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MASSOUD RANJBAR[1*] & KAZEM NEGARESH[1]

A contribution to the genus *Amberboa* (*Asteraceae*, *Cardueae*, *Centaureinae*) from Iran

Abstract

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Amberboa zanjanica (*Asteraceae* , *Cardueae*, *Centaureinae*) is described and illustrated as a new species from Zanjan province, NW Iran. It is a diploid species ($2n = 2x = 32$) and morphologically most similar to *A. sosnovskyi*. The new species is compared with *A. glauca*, *A. moschata* and *A. nana*. Also presented are the habit and conservation status of the new species, the geographical distribution of the new species and *A. sosnovskyi*, and a key to all species of the genus *Amberboa* in Iran.

Additional key words: endangered, new species, taxonomy, *Amberboa sosnovskyi*, *Compositae*, identification key

Introduction

The concept of genera varies enormously in the subtribe *Centaureinae* of the *Asteraceae* (Wagenitz & Hellwig 2000). This is clearly shown by the following list with the number of genera recognized by various authors: Hoffmann (1894): 9 genera; Bobrov & Czerepanov (1963): 26 genera (only the "Flora SSSR area", but most genera occur there); Dostál (1973): 51 genera; Dittrich (1977): 7 genera; and Bremer (1994): 31 genera. Following progress in taxonomy, numerous changes and rearrangements have been proposed in the genera of the subtribe (Garcia-Jacas & al. 2000; Wagenitz & Hellwig 2000; Greuter 2003; Hellwig 2004; Martins & Hellwig 2005; Garcia-Jacas & al. 2006; Hidalgo & al. 2006; Martins 2006; Wagenitz & al. 2006; Susanna & Garcia-Jacas 2007; Ranjbar & al. 2012a–c; Ranjbar & Negaresh 2012). In Iran, the *Centaureinae* comprise c. 20 genera.

Amberboa (Pers.) Less. is a small genus of the subtribe *Centaureinae* with complex taxonomy and nomenclature (Gabrielian 2011). It has been reported that *Amberboa* comprises ten species (Tzvelev 1963; Wagenitz 1975; Rechinger 1980; Hellwig 2004; Gabrielian 2011). In Iran (Rechinger 1980) the genus is represented by five species.

Material and methods

Morphology — Plants were collected from different regions within the natural geographical distribution of the genus *Amberboa* during several excursions in W and C Iran. In addition, this study is based on material in the herbaria of the Bu-Ali Sina University (BASU) and the Ferdowsi University of Mashhad (FUMH) as well as on digital images of type material in the herbaria of B, G, GOET, LD, LE, P, W and WU (all herbarium codes according to Thiers 2008+). The collected *Amberboa* specimens were identified according to the treatment in Flora iranica (Rechinger 1980). A range of taxonomi-

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cally important characters in the genus was investigated. The characters included indumentum of whole plants, shape and dissection of leaves, size and position of capitula, indumentum of involucres, color of florets, length of peripheral and central florets, and length of achenes and pappi.

Cytology — Chromosome counts were made on somatic metaphases using the squash technique. Root meristems from germinating seeds from the type gathering were used. Samples were pre-treated with 0.01 M colchicin at 4 °C for 3.5 hours. The material was fixed in Carnoy's solution for 24 hours at low temperatures. Before staining, the material was hydrolyzed with 5 M hydrochloric acid (HCl) for 30 minutes at room temperature (20 °C), stained with 1 % acetic orcein and mounted in 45 % acetic acid. Photographs of chromosomes were taken with an Olympus BX-41 photomicroscope at initial magnification of 1000x. Chromosome counts were made on eight well-spread metaphases in intact cells by direct observation and from the photomicrographs.

Results and Discussion

Amberboa zanjanica Ranjbar & Negaresh, **sp. nov**. – Fig. 1.

Holotype: Iran, Zanjan province, Bijar to Zanjan, 90 km to Zanjan, 12 km to Halab, 1425 m, 14 Jun 2012, *Ranjbar & Negaresh 32982* (BASU!; isotype: BASU!).

