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IDENTIFICATION AND TAXONOMIC ANALYSIS OF VARIOUS INSECTS IN THE WONOREJO MANGROVE TOURISM AREA IN SURABAYA

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ABSTRACT

The Wonorejo Surabaya Mangrove Tourism Area, one of the largest mangrove ecosystems in East Java, significantly contributes to biodiversity, particularly insect communities. This study aims to identify and analyse the taxonomy of various insect species inhabiting the region. A three-week field study was conducted in December 2024 using the sweep net method. Taxonomic analysis employed Linnaeus' classification, while species identification relied on identification keys and relevant literature. The study revealed 15 insect species, including Pantala flavescens, Acisoma panorpoides, Danaus chrypsippus, Junonia orithya, Balenois aurota, Appias olferna, Junonia coenia, Catopsilia pyranthe, Eurema blanda, Catopsilia pamona, Xylocopa latipes, Papilio demodocus, Junonia almana, Hypolimnas bolina, and Vespa affinis. These species span three orders (Odonata, Lepidoptera, Hymenoptera), six families (Libellulidae, Nymphalidae, Pieridae, Apidae, Papilionidae, Vespidae), and 12 genera (Pantala, Acisoma, Danaus, Junonia, Balenois, Appias, Catopsilia, Eurema, Xylocopa, Papilio, Hypolimnas, Vespa). This study highlights exceptional biodiversity and significant genetic potential for mangrove habitat conservation. These findings are crucial for regional management and conservation, including habitat protection and environmental education. Further research is necessary to understand insect ecological roles and develop effective conservation strategies for maintaining the health of Wonorejo's mangrove ecosystem.

Keywords: *Taxonomic, identification, analysis, insecta, mangrove*

INTRODUCTION

Mangrove ecosystems, a unique habitat, play an important role in maintaining ecological balance around the world. They maintain biodiversity and protect coastlines from abrasion and flooding as transitional zones between land and sea (Feller at al, 2017). Insects are an important part of mangrove ecosystems as they function as pollinators, decomposers, and natural controllers of pest populations (Kathiresan & Bingham, 2001). The Wonorejo Mangrove Area in Surabaya is a natural and educational tourist spot that has a lot of biodiversity potential. However, in-depth research is needed to uncover its ecological role, as scientific research is still limited regarding the identification and analysis of insects in this area (Primack & Corlet, 2010).

Taxonomy-based approaches are essential for understanding insect diversity and their functions in ecosystems. Linnaeus' classification system allows organisms to be identified through a systematic hierarchy from kingdom to species level (Odum & Barreto, 2005). The combination of this method with

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identification keys and relevant literature is an effective approach to identify and analyze biodiversity in the Wonorejo mangrove tourism area (Spalding et al, 2010).

Three main objectives of this study: first, to identify the types of insects in the Wonorejo Surabaya mangrove tourism area. Second, analyze the taxonomy of insects that have been found using the Linnaeus classification system. Third, to identify the insects in the area (Lewis & Brown, 2014). Apart from the main objectives, this research also produced a unique product in the form of insects that have been identified and analyzed, then arranged and preserved using 3D frames and camphor as a preservative (Alongi, 2002). This product is a wall decoration that displays the beauty and uniqueness of insects, so it has a high aesthetic value (Giesen et al, 2007). Thus this research not only provides a scientific contribution, but also produces products that have practical and artistic value, so that they can be an inspiration for the development of innovative and sustainable natural decoration products (Nagelkerken et al, 2008).

This study used exploratory and descriptive methods. Samples were collected purposively over a period of time in mangrove areas (Tomlinson, 2016). To ensure the accuracy of classification, identification was carried out in the Biology Education laboratory of Wijaya Kusuma University Surabaya with the help of identification keys and relevant literature (FAO, 2007). The Wonorejo Mangrove Tourism Area in Surabaya was the main research site because the ecosystem is relatively well preserved and has the potential to serve as a center for environmental conservation and community education.

METHODS

Three representative observation points-a riverbank area, a mangrove forest area, and a nearby settlement-were used to conduct this study, which took place over 3 weeks in December 2024. The purpose of selecting these locations was to collect data on different habitats that may have different insect diversity (Hadi et al., 2022). To collect samples, an active sampling method was used, where an insect net trap-also known as a sweep net-was employed (Rahayu et al., 2020). This method was chosen for its ability to capture flying insects in open areas and bushes (Morris, 1992). To explore the diversity of insects in each study site, this method allows for representative and systematic sample collection.

