

Coleoptera attracted to light traps in the Orhei National Park

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Abstract: White and ultraviolet light traps were used to collect Coleoptera species from the Orhei National Park for the first time. The study was performed from June 28~~th~~ to September 26, 2024 and a total of 82 Coleoptera species of belonging to 22 families were collected, including aquatic ones. Two genera *Cynaesus* and *Spondylis* and three species *Cynaesus angustus*, *Hydaticus grammicus* and *Spondylis buprestoides* are new records for the Republic of Moldova, one of them *Cynaesus angustus* is an adventive species for the country.

1. Introduction

The study of coleopteran species diversity is done through various collecting methods such as entomological nets, soil, tree, window and Malaise traps etc. (Iorgu, 2015; Chapman and Kinghorn, 1955). All the methods listed above are used to collect Coleoptera species with diurnal activity, while species with nocturnal activity remain practically unstudied because the methods cited above are not effective for their collection.

In order to identify as wide as possible spectrum of coleopteran species, white and ultraviolet light traps were used. Light trapping for invertebrate collection has been used more than a hundred years for the purpose of protecting plants from pests, especially for capturing nocturnal lepidoptera (Williams, 1935).

Despite the fact that currently, when combating agricultural and forestry pests, the use of environmentally friendly and biodiversity-friendly products is taken into account, chemical pesticides are still among the most used, even if they are prohibited (Lamberth et al., 2013).

Light traps began to be used in the study of a wide variety of insect groups, including coleoptera, in the 20th century (Merkl and Perimmer, 1954). Today,

light traps are very diverse in shape and different types of light are used, importantly, they are easy to apply (Sheikh et al., 2016; Jocque et al., 2016).

Coleoptera are among the most numerous insects in the world, with a cosmopolitan distribution and presence in all type of ecosystems. They play an important role in many ecological processes (Didham et al., 1996). The greatest biodiversity is attested in tropical forests (Hammond et al., 1997). Forests where human activity is minimal represent exceptional habitats with specific microclimates for the coexistence and conservation of beetle fauna. The deciduous forests of the Republic of Moldova are of the Central European type. (Postolache and Lazu, 2018).

In the Republic of Moldova, the study of the coleopteran fauna ~~began~~ was initiated in 1917 (Miller and Zubowsky), followed by several scientific studies dedicated to species diversity, ecology and distribution of coleopteran species in natural and agricultural ecosystems (Medvedev and Şapiro, 1957; Neculiseanu et al., 2003; Buşmachi and Bacal, 2016, 2022, etc.).

The first checklist of coleoptera was published in 2013 and included 2512 species belong to 69 families (Bacal et al., 2013). Since then, many scientific works have been published, the number of coleopteran species detected in recent years is continuously increasing due to the complex research carried out on local biodiversity. In the last 15 years from 2010 to 2025, over 100 coleoptera species were identified for the first time for the fauna of the Republic of Moldova (Bacal, 2022).

The use of the new collection method will allow the broadening of the spectrum of beetles that will be identified and collected using traps.

In Central and South-Eastern Europe, the light trap method has already been used to study coleopteran species. The method allow to collected 26 species of the family Staphylinidae in the Czech Republic (Bohac and Bezdek, 2024), 7 species of the family Anthicidae in Malta (Nardi and Mifsud, 2003), 22 and 10 species of the family Carabidae in Hungary (Kádár et al., 2003) and Croatia (Tallósi, 2008), respectively and 7 species of the Cerambycidae family in Kazakhstan (Karpiński et al., 2018).

In the Republic of Moldova, the coleopteran species from the families Staphylinidae were collected using the light trap method by Mihailov and Ciubcic (2014); Mihailov and Bacal (2020); and Carabidae by Matalin (1996) and Neculiseanu (2003-2004).

The species of coleopterans with crepuscular and nocturnal activity are usually uniformly dark, similar to bark (*Melanotus villosus*), few collected species have brightly colored shades (*Harmonia axyridis*, *Diaperis boleti*). Sexual dimorphism is not pronounced in the collected species either, with small exceptions such as *Lucanus cervus* or *Cryphaeus cornutus*.

This paper presents the first results of the study of Coleoptera species collected by the light trap method carried in the Orhei National Park.

2. Material and Methods

The light traps were mounted on trees located on the territory of the Orhei National Park, between Orhei and Criuleni districts (GPS 47028'06"07N 28088'04"69E, El. 126 m) during the June- September, 2024 (Fig. 1). The area where the research was carried out is a sector of the private small summer vacation homes.

