

THE GENUS *PHLOMOIDES* MOENCH (LAMIACEAE; LAMIOIDEAE; PHLOMIDEAE) IN IRAN: AN UPDATED SYNOPSIS

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Recent molecular phylogenetic investigations support the inclusion of *Eremostachys* in *Phlomoides* although the generic name *Eremostachys* is still widely in use. This paper presents an updated taxonomic revision and re-circumscription of the genus in Iran. A key to the Iranian taxa is given. For each taxon, a complete list of synonyms, notes on nomenclature and affinities, geographical distribution, ecology, habitat, phenology, IUCN conservation status assessment, and a selection of specimens studied are provided. According to this treatment, 17 species of *Phlomoides* occur in Iran; of which 16 were previously in *Eremostachys*; four species are endemic.

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سردۀ *Phlomoides* Moench (نعنایان؛ زیرتیره نعنا؛ طایفه *Phlomideae*) در ایران

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سردۀ *Phlomoides* از نعنایان در فلور ایران مورد بازنگری آرایه‌شناختی قرار می‌گیرد. بر پایه آخرین مطالعات تبارشناختی، سردۀ *Eremostachys* باید در *Phlomoides* ادغام شود. اما در بین اغلب گیاهشناسان هنوز استفاده از نام *Eremostachys* رواج دارد. مطالعه حاضر یک بازنگری آرایه‌شناختی بر پایه تعریف جدید این سردۀ است و شامل اطلاعات به روز شده و اسامی صحیح برای تمام آرایه‌های آن در ایران می‌باشد. یک کلید شناسایی برای تمام گونه‌های *Phlomoides* پراکنده در ایران، اطلاعات مربوط به تیپ‌ها و فهرست آرایه‌های مترادف ارائه می‌گردد. بر اساس این تحقیق سردۀ *Phlomoides* در ایران دارای ۱۷ گونه می‌باشد که ۱۶ گونه از آن زمانی با نام *Eremostachys* شناخته می‌شدند، و ۴ گونه از آن بومی ایران هستند.

INTRODUCTION

The genus *Phlomoides* Moench (*Lamiaceae*; *Lamioideae*; *Phlomideae*) was recently re-circumscribed to encompass the members of *Eremostachys* Bunge along with part of *Phlomis* L., *Paraeremostachys* Adylov & al. and some other mono- or oligotypic genera (Salmaki & al., 2012). They are non-aromatic or lightly aromatic herbs usually in subalpine and alpine vegetation with a few species preferring desert conditions. In its new definition, *Phlomoides* contains about 150 to 170 species. The

distribution area of the genus extends from central Europe to the Russian Far East. The major centers of diversity of *Phlomoides* are Central Asia (59 species; Czerepanov 2007), the Iranian highlands (41 species; including Afghanistan, Iran, W Pakistan, SW Turkmenistan, NE Iraq) and China (about 42 species), with a diversity hotspot in Yunnan and Sichuan (22 species; Wu & Li, 1982), but includes a few species extending to Mediterranean Europe (Table 1).

The genus was erected in 1794 by Moench who placed *Phlomis tuberosa* L. in the monotypic genus

Phlomoides on the basis of differences in corolla shape and fruit structure, but his new genus was not recognized by contemporary botanists. The genus was ignored for about 200 years, but was recently reinstated (Adylov & al. 1986; Adylov & Machmedov 1987; Kamelin & Machmedov 1990; Mathiesen & al., 2011) to include species with the upper corolla lip not laterally compressed (against *Phlomis*) and with tuberous lateral roots.

Eremostachys was established by Bunge in 1830 as being intermediate between *Moluccella* L. and *Phlomis*. It consisted of about 60 to 80 species distributed chiefly in SW and C Asia (Harley & al., 2004). It is a typically Irano-Turanian genus almost restricted to the rather dry mountains of the Flora Iranica area, from SE Turkey and W Iran to Central Asia and Afghanistan (Azizan & Moore, 1982). Only a few species such as *E. laciniata* (L.) Bunge and *E. molucelloides* Bunge expanded their distribution area towards Turkey and the Mediterranean area. Most species have robust stems, lacinate or pinnate leaves, large calyces, large yellow, creamy, or white corollas, and bearded nutlets. The most extensive studies on *Eremostachys* were the monographic studies by Regel (1884), Popov (1940) and Makhmedov (1990). Rechinger (1982) recognized 41 *Eremostachys* species for the area of "Flora Iranica" classified in five sections. The diagnostic key presented by him does not work well due to over-emphasizing on shape and divisions of the leaves, which are polymorphic and variable even among populations of certain species. Furthermore, some wrong names such as *E. macrophylla* Montbret & Aucher as applied in "Flora Iranica" are still in wide use among Iranian taxonomists. Although they cover different species, the diagnostic keys in accounts on *Eremostachys* in Flora of Pakistan (Hedge 1990), and Flora of China (Li & Hedge, 1994) are based on much reliable characters of bracts, calyx and indumentums.

The position of *Eremostachys* within tribe *Phlomideae* Mathiesen has also been assessed in recent molecular phylogenetic studies of the subfamily *Lamioideae* (Scheen & al., 2010; Bendiksby & al., 2011). Molecular data shows the tribe *Phlomideae* as an assembly of closely related genera confirming previous assumptions (Scheen & al., 2010; Bendinsky & al., 2011; Salmaki & al., 2012). Molecular phylogenetic studies by Salmaki & al. (2012) provided definite evidence on the close relationship between *Eremostachys* and *Phlomoides* based on sequences of nuclear ribosomal (ITS) and cpDNA (*trnK*; *rpl32-trnL*; *trnT-A*). An important result of this research was a widely circumscribed *Phlomoides* (*Phlomoides* s.l. incl. *Eremostachys*, *Notochaete* and *Paraeremostachys*). One of the main reasons for inclusion of *Eremostachys*

in *Phlomoides* was the large number of morphologically transitional species between *Phlomoides* s.str. (which is paraphyletic) and the *Eremostachys* core group (Salmaki & al., 2012). As an example, *Phlomoides sewerzovii* is morphologically intermediate between *Phlomoides* and *Eremostachys*, but most similar to the latter. Moreover, morphologically, *Phlomoides milkoi* Lazkov, *Ph. vavilovii* (Popov) Adylov & al. and *Ph. ajdarovae* Lazkov show transitional states between *Eremostachys* and *Phlomoides*. They have cordate and undivided leaves similar to some species of *Phlomoides*, but have large flowers similar to those of *Eremostachys*. Thus, recent investigations, strongly suggest reducing the number of recognized genera in tribe *Phlomideae* to two: *Phlomis* L. and *Phlomoides* Moench. The two main centers of diversification are Central Asia (including Afghanistan) to E Tibet and E China for *Phlomoides* and south and east Anatolia and NW Iran for *Phlomis* s.str.

To aid future systematic work on these taxa and to reflect our taxonomic conclusions, a list of names under *Phlomoides* in Iran is provided. The main goals of this study are to present a taxonomic synopsis of *Phlomoides* in Iran, listing which taxa should be recognized, their distributions, and which characters traditionally used in discriminating the species are taxonomically informative. An identification key and distribution maps are also provided. This paper is the first one that includes a diagnostic key to the species of *Phlomoides* in its new definition.

MATERIALS AND METHODS

The study presented here is based on fieldwork and examination of more than 2000 herbarium specimens, including types from various herbaria, i.e. B, E, G, G-BOIS, G-DC, IRAN, K, LE, M, MSB, TUH, W, and WU. Although focused on species occurring in Iran, this study also considers material from neighbouring countries. About 100 specimens from our own collections are deposited in TUH, with duplicates in M. All measurements were taken directly from herbarium material. Information that could not be clearly observed on dried material (e.g. flower colour; calyx texture) was recorded in the field.

TAXONOMIC TREATMENT

Phlomoides Moench, Methodus: 403. 1794 - Type (only species cited in protologue): *P. tuberosa* (L.) Moench.

= *Notochaete* Benth. in Wallich, Pl. Asiat. Rar. 1: 63. 1830 -Type (only species cited in protologue): *N. hamosa* Benth.

