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## NEW RECORDS OF GEOMETRID MOTHS (LEPIDOPTERA: GEOMETRIDAE) FROM SOUTHEAST OF TURKEY

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### ABSTRACT

On the basis of the specimens collected in 2015-2017 from southeast of Turkey, an overview is presented on faunistic and distributional points of view. Twenty three species in 4 subfamilies have been discovered for the first time from the area. Endemic and widespread species in the field are mentioned. Comparison of the species number with neighbouring provinces is given. Adults of *Charissa dubitaria* (Staudinger, 1892); *C. onustaria* (Herrich-Schäffer, [1852]); *Eilicrinia cordiaria* (Hübner, 1790); *Eumera hoeferi* Wehrli, 1934; *Gnophos pseudosnelleni* (Rjabov, 1964); *Stueningia wolffi* Hausmann, 1993; *Aplocera plagiata* (Linnaeus, 1758) and *Docirava musculata* (Staudinger, 1892) are illustrated.

**Keywords:** Geometrid moths, Bismil, Silvan, Diyarbakır, Turkey

## TÜRKİYE'NİN GÜNEYDOĞUSUNDAN YENİ GEOMETRİD GÜVE (LEPIDOPTERA: GEOMETRIDAE) KAYITLARI

### ÖZET

Türkiye'nin güneydoğusunda, 2015-2017 yılları arasında toplanan örneklerle dayanarak, faunistik ve dağılımsal bir genel bakış sunulmuştur. Alandan 4 altfamilya içerisinde 23 tür ilk kez keşfedilmiştir. Alandaki endemik ve yaygın türlerden bahsedilmiştir. Tür sayısının komşu illerle karşılaştırılması verilmiştir. *Charissa dubitaria* (Staudinger, 1892); *C. onustaria* (Herrich-Schäffer, [1852]); *Eilicrinia cordiaria* (Hübner, 1790); *Eumera hoeferi* Wehrli, 1934; *Gnophos pseudosnelleni* (Rjabov, 1964); *Stueningia wolffi* Hausmann, 1993; *Aplocera plagiata* (Linnaeus, 1758) ve *Docirava musculata* (Staudinger, 1892) türlerinin ergin bireyleri resmedilmiştir.

**Anahtar Kelimeler:** Geometrid güveleri, Bismil, Silvan, Diyarbakır, Türkiye

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## 1. INTRODUCTION

The Geometridae are one of the most species-rich Lepidoptera-families. Most of the geometrids live in the tropics. The majority of the geometrid moths are nocturnal, and many species are attracted by light traps. However, some species also fly preferably at dusk. They are often small and inconspicuous in wing pattern and colours [1].

In Europe, more than 900 geometrid species are known [1] and 684 species are reported from Turkey [2]. Geometridae species in the Turkish fauna is examined in 208 genera of 6 subfamilies: Archiearinae, Orthostixinae, Geometrinae, Sterrhinae, Larentiinae and Ennominae. Although, there are some general studies on Lepidoptera order, the geometrid moths of Diyarbakır are not well known, and the number of the determined species is 41 so far [2-6]. Besides, Lepidoptera fauna of Bismil and Silvan districts are studied for the first time and, 23 geometrid moth species are new reported from Diyarbakır province.

The collecting localities Silvan and Bismil districts are located in the southeast of Turkey. The northern part of Silvan consists of mountainous-natural areas and, the southern part contains agricultural land. Natural vegetation forms with oak species on the mountain slopes. And, almost all of Bismil district contains of farmland especially wheat, cotton and corn fields.

## 2. MATERIAL AND METHODS

Materials were collected from south-eastern Turkey, Diyarbakır province, Silvan and Bismil districts between in 2015-2017 years, with light traps, using UV strip led and 12 volts 7 ampere battery. The materials were sampled on the following localities: Silvan, Demirkuyu, 860 m, 38°10'47"N–41°09'04"E, oak field; Silvan, Demirkuyu road, 720 m, 38°08'38"N–41°10'38"E, steppe area; Bismil, Arıkgöl, 525 m, 37°50'10"N–40°51'25"E, riverside land.