For the study was selected an site located near two ponds, which allowed to collect also some aquatic coleopterans that are difficult to collect by another method. The light traps allows monitoring the species and collect information regarding the species' activity period. The location of traps plays also an important role, they being set up near the natural deciduous forest and the pine plantation.

The entomological materials were collected using two traps, one with 100 W ~~bulb~~ white light bulb (W) and the other with a 36W ultraviolet light bulb (UV). The traps were fixed to tree branches at a height of 2 meters above the ground. The traps were connected to the light source at dusk from 10pm until sunrise in the morning, on days with clear evenings. The traps were set from 26.06.2024 to 1.10.2024 and the entomological material was extracted every 2 days.

Diesel fuel was used as a fixative solution for the traps. After extraction, the entomological material was strained through a sieve from the fixative liquid and the coleopteran specimens were placed on filter paper. Afterwards, the entomological material was arranged in entomological envelopes for temporary storage of insect specimens and transported to the laboratory for mounting and identification.



Figure 1. Map of light traps locations (<https://earth.google.com/web>)

Identification of coleopteran species are based on morphological characters (Die Käfer Europas) under the stereomicroscope Meiji Techno with camera Bel engineering.

The purpose of the research was to identify the diversity of coleopteran species, especially rare and protected, but also to highlight invasive species.

3. Results

As a result of investigation, 82 coleopteran species were revealed, belonging to 64 genera and 22 families: Anthicidae, Carabidae, Cantharidae, Cerambycidae, Coccinellidae, Curculionidae, Dermestidae, Dytiscidae, Elateridae, Erotylidae, Geotrupidae, Heteroceridae, Hydrophilidae, Lampyridae, Latridiidae, Lucanidae, Oedemeridae, Ptinidae, Scarabaeidae, Scirtidae, Staphylinidae și Tenebrionidae were collected using ultraviolet and white lights traps. Two genera *Cynaesus* and *Spondylis* and three species *Cynaesus angustus*, *Hydaticus grammicus* and *Spondylis buprestoides* are new record for the Republic of Moldova. The new genera and species are marked in text with an (*) asterisk.

Most of the collected coleopterans belong to the family Carabidae with 551 specimens, followed by the families Cantharidae with 137 specimens and Heteroceridae with 128 specimens. Other families were represented with fewer specimens: Coccinellidae with 81, Hydrophilidae - 41, Tenebrionidae - 36, Staphylinidae - 34, Curculionidae - 16, Scarabaeidae and Dytiscidae with 20 and 14 specimens each. Seven families were represented by small number of specimens: Elateridae - 13, Ptinidae - 11, Latridiidae and Cerambycidae with 3 specimens each, Erotylidae - 3, Oedemeridae and Lucanidae with 2 specimens each. Other 5 families Anthicidae, Dermestidae, Geotrupidae, Lampyridae and Scirtidae were represented by one specimen each (Tab. 1).

Table 1. Statistics of coleoptera taxa collected by light traps in the Orhei National Park.

Family	Genus	Species	Number of individuals	Individ./trap light*	
				UV	W
Carabidae	16	28	551	456	95
Cantharidae	2	2	137	80	57
Heteroceridae	1	1	128	124	4
Coccinellidae	3	4	81	73	8
Hydrophilidae	3	3	41	41	0
Tenebrionidae	6	6	36	32	4
Staphylinidae	7	10	34	31	3
Curculionidae	1	1	16	16	0
Scarabaeidae	4	4	20	20	0

Dytiscidae	3	4	14	14	0
Elateridae	4	5	13	13	0
Ptinidae	1	1	11	11	0
Latridiidae	2	2	3	2	1
Cerambycidae	2	2	3	3	0
Erotylidae	1	1	3	0	3
Oedemeridae	2	2	2	0	2
Lucanidae	1	1	2	2	0
Lampyridae	1	1	1	1	0
Scirtidae	1	1	1	1	0
Dermestidae	1	1	1	1	0
Geotrupidae	1	1	1	1	0
Anthicidae	1	1	1	1	0
Total – 22	64	82	1100	923	177

* UV– trap with ultraviolet light, W – trap with white light.

A total of 1100 coleopteran specimens from 82 species were attracted by light traps. Of these, the most numerous 923 specimens from 58 species have flown to ultraviolet light trap. Only 177 specimens from 10 9 families and 25 species were attracted by white light. Common to both types of white and ultraviolet light traps were 14 species.

The list of coleopteran species captured with traps are listed below. The nomenclature and taxonomic order of the analyzed families are presented according to Bouchard et al. (2011).

CARABIDAE Latreille, 1802

***Acupalpus* Latreille, 1829**

Acupalpus maculatus (Schaum, 1860) - 3 ex., 10.07.2024, UV.

