



Insect Species Diversity in Bangek River Area Lubuk Minturun Padang

(Keanekaragaman Jenis Serangga di Kawasan Sungai Bangek Lubuk Minturun Kota Padang)

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Abstrak	Abstract
<p>Metode dalam penelitian ini adalah metode jaring serangga, dimana perairan Sungai Bangek sebagai lokasi pengambilan sampel penelitian. Data yang dikumpulkan adalah data primer dan data sekunder. Penentuan Lokasi Penelitian. Lokasi penelitian ini dilakukan di Sungai Bangek, Kecamatan Lubuk Minturun, Kota Padang, Provinsi Sumatera Barat. Teknik Pengambilan Sampel Pengambilan sampel serangga dilakukan satu kali selama penelitian berlangsung dengan menggunakan jaring serangga. Pengambilan sampel serangga dilakukan dengan menyisir sungai-sungai yang berada di wilayah administrasi Lubuk Minturun. Total serangga yang tertangkap di perairan sungai Bangek berjumlah 35 individu. Total ordo Lepidoptera yang diperoleh sebanyak 5 individu, ordo odonata 28 individu, ordo hemiptera 1 jenis dan ordo orthoptera 1 jenis.</p> <p>Kata kunci: <i>Jaring serangga, Sungai Bangek, Serangga</i></p>	<p><i>The study employed the insect net method to sample insects from the Bangek River. Primary and secondary data were collected for analysis. The research was conducted at Bangek River, Lubuk Minturun District, Padang City, West Sumatra Province. Insect sampling involved a single event using an insect net within the administrative area of Lubuk Minturun. A total of 35 insects were captured from the Bangek River, comprising 5 species from the Lepidoptera order, 28 from the Odonata order, and 1 species each from the Hemiptera and Orthoptera orders.</i></p> <p>Keywords: <i>Bangek River, Insect, Insect net,</i></p>

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INTRODUCTION

Insects are a remarkably diverse group within the animal kingdom, constituting over 72% of its entirety. Approximately 10%

of all insects inhabit aquatic environments, where they are classified into ten orders based on their feeding habits—herbivores, carnivores, and detritivores [1]. Aquatic insects undergo various life stages in water,

both submerged and on the water's surface [2]. Insects play a crucial role in the aquatic nutrient cycle and serve as essential components of aquatic food webs [3].

Research on aquatic biota, such as insect larvae, offers numerous benefits, including monitoring environmental changes caused by human activities (anthropogenic). Aquatic insects are highly regarded as reliable indicators of aquatic ecosystem health [4]. Healthy aquatic insect communities are typically found in pristine, small natural rivers, indicating minimal pollution. These communities exhibit richness and high taxonomic diversity, measured by species diversity [4]. Some aquatic insect species are particularly sensitive to environmental pollution and serve as indicators of water quality, while others can tolerate and reproduce in polluted conditions [5]. Water insects are crucial for maintaining the balance of aquatic ecosystems, contributing significantly to nutrient cycling and forming an essential part of the aquatic food web. Their presence and diversity provide valuable insights into the overall health of aquatic environments, making research on aquatic biota, especially insect larvae, essential for understanding environmental dynamics influenced by human activities.

Aquatic insects are vital for maintaining the equilibrium of aquatic ecosystems. They contribute significantly to nutrient cycling and are essential components of aquatic food webs. The presence and health of aquatic insects serve as indicators of the overall condition of the aquatic environment, offering valuable insights into ecosystem health. Variations in aquatic insect populations can signal environmental disturbances, including those caused by human activities.

Research focusing on aquatic organisms, particularly the larval stages of insects, is crucial for understanding environmental changes. The larval stage is especially vulnerable and can provide a clear indication of water quality and the sustainability of aquatic ecosystems. Analyzing the abundance, distribution, and health of insect larvae offers deep insights into the impacts of human activities, such as water pollution and land use changes, on aquatic ecosystems.

Understanding the roles and responses of aquatic insects to environmental changes supports aquatic biodiversity conservation and provides essential information for sustainable water resource management. This research is key to maintaining the balance of complex aquatic ecosystems and protecting environmental sustainability for future generations.

Aquatic insects encompass various orders with diverse roles, ranging from herbivores and carnivores to detritivores. This diversity reflects their adaptation to different water conditions. Recognizing the roles of each order of aquatic insects helps in detailing their contributions to aquatic ecosystems.