Table 1. Species number of *Eremostachys*, *Phlomis* and *Phlomoïdes* in selected geographic areas. *Eremostachys* is considered here in its former definition according to Rechinger (1982), *Phlomis* s.str. as defined by Scheen et al. (2010), and *Phlomoïdes* as defined by Salmaki et al. (2012).

	<i>Eremostachys</i>	<i>Phlomis</i> s.str.	<i>Phlomoïdes</i> s.l.	References
Flora of Pakistan	8	-	4	Hedge, 1990
Flora Iranica	41	21	3	Rechinger, 1982
Flora of China	5	1	42 (treated under <i>Phlomis</i>)	Li & Hedge, 1994
Former Soviet Union (USSR)	52	27	22	Knorrning, 1954

= *Eremostachys* Bunge in Ledebour, Fl. Altaic. 2: 414. 1830. - Type (designated by Pfeiffer, 1874): *E. laciniata* (L.) Bunge.

= *Lamiophlomis* Kudô in Mem. Fac. Sci. Taihoku Imp. Univ. 2: 210. 1929 - Type (monotypic): *L. rotata* (Benth. ex Hook. f.) Kudô.

= *Pseuderemostachys* Popov in Novye Mem. Moskovsk. Obshch. Isp. Prir. 19: 148. 1941 ('1940') - Type (monotypic): *P. sewerzowii* (Herder) Popov.

= *Paraeremostachys* Adylov, Kamelin & Makhm. in Novosti Sist. Vyssh. Rast. 23: 112. 1986. - Type (designated in protologue): *P. phlomoïdes* (Bunge) Adylov, Kamelin & Makhm.

Perennial herbs, usually with woody rhizomes and/or tuberous rootstock. Stem erect, simple or branched, 20-120 cm. Basal leaves oblong, oblong-orbicular to cordate, 7-15 (25) × 3-15 (20) cm, undivided or laciniate to pinnatisect with toothed margin; lobes 4-7 per side. Cauline leaves sessile or petiolate, oblong, ovate-orbicular or oblong-lanceolate, 2-15 × 1-10 cm, undivided or divided, lobes 1-5 per side, incised-dentate, dentate, crenate or double crenate. Floral leaves sessile, elliptic, oblong-lanceolate or ovate-elliptic, 1.5-8 × 0.5-4 cm, incised-dentate, dentate or entire. Inflorescences thyrsoid to sometimes racemose with 2-20 flowers arranged in opposite axillary cymes, forming verticillasters with bracteoles. Bracteoles linear lanceolate or subulate, 5-30 × 1.5-3 mm. Calyx tubular-campanulate or broadly funnel-shaped, 12-40 mm; calyx lobes equal to subequal, sometimes broad at base and abruptly narrowed to a short spinose apex, or rarely hooked. Corolla 10-40 mm, pale lemon-yellow, white, cream or pinkish, red to dark purple, strongly 2-lipped; the posterior lip hooded (often deeply concave and dome-shaped) and bearded, 10-18 mm; lower lip flabelliform-trilobate or triangular-cordate, white, creamy, orange-yellow or buff-orange, pink, red to purple, the middle lobe obcordate, ovate-cordate, ovate-elliptic, oblong, the lateral lobes oblong, ovate-orbicular, orbicular-elliptic, ovate-elliptic or obcordate. Corolla tube cylindrical and sometimes hairy at the throat. Stamens 4; upper filaments longitudinal, fimbriate; those of lower filaments squamate, with

tooth-like ring of hairs at base. Stigma with equal lobes. Nutlets truncate or sub-truncate and mostly bearded at apex, 3-6 × 1-5 mm. Basic chromosome number $x = 11$.

Diagnostic key to the species of the genus *Phlomoïdes* in Iran

1. Plants with simple undivided rounded leaves distinctly petiolate; calyx infundibular, much expanded and 30-35 (-70) mm in diameter at apex; main roots tuberous

12. *Ph. molucelloïdes*

- Plants with divided leaves, if simple sessile to distinctly petiolate; calyx tubular or campanulate, not or slightly expanded and ≤ 10 (-15) mm in diameter at apex; main roots not tuberous, the lateral roots sometimes tuberous

2. Calyx campanulate, i.e. calyx expanded at fruiting time at upper part (10-15 mm in diameter), constricted at middle

3. Calyx tubular, i.e. calyx non expanded at fruiting time at upper part (≤ 10 mm in diameter), non-constricted at middle

3. Verticillasters with more than 2 flowers

4. *Ph. codonocalyx*

- Verticillasters 2-flowered

4. Plants densely hairy; leaves silvery, basal ones much divided, bipinnatisect

14. *Ph. regeliana*

- Plants sparsely hairy; basal leaves simple, sometimes deeply dentate at margin to pinnatifid

5. Calyx campanulate; floral leaves ovate, 1.5-3 × 1-2 cm

3. *Ph. boissieriana*

- Calyx tubular; floral leaves oblong to oblong-lanceolate, 5-8 × 1-2.5 cm

6. *Ph. hyoscyamoides*

6. Leaves simple undivided

- Leaves divided

7. Plants weak and thin, green; leaves deeply cordate at base, dentate at margin; calyx up to 12 mm long; corolla pink to purple, sparsely covered with short simple hairs < 1 mm

16. *Ph. tuberosa*

- Plant robust and thick; leaves oblong to ovate, attenuate at base; calyx longer than 12 mm; corolla white to yellow, sometimes covered with soft simple hairs ≥ 2 mm

8. Tuberous lateral roots present; lower corolla lip larger than the upper one; calyx 16-22 mm long

7. *Ph. labiosa*

- Tuberos lateral roots absent; lower corolla lip as large as the upper one; calyx 12-15 (-16) mm long 9

9. Plants covered with soft simple hairs; three lower bracts in each verticillaster free at base **11. *Ph. lanata***

- Plants glabrous; three lower bracts in each verticillaster fused at base **5. *Ph. glabra***

10. Stems and/or calyx covered with stellate hairs; bracts short (1/3 to 1/4 as long as the calyx tube), 2-5 mm long 11

- Stems and/or calyx covered with simple hairs; bracts long (1/2 to 2/3 as long as the calyx tube), longer than 8 mm 12

11. Calyx 13-16 mm long; calyx teeth triangular, with a mucron c. 0.5 mm at apex **17. *Ph. vicaryi***

- Calyx 16-20 mm long; calyx teeth lanceolate, with a spine \geq 1 mm at apex **13. *Ph. pulvinaris***

12. Plants glabrous except for inflorescences **10. *Ph. laevigata***

- Plants regularly lanate and/or glandular hairy 13

13. Flowering stem and calyx densely covered with long stalked glandular hairs **1. *Ph. adenantha***

- Flowering stem and calyx covered with simple hairs, if glandular hairs present, then sessile 14

14. Calyx 20-30 mm long; corolla yellow or ochre yellow, up to 40 mm long 15

- Calyx 14-20 (-22) mm long; corolla white or only the middle lobe of the lower lip yellow, 20-25 mm long 16

15. Leaves much divided, usually tripinnatisect; bracts and calyx papery; calyx 20-25 mm long; middle lobe of lower lip much broader than the lateral lobes

2. *Ph. azerbaijanica*

- Leaves usually pinnatifid to pinnatisect; bracts and calyx coriaceous, densely covered with multicellular and glandular hairs; calyx (20-) 25-30 mm long; lateral lobes of lower lip much broader than the middle lobe

Ph. labiosiformis

16. Plants glabrous; leaves pinnatisect; bracts and calyx papery; calyx 15-18 mm long, glabrous or rarely covered with long simple hairs **15. *Ph. tournefortii***

- Plants hairy; leaves bipinnatisect; bracts and calyx coriaceous; calyx 14-20 (-22) mm long, densely covered with scattered flattened hairs **9. *Ph. laciniata***

Enumeration of taxa

1. *Phlomoides adenantha* (Jaub. & Spach) Kamelin & Makhm., Bot. Zhurn. (Moscow & Leningrad) 75: 249. 1990 \equiv *Eremostachys adenantha* Jaub. & Spach, Ill. Pl. Orient. 4: 13 (1850). Syntypes: [Iran] Hab. in Persiae australis collibus prope Schiras et Persepolis, *Koitschy 363 et 801* (G!, LE!, W!); In dumetis montium Sawers, Eschker, Kotal Mallu at prope Kaserun, *Hausknecht* (G-BOIS).