***Amara* Bonelli, 1810**

Amara apricaria (Paykull, 1790) - 2 ex., 19.07.2024, UV.

***Badister* Clairville, 1806**

Badister unipustulatus Bonelli, 1813 - 2 ex., 10.07.2024, W.

Badister meridionalis Puel, 1925 - 4 ex., 13.07.2024, UV.

***Bembidion* Latreille, 1802**

Bembidion biguttatum (Fabricius, 1779) - 1 ex., 10.07.2024, UV.

Bembidion obliquum Sturm, 1825 - 2 ex., 01.07.2024, W; 2 ex., 19.07.2024, UV.

Bembidion octomaculatum (Goeze, 1777) - 2 ex., 10.07.2024, W.

Bembidion quadripustulatum Serville, 1821 - 1 ex., 13.07.2024, UV.

***Brachinus* Weber, 1801**

Brachinus crepitans (Linnaeus, 1758) - 1 ex., 10.07.2024, UV.

Brachinus explodens Duftschmid, 1812 - 1 ex., 10.07.2024, W.

***Calathus* Bonelli, 1810**

Calathus melanocephalus (Linnaeus, 1758) - 1 ex., 02.09.2024, W.

Chlaenius Bonelli, 1810

Chlaenius spoliatus (Rossi, 1792) - 1 ex., 21.08.2024, UV.

Clivina Latreille, 1802

Clivina fossor (Linnaeus, 1758) - 1 ex., 10.07.2024, UV.

Drypta Latreille, 1797

Drypta dentata (P.Rossi, 1790) - 1 ex., 12.08.2024, UV.

Harpalus Latreille, 1802 (syn. Pseudoophonus)

Pseudoophonus calceatus (Duftschmid, 1812) - 1 ex., 16.07.2024, UV, 6 ex., 22.07.2024, UV.

Pseudoophonus rufipes (DeGeer, 1774) - 6 ex., 01.07.2024, UV; 4 ex., 10.07.2024, UV; 4 ex., 10.07.2024, W; 36 ex., 13.07.2024, UV; 13 ex., 13.07.2024, W; 35 ex., 16.07.2024, UV; 2 ex., 16.07.2024, W; 3 ex., 19.07.2024, UV; 6 ex., 22.07.2024, UV; 1 ex., 27.07.2024, UV; 4 ex., 03.08.2024, UV; 104 ex., 09.08.2024, UV; 11 ex., 12.08.2024, UV; 2 ex., 15.08.2024, UV; 3 ex., 18.08.2024, UV.

Harpalus griseus (Panzer, 1796) - 8 ex., 13.07.2024, UV; 2 ex., 16.07.2024, W.

Lebia Latreille, 1802

Lebia cyanocephala (Linnaeus, 1758) - 2 ex., 13.07.2024, UV.

Ophonus Dejean, 1821

Ophonus rufibarbis (Fabricius, 1792) - 12 ex., 13.07.2024, UV; 1 ex., 19.07.2024, UV.

Ophonus puncticeps Stephens, 1828 - 11 ex., 10.07.2024, UV.

Ophonus azureus (Fabricius, 1775) - 21 ex., 01.07.2024, UV; 2 ex., 10.07.2024, UV; 6 ex., 13.07.2024, UV; 1 ex., 19.07.2024, UV.

Ophonus sabulicola (Panzer, 1796) - 1 ex., 10.07.2024, UV.

Paradromius Fowler, 1887

Paradromius longiceps (Dejean, 1826) - 2 ex., 10.07.2024, UV; 1 ex., 16.07.2024, UV.

Polystichus Bonelli, 1809

Polystichus connexus (Fourcroy, 1785) - 1 ex., 10.07.2024, UV; 1 ex., 13.07.2024, UV.

Stenolophus Stephens, 1828

Stenolophus mixtus (Herbst, 1784) - 4 ex., 28.06.2024, UV; 39 ex., 10.07.2024, UV; 1 ex., 10.07.2024, W; 33 ex., 13.07.2024, UV; 18 ex., 13.07.2024, W; 1 ex., 16.07.2024, UV; 4 ex., 16.07.2024, W; 19 ex., 19.07.2024, UV; 1 ex., 27.07.2024, UV; 3 ex., 03.08.2024, UV; 1 ex., 12.08.2024, UV.

Stenolophus skrimshirani Stephens, 1828 - 3 ex., 10.07.2024, W.

Stenolophus teutonius (Schrank, 1781) - 1 ex., 10.07.2024, W; 8 ex., 10.07.2024, UV; 10 ex., 13.07.2024, UV; 15 ex., 16.07.2024, W; 9 ex., 16.07.2024, UV; 5 ex., 19.07.2024, UV.