One critical aspect of this research is using aquatic insects as indicators of aquatic environmental health. Well-preserved water insect communities found in unpolluted small natural rivers signal a healthy environment. Assessing the richness of aquatic insect taxa is an effective method for evaluating the sustainability of aquatic environments. By cataloging existing species, we can map biological diversity and measure the impact of human activities.

It is important to note that some species of aquatic insects are highly sensitive to environmental pollution. Their sensitivity to water quality changes makes them effective

markers of ecosystem disturbances. Thus, continuous monitoring of aquatic insect populations can provide early warnings about threats to the health of aquatic ecosystems.

Human activities, such as industrial and agricultural waste, are significant concerns as potential sources of pollution impacting aquatic insect communities. Understanding the interactions between humans and aquatic ecosystems through the study of aquatic insects is crucial for conservation and rehabilitation efforts.

As global climate change and human populations grow, research on aquatic insects becomes increasingly relevant. The dependence of humans on water resources highlights the urgency of understanding the impacts of human activities on ecosystem balance. Therefore, further research on aquatic insects is essential for developing more effective and sustainable conservation strategies.

Finally, cross-sector collaboration between environmental science, conservation, and policy needs enhancement. Integrating knowledge from various scientific disciplines will facilitate the development of holistic solutions to protect aquatic ecosystems and maintain water resource sustainability for future generations.

METHODS

This research was carried out on October 1 2023 in the waters of the Bangek River, Lubuk Minturun District, Padang City, West Sumatra Province.

Method

The method used in this research is the insect net method, with the Bangek River serving as the sampling location. The

collected data includes both primary and secondary data.

Research sites

The research was conducted in the Bangek River, located in the Lubuk Minturun District, Padang City, West Sumatra Province.



Figure 1. Bangek River, Lubuk Minturun

Sampling technique

Insect sampling was conducted once during the research using an insect net. The samples were collected by sweeping the rivers within the Lubuk Minturun administrative area.

Insect Identification

Insect identification is carried out at the species (morphospecies) level by referring to several websites.

Observation variables

Number of orders, families and species

Data analysis

Data analysis utilized the Shannon-Weiner diversity index (H) as described by Magurran (1988). The formula used is as follows :

$$H' = - \sum_{i=1}^s P_i \ln P_i$$

where :

H' = Species Diversity

S = Number of Species

Pi = Comparison of the number of species of type i with the entire type

This index is used to evaluate the level of insect diversity in the Bangek River. A diversity index value greater than 3 indicates a high level of diversity, reflecting stable environmental conditions. A value between 1 and 3 indicates a medium level of diversity, while a value less than 1 indicates a low level of diversity.

RESULTS AND DISCUSSION

Based on the research conducted, 35 species aquatic insects were found along the Bangek

River, comprising 9 species, 4 orders, and 7 families. The most dominant species was *Paragomphus elpidius*, with 15 species, representing 41.67% of the total. Conversely, species such as *Jamides phaselli*, *Bothrogonia ferruginea*, and *Oedaelus infernalis* were found in smaller numbers, with only 1 species each, accounting for 2.87%.

The evaluation of the diversity index using the Shannon-Weiner method indicates that the Bangek River area has a medium level of diversity, with a diversity index value of 1.52. The total number of species collected at the observation location, based on the sampling technique, is shown in Table 1 below.

Table 1. Types of Insects Caught in the Waters of the Bangek River, Lubuk Minturun

No	Ordo	Famili	Species	Amount	Pi (ni/N)	Ln Pi	Pi.Ln Pi
1	Lepidoptera	<i>Lycaenidae</i>	<i>Jamides phaseli</i>	1	0,028	-3,555	-0,101
			<i>Strymon mellinus</i>	2	0,057	-2,862	-0,163
		<i>Papilionidae</i>	<i>Troides helena</i>	2	0,057	-2,8622	-0,163
2	Odonata	<i>Coenagrionidae</i>	<i>Ceriagrion tenellum</i>	2	0,057	-2,8622	-0,163
			De Villers				
		<i>Libellulidae</i>	<i>Orethetrum sabina</i>	11	0,314	-1,157	-0,363
			<i>Gomphidae</i>	<i>Paragomphus ellpidius</i>	15	0,428	-0,847
		<i>Stylurus amnicola</i>	1	0,028	-3,555	-0,101	
3	Hemiptera	<i>Cicadellidae</i>	<i>Bothrogonia ferruginea</i>	1	0,028	-3,555	-0,101
4	Orthoptera	<i>Acrididae</i>	<i>Oedaelus infernalis</i>	1	0,028	-3,555	-0,101
		Amount		35	1,02	-24,8	1,52

The results highlight varying species abundances, with Odonata being the most

dominant order, comprising 28 species across 3 families. Lepidoptera totaled 5

species from 2 families, while Hemiptera and Orthoptera each represented 1 species and 1 family.

