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STUDIES ON THE FAUNA OF PYRALOIDEA (LEPIDOPTERA) OF KÖPRÜLÜ CANYON NATIONAL PARK (ANTALYA)

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ABSTRACT

Within the order Lepidoptera the superfamily Pyraloidea, is divided into two families that are rich in terms of species diversity: Pyralidae and Crambidae. This study aimed to determine the Pyraloidea fauna of the Köprülü Canyon National Park located in the Manavgat district of Antalya province, Türkiye. Field studies were carried out in the National Park between April and November in 2022-2024. The Pyraloidea species, which are generally active at night, were collected after sunset using light traps. As a result of the identification procedures, 88 species were identified. While all of the identified species are new records for Köprülü Canyon National Park, 72 species are new records for Antalya province.

Keywords: Lepidoptera, Pyraloidea, fauna, Antalya, Köprülü canyon.

1 INTRODUCTION

Butterflies and moths belong to the order Lepidoptera which means “Scaly Wings” [1]. The unique color patterns that distinguish this order from other insects come from their scales. Scales are structures that cover the body and wings like an arrangement of tiles [2]. Approximately 156,100 species of the order Lepidoptera have been identified worldwide and this number is expected to increase (approximately 255,000 species). The majority of these species are represented by moths [1]. The superfamily Pyraloidea is divided into two families

according to the structure of the tympanal organs on the abdomen: Pyralidae and Crambidae. This distinction is also supported by larval characters [3]. The Pyraloidea has about 16,000 species, with approximately as many more waiting to be described. It is a superfamily within the Lepidoptera with a high diversity of life histories. While most species live in different parts of plants, some species are parasites, predators and adapted to live underwater. Because they can live in different conditions, they are a suitable group to study biodiversity [4]. In the last study on the classification of Pyraloidea by Léger et al., [5], the superfamily Pyraloidea was divided into 2 families, Pyralidae and Crambidae. Pyralidae (6,032 species) includes the subfamilies Chrysauginae, Epipaschiinae, Galleriinae, Phycitinae; Crambidae (10,347 species) includes the subfamilies Acentropinae, Crambinae, Erupinae, Heliothelinae, Hoploscopinae, Lathrotelinae, Linostinae, Midilinae, Musotiminae, Odontiinae, Pyraustinae, Schoenobiinae, Scopariinae, Spilomelinae.

Köprülü Canyon National Park is an important natural area with an area of 36,614 hectares, 85 km northeast of Antalya province, and was declared as a national park in 1973. Most of the area of the National Park is located within the Manavgat-Serik districts of Antalya. A small part is within the borders of Sütçüler district of Isparta province. There is an important water source within the National Park, the Köprü River. The river stretches from the Taurus Mountains to Aspendos and flows into the Mediterranean Sea. The National Park has different formations in terms of geology. Some of these structures are Adam Kayalar, Deliklitaş, Krallar Canyon, Honaz Caves, Selge Ancient City, and Oluk Bridge. The livelihoods of the local people living in the canyon include animal husbandry, agriculture, tourism, bee-keeping, thyme-chestnut-carob collection and the harvesting of non-timber forest products. The main tourism activities in the region are trekking, mountaineering, caving and rafting [6].

In Köprülü Canyon National Park, where studies on Lepidoptera fauna are limited, Pyraloidea fauna is tried to be determined. This study will contribute to the emergence of the distribution of species in Türkiye. Additionally, it is thought that this study will be an important source for future studies.

2 MATERIAL AND METHOD

2.1 Collection

The field studies were carried out in the Köprülü Canyon National Park in Manavgat district of the Antalya province. The study was conducted between 2022 and 2024. Samples

were collected between March and November. The aim was to obtain spring, summer and autumn species. As most of the species in the Pyraloidea are nocturnal, the field studies were conducted accordingly. A light trap made of UV LEDs surrounded by a plastic container was used for night field studies. A 7-ampere, 12-volt battery was used as the energy source. After the field studies, the collected specimens were pinned and taken to the Zoology Research Laboratory at Bitlis Eren University for identification.

2.2 Preparation

In laboratory studies, the specimens that had been stretched to make them suitable for identification were identified using morphological and genital evaluations. Genital preparations, generally following the method of Robinson [7], were performed when external morphological characters were insufficient for identification.

2.3 Identification

Samples were identified by comparing them with collection specimens in the Zoology Research Laboratory of Faculty of Science and Literature of Bitlis Eren University. Additionally, various sources were also consulted. The main sources used for identification were Roesler [8-9], Leraut [10-11], Slamka [12-15], Goater et al., [4], Amsel [16-19], and Bleszynski [20]. In addition, websites such as Lepiforum [21], Boldsystem [22] and Mothdissection [23] were also visited.

2.4 Arrangement of taxa and studied localities

For the current use of taxa, the important database Globiz [24] and Koçak & Kemal [25] were used. The distribution of species in Türkiye and worldwide was generally considered in the studies of Koçak & Kemal [25-26] and Kemal & Koçak [27].

