

Full Length Research Paper

Evaluation of morphological characters and male genitalia features of emerald moths (Lepidoptera: Geometridae, Geometrinae) from Turkey

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In this study, we evaluated morphological characters and male genitalia features of emerald moths species (Lepidoptera: Geometridae: Geometrinae) which were collected from 2001 to 2007 in the mediterranean and middle Anatolia regions of Turkey. Fifty-one specimens from 12 species namely *Aplasta ononaria* Fuessly, *Pseudoterpna coronillaria* Hübner, *Comibaena bajularia* (Denis and Schiffermüller), *Proteuchloris neriaria* Herrich-Schäffer, *Thetidia persica* Hausmann, *Chlorissa viridata* Linnaeus, *C. asphaleia* Wiltshire, *Phaiogramma etruscaria* Zeller, *Microloxia herbaria* Hübner, *Jodis lactearia* Linnaeus, *Eucrostes indigenata* Villers and *Culpinia prouti* Thierry-Mieg, were collected from 17 sites by light traps and sweep net. Morphological characteristic of the adults and male genitalia, distribution and flight period of all species in the mediterranean and middle Anatolia regions of Turkey are presented.

Key words: Lepidoptera, Geometridae, Geometrinae, emerald moths, Turkey, Anatolia, Mediterranean region.

INTRODUCTION

Turkey acts as a bridge between Asia and Europe and is one of the richest Pale arctic biodiversity. Hardly this floratic and faunatic diversity has not been fully brought to light. Especially studies about Lepidoptera order are insufficient. Geometridae, which is one of the largest families in Lepidoptera, has only been investigated on limited numbers of studies conducted in old years. The studies on the geometrid fauna of Turkey started in mid 19th century. Some studies such as; Mathew (1881), Wehrli (1934), Zukowsky (1941), De Lattin (1951), Kansu (1963), Mol (1973) could be given as important works on Lepidoptera fauna of different regions. Riemis (1994, 1996 and 1998) listed geometrid moths of Turkey in different works. Seven (1991) listed 595 lepidopter species, in which 110 species belong to Geometridae family, with their proposed scientific names and 1355 citations regarding the collecting sites. Geometridae fauna was investigated in different parts of Turkey, Thrace, the east mediterranean region and Bolu, Düzce provinces, western black sea region ,respectively by Okyar and Aktaç (1999), Okyar and Mironov (2008), Doğanlar (2003), Özdemir (2007) and Okyar at al. (2009). Furthermore, Hausmann (2001) explained comprehensive

morphological, taxonomical and biological features of European species of Geometrinae subfamily, only mentioned the distribution area of this subfamily in Turkey without giving faunistics details. Koçak and Seven (2001) prepared a tentative checklist dealing with the Lepidoptera species recorded in Turkey. Koçak (2006) explained synonyms, Turkish vernacular names, and provincial distributions of 5029 species belonging to 76 Lepidoptera families in Turkey.

Additionally, 5101 species of Lepidoptera, 612 species of Geometridae and 21 species of Geometrinae in Turkey were enumerated and listed alphabetically under the related families in Koçak and Kemal (2007). In the recent study of Can (2008), 76 species of family of Geometridae which 7 of them belong to Geometrinae subfamily were determined in the middle and eastern Black Sea regions of Turkey.

Turkey is located where Asia, Europe, and the Middle East meet and has a total of 779.452 km² land area with an average altitude of 1250 m. Turkey has different climatic zones: like temperate, Mediterranean. Indeed, based on the climatic parameters Turkey is traditionally divided into seven regions including Mediterranean and

Table 1. Collection sites, coordinates and altitudes of the sampling locations of Emerald Moths species (Lepidoptera: Geometridae, Geometrinae) from Mediterranean and middle Anatolia regions of Turkey studied between 2001 and 2007.

No.	Collection site	Coordinate (° , ' , ")	Altitude (m)
1	Adana-Aladağ	37 34 03 N; 35 23 33 E	770
2	Adana-Kozan-Düzağaç	37 34 48 N; 35 49 25 E	564
3	Adana-Yumurtalık	36 50 30 N; 36 44 33 E	174
4	Hatay-Batıyaz-Mağaracık	36 08 40 N; 35 58 15 E	250
5	Hatay-Batıyaz	36 09 90 N; 35 59 67 E	454
6	Hatay-Dörtiyol	36 42 21 N; 36 17 52 E	672
7	Hatay-Samandağı-Çevlik	36 16 04 N; 35 48 27 E	0
8	Hatay-Samandağı-Tekebaşı	36 08 56 N; 35 59 56 E	242
9	Hatay-Alahan	36 18 14 N; 36 12 00 E	82
10	Mersin-Tarsus-Karabucak	36 52 05 N; 34 52 18 E	11
11	Sivas-Taşlıdere	39 39 09 N; 37 00 57 E	1336
12	Ankara-Şereflikoçhisar	38 58 11 N; 33 44 16 E	763
13	Kayseri-Sarız	38 33 28 N; 36 26 52 E	1795
14	Antalya-Kumluca	36 27 02 N; 30 13 44 E	141
15	Isparta-Yenişar	37 41 85 N; 31 22 60 E	1205
16	Isparta-Yenişar- Bademli	37 40 51 N; 31 21 15 E	1363
17	Isparta-Kirazlıdere	37 44 64 N; 30 31 59 E	1236

