THE GENUS *COLCHICUM* IN TURKEY. I. NEW SPECIES

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Six new species of *Colchicum* (*Colchicaceae*) are described (*C. munzurense*, *C. minutum*, *C. sanguicolle*, *C. micaceum*, *C. heldreichii*, *C. inundatum*). The first two flower in early spring with synanthous leaves, the rest are autumn-flowering. All are endemic to Turkey, and confined to small geographical areas. Chromosome numbers and notes on phenology, vegetative reproduction, phytogeography and ecology are provided for all the species.

Keywords. Chromosome numbers, *Colchicum*, phytogeography, reproduction, taxonomy, Turkey.

INTRODUCTION

For his treatment of the genera *Colchicum* and *Merendera* (considered as congeneric by the present author) Brickell (1984) took up 26 regular species for Turkey and added a few others under the heading 'Species imperfectly known or doubtfully recorded'. He also stressed the taxonomic problems of the genus (genera), due partly to the paucity of adequate, well-documented material available and partly to the difficulties stemming from the fact that species with hysteranthous leaves have often been described from flowering material alone or collected in that state. This is probably also the reason for the relatively few species described in modern times despite rather extensive collecting, the latest being *C. burttii* (Meikle, 1977) and *C. baytopiorum* (Brickell, 1983). The present author has studied the genus *Colchicum* in Turkey for some years and travelled across all of the country mainly west of the 'Anatolian Diagonal' (Davis, 1971). Corms have been taken home for cultivation and scientific experiments, and quite a few have turned out to be undescribed species. This instalment is the first of an intended series of articles on the genus in Turkey.

MATERIAL AND METHODS

All species except one (*C. munzurense*) were studied and collected in the field by the author. For further study these plants, together with living material (including *C. munzurense*) supplied by other collectors, were cultivated in the Botanical Garden, Göteborg, partly in pots in the experimental plots, partly free-planted in the bulb garden. In addition dried collections from a number of herbaria (see Acknowledgements) have been examined, and these are listed after each species.

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All measurements and other features in the descriptions refer to wild material, except for flowers of one species (*C. munzurense*) not seen or collected in a flowering condition in nature. Shape and size of leaves refer to mature basal leaves, colour of anthers to the condition before dehiscence, size of anthers and length of styles to the condition after anther dehiscence.

Chromosome numbers were determined on cultivated material from localities marked by an asterisk in the specimen lists. Counts were mostly made on root-tips cold treated at 0°C, fixed in Navashin–Karpechenko fluid, sectioned, and stained in crystal violet. Additional studies were made on root-tips pretreated for 3 hours in 2mM 8-hydroxyquinoline solution at 10°C, fixed in Carnoy solution and stained in acetic orceine.

For each species the general distribution in Turkey is given, followed by a description of habitats and altitudinal distribution. The grid squares given (e.g., A5, B3) are those used in the maps of Davis's *Flora of Turkey* (1965–1988). The phytogeography of the species is summarized by geoelement terms (Fischer & Fischer, 1981), which indicate those phytochoria mainly covered by the distribution of the taxon concerned. The chorological concepts are based mainly on Davis (1971), Zohary (1971, 1973), Hedge & Wendelbo (1978), and Léonard (1989).

DESCRIPTIONS

1. Colchicum munzurense K. Persson, **sp. nov. Fig. 1A–B.**

Cormus ovoideus interdum sobolifer et tum subhorizontalis vel verticalis, forma irregularis. Folia 3, synantha, primo suberecta vel erecto-patula, tandem arcuata interdum spiraliter recurva, linearia vel lanceolato-linearia, maturitate 20cm × 7–10(–12)mm. Flores 1–2, albi vel pallidissime purpureo-lilacini. Perianthii segmenta 1.8–3cm × 2.5–7.5mm, anguste oblonga vel oblanceolata, plana, recurva, distincte 7–11-nervia, sine lamellis basalibus. Filamenta flavida; antherae fuscae, 2.5–3mm longae. Stigma punctiforme.

Type: Turkey. B7 Tunceli: 19km from Tunceli to Ovacık along Munzur river, steep scree slopes and cliff ledges, calcareous rock, 950m, 11 iv 1990, *Kammerlander, Pasche, Persson & Zetterlund* 90-193* (holo. GB).

Corm irregular in shape, main part of corm narrowly ovoid to ellipsoid-ovoid or ovoid, c.1.2–2 × 0.8–1.5cm, with 2 (or more) usually shoot-bearing lobes up to 4cm long, 0.5–1.3cm thick, obliquely horizontal to nearly vertical; tunics delicately membranous, ±ephemeral, glossy light yellowish brown to duller mid-brown, neck mostly missing. *Cataphyll* whitish, c.5–8.5cm long above corm. *Leaves* 3, synanthous, linear to lanceolate-linear, at anthesis extending c.2.5–6(–7.5)cm from cataphyll, usually distinctly shorter than flowers, c.3.5–8mm wide, suberect to erecto-patent, sometimes arcuate, somewhat delicate in texture and rather flat but narrowly furrowed/keeled on upper/underside along ±transparent midvein, subacute to obtuse, often brownish purple on margins and apex; at maturity up to 20cm × 7–10(–12)mm, erecto-patent-