Trechus Clairville, 1806

Trechus sp., 24 ex., 02.09.2024, W; 6 ex., 11.09.2024, UV; 3 ex., 14.09.2024, UV; 5 ex., 17.09.2024, UV.

DYTISCIDAE Leach, 1815

***Agabus* Leach, 1817**

Agabus uliginosus (Linnaeus, 1761) - 1 ex., 13.07.2024, UV.

***Hydaticus* Leach, 1817**

**Hydaticus grammicus* Germar, 1830 - 1 ex., 01.07.2024, UV; 1 ex., 13.07.2024, UV; 1 ex., 18.08.2024, UV.

Hydaticus transversalis (Pontoppidan, 1763) - 2 ex., 10.07.2024, UV.

***Laccophilus* Leach, 1815**

Laccophilus poecilus Klug 1834 - 5 ex., 10.07.2024, UV; 3 ex., 13.07.2024, UV.

HYDROPHILIDAE Latreille, 1802

***Hydrobius* Leach, 1815**

Hydrobius fuscipes (Linnaeus, 1758) - 8 ex., 10.07.2024, UV; 4 ex., 13.07.2024, UV; 13 ex., 16.07.2024, UV; 4 ex., 19.07.2024, UV; 2 ex., 18.08.2024, UV.

***Helochares* Mulsant 1844**

Helochares lividus (Forster, 1771) - 3 ex., 10.07.2024, UV; 4 ex., 13.07.2024, UV.

***Enochrus* Thomson, 1859**

Enochrus testaceus (Fabricius 1801) - 3 ex., 28.06.2024, UV.

STAPHYLINIDAE Latreille, 1802

***Carpelimus* Leach, 1819**

Carpelimus elongatulus (Erichson, 1839) - 19 ex., 01.07.2024, UV.

Carpelimus obesus (Kiesenwetter, 1844) - 3 ex., 19.07.2024, UV.

Carpelimus rivularis (Motschulsky, 1860) - 1 ex., 01.07.2024, UV.

***Bledius* Leach, 1819**

Bledius tricornis (Herbst, 1784) - 1 ex., 01.07.2024, UV.

***Lathrobium* Gravenhorst, 1802**

Lathrobium fulvipenne (Gravenhorst, 1806) - 1 ex., 13.07.2024, UV.

***Phloeopora* Erichson, 1837**

Phloeopora concolor (Kraatz, 1856) - 2 ex., 28.06.2024, W.

***Philonthus* Stephens, 1829**

Philonthus carbonarius (Gyllenhal, 1875) - 2 ex., 13.07.2024, UV.

Philonthus umbratilis (Gravenhorst, 1806) - 1 ex., 01.07.2024, UV.

***Paederus* Fabricius, 1775**

Paederus fuscipes (Curtis, 1826) - 1 ex., 10.07.2024, UV; 2 ex., 22.07.2024, UV.

***Sunius* Stephens, 1829**

Sunius melanocephalus (Fabricius, 1793) - 1 ex., 28.06.2024, W.

GEOTRUPIDAE Latreille, 1802***Geotrupes* Latreille, 1797**

Geotrupes stercorarius (Linnaeus, 1758) - 1 ex., 16.07.2024, UV.

LUCANIDAE Latreille, 1804***Lucanus* Scopoli, 1763**

Lucanus cervus (Linnaeus, 1758) - 1 ex., 28.06.2024, UV; 1 ex., 01.07.2024, UV.

SCARABAEIDAE Latreille, 1802***Aphodius* Illiger, 1798**

Aphodius varians Duftschmidt, 1805 - 4 ex., 28.06.2024, UV; 5 ex., 10.07.2024, UV; 3 ex., 13.07.2024, UV; 2 ex., 19.07.2024, UV; 1 ex., 02.09.2024, UV.

***Calamosternus* Motschulsky, 1859**

Calamosternus granarius (Linnaeus 1767) - 1 ex., 11.09.2024, UV.

***Copris* Geoffroy, 1762**

Copris lunaris (Linnaeus, 1758) - 1 ex., 02.09.2024, UV; 1 ex., 26.09.2024, UV.

***Pleurophorus* Mulsant, 1842**

Pleurophorus caesus (Panzer, 1796) - 2 ex., 19.07.2024, UV.

SCIRTIDAE Fleming, 1821***Cyphon* Paykull, 1799**

Cyphon sp., - 1 ex., 13.07.2024, UV.

