

Diversity of freshwater caridea on the different habitat type in jambi province

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Abstract

This study aims to study the diversity of freshwater shrimp in several habitat type of Jambi Province. The study was conducted in the Batanghari and Sorolangun Regencies in the rivers that exist in rubber plantation habitats, oil palm plantations, community forests and secondary forests. Specimen collection using hand net and fish trap. Determination of sampling location of the sample was done purposively on habitat type, then continued with road sampling. The highest shrimp diversity in the habitat of oil palm plantations ($H' = 1.63$) found in Batanghari Regencies and community forest habitat ($H' = 1.01$) in Sarolangun Regencies.

Keywords: freshwater, caridea, deforestation

Introduction

Indonesian freshwater shrimp consists of the Atyidae and Palaemonidae tribes of the Decapoda order. Shrimp live in all types of aquatic habitats with 89% living in marine waters, 10% in freshwater waters and 1% in terrestrial waters. De Grave (2008) [9] states the Caridea suborder consists of around 2500 species consisting of 3 families. 655 known freshwater shrimp species, some of which are dominated by the Atyidae and Palaemonidae families. Freshwater shrimp have a very important function in ecosystems, as decomposers, bio-indicators of water quality, and as important food important for many species of fish, birds, turtles and mammals (Wowor *et al* 2004; Yeo *et al* 2008; Wowor *et al.* 2009; Taufik 2011) [25, 26, 27, 29]. Jambi Province includes areas with lowland tropical rainforests which are experiencing the fastest deforestation in the Asian region (Archad *et al.* 2002) [1]. The changes that occur in ecosystems can cause habitat fragmentation, habitat degradation and water pollution. This condition is feared to cause an imbalance of river ecosystems that will affect the decline in the diversity of freshwater shrimp species. The main limiting factors that affect the presence of freshwater crabs and shrimp include habitat characteristics, riparian and environmental quality. Changes in freshwater ecosystems are caused, by changes in forest function, water pollution, river flow transfer, and regulation of water flows, (Iwata *et al.* 2003; Foley *et al.* 2005; Dugdeon 2006) [11, 8, 7]. This study aims to study the diversity of freshwater shrimp in Jambi Province. The study was conducted in the Batanghari and Sorolangun Districts in the rivers that exist in rubber plantation habitats, oil palm plantations, community forests and secondary forests.

Method

Time and place

Field research was carried out from February to mid April

2019. Sampling was carried out in two locations, In the some rivers in Batanghari Regency. At this location there are palm oil gardens (L1.KS), rubber gardens (L1.KK), and community forests (L1.HR). In general, rivers in location one have a slow flow, mud-dominated substrate, relative width, and water brownish location. Location 2 is located in Sarolangun Regency, at this location there are palm oilgardens (L2.KS), rubber gardens (L2.KK), community forests (L2.HR), and secondary forests (L2.HS). The some rivers at the location of this study are fast-flowing, there are small rocks, clear water, and have not been configured by human activities.

Collection

Determination of sampling locations was done purposively and continued with the road sampling method upstream for 1 hour as far as 500 m (Ratti and Garton 1996) [20]. Shrimp sampling is done by using handnet, and / or bubu. Bubu is used in waters that cannot be used by handnet. All collected shrimp were put into sample bottles which were given 96% alcohol and labeled.

Identification

Identification was carried out at the Zoology of STKIP PGRI West Sumatra, Padang. With identification Wowor *et al.* (2004) [26] Cai *et al.* (2007) [5]

Data analysis

Analysis of the community structure of freshwater shrimp includes Shannon-Wiener diversity (H'), and Participation (Pielou's). Both indices were analyzed using the Plymouth Routines in Multivariate Ecological Research version 6 (Sommerfield 2008).

