

Surveys on the Pyraloidea and Geometridae (Lepidoptera) Fauna of Mount Ararat and Its Surroundings

Celalettin GÖZÜAÇIK¹ , Kesran AKIN² , Erdem SEVEN^{3*} , Mete TÜRKÖĞLU⁴ 

¹ Department of Plant Protection, Faculty of Agriculture, Iğdır University, 76 000, Iğdır, Turkey.

² Bitlis Eren University, Faculty of Arts and Sciences, Department of Biology, 13000, Bitlis, Turkey.

³ Batman University, School of Tourism and Hotel Management, Department of Gastronomy and Culinary Arts, 72060, Batman, Turkey.

⁴ Ministry of Agriculture and Forestry, Iğdır Nature Conservation and National Parks Branch, Iğdır, Turkey.

Geliş / Received: 14/11/2021, Kabul / Accepted: 11/02/2022

Abstract

The present study is carried out between 2017 and 2019, to determine Pyraloidea and Geometridae fauna of Mount Ararat and its surroundings. The studies are conducted at night with light traps and insect nets during the day. First, samples are identified by using their external morphological characteristics and genital structures of taxa are examined when necessary. As a result of the research, 135 species from Pyraloidea superfamily and 70 species from Geometridae family are determined. Among these taxa, 65 species of Pyraloidea and 41 species of Geometridae are newly discovered in Lepidoptera fauna of Iğdır Province. The number of pyraloid species in Iğdır Province increased to 217 and the number of geometrid species increased to 118. Information on the new location records and distributions of *Ancylodes pallens* Ragonot, 1887, *Aphyletes nigrisparsella* (Ragonot, 1887), *Calamotropha paludella* (Hübner, [1824]), *Cydalima perspectalis* (Walker, 1859), *Ephestia kuehniella* Zeller, 1879, *Gymnancyla hornigii* (Lederer, 1852), *G. nomiella* (Ragonot, 1887), *Myrllaea mimicalis* (Amsel, 1950) and *Tephros verruculella* (Ragonot, 1887), whose distribution areas are limited in Turkey, are presented.

Keywords: Lepidoptera, Fauna, Moth, Turkey

Ağrı Dağı ve Çevresinde Pyraloidea ve Geometridae (Lepidoptera) Faunası Üzerine Araştırmalar

Öz

Bu çalışma, Ağrı dağı ve çevresinin Pyraloidea ve Geometridae faunasının belirlenmesi amacıyla, 2017-2019 tarihleri arasında yürütülmüştür. Araştırmalar gece ışık tuzaklarıyla gündüz ise atrap yardımıyla yapılmıştır. Örnekler öncelikle dış morfolojik karakterler kullanılarak teşhis edilmiş, gerektiğinde ise taksonların genital yapıları incelenmiştir. Araştırmalar sonucunda Pyraloidea üstfamilyasından 135, Geometridae familyasından 70 tür tespit edilmiştir. Bu taksonlardan Pyraloidea üst familyasından 65 tür, Geometridae familyasından ise 41 tür Iğdır ili Lepidoptera faunasında ilk kez tespit edilmiştir. Iğdır ilindeki pyraloid tür sayısı 217'e, geometrid tür sayısı ise 118'e yükselmiştir. Türkiye'deki yayılış alanları sınırlı olan *Ancylodes pallens* Ragonot, 1887, *Aphyletes nigrisparsella* (Ragonot, 1887), *Calamotropha paludella* (Hübner, [1824]), *Cydalima perspectalis* (Walker, 1859), *Ephestia kuehniella* Zeller, 1879, *Gymnancyla hornigii* (Lederer, 1852), *G. nomiella* (Ragonot, 1887), *Myrllaea mimicalis* (Amsel, 1950) ve *Tephros verruculella* (Ragonot, 1887) türlerinin yeni lokasyon kayıtları ve dağılımları ile ilgili bilgiler sunulmuştur.

Anahtar Kelimeler: Lepidoptera, Fauna, Güve, Türkiye

* **Corresponding Author:** erdem_seven@hotmail.com

Celalettin GÖZÜAÇIK, <https://orcid.org/0000-0002-6543-7663>

Kesran AKIN, <https://orcid.org/0000-0003-2921-948X>

Erdem SEVEN, <https://orcid.org/0000-0002-7587-5341>

Mete TÜRKÖĞLU, <https://orcid.org/0000-0002-3018-2453>

1. Introduction

Mount Ararat is located within the borders of Ağrı Province, Doğubeyazıt district and Iğdır Province, Aralık and Karakoyunlu districts. Mount Ararat and the surrounding area (Figure 1), the highest peak of Turkey and the European continent, hosts approximately 52 endemic plant taxa [1], has been declared as a National Park, with the decision of the Turkish Council of Ministers numbered 2004/8078, published and enforced in the Official Gazette dated 17.11.2004 and numbered 25643. The National Park area consists of three parts: The Great Ararat Mountain (5137 m.), the Small Ararat Mountain (3896 m.), and the areas where the Meteor Pit and Noah's Ark [2].