middle Anatolia regions. Dominant plant cover in the Mediterranean region until 700 - 800 m altitudes is maquis. The maquis includes such plant as *Myrtus* sp., *Laurus nobilis*, *Rosa* sp., *Nerium* sp., *Ceratonia* sp. and *Pistacia* sp. Forest in the region begins after maquis and continues until 2400 m altitudes. Following this altitude, meadow areas are common. Climate of the middle Anatolia region is hot and dry in summer, cold and snowy in winter. Therefore, dominant plant cover in this region as differ from the other regions is steppe includes such plant grass, *Nicotiana glauca*, *Chamaemelum nobile*, *Veronica* sp., *Rubus fruticosus*, *Rosa* sp., *Hordeum* sp., *Thymus* sp. and *Lamium* sp. *Elaeagnus angustifolia*, *Salix* sp. and *Populus* sp. trees place through the edges of rivers in steppe. In higher altitudes, forests contain *Pinus nigra*, *Juniperus* sp. and *Quercus* sp. trees. The objective of this study was to determine Geometrinae species (Lepidoptera: Geometridae) in the Mediterranean and middle Anatolia regions which have very different climatic, geographical and faunistic features from the other regions of Turkey.

MATERIALS AND METHODS

Specimens were collected by net in day light and light traps in night at various localities which were different with respect to elevation, climate, vegetation and geology in the Mediterranean and middle Anatolia region of Turkey during 2001 - 2007 (Table 1). Faunistic data, morphological characters and male genitalia of all species collected in this study were given.

All specimens were dissected in the laboratory. Male and female genitalia of all species were prepared as genital slides. The

genitalia preparations were made partly in Entellan, partly in Euperal, following conventional procedures (Doğanlar, 2003). External and genital taxonomic characteristics of all male specimens were examined by a stereo microscope. The identification and confirmation of the species were achieved by the author by comparing the material with identified specimens of the Zoologische Staatssammlung München, Munich, Germany between July and September, 2007.

RESULTS

All taxa were arranged by following the checklist of Europe by Karsholt and Razowski (1996). Since *Culpinia prouti* Thierry-Mieg, 1913 could not be found in the checklist, this species was added to the end of the list.

Aplasta ononaria Fuessly, 1783, Arch. Insectengesch. 3:pl.17, Figures 1a-e, (*Phaleana Geomet* (ra)).

Examined material: Isparta-Yenişar- Bademli: 11.VI.2001 1♂; Antalya-Kumluca: 16.VI.2001 1♀.

Diagnosis: Wingspan ♂ 19.8, ♀ 21.3 mm. Wings reddish-brown (Figure 1a). Subterminal and terminal area of forewing brown. Hind tibia of both sexes with two pairs of spurs. Antennae filiform with cilia in both sexes.

Male genitalia: Valva asymmetric. Harpe heavily spined on only right valva. Uncus forked. Socii absent (Figure 2a). Aedeagus pistillate (Figure 2b).

Distribution: West and South Europe (Hausmann, 2001). Sicily, Corsica, Cyprus, Armenia, Caucasus, Syria, Iran and Iraq (Scoble, 1999; Hausmann, 2001). France (Leraut, 1992; Scoble, 1999) and Poland (Buszko, 2000).

In Turkey: Gallipoli (Graves, 1926; Seven, 1991); Kahramanmaraş (Wehrli, 1934); Amasya, Bursa, Aydın,

