Scientific Papers. Series B, Horticulture. Vol. LXIX, No. 1, 2025
Print ISSN 2285-5653, CD-ROM ISSN 2285-5661, Online ISSN 2286-1580, ISSN-L 2285-5653

COMPARATIVE RESEARCH ON THE SITUATION, STRUCTURE AND ECOLOGICAL INDICES OF ARTHROPOD SPECIES ENCOUNTERED IN SOME FOREST AND APPLE ORCHARDS IN THE NECHIT AREA, NEAMȚ COUNTY

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Abstract

The research was carried out in an apple orchard, located in the Nechit area, Neamț County and in a forestry plantation managed by the forestry district in the same area. For the collection of the material, pitfall traps were used during 2024. The samples were collected from both the apple orchard and the forestry plantation on the same dates, as follows: Harvest I: July 20 Harvest II: July 22 Harvest III: July 31 Harvest IV: August 14 Harvest V: August 28 Harvest VI: September 11 In the apple orchards, 8 material harvests were carried out on the same dates as in the forest plantations. The largest number of specimens was collected at the first harvest, 1,066 specimens, followed by the 6th harvest, on September 11, with 458 specimens. Then, 420 specimens were collected at the 7th harvest, on September 25, and 410 specimens at the 8th harvest, on October 16. The most frequently collected species, which also recorded the largest number of specimens, were Armadillidium vulgare, Pterostichus cupreus, Dermestes laniarius and arachnids.

Key words*: arthropod species, forest, apple orchards.*

INTRODUCTION

Entomofauna is an essential element of forest and orchard ecosystems, playing a fundamental role in the dynamics of insect populations, pollination, trophic cycles, and plant health. The study of the diversity and structure of the entomofauna in forests and apple orchards provides valuable information about ecological balance and the impact of agricultural practices on biodiversity (Bacal and Mihailov, 2020).

In forests, insect communities are influenced by factors such as tree species composition, humidity, temperature, and the presence of invasive species. On the other hand, apple orchards, being anthropogenically managed agroecosystems, are affected by phytosanitary treatments, monoculture, and soil management, which can significantly alter the structure of the entomofauna (Petrescu, 2008).

Coniferous and broadleaf forests are grouped into two layers.

Altitudinally, they are differentiated, with the transition from one layer to another occurring through plant groupings typical for each. The spruce forest layer, found between 1300 and 1700 m, is much more developed on the northern slopes. It is mainly composed of pure spruce stands (*Picea abies*).

At the source of rivers, it appears as a thin band at the upper limit of the forest, with silver fir (*Abies alba*) and, rarely, specimens of Swiss pine (*Pinus cembra*).

The broadleaf forest layer consists of beech forests mixed with spruce, fir, beech forests, and beech forests mixed with sessile oak.

Mixed beech and coniferous forests occur at altitudes between 900 and 1400 m.

They consist of European beech (*Fagus sylvatica*), spruce (*Picea abies*), silver fir *(Abies alba)*, mountain maple (*Acer pseudoplatanus*), mountain elm (*Ulmus glabra*), and rowan (*Sorbus aucuparia*). Beech forests surround the mountain ranges on the northern and western sides, occupying areas between 500 m and 1050 m, and sometimes reaching up to 1500 m in valleys. Typically, at the lower limit, beech appears in association with sessile oak (*Quercus petraea*).

The apple tree (*Malus domestica*) is one of the most cultivated fruit species worldwide, valued for its fruits rich in vitamins, antioxidants, and fiber. The apple cultivation is of significant economic and ecological importance, being essential for the food industry and for maintaining biodiversity through its role in supporting pollinators and beneficial entomofauna.

MATERIALS AND METHODS

Entomofauna plays an essential role in both natural forests and apple orchards, influencing the ecological balance and productivity of these ecosystems. In forests, insects contribute to the decomposition of organic matter, pollination, and regulation of pest populations, thereby maintaining the health of the habitat (Bârdan, 2023).
In apple orchards, beneficial entomofauna, such as pollinators and natural predators of pests, is crucial for achieving sustainable yields and reducing the need for chemical interventions (Malschi and Stan, 2006).
The main objective of this study is to compare the diversity and abundance of insect species in natural forests and apple orchards, highlighting the differences between these habitats and the potential effects of anthropogenic interventions on the entomological balance. The study aims to contribute to a better understanding of the role of insects in maintaining ecosystem health and to provide recommendations for the conservation of beneficial entomofauna in orchards.
To collect the epigeic fauna from both ecosystems (forest and orchard), Barber-type soil traps were installed (Andron, 2019). A 800 ml box was used as a soil trap, which was buried in the soil to its level, allowing insects to move freely without being obstructed by obstacles. A 2.5% NaCl solution was used as a fixative liquid. A metal lid was placed on top of the jar, supported by two stands, to protect the trap from precipitation.
The number of traps installed in each biotope was 6 or more. Talmaciu (2019) demonstrated that by using 5 traps, the dominant, subdominant, rare, and sub-rare species can be captured, while using more than 12 traps significantly alters the percentage ratios.
The traps can be arranged in a line, with equal distances between them, or uniformly across the entire area. The samples were collected from both study sites between April and September at intervals of approximately 7-10 days.
The experimental plots were established in both a forest plot and an intensive apple orchard, both belonging to the Nechit Monastery in Neamț County.

