

The genus *Halothamnus* Jaub. & Spach (Chenopodiaceae) in Turkey

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Abstract: The semidesert taxon *Halothamnus* (Chenopodiaceae), which is confirmed to supersede the later *Aellenia*, is represented in Turkey by *H. glaucus* subsp. *glaucus* and *H. hierochunticus*. The former was known to occur in Kars and Ağrı provinces but was found recently in Kayseri province as well. The latter is a new record for the flora of Turkey from Şanlıurfa province close to the Syrian border. Full descriptions of the genus and the species occurring in Turkey are given and the case of *Aellenia* is discussed. Images and distributional data including maps are provided.

Key words: *Aellenia*, Chenopodiaceae, flora of Turkey, *Halothamnus*

Türkiye’de *Halothamnus* Jaub. & Spach (Chenopodiaceae) cinsi

Özet: *Aellenia* olarak da bilinen yarıkurak tipli *Halothamnus* cinsi (Chenopodiaceae) *H. glaucus* subsp. *glaucus* ve *H. hierochunticus* taksonları ile temsil edilmektedir. İlk takson çok önce Kars ve Ağrı illerinde, yakın zamanda Kayseri ilinde; diğeri ise Türkiye florası için yeni bir kayıt olarak Şanlıurfa ilinde Suriye sınırına yakın bölgede bulunmuştur. Makalede bu taksonların deskripsiyonları yapılmış, genel dağılımı, habitat ve ekolojileri hakkında detaylı bilgiler verilmiştir.

Anahtar sözcükler: *Aellenia*, Chenopodiaceae, Türkiye florası, *Halothamnus*

Introduction

According to the revision by Kothe-Heinrich (1993), *Halothamnus* Jaub. & Spach, tr. *Salsoleae*, subf. *Salsoloideae*, includes 21 species distributed in deserts and semideserts from Tropical NE Africa (Somalia) through the Arabian Peninsula to S Pakistan, and

through the Near and Middle East countries, the new states of the former Russian Middle Asia to the westernmost parts of China. In the *Flora of Turkey* the genus name appears only in a note under *Aellenia glauca* (M.Bieb.) Aellen, because the author (Davis et al., 1988) was not sure if the synonymisation of

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Aellenia Ulbr. with *Halothamnus* Jaub. & Spach by Botschantzev (1981) was correct. The only species from the area was reported in Vol. 2 (Aellen, 1967) from an undefined locality along the Aras valley in E Anatolia. In Fl. Turk. Suppl. Vol. 10 (Davis et al., 1988) 1 more specimen from Kars province and 2 localities from E of Doğubayazıt in Ağrı province are listed. However, in the revision of *Halothamnus* (Kothe-Heinrich, 1993) some additional localities from Kars and Ağrı provinces are included, and the species was also detected in new collections from Yeşilhisar in Kayseri province, C Anatolia. In a collecting trip undertaken in 1997, the first author and N. Adigüzel from Gazi University in Ankara found still more localities in E and C Anatolia and made observations on the ecological and phytocoenological conditions in the respective habitats.

Finally, during ecological field work carried out by the 3 co-authors during September 2005 in the Harran plain E of Akçakale in Şanlıurfa province, SE Turkey, a second species of *Halothamnus* was found. Due to its absence from the *Flora of Turkey* volumes, it was at first misnamed *Salsola crassa* Bieb. respectively (Atamov et al., 2006, 2008). Later it was sent to the first author, who had identified already several taxa of *Chenopodiaceae* new to the flora of Turkey (Freitag & Özhatay, 1997; Freitag et al., 1999; Freitag, 2000; Freitag & Duman, 2000). It proved to be *Halothamnus hierochunticus*, a widespread and somewhat weedy species that is rather common in neighbouring countries of the Near East. In this paper, all data on the distribution and some basics on the ecology of the 2 *Halothamnus* species occurring in Turkey are accumulated. Furthermore, because it might be convenient for those botanists who do not have easy access to the relevant literature on *Halothamnus* (Botschantzev, 1981; Kothe-Heinrich, 1993, 1997), the genus and the species are described and discussed in detail. The descriptions are mainly based on the accounts of the latter author, but some collections from Turkey and the floras of adjacent areas likewise have been evaluated (Syria/Palestine: Post & Dinsmore, 1933, Mouterde, 1966, Zohary, 1966; Iraq: Aellen & Hillcoat, 1964; Transcaucasia: Grossgejm, 1945, Isayev, 1952, Takhtadzhyan & Mulkidiyan, 1956).