HETEROCERIDAE MacLeay, 1825***Heterocerus* Fabricius, 1792**

Heterocerus fenestratus (Thunberg, 1784) - 12 ex., 28.06.2024, UV; 1 ex., 10.07.2024, W; 14 ex., 10.07.2024, UV; 18 ex., 13.07.2024, UV; 1 ex., 16.07.2024, UV; 10 ex., 19.07.2024, UV; 2 ex., 22.07.2024, UV; 1 ex., 25.07.2024, UV; 2 ex., 27.07.2024, W; 2 ex., 03.08.2024, UV; 4 ex., 09.08.2024, UV; 8 ex., 12.08.2024, UV; 3 ex., 24.08.2024, UV; 2 ex., 02.09.2024, UV; 1 ex., 11.09.2024, UV; 31 ex., 14.09.2024, UV; 10 ex., 17.09.2024, UV; 1 ex., 17.09.2024, W; 5 ex., 23.09.2024, UV.

ELATERIDAE Leach, 1815***Agriotes* Eschscholtz, 1829**

Agriotes sputator (Linnaeus, 1758) - 2 ex., 10.07.2024, UV.

Agriotes lineatus (Linnaeus, 1767) - 1 ex., 19.07.2024, UV.

***Melanotus* Eschscholtz, 1829**

Melanotus villosus (Geoffroy in Fourcroy, 1785) - 1 ex., 10.07.2024, UV; 1 ex., 18.08.2024, UV.

Melanotus fusciceps Gyllenhal, 1817 - 2 ex., 01.07.2024, UV; 2 ex., 13.07.2024, UV.

***Stenagostus* Thomson, 1859**

Stenagostus rhombeus (Olivier, 1790) - 1 ex., 13.07.2024, UV; 1 ex., 16.07.2024, UV, 2 ex., 19.07.2024, UV.

LAMPYRIDAE Latreille, 1817

***Lampyris* Geoffroy, 1762**

Lampyris noctiluca (Linnaeus, 1758) - 1 ex., 01.07.2024, UV.

CANTHARIDAE Imhoff, 1856

***Cantharis* Linnaeus, 1758**

Cantharis lateralis Linnaeus, 1758 - 1 ex., 10.07.2024, UV.

***Rhagonycha* Eschscholtz, 1830**

Rhagonycha fulva (Scopoli, 1763) - 20 ex., 01.07.2024, UV; 13 ex., 01.07.2024, W; 8 ex., 10.07.2024, W; 32 ex., 10.07.2024, UV; 5 ex., 13.07.2024, W; 23 ex., 13.07.2024, UV; 4 ex., 16.07.2024, UV; 31 ex., 16.07.2024, W.

DERMESTIDAE Latreille, 1807

***Dermestes* Linnaeus, 1758**

Dermestes bicolor Fabricius, 1781 - 1 ex., 13.07.2024, UV.

PTINIDAE Latreille, 1802 (Anobiinae Fleming, 1821)

***Priobium* Motschulsky, 1845**

Priobium carpini (Herbst, 1793) - 2 ex., 28.06.2024, UV; 3 ex., 10.07.2024, UV; 4 ex., 13.07.2024, UV; 2 ex., 19.07.2024, UV.

EROTYLIDAE (Languriidae)

***Cryptophilus* Reitter, 1874**

Cryptophilus sp., - 3 ex., 28.06.2024, W.

COCCINELLIDAE Latreille, 1807

***Harmonia* Mulsant, 1846**

Harmonia axyridis (Pallas, 1773) - 1 ex., 28.06.2024, UV; 1 ex., 01.07.2024, W; 3 ex., 01.07.2024, UV; 2 ex., 10.07.2024, W; 3 ex., 10.07.2024, UV; 9 ex., 13.07.2024, UV; 2 ex., 16.07.2024, W; 7 ex., 16.07.2024, UV; 4 ex., 19.07.2024, UV; 2 ex., 22.07.2024, UV; 1 ex., 25.07.2024, UV; 5 ex., 27.07.2024, UV; 2 ex., 09.08.2024, UV; 2 ex., 12.08.2024, UV; 2 ex., 15.08.2024, UV; 4 ex., 18.08.2024, UV; 11 ex., 21.08.2024, UV; 1 ex., 24.08.2024, UV; 2 ex., 27.08.2024, UV; 1 ex., 02.09.2024, UV; 1 ex., 11.09.2024, UV; 3 ex., 26.09.2024, UV.

***Hippodamia* Dejean, 1837**

Hippodamia variegata (Goeze, 1777) - 1 ex., 10.07.2024, UV; 1 ex., 16.07.2024, W; 1 ex., 16.07.2024, UV.