The pictures of the specimens were photographed using with Fujifilm Finepix HS30EXR. The samples were identified primarily by the wing-patterns. Male genitalia were prepared for species that cannot be reliably identified based exclusively on the wing morphology. The preparations were carried out following by the standard procedure [7]: by boiling with potassium hydroxide (KOH), dissecting and cleaning, and mounting in Euparal. Literature data were used for identification [1, 8–12] and distribution [2–6, 13–25] of the species. The moth samples are deposited in the Biology Laboratory of Batman University and in the collection of Seven.

## 3. RESULTS

### Faunistic and distributional accounts

**Family Geometridae** Leach, 1815

**Subfamily Ennominae** Duponchel, 1845

**Genus *Charissa*** Curtis, 1826

*Charissa dubitaria* (Staudinger, 1892) (Figure 1. a)

**Material examined.** 2♂♂ 1♀ Silvan, Demirkuyu road, 720 m, 04.VI.2016; 2♂♂ Silvan, Demirkuyu, 860 m, 24.VI.2017.

**Range:** Greece, Turkey, Lebanon, Armenia, Iran [2].

**Distribution in Turkey:** Hakkâri, Kayseri, Mardin, Mersin, Siirt, Van [2, 13, 22, 25] and Diyarbakır.

*Charissa onustaria* (Herrich-Schäffer, [1852]) (Figure 1. b)

**Material examined.** 5♂♂ 1♀ Silvan, Demirkuyu road, 720 m, 19.IV.2017.

**Range:** Southern Europe, Balkans, Turkey, Caucasus, Iran, Iraq, east Mediterranean [10].

**Distribution in Turkey:** Amasya, Antalya, Bolu, Bursa, Elazığ, Hatay, Mersin, Malatya, Kahramanmaraş, Ordu, Siirt, Trabzon, Van, Zonguldak [2, 13, 19, 20, 22, 25] and Diyarbakır.

**Genus *Chiasmia*** Hübner, [1823]

*Chiasmia aestimaria* (Hübner, [1809])

**Material examined.** 4♀♀ Silvan, Demirkuyu, 860 m, 15.VIII.2016.

**Range:** Southern Europe, Portugal, France, Balkans, Ukraine, south-eastern European Russia, South-western Germany, north Africa, Cyprus, Turkey, Transcaucasus, Caucasus, Middle East, Central Asia, Iran and Afghanistan [12].

**Distribution in Turkey:** Artvin, Bursa, Hakkâri, Konya, Kahramanmaraş, Muğla, Siirt, Van [2, 13, 22, 25] and Diyarbakır.

**Genus *Ellicrinia*** Hübner, [1823]

*Ellicrinia cordiaria* (Hübner, 1790) (Figure 1. c)

**Material examined.** 2♂♂ Silvan, Demirkuyu road, 720 m, 19.IV.2017; 2♂♂ 1♀ Silvan, Demirkuyu, 860 m, 24.VI.2017.

**Range:** Europe, Turkey, Caucasus, northern Iran and central Asia [12].

**Distribution in Turkey:** Adana, Adıyaman, Amasya, Ankara, Aydın, Bitlis, Bolu, Bursa, Çankırı, Edirne, Erzincan, Hakkâri, Kars, Kayseri, Kırıkkale, Konya, Malatya, Manisa, Kahramanmaraş, Niğde, Siirt, Sivas, Şırnak, Tekirdağ, Trabzon, Van [2, 15, 17, 18, 19, 22, 23, 25] and Diyarbakır.