Information on the field studies carried out in 24 localities in Köprülü Canyon National Park is given below (Table 1, Figure 1).

Table 1. Localities where field studies are carried out

Location	Coordinate	Altitude
1. Altınkaya	37◦25'60" K 31◦12'00" D	1,143m
2. Ballıbucak Bridge	37◦29'09" K 31◦17'04" D	484m
3. Ballıbucak village	37◦29'09" K 31◦17'03" D	496m
4. Ballıbucak Plateau, Başçukur location	37◦31'39" K 31◦10'06" D	1,459m
5. Bozyaka	37◦11'87" K 31◦20'63" D	225m
6. Delisarnıç	37◦27'77" K 31◦12'87" D	972m
7. Demirciler	37◦22'22" K 31◦06'46" D	987m
8. Gaziler İlbiz	37◦27'15" K 31◦19'58" D	690m
9. Gaziler village, Barak location	37◦31'46" K 31◦21'56" D	480m
10. Gelinkavağı	37◦29'12" K 31◦18'19 "D	607m
11. İlbiz 2 km above	37◦16'27" K 31◦12'19" D	725m
12. Karataş	37◦27'35" K 31.21'46" D	826m
13. Köprülü Canyon, Barak location	37◦30'45" K 31◦22'32" D	489m
14. Köprülü Canyon, Çamurlu location (Figure 2a)	37◦10'63" K 31◦22'48" D	127m
15. Köprülü Canyon, Kövez location	37◦20'65" K 31◦17'79" D	230m
16. Köprülü Canyon, observation deck (Figure 2b)	37◦21'08" K 31◦15'98" D	668m
17. Kövez Eşek Bridge (Figure 2c)	37◦20'08" K 31◦17'88" D	264m
18. Kövez Mercimeklik location	37◦24'63" K 31◦20'84" D	687m
19. National Park, Tazı location	37◦25'82" K 31◦18'22" D	620m
20. National Park, Yeşilvadi location	37◦21'03" K 31◦08'58" D	865m
21. Tazı Canyon, Kapıiçi Gaziler village (Figure 2d)	37◦23'92" K 31◦18'32" D	572m
22. Tazı Canyon	37◦29'09" K 31◦17'03" D	583m
23. Yeşilvadi Karabük road	37◦16'99" K 31◦16'80" D	159m
24. Yeşilvadi village	37◦18'06" K 31◦13'53" D	557m

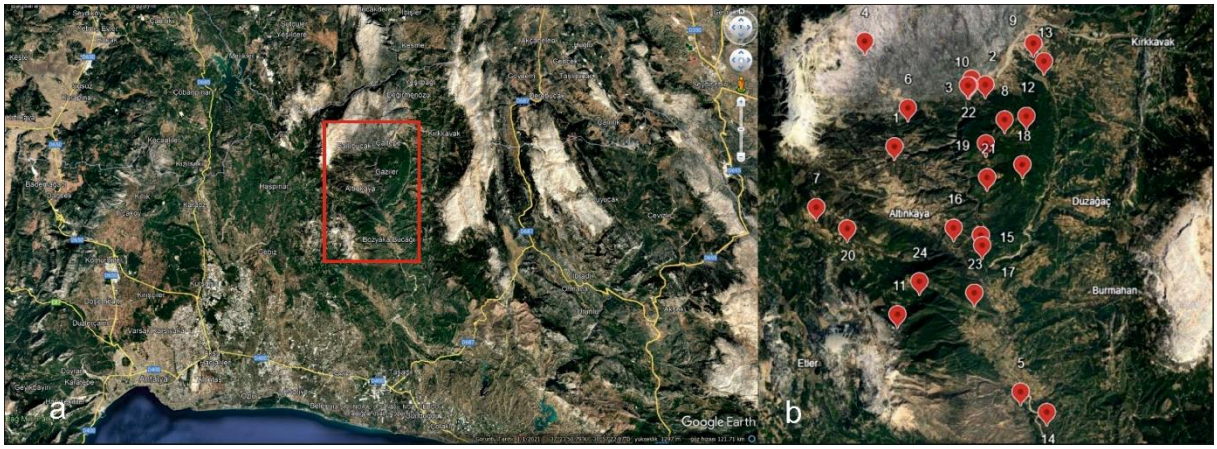


Figure 1. Showing the localities visited in Köprülü Canyon on the map, a. General view of the field; b. Localities visited [28].



Figure 2. Some of the localities studied a. Köprülü Canyon Çamurlu Location; b. Köprülü Canyon observation deck; c. Kövez Eşek Bridge; d. Tazı Canyon, Kapıiçi Gaziler Village.

3 RESULTS AND DISCUSSION

The study examined 1,018 samples and identified 88 species belonging to 10 subfamilies within the Crambidae and Pyralidae families of the Pyraloidea superfamily (Figure 3). While 72 of these species are new records for Antalya province, all of them are new records for Köprülü Canyon National Park, where the study was conducted. The species are listed alphabetically below, with new records for Antalya province are marked with an asterisk (*). Important additional information regarding some species is also provided.