Halothamnus* and *Aellenia

Halothamnus Jaub. & Spach, Ill. Pl. Or. 2: 50, tab. 136, 1845.

Synonyms: *Aellenia* Ulbr. 1934, in Engler & Prantl, Natürl. Pflanzenfam, ed. 2, 16c: 567. – *Aellenia* emend. Aellen 1950, Verh. Naturf. Ges. Basel 61: 172. – *Salsola* L. sect. *Sphragidanthus* Iljin 1936, in Fl. SSSR 6: 245, descr. ross. – *Halothamnus* emend. Botsch. 1981, Novosti Sist. Vyssh. Rast. 18:146.

Shrubs, subshrubs or annuals with glabrous or hispidulous stems and leaves. Branches in young stage green, glaucous or olive-green throughout or with pale collenchymatous lines, terminating into inflorescences, later becoming grey or brownish. Leaves alternate, sessile or slightly decurrent, entire, somewhat succulent, semi-terete or flat, with salsoloid type of C_4 plants, often with tufts of short curled hairs in their axils. Inflorescences loose, long, spike- or panicle-like, with solitary sessile flowers arising from the axil of bracts, with 2 subtending bracteoles. Bracts in lower part leaf-like, in upper part gradually smaller and scale-like, persistent, about as long as bracteoles. Bracteoles usually scale-like, basally dilated and there often with membranous margins, like the bracts with tufts of curled axillary hairs. Flowers bisexual. Tepals erect, at base sometimes slightly connate, almost equal in length, the outer wider, above a transversal line with a triangular green blotch and wide membranous margins. Stamens 5, epitepalous; filaments band-shaped, arising from a fleshy hypogynous disc; anthers oblong to sagittate, divided for about $\frac{1}{2}$, with short, flat appendages. Pistil with globular or ovoid ovary, usually with a conical style-like upper part grading into 2 flat stigmas with papillose inner side. Fruiting perianth 5-winged; wings horizontal, overlapping, membranous, radially veined, the outer wider than the inner; below the wings strongly indurated, forming a tube-like structure often bulge-like dilated at the tepal bases; the perianth tube with flat base furnished with 5 prominent pits around the central abscission scar. Utricle enclosed, horizontally flattened, with hardened pericarp on upper and lower sides. Seed horizontal, lenticular, with thin testa and plano-spiral green or pale embryo. – Type of genus: *H. bottae* Jaub. & Spach.

The genus was based by Jaubert & Spach (1845) on the S Arabian *H. bottae* Jaub. & Spach and defined against the closely related *Salsola* by the glandular surface of the hypogynous disc and the insertion of the filament bases on its crenate margin. The authors noted that eventually several other *Salsola* species, especially *S. genistoides* Juss. ex Poir., also should be transferred to their new genus. However, *Halothamnus* was not accepted and later authors (e.g. Ulbrich, 1934) followed the recombination of *H. bottae* to *Salsola bottae* by Boissier (1879). Then Ulbrich (l.c.) separated his genus *Aellenia* from *Salsola* by the bone-like hardened fruiting perianth, with the 2 species *Ae. auricula* (Moq.) Ulbr. (NW Iran to Pakistan and Uzbekistan) and *Ae. lancifolia* (Boiss.) Ulbr. (from Sinai to Syria, W Iraq and N Saudi Arabia). The concept of the genus *Aellenia* was refined by Aellen (1950) himself. When studying the pertinent taxa of the Near and Middle East, he recognised a whole set of characters beside of the strongly lignified lower, tube-like part of the perianth, in particular the widened flat base of the perianth, which is surrounded by a bulge formed from the basal parts of the tepals and equipped with a most typical flat lower surface of 5 radial ribs forming a star-like structure and 5 distinct pits. Moreover, *Aellenia* has clearly flattened stigmas. This widened concept led him to transfer 3 more taxa to *Aellenia*, including *Ae. hierochuntica* (Bornm.) Aellen, and *Ae. glauca* (M. Bieb.) Aellen. In his later revision, Botschantzev (1981) confirmed most characters, but by extending his studies on a larger set of species he realised that they are present in *Salsola bottae* (Jaub. & Spach) Boiss. as well. As that is the type species of *Halothamnus*, consequently, for sake of priority, he replaced the name *Aellenia* by *Halothamnus* and recombined the respective species accordingly.