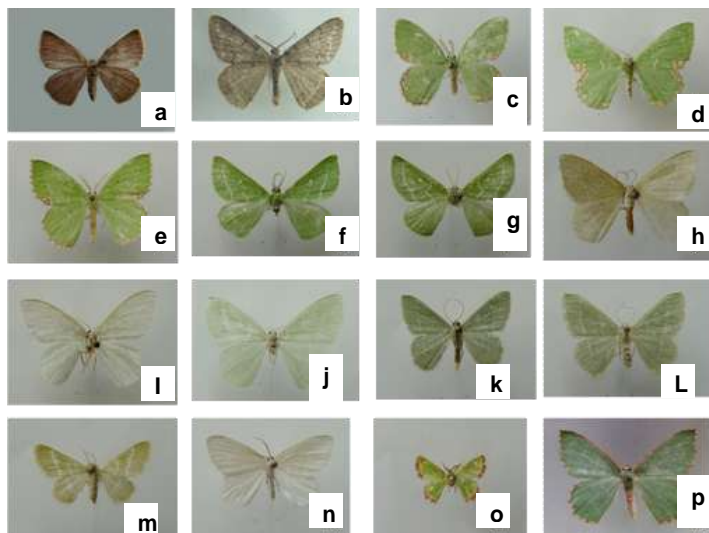


Figure 1. a- *Aplasta ononaria* Fuessly, 1783, ♀ b - *P. coronillaria* Hübner, 1817, ♂ c - *Comibaena bajularia* (Denis and Schiffermüller), 1775, ♂ d - *C. bajularia*, ♀ e - *Proteuchloris neriararia* Herrich-Schäffer, 1852, ♂ f - *Thetidia persica* Hausmann, 1996, ♂ g - *T. persica*, ♀ h - *Chlorissa viridata* Linnaeus, 1758, ♂ i - *C. asphaleia* Wiltshire, 1966, ♂ j - *C. asphaleia*, ♀ k - *Phaiogramma etruscaria* Zeller, 1849, ♂ l - *P. etruscaria*, ♀, m - *Microloxia herbaria* Hübner, (1813), ♀ n - *Jodis lactearia* Linnaeus, 1758, ♂ o - *Eucrostes indigenata* Villers, 1789, ♂ p - *Culpinia prouti* Thierry-Mieg, 1913, ♂.

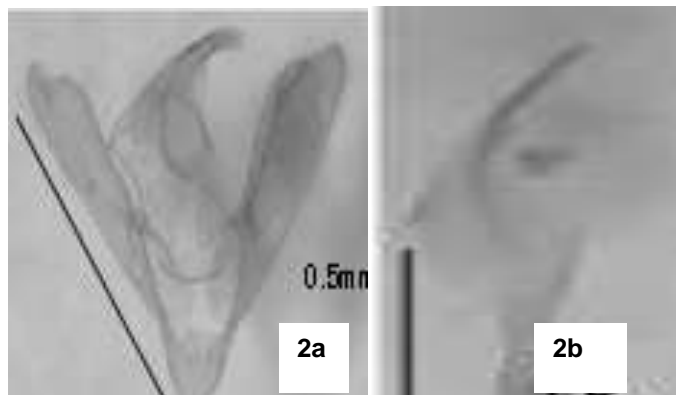


Figure 2. a, b: *Aplasta ononaria* Fuessly, 1783; Scale bar = 1 mm except b.

Adana- Toroslar (Staudinger, 1881: Okyar and Aktac, 1999); Sivrice and Tatvan (De Lattin, 1951); Kırklareli (Vize-Kiyiköy) and Tekirdağ- Şarköy (Okyar and Aktac, 1999); Adana- (Pozanti and Balcali), Osmaniye-Yarpuz, İçel-Tarsus (Doğanlar, 2003); Bolu (Özdemir, 2007).

Pseudoterpna coronillaria Hübner, 1817, Samml. Eur. Schmett. 5 Geometrae (1):pl.93, fig 479-482

Examined material: Hatay-Serinyol: 13.VI.2004 1♂; Hatay- Batiayaz-Mağaracik: 14.VII.2005 2♂; Hatay-Dörtöyl 06.V.2006 1♂, 29.III.2007 1♂.

Diagnosis: Wingspan ♂ 31.3 - 33.1 mm. Ground colour grey (Figure 1b). Antemedial and post medial lines black

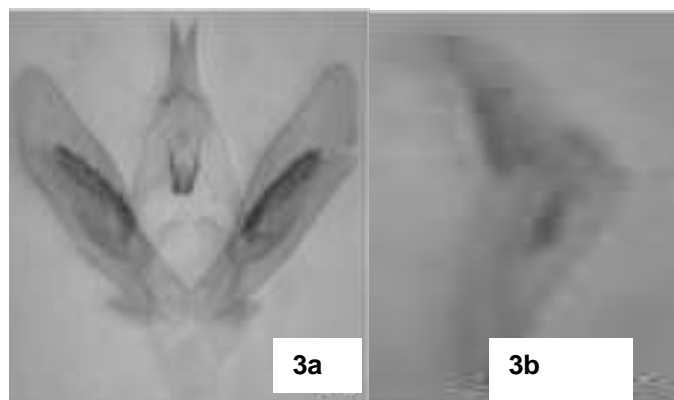


Figure 3a, b. *Pseudoterpna coronillaria* Hübner, 1817; Scale bar = 1 mm.

on forewings. Postmedial line stronger Z-shaped on all wings. Sub terminal line white. Terminal line thin, black or dark brown. Cell spots black striped. Hind tibia of both sexes with two pairs of spurs. Antennae bipectinate nearly to tip.