**Genus *Ematurga*** Lederer, 1853

*Ematurga atomaria* (Linnaeus, 1758)

**Material examined.** 1♀ Silvan, Demirkuyu, 860 m, 15.VIII.2016.

**Range:** Scandinavia, Europe, Balkans, Turkey, Caucasus, Asia [2, 10].

**Distribution in Turkey:** Amasya, Ankara, Bartın, Bilecik, Bingöl, Bitlis, Bolu, Bursa, Çanakkale, Düzce, Edirne, Mersin, İstanbul, Kastamonu, Kırıkkale, Kocaeli, Manisa, Ordu, Sakarya, Samsun, Sinop, Sivas, Tokat, Zonguldak [2, 17–20, 23, 24] and Diyarbakır.

**Genus *Ennomos*** Treitschke, 1825

*Ennomos quercaria* (Hübner, [1813])

**Material examined.** 1♂ 2♀♀ Silvan, Demirkuyu, 860 m, 15.VIII.2016.

**Range:** Mediterranean region and south-eastern central Europe, west Balkans, northern Turkey, Caucasus region, northern Iran, Levant [12].

**Distribution in Turkey:** Amasya, Antalya, Bolu, Hakkâri, Hatay, Mersin, İstanbul, Konya, Samsun, Siirt, Tokat, Van [2, 14, 19, 22, 25] and Diyarbakır.

**Genus *Eumera*** Staudinger, 1892

*Eumera hoeferi* Wehrli, 1934 (Figure 1. d)

**Material examined.** 2♂♂ 1♀ Silvan, Demirkuyu, 860 m, 24.VI.2017.

**Range:** Turkey, Iran, Iraq, Azerbaijan [2].

**Distribution in Turkey:** Hakkâri, Kayseri, Malatya, Siirt, Şırnak [2, 13, 25] and Diyarbakır.

**Genus *Gnophos*** Treitschke, 1825

*Gnophos pseudosnelleni* (Rjabov, 1964) (Figure 1. e)

**Material examined.** 3♂♂ 1♀ Bismil, Arıkgöl, 525 m, 12.VII.2015.

**Range:** Turkey, Azerbaijan, Armenia, Iran, Turkmenistan [2].

**Distribution in Turkey:** Batman, Bitlis, Hakkâri, Siirt, Tunceli, Van [2, 13, 22, 25] and Diyarbakır.

**Genus *Selidosema*** Hübner, [1823]

*Selidosema plumarium* ([Denis & Schiffermüller], 1775)

**Material examined.** 3♂♂ 1♀ Silvan, Demirkuyu road, 720 m, 04.VI.2016.

**Range:** South and central Europe, Balkans, Turkey, Iraq [10].

**Distribution in Turkey:** Amasya, Bolu, Düzce, Karaman, Kahramanmaraş, Siirt, Sivas, Van [2, 19, 25] and Diyarbakır.

**Genus *Stueningia*** Hausmann, 1993

***Stueningia wolfi*** Hausmann, 1993 (Figure 1. f)

**Material examined.** 1♂ Silvan, Demirkuyu road, 720 m, 04.VI.2016.

**Range:** Turkey [2].

**Distribution in Turkey:** Adana, Antalya, Batman, Hakkâri, Mersin, Konya, Van [2, 13] and Diyarbakır.

**Genus *Stegania*** Guenée, [1845]

***Stegania dilectaria*** (Hübner, 1790)

**Material examined.** 2♂♂ 1♀ Bismil, Arıkgöl, 525 m, 12.VII.2015, 3♂♂ Silvan, Demirkuyu road, 720 m, 04.VI.2016.

**Range:** Central Europe, Balkans, Turkey, Azerbaijan, Russia, China [2].

**Distribution in Turkey:** Adana, Bitlis, Bolu, Düzce, Edirne, İstanbul, Konya, Kırıkkale, Malatya, Kahramanmaraş, Samsun, Siirt, Tokat, Van [2, 17–19, 23, 25] and Diyarbakır.

**Subfamily Larentiinae** Duponchel, 1845

**Genus *Aplocera*** Stephens, 1827

***Aplocera plagiata*** (Linnaeus, 1758) (Figure 1. g)

**Material examined.** 2♀♀ Bismil, Arıkgöl, 525 m, 12.VII.2015; 3♂♂ Silvan, Demirkuyu road, 720 m, 04.VI.2016; 3♂♂ 2♀♀ Silvan, Demirkuyu, 860 m, 24.VI.2017.

