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Diversity of Soil Arthopod Species in Campus II UIN Antasari Banjarmasin

Norfajrina[1]*, Agustina Ambar Pertiwi[2]
[1]Biology Education Study Program, Lambung Mangkurat University, Jl. Brig Jend. Hasan Basri, Banjarmasin City, 70123, Indonesia
[2]Study Program of Biology, UIN Antasari Banjarmasin, Jl. A. Yani, Banjarmasin City, 70235, Indonesia.

Corresponding author*
norfajrina1998@gmail.com

Abstract: Soil arthropods are fauna that play an important role in the recycling of nutrients through the decomposition process to maintain the natural structure of the soil. The presence of soil arthropods in an area is influenced by environmental factors such as soil conditions, temperature, humidity and others. Campus II of UIN Antasari Banjarmasin has a combination of land characteristics, namely open land and green land that has the potential to become a habitat for soil arthropods. The unavailability of data on the existence of soil arthropods in the campus II area of UIN Antasari Banjarmasin requires the need to conduct research to identify species and assess the level of diversity of soil arthropod animals in order to add scientific treasures and support learning materials. This study uses the trap method (*Pitfall trap*) with a purposive sampling technique, which is deliberate sampling based on the environmental conditions in the field. The results of this study found 85 individuals of soil arthropods consisting of 26 species from five classes with the class Insecta being the dominant class. The environmental conditions at the research site support the existence of soil arthropods. This can be seen from the results of measuring the average temperature of 21.5ºC and the pH of the soil ranging from 6-7. Based on the calculation of the Shannon-Wiener Diversity Index, the value of H' > 1. This indicates that the diversity of soil arthropods in the Campus II area of UIN Antasari Banjarmasin is in the medium category. These findings provide a scientific basis for the sustainable management and conservation of soil ecosystems.

Keywords: Pitfall Trap, Purposive Sampling, Shannon-Wiener.

Introduction

Biodiversity is the main indicator in assessing the balance of an ecosystem in an area. This can be seen from the number and type of species that reflect the complexity of ecological interactions between organisms and their physical environment (Wahyudi et al., 2024). In terrestrial ecosystems, the existence of various species not only indicates adaptation to environmental conditions, but also illustrates the dynamics of symbiotic relationships, competition, and predation that together maintain the stability and continuity of ecosystem functions (Rahmayanti, 2022).

In addition to playing a role in maintaining ecosystem balance, biodiversity also provides various ecosystem services that are important for life. These services include plant pollination, climate regulation, and decomposition of organic matter, all of which make significant contributions to nature's productivity (Damayanti et al., 2022). The existence of abundant genetic resources in this species diversity has great potential to be developed in various fields, such as sustainable agriculture, drug development, and environmental technology innovation, so a deep understanding of species distribution and adaptation patterns is very important (Nahak et al., 2022).

Soil arthropods have a very significant ecological role in soil ecosystems compared to other groups of organisms. Soil arthropods include insects, spiders, centipedes, centipedes, and small crustaceans that inhabit the soil up to the litter layer (Fahri et al., 2024). The presence or existence of soil arthropods in an environment is vital in the nutrient cycle, as they play an active role in the

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decomposition of organic matter and soil aeration, as well as being an important component in the food chain as predators, detritus eaters and as a source of feed for larger predators. These functions make it an effective indicator of ecosystem health (Aprilianti et al., 2024).

The distribution and distribution of soil arthropods is greatly influenced by environmental variables such as humidity, temperature, availability of organic matter, and the type of vegetation that grows in a habitat. These conditions not only determine population diversity and dynamics, but also reflect the impact of environmental changes both naturally occurring and as a result of human intervention (Navitasari et al., 2024). Therefore, the existence and distribution of soil arthropods is greatly influenced by environmental factors such as humidity, temperature, availability of organic matter, and the type of vegetation that grows in an ecosystem, especially in the environment around campus II of UIN Antasari Banjarmasin.

Campus II of UIN Antasari Banjarmasin is one of the ecological areas with unique characteristics. This area consists of open land and green land. This area is surrounded by wetlands in the form of beautiful swamps so that it provides a contrast between infrastructure development activities and natural resources stored in the campus environment. This uniqueness is an important foundation for studying ecological aspects that are rarely explored in the region.

