

Full Length Research Paper

A taxonomic review of the species of the genus *Amara* Bonelli (Coleoptera: Carabidae: Pterostichinae) from south-central Turkey

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The twelve species and subspecies of the pterostichine genus *Amara* Bonelli living in the study area represent about 22% of the Turkish species of this genus. This study is based on material collected primarily in the province of Kahramanmaraş, but also in the surrounding provinces of Adana, Adıyaman, Gaziantep, Kayseri, and Malatya, situated in south-central Turkey, in the Taurus Mountains, and mostly within the Taurus refugium. The taxa are characterized by: keys; description of structural features; and photographs of habitus (male and female), and of male genitalia. For each species, the localities (many of them new), coordinates, altitudes of collection, its distribution in Turkey, and its chorotype were also given.

Key words: *Amara*, Pterostichinae, Carabidae, Turkey.

INTRODUCTION

This publication is the second part of a taxonomic and geographical treatment of the Pterostichinae of south-central Turkey, with a focus on sites in the province of Kahramanmaraş and some of the geographically adjacent provinces. Treated here is the genus *Amara* Bonelli, a group that includes worldwide 562 species arranged in 46 subgenera (Lorenz, 2005). Reported from Turkey are 55 species and subspecies in 15 subgenera (Casale and Vigna Taglianti, 1999). This is the first detailed taxonomic study of some of the Turkish species of this genus.

Primarily Holarctic, the geographical range of *Amara* extends southward in the western hemisphere in the mountains of the northern Neotropical region to Costa Rica. In the eastern hemisphere, this genus occurs in the mountains of the northern part of the Afrotropical region (Ethiopia) and the Oriental Region (Himalaya, southern China, Indochina) (Kryzhanovskii, 1983; Hurka, 1996).

The identification of species belonging to *Amara* is difficult and for many species is achieved only by examining the male genitalia (Trautner and Geigenmüller, 1987).

THE STUDY AREA

For details, see Avgın and Emre (2009).

Vegetation

The three common biomes represented, from higher elevations to lower elevations are the steppe, the macchie, and the forest. The dominant genera of the steppe vegetation are *Acantholimon* sp. (Plumbaginaceae), *Arenaria* sp. (Caryophyllaceae), *Astragalus* sp., (Leguminosae), as well as *Micromeria* sp., *Teucrium* sp., and *Thymus* sp. (all Lamiaceae). The dominant genera of the macchie vegetation are *Arbutus* sp. (Ericaceae), *Cotinus* sp. and *Pistacia* sp. (Anacardiaceae), *Quercus* sp. (Fagaceae), and *Styrax* sp. (Styracaceae). The dominant genera of the forest are *Abies* sp., *Cedrus* sp., and *Pinus* sp. (Pinaceae), *Fagus* sp. and *Quercus* sp. (Fagaceae), *Ostrya* sp. (Betulaceae), and *Populus* sp. (Salicaceae) on the sides of mountains, the high areas and near rivers (Avgın, 2006a).

MATERIALS AND METHODS

Material

This contribution is based on specimens collected in 2004 and

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Table 1. Provinces and sites in south-central Turkey where *Amara* specimens were collected during 2004 and 2005.

S/N	Localities	Coordinates (° ' ")	Altitudes (m)
1	Adana-Saimbeyli	37 50 59 N; 36 08 56 E	1100
2	Adıyaman-Azaplı	37 45 34 N; 37 32 59 E	920
3	Adıyaman-Gölbaşı	37 46 59 N; 37 39 21 E	939
4	Gaziantep-Nurdağı	37 35 57 N; 36 51 01 E	578
5	Kahramanmaraş-Afşin (apricot orchard)	38 26 17 N; 36 56 22 E	1243
6	Kahramanmaraş-Afşin (peach orchard)	38 14 15 N; 36 55 20 E	1242
7	Kahramanmaraş-Atatürk Parkı	37 33 23 N; 36 55 22 E	465
8	Kahramanmaraş-Çağlayancerit-Düzbağ	37 47 35 N; 37 28 21 E	913
9	Kahramanmaraş-Çağlayancerit-Düzbağ (walnut plantation)		920
10	Kahramanmaraş-Elbistan-Demircilik (poplar plantation)	38 15 00 N; 37 20 29 E	1206
11	Kahramanmaraş-Ekinözü-Akpınar (apple orchard)	38 05 32 N; 37 13 17 E	1380
12	Kahramanmaraş-Göksun (wheat field)	38 01 04 N; 36 30 35 E	1341
13	Kahramanmaraş-Göksun-Çardak	38 03 02 N; 36 38 34 E	1365
14	Kahramanmaraş-Göksun-Çardak-Karaahmet	38 01 42 N; 36 34 17 E	1342
15	Kahramanmaraş-Göksun-Çardak-Küçükusu	38 03 37 N; 36 40 30 E	1358
16	Kahramanmaraş-Göksun-Kireçköy	38 59 48 N; 36 31 10 E	1334
17	Kahramanmaraş-Göksun-Mehmetbey	38 05 54 N; 36 27 54 E	1413
18	Kahramanmaraş-Göksun-Mehmetbey (reservoir)	38 06 15 N; 36 26 40 E	1441
19	Kahramanmaraş-Türkoğlu	37 23 10 N; 36 51 35 E	483
20	Kahramanmaraş-Türkoğlu (Tigem)	37 17 55 N 36 47 59 E	550
21	Kahramanmaraş-Türkoğlu-Çakallıhasanağa (walnut plantation)	37 26 43 N; 36 53 33 E	467
22	Kayseri-Sarız	38 33 28 N; 36 27 02 E	1810
23	Malatya-Karanlıkdere	37 53 48 N; 37 47 39 E	905

2005 from different altitudes (465 to 1810 m) and habitats including steppe, forest, agricultural areas, and in the vicinity of a reservoir and lakes, principally in Kahramanmaraş Province, but also in the provinces of Adana, Adıyaman, Gaziantep, Kayseri, and Malatya. This area is part of the Taurus refugium (Casale and Vigna Taglianti, 1999). The sample that served as the basis for this study is restricted to the specimens whose measurements were made and whose morphological features were checked in detail. The specimens are deposited in the Biology Department of Çukurova University, Adana, Turkey.

Methods

The altitudes and coordinates of the localities from where the material has been collected are given in Table 1. The principal collecting devices were plastic pitfall traps containing 25% ethylene glycol, and placed in the ground. The pitfall traps at each locality were checked once every 15 days or once per month (Armstrong and Mckinlay, 1997; Magura et al., 2000). Additional specimens were collected by hand from under stones.

A few more taxonomically difficult species were identified by Prof. Augusto VignaTaglianti (Rome, Italy).

Descriptions are minimal, including limited numerical data, notes about color, and a moderately detailed treatment of the male genitalia. This publication was derived from a PhD thesis prepared by Avgin (2006b) and therein is data about worldwide distribution and more detailed descriptions. For specimen identification, much reliance is placed on the Figures, particularly those showing adult habitus.