**Range:** Europe, south Scandinavia, Britain, Balkans, Caucasus, Transcaucasia, eastern Mediterranean, North Iran, Afghanistan, central Asia, north America [11].

**Distribution in Turkey:** Adana, Amasya, Ankara, Ardahan, Bitlis, Bolu, Bursa, Çanakkale, Çankırı, Düzce, Edirne, Elazığ, Erzincan, Gümüşhane, Hakkâri, Hatay, Mersin, İstanbul, İzmir, Kahramanmaraş, Kayseri, Kırıkkale, Konya, Malatya, Manisa, Osmaniye, Siirt, Sivas, Tokat, Trabzon, Tunceli, Van [2, 17–19, 23, 25] and Diyarbakır.

**Genus *Docirava*** Walker, [1863]

***Docirava musculata*** (Staudinger, 1892) (Figure 1. h)

**Material examined.** 2♂♂ Silvan, Demirkuyu road, 720 m, 19.IV.2017.

**Range:** Turkey, Iran, Iraq, Turkmenistan [2].

**Distribution in Turkey:** Amasya, Elazığ, Erzurum, Giresun, Hakkâri, Malatya, Mersin, Kahramanmaraş, Kayseri, Kırıkkale, Niğde, Tunceli, Van [2] and Diyarbakır.

**Genus *Eupithecia*** Curtis, 1825

***Eupithecia oblongata*** (Thunberg, 1784)

**Material examined.** 1♂ 1♀ Silvan, Demirkuyu road, 720 m, 19.IV.2017.

**Range:** Europe, north Africa, Asia, eastern Mediterranean, Caucasus, Transcaucasia [9].

**Distribution in Turkey:** Adana, Amasya, Ankara, Batman, Bolu, Bursa, Çanakkale, İstanbul, Konya, Malatya, Kahramanmaraş, Kırıkkale, Ordu, Samsun, Siirt, Sivas, Van [2, 13, 19, 22, 25] and Diyarbakır.

**Genus *Orthonama*** Hübner, [1825]

***Orthonama obstipata*** (Fabricius, 1794)

**Material examined.** 2♀♀ Bismil, Arıkgöl, 525 m, 12.VII.2015; 2♂♂ 1♀ Silvan, Demirkuyu, 860 m, 24.VI.2017. 2♂♂ Silvan, Demirkuyu road, 720 m, 19.IV.2017.

**Range:** Europe, southern Scandinavia, north Africa, Turkey, Caucasus, Transcaucasia, eastern Mediterranean, Middle East, Asia, Far east Asia [11].

**Distribution in Turkey:** Adana, Amasya, Ankara, Antalya, Batman, Bitlis, Bolu, Bursa, Çanakkale, Edirne, Hakkâri, Hatay, Mersin, İstanbul, Konya, Kahramanmaraş, Kırıkkale, Osmaniye, Siirt [2, 13, 14, 17–19, 22, 25] and Diyarbakır.

**Subfamily Orthostixinae** Meyrick, 1892

**Genus *Orthostixis*** Hübner, [1823]

*Orthostixis cribraria* (Hübner, [1799])

**Material examined.** 7♂♂ 5♀♀ Bismil, Arıkgöl, 525 m, 12.VII.2015.

**Range:** Southeast Europe, Balkans, Turkey, Caucasus, Transcaucasia, northern Iran, Lebanon [1].

**Distribution in Turkey:** Adana, Amasya, Ankara, Ardahan, Batman, Bingöl, Bitlis, Bolu, Bursa, Çanakkale, Düzce, Gümüşhane, Hatay, Mersin, Konya, Siirt, Van [2, 16, 19, 25] and Diyarbakır.

