UDC: 595.78(575.2)

Faunistic Analysis of Erebid Moths (Lepidoptera: Erebidae) of the Fergana Valley, Uzbekistan

Masodikova M.A., researcher of Fergana state universitety
Zokirova G.M., PhD, associate professor of Fergana state universitety
Yoqubov A.U., PhD, senior teacher of Fergana state universitety
Zokirov I.I., DSc, professor of Fergana state universitety

Abstract

This article presents the faunistic composition, quantitative structure, and applied significance of moths (Lepidoptera: Erebidae) under Fergana Valley conditions. During 2021–2025, specimens were collected in Fergana, Andijan, and Namangan provinces using light attraction at night (DRL 200/150) and daytime hand-netting; morphological identification, trophic observations, and calculations based on Simpson indices were performed. In total, 21 species representing 17 genera were recorded. Of these, Erebinae accounted for 67%, Arctiinae for 20%, Lymantriinae for 10.4%, and Boletobiinae for 2%; superdominant species were *Dysgonia algira* (20.4%), *Tyta luctuosa* (13.6%), and *Grammodes stolida* (10.1%). Simpson indices were C ≈ 0.093 and D ≈ 0.907, indicating high population diversity and low dominance. The samples are consistent with the Fergana Valley's isolated landscape with a sharply continental climate.

Keywords: Fergana Valley; Erebidae; Erebinae; faunistic analysis; *Dysgonia algira*; *Tyta luctuosa*; *Grammodes stolida*; Simpson index.

Introduction

Erebidae is one of the largest families of noctuoid moths (Noctuoidea), comprising approximately 24,000 species. Its composition includes the subfamilies Arctiinae (tiger moths), Lymantriinae (tussock moths), Herminiinae, Calpinae, and others. Erebidae are distributed on all continents except Antarctica, and some species are known as defoliator pests in agriculture and forestry. Over the past two decades, the system has been revised based on molecular phylogeny, whereby the former families Arctiidae and Lymantriidae have been incorporated into Erebidae with subfamily rank. The modern classification recognizes 18 subfamilies. These updates were reported by Zahiri et al. (2012), Ghanavi et al. (2022), Lafontaine & Schmidt (2010, 2013), as well as historical reviews for Erebinae (Homziak et al., 2016; Salem et al., 2021).

The Fergana Valley is an "isolate" surrounded by mountains on three sides and characterized by a sharply continental climate; owing to its microclimates and landscape mosaic it harbors high endemism and species richness. In recent years, the scope of studies interpreting the valley's biodiversity as a distinct "island" has expanded (Nazarov et al., 2023).

In Uzbekistan, information on noctuoid moths has been accumulated since the first descriptions of the 19th century. In the 20th century, many works documented

Erebidae across desert and oasis ecosystems. In the Fergana Valley, data exist on Lepidoptera composition and agroecosystems in the studies of I. Zokirov and M. Shermatov (e.g., Shermatov, 2024; Zokirov, 2019). However, a comprehensive inventory of the family Erebidae, its seasonal-faunistic dynamics, and the structure by taxonomic units remain insufficiently elucidated (Zokirova et al., 2023).

Accordingly, based on Erebidae samples collected in the Fergana Valley, we analyzed species and genus composition, subfamily-level quantitative shares, and the dominant–subdominant structure, and evaluated the region's erebid fauna.

Materials and Methods

During 2021–2025, fieldwork was conducted across urban parks and boulevards, natural landscapes, and agroecosystems of the Fergana, Andijan, and Namangan provinces. Samples were collected from March–December, primarily by light attraction at night (DRL-200/150 lamps) and by daytime hand-netting. The collected material comprised 1200+ Noctuoidea in total, of which nearly 500 individuals belonged to Erebidae. Specimens and collections were identified based on morphological characters, following Golub et al. (2012), Shapovalov (2021), and Zokirov & Zokirova (2024), and using identification keys, atlases, and GBIF/iNaturalist data. Where necessary, larvae, eggs, and pupae were maintained in the laboratory; trophic specialization was assessed using monophagous–oligophagous–polyphagous criteria, and Levins' B and Hurlbert's PIE indices were calculated. Phenological data were obtained from field observations and climate sources. Altitudinal distribution was analyzed using GIS, and diversity was assessed using Simpson (C, D), Zhivotovsky ($\mu \pm S\mu$), and the share of low-abundance species (h); statistical analyses were performed using standard methods (Gmurman, 2003; Lakin, 1990; Simpson, 1949).