Most of the area on campus II of UIN Antasari Banjarmasin is dominated by wet swampland. This area is an ecosystem that ecologically has different characteristics compared to mineral soils in general. Wet swamplands in this region are known to have very high levels of humidity and abundant organic matter content (Arisanty et al., 2024), thus creating quite extreme conditions due to the pH being too high for various biochemical and biological processes to take place in the soil. These characteristics not only affect the structure of the soil, but also play an important role in determining the type and presence of organisms capable of adapting in the environment (Pelu et al., 2025).

The high humidity and the typical hydrological dynamics of wetlands produce a very supportive habitat for a diverse range of soil organisms, especially for arthropod groups. These unique environmental conditions encourage the development of special adaptations in various species of arthropods, allowing them to survive and thrive despite high humidity and significant rainfall. The adaptation reflects the ability of organisms to adapt to the variability of highly dynamic environmental conditions in wetland areas (Nurhaida et al., 2024).

Soil arthropods, which include insects, spiders, centipedes, centipedes, and small crustaceans, play an important role in maintaining the balance of ecosystems. These organisms contribute directly to the process of decomposition of organic matter, nutrient decomposition, and increased soil aeration, thus helping to maintain soil health while becoming an integral part of the food chain that supports the survival of various species (Jauharlina et al., 2019). Through their activity in the nutrient cycle, the presence of soil arthropods not only reflects essential ecological functions, but also serves as an important indicator in assessing the overall environmental conditions (Swardana et al., 2024).

The wet swampland on Campus II of UIN Antasari Banjarmasin in Banjarmasin has unique characteristics compared to mineral soils in general. These conditions are characterized by extremely high levels of humidity, abundant organic matter content, and characteristic hydrological dynamics, which together create an ideal habitat for soil arthropods. The special adaptations possessed by different species allow them to survive and thrive in these challenging environments, while opening up opportunities to uncover the distribution patterns and adaptation strategies of different species to wetland ecosystem conditions.

This study was conducted to identify the diversity of soil arthropod species in the campus area II of UIN Antasari Banjarmasin, considering the lack of studies that specifically examined these communities in urban wetland environments. In addition, the lack of scientific data on biodiversity in this region makes the potential for conservation efforts and sustainable environmental management, especially in facing infrastructure

development challenges. Therefore, this research is carried out systematically with a comprehensive ecological approach. The results of this study are expected to provide valid data on the composition, distribution, and community structure of soil arthropods, which will later become the scientific basis for landscape planning and biodiversity conservation strategies, as well as make a practical contribution to the development of environmentally friendly technologies.

Materials And Methods

This research was conducted in the Campus II area of UIN Antasari Banjarmasin which is administratively located at Jl. Pandarapan, Guntung Manggis, Banjarbaru, South Kalimantan, Indonesia. The selection of sampling sites is based on several considerations, including: (1) the type of vegetation that affects the number and type of soil arthropods found in the habitat; (2) a location relatively far from tourism activities to minimize external disturbances; and (3) the alignment of the location as a representative field practicum area for students.

The research sample includes all soil arthropods in the Campus II area of UIN Antasari Banjarmasin. The data collection technique uses *the purposive sampling method* with the determination of 4 *traps* where each trap consists of 24 observation points/traps selected to represent the variation of existing species. Sampling was carried out using *a pitfall trap*, which is by installing a plastic cup container with a diameter of 120 mm filled with 60 mL of soap solution. The container is then placed in the mouth hole with the glass parallel to the ground surface, and is equipped with a shield to prevent rainwater from entering which can result in the sample being released.

The trap installation procedure was carried out for 12 hours with sampling carried out in the morning (06.00–18.00 WITA). The captured soil arthropods were then collected and stored in sample bottles that had been given a 70% alcohol solution for preservation and further observation in the biological laboratory. The capture was carried out in three repetitions and was accompanied by photographic documentation as part of the observation process in species identification.

Furthermore, diversity analysis was carried out by calculating the diversity index using the Shannon-Wiener formula (1963), where H' is the Shannon-Wiener diversity index, Pi is the ratio of the number of individuals of a species to the total number of all species, Ni is the number of individuals of the ith species, and N is the total number of individuals. The value of the diversity index obtained is then measured to determine the level of diversity that exists in the ecosystem.