This research aims to explore insect diversity and abundance in the Bangek River region. The findings reveal significant variation in species abundance, with Odonata being notably dominant, constituting 28 out of 29 identified species. This underscores the ecological importance of Odonata in the Bangek River ecosystem.

In addition to the dominance of Odonata with 35 species, the research identified 5 species from the order Lepidoptera, along with 1 species each from the orders Hemiptera and Orthoptera. Despite the lower number of Lepidoptera species compared to Odonata, their presence enriches the area's biological diversity, highlighting its richness.

These results are crucial for understanding the ecosystem's diversity, particularly the pivotal role of Odonata in maintaining ecological balance. Additionally, the presence of species from other orders enriches the complexity of the ecosystem, providing valuable insights for conservation efforts and enhancing our understanding of the Bangek River's natural dynamics.

In the context of the Odonata, their high diversity underscores their dominant role in the Bangek River ecosystem. Although no endemic Sumatran dragonfly species were found, the research identified three dragonfly species inhabiting closed habitats in the Bangek River area. Such species typically exhibit high sensitivity to environmental changes.

The significance of these findings lies in the indication that the environmental quality of the Bangek River is still well-maintained, particularly in areas with closed habitats.

Despite the relatively small number of species found, this can be considered normal given that the Bangek River is characterized by dense vegetation dominated by tall trees, ferns, and moss.

The dense canopy cover results in low light intensity, which can affect the environmental temperature. In this study, the air temperature of the Bangek River ranged from 22°C to 28°C. Although this is below the optimal temperature for dragonflies (25°C - 29.5°C), it still supports a diversity of dragonfly species adapted to closed habitats.

The dense canopy cover around the Bangek River significantly contributes to the local microecosystem. This canopy cover creates a unique environment for the development and survival of various insect species by reducing light intensity and affecting temperature. The recorded air temperature range of 22°C to 28°C, while lower than the optimal temperature for dragonflies, indicates that these species have adapted to these conditions.

Environmental temperature is crucial for the biological activity of dragonflies. Even at temperatures below their optimal range, dragonflies in the Bangek River may have developed adaptive strategies to survive and reproduce. Studies suggest that dragonflies possess relatively wide temperature tolerances and can adjust their behavior to cope with temperature fluctuations.

Adaptations to lower temperatures may include changes in daily activity patterns, different resource utilization, or specific physiological mechanisms that allow them to remain active at suboptimal temperatures. The presence of dragonfly species in closed habitats of the Bangek River demonstrates their adaptability to these environmental conditions.

This research provides valuable insight into the interactions between canopy cover, light intensity, and environmental temperature in river ecosystems. Understanding how insects, such as dragonflies, adapt to suboptimal environmental conditions can enhance our understanding of ecological dynamics and biodiversity conservation in the Bangek River area, characterized by closed habitats.

Low light intensity and relatively low temperatures may also influence the distribution and abundance of other insects, such as those from the orders Lepidoptera, Hemiptera, and Orthoptera. The identification of specific insect species in the Bangek River offers further insight into how these insects adapt to typical environmental conditions.

This research significantly contributes to our understanding of insect ecology in the Bangek River area by emphasizing the identification of various orders and species. This information can serve as a basis for continued research on ecosystem dynamics and insect conservation in similar habitats.

CONCLUSION

A total of 35 insects were collected from the waters of the Bangek River. These included 5 species from the order Lepidoptera, 29 species from the order Odonata, 1 species from the order Hemiptera, and 1 species from the order Orthoptera. The most abundant species was *Paragomphus elpidius*, with 15 species, accounting for 41.67% of the total. In contrast, species such as *Jamides phaselli*, *Bothrogonia ferruginea*, and *Oedaleus infernalis* were found in limited numbers, with only 1 species each, making up 2.87% of the total each.

The evaluation of the diversity index using the Shannon-Wiener method indicates that the Bangek River area exhibits medium diversity or moderate environmental conditions, with an evenness index value of 1.52.

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