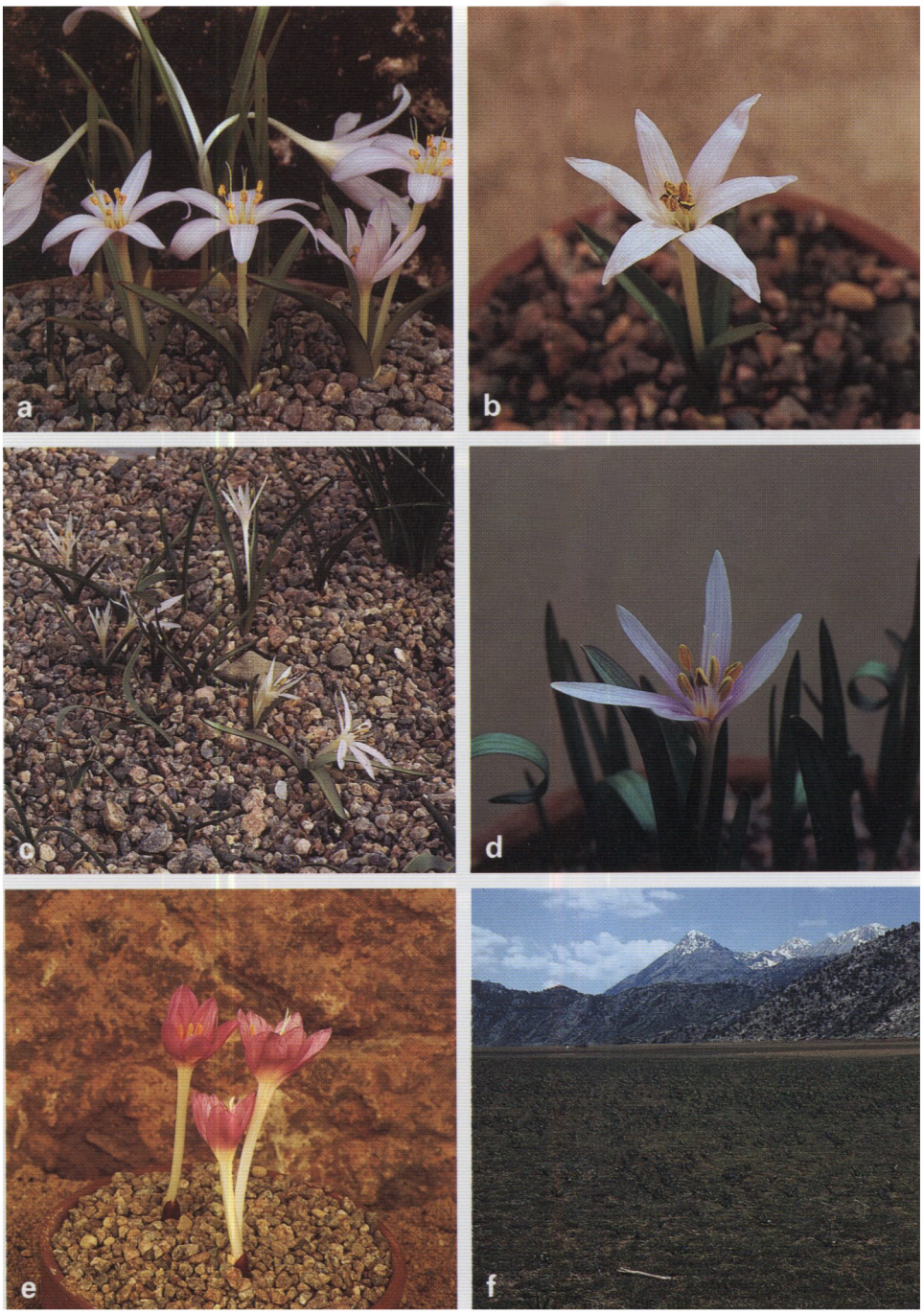

FIG. 1. A–B, *Colchicum munzurense*, note flat perianth segments (*Kammerlander et al.* 90–193, cult. 17 ii & 6 i). C–D, *C. minutum*, note narrow channelled perianth segments (C, *Zetterlund* 88–19, cult. 25 iii; D, *K. Persson* 431, cult. 10 ii). E, *C. sanguicolle*, note deeply stained cataphyll (*T. Baytop & Leep* ISTE 36226, cult. 24 ix). F, *C. inundatum*, type locality with mass vegetation of the species (*K. Persson* 505, 17 iv 1991).

arcuate, occasionally spirally recurved in outer part, somewhat pale and rather glossy (yellowish) green, margins indistinctly cartilaginous, glabrous. *Flowers* 1–2 (rarely −3), very fragrant; perianth tube entire, exceeding the cataphyll by 2.5–5(–7)cm, slender but distinctly dilated in uppermost part, whitish to yellowish white; segments flat, erecto-patent to patent-recurved in full sun, 1.8–3cm × 2.5–7.5mm, narrowly oblong to narrowly oblanceolate, subacute to narrowly obtuse, white to palest purplish lilac, often darker along basal margins, with 7–11 very distinct, sometimes purplish veins; without basal lamellae. Outer *stamens* 7–10mm, inner 8.5–12mm; filaments yellowish white to pale yellow, slightly swollen base dull yellow to green-yellow; anthers versatile, 2.5–3mm, dark purplish grey to chocolate-brown or blackish; pollen mid- to deep yellow. *Styles* ±equalling the stamens, white to pale yellow or yellowish green, often thin and wiry, straight at apex, stigmas punctiform. *Capsules* at ground level, 1–1.5 × 0.7–1cm, ellipsoid to subglobose; seeds few (up to 8 per locule), dimidiate-globose or oblong-ellipsoid to subglobose, 3–4 × 2.3–3.5mm, brown, raphe merely a narrow keel or a pale, indistinctly defined area near micropyle slightly swollen. Flowering in early spring at snow melt (February–April).
Chromosome number: 2n = 24.

Similar species. *C. munzurense* is somewhat similar to *C. minutum* K. Perss. in general habit though it generally gives the impression of a slightly larger plant. Both are more or less soboliferous, *C. minutum* only more pronouncedly so. However, in detail they differ in a number of characters (see below under *C. minutum*) and are probably not really related.

Corms and vegetative reproduction. The 'hypopodium' lobe including the renewal bud is frequently rather long, growing obliquely horizontally rather than vertically. Also the 'reserve buds' axillary to the second and even third leaves mostly develop contemporarily, often in similar short to long lobes. A plantlet developed from such 'extra' lobes may produce flowers simultaneously with the main shoot.

Distribution and habitat. Endemic to EC Turkey (Fig. 3). Scree, boulder beds, cliff ledges recently uncovered from snow, light oak forests; on limestone; 950–1000m. Irano-Turanian element (East Anatolian [Armeno-Kurdic] district).

Additional specimens. TURKEY. B7 Tunceli: 27km from Tunceli to Ovacık along Munzur river, south-facing slope in light deciduous oak forest, 1000m, 11 iv 1990, *Kammerlander, Pasche, Persson & Zetterlund* 90-208* (GB).

C. munzurense is only one of a number of interesting endemics occurring in the Munzur area which has lately been recognized as an important centre of plant diversity by The World Wide Fund For Nature (WWF) and The World Conservation Union (IUCN) (Davis *et al.*, 1994). For instance, *Ranunculus munzurense*, *Omphalodes davisiana*, *Stachys munzurdagensis*, and *Origanum munzurense* are found here. Several take up a more or less isolated taxonomic position among their relations, e.g. *Campanula yildirimlii* (Kit Tan & Sorger, 1986) which represents a