The specimens were measured using an ocular micrometer. Some males were dissected, and the genitalia prepared. Illustrations of habitus and male genitalia are photographs, prepared with

a digital camera. In the investigation, many specimens of *Amara* were collected but this paper is based on only the specimens whose measurements were made and those which were checked in detail. The key is based on Hurka (1996) modified by use of sub-generic features extracted from Lindroth (1968), with further modifications as necessary to cover the species included in this study. For synonymical data, see Löbl and Smetana (2003).

The distribution of each species in Turkey was characterized and analyzed using the chorotype system proposed by Vigna Taglianti et al. (1999), and applied to the Carabidae (Casale and Vigna Taglianti, 1999).

SYSTEMATIC ENTOMOLOGY

Taxonomic treatments of 12 species and subspecies of *Amara*, arranged in four subgenera are given below. Each treatment includes: a description, based on external features, and on details of the male genitalia; and information about geographical distribution within the study area. Most locality records given are new for the region

Genus *Amara* Bonelli, 1810

Descriptive Notes (based on Lindroth, 1968): Size medium to rather large (ca. 4-14 mm.). Color various: dorsal surface uniformly brown to black, or metallic coppery, green, or blue; antennae concolorous equeous, or bicolored, with antennomeres 1-3 testaceous, 4-11 black. Microsculpture mesh pattern isodiametric over entire dorsal surface, or slightly transverse. Dorsal surface dull

or shining. Head short with stout mandibles; supraorbital setae two pair; mental tooth of labium bifid or emarginate. Pronotum (Figures 1a-b to 12a-b) in form trapezoidal, base broad, lateral margins straight basally, convergent anteriorly, or lateral margins sinuate or markedly constricted posteriorly. Prosternum: apex of intercoxal process unmarginated or marginated, setose or glabrous. Elytra with humeri more or less angulate, dentiform or not, posterior-laterally with internal plica distinct; parascutellar setae present or absent, discal setae absent. Striae punctulate or smooth, stria 7 preapically with 1-4 umbilicate punctures. Legs: male fore tarsomeres 1-3 dilated, ventrally each with two rows of adhesive setae; male middle tibiae straight or bowed, not markedly dilated, or dilated internally, armed with a thick protuberant spine.

Abdominal sternum VII (last one normally exposed) bisetose in males, quadrisetose in females. Male genitalia: phallus (Figures 1c-d to 12c-d) in form simple, arcuate ventrally; dorsal surface of shaft extensively membranous; basal lobe rather broad; apical area dorsally thickened (apical disc), parameres (Figures 1e-f to 12e-f) markedly asymmetric, right one long, styloid, preapically hooked or not; left paramere conchoid.

Way of life: Most of the species of *Amara* are xerophilous, living in open country, such as grassland, meadows and pastures. Accordingly many occur in human-disturbed situations. Adults are phytophagous, and will climb vegetation, even tall grasses to obtain seeds. Larvae are predominantly carnivorous, eating eggs of other insects.

Key to species

- 01** Intercoxal process of prosternum with apical margin immarginate, not bordered by a distinct groove; elytral stria 7 with single preapical umbilicate puncture; male right paramere without preapical hookSubgenus *Curtonotus* Stephens 02
- 01'** Intercoxal process of prosternum with apical margin marginated by a distinct groove; elytral stria 7 with 1-4 preapical umbilicate punctures; male right paramere with distinct hook..... 03
- 02 (01')** Pronotum with posteriolateral angles acute, markedly protruded (Figures 11a-b) *A. aulica* (Panzer) 04
- 02'** Posteriolateral angles of pronotum not protruded (Figure 12b).....*A. convexiuscula* (Marsham) 05
- 03 (01')** Antennae concolorous, antennomeres rufous to testaceous..... 06
- 03'** Antennae bicolored, antennomeres 1-3 or 1-4 rufous/testaceous, antennomeres 4-11 or 5-11 black.....Subgenus *Amara* (*sensu stricto*) 07
- 04 (03)** Elytral stria 7 with 2 preapical umbilicate punctures; eyes markedly convex (Figures 8a-b); pronotum with posteriolateral impressions sparsely punctate; tibia with outer edge with dense short, thick spines.....Subgenus *Xenocelia* Hieke.....*A. cursitans* Zimmermann 08
- 04'** Elytral stria 7 with single preapical umbilicate puncture; eyes not markedly convex (Figures 9a-b, 10a, b); pronotum with posteriolateral impressions sparsely punctate; tibia with outer edge with dense short, thick spinesSubgenus *Bradytus* Stephens 09
- 05 (04')** Pronotum (Figures 9a-b) with posteriolateral margins slightly sinuate; elytral striae throughout with uniform punctures.....*A. apricaria* (Panzer) 10
- 05'** Pronotum (Figures 10a-b) markedly constricted basally, posteriolateral margins not sinuate. Elytral striae anteriorly with punctures larger than posteriorly*A. crenata* Dejean 11
- 06 (01)** Base of pronotum impunctate; phallus in dorsal aspect (Figure 3d) with apical flange flattened.....*A. eurynota* (Panzer) 12
- 06'** Base of pronotum sparsely punctate; apical flange in dorsal view of phallus not flattened 13
- 07 (06)** Body green metallic (Figures 5a-b); antennomeres 1-3 red, antennomeres 4-11 black; tibiae entirely red, femora and tarsi red-black; phallus in dorsal view (Figure 5d) with apex acute *A. ovata* (Panzer) 14
- 07'** Legs and body of different colour; phallus in dorsal



Figures 1. Photographs illustrating habitus and male genitalia of *A. (Amara) aenea* (De Geer, 1774). Letters: a and b, habitus, dorsal aspect, male and female, respectively; c-f, male genitalia-c-d, phallus, right lateral and dorsal aspects, respectively; e-f, right and left paramere respectively, ventral aspect.

- tate; tibia with outer edge with dense short, thick spines.....Subgenus *Xenocelia* Hieke.....*A. cursitans* Zimmermann 08
- 04'** Elytral stria 7 with single preapical umbilicate puncture; eyes not markedly convex (Figures 9a-b, 10a, b); pronotum with posteriolateral impressions sparsely punctate; tibia with outer edge with dense short, thick spinesSubgenus *Bradytus* Stephens 09
- 05 (04')** Pronotum (Figures 9a-b) with posteriolateral margins slightly sinuate; elytral striae throughout with uniform punctures.....*A. apricaria* (Panzer) 10
- 05'** Pronotum (Figures 10a-b) markedly constricted basally, posteriolateral margins not sinuate. Elytral striae anteriorly with punctures larger than posteriorly*A. crenata* Dejean 11
- 06 (01)** Base of pronotum impunctate; phallus in dorsal aspect (Figure 3d) with apical flange flattened.....*A. eurynota* (Panzer) 12
- 06'** Base of pronotum sparsely punctate; apical flange in dorsal view of phallus not flattened 13
- 07 (06)** Body green metallic (Figures 5a-b); antennomeres 1-3 red, antennomeres 4-11 black; tibiae entirely red, femora and tarsi red-black; phallus in dorsal view (Figure 5d) with apex acute *A. ovata* (Panzer) 14
- 07'** Legs and body of different colour; phallus in dorsal