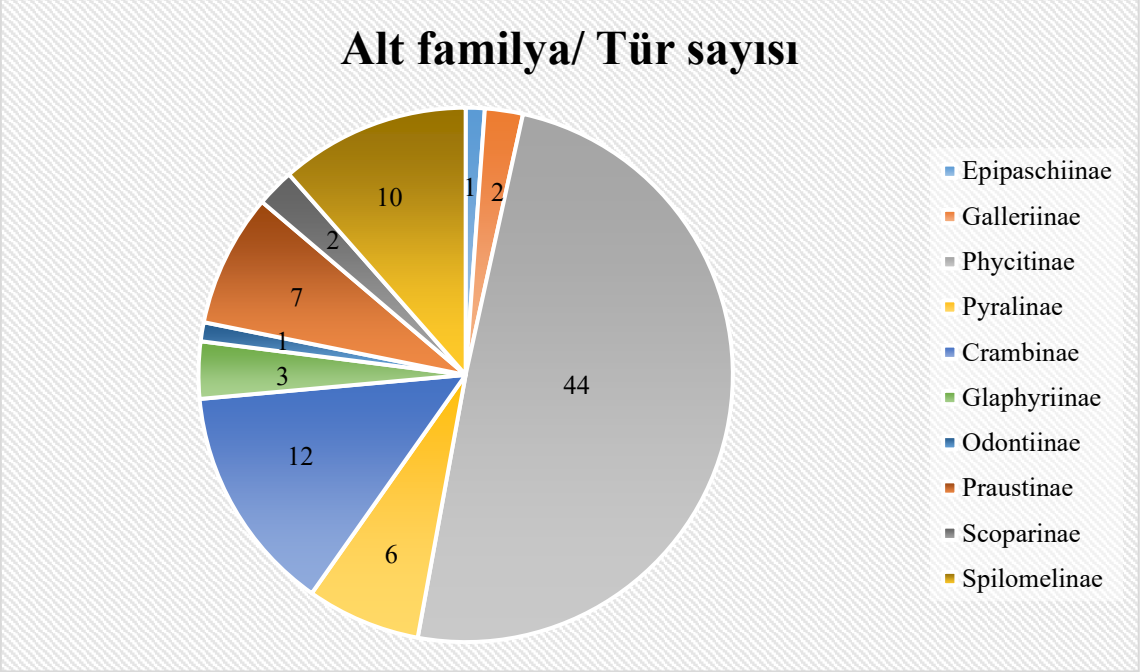


Figure 3. Distribution of species according to subfamilies.

Familya Crambidae Latreille, 1810

Subfamily Crambinae Latreille, 1810

Agriphila paleatellus (Zeller, 1847)*

Ancylolomia palpella (Denis ve Schiffermüller, 1775)*

Catoptria dimorphellus (Staudinger, 1881)*

Catoptria pinella (Linnaeus, 1758)*

Euchromius bella (Hübner, 1796)*

Euchromius rayatella (Amsel, 1949)*

Euchromius vinculellus (Zeller, 1847)

Glaucocharis euchromiella (Ragonot, 1895)*

Metacrambus carectellus (Zeller, 1847)*

Metaeuchromius latoides (Schouten, 1997)*

Taxonomic remarks: Schouten [29] described *Metaeuchromius latoides* stating that it is distinguished from *M. latus* (Staudinger, 1870) by eight black spots on the terminal area. However, he stated that this character could change with further examination of samples. This

study determined that the number of terminal spots on the forewing varied between 6-8 in the evaluated samples.

Pediasia contaminella (Hübner, 1796)*

Pediasia desertellus (Lederer, 1855)*

Subfamily Glaphyriinae W. T. M. Forbes, 1923

Cybalomia pentadalis (Lederer, 1855) (Figure 5b)

Evergestis boursini (Amsel, 1939)*

Evergestis infirmalis (Staudinger, 1870)* (Figure 4c)

Subfamily Odontiinae Guenée, 1854

Phlyctaenomorpha sinuosalis (Le Cerf, 1909)

Subfamily Pyraustinae Meyrick, 1890

Achyra nudalis (Hübner, 1796)*

Loxostege sticticalis (Linnaeus, 1761)

Pyrausta despicata (Scopoli, 1763)*

Pyrausta pauperalis (Staudinger, 1879)*

Pyrausta purpuralis (Linnaeus, 1758)

Pyrausta virginalis (Duponchel, 1832)*

Sitochroa straminealis (Hampson, 1900)* (Figure 4d)

Uresiphita gilvata (Fabricius, 1794)*

Subfamily Scopariinae Guenée, 1854

Eudonia mercurella (Linnaeus, 1758)*

Anarpia incertalis (Duponchel, 1832)*

Subfamily Spilomelinae Guenée, 1854

Antigastra catalaunalis (Duponchel, 1833)