Figure 1. Habitat of Mount Ararat and its surroundings (Photographs: C. Gözüaçık)

More than 15.000 species of the Pyraloidea have been described, and many species are still waiting to be discovered [3]. Koçak and Kemal [4] reported about 670 species of Pyraloidea superfamily. The number of pyraloid species known from the Iğdır Province is 152 [4-8]. Geometridae fauna of Turkey is examined under 208 genera and 7 subfamilies: Archierarinae, Orthostixinae, Desmobathrinae, Geometrinae, Sterrhinae, Larentiinae, and Ennominae [4]. In Turkey, approximately 700 geometrid moths have been determined [4, 9-16]. And, in Iğdır Province, 77 geometrid species were known before the research [4-5].

Romanoff carried out the first comprehensive studies on Lepidoptera (Heterocera) fauna in the research area in 1879 and 1884-1887. These study covers Georgia, Armenia, Azerbaijan, Dagestan and Artvin, Ardahan, Kars, Iğdır (Kazıkoparan, Perli Mountain, Gaziler, Iğdır, Aralık and Mount Ararat) [17-18]. In the following years, Gaziler, Kazıkoparan, Takaltu, and Mount Ararat were studied by Max Korb in 1901 [19-20]. Koçak and Kemal [21] listed 467 Lepidoptera species reported in Iğdır Province. Koçak and Kemal [22] recorded 190 butterfly species from the province. Seven et al. [23] reviewed *Dysgonia* Hübner, [1823] genus (Erebidae) and presented *D. rogenhoferi* (Bohatsch, 1880), which is collected from Iğdır, as a new record for the Turkish fauna. Kemal and Koçak [5] gave 302 Heterocera species of Lower Aras Valley. Akın et al. [8] discovered 12 new records and a new species of pyraloid moth for the Turkish fauna from the province. However, afterward, except this studies on moth fauna of

Iğdır Province [5, 8, 21, 23]; and in the near region in Doğubeyazıt, Ağrı Province [24], adequate research could not be done due to security, geographical conditions, and lack of researchers.

2. Material and Methods

Collection: Field studies were conducted in 20 locations between April-November 2017 and 2019 (Table 1), in and around Mount Ararat. UV LEDs and mercury light bulbs (160 watts) were used for collecting the samples (Figure 2). There are no ethical issues regarding the publication of this study.



Figure 2. Light traps (Photographs: C. Gözüaçık)

Trapped specimens were killed with ethyl acetate and labeled separately with location and date information. Then they were pinned with an appropriate number of insect pins and stored in the naphthalene storage boxes.

Preparation: Collected materials were taken in softening containers for 1-2 days depending on the size of the sample to prepare them as museum material. The softened samples were stretched on boards. They were kept for 2-3 weeks at room temperature to dry and were labeled and deposited in the insect boxes.

Identification: The identification procedures of the specimens were first made using external morphological characters. In cases where morphological characters are not sufficient for the identification of the species, genital structures were made and examined. The method of Robinson [25] was followed for genital preparations.

The main sources used in diagnostic procedures and terminology are as follows:

Pyraloidea: Amsel [26-29], Bleszynski [30], Medvedev [31], Goater et al. [32], Leraut [33], Ragonot [34-35], Roesler [36-37], Slamka [38-41].

Surveys on the Pyraloidea and Geometridae (Lepidoptera) Fauna of Mount Ararat and its surroundings

Geometridae: Seven [16], Hausmann [42-43], Hausmann and Viidalepp [44], Leraut [45], Mironov [46-47], Skou and Sihvonon [48].

Table 1. Studied sites and their data

Location	Altitude (m)	Coordinate
1. Kent Ormanı	943	40°02'12.55"N-43°50'16.01"E
2. Gaziler	1138	40°05'09.82"N-43°27'14.88"E
3. Aşağı Aktaş	1585	40°04'47.11"N-43°31'11.37"E
4. Yüzbaşılar	860	40°00'15.47"N-44°03'41.56"E
5. Yenidoğan	1830	39°46'26.91"N-44°23'15.33"E
6. Suveren	1118	39°48'44.99"N-44°04'56.67"E
7. Suveren-Bal Forest	1122	39°48'30.32"N-44°04'58.05"E
8. Suveren-Seyir Hill	1160	39°48'34.15"N-44°04'58.05"E
9. Melekli	853	39°56'30.14"N-44°07'04.50"E
10. Aktaş	824	40°01'51.23"N-43°27'23.13"E
11. Hıdırlı-Karakoyunlu	827	39°53'25.68"N-44°21'14.70"E
12. Taşburun	842	39°58'22.74"N-44°14'33.84"E
13. Aralık Erosion Area	826	39°51'55.50"N-44°30'08.10"E
14. Aralık	837	39°47'10.06"N-44°37'05.14"E
15. Aşağı Çıyıklı	976	40°07'19.09"N-43°36'20.92"E
16. D.A. Araştırma	865	39°56'25.10"N-44°00'38.48"E
17. Koçkiran	834	40°02'02.80"N-44°18'38.60"E
18. Melekli (Unv. Farm)	853	39°55'45.58"N-44°05'38.41"E
19. Doğubeyazıt	1540	39°46'05.16"N-44°08'38.81"E
20. Çıraklı	1607	40°03'53.38"N-43°29'41.29"E

3. Results

As a result of the surveys around Mount Ararat, 138 taxa (135 at species level and 3 at genus level) belonging to the 2 families in the Pyraloidea superfamily and 70 species in the Geometridae family were identified. New records for the Iğdır Province are marked with an asterisk "*" after the species names.