Hippodamia tredecimpunctata (Linnaeus, 1758) - 2 ex., 16.07.2024, W.

***Vibidia* Mulsant, 1846**

Vibidia duodecimguttata (Poda, 1761) - 1 ex., 10.07.2024, UV; 5 ex., 13.07.2024, UV; 1 ex., 24.08.2024, UV.

LATRIDIIDAE Erichson, 1842

***Cortinicara* Johnson, 1975**

Cortinicara gibbosa (Herbst, 1793) - 1 ex., 01.07.2024, W; 1 ex., 13.07.2024, UV.

***Enicmus* Thomson, 1859**

Enicmus rugosus (Hbst., 1793) - 1 ex., 24.08.2024, UV.

TENEBRIONIDAE Latreille, 1802

***Alphitophagus* Stephens, 1832**

Alphitophagus bifasciatus (Say, 1824) - 1 ex., 01.07.2024, W; 1 ex., 15.08.2024, UV.

****Cynaetus* LeConte, 1862**

**Cynaetus angustus* (LeConte, 1851) - 1 ex., 01.07.2024, W; 2 ex., 01.07.2024, UV; 8 ex., 10.07.2024, UV; 2 ex., 13.07.2024, UV; 1 ex., 13.07.2024, W; 3 ex., 19.07.2024, UV; 2 ex., 09.08.2024, UV; 1 ex., 12.08.2024, UV; 4 ex., 15.08.2024, UV; 1 ex., 27.08.2024, UV; 1 ex., 02.09.2024, UV.

***Cryphaeus* Klug, 1833**

Cryphaeus cornutus Fischer von Waldheim, 1823 - 1 ex., 21.08.2024, UV.

***Diaperis* Geoffroy, 1762**

Diaperis boleti (Linnaeus, 1758) - 2 ex., 10.07.2024, UV.

***Platydemus* Laporte & Brullé, 1831**

Platydemus violaceum (Fabricius, 1790) - 1 ex., 15.08.2024, UV.

***Tenebrio* Linnaeus, 1758**

Tenebrio obscurus Fabricius, 1792 - 2 ex., 01.07.2024, UV; 1 ex., 13.07.2024, UV; 1 ex., 19.07.2024, W.

OEDEMERIDAE Latreille, 1810

***Lagria* Fabricius, 1775**

Lagria hirta (Linnaeus, 1758) - 1 ex., 10.07.2024, W.

***Oedemera* Olivier, 1789**

Oedemera podagrariae (L., 1767) - 1 ex., 13.07.2024, W.

ANTHICIDAE Latreille, 1819

***Anthicus* Paykull, 1798**

Anthicus antherinus (Linnaeus, 1761) - 1 ex., 13.07.2024, UV.

CERAMBYCIDAE Latreille, 1802***Trichoferus* Wollaston, 1854**

Trichoferus campestris (Faldermann, 1835) - 2 ex., 13.07.2024, UV.

****Spondylis* Fabricius, 1775**

**Spondylis buprestoides* (Linnaeus, 1758) - 1 ex., 28.06.2024, UV.

CURCULIONIDAE Latreille, 1802***Curculio* Linnaeus, 1758**

Curculio glandium Marsham, 1802 - 2 ex., 09.08.2024, UV; 2 ex., 12.08.2024, UV; 10 ex., 15.08.2024, UV; 2 ex., 27.08.2024, UV.

The number of individuals collected by the white and ultraviolet light traps demonstrated that the species *Pseudophonus rufipes*, *Stenolophus mixtus* *S. teutonus*, *Heterocerus fenestratus*, *Rhagonycha fulva*, *Harmonia axyridis* and *Cynaues angustus* are attracted by both type of light traps.

Using these collection methods in the study of coleopterans biodiversity allowed to identified several species with crepuscular and nocturnal activity and their population dynamics. It is possible to estimate the degree of rarity of nocturnal species according to their relative abundance (Figures 1, 2).

Coleoptera from the Zopheridae family were also collected using this method, the result of their study is included in another paper (Bacal and Buşmachi, in print).

The use of white and ultraviolet light traps in beetles collecting has great potential.

The short description of 3 new species collected and identified for in the fauna of the Republic of Moldova were presented below.

Hydaticus grammicus

Aquatic species, reaching approximately 10 mm in size, belonging to the predatory trophic group. In a variety of standing, including brackish and salt water bodies; periodically found in slow-flowing rivers and streams, canals and irrigation ditches. Actively flies towards the light.