- view with apex more or less obtuse.....08
- 08 (07)** Basal margin of pronotum (Figure 7a) slightly curved; pronotum and elytra narrower than normal; legs brown-red*A. similata* (Gyllenhal)
- 08** Basal margin of pronotum not curved; pronotum and elytra in normal form09
- 09 (08)** Femora black, tibiae and tarsi brown-black *A. proxima* Putzeys
- 09** Legs entirely red or red-black..... 10
- 10 (09)** Phallus in lateral view (Figure 4c) slightly curved ventrally, ventral surface slightly sinuate *A. lucida* (Duftschmid)
- 10** Phallus in lateral view not slightly curved ventrally, ventral surface not slightly sinuate 11
- 11 (10)** Phallus in dorsal view (Figure 2d) very wide medially, constricted rather abruptly distally, apical flange narrow, indistinctly defined, and apex acute..... *A. anthobia* *A. Villa* & *G.B. Villa*
- 11** Phallus in dorsal view (Figure 1d) not very wide medially, constricted gradually distally, apical flange distinctly defined, apex moderately broadly rounded*A. aenea* (De Geer)

Subgenus *Amara* Bonelli, 1810

Descriptive notes (extracted from Lindroth, 1968). With character states of *Amara* (*sensu lato*), restricted as follows. Color various: dorsal surface metallic coppery, green, or blue; antennae bicolored, with antennomeres 1-3 or 1-4 testaceous, 4-11 or 5-11 black. Dorsal surface shining. Pronotum (Figures 1a-b to 7a) in form trapezoidal, base broad, lateral margins straight basally, convergent anteriorly. Prosternum: apex of intercoxal process margined, glabrous. Elytra: parascutellar seta absent or present; stria 7 preapically with 2-4 umbilicate punctures. Legs: middle tibiae of males relatively slender, without median spine on inner surface. Male genitalia (Figures 1c-f): right paramere apically hooked. Endophallus with scaly or hairy folds.

Amara (Amara) aenea (De Geer, 1774)

Descriptive notes: Habitus, dorsal aspect, as in Figures 1a-b. Measurements and proportions: Body length ♂ 7–7.5 mm, ♀ 7–8.5 mm; pronotum ♂ 1.50–1.67 times as wide as long and ♀ 1.50–2.00 times as wide as long; elytra ♂ 1.33–1.50 times as long as wide and ♀ 1.43–1.67 times as long as wide. Color: dorsal surface of body brown metallic, ventral surface black; Male genitalia (Figures 1c-f): phallus in right lateral view (Figure 1c) with shaft slender, moderately curved ventrally; in dorsal view, (Figure 1d) slightly widened medially, narrowed gradually distally, apical flange short, apex rounded; right paramere twice length of left paramere (Figures 1 e-f).

Material examined: A total of 27 specimens, from the following localities: Adana-Saimbeyli: 19.VI.2004 1♂, 1♀; Adıyaman-Gölbaşı: 19.IV.2004 1♀, 20.V.2004 1♂; Kahramanmaraş-Atatürk Parkı: 30.IV.2004 1♂, 1♀; Kahramanmaraş-Afşin (peach plantation): 27.V.2004 1♀; Kahramanmaraş-Ekinözü-Akpınar (apple plantation): 27.V.2004 1♀; 21.VI.2005 3♂♂, 1♀; Kahramanmaraş-Elbistan-Demircilik (poplar plantation): 27.V.2004 1♂, 1♀; Kahramanmaraş-Göksun-Çardak: 10.X.2004 1♂; Kahramanmaraş-Göksun-Çardak-Karaahmet: 10.X.2004 2♂♂, 3♀♀; 30.VIII.2005 1♀; Kahramanmaraş-Göksun-Mehmetbey: 25.VIII.2004 2♀♀; Kahramanmaraş-Göksun-Mehmetbey (reservoir): 27.V.2004 1♀; 19.VI.2004 1♀; Kahramanmaraş-Türkoğlu (Tigem): 07.V.2004 1♂; Malatya-Karanlıkdere: 26.VI.2004 1♀.

Published records from Turkey: Eskişehir (Türktaş, 1998); Anatolia (no locality) (Casale and Vigna Taglianti, 1999).

Geographical distribution: This range exemplifies a Palaearctic chorotype.

Amara (Amara) anthobia *A. Villa* & *G.B. Villa*, 1833

Descriptive notes: Habitus, dorsal aspect, as in Figures 2a-b. Measurements and proportions: Body length ♂ 6.5–7 mm, ♀ 6.5–7.5 mm; pronotum ♂ 1.25–1.67 times as wide as long and ♀ 1.25–1.33 times as wide as long; elytra ♂ 1.33–1.50 times as long as wide and ♀ 1.50–1.60 times as long as wide. Color: dorsal surface of body copper metallic or brown metallic, ventral surface black. Male genitalia (Figures 2c-f): phallus in right lateral view (Figure 2c) with shaft slender, markedly curved ventrally; in dorsal view (Figure 2d), shaft markedly widened medially, markedly narrowed distally; apical flange thin and apex acute; right paramere 1.5 times as long as left paramere (Figures 2 e-f).

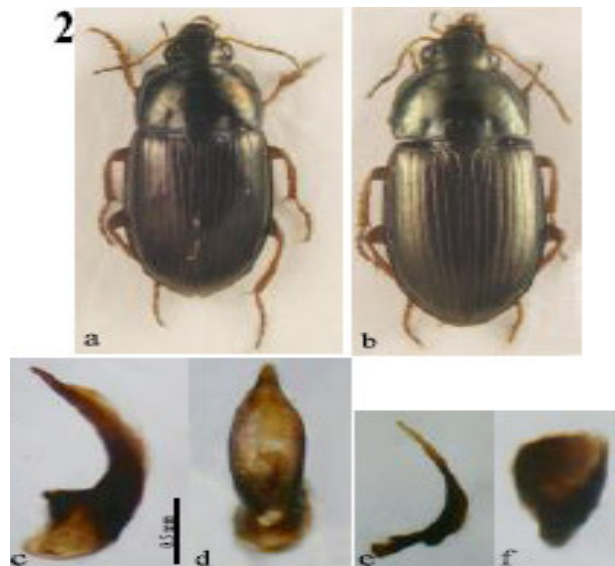
Material examined: A total of 12 specimens, from the following localities: Adıyaman-Azaplı: 20.V.2004 1♀; Kahramanmaraş-Çağlayançerit-Düzbağ (walnut plantation): 08.V.2004 3♀♀; 26.V.2004 1♀; Kahramanmaraş-Elbistan-Demircilik (poplar plantation): 27.V.2004 1♀; Kahramanmaraş-Türkoğlu (Tigem): 07.V.2004 1♂; 26.X.2004 3♂♂, 2♀♀.

Published records from Turkey: Anatolia (no locality) (Casale and Vigna Taglianti, 1999).

Geographical distribution: This range exemplifies a European chorotype.