Superfamily Pyraloidea Latreille, 1809

Family Crambidae Latreille, 1810

Subfamily Acentropinae Stephens, 1836

Parapoynx stratiotatum (Linnaeus, 1758)*

Subfamily Crambinae Latreille, 1810

Agriphila bleszynskiella Amsel, 1961*

Agriphila deliella (Hübner, [1813])*

Agriphila poliella (Treitschke, 1832)*

Agriphila tolli (Bleszynski, 1952)*

Ancylolomia pappella ([Denis & Schiffermüller], 1775)*

Ancylolomia tentaculella (Hübner, 1796)*
Calamotropha paludella (Hübner, [1824])* (Fig. 3a)
Calamotropha aureliellus (Fischer von Röslerstamm, 1841)
Chilo luteellus (Motschulsky, 1866)
Chrysocrambus linetellus (Fabricius, 1781)
Crambus perlellus (Scopoli, 1763)
Euchromius bellus (Hübner, 1796)
Euchromius ocellus (Haworth, [1811])
Euchromius pulverosus (Christoph, 1887)
Euchromius ramburiellus (Duponchel, 1836)
Metacrambus carectellus (Zeller, 1847)*
Pediasia contaminella (Hübner, 1796)
Pediasia matricella (Treitschke, 1832)*
Pediasia persella (Toll, 1948)*
Pediasia sp.
Talis quercella ([Denis & Schiffermüller], 1775)

Subfamily Glaphyriinae (= Evergestinae, Noordinae) W. T. M. Forbes, 1923

Evergestis desertalis (Hübner, [1813])
Evergestis frumentalis (Linnaeus, 1761)
Evergestis politalis ([Denis & Schiffermüller], 1775)*
Evergestis segetalis (Herrich-Schäffer, ([1855]))*
Hellula undalis (Fabricius, 1781)*
Hyperlais claralis (Caradja, 1910)
Prochoristis capparidis (Christoph, 1877)

Subfamily Odontiinae Guenée, 1854

Aeschremon disparalis Herrich-Schäffer, [1855]
Anthophilopsis baphialis (Staudinger, 1870)
Anthophilopsis moeschleri (Christoph, 1862)
Aporodes floralis (Hübner, [1809])
Cynaeda gigantea (Staudinger, 1879)
Ephelis cruentalis (Geyer, [1832])
Tegostoma comparalis (Hübner, 1796)
Tegostoma sp.
Turania pentodontalis (Erschoff, 1874)

Subfamily Pyraustinae Meyrick, 1890

Achyra nudalis (Hübner, 1796)
Anania ochrofascialis (Christoph, 1882)
Anania verbascata (Fabricius, 1787)*
Ecpyrrhorhoe diffusalis (Guenée, 1854)
Loxostege clathralis (Hübner, [1813])

Loxostege deliblatica Szent-Ivány & Uhrík-Mészáros, 1942
Ostrinia nubilalis (Hübner, 1796)*
Paracorsia repandalis ([Denis & Schiffermüller], 1775)
Pyrausta aerealis (Hübner, 1793)
Pyrausta aurata (Scopoli, 1763)
Pyrausta castalis Treitschke, 1829
Pyrausta cingulata (Linnaeus, 1758)
Pyrausta despicata (Scopoli, 1763)
Pyrausta purpuralis (Linnaeus, 1758)
Pyrausta sanguinalis (Linnaeus, 1767)
Pyrausta virginalis Duponchel, 1832*
Sitochroa palealis ([Denis & Schiffermüller], 1775)*
Sitochroa verticalis (Linnaeus, 1758)
Uresiphita gilvata (Fabricius, 1794)*

Subfamily Schoenobiinae Duponchel, 1846

Donacaula nilotica (Zeller, 1867)*
Scirpophaga praelata (Scopoli, 1763)*

Subfamily Scopariinae Guenée, 1854

Anarpia incertalis (Duponchel, 1832)*

Subfamily Spilomelinae Guenée, 1854

Cydalima perspectalis (Walker, 1859)*
Dolicharthria bruguieralis (Duponchel, 1833)*
Dolicharthria punctalis ([Denis & Schiffermüller], 1775)*
Mecyna marcidalis (Fuchs, 1879)*
Mecyna subsequalis (Herrich-Schäffer, 1855)
Metasia suppandalis (Hübner, [1823])
Nomophila noctuella ([Denis & Schiffermüller], 1775)
Udea ferrugalis (Hübner, 1796)
Udea praepetalis (Lederer, 1869)

Family Pyralidae Latreille, 1809

Subfamily Galleriinae Zeller, 1848

Galleria mellonella (Linnaeus, 1758)*
Lamoria zelleri (Joannis, 1932)*

Subfamily Phycitinae Zeller, 1839

Ancyloides pallens Ragonot, 1887* (Fig. 3b)
Ancylosis aspilatella (Ragonot, 1887)
Ancylosis cinnamomella (Duponchel, 1836)