Male genitalia: Valva long and narrow. Inner side of harpe dentate. Uncus forked. Socii vestigial. Gnathos stronger and scobinate to tip (Figure 3a). Aedeagus stout, with long cornutus (Figure 3b).

Distribution: South Europe Portugal, Spain, South and West France, Northwestern Italy, Turkey, Lebanon, Israel and North Africa (Hausmann, 2001).

In Turkey: Gallipoli (Hausmann, 2001); Adana (Balcali, Fekke, Kozan), Hatay (Antakya, Firniz) and Osmaniye - Hinzirli (Doğanlar, 2003).

Comibaena bajularia (Denis and Schiffermüller), 1775, Ankündigung syst. Werkes Schmett Wienergegend:97, (*Geometra*).

Examined material: Antalya-Kumluca: 16.VI.2001 4♂♂. Isparta-Yenişar-Bademli: 27.VI.2007 3♂♂.

Diagnosis: Wingspan ♂ 29.8 - 31.3 ♀ 31 - 33.3 mm. Ground color green (Figures 1c and d). Antemedial and post medial lines white on only forewing. Terminal line brown on all wings. Tornus on forewing and hind wing with two whitish cells. Also, apikal side of hind wings with four cells. The cells with light brown shady border. Hind tibia with two pairs of spurs in both sexes. Antennae long bipectinate in ♂, antennae filiform with cilia in ♀.

Male genitalia: Valvula rounded, costa of the valva strongly sclerotized and emarginate. Uncus forked, fused on base (Figure 4a). Aedeagus long (Figure 4b). Posterior margin of sternum A8 concave, with two pointed (Figure 4c).

Distribution: Europe, North and West Asia (Staudinger and Rebel, 1901; Culot, 1987; Schwenke, 1978; Porter, 1997; Hausmann, 2001). France (Leraut, 1992), Turkey, Caucasus and Transcaucasus (Hausmann, 2001).

In Turkey: Kırklareli-Lüleburgaz (Rebel, 1913), Trabzon, Sinop and Tokat (Can, 2008), Western Black

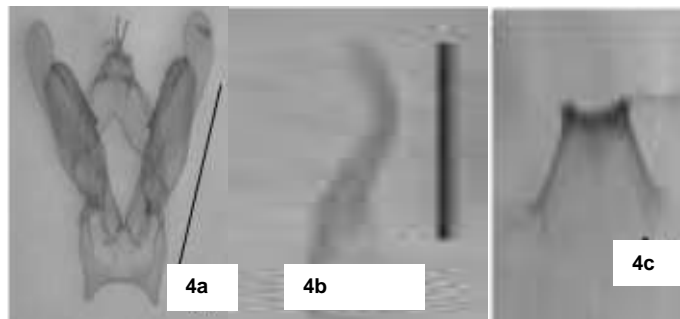


Figure 4a, b, c. *Comibaena bajularia* (Denis and Schiffermüller), 1775; Scale bar = 1 mm.

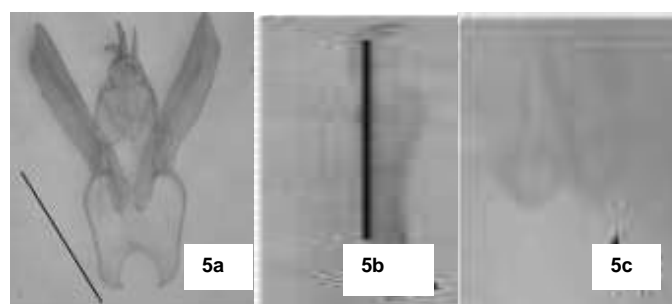


Figure 5a, b, c. *Proteuchloris neriaris* Herrich-Schäffer, 1852, Scale bar = 1 mm

Sea Region (Okyar at al., 2009).

Proteuchloris neriaris Herrich-Schäffer, 1852, Syst. Bearbeitung Schmett. Eur. 6 (55):62; ibidem, (1848) 3:pl.70, fig. 429 (non binominal) (*Geometra*)

Examined material: Adana-Aladağ: 30.IX.2003 1♂; Hatay-Samandağı-Çevlik: IX.V.2004 1♂; Mersin-Tarsus-Karabucak 01.VI.2003 1♂, 15.VII.2003 1♂; Hatay-Alahan 16.V.2007 1♀; Hatay-Batıayaz 20.V.2007 1♂, 25.V.2007 1♂, 1♀.

Diagnosis: Wingspan ♂ 26.8 - 29.7 mm. Antemedial and post medial lines white on only forewing (Figure 1e). Postmedial line angled towards apex of forewing. Terminal line brown on all wings. Tornus on forewing and hind wing, also apex on hind wing with two white cells. The cells with dark brown border. Hind tibia with two pairs of spurs. Antennae long bipectinate.