Figure 1. Installation of traps in the experimental plots

At each collection, the contents of the box were placed in a plastic container with a lid, gently cleaned, and then filled with a diluted medicinal alcohol solution. Each sample was labeled with the collection date, trap number, and variant.
In the laboratory, the material was cleaned of plant residues, then washed under a water jet, and the process of identification and species determination followed.

RESULTS AND DISCUSSIONS

The epigeic fauna collected in the Nechit station differs between the forest and the apple orchard, reflecting the characteristics of each ecosystem. In the forest, species diversity is greater, including beetles, millipedes, and other arthropods adapted to the forest environment. In contrast, the orchard is dominated by ants, spiders, and other invertebrates influenced by agricultural practices and soil structure. These differences highlight the impact of the habitat on the composition of the epigeic fauna.
Throughout the year 2024, from May to September, data collected from six sampling events of epigeic arthropod fauna in both the forest plot and the apple orchard provided the basis for determining the structure, dynamics, and ecological impact of the fauna.

Table 1. Species composition of arthropods collected in soil traps in the forest area from Nechit

No.	Name of species	Harvested								No. of traps	Total samples
		I	II	III	IV	V	VI	VII	VI		
1.	*Geotrupes vernalis*	11	16	2	22	3	3	8	33	31	98
2.	*Phalangium opilo*	28	13	9	8	16	10	12	0	32	96
3.	*Armadilidium vulgare*	6	3	16	0	3	3	2	3	9	36
4.	*Cychrus caraoides*	29	0	0	0	1	0	0	0	1	30
5.	*Necrophorus vespillo*	14	7	1	7	1	0	0	0	10	30
6.	*Panorpa comunnis*	5	11	0	0	0	0	0	0	9	16
7.	*Chromatoulus unilineatus*	3	1	0	0	2	3	3	3	12	15
8.	*Messor structor*	10	2	1	1	0	0	0	0	9	14
9.	*Aptinus bombarda*	8	2	0	3	0	0	0	0	8	13
10.	*Atomaria turgida*	0	9	0	0	0	0	0	0	1	9
11.	*Staphilinus olens*	3	4	0	0	0	0	0	0	5	7
12.	*Dolycoris baccarum*	0	0	1	0	0	0	5	1	5	7
13.	*Carabus coriaceus*	0	3	0	0	0	1	1	1	4	6
14.	*Dadobia immersa*	0	5	0	0	0	0	0	0	1	5
15.	*Poecilus cupreus*	0	1	3	0	0	0	0	0	2	4
16.	*Pterostichus niger*	0	0	0	3	1	0	0	0	4	4
17.	*Carabus convexus*	3	0	0	0	0	0	0	0	1	3
18.	*Ectobius lapponicus*	2	0	0	0	0	0	0	1	2	3
19.	*Dociostaurus marocanus*	0	0	0	2	1	0	0	0	3	3
20.	*Cychrus attenuatus*	0	0	0	0	0	0	3	0	3	3
21.	*Quedius unicolor*	0	0	0	0	0	0	0	3	2	3
22.	*Carabus hungaricus*	2	0	0	0	0	0	0	0	2	2
23.	*Petrobius brevistylis*	0	2	0	0	0	0	0	0	2	2
24.	*Oiceoptoma thoracica*	0	2	0	0	0	0	0	0	1	2
25.	*Silpha carinata*	0	1	1	0	0	0	0	0	2	2
26.	*Pterostichus vulgaris*	0	0	0	0	0	0	0	2	1	2
27.	*Ceruchus chrysomelinus*	1	0	0	0	0	0	0	0	1	1
28.	*Hister sinuatus*	1	0	0	0	0	0	0	0	1	1
29.	*Poecilus cupreus*	1	0	0	0	0	0	0	0	1	1
30.	*Brachynus crepitans*	0	1	0	0	0	0	0	0	1	1
31.	*Cychrus semigranosus*	0	1	0	0	0	0	0	0	1	1
32.	*Pterostichus cylindricus*	0	1	0	0	0	0	0	0	1	1
33.	*Staphylinus caesareus*	0	1	0	0	0	0	0	0	1	1
34.	*Meligethes aeneus*	0	0	0	0	0	1	0	0	1	1
35.	*Psyllobora vigintiduopunctata*	0	0	0	0	0	0	1	0	1	1
36.	*Carabus intricatus*	0	0	0	0	0	0	0	1	1	1
37.	*Leistus rufomarginatus*	0	0	0	0	0	0	0	1	1	1
	Total 37 species	127	86	34	46	28	21	35	49	48	412

The data summarized in Table 1 present the diversity and abundance of the epigeic fauna collected in the 48 traps in the Nechit station, located in the forest plot. A total of 37 species were identified, comprising 412 individuals.