**Subfamily Sterrhinae** Meyrick, 1892

**Genus *Cyclophora*** Hübner, 1822

*Cyclophora suppunctaria* (Zeller, 1847)

**Material examined.** 1♂ Silvan, Demirkuyu road, 720 m, 19.IV.2017.

**Range:** Southern Europe, Tunisia, Turkey, Iran, Saudi Arabia [8].

**Distribution in Turkey:** Bolu, Hakkâri, Mersin, Konya, Kırıkkale, Siirt [2, 19, 22, 25] and Diyarbakır.

**Genus *Idaea*** Treitschke, 1825

*Idaea camparia* (Herrich-Schäffer, [1852])

**Material examined.** 2♂♂ Silvan, Demirkuyu road, 720 m, 04.VI.2016.

**Range:** Balkans, southern Italy, Turkey, Cyprus, eastern Mediterranean, Transcaucasia, Iraq, Iran, Turkmenistan, Libya?, Algeria? [8].

**Distribution in Turkey:** Adana, Amasya, Antalya, Bursa, Çanakkale, Edirne, Hakkâri, Hatay, Mersin, Iğdır, İzmir, Manisa, Kahramanmaraş, Ordu, Tekirdağ, Van [2, 13, 15, 17, 18, 20] and Diyarbakır.

*Idaea elongaria* (Rambur, 1833)

**Material examined.** 1♂ Bismil, Arıkgöl, 525 m, 12.VII.2015; 1♂ Silvan, Demirkuyu, 860 m, 24.VI.2017.

**Range:** Southern Europe, north Africa, Balkans, Turkey, eastern Mediterranean, Transcaucasia, northern Iran, Turkmenistan, Afghanistan, central Asia [8].

**Distribution in Turkey:** Adana, Antalya, Bursa, Çanakkale, Hatay, İstanbul, Kahramanmaraş, Kırıkkale, Siirt [2, 22, 25] and Diyarbakır.

**Genus *Rhodometra*** Meyrick, 1892

*Rhodometra sacraria* (Linnaeus, 1767)

**Material examined.** 2♂♂ Bismil, Arıkgöl, 525 m, 12.VII.2015; 4♂♂ Silvan, Silvan, Demirkuyu road, 720 m, 04.VI.2016; 3♂♂ Silvan, Demirkuyu, 860 m, 15.VIII.2016.

**Range:** Europe (from south Europe to the north), Africa, Madagascar, central Asia, central America? [8].

**Distribution in Turkey:** Adana, Amasya, Ankara, Antalya, Aydın, Batman; Bingöl, Bitlis, Bursa, Çanakkale, Edirne, Gaziantep, Hatay, Mersin, İstanbul, Konya, Malatya, Manisa, Kahramanmaraş, Muğla, Niğde, Ordu, Siirt, Sivas, Tekirdağ, Şanlıurfa, Van [2, 13, 15, 17, 18, 20–22, 25] and Diyarbakır.

**Genus *Scopula*** Schrank, 1802

***Scopula beckeraria*** (Lederer, 1853)

**Material examined.** 3♂♂ Bismil, Arıkgöl, 525 m, 12.VII.2015; 1♂ Silvan, Demirkuyu road, 720 m, 04.VI.2016.

**Range:** Northern Greece, Bulgaria, Macedonia, western Romania, Ukraine?, eastern Mediterranean, central Asia [8].

**Distribution in Turkey:** Adana, Ağrı, Amasya, Ankara, Antalya, Batman, Bitlis, Bolu, Erzincan, Erzurum, Gaziantep, Hakkâri, Kars, Kırıkkale, Konya, Mardin, Niğde, Siirt, Sivas, Şanlıurfa, Van [2, 19, 25] and Diyarbakır.