Amara (Amara) eurynota (Panzer, 1796)

Descriptive notes: Habitus, dorsal aspect, as in Figures 3a-b. Measurements and proportions: Body length ♂ 9–



Figures 2. Photographs illustrating habitus and male genitalia of *A. (Amara) anthobia* A. Villa & G.B. Villa, 1833. Letters: a and b, habitus, dorsal aspect, male and female, respectively; c-f, male genitalia—c-d, phallus, right lateral and dorsal aspects, respectively; e-f, right and left paramere respectively, ventral aspect.



Figures 3. Photographs illustrating habitus and male genitalia of *A. (Amara) eurynota* (Panzer, 1796). Letters: a and b, habitus, dorsal aspect, male and female, respectively; c-f, male genitalia—c-d, phallus, right lateral and dorsal aspects, respectively; e-f, right and left paramere respectively, ventral aspect.

10 mm, ♀ 9–10.5 mm; pronotum ♂ 1.60–1.75 times as wide as long and ♀ 1.60–1.75 times as wide as long; elytra ♂ 1.38–1.50 times as long as wide and ♀ 1.44–1.50 times as long as wide. Color: dorsal surface coppery

or brown metallic, ventral surface black. Male genitalia (Figures 3c-f): phallus in right lateral view (Figure. 3c) with shaft slender, moderately curved ventrally; in dorsal view (Figure. 3d) slightly widened medially, narrowed distally, apex narrowly rounded, apical flange long and flattened; right paramere 1.5 times as long as left paramere (Figures 3e-f).

Material examined: A total of 53 specimens, from the following localities: Gaziantep-Nurdağı: 27.II.2004 1♂; 04.IV.2004 4♂♂, 2♀♀; 08.IV.2004 1♂, 1♀; 14.IV.2004 1♀; 30.IV.2004 1♂, 1♀; 24.V.2005 1♂; Kahramanmaraş-Ekinözü-Akpınar (apple plantation): 09.IV.2004 1♂; 25.IV.2004 1♀; 11.V.2004 1♂, 1♀; 27.V.2004 1♂, 1♀; 18.VI.2005 2♂♂, 1♀; 25.VIII.2005 2♂♂, 3♀♀; Kahramanmaraş-Türkoğlu: 04.IV.2004 9♂♂, 10♀♀; Kayseri-Sarız: 18.VI.2004 2♀♀; 25.VIII.2004 2♂♂, 3♀♀.

Published records from Turkey: Anatolia (no locality) (Casale and Vigna Taglianti, 1999).

Geographical distribution: This range exemplifies a Sibero-European chorotype.

Amara (Amara) lucida (Duftschmid, 1812)

Descriptive notes: Habitus, dorsal aspect, as in Figures 4a-b. Measurements and proportions: Body length ♂ 6.5–7 mm, ♀ 7–7.5 mm; pronotum ♂ 1.67 times as wide as long and ♀ 1.25 times as wide as long; elytra ♂ 1.33–1.50 times as long as wide and ♀ 1.33–1.50 times as long as wide. Color: dorsal surface blue-green metallic, ventral surface black. Male genitalia (Figures 4c-f): phallus short, in right lateral view (Figure 4c) with shaft broad, moderately curved ventrally, ventral surface slightly sinuate; in dorsal view (Figure 4d) shaft widened markedly, right side markedly curved, left side straight; apical flange with apex narrowly rounded, acute; right paramere twice as long as left paramere (Figures 4 e-f).

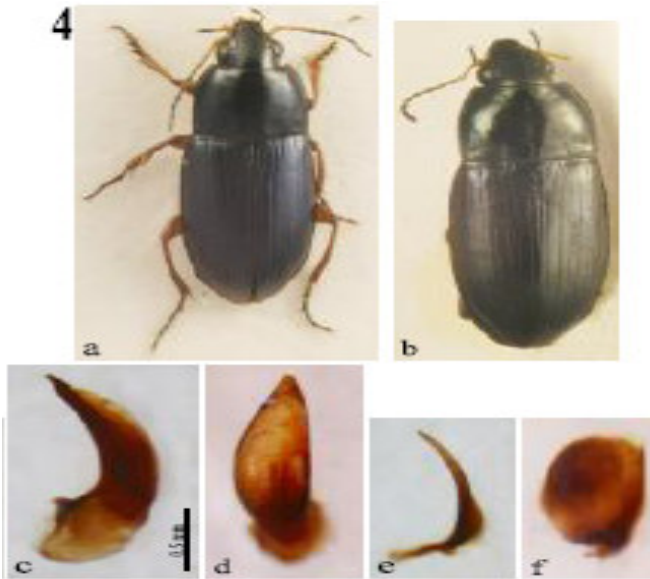
Material examined: A total of 4 specimens, from the following locality: Kahramanmaraş-Afşin (apricot plantation): 25.IV.2004 2♂♂, 1♀; 27.V.2004 1♀.

Published records from Turkey: Anatolia (no locality) (Casale and Vigna Taglianti, 1999).

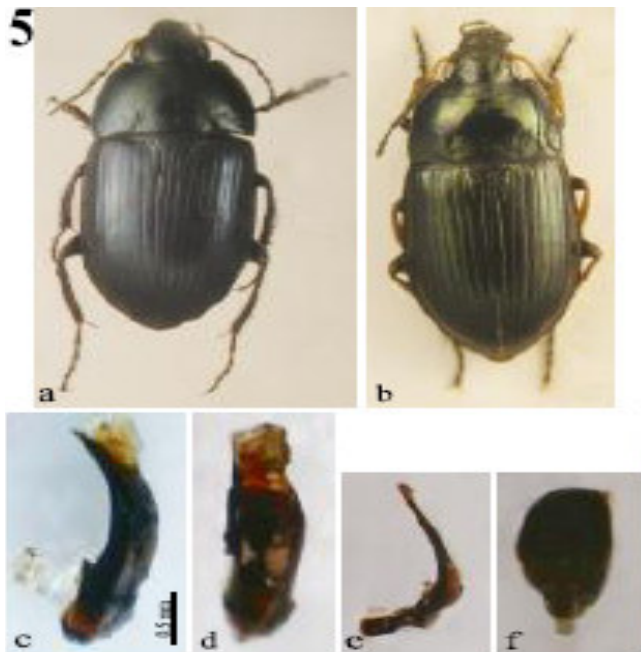
Geographical distribution: This range exemplifies a Turano-European chorotype.