Phenology: Flowering and fruiting from early May to

early June.

Distribution and ecology: S and SW Iran (endemic to Iran; Fig. 3A), mountain gravel slopes mostly with limestone substrate, exposed cliffs and ridges; 2000-2200 m; Irano-Turanian element.

Conservation status: LC (IUCN, 2008). The populations of this species are composed of numerous individuals often close to each other.

Affinities and variation: *Phlomoides adenantha* is closely related to *Ph. laciniata*, especially in habit and having pinnatisect leaves as well as hairy stems and calyx. While *Ph. laciniata* is densely covered with long simple hairs, *Ph. adenantha* has stalked glandular hairs especially on the calyx. Moreover, *Ph. adenantha* is distributed in S to SW Iran (Rechinger, 1982) whereas *E. laciniata* has a northern distribution.

Selected specimens examined: Prov. Kerman: Rouchoun hills, Khabr-va-Rouchoun Protected Region, *Parris 75381* (E); 70 km from Lar to Jahrom, *Davis & Bokhari 56262* (E); Prov. Khuzestan: 5 km W Behbahan, *Pabot 610* (G); Kerman, Hajiabad, *Rechinger & al. 22823* (IRAN). Prov. Fars: 70 km from Lar to Jahrom, *Davis & Bokhari 56262* (K). Prov. Kohgiluyeh-va-Boyer Ahmad: Sisakht, 5-7 km N Sisakht, *Iranshahr & Moussavi 22824^a* (IRAN). Prov. Kermanshah: Kermanshah, *Pabot s.n.* (G).

2. *Phlomoides azerbaijanica* (Rech. f.) Kamelin & Makhm., Bot. Zhurn. (Moscow & Leningrad) 75: 249 (1990). (Fig. 2A) \equiv *Eremostachys azerbaijanica* Rech. f., Fl. Iran. 150: 263 (1982). Holotype: Iran, in declivibus argillosis et calc. 26 km ESE Tabriz, 1900 m, 1.-2. VII. 1971, *Rechinger 40785* (W!, isotypes: G!).

Phenology: Flowering and fruiting from early June to late June.

Distribution and ecology: SW Iran (endemic to Iran; Fig. 3A); 1850-2600 m.

Conservation status: LC (IUCN, 2008). Although this species is not widespread in Iran, the populations are composed of many individuals and not threatened.

Affinities and variation: It is similar to *Ph. laciniata*, a species distributed from the east Mediterranean to Afghanistan, but differs from it in leaf shape, size of calyx and corolla as well as its ecology. It is characterized by much dissected leaves and the large (up to 40 mm) ochre yellow corolla.

Selected specimens examined: Prov. E Azarbaijan: Shibli pass, 30 km near to Tabriz, *Furse 2362* (E, K, LE); 3 km Mianeh boreo-occidentalis, *Rechinger 46029* (M, MSB, W); In declivibus argillosis et calc. 26 km ESE Tabriz, *Rechinger 40785* (B, G, W). Prov. Ardabil: Namin, *Iranshahr 22835* (IRAN); Meshkin-Shahr toward Ahar, 55 km from Meshkin-Shahr,

Iranshahr 22831 (IRAN); Between Khiyav (Meshkin Shahr) and Ahar, *Lamond* 3332 (E); SW Namin near Ardabil, 23 km to Ardabil, 5 km after Namin-Ardabil bifurcation, *Salmaki & Siadati* 39147 (TUH); Astara to Ardabil, SW of Namin, *Lamond* 3070 (E).

3. *Phlomoides boissieriana* (Regel) Adylov, Kamelin & Makhm., *Opred. Rast. Sred. Azii* 9: 91. 1987 ≡ *Eremostachys boissieriana* Regel, *Trudy Imp. S.-Peterburgsk. Bot. Sada* 9: 561 (1886). Holotype: Tadjikistan, Montes Khodza-Kadian, *Regel* (LE!).

= *Eremostachys boissieriana* var. *pinnatifida* Popov, *Novye Mem. Moskovsk. Obshch. Isp. Prir.* 19: 122 (1941).

= *Eremostachys boissieriana* var. *pinnatipartita* Popov, *Novye Mem. Moskovsk. Obshch. Isp. Prir.* 19: 122 (1941).

= *Phlomoides pauciflora* (Kuntze) Adylov, Kamelin & Makhm., *Opred. Rast. Sred. Azii* 9: 91. 1987 ≡ *Eremostachys pauciflora* Kuntze, *Trudy Imp. S.-Peterburgsk. Bot. Sada* 10: 226 (1887).

Phenology: Flowering and fruiting from early May to June.

Distribution and ecology: Iran, Turkmenistan, Tadjikistan and Afghanistan (Fig. 3A); 1100-1600 m. Conservation status: LC (IUCN, 2008).

Affinities and variation: *Phlomoides boissieriana* grows on serpentine and chalky soils in NE Iran to Afghanistan and is characterized by a campanulate calyx as well as undivided leaves. It differs from its allies in the ovate dentate basal leaves as well as ovate floral ones. It is also closely related to *Ph. aralensis* from Turkmenistan.

Selected specimens examined: Prov. Golestan: Golestan National Park, "Dasht" Almehr, N. Robat-e Qareh Bil, *Rechinger* 52927 (B, G, M, W); Shahpasand to Bojnurd, on the road to Almehr, *Termeh* 22836 (IRAN). Prov. Semnan: Shahrud, on the road of Shahrud to Mayamey, ca. 40 km to Mayamey, near the road, *Salmaki & Amini* 39145 (TUH).

4. *Phlomoides codonocalyx* (Rech. f.) Kamelin & Makhm., *Bot. Zhurn. (Moscow & Leningrad)* 75: 246. 1990 ≡ *Eremostachys codonocalyx* Rech. f., *Pl. Syst. Evol.* 134: 127 (1980). Holotype: Iran: Khorassan: SE Ferdos road of Birjand, 5.VI. 1976, *Rejamand & Bazargan* 32176 (W!).

Phenology: Flowering and fruiting from early May to early June.

Distribution and ecology: Lower slopes of mountains with sandy soil; 1300 m (endemic to Iran; Fig. 3B).

Conservation status: EN (IUCN, 2008). An extremely rare species in Iran known only from type specimen.

Affinities and variation: Similar to *Ph. subspicata* but

distinguished by having 6 flowers in verticillasters and flowering stem covered by stellate hairs. *Phlomoides subspicata* is characterized by having bifurcate hairs along with glandular ones especially at flowering stem.

Selected specimen examined: not traced.

5. *Phlomoides glabra* (Boiss. ex Benth.) Kamelin & Makhm., *Bot. Zhurn. (Moscow & Leningrad)* 75: 246. 1990 ≡ *Eremostachys glabra* Boiss. ex Benth. in A.P. de Candolle, *Prodr.* 12: 548 (1848). Holotype: [Iran] In monte Elburz, [Prope Pas Qaleh] *Kotschy* 290 (K; isotypes: G!, G-BOIS, LE!, W!).

Phenology: Flowering and fruiting from early May to June.

Distribution and ecology: Distributed in southern Alborz mountains (endemic to Iran; Fig. 3B) and found there in steppe vegetation mainly of *Astragalus* spp.; 1800-2400 m.

Conservation status: EN (IUCN, 2008). A rare species in Iran known only from type specimens and the few collections mentioned below.

Affinities and variation: Similar to *Ph. lanata* but distinguished by a glabrous calyx and flowering stem along with the lower bracts of the verticillasters basally connate. The conspecificity of *Ph. lanata* with *Ph. glabra* should still be re-assessed, as the molecular markers show also a very low divergence between them (Salmaki et al., 2012).