Results and Discussion

Approximately 500 specimens of erebid moths (Lepidoptera: Erebidae) recorded in the Fergana Valley were analyzed for quantitative abundance at the levels of subfamily and genus using mathematical–statistical methods. Accordingly, the quantitative distribution of the noctuoid moth fauna across subfamilies was determined as follows.

As a result of the empirical surveys, 102 individuals belonging to 5 species of the subfamily Arctiinae were identified. According to the analysis, within this subfamily *Phragmatobia fuliginosa* was the most frequently recorded species, with a share of 43.1%. The remaining species (*Arctia caja*, *Eucharia festiva*, *Utetheisa pulchella*, and *Spilosoma urticae*) each had subfamily shares above 10%, while Arctiinae as a whole accounted for more than 20% of the overall fauna (by individuals).

The subfamily Boletobiinae is species-poor compared with the other subfamilies. Two species were recorded—*Eublemma ostrina* and *Eublemma purpurina*. Although their relative shares within the subfamily were 90% and 10%, respectively, Boletobiinae contributed only a very small fraction (2%) to the overall fauna.

Like Boletobiinae, the subfamily Lymantriinae is also species-poor. Three

species were identified in the region: *Euproctis chrysorrhoea* (40.4%), *Euproctis kargalika* (21.2%), and *Lymantria dispar* (38.4%). Although the number of species in Lymantriinae is low, its overall share in the fauna is higher than that of Boletobiinae, reaching 10.4%.

Among erebid moths, the richest subfamily in terms of species diversity and number of individuals is Erebinae. This subfamily encompasses 334 individuals representing 11 species, corresponding to 67% of the overall fauna. Within Erebinae, *Dysgonia algira* was the most frequently recorded species (102 individuals), accounting for 30.5% of the subfamily fauna. *Tyta luctuosa* (20.4%) and *Grammodes stolida* (15%) ranked next by quantitative share. The remaining species each accounted for approximately 2–10% within the subfamily (Figure 1).

The 21 erebid species recorded in the fauna were allocated among 17 genera: one genus is tritypic (three species), two are bitypic (two species), and the remaining 14 genera are monotypic. Below, we examine the genus-level structure of the noctuoid moth fauna of the valley (Figure 2).

Of the 17 genera, one—*Dysgonia*—is tritypic; three species were recorded in the study area: *D. algira*, *D. rogenhoferi*, and *D. torrida*. Species of this genus occur in warm and arid habitats, and their leaf-feeding larvae damage certain fruit and ornamental trees. Although *Dysgonia* has relatively high species diversity (three species), species of this genus do not constitute a large share of the fauna (25.6%).