Dolicharthria bruguieralis (Duponchel, 1833)

Mecyna subsequalis (Herrich-Schäffer, 1855)*

Metasia rosealis (Ragonot, 1895)*

Metasia suppandalis (Hübner, 1823)* (Figure 5a)

Nomophila noctuella (Denis & Schiffermüller, 1775)* (Figure 5h)

Palpita vitrealis (Rossi, 1794)

Patania balteata (Fabricius, 1798)* (Figure 5f)

Udea ferrugalis (Hübner, 1796)

Udea languidalis (Eversmann, 1842)*

Taxonomic remarks: In the study of Slamka [14], dorsal spines were mostly observed at the distal end of the aedeagus in specimens of the species *Udea languidalis*. However, in the study of Mally & Nuss [30], no dorsal spines were observed in the aedeagus. Similarly, there were no dorsal spines in the aedeagus of the specimen evaluated in this study. Consequently, the specimen was diagnosed as *Udea languidalis* based on morphological characteristics and male genitalia.

Familya Pyralidae, Latreille, 1809

Subfamily Epipaschiinae Meyrick, 1884

Salma lophotalis (Hampson, 1900)

Subfamily Galleriinae Zeller, 1848

Aphomia sociella (Linnaeus, 1758)*

Lamoria anella (Denis ve Schiffermüller, 1775)*

Subfamily Phycitinae Zeller, 1839

Acrobasis fallouella (Ragonot, 1871)*

Acrobasis legatea (Haworth, 1811)*

Acrobasis obliqua (Zeller, 1847)*

Acrobasis tumidana (Denis ve Schiffermüller, 1775)*

Ancylosis cinnamomella (Duponchel, 1836)*

Bradyrrhoa gilveolella (Treitschke, 1833)*

Taxonomic remarks: Some morphological differences have been observed among the specimens belonging to *Bradyrrhoa gilveolella*. Samples were mostly identified through genital

structures. Future molecular studies may be able to determine whether these morphological differences observed in adult individuals are variations or a new taxon.

Cadra calidella (Guenée, 1845)*

Cadra figulilella (Gregson, 1871)*

Cadra furcatella (Herrich-Schäffer, 1849)*

Coenochroa ablutella (Zeller, 1839)*

Denticera divisella (Duponchel, 1842)* (Figure 5c)

Dioryctria mendacella (Staudinger, 1859)

Dioryctria peltieri (Joannis, 1908) (Figure 5e)

Ematheudes punctellus (Treitschke, 1833)*

Ephestia cypriusella (Roesler, 1965)*

Ephestia disparella (Ragonot & Hampson, 1901)*

Ephestia unicolorella (Staudinger, 1879)*

Ephestia welseriella (Zeller, 1848)*

Epischnia illotella (Roesler, 1969)* (Figure 5g)

Epischnia prodromella (Hübner, 1799)*

Etiella zinckenella (Treitschke, 1832)*

Euzophera bigella (Zeller, 1848)

Euzopherodes charlottae (Rothschild, 1914)

Euzopherodes lutisignella (Mann, 1869)

Euzophera umbrosella (Staudinger, 1879)*

Taxonomic remarks: The male of the species *Euzophera umbrosella*, as identified in this study, is morphologically different from the depicted male in the study of Roesler [8], but morphologically similar to the adult male specimen in Lepiforum [21]. As they are also genitally compatible, these samples were identified as *E. umbrosella*.

Homoeosoma inustella (Ragonot, 1884)*

Homoeosoma sinuella (Fabricius, 1794)

Hypsotropa limbella (Zeller, 1848)*

Hypsotropa syriacella (Ragonot, 1888)*

Laodamia combustella (Herrich-Schäffer, 1855)*

Myelois ossicolor (Ragonot,1893)*

Taxonomic remarks: Roesler [31] listed the species *Myelois ossicolor* as a synonym of *Myelois umbratella* (Treitschke, 1833). This is also the case in Globiz [24]. However, P. Leraut [11] examined the female genitalia of both species in his study and concluded that they differed from each other. Similarly, G. Leraut [32] noted in his study, in which he listed the Phycitinae species, including *M. ossicolor* as a distinct species. This study also presented it as a separate species.

Myelois circumvoluta (Geoffroy, 1785)*

Pempelia argillaceella (Osthelder, 1935)*

Pempelia palumbella (Denis & Schiffermüller, 1775)*

Peoria semirosella (Ragonot, 1887)* (Figure 4a)

Phycita diaphana (Staudinger, 1870)*

Phycita roborella (Denis ve Schiffermüller, 1775)*

Phycitodes binaevella (Hübner, 1813)* (Figure 4b)

Phycitodes lacteella (Rothschild, 1915)*

Phycitodes saxicola (Vaughan, 1870)