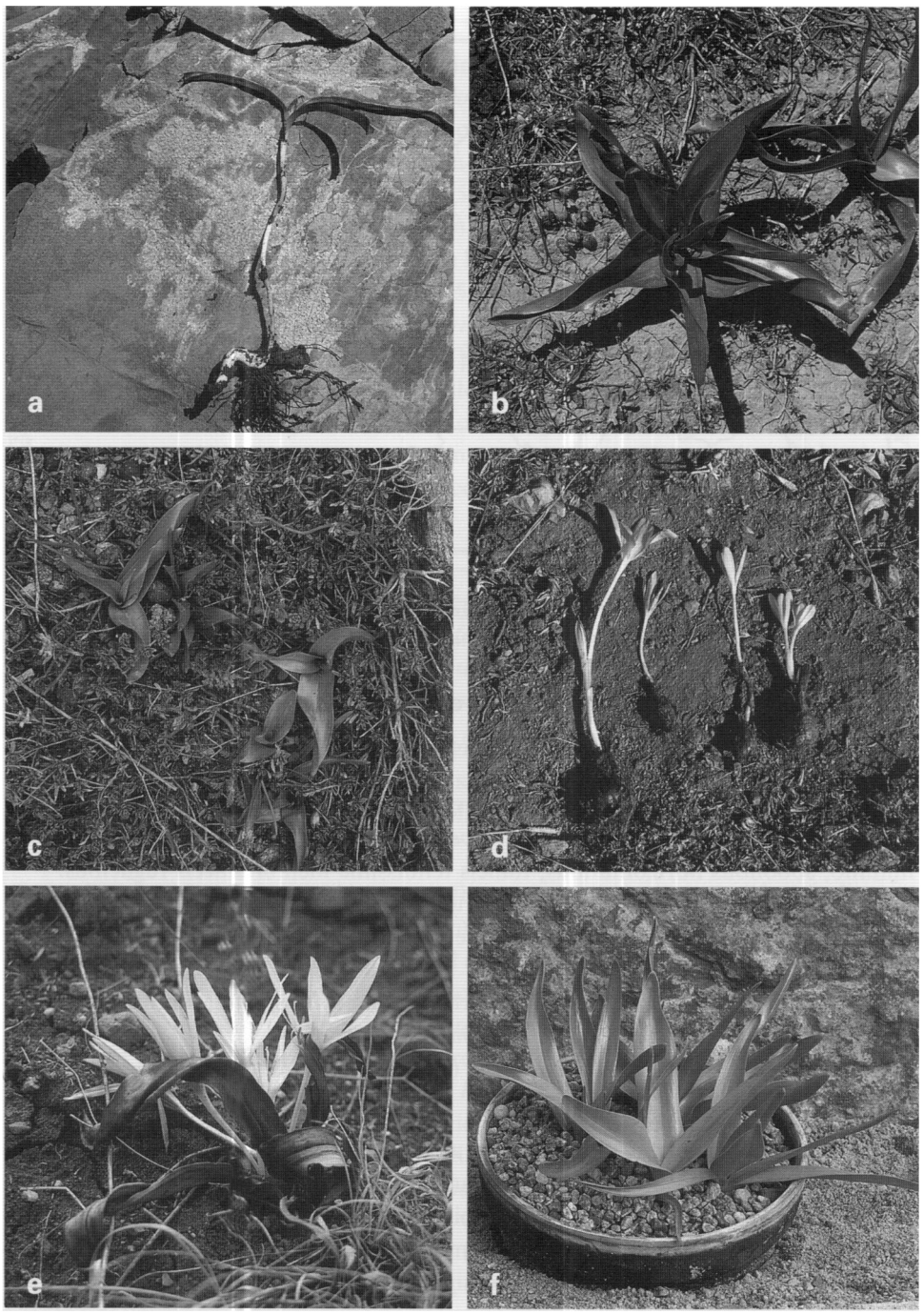

FIG. 2. A, *Colchicum minutum* (*K. Persson* 431, l. n. 19 iv 1987, note soboliferous corm). B, *C. inundatum* (*K. Persson* 505, l. n. 17 iv 1991). C–D, *C. micaceum* (C, *K. Persson* 524, l. n. 24 iv 1991; D, *K. Persson* 553, l. n. 21 viii 1994). E–F, *C. heldreichii* (*K. Persson* 555; E, l. n. 29 viii 1994, note withered leaves with the flowers; F, cult. 9 iv).

FIG. 3. Distribution of *Colchicum munzurense* (●), *C. minutum* (■), *C. sanguicolle* (▲), *C. micaceum* (★), *C. heldreichii* (○), *C. inundatum* (✪), and *C. persicum* (✱).

very unusual type within its genus. To a degree this is certainly true also of *C. munzurense.*

2. Colchicum minutum K. Persson, **sp. nov. Figs 1C–D, 2A.**

Planta parvula; species habitu cum *C. serpentino* optimo congruens, sed differt cormo minimo, sobolibus horizontalibus, tunicis tenuissime membranaceis fugacibus.

Type: Turkey. C3 Antalya: 10km from Gündoğmuş to Manavgat, *Quercus coccifera* scrub, slight depression in deep, moist terra rossa, 1000m, 19 iv 1987, *K. Persson* 431* (holo. GB).

Syn.: *C. hiemale* Siehe in sched. ad Fl. Orient. No. 87, *nom. nud.*, non Freyn (1897).
C. issicum Siehe l. c. No. 97, *nom. nud.*
[*C. psaridis* sensu Brickell in Davis (ed.), Fl. Turk. 8: 335 (1984), non Heldr. ex Hal. (1904).]

Corm ±soboliferous, central part small, at the most c.1cm diam., with 2 (or more) usually shoot-bearing lobes, mosly ±subterete, (1–)2–5cm long, 3–7mm thick, obliquely vertical to horizontal; tunics thinly membranous, yellowish red-brown to yellowish brown, older tunics and neck mostly missing. *Cataphyll* whitish, delicate (frequently missing), often narrow and sinuous, 6–10cm long. *Leaves* 3 (rarely 4), synanthous, linear to lanceolate-linear tapering to a subobtuse apex, at anthesis extending 2–6(–7)cm from cataphyll, often reaching flower tips or at least longer than flower tubes, c.2–6(–10)mm wide, erecto-patent to arcuate, channelled with a distinct midvein and a cucullate apex, often stained crimson-purplish on margins

and apex; at maturity 8–20cm × 2.5–8(–15)mm, patent-recurved, distinctly keeled, somewhat pale to mid-green, margins indistinctly to very narrowly cartilaginous, glabrous (rarely scaberulous basally). *Flowers* 1–2(–4), usually very small and slender; perianth tube entire, exceeding the cataphyll by 1.5–4.5(–6)cm, filiform, white sometimes tinged pale purplish pink in upper part; limb narrowly infundibular, segments slightly channelled, 1.5–3(–3.5)cm × 1.3–4(–5.5)mm, linear to narrowly oblong (to narrowly linear-oblanceolate) gradually tapering to a subobtuse or narrowly obtuse tip, sometimes nearly white but usually pale purplish pink, often darker along margins particularly basally, with 5–7(–9) rather obscure veins; basal lamellae absent or very insignificant. Outer *stamens* 6–13mm, inner 9–15(–17)mm; filaments thin, white often purplish pink in upper part, slightly thickened base orange-yellow; anthers versatile, 2.5–4(–5)mm, buff yellow to yellowish grey (to dark grey); pollen yellow. *Styles* ±equalling or somewhat overtopping stamens, whitish, thin, straight to slightly curved in uppermost part, stigmas punctiform. *Capsules* (rarely developed) at ground level, ellipsoid, often suffused purplish carmine; seeds few. Flowering January–March(–early April).
Chromosome number: 2n = 44.