Amara (Amara) ovata (Fabricius, 1792)

Descriptive notes: Habitus, dorsal aspect, as in Figures 5a-b. Measurements and proportions: Body length ♂ 10–11 mm, ♀ 9–10 mm; pronotum ♂ 1.90–2.00 times as wide as long and ♀ 1.60–1.90 times as wide as long; elytra ♂ 1.38–1.40 times as long as wide and ♀

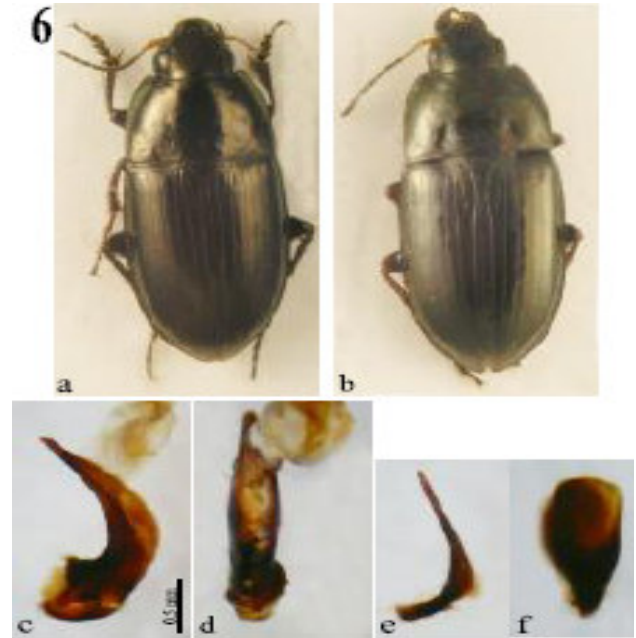


Figures 4. Photographs illustrating habitus and male genitalia of *A. (Amara) lucida* (Duftschmid, 1812). Letters: a and b, habitus, dorsal aspect, male and female, respectively; c-f, male genitalia—c-d, phallus, right lateral and dorsal aspects, respectively; e-f, right and left paramere respectively, ventral aspect.



Figures 5. Photographs illustrating habitus and male genitalia of *A. (Amara) ovata* (Fabricius, 1792). Letters: a and b, habitus, dorsal aspect, male and female, respectively; c-f, male genitalia—c-d, phallus, right lateral and dorsal aspects, respectively; e-f, right and left paramere respectively, ventral aspect.

1.33-1.36 times as long as wide. Color: dorsal surface of body green metallic, ventral surface black. Male genitalia (Figures 5c-f): phallus in right lateral view (Figure 5c) with



Figures 6. Photographs illustrating habitus and male genitalia of *A. (Amara) proxima* Putzeys, 1866. Letters: a and b, habitus, dorsal aspect, male and female, respectively; c-f, male genitalia—c-d, phallus, right lateral and dorsal aspects, respectively; e-f, right and left paramere respectively, ventral aspect.

shaft slender, curved moderately; in dorsal view (Figure 5d) shaft generally wide, right margin bowed, left margin relatively straight, gradually tapered apically; apical flange short, apex narrowly rounded; right paramere 1.5 times as long as left paramere (Figures 5 e-f).

Material examined: A total of 7 specimens, from the following localities: Kahramanmaraş-Afşin (apricot plantation): 25.IV.2004 1♂; Kahramanmaraş-Afşin (peach plantation): 09.IV.2004 1♂; Kahramanmaraş-Ekinözü-Akpınar (apple plantation): 09.IV.2004 1♀; 26.VI.2005 1♂; 30.VII.2005 1♀; Kahramanmaraş-Göksun-Çardak-Küçükusu: 12.VII.2004 1♀; Kahramanmaraş-Türkoğlu: 04.IV.2004 3♂♂, 1♀.

Published records from Turkey: Anatolia (no locality) (Casale and Vigna Taglianti, 1999).

Geographical distribution: This range exemplifies a Asiatic-European chorotype.

Amara (Amara) proxima Putzeys, 1866

Descriptive notes: Habitus, dorsal aspect, as in Figures 6a-b. Measurements and proportions: Body length ♂ 7-7.5 mm, ♀ 6-7 mm; pronotum ♂ 1.67 times as wide as long and ♀ 1.67 times as wide as long; elytra ♂ 1.50-1.67 times as long as wide and ♀ 1.50-1.60 times as long as wide. Color: dorsal surface of body brown metal-



Figures 7. Photograph illustrating female of *A. (Amara) similata* (Gyllenhal, 1810).

lic, ventral surface black. Male genitalia (Figures 6a-f): phallus in right lateral view (Figure 6c) with shaft curved markedly, relatively broad proximally; in dorsal view (Figure 6d), shaft relatively slender, parallel sided medially, apical flange long and rounded at apex; right paramere 1.5 times as long as left paramere (Figures 6 e-f).

Material examined: A total of 32 specimens, from the following localities: Adıyaman-Azaplı: 10.VI.2004 1♂; 29.VI.2005 1♀; Adıyaman-Gölbaşı: 20.V.2004 2♂♂; Gaziantep-Nurdağı: 14.IV.2004 1♂; Kahramanmaraş-Atatürk Parkı: 07.IV.2004 1♂; Kahramanmaraş-Çağlayancerit-Düzbağ: 28.V.2005 1♂; Kahramanmaraş-Çağlayancerit-Düzbağ (walnut plantation): 08.V.2004 11♂♂, 7♀♀; Kahramanmaraş-Ekinözü-Akpınar (apple plantation): 09.IV.2004 1♂; Kahramanmaraş-Göksun-Mehmetbey (reservoir): 27.V.2004 1♀; 19.VI.2004 1♂; Kahramanmaraş-Türkoğlu-Çakallıhasanağa (walnut plantation): 30.IV.2004 1♀; 11.VI.2004 1♀; Kahramanmaraş-Türkoğlu (Tigem): 25.V.2005 2♀♀.

Published records from Turkey: Anatolia (no locality) (Casale and Vigna Taglianti, 1999).

Geographical distribution: This range exemplifies a South-European chorotype.

***Amara (Amara) similata* (Gyllenhal, 1810)**

Descriptive notes: Habitus, dorsal aspect, as in Figure 7b. Measurements and proportions: Body length ♀ 8.5–

9.5 mm; pronotum ♀ 1.40–1.50 times as wide as long; elytra ♀ 1.50–1.57 times as long as wide. Color: dorsal surface of body green to brown, ventral surface black.

Material examined: A total of 6 females, from the following localities: Adıyaman-Azaplı: 10.VI.2004 1♀; Kahramanmaraş-Elbistan-Demircilik (poplar plantation): 27.V.2004 1♀; Kahramanmaraş-Göksun-Çardak-Karaahmet: 30.VIII.2005 2♀♀; Kahramanmaraş-Göksun-Çardak-Küçükusu: 12.VII.2004 1♀; Kahramanmaraş-Türkoğlu (Tigem): 11.VI.2004 1♀.

Published records from Turkey: This species is doubtfully recorded for Anatolia (Casale and Vigna Taglianti, 1999).

Geographical distribution: This range exemplifies an Asiatic-European chorotype.