Selected specimens examined: Prov. Tehran: Vardavard valley, 1650-1900 m, *Wendelbo & al.* 11765 (E); Tehran, Darakeh mts., *Bornmüller* 947 (B); Darakeh mts., *Termeh & Zangooi* 22837 (IRAN); Tehran, on the road of Chalus to Karaj, at the beginning of the road Arangeh from Chalus-Karaj road, *Salmaki & Zarre* 39218 (TUH); Tehran, Elburz center mts, in ditione oppidi Keredj, in montibus Kuh-e Dashte, *Rechinger* 367 (K).

6. *Phlomoides hyoscyamoides* (Boiss. & Buhse) Kamelin & Makhm., *Bot. Zhurn. (Moscow & Leningrad)* 75: 250. 1990 ≡ *Eremostachys hyoscyamoides* Boiss. & Buhse, *Nouv. Mém. Soc. Imp. Naturalistes Moscou* 12: 181 (1860).

Holotype: [Iran, Prov. Semnan] Damghan-Semnan, in montibus prope Semnan, *Buhse* 1456 (G-BOIS!; isotype: LE!).

= *Eremostachys bungei* Regel, *Trudy Imp. S.-Peterburgsk. Bot. Sada* 6: 380 (1879).

Phenology: Flowering and fruiting between late May and early June.

Distribution and ecology: NE Iran (endemic to Iran; Fig. 3B); 1000-2600 m.

Conservation status: LC (IUCN, 2008).

Affinities and variation: *Ph. hyoscyamoides* is

distinguished from its closest relatives, *Ph. regeliana* and *Ph. boissieriana*, in having a tubular not campanulate calyx along with a different type of indumentum.

Selected specimens examined: Prov. Semnan: Between Damghan and Semnan, Ghodrat-Abad, *Wendelbo & Assadi 29737* (E); Semnan, Turan Protected Area, pass road N of Delbar, *Freitag & Mozaffarian 28842* (E); Shahrud-Bustam, Turan Protected Area, Jafar-Abad prope Zaman-Abad (Zaban-Abad), *Rechinger 50914* (B, G, M, W); Shahrud, Zaman-Abad, *Iranshahr 22839* (IRAN). Prov. Khorassan: Pres de Rivash, au nord de Kashmar, *Iranshahr 22840* (IRAN); Ferdows, Abe-Garm, *Delhandi & al. 22841^a* (IRAN).

7. *Phlomoïdes labiosa* (Bunge) Adylov, Kamelin & Makhm. in Adylov, *Consp. Fl. Asiae Mediae* 9: 92. 1987 ≡ *Eremostachys labiosa* Bunge, *Mém. Acad. Imp. Sci. Saint Pétersbourg*, Sér. 7, 21(1): 79. 1873. Lectotype (designated by Sennikov & Lazkov, 2010): Kazakhstan/Uzbekistan, inter Wernoje [Almaty] and Toshkent [Taschkent], 1871, *A. Petzholdt* (P; photo: LE!).

= *Eremostachys tournefortii* Jaub. & Spach var. *macrocalyx* Herder, *Bull. Soc. Imp. Naturalistes Moscou* 41(2): 390. 1868 ≡ *Eremostachys diversifolia* Regel var. *subvillosa* Regel, *Trudy Imp. S.-Peterburgsk. Bot. Sada* 6(2): 382. 1880 nom. illeg.

= *Eremostachys discolor* Bunge, *Mém. Acad. Imp. Sci. Saint Pétersbourg*, Sér. 7, 21(1): 79. 1873.

= *Eremostachys diversifolia* Regel, *Trudy Imp. S.-Peterburgsk. Bot. Sada* 6(2): 380. 1880.

= *Eremostachys diversifolia* Regel var. *canescens* Regel, *Trudy Imp. S.-Peterburgsk. Bot. Sada* 6(2): 382. 1880.

= *Phlomoïdes napuligera* (Franch.) Adylov & al. in Adylov, *Consp. Fl. Asiae Mediae* 9: 93. 1987 ≡ *Eremostachys napuligera* Franch., in *Ann. Sci. Nat., Bot.*, ser. 6, 18: 237. 1884.

= *Eremostachys dielsii* Bornm., *Bot. Jahrb. Syst.* 66: 240. 1934.

Phenology: Flowering and fruiting between early June and early July.

Distribution and ecology: NE Iran, Turkmenistan, Afghanistan, Pakistan (Fig. 3C). Lower mountain slopes with sandy soil; 1200-2700 m.

Conservation status: LC (IUCN, 2008): widely distributed in Iran and adjacent countries.

Affinities and variation: *Phlomoïdes labiosa* is recognized by its lower corolla lip which is larger than the galea. It and its closest relative *Ph. labiosissima* (in Uzbekistan) have tuberous lateral roots, undivided to lyrate leaves and minute bracteoles. It differs from *Ph. labiosissima* mainly in having a smaller median lobe of

lower corolla lip.

Selected specimens examined: Prov. Khorassan: Mashhad, Torbat-e Heydarieh, 15 km to Torbat-e Heydarieh, *Zarre & al. 38227* (M, TUH); Sarakhs, Cheshmeh-Shur, *Foroughi 5458* (LE, TARI); Inter Djenaran et Kutan, *K.H. & F. Rechinger 4226* (B, W); Ad versus argillosas inter Ziarat et Lujali, N Shirvan, *Rechinger 58228* (B, G, W); Mashhad, Delbaran, *Foroughi 1430* (G, TARI); 6 km to Birjand, *Pabot 7828* (G); 6 km E Bojnurd, *Pabot 22843* (IRAN); 25 mile N Quchan, Kopet Daghs mts, *Furse 7499* (K); Mashhad, *Gibbons 67* (K).

8. *Phlomoïdes labiosiformis* (Popov) Adylov, Kamelin & Makhm., *Opred. Rast. Sred. Azii* 9: 97. 1987 ≡ *Eremostachys labiosiformis* (Popov) Knorring in V. L. Komarov, *Fl. URSS* 21: 26. 1954 ≡ *Eremostachys laciniata* var. *labiosiformis* Popov, *Novye Mem. Moskovsk. Obshch. Isp. Prir.* 19: 96 (1941). Holotype: Turkmenistan, Ashkhabad, Kopet dagh, Gaudin (in *Turcomaniae montibus Kopet-Dagh*), 29.6.1912, *V.N. Lipsky 2492* (LE!).

Phenology: Flowering and fruiting from early June to July.

Distribution and ecology: NE Iran, Turkmenistan, Afghanistan (Fig. 3C); 1000-2600 m.

Conservation status: LC (IUCN, 2008).

Affinities and variation: It is frequent in NE Iran and has been attributed to the *Ph. laciniata* complex which is known as a taxonomically difficult group (Rechinger, 1982). The main difference between *Ph. labiosiformis* and *Ph. laciniata* is the large calyx (20-30 mm) in the former which is covered with long simple hairs, a brown yellow corolla as well as its glandular hairs.

Selected specimens examined: Prov. Khorassan: Gulli Sarani protected area, Kopet Daghs mts., *Rechinger 53360* (E, M, W); Shirvan, Namanlu, Kuhha-ye Gulul (Protected Region), *Termeh 22849* (IRAN). Prov. Golestan: Gorgan, 20 km SE Shahpasand, *Pabot 22850* (IRAN); Gorgan, Gombad-Ghabous (Gombad-Kabus), Malek tappeh, *Sharif 22851* (IRAN). Prov. Mazandaran: Marzan-Abad, S. Amol in valley Haraz river, *Furse 7064* (K); In apertis carpetinorum 38-46 km NW Fulad Mahalla, *Rechinger 52390* (B, W); Golestan forest, *Sabeti 5446* (G, TARI); Firuzkuh, pol-e Veresk, *Gheissari 1321* (G, TARI); Firuzkuh, Pol-e Veresk, *Salmaki & Zarre 39154* (TUH). Prov. Tehran: Jajrud, toward Latiyan mts, *Matin & Termeh 22847^b* (IRAN); Marzan-Abad versus Kelardasht, *Termeh & al. 22853* (IRAN).

