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A new alpine species and a new record of *Astragalus* sect. *Stereothrix* (*Fabaceae*) from Iran, with comments on the phytogeography of the section

Abstract

Mahmoodi M., Maassoumi A. A. & Noroozi J.: A new alpine species and a new record of *Astragalus* sect. *Stereothrix* (*Fabaceae*) from Iran, with comments on the phytogeography of the section. – Willdenowia 43: 263–270. December 2013. – ISSN 0511-9618; © 2013 BGBM Berlin-Dahlem.
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Astragalus issatissensis, a new species of *A.* sect. *Stereothrix* (*Fabaceae*), is described and illustrated from the alpine zone of Shirkuh mountain, Yazd province, in C Iran. It is compared with its presumed closest relative, *A. bavanatensis*. Furthermore, *A. hakkariensis*, also in *A.* sect. *Stereothrix*, is recorded for the first time from West Azerbaijan province in NW Iran. An updated list of species of *A.* sect. *Stereothrix* is presented, distribution maps of all species are given and the distribution patterns in the section are discussed.

Additional key words: alpine flora, *Astragalus bavanatensis*, *Leguminosae*, taxonomy, Turkey

Introduction

Astragalus L. (*Fabaceae*) is probably the largest genus of flowering plants containing up to 3000 species (Lock & Simpson 1991). It is the largest genus in both Iran and Turkey, with species distributed in various habitats. Iran and Turkey are considered as major centres of diversity of the genus (Maassoumi 1998). Approximately 80 species of *Astragalus* are known to grow at alpine areas in Iran, and almost 90 % of these are considered to be endemic to the country (Noroozi & al. 2008).

Astragalus sect. *Stereothrix* Bunge (1868) has undergone many changes since its original description, and there is no constant consensus about its circumscription. Many taxa that were once considered to belong in this section have since been transferred to other sections, mostly to *A.* sect. *Hypoglottidei* DC. and *A.* sect. *Malacothrix* Bunge (e.g. *A. brachypetalus* Trautv., *A. coodei* D. F. Chamb. & V. A. Matthews and *A. nabelekii* Czeczott to *A.* sect. *Hypoglottidei*; *A. saganlugensis* Trautv., *A. hirtus* Bunge and *A. stridii* Kit Tan to *A.* sect. *Malacothrix*; *A. autranii* Baldacci to *A.* sect. *Baldaccia* Sytin & Podlech; *A. kurnet-es-saudae* Eig to *A.* sect. *Hololeuce* Bunge; and *A. robertianus* Kit Tan & Sorger to *A.* sect. *Onobrychoidei* DC.).

On the other hand, many new species have recently been described in *Astragalus* sect. *Stereothrix*, which has almost doubled in size over the past 20 years. According to Flora iranica (Podlech & al. 2010, 2012), the section had 12 species in Iran. After the preparation of Flora iranica, *A. montismishoudaghi* Sheikh Akbari Mehr & al. (2011) was published. Counting the new species and new

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record published in the present paper, the number of species in the section in Iran has increased to 15. A recent synopsis of *A.* sect. *Stereothrix* (Ranjbar & al. 2013), in which two further species were described, *A. andabilensis* Ranjbar & Mahmoudian and *A. savanatensis* Ranjbar & al., shows deep contradictions with the treatment of *A.* sect. *Stereothrix* in Flora iranica and we do not agree with its conclusions. We have doubts that the two new species are distinct, but we have not yet had the opportunity to examine the types. Until we can ascertain their status, we prefer to exclude them from the present work.

For Turkey, there is no new revision of *Astragalus* sect. *Stereothrix*. Based on Flora of Turkey (Chamberlain & Matthews 1970; Davis & al. 1988; Guner & al. 2000) and counting the more recently published species *A. subhanensis* F. Ghahrem. & Behçet (Ghahremaninejad & Behçet 2003), *A. mahmutlarensis* Podlech (Podlech & Ekici 2008) and *A. chamardiensis* Podlech (2009) and considering changes made in the last version of the checklist of Old World *Astragalus* (Podlech 2011), the number of Turkish species has reached 11. Species of the section also occur in Armenia, Iraq, Syria and Ukraine (one species each). The total number of species in the section currently stands at 25 (see Table 2). All species are hemicryptophytes.

Material and methods

The new species was discovered during a botanical expedition conducted by the first (MM) and third (JN) authors in early July 2012 to the alpine zone of Mt Shirkuh (highest summit 4075 m) in central Iran. After detailed examination of the samples collected and the materials in the herbarium TARI, we concluded that our samples represent a new species. Furthermore, among older materials in TARI, we found *Astragalus hakkariensis* Podlech as a new record for the flora of Iran. In order to provide a preliminary picture of the distribution patterns in *A.* sect. *Stereothrix*, an up-to-date checklist of accepted names in the section is provided using Flora Iranica (Podlech & al. 2010, 2012), Flora of Turkey (Chamberlain & Matthews 1970; Davis & al. 1988; Güner & al. 2000), Flora USSR (Komarov 1965) and other monographs, revisions and recent articles (Maassoumi 1989, 1998, 2005; Podlech 1999, 2004, 2009, 2011; Ghahremaninejad & Behçet 2003; Podlech & Ekici 2008; Sheikh Akbari Mehr 2011). The locations of records of all species were georeferenced and the distributions were mapped by Diva-GIS (Hijmans & al. 2005). Finally, by grouping of species with similar distributions, the distribution patterns of *A.* sect. *Stereothrix* were determined. These georeferenced observations include literature records, all herbarium specimens in TARI and some of our personal field observations. Herbarium codes used follow Thiers (2008+).