Diagnosis — Haec species *Amberboae sosnovskyi* Iljin similis, sed caule dense griseo-floccoso-tomentoso (nec glabro vel subglabro), foliis plus minusve dense floccoso-tomentosis (nec sparse crispis interdum omnino glabris), foliis basalibus et inferioribus indivisis, margine dictincte dentato-serrato (nec plus minusve pinnatilobato vel pinnatipartito), involucro globoso 18–20 × 16–20 mm (nec ovoideo 9–15 × 5–11 mm), phyllariis plus minusve laxe tomentoso-crispis (nec omnino glabrescentibus), flosculorum peripheralium corollae lobis 7–10 mm (nec 2–3 mm) longis atque achaeniis 5.5–6 mm (nec 3.5–4.5 mm) longis, differt.

Description — *Herbs* biennial, usually pale green all over, 30–55 cm tall. *Stem* solitary, erect, branched in upper part, cylindrical, c. 5 mm in diam. at base, striate, densely covered with grey floccose-tomentose indumentum. *Leaves* coriaceous, ± densely covered with floccose-tomentose indumentum, rarely subglabrous; *basal and lower cauline leaves* shortly petiolate, blade undivided, lanceolate or lanceolate-elliptic, 9–13 × 2–3 cm, margin distinctly dentate-serrate, apex acute or shortly acuminate; *median cauline leaves* subsessile, divided, lanceolate in outline, 4–7 cm long; *segments* in 3 or 4(or 5) pairs, triangular or narrowly lanceolate, smaller toward base, 0.5–1 × 0.2–0.6 cm (sometimes terminal segment longer), margin with 2–4 acute teeth (4–8 teeth in terminal segment), rarely entire; *upper cauline leaves* sessile or subsessile, smaller than median leaves, lanceolate or narrowly lanceolate, divided or margin with coarse teeth or entire, apex acute or mucronate. *Capitula* solitary at tips of branches; *peduncle* up to 2 cm long, leafless; *involucre* globose, 18–20 × 16–20 mm; *phyllaries* multiseriate, imbricate, light green, coriaceous, ± loosely covered with tomentose-crisped hairs, margin with distinct nerves; *outer phyllaries* ovate, 4–6 × 2.2–4 mm, margin narrowly scarious, apex rounded or subacute, appendage absent; *median phyllaries* broadly ovate-oblong, 8–12 × 5–8 mm, margin narrowly pale brown or shining or scarious, apex subacute, appendage absent; *inner phyllaries* oblong or linear, 16–18 × 3–7 mm, with an appendage; *appendage* caducous, brownish with brown-orange nerves, ovate or suborbicular, 1.6–2.2 × 3–4 mm, margin denticulate and irregularly lacerate. *Florets* pink, in dry state distinctly pale pink; *peripheral florets* few, equalling or slightly longer than central florets, corolla radiant, 10–12-lobed, orange nerved, weakly hairy at middle, lobes 7–10 mm long. *Achenes* oblong or oblong-arcuate, 5.5–6 × c. 1 mm, somewhat densely appressed hairy, apex truncate; *hilum* lateral, 1.1–1.3 mm long, surrounded by a light-coloured annular ridge, hairy; *pappus* persistent, whitish, plumose, shorter than achene, 3–3.6 mm long.

Chromosome number — We found the constant chromosome number of $2n = 2x = 32$ (Fig. 1E) in all eight metaphase plates examined. This basic number of $x = 16$ was already known from other species of the genus (Gupta & Gill 1981, 1989; Garcia-Jacas & al. 1998a, 1998b).

Phenology — Flowering from May to June; fruits ripening from June to July.

Distribution and ecology — *Amberboa zanjanica* is a rare endemic of NW Iran and is so far known only from the road to Halab between Bijar and Zanjan in Zanjan province (Fig. 2). It grows in clay and on roadsides at 1400–1800 m in altitude. It is associated with *Anchusa azurea* Mill. (*A. italica* Retz.), *Avena sativa* L., *Carthamus oxyacantha* M. Bieb., and species of *Chenopodium* and *Euphorbia*.

Conservation status — *Amberboa zanjanica* is a narrow endemic. It is very rare and known only from the type locality in Zanjan province. The estimated area of occupancy is less than 2 km^2 and the number of mature individuals is fewer than 100. It should be categorized as Endangered (EN) according to IUCN criterion D (IUCN 2012).