9. *Phlomoïdes laciniata* (L.) Kamelin & Makhm., *Bot. Zhurn. (Moscow & Leningrad)* 75: 249 (1990) (Figs. 1B, 1D; 2B). Type: [Planta quaedam culta, Linn] ≡

Phlomis laciniata L., Sp. Pl.: 585. 1753 ≡ *Eremostachys laciniata* (L.) Bunge in C.F. von Ledebour, Fl. Altaic. 2: 416 (1830).

= *Eremostachys cilicica* Gand., Bull. Soc. Bot. France 65: 65 (1918).

= *Eremostachys iberica* Vis., Index Seminum (PAD) 1846: 64. 1846 ≡ *Phlomis iberica* Vis. ex Boiss., Fl. Orient. 4: 793 1879 ≡ *Eremostachys laciniata* subsp. *iberica* (Vis.) Popov, Novye Mem. Moskovsk. Obshch. Isp. Prir. 19: 87 (1941).

= *Eremostachys laciniata* var. *rudbarica* Popov, Novye Mem. Moskovsk. Obshch. Isp. Prir. 19: 87 (1941).

= *Eremostachys laciniata* subsp. *sanguinea* (Jaub. & Spach) Popov, Novye Mem. Moskovsk. Obshch. Isp. Prir. 19: 87. 1941 ≡ *Eremostachys laciniata* var. *sanguinea* (Jaub. & Spach) Regel, Trudy Imp.S.-Peterburgsk. Bot. Sada 9: 555. 1886 ≡ *Eremostachys sanguinea* Jaub. & Spach, Ill. Pl. Orient. 5: 13 (1855).

= *Eremostachys macrochila* Jaub. & Spach, Ill. Pl. Orient. 5: 13 (1855).

= *Eremostachys nerimani* Stapf, Denkschr. Kaiserl. Akad. Wiss., Wien. Math.-Naturwiss. Kl. 50: 50 (1885).

Phenology: Flowering and fruiting from early May to July.

Distribution and ecology: Egypt, Palestine, Syria, NE and E Turkey, Azerbaijan, Armenia, Georgia, Iraq, N and NW Iran, Afghanistan (Fig. 3C). It is the most widespread species in the genus. It prefers rocky slopes, gravelly ground and meadows, near fields; 1350-2160 m.

Conservation status: LC (IUCN, 2008).

Affinities and variation: *Phlomoides laciniata* is a very variable taxon with a wide distribution. The delimitation of species in the *Ph. laciniata* complex, based solely on morphological characters, is problematical. Various botanists have tried to recognize taxa among its forms such as *Ph. azerbaijanica* in NW Iran and *Ph. laevigata* in W Iran and Iraq. According to Rechinger (1982), some of these forms may represent independent taxa, but here we prefer to include all these forms in a rather polymorphic *Ph. laciniata*.

Selected specimens examined: Prov. Qazvin: Qazvin mts., Bornmüller 7886 (B). Prov. Tehran: between Karadj et Gachsar, Schmid 5701 (G); Elburz mts. ad basin septentr. alpinum Totschal, prope Shahrestanak, Bornmüller 7887 (B, G); Pabot 3239 (G); Evin-Darakeh, Haft-Houz, Termeh & al., 22871 (IRAN); Evin-Darakeh, Velenjak, Temeh & Zangoi 22866^c (IRAN); Pichler s.n. (LE); NW Tehran, 5 km on the road to Emamzadeh Davoud, Salmaki & Zarre 39221 (TUH). Prov. Gilan: in montibus ad Manjil, Bornmüller 7884 (B, WU).

10. *Phlomoides laevigata* (Bunge) Kamelin &

Makhm., Bot. Zhurn. (Moscow & Leningrad) 75: 249. 1990 ≡ *Eremostachys laevigata* Bunge, Labiat. Persic.: 81 (1873). Holotype: [Iran], In monte Schah Kuh prope Isfahan, Derderian (LE!).

Phenology: Flowering and fruiting from early May to June.

Distribution and ecology: W and NW Iran, N Iraq (Irano-Turanian element, Fig. 3D). It is distributed in the Zagros Mountains in western Iran and adjacent areas of Iraq; 800-3000 m.

Conservation status: LC (IUCN, 2008).

Affinities and variation: Frequent in western Iran. It is a member of the *Ph. laciniata* complex and distinguished from other taxa in it by its tall branched flowering stems as well as its inflorescences being densely covered with long hairs. The type of *E. laevigata* is a single specimen deposited in LE. The collection data for this specimen has erroneously been mentioned as between "Gorgan and Shahrud" (Schah-kuh) collected by Derderian (Bunge 1873). However, Popov (1940) corrected the mistake and cited the type locality from an area near Esfahan. The latter citation was followed by Rechinger (1982).

Selected specimens examined: Prov. W Azarbaijan: Rezaieh (Uroumieh), Targevar, Oshnavieh, Haji-Houh mts., Moussavi & Zargani 22888 (IRAN); ca. 14 km to Oshnaviyeh from Uroumieh, ca. 45 km after Uroumieh to Oshnaviyeh, (1780 m), Salmaki & Siadati 39152 (TUH). Prov. Kordestan: Kordestan, 20 km E Marivan, inter Marivan and Sanandaj, Wright & Bent 525-401 (K). Prov. Lorestan, Baghbanan: 55 km SE Khorramabad versus Sefid Dasht, in quercetis devastatis, Rechinger 47828 (G, W); Khorramabad, 2 km S Regan, Iranshahr & Moussavi 22892 (IRAN); Oshtoran Kuh, Saravand, 20 km SE Dow Rud, Rechinger 48095 (G, W). Prov. Khuzestan: Masjed-Soleyman to Tenbi-Golgir, 2 km after Tenbi bridge, 5 km after Masjed-Soleyman, Zarre 460 (M, TUH).

11. *Phlomoides lanata* (Jamzad) Salmaki, Taxon 61(1): 176. 2012 ≡ *Eremostachys lanata* Jamzad, Iran. J. Bot. 3: 112. 1987. Holotype: Prov. Mazandaran, 85 km from Kandavan to Haraz road, Mazid village, 1900-2300 m, Assadi & Mozaffarian 33028 (TARI).

Phenology: Flowering and fruiting from late May and early July.

Distribution and ecology: A narrow endemic of the central Alborz mountains (Fig. 3D); found there in steppe vegetation; 1800-2400 m.

Conservation status: VU (IUCN, 2008), a very rare plant forming sparse patches.

Affinities and variation: Similar to *Ph. glabra* (see above) but characterized by having a hairy calyx and flowering stems covered with soft, long simple hairs.

Specimen examined: Prov. Mazandaran: Haraz to Chalus, on the road Baladeh-Mazid (2 km after Baladeh toward Haraz) 5 km on the deviation of Baladeh to Noor (2550 m), *Salmaki & Zarre 39216* (TUH).

12. *Phlomoides molucelloides* (Bunge) Salmaki, Taxon 61: 176 (2012) (Figs. 1A, 1C). Lectotype (designated by Y. Salmaki in Salmaki et al. 2012): *Elegantissima* haec stirps non raro in arenosis et siccis deserti Soongoro-Kirghisici, Majo 1829, *Bunge 894* (LE!; isotype: P) \equiv *Eremostachys molucelloides* Bunge in Ledebour, Fl. Altaic. 2: 415. 1830.

= *Eremostachys macrochila* Jaub. & Spach, Ill. Pl. Orient. 5: 13 (1855).

= *Eremostachys molucelloides* var. *intermedia* Regel, Trudy Imp. S.-Peterburgsk. Bot. Sada 9: 570 (1886).