Results and Discussion

New species

Astragalus issatissensis Maassoumi & Mahmoodi **sp. nov.** – Fig. 1, 2.

Holotype: Iran, Yazd province, Taft, Deh-e Balla village, Mt Shirkuh, 31°37'04"N, 54°03'55"E, 3800–3900 m, 4 Jul 2012, *Mahmoodi & Noroozi 98654* (TARI).

Diagnosis — Haec species *Astragalo bavanatensi* Zarre & Podlech similis, sed petiolis pedunculisque dense ascendenter vel patenter duplicato-pilosis (nec adpresse unicato-pilosis), pilis manifeste basifixis (nec valde asymmetrice medifixis), foliolis 9–13(–16)-jugis, imbricatis vel approximatis, complicatis (nec 4- vel 5-jugis, remotiusculis, applanatis), petalis luteolis, dense violaceo-paralleliveniis, in sicco atroviolaceis (nec albido-luteis), vexilli lamina rectangulari (nec orbiculari), alis c. 10 mm (nec c. 7 mm) longis, alarum laminis c. 6.5 × 3 mm (nec c. 3 × 2.5 mm), carina c. 7 mm (nec c. 6 mm) longa, differt.

Description — *Plants* hemicryptophytes, subacaulescent, prostrate, 8–10 cm tall; *caudex* diffusely branched, with short subterranean stolons; *stems* to 2 cm long, densely covered with ± confusedly ascending to spreading rigid hairs 0.2–0.3 mm long. *Leaves* 2–6 cm long; *stipules* narrowly triangular, c. 8 mm long, adnate to petiole for 1.5–2 mm, very shortly vaginate-connate behind stem, rather densely covered with spreading to ascending white hairs to 0.2 mm long; *petiole* 1–2.5 cm long, with two kinds of basifixed hairs: densely covered with confusedly spreading white short hairs to 0.2 mm long mixed with few long hairs to 0.7 mm long; *leaflets* in 9–13(–16) pairs, imbricate or approximate, folded, elliptic, 7–8 × 5–8 mm, both surfaces densely covered with confusedly ascending to nearly spreading hairs 0.3–1 mm long, apex obtuse to rounded. *Peduncle* often recurved, 5–7 cm long, sulcate, like petiole rather densely covered with basifixed ascending white short and long rigid hairs; *raceme* densely many-flowered, 2–2.5 cm wide; *bracts* narrowly triangular, 3.5–4 mm long, covered with white hairs to 1 mm long; *pedicels* very short. *Calyx* funnel-shaped, c. 10 mm long, rather densely covered with confusedly ascending to spreading white hairs 1–1.5 mm long; teeth subulate, c. 6 mm long, hairy on inner surface. *Petals* pale yellow with dense parallel violet veins, in dry state dark violet; *standard* c. 11 × 6 mm, base gradually narrowed with a cuneate claw, blade rectangular, distally gradually narrowed, apex widely retuse to emarginate; *wings* c. 10 mm long, claw c. 4 mm long, auricle c. 0.5 mm long, blade oblong, c. 6.5 × 3 mm, apex rounded; *keel* c. 7 mm long, claw c. 3.5 mm long, auricle absent, blade obliquely obovate, distally with widely rectangular-curved lower edge and minutely concave upper edge, c. 2.5 × 3.5 mm, apex subacute. *Stamen tube* truncate at mouth. *Ovary* sessile, white hairy; *style* glabrous; *stigma* punctate. *Legume* unknown.