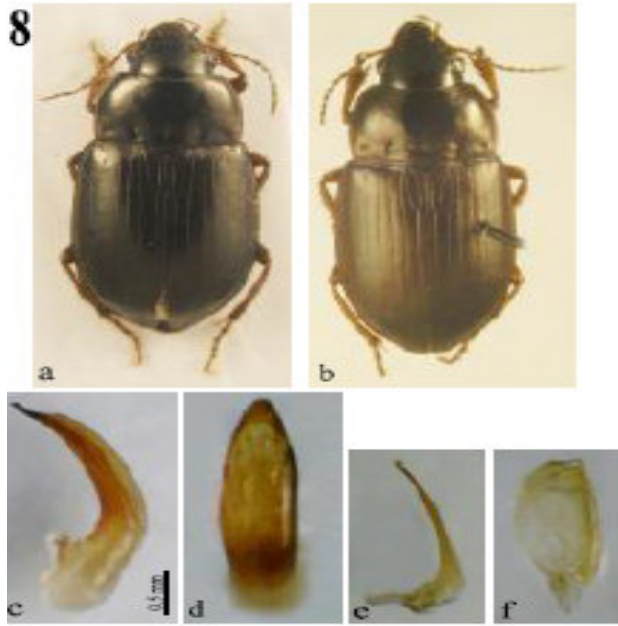
Subgenus *Xenocelia* Hieke, 2001

Descriptive notes (extracted from Hieke, 2001). With character states of *Amara (sensu lato)*, stated as follows; Size medium (ca. 7-9 mm); Color: dorsal surface piceous; antennae concolorous, testaceous, dorsal surface rather dull. Pronotum (Figures 8a-b) in form trapezoidal, short, base broad, lateral margins straight basally, convergent anteriorly; parascutellar setae absent; Prosternum: apex of intercoxal process margined, glabrous; Elytra: parascutellar setae absent; stria 7 preapically with 2 umbilicate punctures. Legs: middle tibiae of males relatively slender, without median spine on inner surface. Male genitalia (Figures 8c-f): phallus with small preapical “wrinkle” on right margin (Hieke, 2001; Figure 1); right paramere preapically hooked.

***Amara (Xenocelia) cursitans* Zimmermann, 1832**

Descriptive notes: Habitus, dorsal aspect, as in Figures 8a-b. Measurements and proportions: Body length ♂ 9–10 mm, ♀ 9.5–10 mm; pronotum ♂ 1.50–1.75 times as wide as long and ♀ 1.75 times as wide as long; elytra ♂ 1.38–1.50 times as long as wide and ♀ 1.44–1.50 times as long as wide. Color: dorsal surface of body brown metallic, ventral surface red-black. Male genitalia (Figures 8c-f): phallus in right lateral view (Figure 8c) with shaft slender moderately curved ventrally, ventral surface sinuate distad; in dorsal view (Figure 8d) broad, parallel sided medially, slightly narrowed distally; apical flange short and wide proximally, apex rather broadly rounded; right paramere 1.5 times as long as left paramere (Figures 8 e-f).

Material examined: A total of 17 specimens, from the following localities: Kahramanmaraş-Ekinözü-Akpınar (apple plantation): 18.VI.2004 4♂♂, 4♀♀; 21.VI.2005



Figures 8. Photographs illustrating habitus and male genitalia of *A. (Xenocelia) cursitans* Zimmermann, 1832. Letters: a and b, habitus, dorsal aspect, male and female, respectively; c-f, male genitalia—c-d, phallus, right lateral and dorsal aspects, respectively; e-f, right and left paramere respectively, ventral aspect.

3♂♂, 5♀♀; Kahramanmaraş-Göksun-Kireçköy:
19.VI.2005 1♀.

Published records from Turkey: This species is doubtfully recorded for Anatolia (Casale and Vigna Taglianti, 1999).

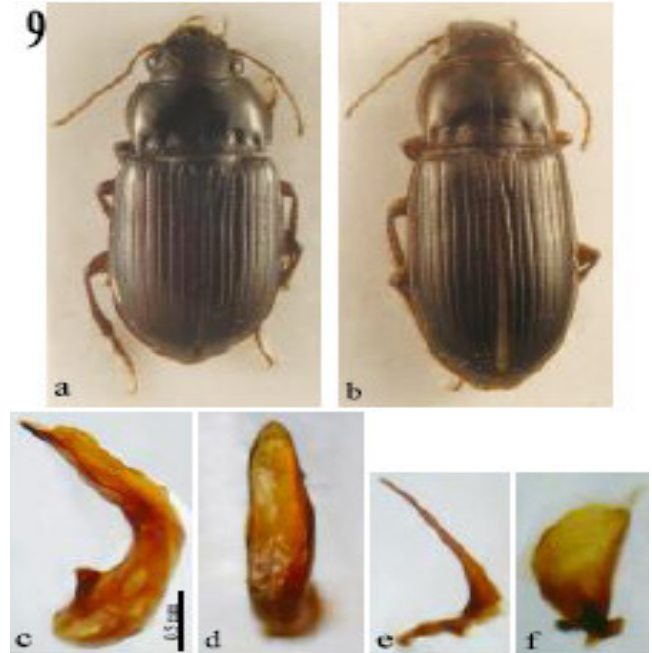
Geographical distribution: This range exemplifies a European chorotype.

Subgenus *Bradytus* Stephens, 1827

Descriptive Notes (extracted from Lindroth, 1968). With character states of *Amara (sensu lato)*, stated as follows; Size medium (ca. 7-10 mm.); Color: dorsal surface uniformly brown; antennae concolorous testaceous. Pronotum (Figures 9a-b to 10a-b) with base constricted somewhat, lateral margins slightly sinuate basally. Prosternum: apex of intercoxal process margined, glabrous. Elytra: parascutellar seta absent; stria 7 preapically with 1 umbilicate puncture. Legs: middle tibiae of males relatively slender, without median spine on inner surface. Male genitalia: right paramere with prominent preapical hook.

Amara (Bradytus) apricaria (Paykull, 1790)

Descriptive notes: Habitus, dorsal aspect, as in Figures 9a-b. Measurements and proportions: Body length ♂ 8



Figures 9. Photographs illustrating habitus and male genitalia of *Amara (Bradytus) apricaria* (Paykull, 1790). Letters: a and b, habitus, dorsal aspect, male and female, respectively; c-f, male genitalia—c-d, phallus, right lateral and dorsal aspects, respectively; e-f, right and left paramere respectively, ventral aspect.

mm, ♀ 7.5 mm; pronotum ♂ 1.25 times as wide as long and ♀ 1.67 times as wide as long; elytra ♂ 1.67 times as long as wide and ♀ 1.29 times as long as wide. Color: dorsal surface of body brown, ventral surface brown-red. Male genitalia (Figures 9c-f): phallus in right lateral view (Figure 9c) markedly curved ventrally, ventral surface markedly sinuate, slightly narrowed apicad; in dorsal view (Figure 9d) dorsal surface of shaft broad, about parallel-sided, slightly widened mediad, slightly narrowed distally, apical flange broad proximally, apex broadly rounded; right paramere 1.5 times as long as left paramere (Figures 9 e-f).