= *Eremostachys molucelloides* var. *macrophylla* (Montbret & Aucher ex Benth.) Regel, Trudy Imp. S.-Peterburgsk. Bot. Sada 9: 570. 1886 \equiv *Eremostachys molucelloides* subsp. *macrophylla* (Montbret & Aucher ex Benth.) Takht. in A.L. Takhtajan & A.A. Fedorov, Fl. Erevana: 256. 1972 \equiv *Eremostachys macrophylla* Montbret & Aucher ex Benth., Ann. Sci. Nat., Bot., II, 6: 54 (1836).

= *Eremostachys pyramidalis* Jaub. & Spach, Ill. Pl. Orient. 5: t. 462 (1855).

Phenology: Flowering and fruiting from early May to June.

Distribution and ecology: NE Turkey, E Iraq, Iran, Azerbaijan, Armenia, Georgia (Fig. 3D); Irano-Turanian element. It is another widespread species in the above-mentioned countries. In Iran, it usually grows in submontane steppe; (750-) 1800-2800 m.

Conservation status: LC (IUCN, 2008); many individuals grow in most subalpine steppes in Iran.

Affinities and variation: Related to *Ph. roatala* Schrenk ex Fisch & C. A. Mey. (distributed in Central Asia), but differing in its broadly campanulate calyx and the white upper lip of corolla and the yellow lower lip. It usually grows on serpentine or limestone soils in the mountains of NW Iran and Caucasus. It is morphologically unique among the studied species because of its infundibular calyx and simple rounded leaves crenate at margins.

Selected specimens examined: Prov. Khorassan: 16 km NW of Doruneh towards Bargh, *Parris 7597* (E). Prov. Markazi: ca. 20 km to Saveh from Zarandiyeh, Rangraz pass, *Salmaki & al. 39960* (TUH); Arak to Golpaigan, 25 km S Arak, *Furse 1559* (K). Prov. Kordestan: 75 km NW Sanandaj towards Marivan, *Archibald 2049* (E); Prov. Lorestan: In declivibus montium Ghali Kuh, 60-80 km ab Aligudarz meridiem versus, *Rechinger 47959* (B, W); Prov. W Azarbaijan: in valle fluvii Qotur W Khoy versus fines Turcicas, *Rechinger 41659* (G, W).

C. Prov. Esfahan: Kashan, Mooteh protected area, in montibus a Muteh (Mooteh) septentrionalis versus, *Rechinger 46892* (G, W). Prov. Tehran: Firuzkuh towards Semnan, 3 km of Torud, *Moussavi & Tehrani 228871^a* (IRAN); Tehran to Karaj, Vardavard station, on the road of Daroupakhsh factory, Dashte mountain, *Salmaki & Zarre 39219* (TUH). S. Prov. Fars: Schiraz, prope ruinas Persepolis, *Kotschy 828* (LE).

13. *Phlomoides pulvinaris* (Jaub. & Spach) Kamelin & Makhm., Bot. Zhurn. (Moscow & Leningrad) 75: 249. 1990 (Figs. 1E, 1F). Holotype: [Iran] *Aucher-Eloy 5163* (P, isotype: G!) \equiv *Eremostachys pulvinaris* Jaub. & Spach, Ill. Pl. Orient. 5: 13 (1855).

= *Eremostachys ispahanica* Popov, Novye Mem. Moskovsk. Obshch. Isp. Prir. 19: 96 (1940 publ. 1941).

Phenology: Flowering and fruiting from early May to June.

Distribution and ecology: C Iran (endemic to Iran; Fig. 3E), subalpine areas, mountainous gravel slopes mostly on limestone; 2200-2500 m; an Irano-Turanian element. It forms a community with several other cushion forming plants such as *Astragalus* and *Artemisia* spp.

Conservation status: LC (IUCN, 2008).

Affinities and variation: Similar to *Ph. laciniata* but with a stellate calyx indumentum. The calyx is papery in texture against the latter with leathery calyx.

Selected specimens examined: Prov. Markazi: Arak, in monte Raswand, *Bornmüller s.n.* (B); Sultan-Abad, *Strauss s.n.* (WU); Prov. Esfahan: on the road of Kashan toward Esfahan, Meymeh, *Salmaki & Zarre 39220* (TUH).

14. *Phlomoides regeliana* (Aitch. & Hemsl.) Adylov, Kamelin & Makhm., Opred. Rast. Sred. Azii 9: 91 (1987) (Fig. 2C). Holotype: [Afghanistan] Hari-rud vally, no. 290, April 21, 1885 (LE!) \equiv *Eremostachys regeliana* Aitch. & Hemsl., Trans. Linn. Soc. London, Bot. 3: 99 (1886).

= *Eremostachys bachardenica* B. Fedtsch., Bot. Zhurn. (St. Petersburg) 1906: 193 (1906).

= *Eremostachys regeliana* var. *brachycalyx* Popov, Novye Mem. Moskovsk. Obshch. Isp. Prir. 19: 124 (1941).

= *Eremostachys regeliana* var. *chimaera* Popov, Novye Mem. Moskovsk. Obshch. Isp. Prir. 19: 124 (1941).

= *Eremostachys regeliana* var. *latiloba* Popov, Novye Mem. Moskovsk. Obshch. Isp. Prir. 19: 124 (1941).

Phenology: Flowering and fruiting from early May to June.

Distribution and ecology: Iran, Turkmenistan, Afghanistan (Fig. 3E). Lower slopes of mountains with sandy soil; 1200-2700 m.

Conservation status: VU (IUCN, 2008). A rare plant in our area.

Affinities and variation: It is characterized by two flowers in each verticillaster and pinnate leaves. It differs from its allies (e.g. *Ph. boissieriana*) by its clearly silvery leaves covered with simple hairs.

Selected specimens examined: Prov. Khorasan: Inter Djenaran et Kučan, K.H. & F. Rechinger 4493 (E, G, W, WU); Badghiz, inter Tayyebat et Kisil Islam Qalah, Rechinger 33257 (B, W); Golestan National Park, Polunin 11891 (K).

15. *Phlomoides tournefortii* (Jaub. & Spach) Kamelin & Makhm., Bot. Zhurn. (Moscow & Leningrad) 75: 249. 1990 (Fig. 2D). Holotype: [Armenia] *Aucher-Eloy 5169*. (P, isotype: G!) ≡ *Eremostachys tournefortii* Jaub. & Spach, Ill. Pl. Orient. 4: 12. 1842 ≡ *Eremostachys laciniata* subsp. *tournefortii* (Jaub. & Spach) Popov, Novye Mem. Moskovsk. Obshch. Isp. Prir. 19: 86 (1941).

Phenology: Flowering and fruiting from early June to early July.

Distribution and ecology: Turkey, Azerbaijan, NW Iran (Fig. 3E). Lower slopes of mountains among *Stachys inflata*, *Scabiosa* spp. and *Salvia* spp.; 1700-2300 m.

Conservation status: NT (IUCN, 2008) in Iran, more widespread in adjacent Caucasus and Turkey.

Affinities and variation: Contrary to Edmondson (1982), we follow Rechinger (1982) in considering *Ph. tournefortii* as a separate taxon from *Ph. laciniata*. It is closely related to *Ph. laciniata*, but differs in having larger habit, a smaller calyx as well as the flowering stems being sparsely covered with soft simple hairs.

Selected specimens examined: Prov. W Azarbaijan: 10 km SE Maku, in saxosis calc., Rechinger 39258 (B, G, M, W); ca. 98 km to Maku from Khoy, ca 12 km to Hossein-Abad village, *Salmaki & Siadati 39151* (TUH).

16. *Phlomoides tuberosa* (L.) Moench, Methodus: 403 (1794) (Figs. 1G, 1H.) ≡ *Phlomis tuberosa* L., Sp. Pl.: 586 (1753). Lectotype (designated by Alziar & Cafferty in *Biocosme Mésogéen* 14: 125, 1998): Habitat in Sibiriae campestribus, Herb. Linn. No. 740.13 (LINN, photograph!)

= *Phlomis tuberosa* var. *discolor* K.Koch, Linnaea 21: 700 (1849).

= *Phlomis hypanica* Des.-Shost., Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk S.S.S.R. 8: 33 (1938).

= *Phlomis maeotica* Des.-Shost., Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk S.S.S.R. 8: 36 (1938).