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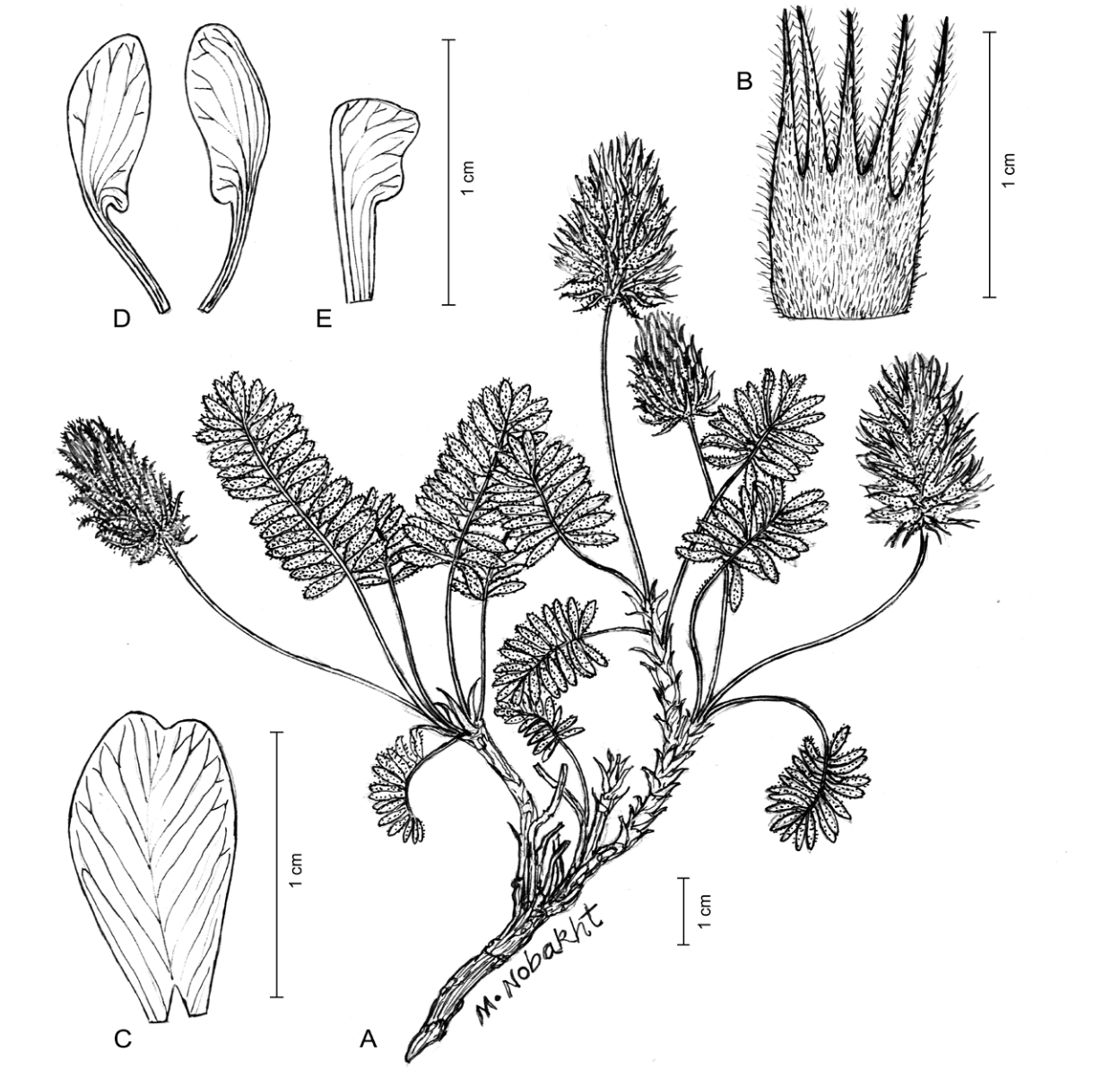


Fig. 1. *Astragalus issatissensis* – A: habit; B: calyx; C: standard; D: wings; E: keel. – Drawn by M. Nobakht from the holotype.

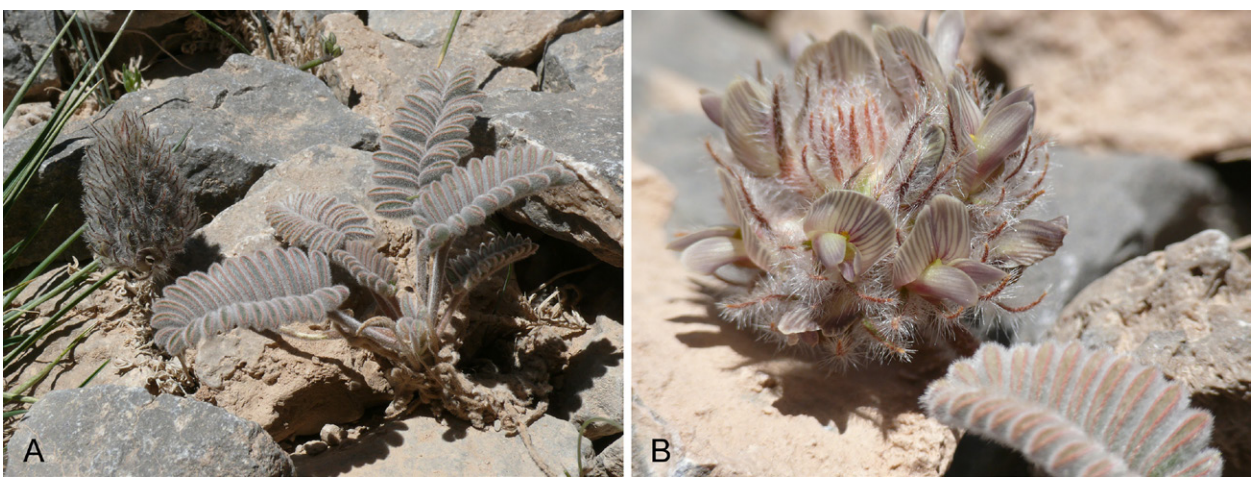


Fig. 2. *Astragalus issatissensis* – A: habit of an individual; B: inflorescence and leaf. – Photographs taken at the type locality, 4 Jul 2012, by J. Noroozi.

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Table 1. Morphological differences between *Astragalus issatissensis* and *A. bavanatensis*.