The most abundant species are *Geotrupes vernalis* (98 individuals) and *Phalangium opilo* (96 individuals), indicating their dominant presence in the habitat. Some species, such as *Ceruchus chrysomelinus* and *Hister sinuatus*, as well as 11 other species, are very rare, represented by only a single specimen.

The distribution across collections varies widely, suggesting differences in microhabitat and the ecological preferences of the species.

Table 2. The situation regarding the calculation of ecological factors for each species during the period in forest area from Nechit

No.	Name of species	No. of traps	Abundance	Constancy		Dominance		W	
				%	***	%	***	%	***
1.	*Geotrupes vernalis*	31	98	64,6	C3	23,8	D3	15,375	W5
2.	*Phalangium opilo*	32	96	66,7	C3	23,3	D5	15,541	W5
3.	*Armadilidium vulgare*	9	36	18,7	C1	8,7	D4	1,627	W3
4.	*Cychrus caraoides*	1	30	2,1	C1	7,3	D1	0,153	W2
5.	*Necrophorus vespillo*	10	30	20,8	C1	7,3	D4	1,518	W3
6.	*Panorpa comunnis*	9	16	18,7	C1	3,9	D3	0,729	W2
7.	*Chromatoulus unilineatus*	12	15	25,0	C1	3,6	D3	0,900	W2
8.	*Messor structor*	9	14	18,7	C1	3,4	D1	0,636	W2
9.	*Aptinus bombarda*	8	13	16,7	C1	3,1	D3	0,518	W2
10.	*Atomaria turgida*	1	9	2,1	C1	2,2	D3	0,046	W1
11.	*Staphilinus olens*	5	7	10,4	C1	1,7	D2	0,176	W2
12.	*Dolycoris baccarum*	5	7	10,4	C1	1,7	D2	0,176	W2
13.	*Carabus coriaceus*	4	6	8,3	C1	1,5	D2	0,124	W2

No.	Name of species	No. of traps	Abundance	Constancy		Dominance		W	
				%	***	%			
14.	*Dadobia immersa*	1	5	2,1	C1	1,2	D2	0,025	W1
15.	*Poecilus cupreus*	2	4	4,2	C1	1,0	D1	0,042	W1
16.	*Pterostichus niger*	4	4	8,3	C1	1,0	D1	0,083	W1
17.	*Carabus convexus*	1	3	2,1	C1	0,7	D1	0,015	W1
18.	*Ectobius lapponicus*	2	3	4,2	C1	0,7	D4	0,029	W1
19.	*Dociostaurus marocanus*	3	3	6,2	C1	0,7	D1	0,043	W1
20.	*Cychrus attenuatus*	3	3	6,2	C1	0,7	D1	0,043	W1
21.	*Quedius unicolor*	2	3	4,2	C1	0,7	D1	0,029	W1
22.	*Carabus hungaricus*	2	2	4,2	C1	0,5	D1	0,021	W1
23.	*Petrobius brevistylis*	2	2	4,2	C1	0,5	D1	0,021	W1
24.	*Oiceoptoma thoracica*	1	2	2,1	C1	0,5	D1	0,010	W1
25.	*Silpha carinata*	2	2	4,2	C1	0,5	D1	0,021	W1
26.	*Pterostichus vulgaris*	1	2	2,1	C1	0,5	D1	0,010	W1
27.	*Ceruchus chrysomelinus*	1	1	2,1	C1	0,2	D1	0,004	W1
28.	*Hister sinuatus*	1	1	2,1	C1	0,2	D5	0,004	W1
29.	*Poecilus cupreus*	1	1	2,1	C1	0,2	D1	0,004	W1
30.	*Brachynus crepitans*	1	1	2,1	C1	0,2	D1	0,004	W1
31.	*Cychrus semigranosus*	1	1	2,1	C1	0,2	D1	0,004	W1
32.	*Pterostichus cylindricus*	1	1	2,1	C1	0,2	D1	0,004	W1
33.	*Staphylinus caesareus*	1	1	2,1	C1	0,2	D1	0,004	W1
34.	*Meligethes aeneus*	1	1	2,1	C1	0,2	D1	0,004	W1
35.	*Psyllobora vigintiduopunctata*	1	1	2,1	C1	0,2	D1	0,004	W1
36.	*Carabus intricatus*	1	1	2,1	C1	0,2	D1	0,004	W1
37.	*Leistus rufomarginatus*	1	1	2,1	C1	0,2	D1	0,004	W1
	Total 37 species	48	412						

As a result of the calculation of the ecological indices, the distribution and importance of species in the epigeic fauna collected are highlighted (Table 2). *Geotrupes vernalis* (C3, D3, W5) and *Phalangium opilo* (C3, D5, W5) are constant and edifice species, having the highest values of constancy and dominance, which gives them an essential role in the community structure. *Armadilidium vulgare* (C1, D4, W3) and *Necrophorus vespillo* (C1, D4, W3) are dominant accessory species, with a significant presence, but lower compared to the edifice species. In contrast, species like *Cychrus caraboides* (C1, D1, W2) and *Panorpa communis* (C1, D3, W2) are subdominant and occasional, with low constancy, indicating a sporadic presence in the habitat.