Plodia interpunctella (Hübner, [1813])*

Polyocha venosa (Zeller, 1847)*

Pterothrixidia rufella (Duponchel, 1836)*

Uncinus nobilella (Ragonot, 1887)*

Subfamily Pyralinae Latreille, 1809

Aglossa asiatica (Erschoff, 1872)*

Aglossa caprealis (Hübner, 1809)*

Endotricha flammealis (Denis & Schiffermüller, 1775)*

Stemmatophora syriacalis (Ragonot, 1895)*

Synaphe berytalis (Ragonot, 1889)* (Figure 5d)

Zitha subustalis (Lederer, 1855)*

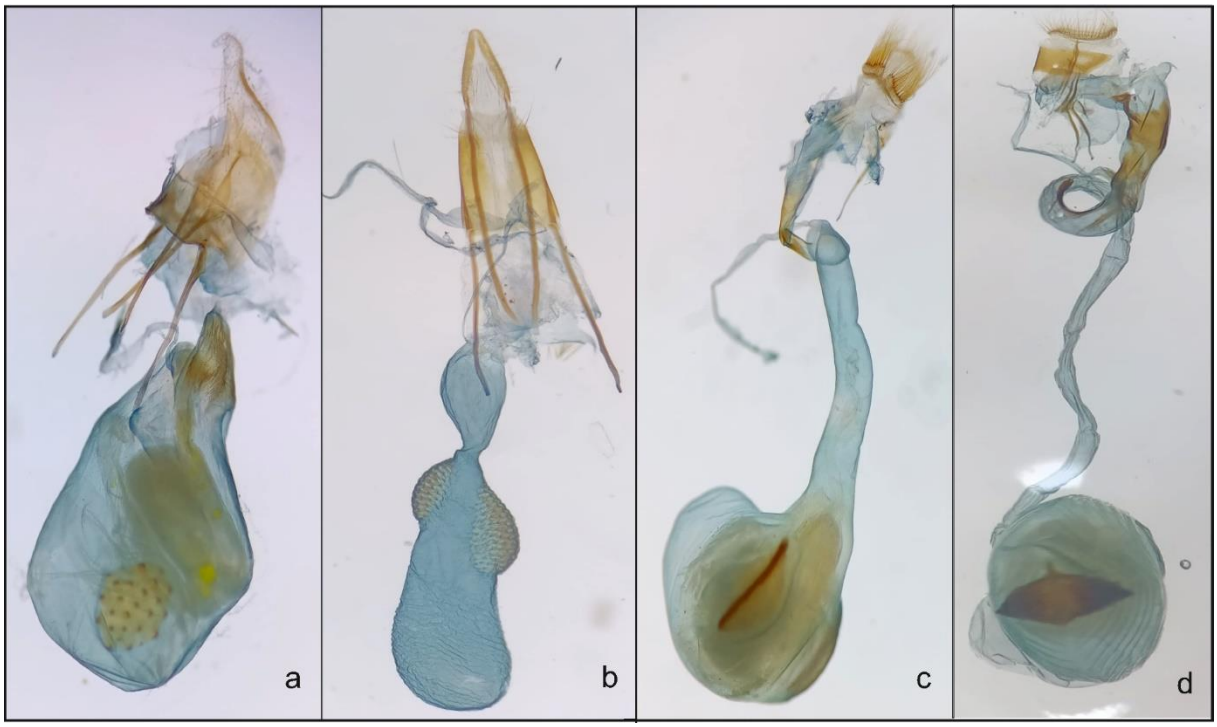


Figure 4. The female genitalia of some species identified in the study. a. Peoria semirosella; b. Phycitodes binaevella; c. Evergestis infirmalis; d. Sitochroa stremineali.