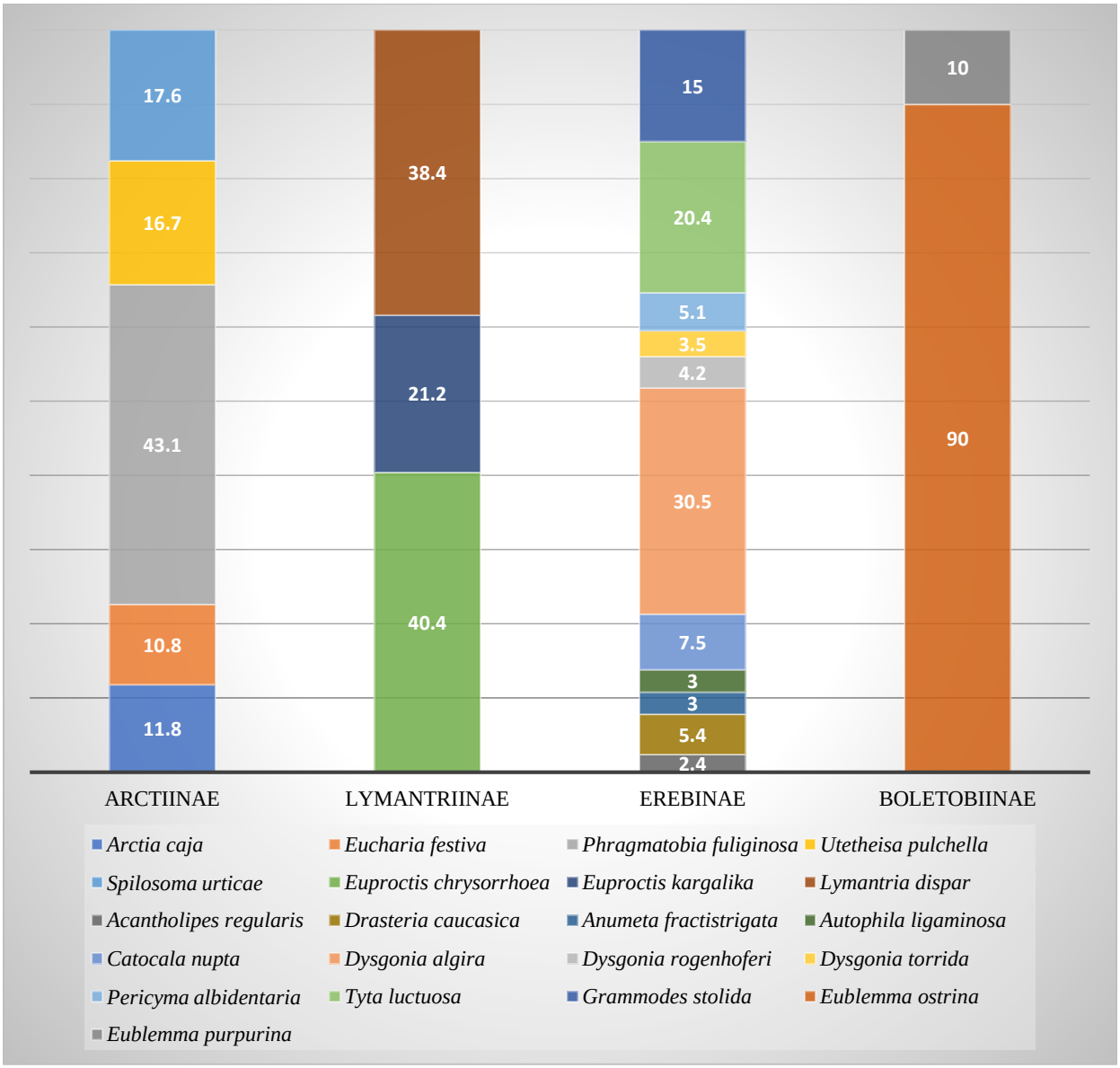

Figure 1. Frequency of occurrence by subfamily in the erebid moth fauna.

Euproctis and *Eublemma* are **bitypic** genera, i.e., each includes two species. The genus *Euproctis* comprises *E. chrysorrhoea* and *E. kargalika*; in the valley, more than 30 individuals of these species were recorded. The overall share of *Euproctis* in the fauna equals 6.4%, and its representatives are controlled by natural enemies in orchards and forests. However, the eggs and larvae of this genus bear urticating hairs, which reduces mortality at the larval and egg stages.

The genus *Eublemma* includes the small moths *E. ostrina* and *E. purpurina*, whose share in the fauna is very low—only 2%.

The genus *Arctia*, like all remaining genera, is monotypic. Species of this genus are usually aposematically colored, and their larvae are polyphagous. The only species of the genus recorded in the valley, *Arctia caja*, has a 2.4% share in the fauna and is important as a bioindicator.

Distributed in semi-desert and forest-steppe habitats, the genera *Eucharia*, *Anumeta*, and *Autophila* each have a share exceeding 2% in the fauna, with more than 10 individuals recorded in the surveys. Some representatives of these genera

hide by sand-colored crypsis.