= *Phlomis scythica* Klokov & Des.-Shost., Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk S.S.S.R. 8: 31

(1938).

= *Phlomis desertorum* P.A.Smirn., Byll. Moskovsk. Obshch. Isp. Prir., Otd. Biol., n.s., 48(5-6): 117 (1939).

= *Phlomis glandulifera* Klokov, in Fl. RSS Ukr. 9: 643 (1960).

= *Phlomis jailicola* Klokov, in Fl. RSS Ukr. 9: 643 (1960).

= *Phlomis stepposa* Klokov, in Fl. RSS Ukr. 9: 642 (1960).

Phenology: Flowering and fruiting from early May to June.

Distribution and ecology: Europe to E Asia; frequent in eastern Turkey, northern and eastern Iraq, Iran and Georgia (Fig. 3F). It prefers dry stony slopes, mountain slopes or submontane meadows from 1800-2800 m. It is one of the most widespread species in the genus.

Conservation status: NT (IUCN, 2008). In Iran, this species is somewhat threatened, but is more widespread in neighbouring countries; 1800-2800 m.

Affinities and variation: *Phlomoides tuberosa* is the oldest published name in the genus and is the type species of *Phlomoides*. It is characterized by its thin stems, tuberous roots and small calyx (8-12 mm).

Selected specimens examined: Prov. Azarbaijan: E Azarbaijan, in front of Payam (Yam) village, toward the peak of Mishoudagh mountain, *Salmaki & al. 39881* (TUH).

17. *Phlomoides vicaryi* (Benth. ex Hook.f.) Kamelin & Makhm., Bot. Zhurn. (Moscow & Leningrad) 75: 247 (1990). Syntypes: Pakistan, Peshawar, *Vicary* (K); Jhelum, salt range, *Aitchison 36, 386* (K); Baluchistan, *Lace* (K) ≡ *Eremostachys vicaryi* Benth. ex Hook.f., Fl. Brit. India 4: 695 (1885).

= *Eremostachys sharifii* Rech.f. & Esfand., Oesterr. Bot. Z. 99: 43 (1952).

Phenology: Flowering and fruiting from early May to June.

Distribution and ecology: Iran and Pakistan (Fig. 3F); 1100-1600 m.

Conservation status: VU (IUCN, 2008). A rare plant in our area but more widespread in neighbouring countries (Pakistan and India).

Affinities and variation: With densely adpressed stellate hairs, small calyces (13-16 mm) with triangular teeth and acute lanceolate bracteoles, this is an isolated species in the genus. It is extremely rare species in Iran known only from the type of *Eremostachys sharifii*

Selected specimens examined: No specimen from Iran was seen by the authors, therefore an Indian examined specimen is cited. India: Punjab, *Drummond 20458* (K).

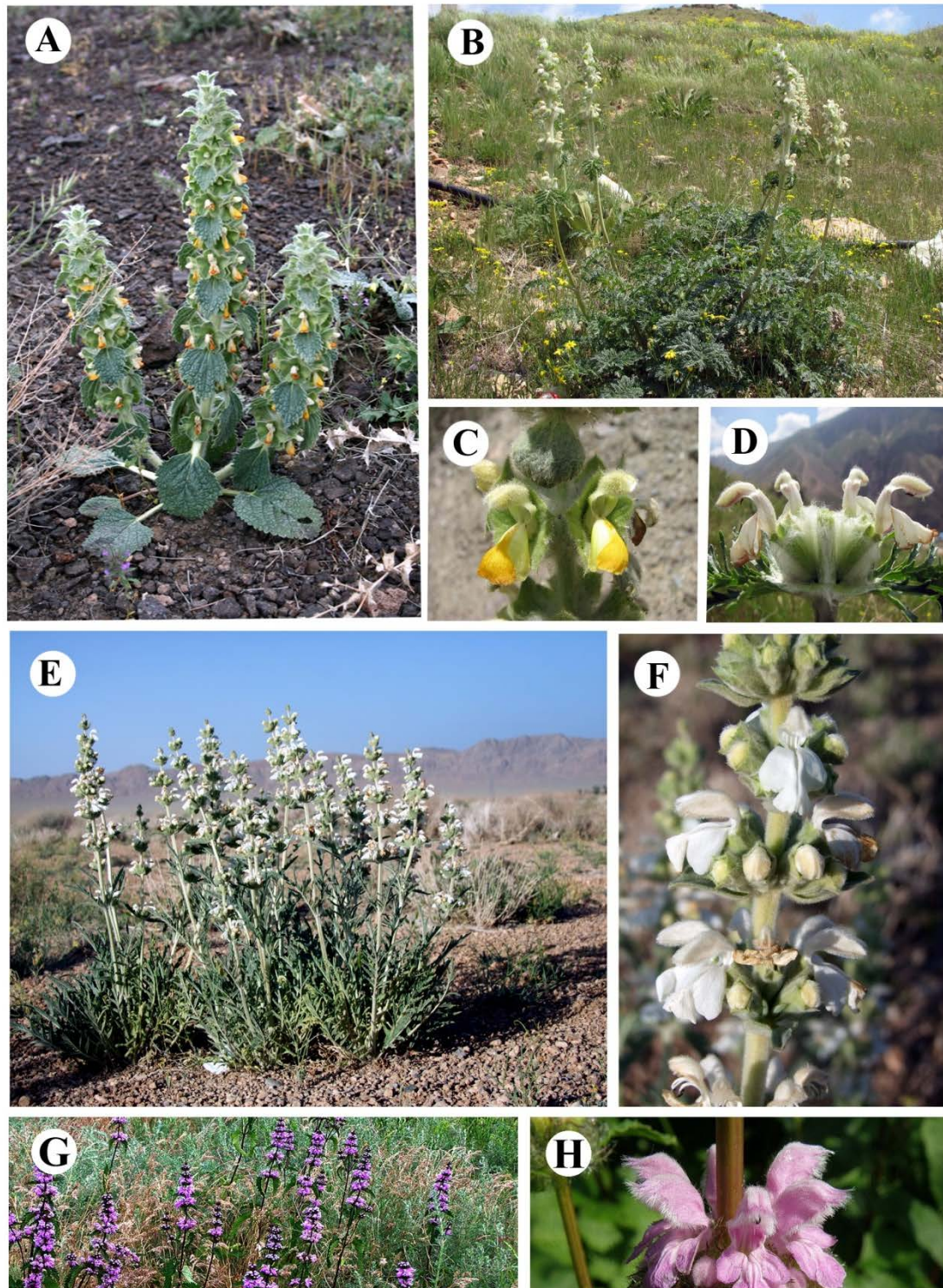


Fig. 1. A. *Ph. molucelloides* (Zarre & Salmaki 39219); B. *Ph. laciniata* (Salmaki & Zarre, s.n.); C. Calyx of *Ph. molucelloides* (Salmaki & Zarre 39219); D. Calyx of *Ph. laciniata* (Salmaki & Zarre, s.n.); E. *Ph. pulvinaris* (39220); F. Calyx of *Ph. pulvinaris* (Salmaki & Zarre 39220); G. *Ph. tuberosa* (Salmaki & al. 39881); H. Flowers of *Ph. tuberosa* (Salmaki & al. 39881).