The majority of species (e.g., *Staphilinus olens*, *Carabus coriaceus*, *Dociostaurus marocanus*) are classified as accidental species (C1, D1-D2, W1), having very low frequency and ecological influence.

This analysis suggests an ecosystem in which only a few species are dominant, while most species have a sporadic presence, influenced by environmental factors, possibly even by the zoophagous nature of predatory species.

Table 3. Species composition of arthropods collected in soil traps in apple orchards from Nechit

No.	Name of species	Harvest								Number of traps	Total samples
		I	II	III	IV	V	VI	VII	VIII		
1.	*Absidia pilosa*	1	0	0	0	0	0	0	0	1	1
2.	*Aclypea alpicola*	0	3	1	0	7	15	1	0	3	3
3.	*Acylophorus glaberimus*	0	8	0	0	0	0	0	0	5	8
4.	*Acylophorus glaberrimus*	0	0	1	0	0	0	0	0	1	1
5.	*Agriotes aterrimus*	7	0	0	0	0	0	0	0	4	7
6.	*Agriotes lineatus*	0	0	0	0	0	0	1	0	1	1
7.	*Agriotes ustulatus*	15	1	0	0	0	0	0	0	10	16
8.	*Aleochara moerens*	0	0	0	0	1	0	0	0	1	1
9.	*Amara aenea*	6	0	0	0	0	0	0	0	4	6
10.	*Anisodactylus binotatus*	0	0	1	0	1	0	0	0	2	2
11.	*Anisodactylus signatus*	0	0	0	7	0	0	0	0	2	7
12.	*Aphanisticus pusillus*	0	1	0	0	0	0	0	0	1	1
13.	*Aptinus bombarda*	0	0	0	0	1	0	0	0	1	1
14.	*Armadilidium vulgare*	389	194	108	42	74	287	329	339	81	1762
15.	*Athous haemorrhoidalis*	0	2	0	0	0	0	0	0	1	2
16.	*Barynotus obscurus*	0	0	0	0	0	1	0	0	1	1
17.	*Bembidion varium*	1	0	0	0	0	0	0	0	1	1
18.	*Brachinus crepitans*	4	0	0	0	0	0	0	0	3	4
19.	*Byrrhus pustulatus*	0	0	0	0	0	0	0	1	1	1
20.	*Calathus fuscipes*	0	0	0	0	0	1	0	0	1	1
21.	*Carabus coriaceus*	2	0	0	0	0	0	0	0	2	2