Morphological characters	***Astragalus issatissensis***	***Astralagus bavanatensis***
Stem length	to 2 cm	1.5–5 cm
Stem indumentum	dense ± confusedly ascending to spreading rigid hairs 0.2–0.3 mm long	dense subappressed hairs to 0.5 mm long
Leaf length	2–6 cm	2–3 cm
Stipule length	c. 8 mm	4–8 mm
Stipule connectivity	adnate to petiole for 1.5–2 mm	free from petiole
Stipule indumentum	rather densely hairy	laxly hairy
Petiole length	1–2.5 cm	1–1.5 cm
Petiole and peduncle indumentum	densely covered with 2 types of basifixed hairs: short hairs mixed with few long hairs	covered with 1 type of very asymmetrical medifixed hairs
Leaflets	9–13(–16) pairs, imbricate or approximate, folded	3 or 4 pairs, somewhat remote, flattened
Leaflet dimensions	7–8 × 5–8 mm	7–12 × c. 3 mm
Leaflet indumentum	confusedly ascending to nearly spreading hairs 0.3–1 mm long	± appressed hairs c. 1 mm long
Peduncle length	5–7 cm	c. 3 cm
Bract length	3.5–4 mm	2–2.5 mm
Calyx indumentum	hairs 1–1.5 mm long	hairs 0.5–1.2 mm long
Petal colour	pale yellow with dense parallel violet veins, in dry state dark violet	whitish yellow
Standard shape	base gradually narrowed, blade rectangular	base constricted, blade orbicular
Standard dimensions	c. 11 × 6 mm	c. 8 × 3 mm
Wing length	c. 10 mm	c. 7 mm
Wing lamina shape	oblong	narrowly obovate
Wing lamina dimensions	c. 6.5 × 3 mm	c. 3 × 2.5 mm
Keel length	c. 7 mm	c. 6 mm
Ovary indumentum	white hairy	glabrous

Phenology — Flowering in late June and early July.

Distribution and ecology — Endemic to the alpine zone of Mt Shirkuh (Fig. 3D), growing on screes at 3800–3950 m (possibly up to 4075 m) in altitude.

Conservation status — The new species is known so far only from the highest elevations of Mt Shirkuh above 3800 m. The highest summit of this mountain is about 4075 m. Therefore, both the altitudinal range and geographical distribution of this species are very narrow. With regard to ongoing climate change and its effect on cold-adapted species, the new species could be very vulnerable as there is no possibility of migration to higher elevations. Consequently, following the IUCN Red List criteria (IUCN, 2012) *Astragalus issatissensis* is categorized as Critically Endangered: CR B1ab(iii)+2ab(iii).

Etymology — *Astragalus issatissensis* is named after Issatiss, the old name of the city Yazd in C Iran.

Remarks — The new species is morphologically close to *Astragalus bavanatensis*, which is endemic to the S Zagros mountains, but there are clear differences in pubescence, stipule length, peduncle length, bract length, petal colour, shape, and length and ovary hairs. The morphological characters of these two species are compared in Table 1.

Additional specimen seen (paratype) — Iran: Yazd province, Taft, Deh-e Balla village, Mt Shirkuh, 3950 m, 24 Jun 2012, *A. Dehghani-Esmatabadi. 3520* (Herbarium of Mazandaran University).

New record

Astragalus hakkariensis Podlech in Sendtnera 6: 168. 1999 (*A.* sect. *Stereothrix*).
Holotype: Turkey, Hakkâri province, 5 km W of Esendere toward Yüksekova, 1720 m, 24 Jul 1983, *M. Nydegger 18427* (MSB; isotype: BASBG).
Material examined: Iran, West Azerbaijan province, Urmiye, Nazlu, 16 Jun 1981, *Tarighi & Amini 1351* (TARI).

This specimen was determined as *Astragalus barbatus* Lam. by Maassoumi (1989), before the publication of *A. hakkariensis*, and later as *A. pseudocapito* Podlech by

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Table 2. Checklist of species of *Astragalus* sect. *Stereothrix* including their distribution, altitudinal range and number of records. All species listed are hemicryptophytes. Asterisks (*) indicate new treatments after Flora iranica (Podlech & al. 2010; 2012). – Country codes: AM = Armenia; IR = Iran; IQ = Iraq; SY = Syria; TR = Turkey; UA = Ukraine.