The genera *Spilosoma*, *Drasteria*, *Pericyma*, and *Utetheisa* each have a share greater than 3% (3.4–3.6%); 17–18 individuals each were recorded in the surveys.

Representatives of the genus *Spilosoma* are a group of whitish moths; the polyphagous larvae of *Spilosoma urticae* defoliate various grasses and ornamental plants. *Drasteria* is a regularly active group occurring in desert regions; the larvae of *Drasteria caucasica* feed on plants in the Chenopodiaceae and Fabaceae. Members of the genus *Pericyma* are primarily subtropical–tropical elements; their larvae mainly consume acacia (Fabaceae) leaves and are recorded as defoliators. The genus *Utetheisa* represents a migratory element in Central Asia, and *Utetheisa pulchella* sequesters alkaloids in its body, providing protection against predators.

The shares of the genera *Lymantria* and *Catocala* in the fauna are around 4–5%; the surveys recorded 20 individuals of L. dispar and 25 individuals of *Catocala nupta*. *L. dispar* is a regulated quarantine pest that causes large-scale defoliation; however, under valley conditions, due to its low abundance, it was listed as a facultative quarantine species. Catocala nupta is mainly nocturnal and is distinguished by the dark patterns on its hindwings.

The genera *Phragmatobia*, *Grammodes*, and *Tyta* have relatively high shares in the fauna, around 8–14%. *Phragmatobia fuliginosa* is widespread in moist-meadow ecotopes, and its larvae feed on numerous medicinal herbs.

According to the study, the least widespread genus is *Acantholipes*, with a faunistic share of 1.6%. *A. regularis* is an erebid adapted to desert–steppe floristic conditions; its larvae feed on cotton and ephemeral herbs.