Ancylosis dumetella (Ragonot, 1887)*
Ancylosis faustinella (Zeller, 1867)*
Ancylosis hellenica (Staudinger, 1870)
Ancylosis maculifera Staudinger, 1870
Ancylosis oblitella (Zeller, 1848)
Ancylosis pyrethrella (Herrich-Schäffer, 1860)*
Ancylosis rhodochrella (Herrich-Schäffer, 1855)
Ancylosis igdirensis Akın, Gözüaçık, Seven & Türkoğlu, 2021
Anerastia lotella (Hübner, [1813])*
Aphyletes nigrisparsella (Ragonot, 1887)* (Fig. 3c)
Arsissa ramosella (Herrich-Schäffer, [1855])*
Asalebria venustella (Ragonot, 1887)
Bradyrrhoa gilveolella (Treitschke, 1833)*
Cadra figulilella (Gregson, 1871)
Cadra furcatella (Herrich-Schäffer, [1849])*
Christophia bilineella (Ragonot, 1887)
Coenochroa ablutella (Zeller, 1839)*
Ematheudes punctellus (Treitschke, 1833)*
Ephestia kuehniella Zeller, 1879* (Fig. 3d)
Ephestia sp.
Ephestia welseriella (Zeller, 1848)*
Epiepischnia pseudolydella Amsel, 1954*
Epischnia albunculella (Staudinger, 1879)
Epischnia prodromella (Hübner, [1799])*
Etiella zinckenella (Treitschke, 1832)
Eurhodope monogrammos (Zeller, 1867)*
Euzophera bigella (Zeller, 1848)
Euzophera imperfectella Ragonot, 1895*
Euzopherodes lutisignella (Mann, 1869)*
Gymnancyla canella ([Denis & Schiffermüller], 1775)*
Gymnancyla hornigii (Lederer, 1852)* (Fig. 3e)
Gymnancyla nomiella (Ragonot, 1887) (Fig. 3f)
Isauria dilucidella (Duponchel, 1836)*
Merulempista amoenella (Zeller, 1848)
Merulempista cingillella (Zeller, 1846)*
Myelois cinctipalpella Christoph, 1877
Myelois circumvoluta (Fourcroy, 1785)*
Myelois multiforella Ragonot, 1893*
Myrlaea mimicalis (Amsel, 1950)* (Fig. 3g)
Neopempelia hieroglyphella (Ragonot, 1887)
Nyctegretis lineana (Scopoli, 1786)
Oncocera semirubella (Scopoli, 1763)
Phycitodes binaevella (Hübner, [1813])*

Phycitodes lacteella (Rothschild, 1915)*
Phycitodes saxicola (Vaughan, 1870)
Plodia interpunctella (Hübner, [1813])*
Prorophora curvibasella Ragonot, 1887
Pseudophycita deformella (Moschler, 1866)
Psorosa nucleolella (Möschler, 1866)
Pterothrixidia rufella (Duponchel, 1836)*
Sciota rhenella (Zincken, 1818)
Sciota campicolella (Erschoff, 1874)
Tephris verruculella (Ragonot, 1887)* (Fig. 3h)

Subfamily Pyralinae Latreille, 1809

Aglossa caprealis (Hübner, [1809])*
Aglossa pinguinalis (Linnaeus, 1758)*
Hypotia colchicalis (Herrich-Schäffer, [1855])*
Hypotia massilialis (Duponchel, 1832)*
Hypsopygia costalis (Fabricius, 1775)
Pyralis farinalis (Linnaeus, 1758)*
Pyralis perversalis (Herrich-Schäffer, [1849])
Rungsina iranalis (Amsel, 1949)
Scotomera caesarealis (Ragonot, 1891)*
Stemmatophora brunnealis (Treitschke, 1829)*
Synaphe bombycalis ([Denis & Schiffermüller], 1775)

Superfamily Geometroidea Leach, 1815

Family Geometridae Leach, 1815

Subfamily Geometrinae Leach, 1815

Aplasta ononaria (Fuessly, 1783)*
Chlorissa asphaleia Wiltshire, 1966*
Microloxia herbaria (Hübner, [1813])*
Phaiogramma etruscaria (Zeller, 1849)
Thetidia persica Hausmann, 1996*

Subfamily Ennominae Duponchel, 1845

Charissa obscurata ([Denis & Schiffermüller], 1775)*
Chiasmia aestimaria (Hübner, [1809])*
Chiasmia syriacaria (Staudinger, 1871)
Chiasmia clathrata (Linnaeus, 1758)
Crocallis inexpectata Warnecke, 1940*
Dyscia innocentaria (Christoph, 1885)*
Dyscia malatyana (Wehrli, 1934)

Eilicrinia cordiaria (Hübner, 1790)
Enanthyperythra legataria (Herrich-Schäffer, [1852])*
Eumera hoeferi Wehrli, 1934*
Gnophos pseudosnelleni Rjabov, 1964*
Heliomata glarearia (Brahm, 1791)
Isturgia arenacearia ([Denis & Schiffermüller], 1775)
Isturgia murinaria ([Denis & Schiffermüller], 1775) (Fig. 4a)
Narraga tessularia (Metzner, 1845)
Nychiodes variabila Brandt, 1938*
Odontognophos zacharius (Staudinger, 1879)*
Peribatodes rhomboidarius ([Denis & Schiffermüller], 1775)*
Phaselia serrularia (Eversmann, 1847)*
Selidosema plumarium ([Denis & Schiffermüller], 1775)*
Synopsia sociaria (Hübner, [1799])