Species	Distribution	Altitudinal range [m]	No. of records
Astragalus altimontanus Podlech & Maassoumi	IR	c. 2250	1
Astragalus barbatus Lam.	AM, TR	1900–3100	5
Astragalus bavanatensis Zarre & Podlech	IR	1800–2200	2
Astragalus capito Boiss. & Hohen.	IR	2250–3850	10
Astragalus chamardiensis Podlech	TR	c. 1400	1
Astragalus chamberlainianus Sümbül	TR	1300–1400	1
Astragalus damghanensis Podlech	IR	c. 1450	1
Astragalus doshman-ziariensis Maassoumi & Podlech	IR	1900–2500	1
Astragalus hakkariensis Podlech*	IR, TR	1720–2500	5
Astragalus hispidus Labill. (= *A. nanus* DC.)	SY, TR	1100–2350	10
Astragalus issatissensis Maassoumi & Mahmoodi*	IR	3800–3950	2
Astragalus koelzii Barneby	IR	c. 2000	1
Astragalus ledinghamii Barneby	IR	420–2800	27
Astragalus leucothrix Freyn & Bornm.	TR	800–2300	4
Astragalus mahmutlarensis Podlech	TR	c. 1270	1
Astragalus mahneshanensis Maassoumi & Moussavi	IR	c. 2950	1
Astragalus montismishoudaghi Sheikh Akbari Mehr & al.*	IR	c. 1930	1
Astragalus montis-varvashti Podlech	IR	3500–4100	1
Astragalus podosphaerus Boiss. & Hausskn.	IR	2200–3350	3
Astragalus pseudocapito Podlech	IR	1700–1900	2
Astragalus setosulus Gontsch.	UA	c. 1200	1
Astragalus sorgerae Hub.-Mor. & D. F. Chamb.	TR	1150–1600	2
Astragalus sparsipilis Hub.-Mor. & D. F. Chamb.	TR	c. 1800	2
Astragalus sphaeranthus Boiss.	IQ, IR, TR	c. 3320	8
Astragalus subhanensis F. Ghahrem. & Behçet	TR	c. 2300	1

Podlech & al. (2010). However, we examined the specimen carefully and found that its characters match exactly the description of *A. hakkariensis*. Among the species of *A.* sect. *Stereothrix*, *A. hakkariensis* is the only one with a very long standard. This species was previously considered endemic to SE Turkey (Podlech 1999). The new locality in Iran is only c. 40 km from the type locality (Fig. 4A).

Phytogeography of *Astragalus* sect. *Stereothrix*

With 25 species, *Astragalus* sect. *Stereothrix* is a medium-sized section in the genus (Mahmoodi & al. 2012). A list of the species accepted in this section is presented in Table 2. For convenience, authors of the names are omitted in the following notes but may be found in Table 2.

The distribution of *Astragalus* sect. *Stereothrix* is almost entirely confined to Iran and Turkey. Exceptions are *A. setosulus*, known only from the type locality in the Crimean Peninsula, Ukraine; *A. barbatus* and *A. hispidus*, two Turkish subendemics each also with one record from Armenia and Syria, respectively; and *A. sphaeranthus*, recorded from NE Iraq as well as from SE Turkey and Iran. Most of the species are local endemics and many of them are well-adapted to high elevations (Mahmoodi & al. 2009). Outlining the exact phytogeographical status of *A.* sect. *Stereothrix* is very difficult due to the deficit of data. More than half of the species are recorded only from the type localities and only five species have more than five records. The most-recorded species is *A. ledinghamii* with 27 records. The circumscription of *A.* sect. *Stereothrix* is not stable, and the boundaries between *A.* sect. *Hololeuce*, *A.* sect. *Hypoglottidei*, *A.* sect. *Malacothrix* and *A.* sect. *Stereothrix* are not definitely clear. Without intending to draw any phytogeographical conclusions, based on the available data, the species of *A.* sect. *Stereothrix* can be categorized in five distributional groups, as follows:

1. Distribution in the Alborz Mountains with an extension to the west (Fig. 3A–C) — There are four endemic

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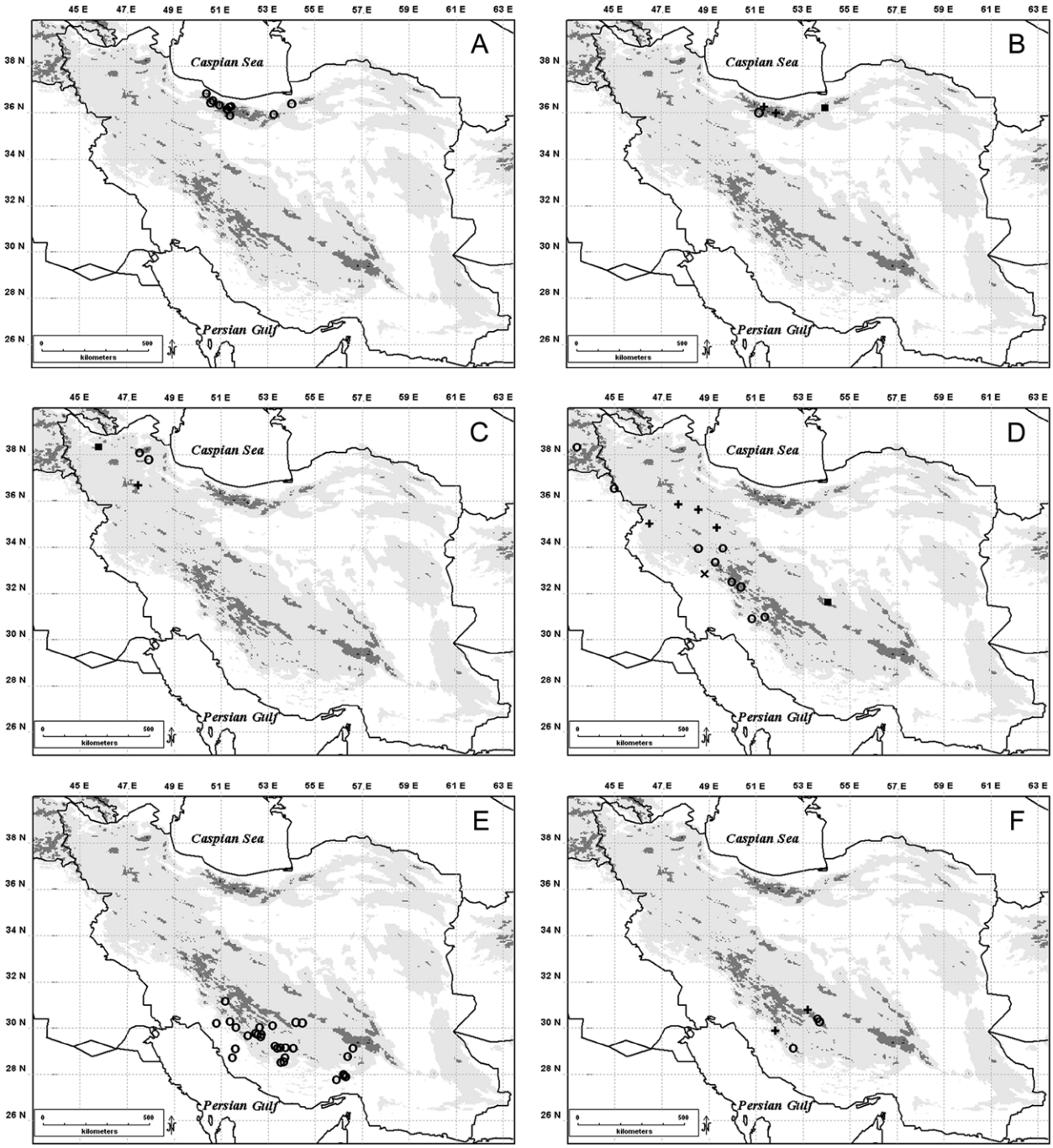