C. minutum is one of the smallest species of the genus, only rivalled by *C. pusillum* Sieber and small specimens of *C. crocifolium* Boiss. and *C. soboliferum* (Fisch. & C.A. Mey.) Stefanov. Only when *C. minutum* grows among other plants in very rich and moist conditions do some specimens show an increase in stature.

Similar species. Similarly to *C. munzurense*, *C. minutum* does not seem to have any close relatives although it has superficial similarities to *C. serpentinum* Wor. ex Miscz. (syn. *C. tauri* Siehe ex Stef.) and *C. munzurense*.

Apart from being generally smaller in all parts, the new species differs from *C. munzurense* in a number of characters: the corm is distinctly soboliferous; leaves at anthesis are relatively longer, at maturity more patent, never spirally recurved in outer part, more channelled, thicker, and darker green; the flowers are more narrowly infundibular with channelled, more obscurely veined segments (in *munzurense* segments are very distinctly veined, flat, and often patent/reflexed); stamen filaments and styles are white, not yellowish or greenish as in *munzurense*.

The species figures as '*C. psaridis*' in *Flora of Turkey* (Brickell, 1984) but except for the soboliferous habit, the two species are not really similar. *C. psaridis* Heldr. ex Hal. is a Greek endemic (Peloponnesus) with usually two leaves (3 only in very luxuriant specimens) and bright purplish pink (rarely pale) flowers. It is closely related to *C. cupanii* Guss. and its allies. One (*Allison et al.* 28) of the two collections listed as '*C. psaridis*' in *Flora of Turkey* is *C. serpentinum*, not *C. minutum*.

C. hiemale sensu Siehe is *C. minutum*, not *C. baytopiorum* C.D. Brickell as stated in Brickell (1983). The collection was made near Anamur (C4), probably on the same locality as *Markgraf* 11121, i.e. in red soil in a moist doline, conditions typical of *C. minutum*. As far as I know, *C. baytopiorum* (more a woodland plant) is not known to occur east of Manavgat (C3).

Corms and vegetative reproduction. *Colchicum minutum* is more pronouncedly soboliferous than the preceding species. Siehe noted on the labels to the sheets of *C. issicum* n. n. (*Siehe* Fl. orient. 97): 'Bildet öfter Stolonen'. The soboles, containing the renewal bud and 'reserve' bud(s), respectively, grow more or less horizontally to a length of c.5cm or perhaps more, thereby spreading the plant in all directions. Only three other species of *Colchicum* are decidedly soboliferous (i.e. always developing soboles): *C. soboliferum*, *C. psaridis*, and *C. boissieri*.

The reserve buds usually develop contemporarily with the main shoot at least to leafing stage. Many plantlets only develop leaves, although flowering specimens are not too uncommon. Capsules have been observed only occasionally, however. As in many other plants that are spread vegetatively, clonal growth in this species, by allowing indefinite survival of the genets, allows for a certain reduction in sexual reproduction.

Distribution and habitat. Endemic to S Turkey (Fig. 3). Deep terra rossa in depressions in sparse *Quercus* scrub, old fields, dolines; on limestone; 1000–c.1400m. East Mediterranean element (Taurus district).

Additional specimens. TURKEY. C4 Antalya: Taurus mtns in region of Gündoğmuş N of Alanya, 1370m, 1977, *Allison & Ball* 77/7 (K); 2km from Gündoğmuş to Güselbağ, old fields and *Quercus coccifera* scrub on limestone, 1100m, 1 iv 1990, *Kammerlander, Pasche, Persson & Zetterlund* 90-08* (E, GB); 5.8km from Gündoğmuş to Köprülü, 1200m, 5 iv 1988, *Zetterlund* 88-19* (GB). Içel: Oberhalb Anamur am Flusse, Anf. Jan. 1911, *Siehe* Fl. orient. 87, *sub C. hiemale* (JE, LE); Taurus, Anamur, Sitmalı Yaylası, Roterde über Kalk in einer feuchten Doline, 1100m, 14 ii 1958, *Markgraf* 11121 (Z). C6 Adana/Hatay: An feuchten Orten westlich von Issus in der Cilicia pedia, Jan., *Siehe* Fl. orient. 97, *sub C. issico* (LE).

3. Colchicum sanguicolle K. Persson, **sp. nov. Figs 1E, 4B.**

Species valde distincta, cataphyllo saturate puniceo-purpureo vel atropurpureo; floribus campanulatis, perianthii tubo albo, segmentis intense roseo-purpureis, basi lamellis 1–3-dentatis; stylis rectis, stigmatibus punctiformibus; foliis 3(–4), hysteranthis, loratis, 20–28 × 3.5–4cm, saepe fere flaccidis.

Type: Turkey. C2 Antalya: Akçay, Ak Dağ near Yeşilgöl, 1650–1800m, 29 ix 1976, *T. Baytop & Leep* ISTE 36226* (holo. ISTE; iso. GB).

Syn.: [*C. cilicicum* sensu Brickell in Davis (ed.), Fl. Turk. 8: 348 (1984) p.p., non Dammer (1898).]

Corm usually ±asymmetric, obliquely ovoid-oblong to ovoid, often somewhat flattened, 3–4.5 × 2–3.5cm, often with rather long hypopodium up to 3cm; tunics membranous, of a tissue-paper-like quality, light brown to reddish brown, produced into a neck c.3.5–7.5cm long, extending along at least lower half of cataphyll. *Cataphyll* 7–15cm long above corm, stained ±saturated crimson-purple (HCC 826/0027/828 'Indian Lake/Erythrite Red/Garnet Lake', cf. Wilson 1939, 1942) at least in upper third but often completely. *Leaves* 3(–4), hysteranthous, crowded shortly above ground or somewhat spread on stem, sheaths split along most of their length, blades 20–28 × 3.5–4cm, suberect to erecto-patent, often limp in upper part as if short of

