, G, GB, K, M, and P. I should like to record the debt I owe to Admiral P. J. Furse, and thank him for his advice and for providing me with living material from his collection. I thank the following for financial support during field work: the Royal Society, Corpus Christi College, Cambridge, and the British Petroleum Co. Ltd.

References

- Bornmüller, J. 1930: Über zwei neue Fritillarien der Flora Persiens, sowie Bemerkenswertes über andere orientalische Arten dieser Gattung. — Fedde Repert. 27(3): 337–348.
- Freedman, A. & Jones, P. 1969: *Fritillaria reuteri* Boiss. — Journ. Roy. Hort. Soc. 94: 133.
- Gilliat-Smith, B. & Turrill, W. B. 1930: A contribution to our knowledge of the Flora of Azerbaijan, N. Persia. — Kew Bull. 1930: 489.
- Lozina-Lozinskaya, A. S. 1935: In Komarov, V. L. (ed.), Fl. U.R.S.S. vol. 4: 297–298. — Leningrad.
- Rix, E. M. 1974: Notes on *Fritillaria* (Liliaceae) in the eastern Mediterranean region, I & II. — Kew Bull. 29(4): 633–654.
- Walter, H. 1956: Das Problem der Zentralanatolischen Steppe. — Die Naturwissenschaften 43:97–102.