Fig. 3. Distribution of endemic and subendemic species of *Astragalus* sect. *Stereothrix* in Iran – A–C: species distributed in the Alborz Mountains with an extension to the west: A: *A. capito* (○); B: *A. altimontanus* (○), *A. damghanensis* (■) and *A. montis-varvashti* (+); C: *A. mahneshanensis* (+), *A. montismishoudaghi* (■) and *A. pseudocapito* (○); D: species distributed in the C and N Zagros Mountains extending to NE Iraq and SE Turkey: *A. issatissensis* (■), *A. koelzii* (×), *A. podosphaerus* (+) and *A. sphaeranthus* (○); E, F: species distributed in the S Zagros Mountains; E: *A. ledinghamii* (○); F: *A. bavanatensis* (○) and *A. doshman-ziariensis* (+).

species in the C Alborz Mountains (Fig. 3A, B), each belonging to a certain altitudinal zone. They are *Astragalus damghanensis* (montane zone), *A. altimontanus* (subalpine zone), *A. capito* and *A. montis-varvashti* (alpine and subnival zones). The distribution extends from the Alborz Mountains to Iranian Azerbaijan (Fig. 3C) with *A. mahneshanensis*, *A. montismishoudaghi* and *A. pseudocapito*. Although *A. capito* has been reported from the E Anatolian mountains (Chamberlain & Matthews 1970), the presence of this species in Turkey is doubtful, and we follow Podlech & al. (2010), who recently considered it as endemic to the Alborz Mountains. All species of this group are local endemics and most have been recorded only from the type localities. Nearly all species