Geographical distribution: France, Italy, Switzerland, Germany, Poland, Czechia, Austria, Slovakia, Hungary, Slovenia, Croatia, Serbia, Bosnia and Herzegovina, North Macedonia, Greece, Romania, Bulgaria, Ukraine, Russia, Turkey, Georgia, Armenia, Azerbaijan, Iran, Turkmenistan, Kazakhstan, Uzbekistan, Tajikistan, Kyrgyzstan, Afghanistan, China, North Korea, South Korea, Japan (Wewalka, 2023).

Spondylis buprestoides

This is bark and wood-boring beetle with shiny black cylindrical shape and large mandibles. The adults of the species have are 12-24 mm in size, usually fly

in the evening and at night. Polyphagous species but strongly prefers pines (*Pinus* spp.), rarely in *Picea*, *Abies* and *Larix*. Females lay about 100-150 eggs. The larvae develop in the roots of coniferous trees and burrow into stumps. Larval development takes two years. Adults are active from May to September, are mainly crepuscular and nocturnal. Beetles are usually hidden under the pieces of wood, logs or bark, but they also fly during the day, especially on warm summer days (Sláma, 1998).

Geographical distribution: Palaearctic region, from Portugal to Japan.

Cynaëus angustus

Adults of the species have are 5.9 mm in size and are found in nature under the bark of de *Pinus* sp., *Ulmus* sp., *Fagus* sp., *Populus* sp. and *Salix* sp. *Cynaëus angustus* feeds on decaying plant debris, crop residues and stored products (dried fruits, etc.). The species is attracted to light. In Europe, *Cynaëus angustus* is carefully monitored, being in the focus of biologists and ecologists, as it is an invasive species that can cause considerable damage (Pintilioaie and Teodorescu, 2021).

The species *C. angustus* was described from the desert of California, USA (Dunkel et al., 1982). Since the middle of the 20th century, it accidentally entered Europe and quickly became extinct throughout the continent (Pintilioaie and Teodorescu, 2021).

The light trap method also attracted some rare species from the Republic of Moldova as *Lucanus cervus* (Red Book of the Republic of Moldova, 2015), which is protected at European level by the Habitats Directive (listed in Annex II). Likewise, was collected the species *Stenagostus rhombeus*, included in the Red List of Saproxylic Coleoptera in Europe (Nieto, 2010; Cáliz et al., 2018) in the least threatened category (LC). In Poland, the species is listed as critically endangered (CR) (Pawłowski et al., 2002). The species occurs in trunks and stumps of deciduous trees (Burakowski et al., 1985). In the Republic of Moldova, the species is also rare, occurring only in the Plaiul Fagului Reserve (Bacal, 2022).

The dynamics of species during the research period conducted from June to September allowed highlighting the period of activity of the beetles.

The flight period of the specimens are shown below. The largest number of species were collected starting with 10.06.2024 until 19.07.2024, after which the number decreased noticeably.

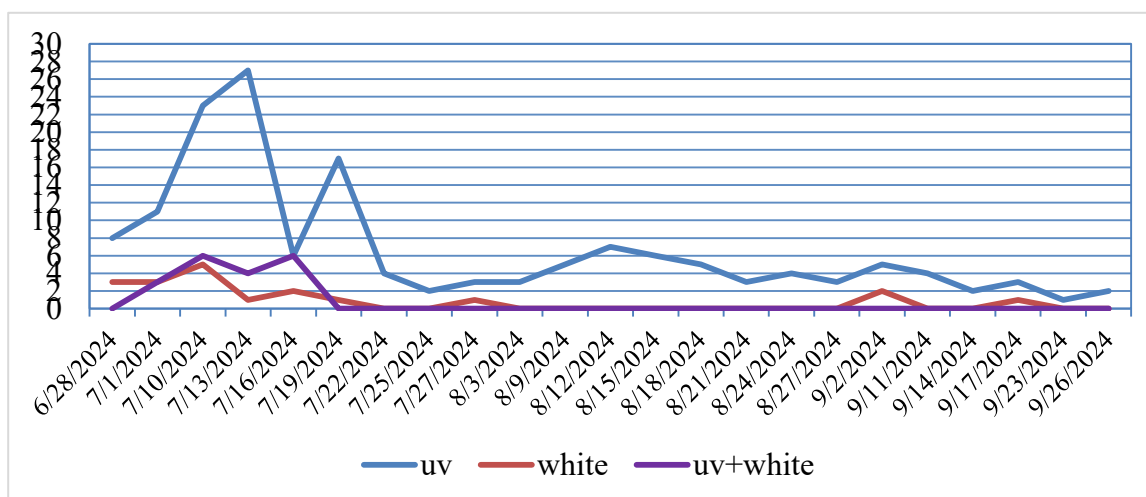


Figure 1. Number of beetle species collected in white and ultraviolet light traps.