Results and Discussion

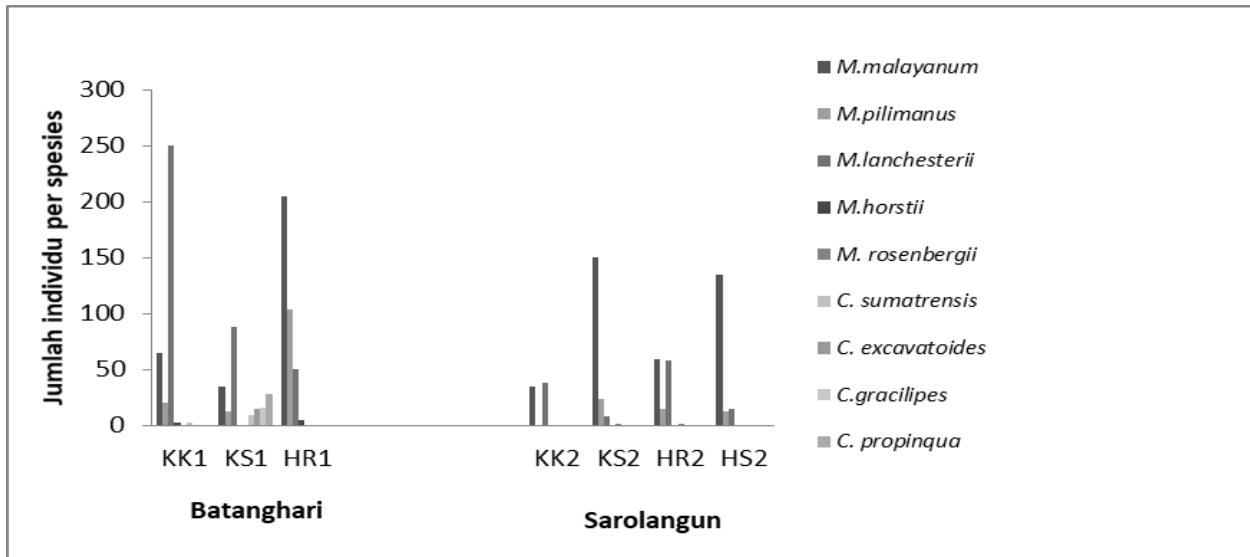


Fig 1: Number of individuals per species of freshwater shrimp in Batanghari District and Sarolangun District in all habitat.

Information: KK1: rubber gardens, KS1: palm oil gardens, HR1: community forests, KK2: rubber gardens, KS2: palm oil gardens, HR2: community forests, HS2: secondary forests.

The total number of freshwater crab species collected in the Batanghari and Sarolangun districts was 1459 individuals, consisting of two genera, namely Palaemonidae (1139) and Atyidae (320).

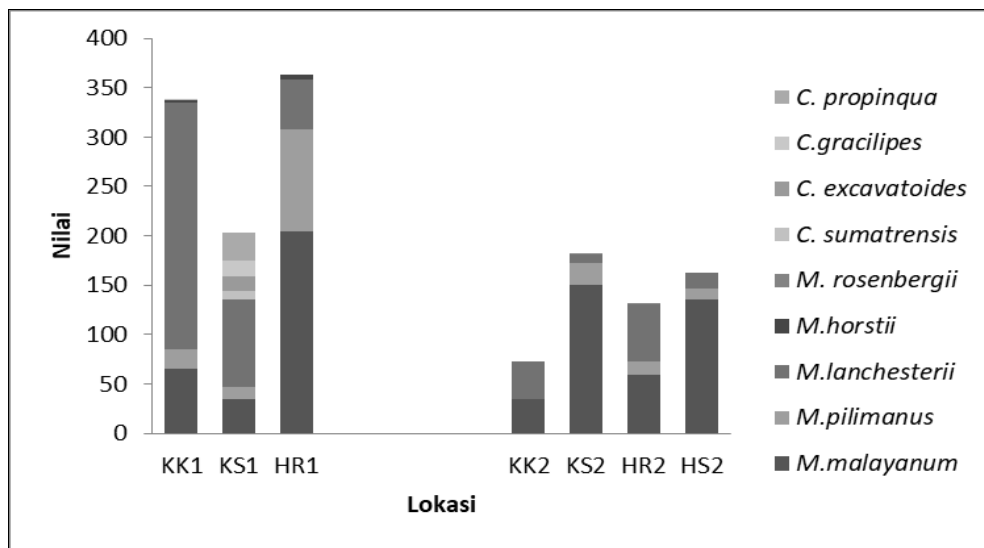


Fig 3: Individual composition of each type of freshwater shrimp in Batanghari District and Sarolangun District in all habitat types

Information: KK1: rubber gardens Batang Hari Regency, KS1: palm oil gardens Batang Hari Regency, HR1: community forests Batang Hari Regency, KK2: rubber gardens Sarolangun Regency, KS2: palm oil gardens Sarolangun Regency, HR2: community forests Sarolangun Regency, HS2: secondary forests Sarolangun Regency.