***Scopula decorata*** ([Denis & Schiffermüller], 1775)

**Material examined.** 2♂♂ 1♀ Silvan, Demirkuyu, 860 m, 24.VI.2017.

**Range:** Europe (except for Britain and Scandinavia), Turkey, Caucasus, Transcaucasia, north Iran, Central Asia [8].

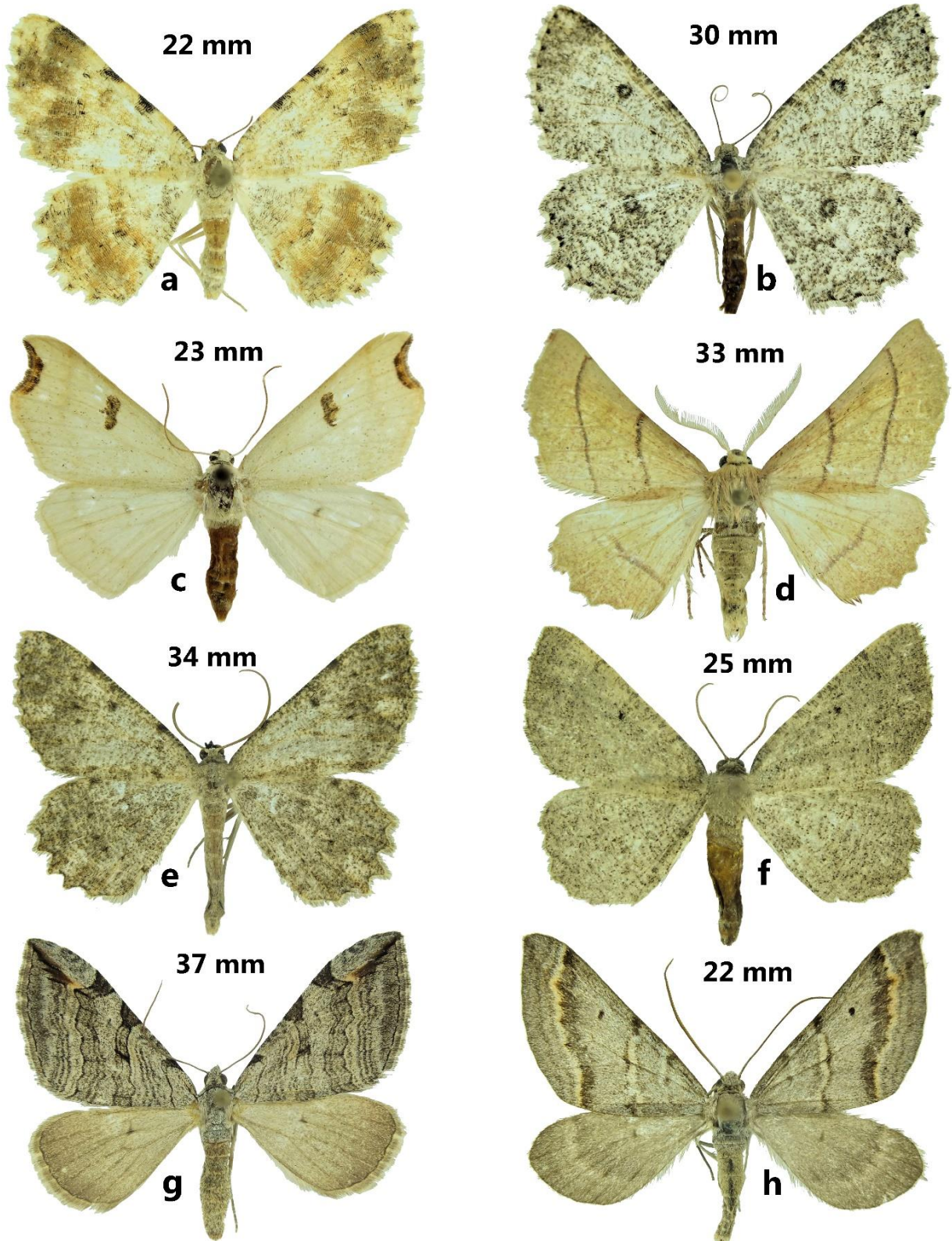
**Distribution in Turkey:** Afyon, Amasya, Ankara, Bitlis, Bolu, Bursa, Gaziantep, Gümüşhane, Hakkâri, Iğdır, Kayseri, Kahramanmaraş, Kırıkkale, Konya, Kütahya, Malatya, Manisa, Niğde, Osmaniye, Sivas, Tokat, Trabzon, Van [2, 16–19, 23] and Diyarbakır.