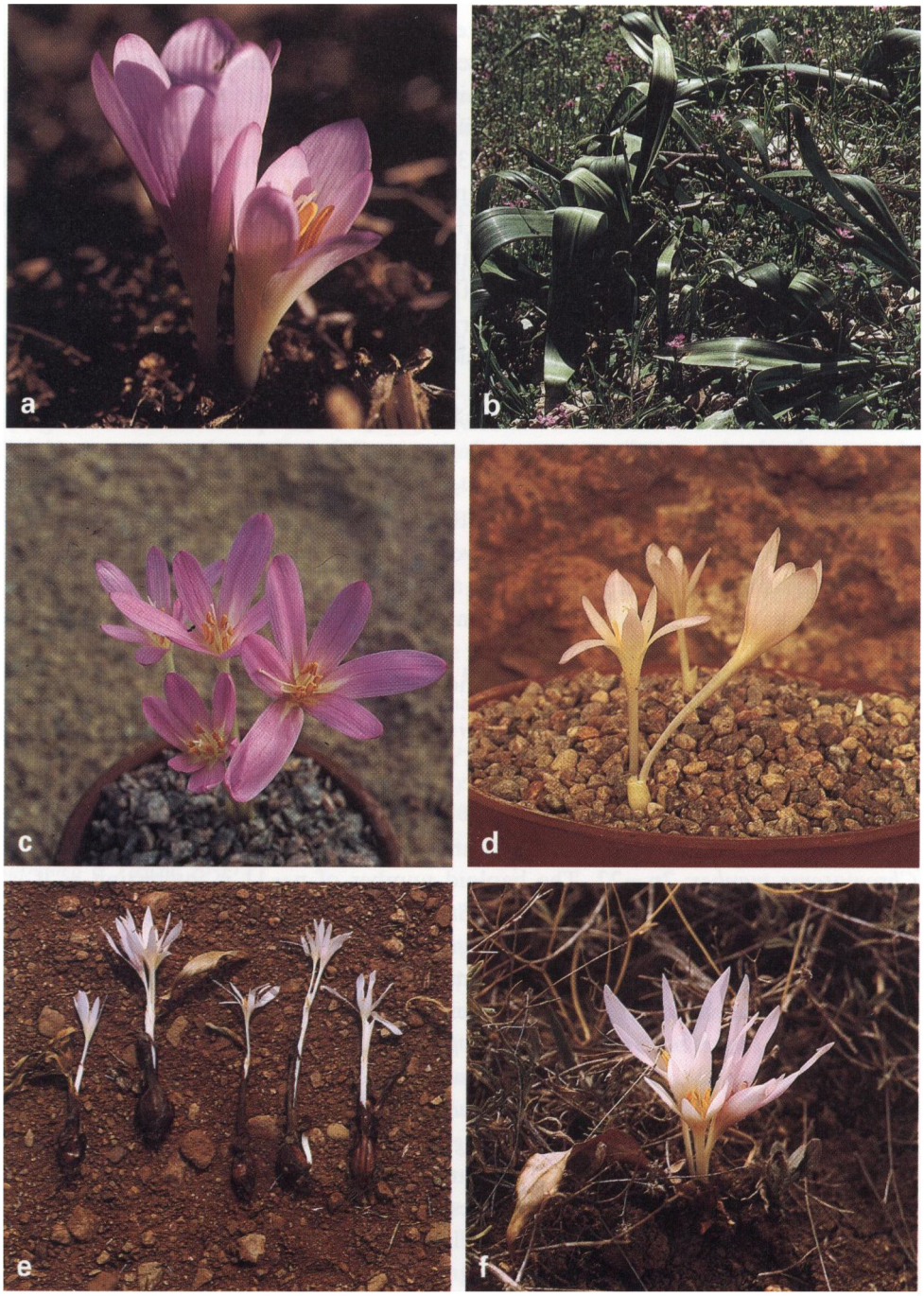

FIG. 4. A, C, *colchicum micaceum*, note distinct veins (A, *K. Persson* 553, l. n. 21 viii 1994, perianth limb is only c.1.5cm!; C, *J. & J. Archibald* 5963, cult. 23 ix). B, *C. sanguicolle* (*K. Persson* 513, l. n. 19 iv 1991). D, *C. inundatum* (*K. Persson* 505B, cult. 29 ix). E–F, *C. heldreichii*, note withered leaves (*K. Persson* 555, l. n. 29 viii 1994).

moisture, lorate, obtuse to truncate or retuse, rather flat, not twisted, sometimes slightly plicate, rather glossy light green frequently flushed brownish purple on lower third and sheath (young leaves often stained all over), above with rather distinct veins, margins not or very narrowly cartilaginous, glabrous. *Flowers* 2–4; perianth tube entire, exceeding the cataphyll by (3–)5–8cm, often stout (to c.5mm diam.), white (rarely shortly suffused purplish pink in upper part); limb campanulate but opening up in full sun, segments 3.3–4.6cm long, outer and inner only differing 1–5mm in length, 0.8–1.7(–2)cm wide, oblanceolate to narrowly obovate, bluntly keeled on the back and a corresponding groove on the face, subobtuse to broadly rounded or retuse at apex, often cucullate, pinkish purple or generally rich rosy purple or violet-purple (HCC 33/34), paler on keels outside and along upper median grooves and white basally; filament channels glabrous, surrounded and almost covered by broad basal lamellae with 1–3 filiform teeth. *Stamens* c.½ to ⅔ of perianth limb in length, outer 1.6–2cm, inner 2–2.6cm, inserted at subequal level in perianth throat or inner series up to 4mm higher; filaments rather slender, white, sometimes curving slightly inwards thus providing space for the anthers to lie horizontally, slightly widened base bordered with pale yellow; anthers versatile, mostly straight, distinctly shorter than filaments (in inner series c.¼ to ⅓ as long), 5–8 × 1.5–1.8mm, bright yellow to golden yellow, thecae without hyaline median wall; pollen bright yellow to golden yellow. *Styles* equalling to much exceeding stamens but rarely reaching tip of perianth segments, white, apex straight or slightly hooked, scarcely thickened, stigmas almost punctiform or very slightly decurrent, 0.4–0.6mm. *Capsules* at ground level or often ±subterranean, 1.7–3 × 1–1.5cm, oblong-ellipsoid to broadly oblong-ovoid, obtuse to short-pointed; seeds c.10–15 per locule, ±globose, 4–5mm diam., brown, raphe region swollen to a yellowish white, rather low appendage. Flowering without leaves September–October; leaves and fruits March–June.

Chromosome number: 2n = 22. The haploid number of n = 11 is interesting as it is postulated to be the basic number in *Colchicaceae* (Dahlgren *et al.*, 1985) and occurs in all four tribes of the family. Most *Anguillarieae* have x = 10 or 11, *Baeometreae* x = 11, *Iphigenieae* x = 11 or 12 (Nordenstam, 1982). In *Colchiceae* the situation is more complicated with many basic numbers, x = 11 being one of them. In the genus *Colchicum* n = 11 has been recorded by the present author in 6 species, e.g. *C. sanguicolle*, *C. feinbruniae* K. Perss. and *C. polyphyllum* Boiss. & Heldr. (Persson, 1993a). 2n = 44 (n = 22) has been found in *C. minutum* (this article), *C. peloponnesiacum* Rech.fil. & Davis (Persson, 1993b) and *C. graecum* K. Perss. (Persson, 1988). Diploid numbers in *Colchicum* species with hysteranthous leaves are very unusual, altogether 6 species all of which are from South-West Asia, i.e. the eastern part of the distribution area (for discussion on ploidy levels, see Persson, 1993a).

The contrast is striking between the 'oxblood'-coloured cataphylls (not known in any other *Colchicum* species) and the pure white tubes, and also between the latter and the perianth limbs stained in a rich hue of purple. The toothed lamellae covering the filament channels is also an unusual trait among the larger, autumn-flowering

species with hysteranthous leaves (subgen. 'Eucolchicum' according to Stefanov, 1926). A characteristic feature of the leaves is a tendency towards a slight decrease in turgidity at least in outer portions: there is a certain quality of limpidness in the leaf blades to the touch. This phenomenon has been observed both in cultivation and in the original localities.