Etymology — The specific epithet refers to Zanjan province, Iran, where the new taxon is found.

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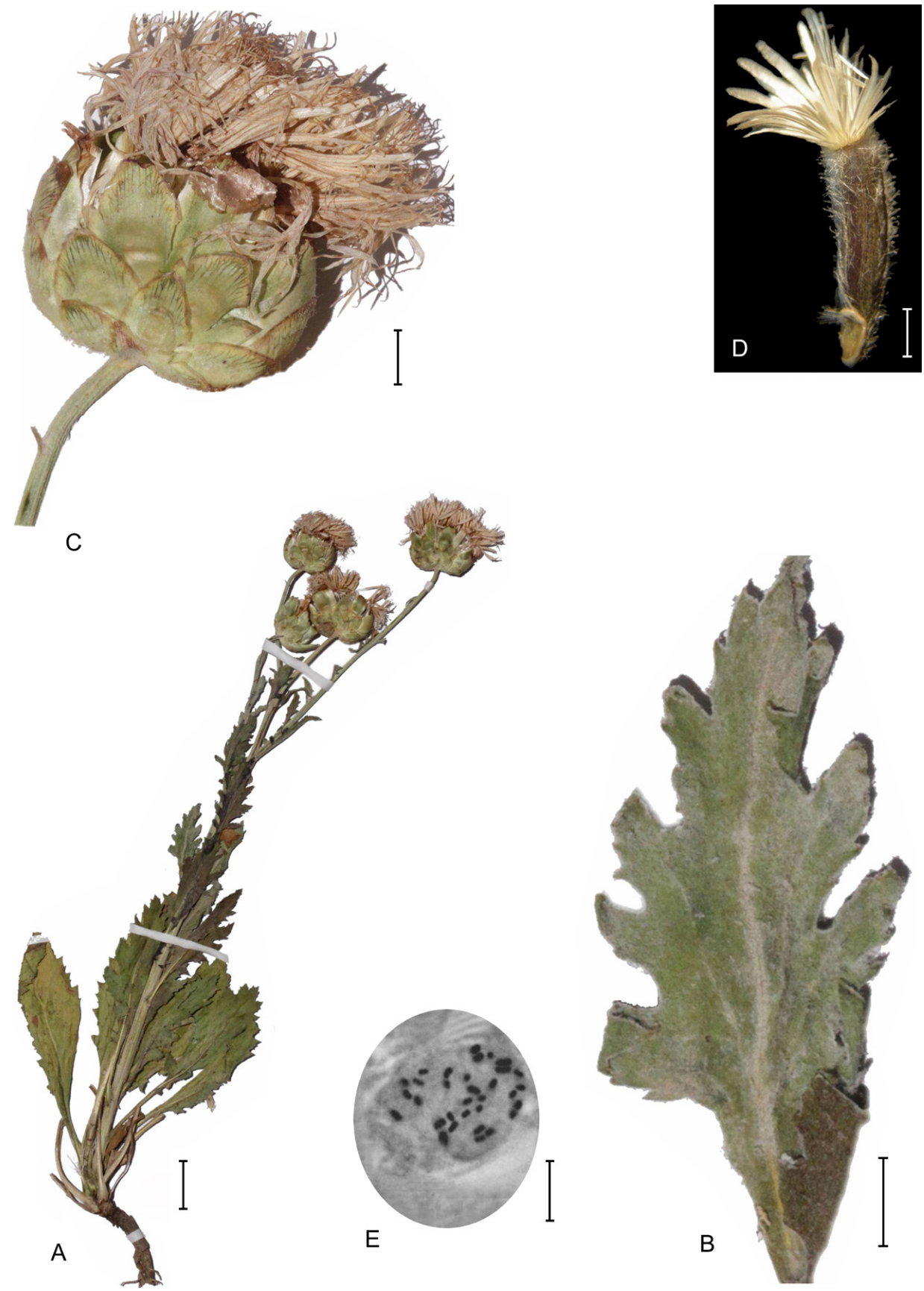


Fig. 1. *Amberboa zanjanica* – A: habit; B: upper cauline leaf showing indumentum; C: capitulum; D: achene with pappus; E: metaphase plate, $2n = 32$. – Scale bars: A = 2 cm; B = 5 mm; C = 3 mm; D = 1 mm; E = 2 µm. – A–D from the holotype; E from root meristems from seeds from the type gathering.