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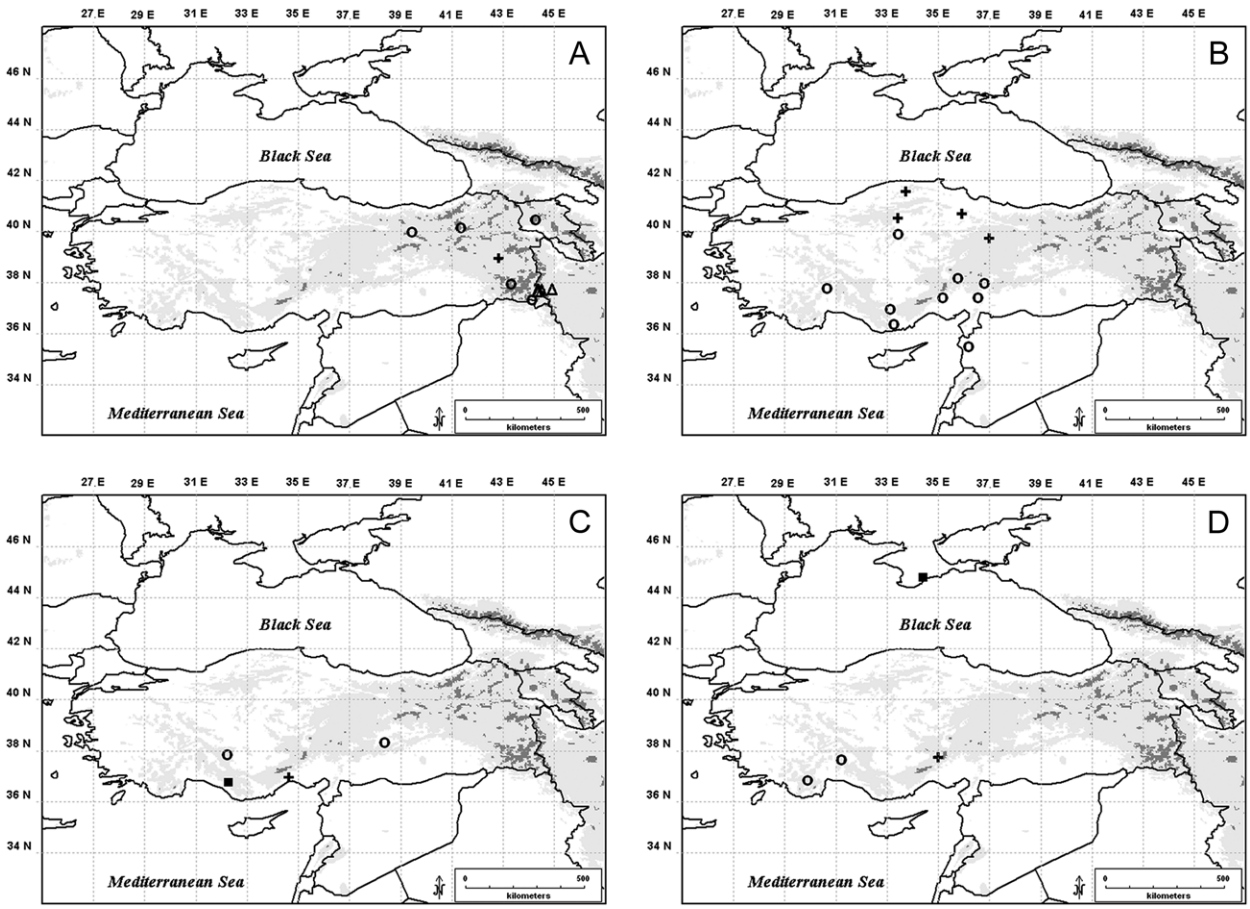


Fig. 4. Distribution of endemic and subendemic species of *Astragalus* sect. *Stereothrix* in southeastern Europe and Turkey – A: species distributed in E Anatolia: *A. barbatus* (○), *A. hakkariensis* (△) and *A. subhanensis* (+); B–D: species distributed in C Anatolia; B: *A. hispidus* (○) and *A. leucothrix* (+); C: *A. chamberlainianus* (+), *A. mahmutlarensis* (■) and *A. sparsipilis* (○); D: *A. chamardiensis* (+), *A. setosulus* (■) and *A. sorgerae* (○).

are morphologically close to each other. The exception is *A. montismishoudaghi*, which is somewhat close to *A. ledinghamii*, with a large geographical disjunction between the two species (Sheikh Akbari Mehr & al. 2011). Based on unpublished molecular data, these two species are distinct (Kazempour Osaloo, pers. comm.).

2. Distribution in the C and N Zagros Mountains extending to NE Iraq and SE Turkey (Fig. 3D) — There are four species in this group. *Astragalus issatissensis*, described here, is endemic to the C Zagros Mountains; *A. podosphaerus* is known from only four localities in the N Zagros Mountains; and *A. sphaeranthus* is rather widespread in the C Zagros Mountains extending to NE Iraq and SE Turkey. The remaining species in this group is *A. koelzii* which, despite numerous attempts by the second of the present authors (Maassoumi), has not been recorded since the type specimen was collected.

3. Distribution in the S Zagros Mountains (Fig. 3E, F) — There are three related species, *Astragalus bavanatensis*, *A. doshman-ziariensis* and *A. ledinghamii* restricted to the S part of the Zagros Mountains. Among these, *A. ledinghamii* has the widest distribution of *A.* sect. *Stereothrix* in Iran (Fig. 3E) and represents the southern limit of the section. Unlike other Iranian species in *A.* sect. *Stereothrix*, the species of this group grow at relatively low altitudes (average altitude: 1550 m).

4. Distribution in E Anatolia (Fig. 4A) — This group comprises three species: *Astragalus barbatus*, *A. hakkariensis* and *A. subhanensis*. The most abundant is *A. barbatus*, the type specimen of which is from Armenia. The other two species were recently described from the S part of E Anatolia, and *A. hakkariensis* is recorded here from adjacent NW Iran.

5. Distribution in C Anatolia (Fig. 4B–D) — One of the most important centres of diversity in *Astragalus* sect. *Stereothrix* is C Anatolia, which has the following seven species: *A. chamardiensis*, *A. chamberlainianus*, *A. hispidus*, *A. leucothrix*, *A. mahmutlarensis*, *A. sorgerae* and *A. sparsipilis*. Almost all the species in this area have been recorded from low altitudes (1100–1800 m). *Astragalus hispidus* (*A. nanus* DC.) is widespread in the S part of C Anatolia (Fig. 4B) and its type is from NW

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Syria. In contrast, the N part of the area is occupied by *A. leucothrix* (Fig. 4B). The other five species, each with one or two records, are locally endemic within a range of about 2° latitude in the S part of C Anatolia (Fig. 4C, D). *Astragalus setosulus* is the only representative of the section in Europe, described from the Crimean Peninsula on the Black Sea coast of Ukraine. It is an isolated species representing the northern limit of the distribution of *A.* sect. *Stereothrix* (Fig. 4D). In this paper, the latter species is considered as a member of the C Anatolian distribution group.