***Scopula immistaria*** (Herrich-Schäffer, [1852])

**Material examined.** 3♂♂ Bismil, Arıkgöl, 525 m, 12.VII.2015; 2♂♂ Silvan, Demirkuyu, 860 m, 24.VI.2017.

**Range:** Eastern Ukraine, southwest Bulgaria, southeastern Russia, Turkey, Caucasus, Transcaucasia, northern Iraq, Iran, Turkmenistan [8].

**Distribution in Turkey:** Ankara, Artvin, Batman, Bitlis, Elazığ, Erzincan, Erzurum, Hakkâri, Iğdır, Malatya, Kahramanmaraş, Mardin, Siirt, Sivas, Van [2, 22, 25] and Diyarbakır.



**Figure 1.** Adults of some species. **a.** *Charissa dubitaria*, **b.** *Charissa onustaria*, **c.** *Eilicrinia cordiaria*, **d.** *Eumera hoeferi*, **e.** *Gnophos pseudosnelleni*, **f.** *Stuenyingia wolffi*, **g.** *Aplocera plagiata*, **h.** *Docirava musculata*

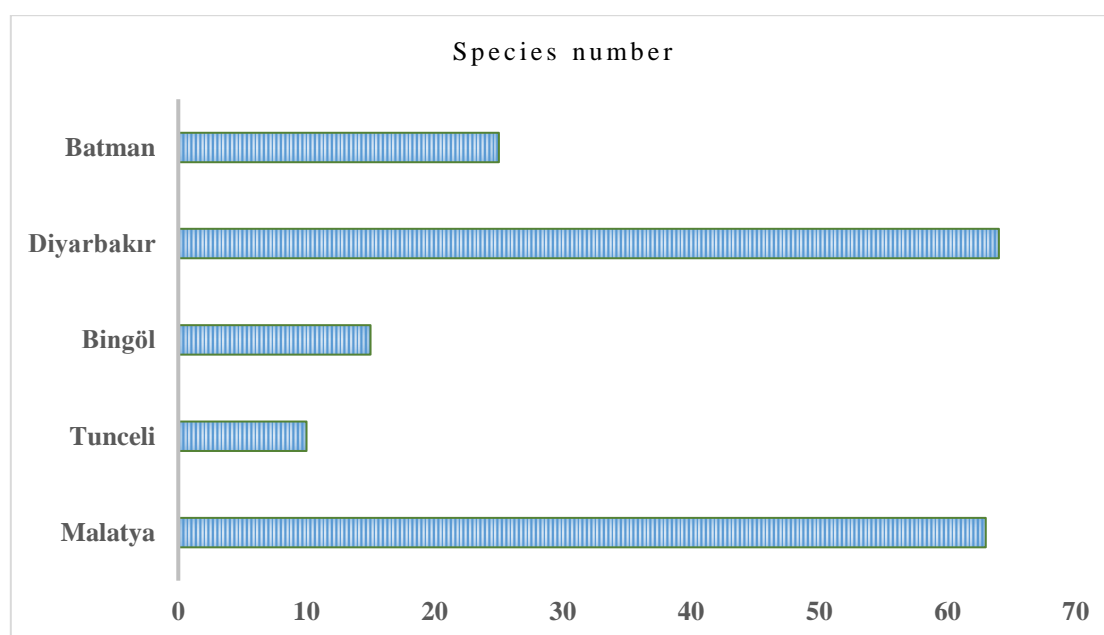
#### 4. DISCUSSION AND CONCLUSION

Before the research, 41 species were known in 5 subfamilies of Geometridae family from Diyarbakır province. In this study, 23 species are new discovered in the 4 subfamilies: Ennominae (11), Larentiinae (4), Orthostixinae (1) and Sterrhinae (7). Ennominae subfamily contains the highest species number. Moreover, Orthostixinae subfamily, represented by 2 species in Turkey and 1 in Europe [1, 2], is new reported from the study area (Table 1).