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Remarks — *Amberboa zanjanica* most closely resembles *A. sosnovskyi* Iljin. The latter species occurs in Armenia, Nakhchivan, Azerbaijan and NW Iran (Tzvelev 1963) and, according to Flora iranica (Rechinger 1980), it is the most narrowly distributed species of *Amberboa* in Iran and the only one that grows in Zanjan province (Fig. 2). The new species also resembles *A. glauca* (Willd.) Grossh., from Caucasus and Transcaucasia (Tzvelev 1963), *A. moschata*, from Turkey and Transcaucasia (Tzvelev 1963; Wagenitz 1975), and *A. nana* (Boiss.) Iljin from S and E Transcaucasia, NW, N, C and SE Iran and C Asia (Tzvelev 1963; Rechinger 1980). A comparison of the morphological characters of all five species is provided in Table 1.

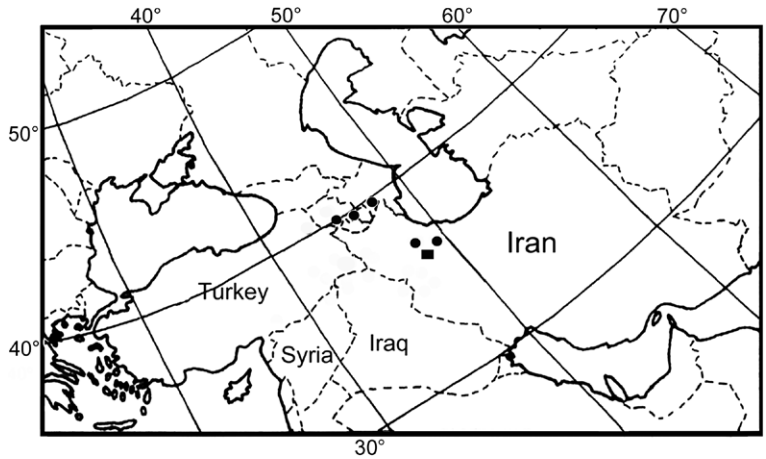


Fig. 2. Distribution of *Amberboa zanjanica* (square) and *A. sosnovskyi* (circles).

Key to the species of *Amberboa* in Iran

1. Florets yellow 2
– Florets pink 4
2. Peripheral florets usually 4–10 mm longer than central florets . . . . . ***A. amberboi***
– Peripheral florets scarcely longer than central florets 3
3. Plants often strongly branched from base, often with 1 or more capitula on greatly shortened peduncles in centre of basal leaf rosette; margin of basal and lower cauline leaves pinnately lobed, ± toothed or entire; involucre 10–16 × 5–12 mm; appendage of inner phyllaries very small, lanceolate, early withering; corolla of peripheral florets 5–10-lobed . . . . . ***A. turanica***
– Plants with simple or branched stems, never with capitula at base; margin of basal and lower cauline leaves usually unlobed but ± toothed; involucre 16–24 × 16–24 mm; appendage of inner phyllaries somewhat large, ovate-lanceolate or oblong, subcoriaceous; corolla of peripheral florets 8–20-lobed . . . . . ***A. bucharica***
4. Involucre globose, 18–20 × 16–20 mm; appendage of inner phyllaries large, ovate or suborbicular, margin denticulate and irregularly lacerate; achenes 5.5–6 mm long; pappus distinctly shorter than achene . . . . . ***A. zanjanica***
– Involucre ovoid or oblong-ovoid, 9–16 × 5–12 mm; appendage of inner phyllaries very small, lanceolate; achenes 3.5–4.5(–5) mm long; pappus equalling or slightly shorter than achene 5
5. Plants never with capitula at base; stem glabrous or subglabrous; phyllaries completely glabrous; peripheral florets usually 3–7 mm longer than central florets, corolla 8–16-lobed, glabrous or very weakly hairy at middle . . . . . ***A. sosnovskyi***
– Plants often with 1 or more capitula on greatly shortened peduncles in centre of basal leaf rosette; stem scattered with short crisped hairs; phyllaries arachnoid-tomentose to subglabrous; peripheral florets scarcely longer than central florets, corolla 5–10-lobed, ± hairy at middle . . . . . ***A. nana***