Subfamily Larentiinae Duponchel, 1845

Aplocera plagiata (Linnaeus, 1758)*
Camptogramma bilineatum (Linnaeus, 1758)*
Catarhoe permixtaria (Guenée, [1858])*
Catarhoe rubidata ([Denis & Schiffermüller], 1775)*
Costaconvexa polygrammata (Borkhausen, 1794)*
Eupithecia biornata Christoph, 1867
Eupithecia breviculata (Donzel, 1837)*
Eupithecia egenaria Herrich-Schäffer, [1848]*
Eupithecia limbata Staudinger, 1879
Eupithecia millefoliata Roesler, 1866
Eupithecia minusculata Alpheraky, 1883*
Eupithecia ochridata Schütze & Pinker, 1968*
Eupithecia silenicolata Mabille, 1867*
Lithostege coassata (Hübner, [1825])
Lithostege infuscata Eversmann, 1837
Lithostege witzenmanni Standfuss, 1892*
Lythria purpuraria (Linnaeus, 1758) (Fig. 4b)
Nebula senectaria (Herrich-Schäffer, [1852])
Orthonama obstipata (Fabricius, 1794)*
Protorhoe unicata (Guenée, [1858])*
Scotopteryx subvicinaria (Staudinger, 1892)*
Triphosa dubitata (Linnaeus, 1758)*

Subfamily Sterrhinae Meyrick, 1892

Casilda antophilaria (Hübner, [1813])*
Glossotrophia sacraria (A.Bang-Haas, 1910)*
Idaea degeneraria (Hübner, [1799])

Surveys on the Pyraloidea and Geometridae (Lepidoptera) Fauna of Mount Ararat and its surroundings

- Idaea elongaria* (Rambur, 1833)*
Idaea ochrata (Scopoli, 1763)
Idaea rusticata ([Denis & Schiffermüller], 1775)*
Idaea sericeata (Hübner, [1813])
Ochodontia adustaria Fischer de Waldheim, 1840 (Fig. 4c)
Rhodometra sacraria (Linnaeus, 1767)*
Rhodostrophia auctata (Staudinger, 1879)
Rhodostrophia sieversi (Christoph, 1882)
Rhodostrophia cuprinaria (Christoph, 1876)*
Scopula beckeraria (Lederer, 1853) (Fig. 4d)
Scopula decorata ([Denis & Schiffermüller], 1775)
Scopula flaccidaria (Zeller, 1852)*
Scopula immistaria (Herrich-Schäffer, [1852])
Scopula marginepunctata (Goeze, 1781)
Scopula ochraceata (Staudinger, 1901)*
Scopula ornata (Scopoli, 1763)
Scopula rubiginata (Hufnagel, 1767)*
Scopula transcaspica L.B. Prout, 1935*



Figure 3. Adult of some pyraloid species: a. *Calamotropha paludella*, b. *Ancylodes pallens*, c. *Aphyletes nigrisparsella*, d. *Ephestia kuehniella*, e. *Gymnancyla hornigii*, f. *G. nomiella*, g. *Myrllaea mimicalis*, h. *Tephrys verruculella* (Photographs: K. Akin)

Surveys on the Pyraloidea and Geometridae (Lepidoptera) Fauna of Mount Ararat and its surroundings