**Table 1.** Species number of the subfamilies before and after the studies in Diyarbakır province

	Desmobathrinae	Ennominae	Geometrinae	Larentiinae	Orthostixinae	Sterrhinae	Total
<b>Old records</b>	1	18	3	11	-	8	41
<b>New records</b>	-	11	-	4	1	7	23
<b>Total</b>	1	27	3	15	1	17	<b>64</b>

As the geometrid moths of Diyarbakır province are compared with some nearby provinces [2, 13], the contribution of this research is clearly seen with an increase of 56 %. The low number of the species in Bingöl and Tunceli provinces indicate that these regions have not been studied sufficiently yet (Figure 2).



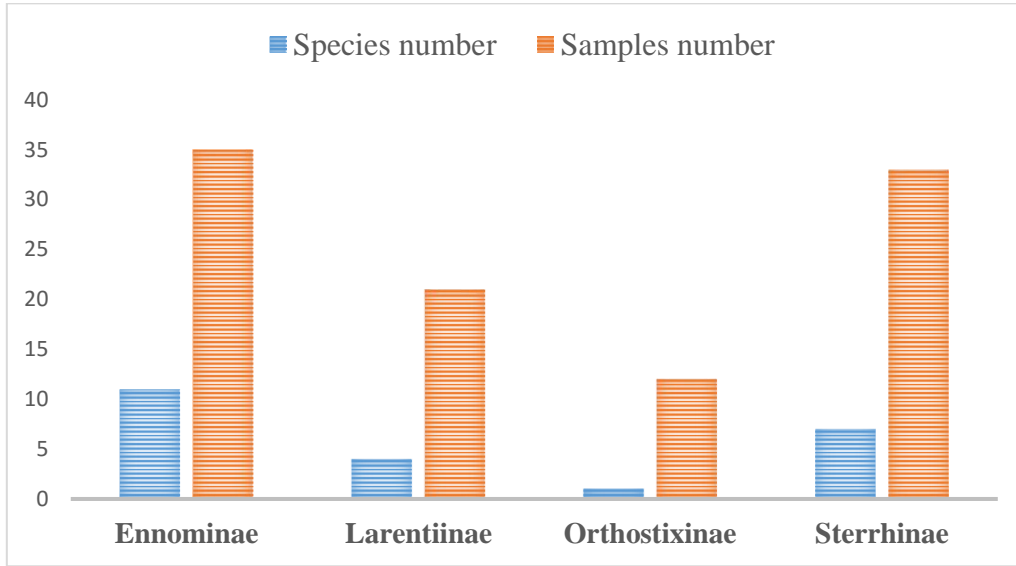
**Figure 2.** Comparison of the species number in Diyarbakır and some nearby provinces

*Stueningia wolffi* Hausmann, 1993 is an endemic species and known only from Turkey in Adana, Antalya, Batman, Hakkâri, Mersin, Konya, Van [2, 13] and Diyarbakır (new record).

*Eumera hoeferi* Wehrli, 1934 is known from Turkey, Iran, Iraq to Azerbaijan [2]. In Turkey, it shows a local distribution in east and south regions and, is known from Hakkâri, Kayseri, Malatya, Siirt, Şırnak [2, 25] and Diyarbakır (new record) provinces.

*Aplocera plagiata* (Linnaeus, 1758), *Orthonama obstipata* (Fabricius, 1794) and *Rhodometra sacraria* (Linnaeus, 1767) species show widespread distribution in the study area.





**Figure 3.** Comparison of the species and samples numbers according to subfamilies

As the number of collected samples in subfamilies are compared with the diagnosed species, Ennominae and Sterrhinae include the highest numbers and are proportional to the number of the samples (Figure 3).

The research results showed that the investigations on Lepidoptera fauna are still insufficient and are not examined thoroughly in east and southeast of Turkey. The surveys on this regions are continuing to eliminate this deficiency.

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