Male genitalia: Valva narrow, valvula rounded. Uncus forked. Tip of socii curved towards outside (Figure 5a). Aedeagus long, slender (Figure 5b). Posterior margin of sternum A8 bilobed (Figure 5c).

Distribution: South Europe. South Balkans, (Hausmann, 2001), Syria (Culot, 1987; Hausmann, 2001), Cyprus (Staudinger and Rebel, 1901; Hausmann, 2001 and Müller, 2004) and Georgia (Staudinger and Rebel, 1901; Scoble, 1999).

In Turkey: Kahramanmaraş (Wehrli, 1934); Gallipoli

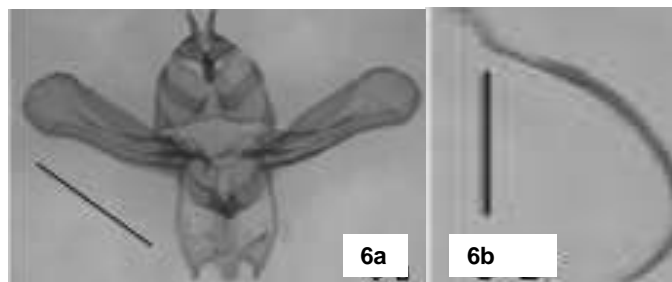


Figure 6a, b. *Thetidia persica* Hausmann, 1996; Scale bar = 1 mm.

(Mathew, 1881); Adana-Çatalan and Hatay (Samandağı, Dört Yol) (Doğanlar, 2003); Amasya, Bolu, Bursa, Çanakkale, İçel, Kahramanmaraş, Osmaniye (Koçak and Kemal, 2009).

Thetidia persica Hausmann, 1996, Nota lepid. 19 (1\2): 27, Figure 6, 114 -116, 147, (*Thetidia*).

Examined material: Sivas-Taşlıdere: 12.VI.2005, 2♂♂1♀.

Diagnosis: Wingspan ♂ 26.6 - 30.1, ♀ 27.9 mm. Wings green (Figure 1f and g). Antemedial and post medial lines white and wavy on forewings. Cell spots white and large round on all wings. Hind tibia of both sexes with two pairs of spurs. Antennae bipectinate in both sexes.

Male genitalia: Valva simple, valvula rounded. Uncus forked. Socii stout (Figure 6a). Aedeagus acicular (Figure 6b).

Distribution: Northern Iran and Armenia (Hausmann, 1996a; Hausmann, 2001).

In Turkey: Bitlis, Hakkari, Kahramanmaraş, Sivas, Van (Koçak and Kemal, 2009).

Chlorissa viridata Linnaeus, 1758, Syst. Nat. (Ed.X)1: 519, (*Phalaena* (*Geometra*))

Examined material: Çankırı-Ilgaz: 12.VI.2003 3♂♂.

Diagnosis: Wingspan ♂ 22.2 - 23.6 mm. Ground colour yellowish-green (Figure 1h). Postmedial line white on all wings. Antemedial line and cell spots invisible on all wings. Hind tibia with pencil and pair of terminal spurs. Antennae filiform with cilia.

Male genitalia: Costal process of valva long, broad at base, posterior side very slightly convex and strongly tapered towards end. Valvula long and simple. Uncus and socii long (Figure 7a). Aedeagus pistillate and, with group of micro cornuti (Figure 7b). Posterior margin of sternum A8 with sclerotized medial tooth (Figure 7c).

Distribution: Southern Germany, northern Italy, Armenia, central Asia (Hausmann, 1996a). Further, Spain, France, the Balkans, Portugal, Corsica, Sicily, Malta (Hausmann, 2001) and Sweden (Scoble, 1999).

In Turkey: Gallipoli (Mathew, 1881); Lüleburgaz (Rebel, 1913; Seven, 1991); Konya and Ilgaz Mountain (Hausmann, 2001); Hatay-Iskenderun (Doğanlar, 2003); Bolu (Özdemir, 2004); Sinop (Can, 2008); western black sea region (Okyar at al., 2009). *Chlorissa asphaleia* (Wiltshire, 1966), Z. Wien.ent.Ges. 51 (1/2):30, pl. 2,

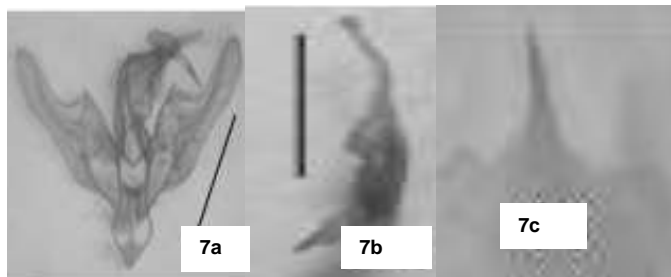


Figure 7a, b, c. *Chlorissa viridata* Linnaeus, 1758; Scale bar = 1 mm.