The oil palm plantation has the highest composition of individual types of freshwater shrimp in Batanghari Regency with 7 species of freshwater shrimp *M. malayanum*, *M. pilimanus*, *M. lanchesteri*, *C. sumatrensis*, *C. excavatoides*, *C. gracilipes* and *C. Propinqua*. In Sarolangun district the composition of individual species of freshwater shrimp is found in the habitat of oil palm plantations and community forests. The two habitats have the same species composition with each found 4 species of freshwater shrimp, namely *M. malayanum*, *M. pilimanus*, *M.*

lanchesteri and *M. rosenbergii*.

Species diversity: The highest diversity of freshwater shrimp in the Batanghari district was in oil palm plantation habitat (1.636), while the highest evenness was in oil palm plantations (0.008). In Sarolangun district, the highest diversity index was in community forest habitat as much as 1.096, while the highest evenness value was in rubber gardens (0.009). The highest diversity of freshwater crabs in Sarolangun district was in the community forest habitat of 1.083, while the highest evenness in community forest gardens (0.016.) In Sarolangun District, the highest diversity index value is found in rubber gardens of 0.961, while the highest evenness in rubber plantation habitat is 0.013. In general, the diversity index in all studied habitats is low ($H' < 2$). The low diversity index value is thought to be

influenced by community activities that convert forest into agricultural land which results in riparian loss which causes sedimentation, water pollution, which causes a decrease in diversity in freshwater ecosystems such as freshwater shrimp and freshwater crabs in Sarawak (Iwata *et al.* 2003)^[11]. *Macrobrachium malayanum* was in all the habitats studied. This is because the rivers in the location provide microhabitat which supports the life of this type of shrimp with a temperature of 26 ° C-30 ° C, pH 6-7.12. This is the most abundant species in the rivers of southern Malaya forests, Thailand, Sumatra and Borneo (Wowor 2009)^[27]. *Macrobrachium pilimanus* is obtained in habitats that have heavy currents, rocky substrates, temperatures of 27 ° C-30 ° C, and pH 6-6.56, which support the life of these shrimp. Its wide distribution is from the lowlands to the mountains, spread on Java and Peninsular Malaysia (Wowor 2010)^[28]. In this study found invasive types, namely *M. lanchesteri*. *Macrobrachium lanchesteri* is obtained at 26 ° C-30 ° C and pH 6-7.12. This type is mostly obtained in pond and swamp habitat. This type of shrimp can survive in extreme environments compared to other types so that its presence can threaten various native species. *M. lanchesteri* is expected to enter Jambi waters along with fisheries activities that introduce fish seeds. The type of *M. lanchesteri* is widespread in Thailand (Wowor *et al.* 2009)^[27].

The Atyidae tribe obtained consisted of *Caridina malayensis*, *C. excavatooides*, *C. propinqua*, and *C. gracilipes*. The four types of shrimp are only found in rivers found in oil palm plantations that have aquatic plants with a temperature of 30 ° C and pH 6.56. This is confirmed by the research of Cai *et al.* (2007)^[5] and Johnson (1967)^[15] that the Atyidae tribe can only be found in waters that have aquatic plants, rocky and underground rivers, with temperatures around 23.5 ° C-35 ° C and pH 5.4 -8.2. Types of *C. malayensis* are spread in Peninsular Malaysia and Singapore (Cai *et al.* 2007)^[5]; *C. excavatooides* are also scattered in Peninsular Malaysia and Sumatra (Johnson 1961)^[12]; while *C. propinqua* is more widespread in Sri Lanka, India, Peninsular Malaysia, Philippines, Japan and China (Cai *et al.* 2007)^[5].

Conclusion

The distribution of types of freshwater shrimp found in Batanghari and Sarolangun Districts differ according to the environmental factors that influence them. The diversity index value of freshwater shrimp in Batanghari and Sarolangun Districts is low ($H' < 3.32$). This is proven by only found 9 species shrimp that is *M. malayanum*, *M. pilimanus*, *M. lanchesteri*, *M. rosenbergii*, *M. horsti*, *C. sumatrensis*, *C. excavatooides*, *C. gracilipes* and *C. Propinqua*.

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