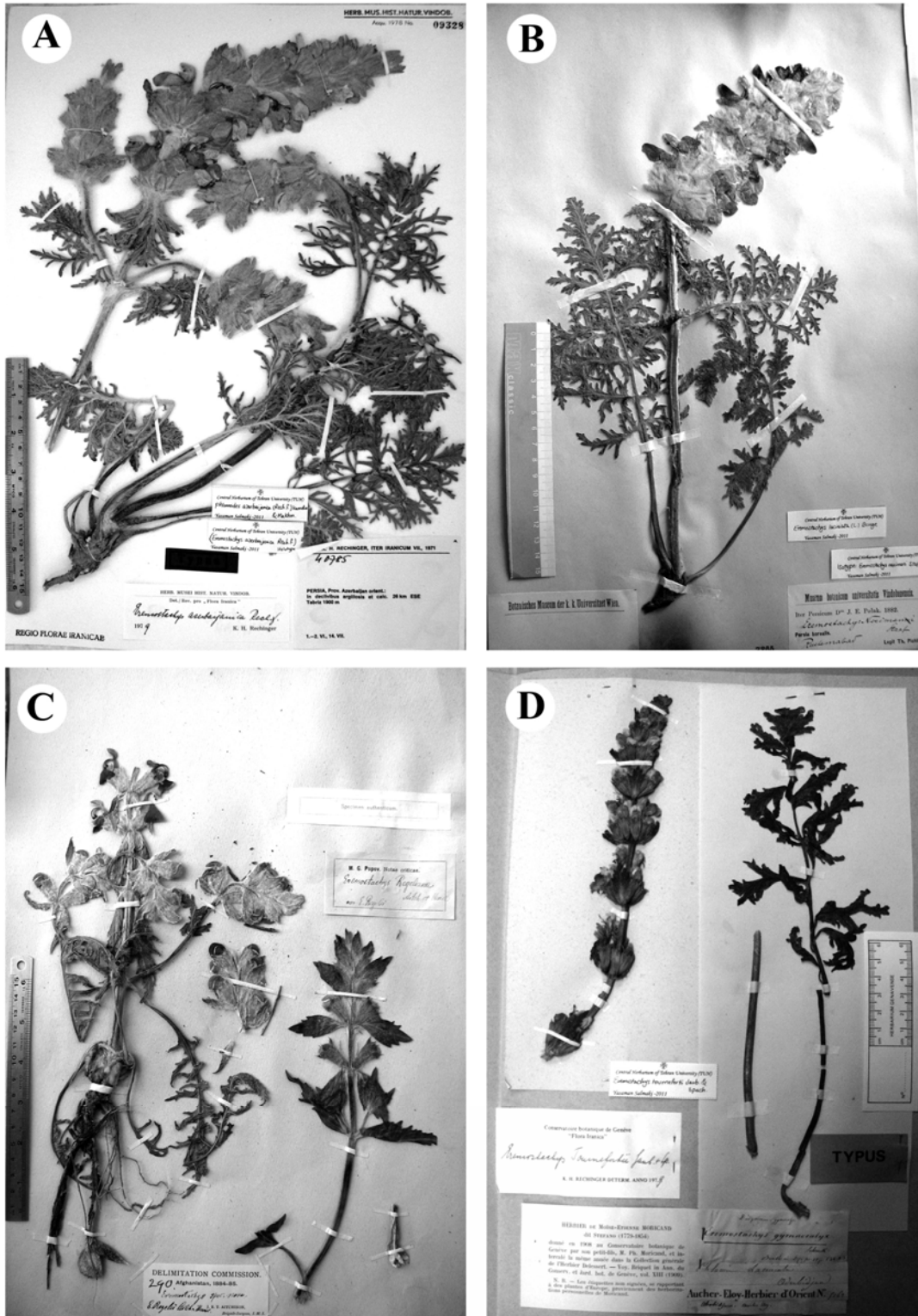


Fig. 2. A. *Phlomoides azerbaijanica* (holotype of *Eremostachys azerbaijanica*; W); B. *Ph. laciniata* (isotype of *Eremostachys nerimanii*=*Eremostachys laciniata*, WU); C. *Ph. regeliana* (holotype of *Eremostachys regeliana*, LE!); D. *Ph. tournefortii* (isotype of *Eremostachys tournefortii*, G-BOIS).

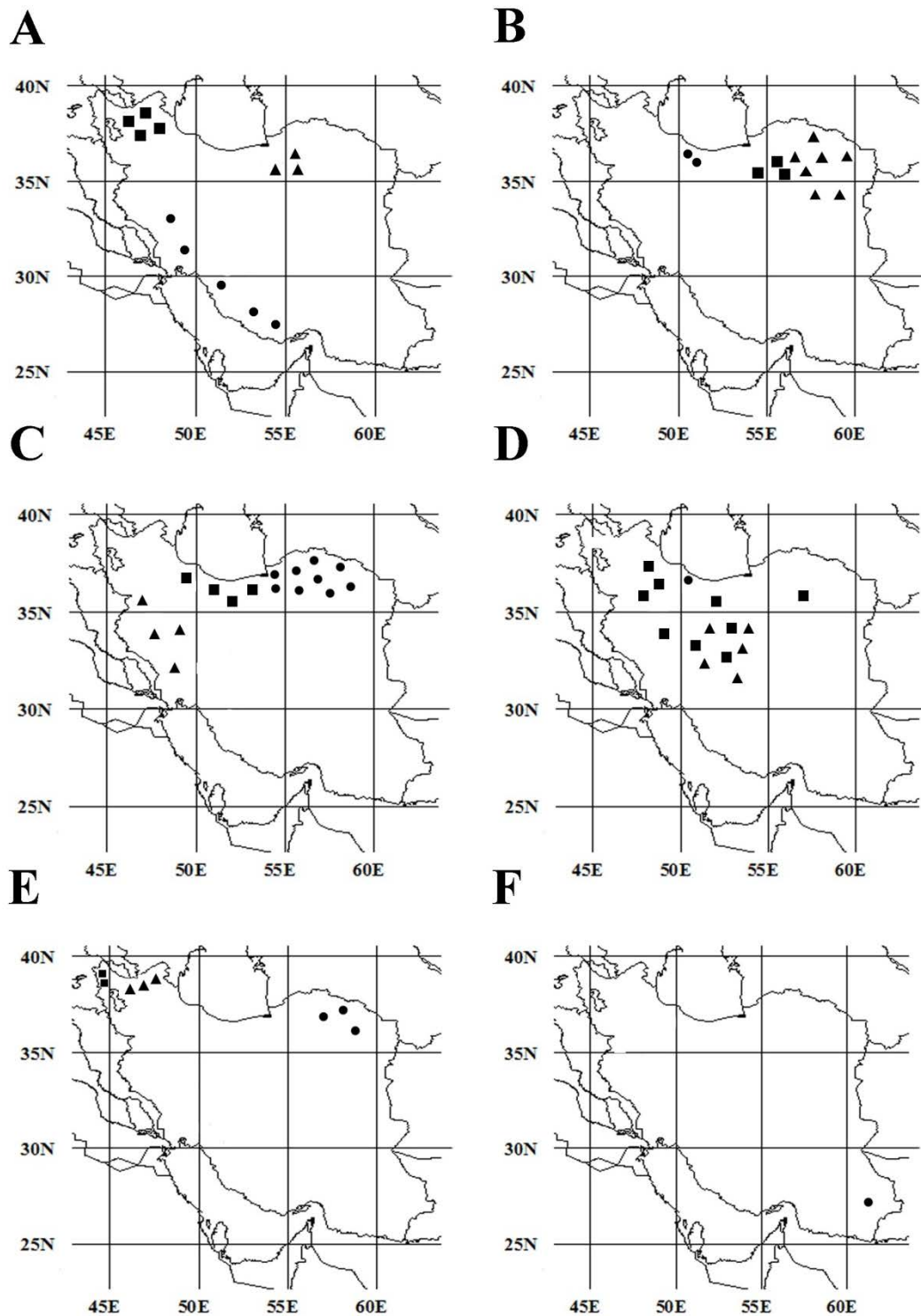


Fig. 3. Distribution of *Phlomoides* taxa in Iran: A. *Ph. adenantha* (●), *Ph. azerbaijanica* (■), *Ph. boissieriana* (▲); B. *Ph. codonocalyx* (●), *Ph. glabra* (■), *Ph. hyoscyamoides* (▲); C. *Ph. labiosa* (●), *Ph. labiosiformis* (■), *Ph. laciniata* (▲); D. *Ph. laevigata* (●), *Ph. lanata* (■), *Ph. molucelloides* (▲); E. *Ph. pulvinaris* (●), *Ph. regeliana* (■), *Ph. tournefortii* (▲); F. *Ph. tuberosa* (●), *Ph. vicaryi* (■).

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