In order to solve some remaining taxonomical problems for the account of *Halothamnus* in *Flora Iranica* (Kothe-Heinrich, 1997), another revision of *Halothamnus* was undertaken as a PhD thesis in the lab of the first author by Kothe-Heinrich (1993).

Curiously enough, the glandular surface of the hypogynous disc, which originally was considered the only character separating the new genus *Halothamnus* from *Salsola*, was neither confirmed by Botschantzev nor by Kothe-Heinrich. Instead, it was detected by Freitag in numerous species of *Salsola* (Freitag & Rilke, 1997, see p. 160, fig. 5F-G). However, this does not interfere with the validity of the name.

Recently, the morphological separation of *Halothamnus* from *Salsola* got strong support from phylogenetic analyses of nuclear and chloroplast sequences. Akhiani et al. (2007) included *Halothamnus glaucus* and 3 other species of the genus in a combined ITS and *psbB-psbH* analysis of a great number of Salsoleae and detected that they take a position close to the *Kali* clade¹ and to *Noaea*. Unpublished data from Kadereit and Freitag from *Halothamnus glaucus* and *H. subaphyllus* show similar results, and in a likewise unpublished *ndhF* sequence tree *H. bottae* is placed even closer to the roots of Salsoleae.

Halothamnus in Turkey

1. *Halothamnus glaucus* (M.Bieb.) Botsch. 1981, Novosti Sist. Vyssh. Rast. 18: 157.

Synonyms² – *Salsola glauca* M.Bieb. 1798, Tabl. Prov. Mèr casp. St. Petersburg. pp. 112; id. 1800, Besch. Länd. Casp.: 144. – *Caroxylon glaucum* (M.Bieb.) Moq. 1849 in DC. Prodr. 13,2: 173. – *Aellenia glauca* (M.Bieb.) Aellen 1950, Verh. Naturf. Ges. Basel 61: 182. – *Salsola brachyphylla* Boiss. & Hausskn. in Boiss. 1879, Fl. Or. 4: 959, non Spreng. (1824).

Illustrations (in selection) – Buxb.1728, Cent. 1, Tab. 13 (sub *Kali fruticosum spicatum* (habit). – Isayev 1952, Fl. Azerb. Vol. 3, Tab. 21: 2a, b (habit, fruit). – Kothe-Heinrich 1993, Bibl. Bot. 143, fig. 34 (leaves, bracts, braceoles, flowers), fig. 35, upper row (fruits). – Kothe-Heinrich 1997, Fl. Iranica 172, fig. 8d (fruits). – Sorger 2000, 2004, Stapfia 68, fig. 19-22 (photos, habit and macros). – See also our Figures 1, 2, 3a,b.

Type: (Transcaucasia) ‘Ex montibus Schirvanensibus et Armenia iberica’, F.A. Marschall von Bieberstein, LE !

¹ In that paper, the polyphyletic genus *Salsola* was split into several smaller genera. Though this is basically justified, here the traditional names are maintained because from the species cited in this paper, 2 were not correctly recombined, and a third species that likewise needs to be recombined was still left over in *Salsola*.

² Here only synonyms are given that were used for plants from the Near and Middle East.



Figure 1. *Halothamnus glaucus* Jaub. & Spach, habit; roadside near Tuzluca; from Sorger (2000, 2004), by permission of Stafia.



Figure 2. Habitat of *Halothamnus glaucus*, eroded slope in gypsiferous marl, Aras valley W Tuzluca; *H. glaucus* preferably in the ravine; photo H. Freitag 09.1997.