After the samples were collected, identification was carried out in the Biology Education laboratory of Wijaya Kusuma University Surabaya using dichotomous keys and relevant literature adapted for tropical insects (Suryani et al., 2021). Order, family, genus, and species were identified by collecting visual data that included wing morphology, antennae, and body shape. Taxonomic analysis was conducted using the Linnaeus classification system, which follows a hierarchy from kingdom to species (Chapman, 2009).

This classification system considers morphological characteristics and ecological aspects of species to ensure proper taxonomic determination and the relationship between species and their environment (Wahyuni et al., 2023).

RESULTS AND DISCUSSION

Number and Type of Insects Found From the results of the study, 15 species of insects were found, belonging to 4 orders, 6 families, and 11 genera. Distribution details are as follows:

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1. Pantala flavescens

Classification by Fabricius, 1798:
Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Order: Odonata
Family: Libellulidae
Genus: *Pantala*
Species: *Pantala flavescens*

This dragonfly is known as the "Wandering Glider". One type of migrant dragonfly is Pantala flavescens. Many of these dragonflies fly in groups during the day (Setiyono et al., 2017). According to William and Phipps (1893), this species is the largest dragonfly species in the world. This dragonfly also has a local name, kembara buana dragonfly, which means world traveler dragonfly. Pantala flavescens habitat includes rice fields, grasslands, fields, bushes to around the yard (Sigit et al., 2013).

2. Acisoma panorpoides

Classification according to Rambur, 1842:
Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Order: Odonata
Family: Libellulidae
Genus: *Acisoma*
Species: *Acisoma panorpoides*

One species of dragonfly from the Libellulidae family, Acisoma panorpoides, is often found in aquatic habitats such as rice fields, ponds, and swamps. This dragonfly is known for its unique abdominal shape, resembling a mace (Subramanian, 2005). Corbet (1999) states that Acisoma panorpoides is widely distributed in Asia and Africa, especially in tropical areas. This species is often found in places with calm water with lots of vegetation, such as bushes and grass around water bodies. This dragonfly is known as the "Pin-tailed Dasher" or "Needle-tailed Dragonfly."

3. Danaus chrysippus

Classification
Domain: Eukarya
Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Order: Lepidoptera
Family: Nymphalidae

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Genus: *Danaus*
Species: *Danaus chrysippus*

Danaus chrysippus, also known as the Plain Tiger butterfly, is a member of the Nymphalidae family that lives in many places in the world, including Indonesia. Due to their ability to adapt to a variety of habitats, these butterflies are often found in various ecosystems, ranging from forests to cities. Danaus chrysippus can be found in many countries, including Africa, India, China, Japan, and Australia, as well as in Sumatra, Java, Bali, Nusa Tenggara, Kalimantan, Sulawesi, Maluku, and Papua, according to Peggi and Amir (2006). In addition to its attractive color pattern, this butterfly has orange wings with black edges and white spots. In addition, Danaus chrysippus is considered an invasive species in Indonesia, which can jeopardize the habitat of local butterflies. This butterfly is known as the "Plain Tiger" or "Plain Tiger Butterfly".

4. *Junonia orithya*

Classification
Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Order: Lepidoptera
Family: Nymphalidae
Genus: *Junonia*
Species: *Junonia orithya*

Junonia orithya, also referred to as the "blue-eyed butterfly", is a species of butterfly from the Nymphalidae family that lives in many places in the world, including Indonesia. Sumatra, Java, Bali, Nusa Tenggara, Kalimantan, Sulawesi, Maluku, and Papua are home to this species (Peggie & Amir, 2006). When the weather is clear in the morning, these butterflies actively fly around flowering plants. However, they tend to take shelter under leaves or twigs during cloudy or rainy weather. Junonia orithya lives in a variety of ecosystems, including urban green spaces. It is known as the "Blue Pansy" or "Blue Butterfly."

5. *Belenois aurota*

Classification
Domain: Eukarya
Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Order: Lepidoptera
Family: Pieridae
Genus: *Belenois*
Species: *Belenois aurota*

Belenois aurota from the Pieridae family is a small to medium-sized butterfly. Other names for this butterfly are caper white or pioneer white. Large migrations occur in South Africa, and this species is called a migrant (Dickson & Schofield, 1958). B. Aurota lives in various places in Indonesia, including in citrus plantations. The larvae of B. Aurota feed on Capparaceae plants, especially the genus Capparis. They can be a major pest for plants such as Capparis decidua (Chandra,

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1985). This butterfly is known as the "Brown-veined White" or "Brown-veined White Butterfly."