No.	Name of species	No. of traps								Abundance	Constancy
		I	II	III	IV	V	VI	VII	VIII		
22.	*Chromatiulus unilineatus*	0	1	1	0	1	0	1	11	14	15
23.	*Chrysomela geminata*	1	1	0	0	0	0	0	0	2	2
24.	*Chrysomela rufa*	0	0	0	0	0	0	0	1	1	1
25.	*Cicindela campestris*	1	0	0	0	0	0	0	0	1	1
26.	*Cicindela germanica*	0	1	0	0	0	0	0	0	1	1
27.	*Cleonis punctiger*	1	0	0	0	0	0	0	0	1	1
28.	*Clivina fossor*	1	0	0	0	0	0	0	0	1	1
29.	*Clytra humeralis*	1	0	0	0	0	0	0	0	1	1
30.	*Coccinella septempunctata*	0	0	0	0	0	0	0	1	1	1
31.	*Dermestes laniarius*	15	6	1	1	1	1	0	0	12	25
32.	*Drypta dentata*	1	0	0	0	0	0	0	0	1	1
33.	*Elater nigrinus*	0	0	0	0	0	0	0	1	1	1
34.	*Forficula auricularia*	0	0	0	0	0	2	0	1	3	2
35.	*Galeruca pomonae*	0	0	1	0	0	0	0	1	2	2
36.	*Galeruca tanaceti*	0	0	0	0	0	0	1	1	1	1
37.	*Gryllotalpa gryllotalpa*	0	2	0	0	0	0	0	0	1	2
38.	*Harpalus calceatus*	0	0	0	0	0	1	1	0	1	2
39.	*Harpalus distinguendus*	0	0	0	0	0	0	0	1	1	1
40.	*Harpalus marginella*	0	0	0	0	0	0	0	1	1	1
41.	*Harpalus tardus*	1	0	0	1	0	0	0	0	2	2
42.	*Hister funestus*	1	0	0	0	0	0	0	0	1	1
43.	*Hister neglectus*	3	0	0	0	0	0	0	0	2	3
44.	*Hister ruficornis*	0	2	0	0	0	0	0	0	1	2
45.	*Hister vernalis*	0	1	0	0	0	0	0	0	1	1
46.	*Hypera nigriostris*	0	1	0	0	0	0	0	0	1	1
47.	*Licinus granulatus*	1	0	0	0	0	0	0	0	1	1
48.	*Liophloeus tessulatus*	0	0	0	0	0	0	1	0	1	1
49.	*Lixus cardui*	0	0	0	0	0	0	1	0	1	1
50.	*Lygaeus aequestris*	47	7	3	0	0	0	0	0	12	57
51.	*Messor structor*	15	0	0	0	22	92	2	0	9	131
52.	*Mordellistena parvula*	0	1	0	0	0	0	0	0	1	1
53.	*Nebria brevicollis*	0	0	0	0	0	0	0	2	1	2
54.	*Necrophorus vespillo*	1	6	2	0	0	0	0	0	7	9
55.	*Notaris bimaculatus*	0	0	0	0	0	1	0	0	1	1
56.	*Oiceoptoma thoracium*	1	0	0	0	0	0	0	0	1	1
57.	*Onthophagus ovatus*	20	2	1	0	0	0	6	0	11	29
58.	*Onthophagus vacca*	5	0	0	0	0	0	0	0	2	5
59.	*(Dociostaurus maroccanus)*	0	0	0	0	0	0	0	1	1	1
60.	*Panorpa communis*	1	1	1	0	0	0		0	10	14
61.	*Phalangium opilio*	206	71	29	49	49	49	44	23	87	520
62.	*Philonthus coruscus*	0	0	0	0	0	1	0	0	1	1
63.	*Plagiodera versicolora*	0	0	0	0	0	1	0	0	1	1
64.	*Platynus glacialis*	0	0	0	0	0	0	1	0	1	1
65.	*Pseudophonus griseus*	0	0	0	1	0	0	0	0	1	1
66.	*Pseudophonus pubescens*	4	4	0	0	2	0	0	0	9	10
67.	*Pterostichus cupreus*	286	74	30	19	6	11	17	22	53	485
68.	*Pterostichus lepidus*	6	0	0	0	0	0	0	0	3	6
69.	*Pterostichus niger*	0	0	0	0	0	2	0	0	1	2
70.	*Pterostichus nigrita*	1	0	0	0	0	0	0	0	1	1
71.	*Pterostichus vulgaris*	0	0	0	0	0	0	0	2	1	1
72.	*Pyrrhocoris apterus*	0	6	0	6	6	2	0	0	15	20
73.	*Quedius cruentus*	5	0	0	0	0	0	0	0	2	5
74.	*Quedius unicolor*	0	0	0	0	1	1	0	1	3	3
75.	*Silpha carinata*	1	1	0	0	0	0	0	0	2	2
76.	*Silpha obscura*	5	0	0	1	0	0	1	0	5	7
77.	*Sitona lineatus*	0	0	0	0	0	0	1	1	2	2
78.	*Sphenophorus piceus*	1	0	0	0	0	0	0	0	1	1
79.	*Staphylinus caesareus*	13	1	0	0	0	0	1	0	7	15
80.	*Staphylinus olens*	5	1	0	0	0	0	0	0	4	6
81.	*Tachinus elongatus*	0	0	0	0	0	0	1	0	1	1
82.	*Typocerus attenuatus*	0	1	0	0	0	0	0	0	1	1
Total 82 species		1075	400	180	127	172	468	409	411	96	3247

The study of epigeic arthropods (Table 3) collected through soil traps in the apple orchard at Nechit from May to September highlights significant diversity, with 82 identified species and a total of 3247 individuals collected. The data suggest the presence of dominant species, as well as a variable seasonal distribution. The dominant species include *Armadilidium vulgare* (1762 individuals), *Phalangium opilio* (520 individuals), and *Pterostichus cupreus* (485 individuals), indicating a major presence of detritivorous and predatory species, which are

essential for the ecological balance of the soil. In contrast, some species such as *Brachinus crepitans* or *Cicindela campestris* are represented by a single specimen, suggesting a sporadic presence or more restricted habitat. Additionally, the significant variation between collections suggests a heterogeneous distribution of species, possibly influenced by microclimatic factors.