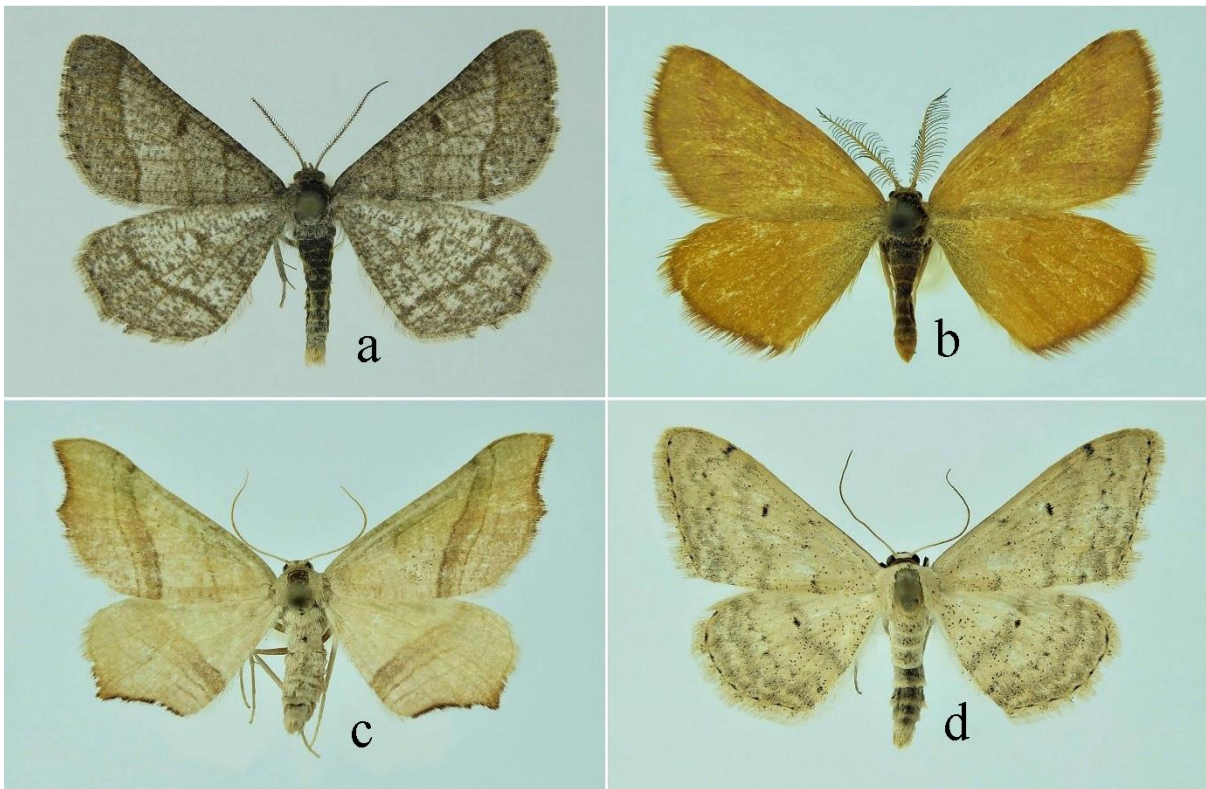


Figure 4. Adult of some geometrid species: a. *Isturgia murinaria*, b. *Lythria purpuraria*, c. *Ochodontia adustaria*, d. *Scopula beckeraria* (Photographs: E. Seven)

4. Discussion

In this study, 138 taxa of Pyraloidea superfamily were identified. Of these identified taxa, 3 are at the genus level and 135 are at the species level.

Table 2. Number of determined species of Pyraloidea subfamilies and new records for Iğdır

Family	Subfamily	Species number	New records
Crambidae	Acentropinae	1	1
	Crambinae	20	10
	Glaphyriinae	7	3
	Odontiinae	8	-
	Pyraustinae	19	5
	Schoenobiinae	2	2
	Scopariinae	1	1
	Spilomelinae	9	4
Pyralidae	Galleriinae	2	2
	Phycitinae	55	30
	Pyralinae	11	7
Total		135	65

Surveys on the Pyraloidea and Geometridae (Lepidoptera) Fauna of Mount Ararat and its surroundings

In the research area, 65 out of 135 species belonging to the Pyraloidea superfamily are new records for Iğdır Province (Table 2). Before the survey, 152 species were known from the province [4-8]. With this study, the number of pyraloid species in Iğdır Province has increased to 217.

Ancylodes pallens Ragonot, 1887 is known from Bitlis and Mersin [49]. In this study, Iğdır Province is the 3rd locality record of the species.

Aphyletes nigrisparsella (Ragonot, 1887) is known only from Aksaray [49]. In this study, Iğdır is the second locality record of the species.

Calamotropha paludella (Hübner, [1824]) is known from Konya and Kahramanmaraş until now [4]. In this study, Iğdır Province is the 3rd locality record of the species.

Cydalima perspectalis (Walker, 1859), originating from East Asia, is harmful to *Buxus* spp. and has spread from İstanbul and Düzce Provinces [50]. Iğdır Province is the new location of this species.

Ephestia kuehniella Zeller, 1879 is known from Adana and Ankara [49]. In this study, Iğdır is the 3rd locality record of the species.

Gymnancyla hornigii (Lederer, 1852) is known only from Ankara [4]. In this study, Iğdır is the second locality record of the species.

Gymnancyla nomiella (Ragonot, 1887) is hitherto known from the province of Iğdır [4]. It has been identified in the region again in this study.

Myrllaea mimicalis (Amsel, 1950) is known from Kars and Nevşehir [49]. In this study, Iğdır is the 3rd locality record of the species.

Tephtris verruculella (Ragonot, 1887) shows distribution only Bitlis Province [4]. It is newly discovered from Iğdır Province.

Table 3. Number of determined species of Geometridae subfamilies and new records for Iğdır

Subfamily	Species number	New records
Geometrinae	5	4
Ennominae	21	12
Larentiinae	22	15
Sterrhinae	22	10
Total	70	41

The Geometridae family is represented by 70 species in the research area. Of these, Geometrinae subfamily includes 5, Larentiinae 21, Ennominae 22, and Sterrhinae 22 species.

When the new records for the province of Iğdır are examined, the Larentiinae subfamily contains the highest number with 15 species. In total, 41 Geometridae species are determined for the first time in the fauna of Iğdır Province (Table 3). Thus, the number of geometrid moths in the province reached 118 species in total with the new records adding to 77 previously known species [4-5], and so there was an increase of approximately 35%.

Ethics in Publishing

There are no ethical issues regarding the publication of this study.

Author Contributions

Celalettin GÖZÜAÇIK: Design of the study, collection of the material.

Kesran AKIN: Design of the study, evaluation of results, writing the article.

Erdem SEVEN: Design of the study, evaluation of results, writing the article.

Mete TÜRKOĞLU: Collection of the material.

Acknowledgments

We thank Iğdır University, Scientific Research Projects Unit for support of this study by Project number 2017-FBE-A01.