6. *Appias olferna*

Classification (Domain: Eukarya
Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Order: Lepidoptera
Family: Pieridae
Genus: *Appias*
Species: *Appias olferna*

Appias olferna, from the Pieridae family is also known as the Striped Albatross. It is often found in various places, such as city parks. The wings of this butterfly have a white base color and brownish-black venation lines on the edges (Andrianto & Ginoga, 2020). This species exhibits sexual dimorphism, with males and females having different wing patterns. Females generally have darker or gray wing coloration, with white only on certain parts of the wings (Putri, 2021). Appias olferna has a body size of about 5.6 cm. The primary wings are white, while the secondary wings are brown and yellow, with a pattern of brown lines on the edge of the wings (Setiyono et al., 2017). This butterfly is known as the "Plain Puffin" or "Olferna Butterfly".

7. Junonia coenia (Hübner, 1822).

Classification (Hübner, 1822).
Domain: Eukarya
Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Order: Lepidoptera
Family: Nymphalidae
Genus: *Junonia*
Species: *Junonia coenia*

Junonia coenia, known as the "common buckeye," is a species of butterfly that is widespread in North America. It has brown wings with a distinctive pattern of conspicuous eyespots, which serve as a defense mechanism against predators. It is also known as the "Meadow Argus" or "Coenia Butterfly".

8. Catopsilia pyranthe

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Classification (Linnaeus, 1758).

Domain: Eukarya

Kingdom: Animalia

Phylum: Arthropoda

Class: Insecta

Order: Lepidoptera

Family: Pieridae

Genus: *Catopsilia*

Species: *Catopsilia pyranthe*

One of the butterfly species from the Pieridae family is Catopsilia pyranthe, also known as the rare butterfly or lemon butterfly. The wings of this butterfly have black edges and a bright yellow color. Catopsilia pyranthe is usually found in tropical and subtropical environments, such as Australia, India, and Southeast Asia (Maul, 2024). Its habitat consists of open forests, gardens, and areas with moderately dense vegetation. In these places, host plants such as leguminous plants serve as their breeding grounds. This butterfly also lives in lowlands up to 1000 meters above sea level. It is known as the "Orange Emigrant" or "Orange Migrant Butterfly."

9. Eurema blanda

Classification
Domain: Eukarya
Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Ordo: Lepidoptera
Family: Pieridae
Genus: *Eurema*
Species: *Eurema blanda*

- *Eurema blanda*, juga dikenal sebagai kupu-kupu jelita kecil, adalah salah satu spesies kupu-kupu dari keluarga Pieridae yang tinggal di sebagian besar Asia Tenggara. Menurut Setiawan et al. (2022), spesies ini dapat ditemukan di padang rumput, ladang, dan kebun terbuka. Kupu-kupu ini mudah dikenali karena bagian sayapnya yang berwarna kuning cerah. *Eurema blanda* tinggal di tempat yang penuh dengan vegetasi, terutama yang memiliki banyak bunga karena memberikan makanan bagi larvanya . Kupu-kupu ini juga sering terlihat di jalan-jalan dan pertanian di kota. Kupu-kupu ini dikenal sebagai "Three-spot Grass Yellow" atau "Kupu-kupu Kuning Rumput Tiga Bintik."

10. Catopsilia pomona

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Classification

Domain: Eukarya
Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Order: Lepidoptera
Family: Pieridae
Genus: *Catopsilia*
Species: *Catopsilia pomona*

One of the members of the Pieridae family is the Catopsilia pomona butterfly. Due to its bright colors, this butterfly is often referred to as the "Lemon Refugee". Catopsilia pomona lives in the Indian subcontinent and Southeast Asia (Subhan et al., 2018). This butterfly usually lives in open areas such as grasslands, gardens, and forest environments. The main habitat of this species is located in warm climates in tropical and subtropical regions (Sugiarto, 2020). According to Sugiarto (2020), Catopsilia pomona is very active in the morning and afternoon, and is often seen visiting flowers in search of nectar. In addition, its life cycle starts from an egg that develops into a larva, cocoon, and finally into an adult butterfly. This butterfly is known as the "Lemon Emigrant" or "Pomona Butterfly."

11. *Xylocopa latipes*

Classification (Drury, 1773).
Domain: Eukarya
Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Order: Hymenoptera
Family: Apidae
Genus: *Xylocopa*
Species: *Xylocopa latipes*

Xylocopa latipes, known as the carpenter bee or carpenter bee, is a species of bee that belongs to the family Apidae. It is commonly found in tropical and subtropical regions, particularly in forests and flowering areas. Xylocopa latipes is best known for its ability to build nests in wood, especially in decaying tree trunks. They play an important role in the pollination of some flowering plants. Their habitats include areas with diverse vegetation, such as primary forests, shrubs, and flower-rich gardens. This insect is known as the "Wood Beetle" or "Carpenter Bee."

12. *Papilio demodocus*

Classification (Esper, 1798).
Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Order: Lepidoptera