Similar species. *C. sanguicolle* was included under *C. cilicicum* in Brickell (1984), presumably because of the long styles and the size of the leaves. Otherwise the two species do not seem have anything in common and are probably not even closely related. Their areas of distribution are well separated, *C. sanguicolle* being a Lycian endemic, and *C. cilicicum* mainly occurring in Cilicia and Amanus with an outskirt locality in Dedegöl Dağ.

Corms and vegetative reproduction. Compared with other non-soboliferous *Colchicum* species, the corms of *C. sanguicolle* are unusually irregular in shape, and often flat or even more or less concave on the side carrying the shoot. The 'reserve' buds axillary to the second leaves sometimes develop into flowering shoots.

Distribution and habitat. Endemic to SW Turkey (Fig. 3). Meadows, open slopes, edges of cedar forest; 1200–1800m. East Mediterranean element (Lycian Taurus district).

Additional specimens. TURKEY. C2 Muğla: Baba Dağ near Fethiye, cult. K 16 x 1977, *Polunin* 14920 (K); *ibid.*, above Ovacık, open sunny slopes at edge of cedar forest, deep fertile gritty soil, 1200m, also on gently sloping grassy meadows at 1250m, 19 iv 1991, *K. Persson* 513* (E, GB). Antalya: Lycia, cult. spec. from Jardin de Valeyres, ix 1861, 1862 & 1865, iv 1866, *Bourgeau* (G); Gögübeli (Gülübeli Geçidi) to Seki, 1750m, 7 xi 1993, *Kerndorff & Pasche* 93-68 (GB); Elmalı, Ak Dağ, Yeşilgöl, 1600–1800m, 1980, *Sarızar* ISTE 44511 (ISTE); *ibid.*, 1700m, 28 v 1982, *Sütlüpınar* ISTE 48868 (ISTE). C3 Antalya: Tahtali Dağ, 1350m, 5 x 1996, *Kerndorff & Pasche* 96-17.

According to material in the Geneva herbarium, *C. sanguicolle* was collected by Bourgeau, who in 1860 had been sent out by Boissier on a botanical tour to the Elmalı/Ak Dağ area (Cosson, 1866), an expedition that resulted in many interesting collections, a number of which were later described as new species, mostly by Boissier himself and often given a specific epithet after the collector ('bourgaei'). Some living material (seeds or corms), e.g. of *C. sanguicolle*, was obviously also collected and cultivated in the Jardin de Valeyres (Geneva).

4. Colchicum micaceum K. Persson, **sp. nov. Figs 2C–D, 4A, C.**

In statu florenti parvum, *C. micrantho* simile, sed perianthii segmentis intensius roseo-purpureis; ab eo foliis usque ad 6 (nec 3), lanceolato-oblongis (nec linearis) differt. Type: Turkey. B2 Izmir: Ödemiş, Boz Dağ, schistose slopes, 1700–1800m, 15 viii 1950, *Davis* 18189 (holo. E; iso. GB).

The new species was collected by P.H. Davis in 1950 on two mountains in W Turkey. The species is still known only from these two locations, both on micaceous schist (hence its name), where I refound and collected it forty years later.

Corm ovoid to globular-ovoid (to globose), 1.7–3.5(–4) × 1.1–3(–4)cm; tunics membranous to submembranous (outer sometimes subcoriaceous), often several layers, light to mid-brown (inner often somewhat rufous), produced into a neck c.1.5–6(–9.5)cm long, equalling or slightly shorter than the cataphyll. *Cataphyll* whitish, 1.5–6.5(–9.5)cm long above corm. *Leaves* usually 3 plus 0–3 extra ones, hysteranthous, crowded at ground surface, 6–10(–15) × 1–2.7(–3.5)cm (extra leaves much smaller), patulous to patent, narrowly oblong to lanceolate-oblong, subobtuse to obtuse, shallowly channelled or flattish, ±twisted, pale green, with distinctly darker veins above, often crimson-purplish at apex, margins narrowly (to distinctly) cartilaginous, glabrous. *Flowers* usually 1–3, small for an 'Eucolchicum'; perianth tube entire, slender, exceeding the cataphyll by 1.5–6.5(–8)cm, yellowish white to straw yellow occasionally tinged greenish; limb infundibular to infundibular-campanulate, segments 1.5–3.5(–4)cm long, often of very unequal length within a flower (differing by up to 7mm), 3–9mm wide, narrowly oblong to oblanceolate, (subacute to) subobtuse to obtuse or rarely retuse, sometimes ±cucullate, pinkish purple to mid-rosy purple with a short white base and a white median stripe up to ⅔ of segment length, 7–13(–15) veins distinct particularly outside; filament channels shallow, glabrous to sparsely puberulous. *Stamens* c.⅓ to ½ of perianth limb in length, outer 0.8–1.5(–1.7)cm, inner 1–1.8(–2)cm, inserted at subequal level in perianth throat; filaments yellowish white, swollen base bright yellow; anthers versatile, often somewhat curved, c.(¼–)⅓–½ as long as filaments, 3.5–7 × 0.8–1.2mm, yellow, thecae with a distinct hyaline median wall; pollen yellow. *Styles* equalling or slightly overtopping stamens, white, apex somewhat thickened, hooked to slightly recurved, stigmas ±punctiform to shortly decurrent, 0.3–0.8(–1.2)mm. *Capsules* at ground level, 1–2 × 0.6–1cm, oblong to oblong-ellipsoid, short-pointed, occasionally papillose in upper part, sometimes suffused reddish purple; seeds c.8–20 per locule, dimidiate-globose to broadly oblong-ellipsoid or subglobose, 2–2.5(–3) × 1.5–2.5mm, rufous-brown to brown, raphe region a narrow keel, near micropyle swollen to a distinct, whitish appendage. Flowering without leaves August–mid-September; leaves and fruits late April–June.
Chromosome number: 2n = 54.

The length of the period when *C. micaceum* is visible above ground is comparatively short, a feature which is presumably related to the nature of its habitat. The known localities of the species are in moist turf at rather high altitudes, usually connected with snowbeds in sheltered places where the winter season is long. As a result the species will flower rather early in the autumn (from August), and then because the snow in these localities will melt very late, the leaves often do not emerge until late May or June. Owing to the short period of time between generations, small remnants of withered leaves and capsules are often seen in flowering specimens (e.g., *Davis* 18189, *K. Persson* 553). The same pattern will be repeated in cultivation, i.e., the plants will flower early, more or less in the same months (or even weeks) regardless of the climate at the site of transplantation (excepting, of course, severe cold), and

the leaves will appear when temperatures allow vegetative growth but always much later than in most other *Colchicum* species with hysteranthous leaves. Thus, the plants retain the timing of the ancestral populations, a phenomenon not unusual in autumn-flowering hysteranthous species of this genus (Burtt, 1970; Gutterman & Boeken, 1988), indicating that differences in this respect between species are genetically conditioned. Root and leaf growth are triggered by changes in temperature and/or moisture, also with a probably hereditary variation between species. A curious feature of *C. micaceum* is its very thin roots, much thinner than in other hysteranthous autumn-flowering species but rather similar to those of synanthous spring-flowering species of much the same type of habitats, and possibly related to the moist conditions in these.