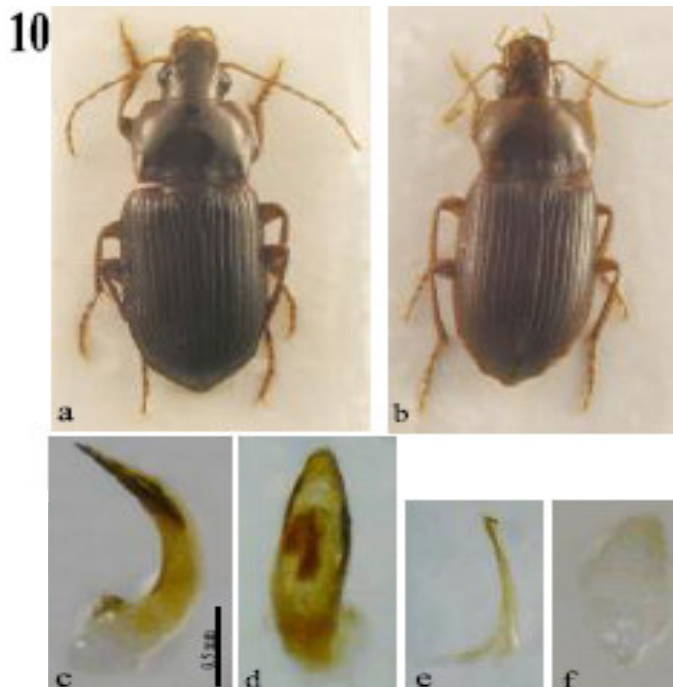
Material examined: One male and one female, collected at Kahramanmaraş-Ekinözü-Akpınar (apple plantation): 27.V.2004 1♂; 18.VI.2004 1♀.

Published records from Turkey: West and North Anatolia mainly in the mountains (Schweiger, 1966); Anatolia (no locality) (Casale and Vigna Taglianti, 1999).

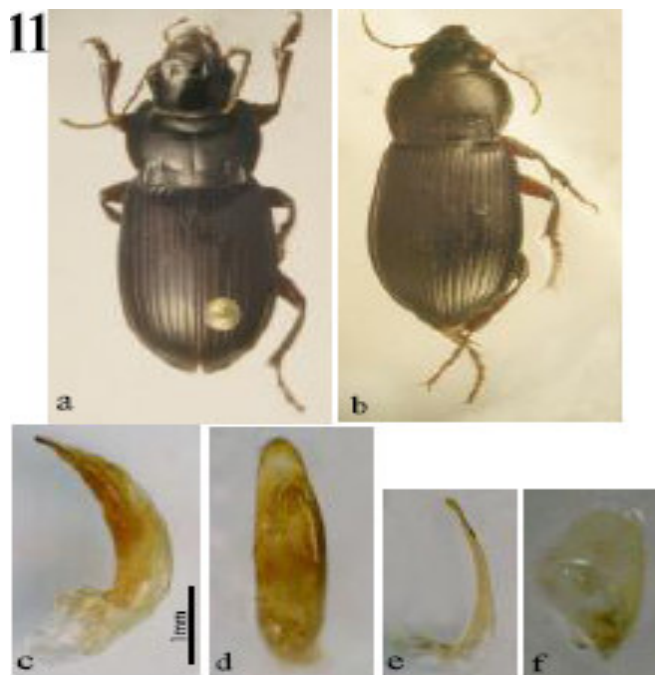
Geographical distribution: This range exemplifies a Palaearctic chorotype.

Amara (Bradytus) crenata Dejean, 1828

Descriptive notes: Habitus, dorsal aspect, as in Figures



Figures 10. Photographs illustrating habitus and male genitalia of *A. (Bradytus) crenata* Dejean, 1828. Letters: a and b, habitus, dorsal aspect, male and female, respectively; c-f, male genitalia—c-d, phallus, right lateral and dorsal aspects, respectively; e-f, right and left paramere respectively, ventral aspect.



Figures 11. Photographs illustrating habitus and male genitalia of *A. (Curtonotus) aulica* (Panzer, 1796). Letters: a and b, habitus, dorsal aspect, male and female, respectively; c-f, male genitalia—c-d, phallus, right lateral and dorsal aspects, respectively; e-f, right and left paramere respectively, ventral aspect.

10a-b. Measurements and proportions: Body length ♂ 6.5–7 mm, ♀ 7–8 mm; pronotum ♂ 1.33–1.67 times as wide as long and ♀ 1.33–1.67 times as wide as long; elytra ♂ 1.60–1.80 times as long as wide and ♀ 1.50–1.60 times as long as wide. Color: dorsal surface of body brown, ventral surface brown-red. Male genitalia (Figures 10c-f): phallus in right lateral view (Figure 10c) moderately curved ventrally, shaft narrow, apex acute; in dorsal view (Figure 10d), dorsal surface of shaft broad, lateral margins bowed slightly, tapered distally, to rather broadly based apical flange, latter tapered to broadly rounded apex; endophallus medially with two spinose patches side by side; right paramere twice as long as left paramere (Figures 10 e-f).

Material examined: A total of 6 specimens, from the following localities: Kahramanmaraş-Afşin (apricot plantation): 11.V.2004 1♀; 27.V.2004 2♂♂, 2♀♀; Kahramanmaraş-Ekinözü-Akpınar (apple plantation): 27.V.2004 1♂.

Published records from Turkey: Anatolia (no locality) (Casale and Vigna Taglianti, 1999).

Geographical distribution: This range exemplifies a Turano-European chorotype.

Subgenus *Curtonotus* Stephens, 1827

Descriptive Notes (extracted from Lindroth, 1968): Size: medium to large (ca. 9-14 mm.); Color: dorsal surface uniformly brown to dark piceous; antennae concolorous testaceous. Dorsal surface dull or shining. Pronotum (Figures 11a-b to 12a-b): base constricted, lateral margins sinuate posteriorly. Prosternum: apex of intercoxal process unmarginated; Elytra: humeri dentiform; parascutellar setae absent, discal setae absent, stria 7 preapically with single umbilicate puncture. Legs: middle tibiae of males dilated internally, most species armed with a thick protuberant spine. Male genitalia: right paramere (Figures 11f and 12f) without preapical hook.

Amara (Curtonotus) aulica (Panzer, 1796)

Descriptive notes: Habitus, dorsal aspect, as in Figures 11a-b. Measurements and proportions: Body length ♂ 12–13 mm, ♀ 13–14 mm; pronotum ♂ 1.60–1.80 times as wide as long and ♀ 1.50–1.60 times as wide as long; elytra ♂ 1.40–1.50 times as long as wide and ♀ 1.45–1.55 times as long as wide. Color: dorsal surface of body brown, ventral surface red-brown. Male genitalia (Figures 11c-f): Phallus in right lateral view (Figure 11c) with shaft curved moderately ventrally, broad medially, and narrowed distad; apical flange rounded on apex; in dorsal view (Figure 11d) shaft broad, lateral margins parallel, tapered slightly distad to short apical flange, latter with apex broadly rounded; right paramere 1.33 times as long



Figures 12. Photographs illustrating habitus and male genitalia of *A. (Curtonotus) convexiuscula* (Marsham, 1802). Letters: a, habitus, dorsal aspect, male; c-f, male genitalia-c-d, phallus, right lateral and dorsal aspects, respectively; e-f, right and left paramere respectively, ventral aspect.

as left paramere (Figures 11 e-f).