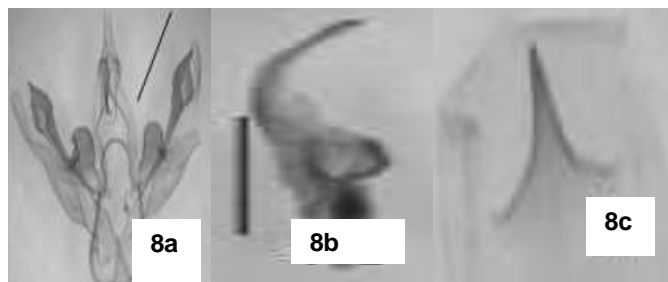


Figure 8a, b. *C. asphaleia* Wiltshire, 1966; Scale bar = 1 mm.

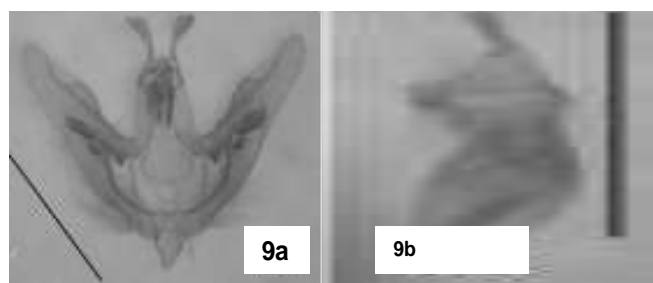


Figure 9a, b. *Phaiogramma etruscaria* Zeller, 1849; Scale bar = 1 mm.

Figure 8, (*Chlorissa*).

Examined material: Adana-Kozan-Düzağaç: 19.V.2003 1♂; Hatay-Dörtyol: 22.VI.2005 1♀.

Diagnosis: Wingspan ♂ 31.6, ♀ 33.9 mm. Ground color bright green (Figure 1i and j). Postmedial line white on all wings. Antemedial line visible on forewing. Hind tibia with pair of terminal spurs. Antennae filiform with cilia in both sexes.

Male genitalia: Costa curved and pointed on basal and costal projection rounded and tapered towards end. Valvula rounded. Uncus and socii long. Saccus with three lobes (Figure 8a). Coremata present. Aedeagus pistillate (Figure 8b). Posterior margin of sternum A8 strongly pointed (Figure 8c).

Distribution: Northern and eastern Turkey (Hausmann, 1996a, 1996b) and northern Iran (Scoble, 1999).

In Turkey: Kars, Van (Koçak and Kemal, 2009).

Phaiogramma etruscaria Zeller, 1849, Stettin. Ent.Ztg X (7):203, index, (*Geometra*)

Examined material: Hatay-Alahan 28.VIII.2003 1♀; 01.IX.2003 1♀; 10.VI.2004 1♂; 19.IV.2006 1♂, 13.V.2006 2♂; Hatay-Dörtyol: 09.VI.2005 1♀, 06.VI.2006 1♂; Hatay-Samandağı -Tekebaşı: 23.VI.2005 1♂; 30.VI.2005 1♀; Mersin-Tarsus-Karabucak 10.VI.2003 1♂, 08.VII.2003 1♂; Isparta-Kirazlıdere 26.VI.2007 3♀.

Diagnosis: Wingspan ♂ 17.7 - 19.3, ♀ 20 - 23.3 mm. Wings green (Figure 1k and L). Antemedial line of forewing distinctly visible, white. Postmedial line of forewing dentate of hind wing angled. Hind tibia with only terminal spurs in ♂, with two pairs of spurs in ♀. Antennae ciliate in ♂, antennae filiform in ♀.

Male genitalia: Valva narrow, costa of valva sclerotized. Socii very broad at terminal. Coremata present (Figure 9a). Aedeagus pistillate, with creased surface and, with some small cornuti to tip (Figure 9b).

Distribution: Widespread species. South Europe, South France, South Switzerland, Italy, the Balkans, Ukraine and Ural Mountains (Scoble, 1999; Hausmann, 2001). Moreover, Cyprus (Müller, 2004), Tunisia, Turkey, Caucasus, Transcaucasus, Afghanistan, South Iran and Iraq (Hausmann, 2001).

In Turkey: Kırklareli-Lüleburgaz (Rebel, 1925); Gallipoli (Graves, 1926: Seven, 1991); Adana (Balcalı, Aladağ, Feke, Kozan, Çatalan) and Hatay (Batriyaz, Arsus-Işıklı and Uzunbağ) (Doğanlar, 2003); Bolu (Özdemir, 2004); Giresun and Trabzon (Can, 2008); Edirne (Okyar and Mironov, 2008).

Microloxia herbaria Hübner, (1813), Samml. Eur. Schmett. 5 Geometrae (1):pl.79.