Subshrub, 20-70(100) cm, erect, glabrous. Stem loosely branched; branches ascending, glaucous when young, striate, later with grey cortex. Leaves spreading, not or slightly decurrent, semi-terete, acuminate, the lower linear, 15-50 × 0.7-2.6 mm, the upper gradually shorter, linear-lanceolate, 3-10 × 0.7-1.5 mm. Bracts of lower flowers similar to leaves, basally widened and with membranous margins, longer than or as long as bracteoles and perianth; higher up scale-like, lanceolate-ovate to triangular ovate, shorter than bracteoles and perianth, 1.8-3.7 × 2-2.9 mm. Bracteoles similar to bracts but except for the upper shorter and always basally more dilated, with wide membranous margins. Tepals lanceolate-ovate to triangular-ovate, 3.5-4.5 mm long, the outer 2.1-3 mm wide, transverse line at 1/4-1/3, in upper part with narrowly triangular green blotch and

prominent membranous margins. Filaments arising from outer side of disc, 0.6-0.9 mm wide. Anthers 2.4-3.1 mm long, with 0.1-0.3 mm long appendage. Disc with short interstaminal lobes. Ovary-style complex in flowering stage ovoid, in fruiting stage clearly separated into seed-bearing disc-shaped lower part and conical upper part. Stigmas 1.2-2.1 × 0.35-0.6 mm, with rounded denticulate apex. Fruits including wings (9)11-17 × 3.2-5.0(5.6) mm; perianth tube at the wings 3-4.5 mm, at base 2.5-4.8 mm diam., 1.4-2.3 mm high; heterocarpic: in lower parts of inflorescences with smaller wings, thicker perianth tube distinctly widened at base, and basal plate with deeper pits; wings in or below the middle, straw-coloured, in immature stage often yellowish or reddish tinged; tepal lobes keeled, forming a moderately steep cone.

The description refers to subspecies *glaucus*, which is the only one known from Turkey to NE Iran. In *Fl. Turk.*, Vol. 2, Aellen (1967) cited *Aellenia glauca* subsp. *cinerascens* (Moq.) Aellen. However, in Vol. 10 the error had been corrected already. That taxon, which has regained species rank as *Halothamnus cinerascens* (Moq.) Kothe-Heinrich, was described from C Iran and extends westward up to Iranian Azerbaijan. It differs from *H. glaucus* mainly by furrow-like, linear, \pm curved pits, but also by distinctly verrucose surface of the young branches, wider leaves and bracts, bracteoles embracing the fruit base, and smaller diameter and height of the fruiting perianth tube.

Specimens seen – **E Anatolia: A9** Kars: Banks of Aras river, 29.07.1938, Gassner 1227 (G-PAE); 33 km W Tuzluca, 5 km E Köprübaşı, steep slopes in red marl, 22.09.1997, Freitag 28.626 KAS, GAZI; 31 km W of Tuzluca, salt steppe, 1100 m, 24.09.1984, Sorger 84-94-1 (KAS); ‘Armenia Rossica, Kulp’ (=Tuzluca), 12.09.1855, Seidlitz s.n. (P, G); 11 km S Iğdır at road to Doğubayazıt, skeleton soil on old lava flow, 960 m, 23.09.1997, Freitag in obs.; 20-25 km from Tuzluca to Iğdır, 950 m, dry gravelly hill, \pm saline, 19.07.1966, Davis 46858 (E, G-PAE); **B10** Ağrı: 9.5-11 km N Doğubayazıt to Iğdır, dry sandy loam, 01.08.1969, Hewitt 189 (E); 9 km E Doğubayazıt, N of main road, 1600 m, salt steppe, 23.10.1988, Sorger 88-12-1 (KAS); Between Doğubayazıt and Bazargan, 17.08.1967,

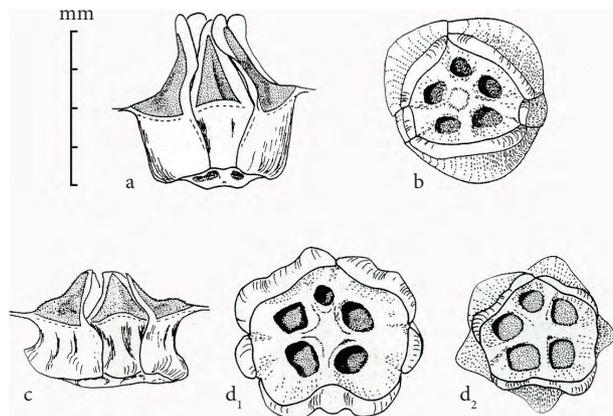


Figure 3. Fruits of *Halothamnus glaucus* (upper row) and *H. hierochunticus* (lower row) in side view (a, c) and in view on the basal plate (b, d), with heterocarpy in the latter species (d₁, d₂), wings cut; from Kothe-Heinrich (1993), by permission of Schweizerbart Publ.