Material examined: A total of 18 specimens, from the following localities: Kahramanmaraş-Ekinözü-Akpınar (apple plantation): 27.V.2004 1♂, 1♀; 18.VI.2004 1♀, 21.VI.2005 1♂, 1♀; 25.VIII.2005 2♂♂, 1♀; Kahramanmaraş-Göksun (wheat field): 11.V.2004 1♀; 26.VIII.2004 2♂♂; Kahramanmaraş-Göksun-Çardak: 10.X.2004 3♂♂, 2♀♀; Kahramanmaraş-Göksun-Mehmetbey: 19.VI.2004 1♂; Kahramanmaraş-Göksun-Mehmetbey (reservoir): 27.V.2004 1♀.

Published records from Turkey: Anatolia (no locality) (Casale and Vigna Taglianti, 1999).

Geographical distribution: This range exemplifies a Holarctic chorotype.

Amara (Curtonotus) convexiuscula (Marsham, 1802)

Descriptive notes: Habitus, dorsal aspect, as in Figure 12a. Measurements and proportions: Body length ♂ 11 mm; pronotum ♂ 1.40 times as wide as long; elytra ♂ 1.56 times as long as wide. Color: dorsal surface of body bright brown, ventral surface red-brown. Male genitalia (Figures 12c-f): phallus in right lateral view (Figure 12c) curved moderately ventrally, shaft with ventral surface slightly sinuate, wide medially and narrowed abruptly distally; in dorsal view (Figure 12d), shaft with lateral margins sinuate, sloped gradually to short and broad

apical flange, apex broadly rounded; endophallus with spine patch medially; right paramere twice as long as left paramere (Figures 12 e-f).

Material examined: A single male, collected at Kahramanmaraş-Ekinözü-Akpınar (apple plantation): 18.VI.2004 1♂.

Published records from Turkey: Anatolia (no locality) (Casale and Vigna Taglianti, 1999).

Geographical distribution: This range exemplifies a Sibero-European chorotype.

Conclusion

Samples of the 12 species of *Amara* that inhabit Kahramanmaraş Province and the surrounding regions situated in South-Central Turkey were examined in detail. According to the checklist of Anatolian Carabidae (Casale and Vigna Taglianti, 1999) the number of species and subspecies belonging to *Amara* in Turkey is 55. Thus, 22% (12) of that total was included in this study. Two species each of Palaearctic, European, Sibero-European, Turano-European and Asiatic-European were included along side with one species each of South-European and Holarctic. According to these chorotypes, the species of *Amara* living in the study area have extensive geographical ranges.

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REFERENCES

- Armstrong G, McKinlay RG (1997). Vegetation management in organic cabbages and pitfall catches of carabid beetles. *Agric. Ecosyst. Environ.* 64: 267-276.
- Avgın S (2006a). The Tribe Bembidiini In Southern Turkey, With A New Record of *Bembidion* (Coleoptera: Carabidae). *Entomol. News.* 117: (1)109-114.
- Avgın SS (2006b). Faunistic And Taxonomic Researches On The Family Carabidae (Coleoptera) In Kahramanmaraş And The Surrounding Area. PhD Thesis. University of Çukurova, Adana, Turkey, p. 352.
- Avgın SS Emre I (2009). A Taxonomic Review Of The Species Of Four Genera Of Pterostichinae (Coleoptera: Carabidae) From South-Central Turkey. *J. Entomol. Sci.* 44 (3): 230-255.
- Casale A, Vigna Taglianti A (1999). Caraboid Beetles (excl. Cicindelidae) of Anatolia, and Their Biogeographical Significance (Coleoptera, Caraboidea). pp. 277-406. In: G. Aymonin, A. Azzaroli, F. Garbari, W. Greuter, H. Janetschek, M. La Greca, A. Minelli, E. Nevo, F. Pedrotti, R. Pichi Sermolli, Ch. Remington, S. Ruffo, V. Sbordoni, A. Vigna Taglianti (Editors). *Biogeographia. Parte I. Biogeografia Dell'Anatolia. Pubblicato Sotto Gli Auspici Del Ministero Dei Beni Culturali Ed Ambientali.* Siena, Italy. p. 406.

- Hieke F (2001). Das *Amara*-Subgenus *Xenocelia* subg. n. (Coleoptera: Carabidae). Folia Heyrovskyana, Supplementum 7, pp. 1-153. , V. Kabourek, Zlín.
- Hurka K (1996). Carabidae of the Czech and Slovak Republics. Zlín, Czech Republic. p. 565.
- Kryzhanovskii OL (1983). Fauna of the USSR. Coleoptera, Volume 1, Number 2. Academy of Sciences USSR. Beetles of the suborder Adephaga: families Rhysodidae and Trachypachidae; family Carabidae (introductory part and review of USSR fauna). Zoological Institute, New Series, No. 128. Science Press, Leningrad Division, p. 341.
- Lindroth CH (1968). The ground-beetles (Carabidae, excl. Cicindelinae) of Canada and Alaska. Part 5. Opuscula Entomologica Supplementum 33: 649-944.
- Lorenz W (2005). Systematic list of extant ground beetles of the world (Insecta, Coleoptera "Geadephaga": Trachypachidae and Carabidae incl. Paussinae, Cicindelinae, Rhysodinae). Privately published, Tutzing, Germany, p. 530.
- Löbl I, Smetana A (2003). Catalogue of Palaearctic Coleoptera. Volume I. Archostemata-Myxophaga-Adephaga. Apollo Books. Stenstrup, Denmark. p. 819.
- Magura T, Tothmeresz B, Bordan Zs (2000). Effects of nature management practice on carabid Assemblages (Coleoptera: Carabidae) in A Non-Native Plantation. Biol. Conserv. 93: 95-102.
- Schweiger H (1966). *Bradytus* Zimm. Genusunun (Col. Carabidae) Türkiye'deki Türleri. İstanbul Üniv. Fen Fak. Mec., XXXI, 1 (2): 37-48.
- Türktaş H (1998). Eskişehir Çevresi Carabidae (Insecta: Coleoptera) Üzerine Faunistik Araştırmalar. Yüksek Lisans Tezi, Eskişehir, p. 34.
- Trautner J, Geigenmüller K (1987). Tiger Beetles Ground Beetles, Illustrated Key to The Cicindelidae and Carabidae of Europe. Josef Margraf Publisher. Gaimersheim, Germany. p. 488.
- Vigna Taglianti A, Audisio PA, Biondi M, Bologna MA, Carpaneto GM, Biase AD, Fattorini S, Piattella E, Sindaco R, Venchi A, Zapparoli M (1999). A Proposal for a Chorotype Classification of The Near East Fauna, in the Framework of the Western Palearctic Region. pp. 31-59. In, G. Aymonin, A. Azzaroli, F. Garbari, W. Greuter, H. Janetschek, M. La Greca, A. Minelli, E. Nevo, F. Pedrotti, R. Pichi Sermolli, Ch. Remington, S. Ruffo, V. Sbordoni, A. Vigna Taglianti (Editors). Biogeographia. Parte I. Biogeografia Dell'Anatolia. Pubblicato Sotto Gli Auspici Del Ministero Dei Beni Culturali Ed Ambientali. Siena, Italy. p. 406.