Results And Discussion

This study shows significant diversity in the soil arthropod community at Campus II of UIN Antasari Banjarmasin with a total of 26 species identified that play an important role in maintaining the balance of the wetland ecosystem. These findings suggest that environmental conditions, characterized by high humidity and distinctive hydrological dynamics, can support the unique adaptations of different arthropod groups thereby improving the efficiency of soil decomposition, nutrient cycling, and aeration processes. Variations in distribution and number of individuals between species have been analyzed using the Shannon-Wiener diversity index, which provides an in-depth picture of the complexity and stability of these ecosystems. The following data is presented in the form of the following table.

Table 1. Diversity Index of Soil Arthopods on Campus II UIN Antasari Banjarmasin

No	Species Name	Σ Ind	H'
1	*Parcoblatta virginica*	5	0,072
2	*Solenopsis invicta*	9	0,103
3	*Pritomytmex punctatus*	33	0,160
4	*Camponotus pennsylvancus*	2	0,038
5	*Stromatium barbatum*	1	0,023
6	*Trigoniulus corallinus*	3	0,051
7	*Suriname cocroach*	3	0,051
8	*Armadillidium pictum*	2	0,038
9	*Formica rufa*	3	0,051
10	*Thomisius cherapunjeus*	1	0,023
11	*Aides alboctus*	3	0,051
12	*Anomalous cupsale*	1	0,023
13	*Lepidiota stigma*	2	0,038

14	*Anelosimus eximus*	1	0,023
15	*Half-granddaughter larva*	1	0,023
16	*Latrodectus hasseltii*	1	0,023
17	*Anoplotrupes stercorosus*	1	0,023
18	*Scotophaeus blackwalli*	1	0,023
19	*Tapinoma melanocephalum*	2	0,038
20	*Anoma varicolor*	2	0,038
21	*Aplidia tranversa fabricilis*	1	0,023
22	*Euphyllura olivina*	1	0,023
23	*Coptosoma* sp.	1	0,023
24	*Leptomyrmex darlingtoni*	1	0,023
25	*Anoplolepis gracilipes*	3	0,051
26	*Oecophylla smaragdina*	1	0,023
	Sum	85	1,006

Table 2. Environmental Parameters of UIN Antasari Banjarmasin Campus II *Environmental Parameters*

Environmental Parameters	Unit	Repetition			Range
		1	2	3	
Temperatures	°C	20	20,7	22	20–22
Light Intensity	Lux	4067–4563	4525–5027	4332–4189	4067–5027
Wind Speed	m/s	0–0,2	0–0,7	0–0,7	0–0,7
Air Humidity	%	70–72	70–74	58–71	58–74
Soil Moisture	%	1–2	1–2	1–2	1–2
Soil pH		7	6,9	7	6,9–7

Based on the results of research conducted at Campus II of UIN Antasari Banjarmasin for three iterations, 26 species came from the classes Insecta, Arachnida, Diplopoda, Malacostraca, and Hexapoda. Most of the species found belong to the class Insecta. This is in line with the statements of Arlen (2020) and Wulandari & Andriani (2024) who stated that soil arthropods of the class Insecta have a wide distribution and are often found below the surface of the ground. Insects have features of bodies wrapped in chitin and an external body skeleton, allowing them to adapt to various environmental conditions.

Based on the analysis of the Shannon-Wiener diversity index on 26 observed species, each species showed an H' value of less than 1. However, when the total data from 85 individuals were summed up, it was found that the aggregate diversity index value was above 1, indicating that the diversity of soil arthropods at the study site was categorized as moderate. The classification of species diversity can be explained as follows: a value of H' > 3 indicates high abundance, a value of H' between 1 and 3 indicates moderate diversity, while a value of H' of less than 1 indicates little or low diversity. Thus, these findings support that the observed soil arthropod communities have a moderate level of diversity, which is in line with the criteria that have been established in the literature (Fachrul, 2012).

The number of samples obtained in this study reached 85 species, with a clear dominance of the Insecta class. This is in accordance with the characteristics of the habitat, where soil is the main factor in the survival of soil arthropods. Soil not only serves as a habitat medium, but also as a source of food and a means of interaction between individuals in the ecosystem. In addition, physical factors such as soil temperature and pH also affect the composition and condition of soil arthropods.