Rechinger 37652 (W); SE Doğubayazıt, 1.6 km from Iranian border, dry rocky to sandy soil, 10.08.1970, Hewitt 305 (E); near Telgeker village, ca. 15 km W Bazargan, 1500 m, gravelly steppe and roadside, 20.08.1972, Uotila 19534 (H, LE). **C Anatolia: B5** Kayseri: SW Kayseri, S Yeşilhisar, salt steppe, 1100 m, 01.10.1984, Sorger 84-116-1 (KAS); Idem. 12 km S Yeşilhisar, steep eroded slopes in coloured volcanic tuff, 1150 m, 12.10.1997, Freitag 28.876 (KAS, GAZI).

General distribution – The species is \pm continuously distributed from E Turkey through the arid parts of Transcaucasia and NW Iran up to NE Iran (Figure 4). Like many other chenopods, e.g., *Halostachys belangeriana* (Moq.) Botsch., *Kalidium caspicum* (L.) Ungern-Sternb, *Bienertia cycloptera* Bunge, *Suaeda linifolia* Pall., *Salsola dendroides* Pall., *S. nodulosa* (Moq.) Iljin, *Petrosimonia squarrosa*, (Schrenk) Bunge, *Halanthium rarifolium* Koch, and *Seidlitzia florida* (M.Bieb.) Bunge, it belongs to the Irano-Turanian (IT) chorotype, in particular to the subtype IT2 (Léonard, 1988) that includes the species restricted to the western and central parts of the Irano-Turanian floristic region.

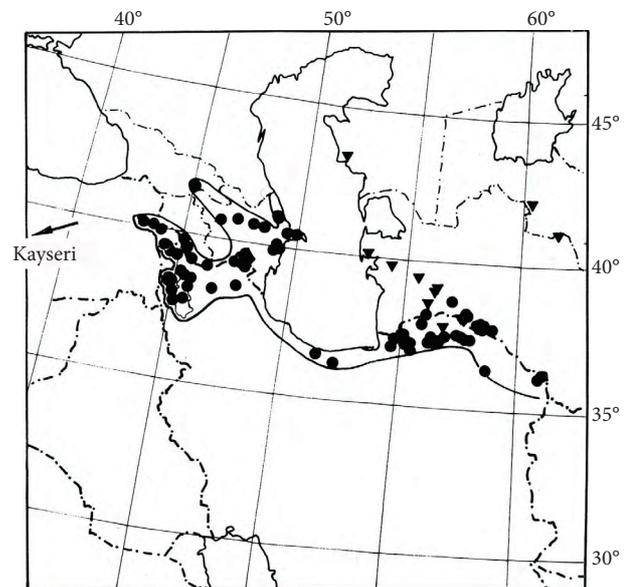


Figure 4. Distribution of *Halothamnus glaucus* subsp. *glaucus*; modified from Kothe-Heinrich (1993), by permission of Schweizerbart Publ. The triangles refer to subsp. *hispidulus* (Bunge) Kothe-Heinrich.