References

- [1] Zeynelov, Y., Türkoğlu M. (2016). *Ağrı Dağı Florası*. Orman Su İşleri Bakanlığı Doğa Koruma ve Milli Parklar Genel Müdürlüğü, pp. 1-400.
- [2] Ministry of Forestry and Water Affairs, (2015). *Doğa Koruma ve Milli Parklar Genel Müdürlüğü, Ağrı Dağı Milli Parkı Uzun Devreli Gelişme Planı, Analitik Etüt-Sentez Raporu*. pp. 1-54.
- [3] Nuss, M., Landry, B., Mally, R., Vegliante, F., Tränkner, A., Bauer, F., Hayden, J., Segerer, A., Schouten, R., Li, H., Trofimova, T., Solis, M.A., De Prins J., Speidel, W. (2003–2021). *Global Information System on Pyraloidea*. - www.pyraloidea.org. Erişim Tarihi: 02.07.2021.
- [4] Koçak, A.Ö., Kemal, M. (2018). A Synonymous and Distributional List of the Species of the Lepidoptera of Turkey. Ankara, Türkiye, *Priamus*, 8, 1-487.
- [5] Kemal, M., Koçak, A.Ö. (2019a). On the Heterocera fauna of Lower Aras Valley in NE Turkey (Lepidoptera). *Misc. Pap*, 186, 1-57.
- [6] Kemal, M., Kızıldağ, S., Koçak, A.Ö. (2020a). On the genus Aglossa of Turkey with description of a new species (Lepidoptera, Pyraloidea). *Misc. Pap*, 207, 1-7.
- [7] Kemal, M., Kızıldağ, S., Koçak, A.Ö. (2020b). On some Cybalomiinae from Turkey

(Lepidoptera, Pyraloidea). *Misc. Pap.*, 212, 1-10.

[8] Akın, K., Gözüaçık, C., Seven E., Türkoğlu, M. (2021). New species and new records of Pyraloid moths (Lepidoptera: Pyraloidea) from Turkey. *Zootaxa*, 4951(3), 529-540.

[9] Doğanlar, F. (2003). Systematic and Faunistic studies of Geometridae (Lepidoptera) in the East Mediterranean region of Turkey. Doctoral dissertation, Cukurova University, Adana, Turkey, 275 pp.

[10] Can, F., Mironov, V. (2006). *Perizoma onurcani* sp.n. from Turkey (Geometridae, Larentiinae). *Nota lepid.*, 28 (3/4), 163-166.

[11] Can, F. (2008). The Geometrid Moths (Lepidoptera) from the Middle and Eastern Black Sea regions of Turkey. *Turkish Journal of Zoology*, 32, 351-358.

[12] Can, F. (2010). Evaluation of morphological characters and male genitalia features of emerald moths (Lepidoptera: Geometridae, Geometrinae) from Turkey. *African Journal of Agricultural Research*, 5(9), 867-873.

[13] Okyar, Z., Aktaç, N. (1999). Faunistic and Taxonomic Studies on the Geometridae Species of Turkish Thrace. *Turkish Journal of Zoology*, 23(1), 99-132.

[14] Özdemir, M. (2007). Studies on the Geometridae fauna of the Provinces Bolu and Düzce in North-West Turkey (Lepidoptera). *Priamus Supplement*, 7, 1-154.

[15] Seven, E. (2017). A new record and three little-known Eupithecia Curtis species from Turkey (Lepidoptera: Geometridae). *Turkish Journal of Zoology*, 41, 583-586.

[16] Seven, E. (2019). New data and notes on the *Protorhoe Herbulot*, 1951 (Lepidoptera, Geometridae, Larentiinae) species in Turkey with first report of *Protorhoe centralisata* (Staudinger, 1892). *Acta Biologica Turcica*, 32(3), 123-127.

[17] Romanoff, N.M. (1884-1887). Les Lépidoptères de la Transcaucasie I-III. [in] Romanoff, *Mémoires sur les lépidoptères*, 1, 1-92; 2, 1-118; 3, 1-49.

[18] Romanoff, N.M. (1879). Quelques observations sur les Lépidoptères de la partie du Haut-Plateau Armenien, comprise entre Alexandropol, Kars et Erzeroum. *Horae Societatis Entomologicae Rossicae*, 14, 483-495.

[19] Rebel, H. (1901). Über eine neue von Herrn Max Korb in Westasien gesammelte Lepidopterenformen. *Annalen des Naturhistorischen Museums in Wien*, 16, 165-169.

[20] Korb, M. (1910-1924). Über die von mir beobachteten palaearktischen Lepidopteren (Vorkommen, Lebensweise etc.). *Mitteilungen der Münchner Entomologischen Gesellschaft*, 1 (1910), 2-5; (2), 15-16; (3-4), 17-19; (9-10), 66-70; 2 (1911), 17-22, 55-59, 88-91; 3 (1912), 17-20; 4 (1913), 5-8, 49-54; 6 (1915), 35-42; 7 (1916), 25-30, 91-99; 9 (1919), 57-64; 11

(1921), 4-14; 14 (1924), 18-24.

[21] Koçak, A.Ö., Kemal, M. (2007). Synonymical and distributional List of the species of Iğdır Province (North East Turkey) (Lepidoptera). *Cent. ent. Stud., Misc. Pap*, 129/130, 1-12.

[22] Koçak, A.Ö., Kemal, M. (2012). Iğdır Kelebekleri (Lepidoptera). *Cent. Ent. Stud., Priamus Supplement*, 27, 1-253.

[23] Seven, E., Gözüaçık, C., Aykut, E. (2019). A review of genus *Dysgonia* Hübner (Lepidoptera, Erebidae, Erebiinae) from Turkey with distinctive external and genital morphological characters and a new species for the Turkish fauna. *Transactions American Entomological Society*, 145, 385-393.