Specimens seen of *Amberboa* species

Amberboa amberboi (L.) Tzvelev — Iran: North Khorasan province: NW of Bojnord, 3 km from Eshgh Abad to Khorram Deh, 550–600 m, 8 May 2007, *Memariani & Zangui 38817* (FUMH); SE of Bojnord, first road Sheikh, 1100–1200 m, 4 Jul 1993, *Faghihnia & Zangui* 23556 (FUMH).

Amberboa bucharica Iljin — Iran: Razavi Khorasan province: E of Dargaz, between post Hatam Ghaleh and Shilgan, 400–500 m, 11 Jun 2002, *Joharchi 34230* (FUMH); S of Dargaz, between Chapeshlu and Zanglanlu, 750–800 m, 30 May 2011, *Joharchi 44239* (FUMH). Afghanistan: Takhar province, Naqel, a Darya-e Taloqan, 600–700 m, 27 May 1972, *Anders 9261* (W). Baghlan province, Dasht-e Beshgaze, E of Pol-e Khumeri, 1500–1600 m, 25 May 1971, *Anders 6852* (W).

Amberboa glauca (Willd.) Grossh. — Georgia: *Linz* (P).

Amberboa moschata (L.) DC. — Turkey: A9 Kars: 3 km E of Tuzluca (Aras valley), 1000 m, *Davis 43634* (E); below Kağızman, 1300 m, 18 Jul 1966, *Davis 46836* (E). — B10 Ağrı: N of Doğubeyazıt, foot of Mt Ararat (Ağrı Da.), *Hewitt 401* (E); Aras valley nr Iğdır, 28 Jun 1967, *Rossi* (E).
Georgia: Tbilisi, Kojori, Khrogoli (Azeula), 65–100 m, 7 May 2010, *R. Brown & al. 3* (E).

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Table 1. Morphological comparison of *Amberboa glauca*, *A. moschata*, *A. nana*, *A. sosnovskyi* and *A. zanjanica*.

	Amberboa glauca	***Amberboa moschata***	***Amberboa nana***	***Amberboa sosnovskyi***	***Amberboa zanjanica***
Life cycle	biennial	biennial or annual	annual	annual or biennial	biennial
Plant height [cm]	20–70	20–70	2–35	20–50	30–55
Stem branching	simple or ± branched	simple or ± branched	often strongly branched from base, often with 1 or more capitula on greatly shortened peduncles in centre of basal leaf rosette	stems 2 to 5, branched at base or in upper part, sometimes simple	stem 1, branched in upper part, never with capitula at base
Stem indumentum	± covered with short crisped hairs	± covered with short crisped hairs	scattered with short crisped hairs	glabrous or subglabrous	densely grey floccose-tomentose
Leaf indumentum	± covered with short crisped hairs, often subglabrous	± covered with scattered crisped hairs, often subglabrous	± covered with short crisped hairs, and thinly arachnoid-tomentose, often subglabrous	with scattered crisped hairs, sometimes entirely glabrous	± densely floccose-tomentose, rarely subglabrous
Basal and lower cauline leaf dissection	± toothed or pinnately lobed, sometimes entire	unlobed, ± toothed, or pinnately lobed	± toothed, or pinnately lobed or entire	unlobed or pinnately lobed, margin ± toothed	unlobed, margin distinctly dentate-serrate
Involucre shape	ovoid	broadly ovoid	oblong-ovoid or ovoid	ovoid	globose
Involucre size [mm]	13–18 × 10–18	13–20 × 10–20	10–16 × 5–12	9–15 × 5–11	18–20 × 16–20
Phyllary indumentum	often glabrous or very finely arachnoid-tomentose	± finely arachnoid-tomentose	arachnoid-tomentose to subglabrous	completely glabrous	± loosely tomentose-crisped
Inner phyllary appendage	large, orbicular or ovate	somewhat large, suborbicular or ovate, obtuse	very small, lanceolate	very small, lanceolate	large, ovate or suborbicular, margin denticulate and irregularly lacerate
Peripheral floret length relative to central florets	slightly longer than central florets	usually 5–10 mm longer than central florets	scarcely longer than central florets	usually 3–7 mm longer than central florets	equalling or slightly longer than central florets
Peripheral floret corolla indumentum	glabrous	± pilose at middle with long flexuous hairs	± hairy at middle	glabrous or very weakly hairy at middle	weakly hairy at middle
Peripheral floret corolla lobe number	10–20	10–20	5–10	8–16	10–12
Peripheral floret corolla lobe length [mm]	?	5–8	2–3.5	2–3	7–10
Achene length [mm]	3–4	3.2–4	3.5–5	3.5–4.5	5.5–6
Pappus length relative to achene	almost as long as achene, occasionally absent	almost as long as achene, very rarely absent	usually slightly shorter than achene	± equalling achene	shorter than achene