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References

Bunge A. A. von 1868: Generis *Astragali* species gerontogaeae. Pars prior. Claves diagnosticae. – Mém. Acad. Imp. Sci. St.-Pétersbourg, Sér. 7, **11(16).**

Chamberlain D. P. & Matthews V. A. 1970: *Astragalus*. – Pp. 49–254 in: Davis, P. H. (ed.), Flora of Turkey and the East Aegean Islands **3.** – Edinburgh: University Press.

Davis P. H., Mill R. R. & Tan K. (ed.) 1988: Flora of Turkey and the Aegean Islands **10** (supplement I). – Edinburgh: University Press.

Ghahremaninejad F. & Behçet L. 2003: *Astragalus subhanensis* (*Fabaceae*), a new species from Turkey. – Ann. Bot. Fenn. **40:** 209–211.

Guner A., Ozhatay N., Ekim T. & Baser K. H. C. (ed.) 2000: Flora of Turkey and the Aegean Islands **11** (supplement II). – Edinburgh: University Press.

Hijmans R. J., Guarino L., Bussink C., Mathur P., Cruz M., Barrantes I. & Rojas E. 2005: DIVA_GIS, Version 5: A geographic information system for the analysis of biodiversity data [Software]. – International Plant Genetic Resources Institute (IPGRI): published at http://diva-gis.org

IUCN 2012: IUCN Red List categories and criteria: Version 3.1, ed. 2. – Gland & Cambridge: IUCN.

Komarov V. (ed.) 1965: Flora URSS **12** [English translation]. – Jerusalem: Israel Program for Scientific Translations.

Lock J. M. & Simpson K. 1991: Legumes of west Asia: a check-list. – Kew: Royal Botanic Gardens.

Maassoumi A. A. 1989: The genus *Astragalus* in Iran **2.** Perennials. – Tehran: Research Institute of Forests and Rangeland [in Persian, with English summary].

Maassoumi A. A. 1998: *Astragalus* in the old world: check list. – Tehran: Research Institute of Forests and Rangeland.

Maassoumi A. A. 2005: Some interesting new species of the genus *Astragalus* in Iran. – Iran. J. Bot. **11(1):** 101–109.

Mahmoodi M., Maassoumi A. A. & Hamzeh'ee, B. 2009: Geographic distribution of *Astragalus* (*Fabaceae*) in Iran. – Rostaniha **10(1):** 112–132 [in Persian, with English summary].

Mahmoodi M., Maassoumi A. A. & Jalili A. 2012: Distribution patterns of *Astragalus* in the old world based on some selected sections. – Rostaniha **13(1):** 39–56 [in Persian, with English summary].

Noroozi J., Akhani H. & Breckle S. W. 2008: Biodiversity and phytogeography of the alpine flora of Iran. – Biodivers. & Conservation **17:** 493–521.

Podlech D. 1999: New *Astragali* and *Oxytropis* from North Africa and Asia, including some new combinations and remarks on some species. – Sendtnera **6:** 135–174.

Podlech D. 2004: New species of *Astragalus* L. (*Leguminosae*), mainly from Iran. – Ann. Naturhist. Mus. Wien. **105B:** 565–596.

Podlech D. 2009: Some new species and combinations in *Astragalus* and *Phyllolobium* (*Fabaceae*). – Feddes Repert. **120:** 48–58.

Podlech D. 2011: Thesaurus Astragalorum: Index of all taxa within the genus *Astragalus* L. and other genera but belonging to the genus *Astragalus*. Taxa of the Old World and related taxa of the New World. – Published at http://www.botanik.biologie.uni-muenchen.de/botsyst/theslit.html [accessed 7 Oct 2012].

Podlech D. & Ekici M. 2008: Some new and interesting *Astragalus* species (*Fabaceae*) from Turkey. – Feddes Repert. **119:** 24–36.

Podlech D., Maassoumi A. A. & Zarre S. H. 2012: *Papilionaceae* VII., *Astragalus* V. – In: Rechinger K. H. (ed.), Flora Iranica **179.** – Wien: Naturhistorisches Museum.

Podlech D., Zarre S. H., Maassoumi A. A., Ekici M. & Sytin A. 2010: *Papilionaceae* VI., *Astragalus* IV. – In: Rechinger K. H. (ed.), Flora Iranica **178.** – Wien: Naturhistorisches Museum.

Ranjbar M., Mahmoudian B. & Vitek E. 2013: A synopsis of genus *Astragalus* L. sect. *Stereothrix* Bunge (*Fabaceae*). – Biol. Diversity Conservation **6(1):** 114–133.

Sheikh Akbari Mehr R., Ghorbani Nohooji M. & Saidi A. 2011: A new isolated species of the genus *Astragalus* from Azerbaijan, Iran. – Iran. J. Bot. **17(2):** 178–180.

Thiers B. 2008+ [continuously updated]: Index herbariorum: a global directory of public herbaria and associated staff. – Published at http://sweetgum.nybg.org/ih/ [accessed 29 Sep 2012].

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