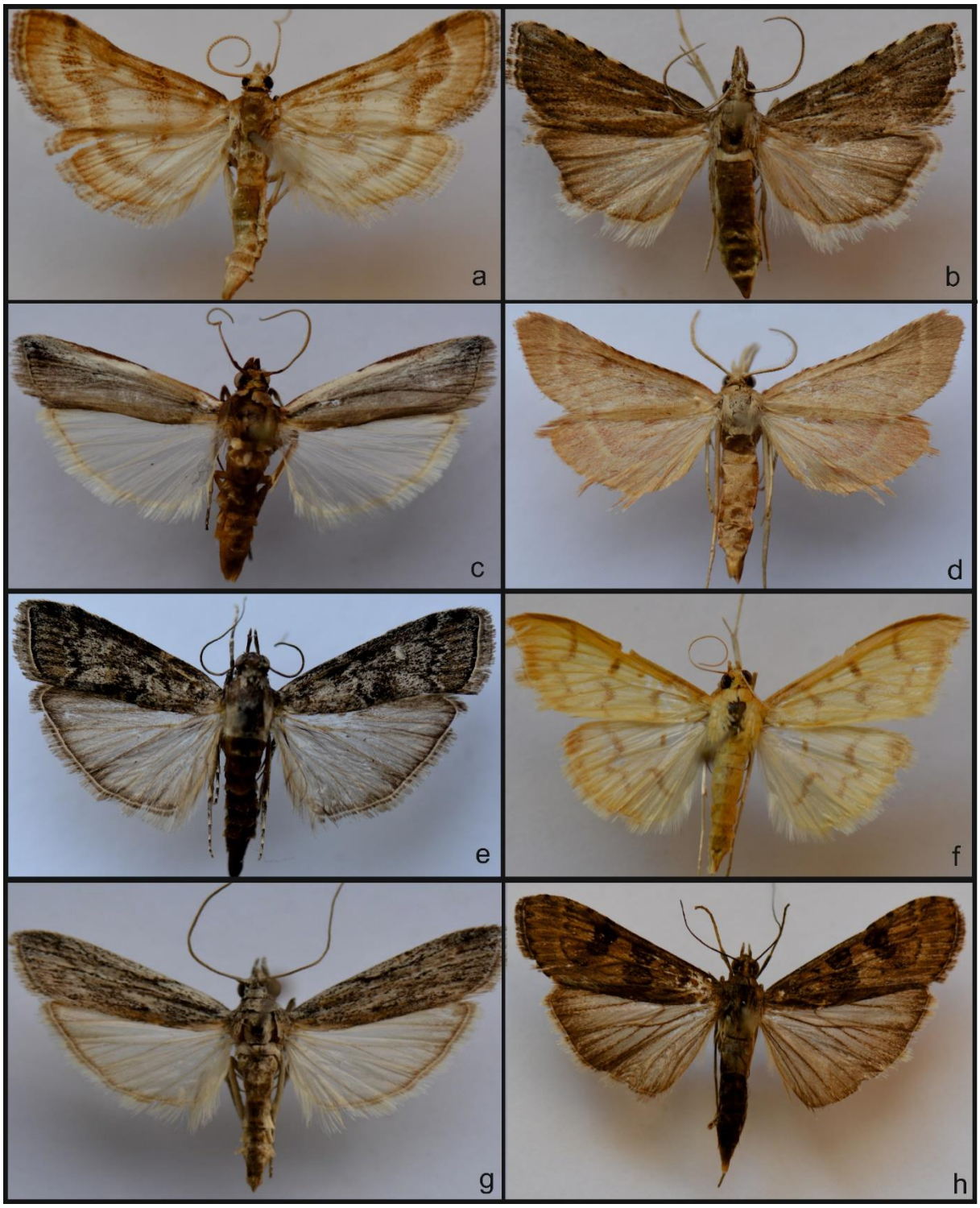


Figure 5. Adult specimens of some species identified in the study a. Metasia suppandalis; b. Cybalomia pentadalis; c. Denticera divisella; d. Synaphe berytalis; e. Dioryctria peltieri; f. Patania balteata; g. Epischnia illotella; h. Nomophila noctuella.

The study was carried out in 24 different localities within the Köprülü Canyon, and the number of species detected in each locality was also determined (Table 2).

Table 2. Number of species according to the localities visited

Localities	Number of Species Detected
1. Altınkaya	10
2. Ballıbucak Bridge	7
3. Ballıbucak village	12
4. Ballıbucak Plateau, Başçukur location	25
5. Bozyaka	10
6. Delisarnıç	5
7. Demirciler	6
8. Gaziler İlbiz	8
9. Gaziler Village, Barak location	3
10. Gelinkavağı	9
11. İlbiz 2 km above	2
12. Karataş	3
13. Köprülü Canyon, Barak location	6
14. Köprülü Canyon, Çamurlu location	15
15. Köprülü Canyon, Kövez location	3
16. Köprülü Canyon, Observation deck	17
17. Kövez Eşek Bridge	21
18. Kövez Mercimeklik location	9
19. National Park, Tazı location	23
20. National Park, Yeşilvadi location	29
21. Tazı Canyon, Kapıiçi Gaziler village	10
22. Tazı Canyon	4
23. Yeşilvadi, Karabük road	14
24. Yeşilvadi village	4

4 CONCLUSION AND SUGGESTION

A study conducted in Köprülü Canyon National Park located in the Manavgat district of Antalya province, identified 88 species belonging to the Pyralidae and Crambidae families within the Pyraloidea superfamily. 72 of these species are new records for Antalya province, and all of them are new records for Köprülü Canyon where the study was conducted. Prior to

this study, 30 species were known to occur from Antalya province [25], [27], [33-35]. 16 of these species were identified again in this study. As a result of the study, the number of pyraloid species in Antalya province increased to 102. Identifying species such as *Hypsotropa syriacella, Pempelia argillaceella, Peoria semirosella, Phycita diaphana, Uncinus nobilella* and *Evergestis boursini*, which are lesser-known to have a distribution in Türkiye [25], [27], is important in terms of their distribution.

The majority of species identified in the study belong to the Phycitinae subfamily (44 species). This is followed by the subfamilies Crambinae (12 species) and Spilomelinae (10 species). The Pyraustinae subfamily is represented by 7 species, the Pyralinae subfamily by 6 species, the Glaphyriinae subfamily by 3 species, the Scopariinae subfamily by 2 species, the Gallerinae subfamily by 2 species, the Epipaschiinae subfamily by 1 species and the Odontiinae subfamily by 1 species.