Habitat/ecology – The species is bound to the driest semi-desert areas in Turkey with less than 300(350) mm (İğdır 256 mm) per year in E and C Anatolia. Due to the altitudes of 850-1500 m and the continental position, the climate is also characterised by a dry and hot summer (up to 40 °C) and a very harsh winter (down to –30 °C). There *Halothamnus glaucus* grows in a wide variety of habitats but preferably on skeletal soils with high permeability and on steep, eroded slopes that are much drier than normal habitats due to high rates of runoff and

probably reduced snow cover due to drifting. It was found on gypsiferous marls and volcanic tuffs (Figure 2), which are by origin rich in soluble salts but certainly it is not a typical halophyte. On some labels the plant communities with *Halothamnus glaucus* are referred to as “salt steppe” but in fact they are real semidesert associations. Depending on slope inclination and content of soluble salts in the soil, the communities differ considerably in floristic composition but they have in common a high percentage of chenopods (see the Table). On strongly

Table. Relevés containing *Halothamnus glaucus* from E and C Anatolia by H. Freitag, Oct. 1997; ephemerals missing; chenopods in bold type. The species-related figures indicate the cover degree acc. to Braun-Blanquet (see, e.g., Knapp 1984): 2 – 1/4-1/20, 1 – less than 1/20, + – occasional, – absent.

No. of relevé	1	2	3	4
Exposition	S	S	SE	SE
Inclination in degrees	30	10	35	20
Coverage in percentage	2-5	15	1-5	15
No. of higher plant species	55	12	4	11
Substrate	marl	lava/tuff	tuff	tuff
<i>Halothamnus glaucus</i> (M.Bieb.) Botsch.	+	1	1	1
<i>Salsola verrucosa</i> M.Bieb.	1	-	-	-
<i>Reaumuria cistoides</i> Adams	+	-	-	-
<i>Seidlitzia florida</i> (M.Bieb.) Bunge ex Boiss.	+	-	-	-
<i>Atraphaxis spinosa</i> L.	+	-	-	-
<i>Eryngium campestre</i> L.		+	-	1
<i>Salsola nitraria</i> Pall.	-	2	-	-
<i>Bassia prostrata</i> (L.) A.J.Scott	-	1	-	-
<i>Noaea mucronata</i> (Forssk.) Aschers. & Schweinf.	-	1	-	-
<i>Teucrium polium</i> L.	-	+	-	-
<i>Chenopodium strictum</i> Roth	-	+	-	-
<i>Stipa arabica</i> Trin. & Rupr.	-	+	-	-
<i>Rhamnus pallasii</i> Fisch. & C.A.Mey.	-	+	-	-
<i>Tribulus terrestris</i> L.	-	+	-	-
<i>Heliotropium</i> sp.	-	+	-	-
<i>Carlina</i> sp.	-	+	-	-
<i>Krascheninnikovia ceratoides</i> (L.) Gueldenst.	-	-	+	+
<i>Atriplex tatarica</i> L.	-	-	+	-
<i>Alhagi maurorum</i> Medik. subsp. <i>maurorum</i>	-	-	-	2
<i>Bothriochloa ischaemum</i> (L.) Keng	-	-	-	1
<i>Artemisia</i> sp.	-	-	-	1
<i>Euphorbia</i> sp.	-	-	-	1
<i>Amygdalus orientalis</i> Duhamel	-	-	-	1
<i>Salsola canescens</i> (Moq.) Boiss.	-	-	-	+
<i>Salsola tragus</i> (L.) L.	-	-	-	+
<i>Jurinea</i> aff. <i>pontica</i> Hausskn. & Freyn ex Hausskn.	-	-	-	+
<i>Asphodeline</i> sp.	-	-	-	+

eroded slopes in weak substrates they show a very low coverage of 1%-5% with a correspondingly poor diversity of 3-5 species. In contrast, on gentle slopes with better water supply the coverage might reach up to 20% and the species number certainly surpasses the number of 13 given in relevé 4 because the ephemeral component of the vegetation had gone already when the locality was visited late in autumn.

Status – Obviously *Halothamnus glaucus* is not only rather common but also native to the driest parts of E Anatolia because it occurs predominantly in almost undisturbed or only by grazing moderately influenced habitats. The isolated locality in C Anatolia seems to be the result of a more recent dispersal event. The species is not endangered but slightly favoured by anthropogenic factors.

2. *Halothamnus hierochunticus* (Bornm.) Botsch. 1981, *Novosti Sist. Vyssh. Rast* 18: 156.