Examined material: Adana-Yumurtalık 19.VIII.2003 1♂, 2♀; Ankara-Şereflikoçhisar: 10.IX.2003 1♀.

Diagnosis: Wingspan ♂ 16.3, ♀ 15.1 mm. Wings bright green (Figure 1m). Antemedial and post medial lines white and clear on forewing. Hind wing only with post medial line. Cell spots absent. Hind tibia with only terminal spurs in both sexes. Antennae bipectinate and last five to tip filiform in ♂, antennae bipectinate with very short branches and cilia in ♀.

Male genitalia: Valva simple, sacculus elongate and pointed. Uncus long and slender (Figure 10a). Aedeagus long, slender (Figure 10b).

Distribution: South and West Europe and Middle Asia (Culot, 1987). Portugal, Spain, Italy, the Balkans, Ukraine, Turkey, Iran, Afghanistan, Transcaucasus, Armenia, Azerbaijan, Turkmenistan, Uzbekistan, Tajikistan, Ural Mountains and the Altays (Leraut, 1992; Scoble, 1999; Hausmann, 2001).

In Turkey: Gallipoli (Graves, 1926: Seven, 1991) and Adana-Balcalı (Doğanlar, 2003); Amasya, Ankara, Bursa, Çanakkale, Konya, Kirikkale (Koçak and Kemal, 2009).

Jodis lactearia Linnaeus, 1758, Syst. Nat. (Ed.X) 1: 519, (*Phalaena* (*Geometra*))

Examined material: Kayseri-Sarız: 19.III.2005 2♂♂.

Diagnosis: Wingspan ♂ 25.8 - 27.8 mm. Wing colour

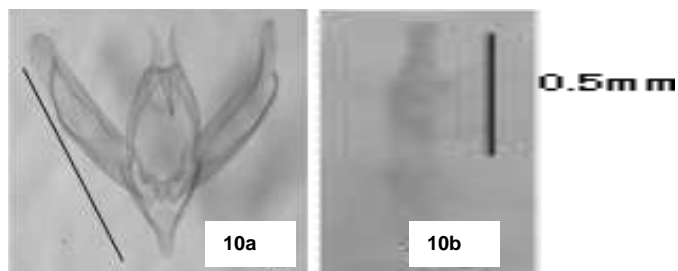


Figure 10a, b. *Microloxia herbaria* Hübner, (1813); Scale bar = 1 mm except 9-b

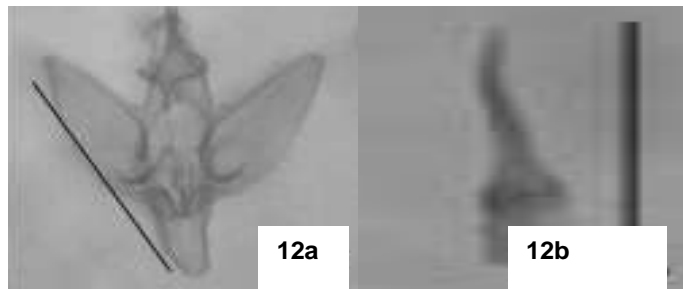


Figure 12a, b. *Eucrostes indigenata* Villers, 1789; Scale bar = 1 mm.

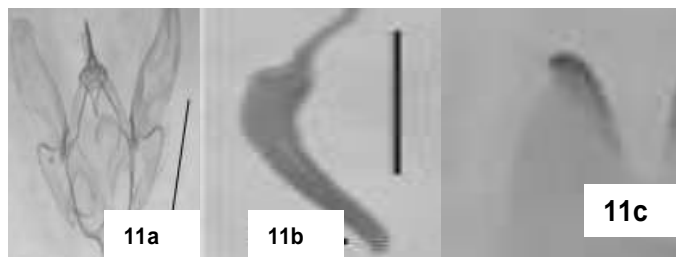


Figure 11a, b, c. *Jodis lactearia* Linnaeus, 1758; Scale bar = 1 mm.

white, transparent (Figure 1n). Antemedial and post medial lines white, opak on all wings. Hind tibia with pencil and four spurs. Antennae bipectinate. Length of longest branches about 4 - 5 times width of flagellum.

Male genitalia: Valva simple, sacculus clear. Uncus stout, socii weak. Saccus like tongue (Figure 11a). Aedeagus slender, without cornuti (Figure 11b). Posterior margin of sternum A8 with deep cavity in the middle. Right and left processes curled to outside and inner surface with many small spines toward tip (Figure 11-c).

Distribution: Europe except northern Scandinavia, Caucasus, Transcaucasus and in the East to Japan (Hausmann, 2001).

In Turkey: Bursa (Staudinger, 1881: Okyar and Aktaç, 1999); Düzce (Özdemir, 2004); Kastamonu, Ordu, Trabzon (Can, 2008); Western Black Sea Region (Okyar et al., 2009).