Soil temperature plays an important role in the process of decomposition of organic matter, which in turn affects soil fertility and its attractiveness to insects. A faster decomposition process will increase the availability of organic matter, thus attracting more soil organisms to breed. Higher temperatures or ideal for the decomposition of organic matter also favor the growth of more fertile vegetation (Wibowo & Alby, 2020). This, in turn, increases the number of soil arthropods present in the environment.

Based on the results of environmental parameter measurement, the soil temperature in the research area ranged from 20-22°C with an average temperature of 21.5°C. The optimal soil temperature for the development of soil arthropods is in the range of 15°C (minimum temperature) to 25°C (optimal temperature). The maximum temperature that can be maintained is 45°C (Asrina et al., 2024). This means that the soil temperature in the research area is ideal to support the survival of various arthropod species.

The influence of temperature on soil arthropod populations is consistent with the fact that soil temperature plays a key role in determining the presence and activity of arthropods. Suitable temperature can accelerate the rate of decomposition of organic matter (Stuart et al.,

2020). This directly increases the availability of nutrients for vegetation growth. The lush vegetation then attracts more soil organisms to thrive.

In addition to temperature, soil pH is also an important factor in determining the distribution and activity of soil arthropods. The degree of acidity of the soil in the study area showed a range between 6-7, indicating that the soil in this region had a slightly acidic pH. In general, neutral soil pH is preferred by soil arthropods for growth, although some species can survive in slightly acidic or alkaline soils. Soil fauna is more commonly found in soils with a neutral to slightly acidic pH because these conditions favor the availability of organic matter and nutrients (Trisnawati, 2022).

In the study area, the pH of the soil with a little acidity indicates that abundant organic litter allows soil arthropods to develop properly. The presence of high organic matter supports the overall health of the soil biosphere. Soil is a vital component that not only provides food, but also becomes a medium of interaction for arthropods (Leksono, 2017). The role of soil as a primary habitat also supports essential biochemical processes, such as the decomposition of organic matter.

The decomposition process is greatly influenced by other environmental factors, namely soil temperature and pH. The combination of ideal temperature and favorable pH creates optimal conditions for the growth of soil arthropods. The presence of arthropods in the soil reflects the synergy between nutrient availability and optimal environmental conditions. This allows arthropods to grow and interact harmoniously within soil ecosystems.

Ideal temperature conditions are indirectly related to the availability of lush vegetation. Faster decomposition of organic matter promotes soil fertility and attracts the presence of insects as a food source for arthropods. In contrast, the acidity of the soil that is close to neutral to slightly acidic creates favorable conditions for the presence of arthropods. Soil pH fluctuations can be caused by environmental factors such as rainfall, volcanic activity, and tides, as well as human intervention through fertilization, lime, and insecticides.

Previous research in the rice field area of Watugaluh Village, Jombang Regency showed that the soil arthropod diversity index during the day was at a moderate level with an index value of > 1. The index is influenced by vegetation conditions, crop productivity, and the amount of organic litter available. Factors such as humidity, temperature, pH, and organic matter content together determine the presence of soil arthropods. This data is an important indicator in the sustainable management and conservation of soil ecosystems (Wulandari & Andriani, 2024).

The existence of soil macrofauna is dominant in the class Insecta. The majority of the species found in this study belong to the class Insecta, which has a wide distribution and optimal adaptation to soil habitats. The body morphology of insects protected by chitin allows them to survive in a wide range of environmental conditions (Fachrul, 2012). This explains the predominance of insects in the observed soil arthropod community.

Conclusions

Based on the results of the research, at Campus II of UIN Antasari Banjarmasin, there were 85 soil arthropod individuals consisting of 26 species and coming from five classes dominated by the Insecta class. The environmental conditions at the research site support the existence of soil arthropods. This can be seen from the results of measuring the average temperature of 21.5ºC and the pH of the soil ranging from 6-7. Based on the calculation of the Shannon-Wiener Diversity Index, the value of H' > 1. This indicates that the diversity of soil arthropods in the Campus II area of UIN Antasari Banjarmasin is in the medium category.

Conflict of Interest: The publication of an article entitled "Diversity of Soil Arthopod Species at Campus II of UIN Antasari Banjarmasin", the author hereby states that there is no conflict of interest related to this research. The author is committed to maintaining academic integrity and ensuring that all findings and analyses presented in this article are objective and based on accurate

data. Therefore, this article is expected to make a meaningful contribution to the development of science and further understanding of animal diversity found on campus II of UIN Antasari Banjarmasin.

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