Considering the studies of Koçak & Kemal [25-26] and Kemal & Koçak [27] on the distribution of species, it can be seen that the species detected in the study area are mostly distributed in Asia, followed by Europe and then the African continent (Table 3).

Table 3. Distribution of species in subfamilies according to continents

Continents / Subfamilies	Africa	Asia	Europe
Crambinae	4	12	2
Glaphyriinae	-	3	2
Pyraustinae	5	7	5
Spilomelinae	8	10	10
Phycitinae	24	42	36
Odontinae	-	1	-
Epipaschiinae	-	1	-
Pyralinae	3	6	3
Gallerinae	2	2	2
Scopariinae	1	2	1
	47	86	61

As can be seen in Table 2, the locality with the highest number of species is the National Park, Yeşilvadi location, with 29 species. This is followed by the Ballıbucak Plateau, Başçukur location with 25 species, and the National Park, Tazı Location with 23 species. The localities with the fewest species are the İlbiz 2 km above, and the Karataş locality. It is thought that factors such as the season of the visit, the state of the month, altitude, plant diversity, proximity to wetlands, wind intensity, and the amount of landworks carried out in the area effect the species diversity that occurs in the fields.

With this study, species belonging to the Pyraloidea superfamily in the National Park were identified and the pyraloid fauna of the region was tried to be revealed. As mentioned above, the main activities carried out in the National Park are tourism, agriculture and animal husbandry. It is crucial that further research is conducted to understand these groups before the existing biodiversity in the area is destroyed.

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Conflict of Interest Statement

There is no conflict of interest between the authors.

Statement of Research and Publication Ethics

The study is complied with research and publication ethics.

Artificial Intelligence (AI) Contribution Statement

This manuscript was entirely written, edited, analyzed, and prepared without the assistance of any artificial intelligence (AI) tools. All content, including text, data analysis, and figures, was solely generated by the authors.

Contributions of the Authors

The collection of samples, stretching, preparation of genital preparations, diagnosis, and writing of the article were done by the first author. The diagnosis of samples, writing and editing of the article were done by the second author.

REFERENCES

[1] J. B. Hepner, "Butterflies and Moths (Lepidoptera)". J.L. Capinera (Ed.), *Encyclopedia of Entomology*, (pp. 626-672). Springer, 2008.

[2] V. H. Resh, "Lepidoptera (Moths, Butterflies)". Vincent HR (Ed.), *Encyclopedia of Insects*, (pp. 559-561), 2009.

[3] M. A. Solis, "Phylogenetic studies and modern classification of the Pyraloidea (Lepidoptera)," *Revista Colombiana de Entomologia*, vol. 33(1), pp. 1-9, 2007.

[4] B. Goater, M. Nuss, W. Speidel, "Pyraloidea I (Crambidae: Acentropinae, Evergestinae, Heliothelinae, Schoenobiinae, Scopariinae).," P. Huemer, O. Karsholt (Eds.), *Microlepidoptera of Europe 4*, (pp.1-304), Apollo Books, Stenstrup, 2005.

[5] T. Léger, R. Mally, C. Neinhuis, M. Nuss, "Refining the phylogeny of Crambidae with complete sampling of subfamilies (Lepidoptera, Pyraloidea)". *Zoologica Scripta*, vol. 50 (1), pp. 84-99, 2020.

[6] M. Kırmacı, H. Özçelik, "Köprülü Kanyon Milli Parkı (Antalya) Karayosunu Florasına Katkılar". *Süleyman Demirel Üniversitesi Orman Fakültesi Dergisi*, vol. 2, pp. 59-73, 2010.

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

[8] R-U. Roesler, "Trifine Acrobasiina (1. Teilband der Phycitinae)". H. G. Amsel, H. Reisser, F. Gregor (Eds.), *Microlepidoptera Palaearctica 4*, (pp. 752+137), Verlag Georg Fromme & Co, Wien, 1973.

[9] R-U. Roesler, "Quadrifine Acrobasiina Erster Teil (2. Teilband der Phycitinae)". H. G. Amsel, H. Reisser, F. Gregor (Eds.), *Microlepidoptera Palaearctica vol. 8* (Text & Tafeln) (pls 1-82+xxii+305), Verlag G.Braun, Karlsruhe, 1993.

[10] P. Leraut, *Moths of Europe. Volume 3: Zygaenids, Pyralids 1*. N.A.P. ed., Verrières-le-Buisson, 2012.

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

[12] F. Slamka, *Pyraloidea of Europe (Lepidoptera) Volume 2. Crambinae & Schoenobiinae. Identification, Distribution, Habitat, Biologie*. Bratislava, 2008.

[13] F. Slamka, *Pyraloidea of Europe (Lepidoptera) Volume 1. Pyralinae, Galleriinae, Epipaschiinae, Cathariinae & Odontiinae. Identification, Distribution, Habitat, Biologie*. Bratislava, 2011.