[24] Kemal, M., Koçak, A.Ö. (2019b). First attempt on the Heterocera fauna of Doğubeyazıt (Ağrı Province, NE Turkey). *Misc. Pap*, 193, 1-5.

[25] Robinson, G.S. (1976). The Preparation of slides of Lepidoptera genitalia with special reference to the Microlepidoptera. *Entomologist's Gazette*, 27, 127-132.

[26] Amsel, H.G. (1950). Die Microlepidopteren der Brandt'schen Iran Ausbeute II. *Ark. Zool.*, 1(17), 223-257.

[27] Amsel, H.G. (1951). Die Microlepidopteren der Brandt'schen Iran Ausbeute III. *Ark. Zool.*, 1(36), 525-563.

[28] Amsel, H.G. (1954). Die Microlepidopteren der Brandt'schen Iran Ausbeute IV. *Ark. Zool.*, 6(16), 255-326.

[29] Amsel, H.G. (1961). Die Microlepidopteren der Brandt'schen Iran Ausbeute V. *Ark. Zool.*, 13(17), 323-445.

[30] Bleszynski, S. (1965). *Crambinae*. In *Microlepidoptera Palaearctica* 1. (eds: Amsel HG, Reisser H, Gregor F). Verlag Georg Fromme & Co, Wien.

[31] Medvedev, G.S. (1997). Keys to the Insects of the European Part of the USSR.: Lepidoptera. *Science Publishers*, 4(3), 690.

[32] Goater, B., Nuss, M., Speidel, W. (2005). *Pyraloidea I (Crambidae: Acentropinae, Evergestinae, Heliothelinae, Schoenobiinae, Scopariinae)*. In P. Humer & O. Karsholt (eds.): *Microlepidoptera of Europe* 4., 1-304.

[33] Leraut, P. (2014). *Moths of Europe. Volume 4 Pyralids* 2. N.A.P. ed., Verrières-le-Buisson.

[34] Ragonot, E.L. (1893). Monographie des Phycitinae et Galleriinae I. In Romanoff, N.M., *Mém. Lépid.*, 7, 658.

- [35] Ragonot, E.L., Hampson, G.F. (1901). Monographie des Phycitinae et Galleriinae II. [in] Romanoff, N.M., *Mém. Lépid.*, 8, 602.
- [36] Roesler, R-U. (1973). *Trifine Acrobasiina (1. Teilband der Phycitinae)* 752+137. *In: Microlepidoptera Palaearctica 4.* (eds: Amsel HG, Reisser H, Gregor F). Verlag Georg Fromme & Co, Wien.
- [37] Roesler, R-U. (1993). *Quadrifine Acrobasiina Erster Teil (2. Teilband der Phycitinae) pls 1-82+xxii+305. Microlepidoptera Palaearctica vol. 8 (Text & Tafeln)* (eds: Amsel HG, Reisser H, Gregor F). Verlag G. Braun, Karlsruhe.
- [38] Slamka, F. 2006 (2011). *Pyraloidea of Europe (Lepidoptera) Volume 1.* Pyralinae, Galleriinae, Epipaschiinae, Cathariinae & Odontiinae. Identification, Distribution, Habitat, Biologie. Bratislava.
- [39] Slamka, F. (2008). *Pyraloidea of Europe (Lepidoptera) Volume 2.* Crambinae & Schoenobiinae. Identification, Distribution, Habitat, Biologie. Bratislava.
- [40] Slamka, F. (2013). *Pyraloidea of Europe (Lepidoptera) Volume 3.* Pyraustinae & Spilomelinae. Identification, Distribution, Habitat, Biologie. Bratislava.
- [41] Slamka, F. (2019). *Pyraloidea of Europe (Lepidoptera) Volume 4.* Phycitinae- Part 1. Bratislava.
- [42] Hausmann, A. (2001). *The Geometrid Moths of Europe Vol. 1.* Apollo Books. Stenstrup.
- [43] Hausmann, A. (2004). “*The Geometrid Moths of Europe Vol. 2 Sterrhinae.*” Apollo Books. Stenstrup.
- [44] Hausmann, A., Viidalepp, J. (2012). *The Geometrid Moths of Europe. Vol. 3.* Apollo Books, Stenstrup.
- [45] Leraut, P. (2009). *Moths of Europe. Volume 2 Geometrid Moths.* N.A.P. ed., Verrières-le-Buisson.
- [46] Mironov, V.G. (2003). *The Geometrid Moths of Europe Vol. 4 Larentiinae II.* Apollo Books.
- [47] Mironov, V. (2013). New species and checklist of Turkish Eupithecia Curtis (Geometridae, Larentiinae). *Zootaxa*, 3717(1), 39-52.
- [48] Skou, P., Sihvonen, P. (2015). *The geometrid moths of Europe 5. Ennominae I.* Brill & Leiden.
- [49] Kemal, M., Koçak, A.Ö. (2020). On the Phycitinae of Turkey: updated synonymic and distributional list of species (Lepidoptera) with some remarks. *Priamus* 18(3), 130-154.

[50] Öztürk, N., Akbulut, S., Yüksel, B. (2016). Düzce İçin Yeni Bir Zararlı *Cydalima perspectalis* (Walker, 1859) (Lepidoptera: Crambidae). *Ormancılık Dergisi*, 12(1), 112-121.