Eucrostes indigenata Villers, 1789, Linn. Ent.2: 383, pl.6, Figure 12ab, (*Phal(aena) Geom(etra)*)

Examined material: Hatay-Batıayaz-Mağaracık: 14.VII.2005 2♂♂.

Diagnosis: Wingspan ♂ 11.5 -12.5 mm. Wings bright green, with yellow tinge (Figure 10). Fringe and terminal line red-brown on all wings. Cell spots brown, sharp and very small. Hind tibia with two spurs. Antennae bipectinate with long branches.

Male genitalia: Base of valva with small and stout spines. Costa of valva sclerotized. Uncut long and slender, terminally forked (Figure 12a). Aedeagus long and thin toward to tip (Figure 12b).

Distribution: Species has Palaearctic distribution.

North Africa, North and South Europe (Seitz, 1915; Hausmann, 2001). Spain, South East Fransa, Georgia, Bulgaria, Hungary, Makedonia, Lebanon and Israel (Staudinger and Rebel, 1901; Hausmann, 2001) and Syria (Staudinger and Rebel, 1901; Culot, 1987).

In Turkey: İzmir, İstanbul (Hausmann, 2001) and Hatay-Yayladağı (Doğanlar, 2003); Antalya, Bursa (Koçak and Kemal, 2009).

Culpinia prouti, Thierry-Mieg, 1913, Feuille jeun Nat. (5)43: 180, (*Thalera*)

Examined material: Hatay-Batıayaz-Mağaracık: 30.V.2004 1♂; Hatay-Batıayaz: 23.V.2007 3♂; 25.V.2007 2♂.

Diagnosis: Wingspan ♂ 27.4 mm. Ground colour dark green (Figure 1p). All wings were brown fringe. Hind wing angled concave at M1 - M3. Antemedial and post medial lines white on forewing. Hind wing only with post medial line. Hind tibia with pair of terminal spurs. Antennae bipectinate nearly to tip.

Male genitalia: Costal process of valva broad at base, tapered. Basal process of valva present, long and tapered. Uncus long, slender, tapered. Socii long, rounded. Gnathos weak (Figure 13a). Aedeagus long, pistillate (Figure 13b).

Distribution: Syria (Scoble, 1999), southern Turkey and Lebanon (Hausmann, 1996b) and northern Cyprus (Can Doğanlar and Arap, 2005).

In Turkey: Alanya (Riemis, 1998); Adana-Feke and Hatay (Dörtüol, Samandağı) (Doğanlar, 2003).

DISCUSSION

In this study, *C. asphaleia* and *C. viridata* species belonging to *Chlorissa* genus were detected in different regions apart from their previously known distribution areas in Turkey: *C. asphaleia* Wiltshire, 1966, an Anatolian-Iranian (AI) species, was collected from the Mediterranean region for the first time with this study. *C. viridata*, reported to be present in the province of Sinop in the black sea region of Turkey earlier (Can, 2008), was identified in the province of Çankiri in the middle Anatolia region by the present study.

J. lactearia is known to exist in Bursa from the Marmara

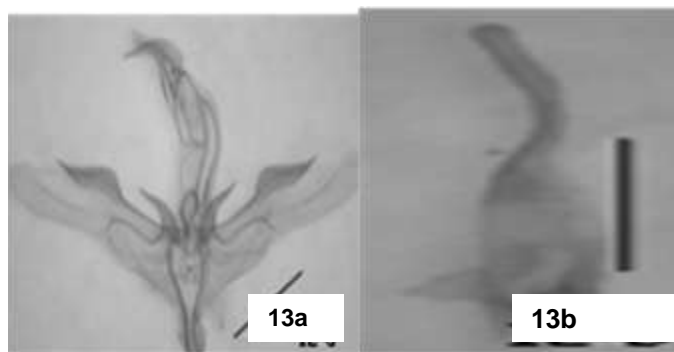


Figure 13a, b. *Culpinia prouti* Thierry-Mieg, 1913; Scale bar = 1 mm

region (Staudinger, 1881; Okyar and Aktaç, 1999), Düzce (Özdemir, 2004), Kastamonu, Ordu and Trabzon from the Black Sea region (Can, 2008). The study served to sample *J. lactearia* from the middle Anatolia of Turkey. *T. persica* displays a wide distribution in Turkey and the near Caucasian (Hausmann, 2001). The study added a new location to the distribution area of *T. persica* in the middle Anatolia. In conclusion, the current study was aimed to determine Geometrinae species (Lepidoptera: Geometridae) in the Mediterranean and middle Anatolia regions which have very different climatic, geographical and faunistic features from the other regions of Turkey. As a result of our study, the presence 12 emerald moths species belonging to 11 genera of the subfamily Geometrinae were proved from 17 localities in these regions.

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