Similar species. *C. micaceum* in the flowering state is a rather small plant for a hysteranthous colchicum, with certain similarities to *C. micranthum* Boiss. but of a stronger flower colour (the latter has rather pale lilac-pink flowers). In leaf they are quite different: *C. micranthum* has three linear, narrow leaves, at the most c.1cm broad. There are also discrepancies both in ecology and distribution.

Corms and vegetative reproduction. The 'reserve' buds only rarely give rise to independent plants, and then not on prolonged side-lobes but rather as cormlets becoming disconnected at rather early stage, as in *C. stevenii* Kunth (Zohary, 1938) and *C. pulchellum* K. Perss. (Persson, 1988).

Distribution and habitat. Endemic to W Turkey (Fig. 3). Gritty or rocky mountain slopes, often in turf, predominantly in sheltered spots uncovered by snow late in the spring; on schist; (1000–)1500–1800m. East Mediterranean element (West Anatolian district).

Additional specimens. TURKEY. B2 Izmir: Boz Dağları, slopes around and above village of Boz Dağ, on schist, wet mossy or turfy ledges or among schist detritus, 1000m, 25 iv 1985, *J. & J. Archibald* 5963* (GB); *ibid.*, steep rocky slopes above village, micaceous schist, in sheltered places where the snow melts late, with *Chionodoxa luciliae*, *Crocus gargaricus* and *Corydalis oppositifolia*, 1750–1800m, 24 iv 1991, *K. Persson* 524* (GB). C2 Denizli: Babadağ, schistose slopes, 1500–1700m, 23 viii 1950, *Davis* 18436 (E, GB); *ibid.*, road from village to the mountain, slopes above pass at 14km, 37°47'N, 28°49'E, in turf or in spiny *Astragalus* and *Asparagus* cushions on micaceous schist, in areas where the snow cover melts late, 1500m, 23 iv 1991, *K. Persson* 518* (G, GB); *ibid.*, 21 viii 1994, *K. Persson* 553 (GB).

Recent floristic research (Ekim, 1993) indicates that some of the endemics from the western mountains such as Boz Dağ, penetrate to the inner parts of W Turkey and to inner Anatolia, e.g. Kocatepe near Afyon (B3), and Akdăg near Sandıklı (B2/3). In August 1994 some of these mountains were visited by the present author looking for *C. micaceum*, but in vain. A variety of substrates, generally non-calcareous, were observed in these mountains, though no mica-schists. It is worth mentioning that the original substrate of all collections cited above is very obvious in the dried material: the corms are ±coated by glistening mica grains.

5. Colchicum heldreichii K. Persson, **sp. nov. Figs 2E–F, 4E–F.**
Differt a *C. kotschyi* statura minore; tunicarum textura tenui; foliis ad marginem cartilagineis saepe scabridis; perianthii tubo graciliore, segmentis basi vix pubescentibus; staminum cum perianthii limbo proportione diversa.
Type: Turkey. C4 Konya: 3km ENE of Derbent, grassy depressions in hills near road, deep reddish brown soil, 1600m, 29 viii 1994, *K. Persson* 555* (holo. GB).

Corm ellipsoid-ovoid to ovoid, 3–4.5 × 2–3cm; tunics membranous to submembranous, delicate, soon ±split and torn, outer (red)brown to brown, inner very thin, glossy pale-brown or yellowish red-brown, produced into a neck c.2.5–9cm long, somewhat shorter than the cataphyll. *Cataphyll* whitish, sometimes purplish carmine at mucronate apex, 4–10cm long above corm. *Leaves* 3–4 (mostly 3), hysteranthous, crowded at ground surface, 7–15 × 1–2.5cm, erecto-patent to arcuate-procumbent, linear or narrowly oblong to (lanceolate-)oblong, obtuse (to retuse), shallowly channelled to flattish with a distinct mid-vein, ±twisted, somewhat glossy mid-green, margins slightly undulate, distinctly cartilaginous, glabrous to scabrid. *Flowers* 1–4; perianth tube entire, exceeding the cataphyll by 1–4cm, slender, white to yellowish white; limb narrowly infundibular, sometimes ribbed basally, segments (2–)2.5–4(–5)cm long, often of very unequal length within a flower (differing by 2–10mm), 3–8(–10)mm wide, occasionally somewhat twisted, linear to narrowly oblanceolate-oblong, often gradually tapering to the subobtuse or obtuse (to retuse) tip, whitish to palest lilac-pink (darker when dry) particularly towards apex, 9–13(–15) rather inconspicuous veins; filament channels shallow, wholly glabrous or often a small patch at base pubescent. *Stamens* c.⅓ to little more than ½ of perianth limb in length, outer 0.9–1.5cm, inner 1.1–1.9cm, inserted at slightly different level in perianth throat; filaments white, slightly swollen base golden yellow; anthers versatile, ⅓ to nearly as long as filaments, 4–7(–8) × 1–1.3mm, yellow, thecae with a narrow hyaline median wall; pollen yellow to golden yellow. *Styles* distinctly, often much overtopping stamens, recurved at apex, stigmas decurrent for 1–4.5mm. *Capsules* shortly pedicelled at ground level, c.1.2–2 × 0.7–1.3cm, broadly oblong to ellipsoid-oblong, apiculate, obscurely brown-dotted when dry; seeds numerous, ellipsoid-globose to globose, c.2.5mm diam., brown, with a low, yellowish white appendage. Flowering without leaves late August–mid-September; leaves and fruit in spring.
Chromosome number: 2n = 54.

More or less complete leaves (withered) and capsules from the preceding generation can be seen remaining in early-flowering specimens.

Similar species. The collection *Heldreich* 1257 was cited by Boissier (1882) under *C. candidum* var. *hirtiflorum* Boiss., i.e. *C. kotschyi* Boiss. Although *C. heldreichii* is a much smaller plant, the mistaken identity seems understandable, particularly as only pressed material was available. However, the new species differs in a number of characters:

- different chromosome number (2n = 20 in *kotschyi*, cf. Persson, 1992)
- smaller in all parts

- thinner tunics
- flowers redden when dried (not so in *kotschyi*)
- tepal base only sparsely pubescent (densely in *kotschyi*)
- flower tube thinner relative to limb
- stamens somewhat longer relative to limb (in *kotschyi* ¼ – less than ½ of limb)
- anthers somewhat shorter relative to filaments (in *kotschyi* c.½ to longer than filaments)
- leaf margins cartilaginous, often scabrid (not so in *kotschyi*)

C. kotschyi is not known to occur west of Pozantı (C5) and is rather rare west of B8/C8.

Distribution and habitat. Endemic to WC Turkey (Fig. 3). Grassy meadows and depressions in mountains; 1600–2338m. Irano-Turanian element (Central Anatolian district).