[14] F. Slamka, *Pyraloidea of Europe (Lepidoptera) Volume 3. Pyraustinae & Spilomelinae. Identification, Distribution, Habitat, Biologie*. Bratislava, 2013.

[15] F. Slamka, *Pyraloidea of Europe (Lepidoptera) Volume 4. Phycitinae. Identification, Distribution, Habitat, Biologie*. Bratislava, 2019.

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

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

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

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

[20] S. Bleszynski, "Crambinae". H. G. Amsel, H. Reisser, F. Gregor (Eds.), *Microlepidoptera Palaearctica 1*, (pp. 1-553), Verlag Georg Fromme & Co, Wien, 1965.

[21] Lepiforum e. V., "Bestimmung von Schmetterlingen und ihren Präimaginalstadien". [Online]. Available: https://lepiforum.org/. [Accessed: Nov. 28, 2004].

[22] S. Ratnasingham, P. D. N. Hebert, "BOLD: The Barcode of Life Data System. Molecular Ecology Notes". [Online]. Available: http://www.barcodinglife.org/ (Bold Systems). [Accessed: Nov. 28, 2004].

[23] J. Wheeler, "Moth Dissection UK". [Online]. Available: https://mothdissection.co.uk/index.php. [Accessed: Nov. 28, 2004].

[24] M. Nuss, B. Landry, R. Mally, F. Vegliante, A. Tränkner, F. Bauer, J. Hayden, A. Segerer, R. Schouten, H. Li, T. Trofimova, M. A. Solis, J. De Prins, W. Speidel, 2003–2024, "Global information system on pyraloidea". [Online]. Available: -www.pyraloidea.org. [Accessed: Dec. 19, 2004].

[25] A. Ö. Koçak, M. Kemal, "A synonymous and distributional list of the species of the Lepidoptera of Turkey". *Centre for Entomological Studies*, *Memoirs*, vol. 8, pp. 1-487, 2018.

[26] A. Ö. Koçak, M. Kemal, "First updated geographical codes used in the publications of the Cesa". *Centre for Entomological Studies*, *Priamus*, vol. 17(4), pp. 319-361, 2019.

[27] M. Kemal, A. Ö. Koçak, "On the Phycitinae of Turkey: updated synonymic and distributional list of species (Lepidoptera) with some remarks". *Centre for Entomological Studies*, *Priamus*, vol. 18(3), pp. 130-154, 2020.

[28] Google Earth, "Google Earth Pro". [Online]. Available: https://www.google.com/intl/tr/earth/versions/. [Accessed: Jan. 16, 2005].

[29] R. T. A. Schouten, "Revision of the genus *Metaeuchromius* Bleszynski (Lepidoptera: Pyralidae: Crambinae)". *Tijdschrift voor Entomologie*, vol. 140, pp. 111-127, 1997.

[30] R. Mally, M. Nuss, "Molecular and morphological phylogeny of European *Udea* moths (Insecta: Lepidoptera: Pyraloidea)". *Arthropod Systematics & Phylogeny*, vol. 69(1), pp. 55-71, 2011.

[31] R.-U. Roesler, "Die Gattung *Myelois* Hübner, [1825] 1816 (Lepidoptera, Pyraloidea, Phycitinae) in der Palaearktis – Taxonomische neuorientierung und Beschreibung neuer taxa". *Ent. Z., Frank. a. M.*, vol. 98(13), pp. 177-192, 1988.

[32] G. H. C. Leraut, "Spécies général des Phycitinae (Lep. : Pyraloidea, Pyralidae) / A global comprehensive check-list of the Phycitinae (Lep.: Pyraloidea, Pyralidae)". *Revue Française d'Entomologie Générale, Autun*, vol. 2 (5–6, Supplement), pp. 1–371, 2021.

[33] H. Part, "Antalya Susam Alanlarında Susam Güvesi *Antigastra catalaunalis* Dup. (Lepidoptera: Pyralidae) Ve Tütün Beyaz Sinek *Bemisia tabaci* (Hemiptera: Aleyrodidae) Üzerinde Biyolojik Mücadele Olanakları". [Yüksek lisans tezi]. Isparta Uygulamalı Bilimler Üniversitesi, 2023.

[34] M. Keçeci, "The population dynamic of honeydew moth [*Cryptoblabes gnidiella* Mill. (Lepidoptera: Pyralidae)] in vineyard in Antalya". *Mediterranean Agricultural Sciences*, vol. 34(2), pp. 169-173, 2021.

[35] M. Koçak, "Antalya İli Kaş İlçesi Zeytin Bahçelerinde Zeytin Fidantırtılı, *Palpita unionalis* (Hübner) (Lepidoptera, Pyralidae)'in Popülasyon Gelişimi Üzerine Araştırmalar". [Yüksek lisans tezi]. Mustafa Kemal Üniversitesi, 2016.