Table 4. The situation regarding the calculation of ecological factors for each species during the period in apple orchards from Nechit

No.	Name of species	Number of traps	Abundance	Constancy		Dominance		W	
				%	***	%	***	%	***
1.	*Armadilidium vulgare*	81	1762	84,4	C4	54,3	D5	45,829	W5
2.	*Phalangium opilio*	87	520	90,6	C4	16,0	D5	14,496	W5
3.	*Pterostichus cupreus*	53	485	55,2	C3	14,9	D5	8,224	W4
4.	*Messor structor*	9	131	9,3	C1	4,0	D3	0,372	W2
5.	*Lygaeus aequestris*	12	57	12,5	C1	1,7	D2	0,212	W2
6.	*Onthophagus ovatus*	11	29	11,5	C1	0,9	D1	0,103	W2
7.	*Dermestes laniarius*	12	25	12,5	C1	0,8	D1	0,100	W1
8.	*Pyrrhocoris apterus*	15	20	15,6	C1	0,6	D1	0,094	W1
9.	*Agriotes ustulatus*	10	16	10,4	C1	0,5	D1	0,052	W1
10.	*Chromatiulus unilineatus*	14	15	14,6	C1	0,5	D1	0,073	W1
11.	*Staphylinus caesareus*	7	15	7,2	C1	0,5	D1	0,036	W1
12.	*Panorpa communis*	10	14	10,4	C1	0,4	D1	0,042	W1
13.	*Pseudophonus pubescens*	9	10	9,3	C1	0,3	D1	0,028	W1
14.	*Necrophorus vespillo*	7	9	7,2	C1	0,3	D1	0,022	W1
15.	*Acylophorus glaberimus*	5	8	5,2	C1	0,2	D1	0,010	W1
16.	*Agriotes aterrimus*	4	7	4,2	C1	0,2	D1	0,008	W1
17.	*Anisodactylus signatus*	2	7	2,1	C1	0,2	D1	0,004	W1
18.	*Silpha obscura*	5	7	5,2	C1	0,2	D1	0,010	W1
19.	*Amara aenea*	4	6	4,2	C1	0,2	D1	0,008	W1
20.	*Pterostichus lepidus*	3	6	3,1	C1	0,2	D1	0,006	W1
21.	*Staphylinus olens*	4	6	4,2	C1	0,2	D1	0,008	W1
22.	*Onthophagus vacca*	2	5	2,1	C1	0,1	D1	0,002	W1
23.	*Quedius cruentus*	2	5	2,1	C1	0,1	D1	0,002	W1
24.	*Brachinus crepitans*	3	4	3,1	C1	0,1	D1	0,003	W1
25.	*Aclypea alpicola*	3	3	3,1	C1	0,1	D1	0,003	W1
26.	*Hister neglectus*	2	3	2,1	C1	0,1	D1	0,002	W1
27.	*Quedius unicolor*	3	3	3,1	C1	0,1	D1	0,0003	W1
28.	*Anisodactylus binotatus*	2	2	2,1	C1	0,1	D1	0,002	W1
29.	*Athous haemorrhoidalis*	1	2	1,0	C1	0,1	D1	0,001	W1
30.	*Carabus coriaceus*	2	2	2,1	C1	0,1	D1	0,002	W1
31.	*Chrysomela geminata*	2	2	2,1	C1	0,1	D1	0,002	W1
32.	*Forficula auricularia*	3	2	3,1	C1	0,1	D1	0,003	W1
33.	*Galeruca pomonae*	2	2	2,1	C1	0,1	D1	0,002	W1
34.	*Gryllotalpa gryllotalpa*	1	2	1,0	C1	0,1	D1	0,001	W1
35.	*Harpalus calceatus*	1	2	1,0	C1	0,1	D1	0,001	W1
36.	*Harpalus tardus*	2	2	2,1	C1	0,1	D1	0,002	W1
37.	*Hister ruficornis*	1	2	1,0	C1	0,1	D1	0,001	W1
38.	*Nebria brevicollis*	1	2	1,0	C1	0,1	D1	0,001	W1
39.	*Pterostichus niger*	1	2	1,0	C1	0,1	D1	0,001	W1
40.	*Silpha carinata*	2	2	2,1	C1	0,1	D1	0,002	W1
41.	*Sitona lineatus*	2	2	2,1	C1	0,1	D1	0,002	W1
42.	*Absidia pilosa*	1	1	1,0	C1	0,03	D1	<0,001	W1
43.	*Acylophorus glaberrimus*	1	1	1,0	C1	0,03	D1	<0,001	W1
44.	*Agriotes lineatus*	1	1	1,0	C1	0,03	D1	<0,001	W1
45.	*Aleochara moerens*	1	1	1,0	C1	0,03	D1	<0,001	W1
46.	*Aphanisticus pusillus*	1	1	1,0	C1	0,03	D1	<0,001	W1
47.	*Aptinus bombarda*	1	1	1,0	C1	0,03	D1	<0,001	W1
48.	*Barynotus obscurus*	1	1	1,0	C1	0,03	D1	<0,001	W1
49.	*Bembidion varium*	1	1	1,0	C1	0,03	D1	<0,001	W1
50.	*Byrrhus pustulatus*	1	1	1,0	C1	0,03	D1	<0,001	W1
51.	*Calathus fuscipes*	1	1	1,0	C1	0,03	D1	<0,001	W1
52.	*Chrysomela rufa*	1	1	1,0	C1	0,03	D1	<0,001	W1
53.	*Cicindela campestris*	1	1	1,0	C1	0,03	D1	<0,001	W1
54.	*Cicindela germanica*	1	1	1,0	C1	0,03	D1	<0,001	W1
55.	*Cleonis punctiger*	1	1	1,0	C1	0,03	D1	<0,001	W1
56.	*Clivina fossor*	1	1	1,0	C1	0,03	D1	<0,001	W1
57.	*Clytra humeralis*	1	1	1,0	C1	0,03	D1	<0,001	W1
58.	*Coccinella septempunctata*	1	1	1,0	C1	0,03	D1	<0,001	W1
59.	*Drypta dentata*	1	1	1,0	C1	0,03	D1	<0,001	W1
60.	*Elater nigrinus*	1	1	1,0	C1	0,03	D1	<0,001	W1
61.	*Galeruca tanaceti*	1	1	1,0	C1	0,03	D1	<0,001	W1