The decrease in the number of collected species can be easily seen after the month of July. A total number caught of specimens captured in both types of traps was 34 species on 10.07.2024, 32 species on 13.07.2024 and 18 species on 19.07.2024. At the same time, the ultraviolet light trap collected the largest number of species (Fig.1).

The most specimens 131 were collected on 13.07.2024 and belonged to 32 species.

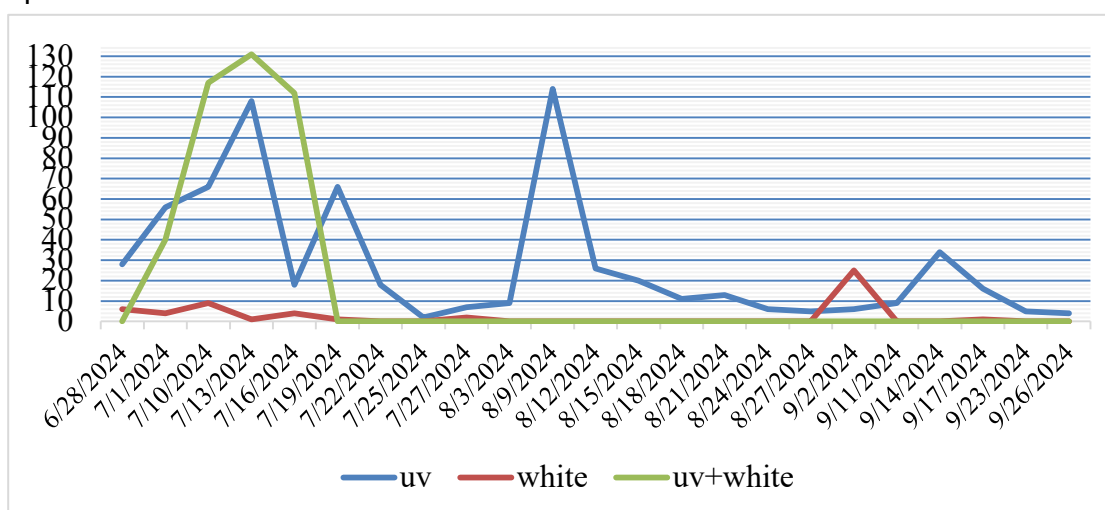


Figure 2. Number of beetle specimens collected from white and ultraviolet light traps.

While in August 9, only 5 species were collected, with the overwhelming predominance of the species *Pseudoophonus rufipes* with 104 specimens.

4. Discussion

Natural ecosystems are constantly threatened by climate change and human activities manifested through logging, drainage of water basins, urbanization and the export of goods (Michelle et al., 2012).

In 2021, the invasive species *Cynaesus angustus* was reported in Romania (Pintilioaie and Teodorescu, 2021), and later in 2022 in Bulgaria (Sivilov and Hristova, 2022). The species is firstly recorded in the Republic of Moldova, being collected in the Orhei National Park in number of 26 specimens that were attracted to both white and ultraviolet light traps from July to September.

Due to climate change, anthropogenic pressure and habitat modification, rare and protected species such as *Rosalia alpina*, previously collected in Ivancea in 1953 - have no longer been recorded since. The species had been historically reported in Orhei National Park, but had not been recorded there for more than 70 years (Bacal et al., 2020).

To thoroughly investigate insect species diversity, it is necessary to use various sampling methods throughout the year. The difference between the methods of collecting coleoptera is very significant and essential for highlighting a wide spectrum of species.

For example, collecting xylophagous beetles using trunk trap allowed the identification of numerous Coleoptera species reported for the first time in the Plaiul Fagului and Pădurea Domnească Reserves (Bacal and Buşmachiu, 2022; Bacal, 2023; Bacal and Buşmachiu, 2023a, 2023b).

The use of white street lighting at night in the protected area near the forest leads to a decrease in the number of insects because they fall into the protective housings of the lamps and die (Hale and Arlettaz, 2019).

5. Conclusions

Using the new insect collecting methods for the study of coleopteran species diversity in the Orhei National Park allow to identified 82 coleopteran species belonging to 64 genera and 22 families, including aquatic ones. Two genera *Cynaesus* and *Spondylis* and three species *Cynaesus angustus*, *Hydaticus grammicus* and *Spondylis buprestoides* are new records for the Republic of Moldova.

The largest number of species and their highest abundance was in July, and the ultraviolet light trap was much more attractive to insects. The use of white street lighting at night in the protected area decrease the number of insects that die being attracted to the light.

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