Synonyms – *Salsola hierochuntica* Bornm. 1912, *Beih Bot Centralbl* 29, 2: 13. – *S. austrani* Post var. *hierochuntica* (Bornm.) Eig 1945, *Palest J Bot Jerusalem ser 3*, 3: 129. – *Aellenia hierochuntica* (Bornm.) Aellen, *Verh Naturf Ges Basel* 61: 180. – *Aellenia austrani* Post var. *hierochuntica* (Bornm.) Zoh. 1966 nom. inval., *Fl. Palaest* 1: 168, in notes.

Illustrations (in selection) – Aellen 1950, *Verh Naturf Ges Basel* 61, figs 2b-c (perianth, pistill). – Kothe-Heinrich 1993, *Bibl Bot* 143, fig. 19 (leaves,

bracts, braceoles, flower, fruit). – Zohary 1966, *Fl Palaest* 1, pl. 245 (sub *Aellenia austrani*). – See also our Figures 3c, d, 5, 6.

Type – (Palestine) 'Maris Mortui, ad viam ex Khan-Hadrur ad Jericho, in agris, 15.09.1905, Dinsmore 1001(lecto JE!, iso W!).

Annual, richly and divaricately branched from base, semi-globular to globular in shape, 20-40(50) cm, when dry becoming a tumble weed. Branches ascending, glaucous when young, densely papillose or hispidulous like all leafy organs, non-striate. Leaves spreading to recurved, remote on the stem, soon deciduous, not or shortly decurrent, semi-terete, acuminate, the lower linear, 6-35(50) × 1.2-1.9 mm, the upper lanceolate to triangular, 3-6 × 2.0-3.0(3.4) mm. Bracts scale-like, basally widened and with membranous margins, the lower lanceolate-triangular, the upper broadly ovate-triangular, mucronulate, about as long as bracteoles and perianth, 2.8-7.5 × 2.2-3.6(3.9) mm. Bracteoles similar to bracts but basally with wide membranous margins. Tepals triangular, 2.6-3.2 × 1.7-2.1 mm, transverse line at 1/4-1/3, in upper part with narrowly triangular green blotch and membranous margins. Filaments arising from margin of disc, at base 0.4-0.5 mm wide. Anthers (1.2)1.3-1.7 × 0.5-0.6 mm, with 0.3-0.35 mm long triangular appendage. Disc without interstaminal lobes. Ovary-style complex in flowering stage conical to ovoid, in fruiting stage separated in semi-globular



Figure 5. *Halothamnus hierochunticus* (Bornm.) Botsch., close-up; near Akçakale; phot. V. Atamov 29.09.2005.



Figure 6. *Halothamnus hierochunticus*, habit, in an abandoned field together with *Alhagi maurorum* Medik. and *Salsola incanescens* C.A.Mey. near Akçakale; phot. V. Atamov 29.09.2005.

seed-bearing lower part and a smaller conical upper part. Stigmas 0.9-1.1 × 0.25-0.35 mm, apically denticulate. Fruits including wings 10-16 m × 2.4-3.3 mm; perianth tube at the wings 3.1-3.9 mm, at base usually dilated, (2.8)3.0-5.3 mm diam., (1.1)1.2-1.4(1.5) mm high, basal plate with large, circular pits; wings in or below the middle, straw-coloured, pale yellowish or reddish; tepal lobes forming a flat cone; strongly heterocarpic: in lower parts of inflorescences with smaller wings, thicker perianth tube, basal plate with deeper pits, and yellow embryo in contrast to the green embryo in upper fruits (Figures 3d₁, d₂).

Specimens seen – SE Anatolia: C7. Şanlıurfa: Akçakale, Öncül village, 350 m, 29.09.2005 Atamov (GAZI, ANK, ISTE, Herb. Harran and Rize Univ., KAS); idem., some other places in southern Harran plain, 29.09.2005 Atamov in obs.

General distribution – The species is rather common in all countries of the “fertile crescent” from C Israel to SW Iran, thereby nicely representing the south-western subtype IT1 of the Irano-Turanian chorotype (Figure 7).