Amberboa nana (Boiss.) Iljin — IRAN: MARKAZI PROVINCE: 8 km to Nubaran, 1400–1500 m, 25 May 2012, *Ranjbar & Negaresh 30959* (BASU); 30 km from Nubaran to Tafresh, 1400–1450 m, 26 May 2012, *Ranjbar & Negaresh 31344* (BASU); Delijan, 175 km to Isfahan, 1500–1700 m, 26 Apr 2011, *Ranjbar & Negaresh 23728* (BASU). — KERMAN PROVINCE: 5 km after Sirch, 2000–2050 m, 3 May 2011, *Ranjbar & Negaresh 24607* (BASU), *24357* (BASU). — ISFAHAN PROVINCE: Kashan to Mashhad-e Ardehal, 1750–1800 m, 6 May 2011, *Ranjbar & Negaresh 24482* (BASU).

Amberboa sosnovskyi Iljin — ARMENIA: ARARAT PROVINCE: 14 Jun 1997, *Gabrielian* (B).
IRAN: ZANJAN PROVINCE: in collibus argilloso-gipsaceis 60 km NW of Zanjan, 1520 m, *Rechinger 42294* (W); ibid., *Rechinger 42299* (W); 10 km NW of Zanjan toward Mianeh, 1000 m, *Soják 7592* (W). — QAZVIN PROVINCE: between Kllej and Manjil, 1200 m, *Sabeti 3427* (TARI).

Amberboa turanica Iljin — IRAN: ISFAHAN PROVINCE: Mobarkeh, 12 May 2012, *Ranjbar & Negaresh 31955* (BASU); Mobarkeh, Kalmaran, 6 May 2012, *Ranjbar & Negaresh 31965* (BASU). — RAZAVI KHORASAN PROVINCE: road Sarakhs-Mashhad, 28 Apr 1994, *Faghihnia & Zangui 23847* (FUMH); between Saleh Abad and Pol-e Khaton (Torbat-e Jam), 500–600 m, 13 Apr 1993, *Faghihnia & Zangui 22689* (FUMH); Torbat to Gonabad, 650–700 m, 26 Apr 1975, *Zargari* (FUMH); Mashahd to Saleh Abad, 550–600 m, 18 May 1991, *Joharchi & Zangui 20275* (FUMH).
AFGHANISTAN: *Aitchison 262* (P); Tang-i-Taschkurgan, 600 m, 27 Apr 1969, *Freitag 5113* (W); Samangan, 20 km to Tashqurghan and Mazar-e Sharif, 350 m, 22 Apr 1971, *Podlech 20520* (W); Andarab valley below Khinjan Ghazon, 1000 m, 19 Jun 1968, *Freitag 3052* (W); 35 km W of Herat, hills near road, 850 m, 9 May 1968, *Freitag 5434* (W).

Amberboa zanjanica Ranjbar & Negaresh — IRAN: ZANJAN PROVINCE, Bijar to Zanjan, 90 km to Zanjan, 12 km to Halab, 1425 m, 14 Jun 2012, *Ranjbar & Negaresh 32982* (BASU) [holotype and isotype].

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