Additional specimens. TURKEY. C3/4 Konya: Entre Beychehr et Koniah près du chemin, 28 viii 1845, *Heldreich* 1257 (G-Boiss). C4 Antalya: Geyik Dağ, 2338m, 31 viii 1947, *Davis* 14520 (E, GB).

It is not entirely improbable that the the locality of *Heldreich* 1257 is close to or even identical with the type locality. The road from outside Konya passing Derbent and several other villages seemed to me to be an ancient road, perhaps the main connection of old between Konya and Beyşehir.

6. Colchicum inundatum K. Persson, **sp. nov. Figs 2B, 4D.**
Affinis *C. persico* (syn. *C. haussknechtii*) sed perianthii segmentis oblongis pallide lilacinis (nec oblanceolatis vel obovatis nec intense purpureis); staminum cum perianthii limbo proportione diversa, filamentis in tubum haud insertis.
Type: Turkey. C3 Konya/Antalya: 20–30km from Gencek to Aydınkent (Ibradi), masses on large flat meadows (periodically waterlogged), with *Lagotis stolonifera*, 1200–1250m, 17 iv 1991 (fr.), *K. Persson* 505* (holo. GB; iso. E).

Corm broadly ovoid to ovoid-globose, 2.5–6 × 2–4.5cm; tunics membranous to submembranous, glossy (red-brown to) light brown, often in several layers and then the outer ones thicker, duller and darker brown, often striate (distinctly veined) on the shoot side at least basally; neck stout, 6–8.5cm long. *Cataphyll* wholly covered by neck. *Leaves* 4–12, hysteranthous, crowded near ground, 13–16 × 4–5cm (leaves in addition after 4th or 5th leaf are abruptly smaller), (erecto-)patent-arcuate, oblong-lanceolate, obtuse to truncate, ±channelled in lower part, twisted, somewhat glaucous green with a rather distinct mid-vein, apex of young leaves pale green or tinged crimson-purplish, margins narrowly cartilaginous, glabrous to scabrous or short-ciliate. *Flowers* 1–3; perianth tube entire, exceeding the cataphyll by 4.5–7cm, up to 3mm thick, creamy white; limb infundibular to campanulate-infundibular, segments 2.7–4.5cm long, outer and inner differing up to 1cm in length, 0.5–1.2cm wide, narrowly oblong, oblong-elliptic or oblanceolate-oblong, at least outer ones bluntly

keeled on the back, (subacute to) subobtuse to obtuse or retuse, often cucullate, pale pinkish lilac often paler in lower part and on keels, rarely obscurely tessellated, 7–15 rather inconspicuous veins; filament channels wholly or basally puberulous to pubescent, sometimes densely ciliate on margins. *Stamens* c.(¼–) ⅓–½ of perianth limb in length, outer 1.2–1.7cm, inner 1.5–2cm, outer and inner inserted at equal or slightly different level in perianth throat; filaments whitish to yellowish white, slightly thickened base narrowly inconspicuously bordered in brownish yellow; anthers versatile, ½–⅔ as long as filaments, 4.5–7 × 1.2–1.8mm, yellow, thecae without or with a very narrow hyaline median wall; pollen golden yellow. *Styles* slightly to distinctly overtopping stamens, whitish to pale purplish lilac, scarcely thickened at apex, recurved, stigmas decurrent for 1.2–3mm. *Capsules* at ground level or only half emerging, 2.4–4.3 × 0.9–1.8cm, narrowly ellipsoid-oblong to oblong, pointed to ± rostrate, not or sometimes finely brown-dotted at least basally; seeds numerous, ± globose to dimidiate-globose, often flattened laterally, c.2.5–3 × 2–2.5mm, (red-)brown, raphe region swollen to a distinct, rather large, yellowish white appendage. Flowering without leaves September–October (?); leaves and fruits April–May. *Chromosome number*: 2n = 54.

Similar species. *C. inundatum* in leaf is reminiscent of *C. persicum* Baker, an Irano-Turanian species occurring on steppes, alluvial plains and subdeserts in Iran, NE Iraq, Syria, Lebanon, and SC Turkey (Gaziantep and Urfa, Fig. 3), and they may well be related. In flower *C. inundatum* is perhaps less similar to *C. persicum*: tepals are less pronouncedly oblanceolate and of a more violet colour, and the relatively shorter stamens are inserted at the base of the tepal segments, not down into the tube (as in *persicum*). In comparison with other pale-flowered hysteranthous species, *C. inundatum* has relatively shorter stamens, thicker and darker anthers, and longer styles than *C. decaisnei* Boiss.; more lilac flowers, and shorter anthers than *C. kotschyi* Boiss.; broader tepals, more pubescent filament channels, relatively shorter stamens, more inconspicuous filament bases than *C. heldreichii* K. Perss.; and lastly, much shorter anthers than *C. balansae* Planchon. Furthermore, all these species differ in their tunics.

Distribution and habitat. Endemic to S Turkey (Fig. 3). Meadows, flat alluvial plains periodically waterlogged; c.1200–1300m. Irano-Turanian element (Central Anatolian district, peripheral in the south).

The new species is only known from the valley between Gencek and Aydinkent (Fig. 1F) in the borderland between the Konya and Antalya provinces. In August 1994 I visited the area again with J. Persson to look for more localities, but none were found. On the contrary, we observed a drastic decrease in the original area of distribution. The greater part of the valley plain has now been drained for agricultural purposes, mainly for the cultivation of chick peas, as has occurred in other former flood plains and lakes now transformed into arable land, e.g. Avlan Gölü in the

Beydağları (Antalya). *Colchicum inundatum* has seemingly disappeared from most of the places where it was first observed and is now only found in a small untouched area on the Konya side of the border.

A possible relationship with *C. persicum* was hinted at above. Another interesting connection to more eastern plant associations on the same locality is the occurrence of hundreds of plants of *Lagotis stolonifera* (*Scrophulariaceae*), which is the only representative of its genus in Turkey but before this find only known from much further east (eastwards from A7/B6) and in Georgia-Armenia-NW Iran. Other plant taxa or groups with the same type of disjunct distribution as *C. inundatum/persicum* and in addition a similar ecology are e.g., *Iris spuria* ssp. *musulmanica* (damp meadows, salty flats and alluvial plains in Kayseri/Niğde B5/C5 and E Turkey-NW Iran-Caucasus), and the *Gladiolus halophilus/ persicus/atroviolaceis* complex (salty inundated flats, fallow fields, disturbed steppes in Konya-Niğde/Fars distr. of Iran/ Anatolia-Syria-N Iraq-Iran-Transcaspia, respectively).

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