Habitat/ecology – In Turkey, the species is bound to the northernmost extensions of the western Mesopotamian plains close to the Syrian border. The climatic conditions as measured in Akçakale are characterised by annual mean precipitation of 363 mm, and annual variation of temperatures from 40 °C

in the hottest to 0.9 °C in the coldest month (data from DMI, see Atamov et al., 2006). Theoretically, this would allow warm-temperate woodlands, but as the area has been intensively used for millennia, the vegetation had changed to a mesic type of the “Mesopotamian steppes” (Phlomidetalia sensu Zohary, 1973). From 1995-1999 a fundamental change happened after the implementation of the large-scale irrigation project after the construction of the Atatürk dam. Caused by inappropriate irrigation and poor drainage, large parts of the Harran plain underwent a rise in groundwater level followed by increasing salinisation of the dark red or reddish brown, clayey, calcareous alluvial soils (for details see Atamov et al., 2006 and references therein), which are the habitats of *Halothamnus hierochunticus*.

There it grows in secondary halophytic plant communities that have established on former cotton fields, preferably together with *Aeluropus lagopoides* (L.) Trin., *Cressa cretica* L., *Frankenia pulverulenta* L., *Peganum harmala* L., *Lagonychium farctum* (Banks & Soland.) Bobr., *Alhagi maurorum* Medik.), *Polygonum aviculare* L., *P. equisetiforme* Sibth. & Sm., *Salsola vermiculata*, *S. nitraria* Bieb., *S. incanescens* C.A.Mey. etc. (for details see Atamov et al., 2006). From similar plant communities, the sites with *Halothamnus* differ by significantly higher contents of potassium and phosphorus. From the main area of distribution, *Halothamnus hierochunticus* also is reported as

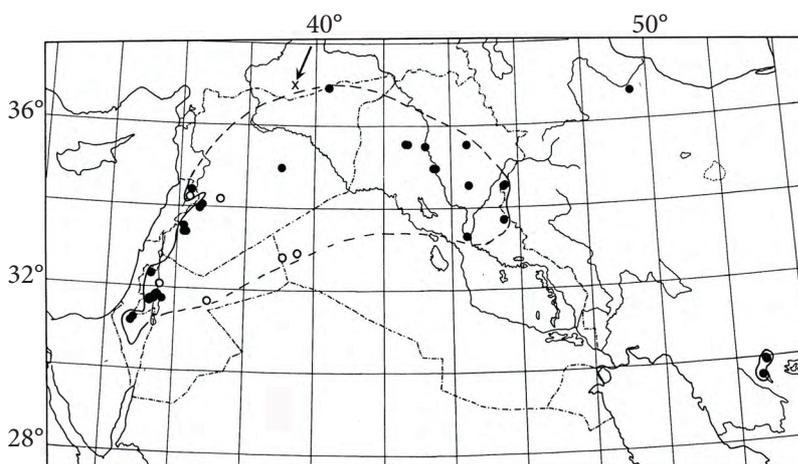


Figure 7. Distribution of *Halothamnus hierochunticus*; modified from Kothe-Heinrich (1993), by permission of Schweizerbart Publ. The open circles refer to literature records; arrow and cross indicate the Turkish locality.

growing preferably in segetal, ruderal, and other disturbed, mainly saline habitats, e.g., fields, roadsides, and ruins (Kothe-Heinrich, 1997).

Status – From the history of the anthropogenic habitats at the southern periphery of SE Anatolia it can be concluded that *Halothamnus hierochunticus* most likely is a recent newcomer to the Harran plain and maybe to the flora of Turkey as well. However, it cannot be excluded that it had invaded already earlier as a weed or ruderal plant into some traditional villages of the area.

Determination key for *Halothamnus* in Turkey

- 1a. Chenopods with fruiting perianth not indurated below the wings, without dilated base carrying deep rounded grooves.....*Bassia* (incl. *Kochia*), *Climacoptera*, *Halanthium*, *Noaea*, *Salsola*, *Seidlitzia*
- b. Chenopods with the fruiting perianth strongly indurated below the wings, with a dilated base carrying 5 deep rounded grooves.....2 *Halothamnus* (= *Aellenia*)

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- 2a. Plant annual, 20-50 cm, densely branched, ± globular in shape; tepals above the wings strongly keeled; SE Turkey only.....*H. hierochunticus* (Bornm.) Botsch.
- b. Plant subshrubby, 20-100 cm, loosely branched, shape irregular; tepals above the wings not keeled; C & E Turkey.....*H. glaucus* (M. Bieb.) Botsch.

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