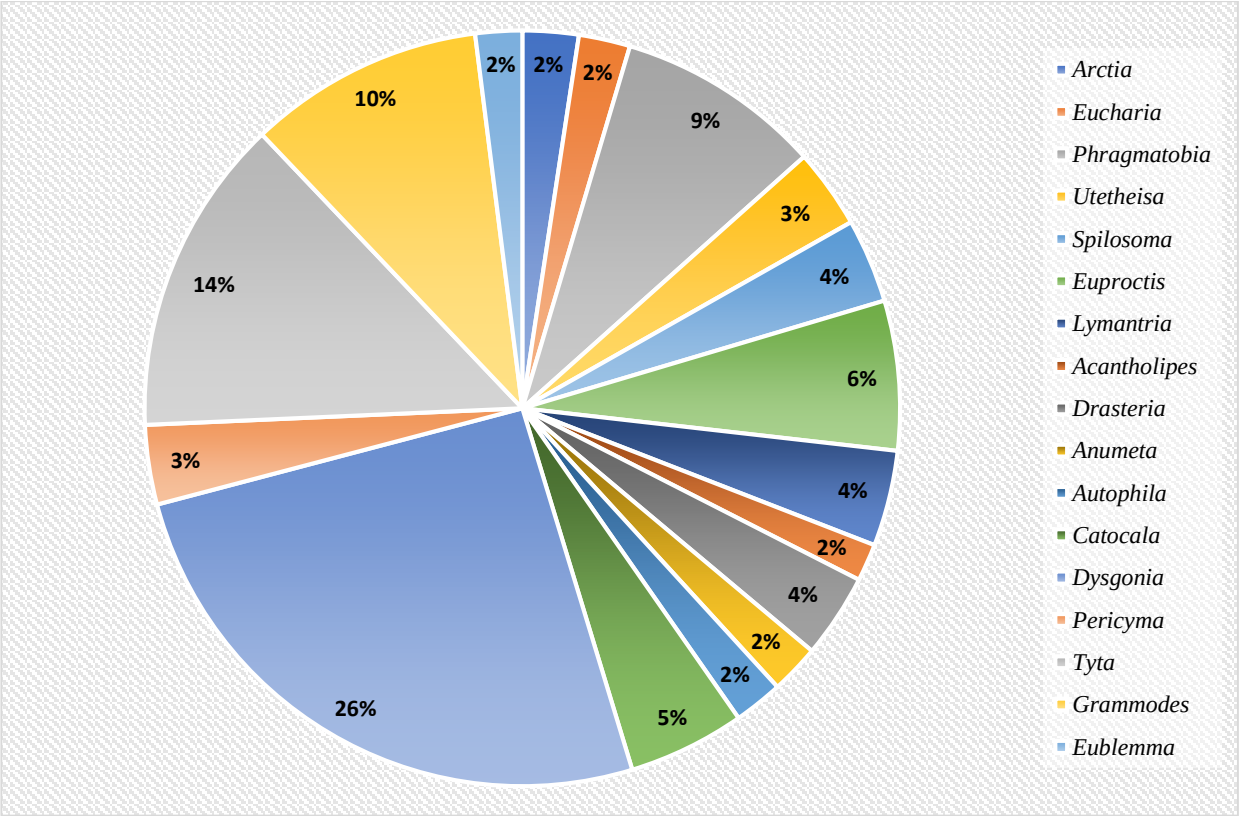

Figure 2. Frequency of occurrence by genus in the erebid moth fauna.

In summary, three superdominant species (>10%) were recorded in the Fergana Valley erebid fauna: *Dysgonia algira*, *Tyta luctuosa*, and *Grammodes stolida*. *Dysgonia algira* had the highest percentage, comprising 20.4% of the fauna; it was documented across nearly all geographic settings and ecological conditions, with more than 100 individuals recorded. *Tyta luctuosa* and *Grammodes stolida* each had shares of 10–13%, with more than 50 individuals recorded for each.

Among erebid moths, *Phragmatobia fuliginosa* and *Catocala nupta* held dominant status (5–10%). *P. fuliginosa* accounted for 8.8% of the fauna with more than 40 individuals, whereas *C. nupta* exceeded 20 individuals and comprised 5% of the fauna.

Many species recorded in the region had subdominant populations with shares of 2–5%, indicating moderate occurrence. In the Fergana Valley noctuoid fauna, the number of subdominant species was 13: *Arctia caja*, *Eucharia festiva*, *Utetheisa pulchella*, *Spilosoma urticae*, *Euproctis chrysorrhoea*, *Euproctis kargalika*, *Lymantria dispar*, *Drasteria caucasica*, *Anumeta fractistrigata*, *Autophila ligaminosa*, *Dysgonia rogenhoferi*, *Dysgonia torrida*, and *Pericyma albidentaria*.

The least-detected populations were *Eublemma purpurina*, *Eublemma ostrina*, and *Acantholipes regularis*, each with a faunistic share below 2%. Specifically, *E. purpurina* had a share of 0.2%, while *E. ostrina* and *A. regularis* accounted for 1.8% and 1.6%, respectively, indicating that these are low-abundance species within the fauna.

Conclusion

Materials collected in the Fergana Valley during 2021–2025 showed that the

Erebidae fauna comprises 21 species in 17 genera. Erebinae predominated with 67%, followed by Arctiinae (20%), Lymantriinae (10.4%), and Boletobiinae (2%). Superdominants were *Dysgonia algira* (20.4%), *Tyta luctuosa* (13.6%), and *Grammodes stolida* (10.1%); *Phragmatobia fuliginosa* (8.8%) and *Catocala nupta* (5.0%) were dominant; 13 species were subdominant; and *Eublemma purpurina* (0.2%), *E. ostrina* (1.8%), and *Acantholipes regularis* (1.6%) formed the low-abundance group. This structure is corroborated by Table 3.3 and the corresponding diagrams.

Population metrics yielded Simpson C ≈ 0.094 and D ≈ 0.906, indicating high diversity and low, weakly aggregated dominance within the valley's erebid fauna.

The results highlight how the Fergana Valley's isolated location, sharply continental climate, and landscape mosaic shape species richness and the predominance of Erebinae. Practically, *Tyta luctuosa* shows potential for biological control of field bindweed, whereas *Lymantria dispar* and *Euproctis* spp. warrant pheromone/sanitation monitoring.

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