No.	Name of species	Number of traps	Abundance	Constancy		Dominance		W	
				%	***	%	***	%	***
62.	*Harpalus distinguendus*	1	1	1,0	C1	0,03	D1	<0,001	W1
63.	*Harpalus marginella*	1	1	1,0	C1	0,03	D1	<0,001	W1
64.	*Hister funestus*	1	1	1,0	C1	0,03	D1	<0,001	W1
65.	*Hister vernalis*	1	1	1,0	C1	0,03	D1	<0,001	W1
66.	*Hypera nigriostris*	1	1	1,0	C1	0,03	D1	<0,001	W1
67.	*Licinus granulatus*	1	1	1,0	C1	0,03	D1	<0,001	W1
68.	*Liophloeus tessulatus*	1	1	1,0	C1	0,03	D1	<0,001	W1
69.	*Lixus cardui*	1	1	1,0	C1	0,03	D1	<0,001	W1
70.	*Mordellistena parvula*	1	1	1,0	C1	0,03	D1	<0,001	W1
71.	*Notaris bimaculatus*	1	1	1,0	C1	0,03	D1	<0,001	W1
72.	*Oiceoptoma thoracium*	1	1	1,0	C1	0,03	D1	<0,001	W1
73.	*Ortoptere (Dociostaurus maroccanus)*	1	1	1,0	C1	0,03	D1	<0,001	W1
74.	*Philonthus coruscus*	1	1	1,0	C1	0,03	D1	<0,001	W1
75.	*Plagiodera versicolora*	1	1	1,0	C1	0,03	D1	<0,001	W1
76.	*Platynus glacialis*	1	1	1,0	C1	0,03	D1	<0,001	W1
77.	*Pseudophonus griseus*	1	1	1,0	C1	0,03	D1	<0,001	W1
78.	*Pterostichus nigrita*	1	1	1,0	C1	0,03	D1	<0,001	W1
79.	*Pterostichus vulgaris*	1	1	1,0	C1	0,03	D1	<0,001	W1
80.	*Sphenophorus piceus*	1	1	1,0	C1	0,03	D1	<0,001	W1
81.	*Tachinus elongatus*	1	1	1,0	C1	0,03	D1	<0,001	W1
82.	*Typocerus attenuatus*	1	1	1,0	C1	0,03	D1	<0,001	W1
Total 82 species		96	3247						

As a result of the determinations and data compilation obtained from the apple orchard in Nechit, the epigeic arthropod fauna is dominated by a few species with constant presence and major ecological impact, while the majority of species are accidental and have reduced influence. The species *Armadilidium vulgare* (C4, D5, W5) and *Phalangium opilio* (C4, D5, W5) are the most frequent and influential, with high constancy and significant ecological weight, while the species *Pterostichus cupreus* (C3, D5, W4) joins them as a constant species, playing an important role in the ecosystem.

In contrast, most species are accidental (C1), with a presence below 25% and low dominance (D1-D3). Among these, *Messor structor* (C1, D3, W2) and *Lygaeus aequestris* (C1, D2, W2) are worth mentioning. Over 90% of these species have a very low ecological significance index (W1 <0.1%).

Overall, the structure of the fauna suggests a relatively stable ecosystem, dominated by a few species adapted to the orchard environment, while the rest appear sporadically, without a major impact.

Table 5. Centralization of common species collected in both ecosystems during the observation period

No.	Name of species	Forest area		Apple orchards		Total samples	Type of food***
		No. of traps	Abundance	No. of traps	Abundance		
1.	*Aptinus bombarda*	8	**13**	1	**1**	**14**	P
2.	*Armadilidium vulgare*	9	**36**	81	**1762**	**1798**	I
3.	*Brachinus crepitans*	1	**1**	4	**5**	**6**	P
4.	*Carabus coriaceus*	4	**6**	2	**2**	**8**	P
5.	*Chromatiulus unilineatus*	12	**15**	14	**15**	**30**	
6.	*Messor structor*	9	**14**	9	**131**	**145**	P
7.	*Necrophorus vespillo*	10	**30**	7	**9**	**39**	I
8.	*Oiceoptoma thoracium*	1	**2**	1	**1**	**3**	I
9.	*Panorpa communis*	9	**16**	10	**14**	**30**	P
10.	*Phalangium opilio*	32	**96**	87	**520**	**616**	P
11.	*Pterostichus niger*	4	**4**	1	**2**	**6**	P
12.	*Quedius unicolor*	2	**3**	3	**3**	**6**	P
13.	*Silpha carinata*	2	**2**	2	**2**	**4**	P
14.	*Staphylinus caesareus*	1	**1**	7	**15**	**16**	P
Total			**239**		**2482**	**2721**	

***P=pradatory species, D=harmful species, I= indifferent species

Table 5 reflects the distribution and abundance of 14 common insect species in the two ecosystems, forest and apple orchard, in Nechit village, Neamț County.

Species such as *Armadilidium vulgare* and *Phalangium opilio* are much more abundant in the apple orchard plantation, being present in 81 and 87 traps, respectively, in this location,

indicating their preference for the conditions in the orchard. Other species, such as *Necrophorus vespillo* and *Messor structor*, have a more balanced distribution between the two experimental plots (forest and apple orchard), suggesting greater adaptability to both environments.
When analyzing the data for species such as *Brachinus crepitans* and *Oiceoptoma thoracium*, these are much rarer, with only a few individuals captured in both ecosystems.
In total, there is a significantly greater abundance in the apple orchard, with 2482 individuals collected, compared to 239 individuals from the traps placed in the forest plot, suggesting a higher ecological diversity in this habitat.

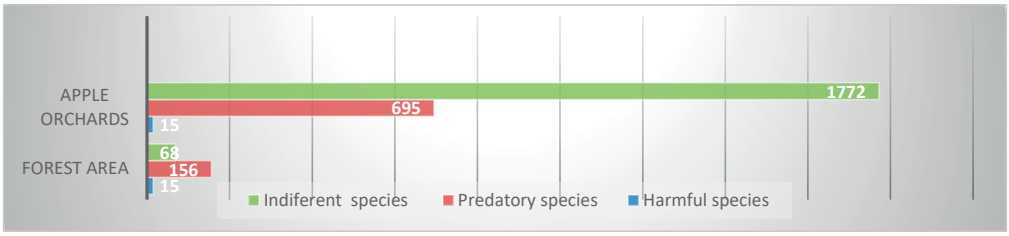

Figure 2. Abundance of common species collected in the two stations and their feeding type

In the graphical representation, it can be observed that the common species collected in the two ecosystems are strongly influenced by the habitat conditions provided. Thus, following the collections from May to September 2024, the common arthropod species totaled 239 individuals in the traps from the forest plot and 2482 individuals in the station located in the apple orchard plantation. It is evident that in the orchard plantation, the number of indifferent individuals is the highest, reaching a value of 1772, followed by the predatory species, while the number of herbivorous individuals is balanced in both plots, totaling 15 individuals each.

CONCLUSIONS

Diversity and abundance of fauna are influenced by the type of ecosystem, which reflects the fact that in the forest plot, the epigeic fauna is characterized by low abundance and a sporadic presence of most species, whereas in the apple orchard plantation, a much greater diversity and significantly higher abundance were observed (2482 individuals compared to 239 in the forest). This suggests that apple orchards provide much more favorable conditions for the development
The dominant species are constant in both ecosystems, and species such as *Geotrupes vernalis* and *Phalangium opilio* are the most abundant and constantly present in both locations, having a significant ecological impact. These species are considered "edifices," with a large proportion in the faunal structure of the studied habitats.
Accidental species play a minor ecological role, as many of the species collected in both stations, such as *Staphilinus olens* and *Carabus coriaceus*, have low frequency and minor ecological influence, which places them in the category of accidental species, with a sporadic presence and low weight in the faunal structure.
The significant variability in the collections from May to September indicates the influence of microclimatic factors on species distribution, especially in the case of species with sporadic presence (e.g., *Brachinus crepitans*, *Cicindela campestris*).
The different abundance between the two ecosystems suggests specific ecological preferences. Therefore, detritivorous and predatory species, such as *Armadilidium vulgare* and *Pterostichus cupreus*, are much more abundant in apple orchards, indicating a preference for the ecological conditions of this type of habitat, in contrast to species with a lower presence in the forest.

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