The potential of geronggang (Cratoxylon arborescens (Vahl.) Blume) in conserving Sycanus sp. as natural enemy of insect pests in peatland areas

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Abstract. Geronggang (Cratoxylon arborescens) is a promising species for peatland management. This tree is a native species dominantly distributed in several areas of Riau Province. In addition to being used for construction timber and a source of natural fibre, it has a role in the conservation of biological resources, such as insects. Some natural enemies (predators and parasitoids) commonly breed around Geronggang tree areas, such as a predator namely Sycanus sp. Conserving biological resources is a strategy to support integrated pest management. This observations aims to explore the potency of Geronggang as habitat for Sycanus sp. The role of the native tree in conserving Sycanus sp. was observed from January to December 2020 by observing interval at about 4.8 days. The results indicated that at about 26.09 individuals of Sycanus sp. caught per 100 m² of the Geronggang tree. This implies that Geronggang has great potentials for conserving Sycanus as natural enemy of insect pests. In summary, potential natural enemies can then be developed by applying the “capture, develop and release” method.

1. Introduction
Geronggang (Cratoxylon arborescens) is a promising species for peatland management. This tree is a native species dominantly distributed in several peatlands of Riau Province. A study shows that Geronggang was predominated species of the secondary peat-swamps forests with importance index at 18.58% in Bengkalis, Riau [1]. It is considered as the most well-studied species for pulpwood plantation in peat areas in Sumatera and Kalimantan [2–4]. A 2018 study reported that Geronggang’s survival percentage was up to 80% at 5.5 years after planting [2]. Another study found that it has promising growth and yield as its height, diameter and yield increment are relatively comparable to those of A. crassicarpa [4]. Geronggang is one of recommended species for peat areas with the water table less than 40 cm.

Apart from being used as construction timber and a source of natural fibre, Geronggang also has another important role in the conservation of biological resources, such as insects. Some natural enemies (predators and parasitoids) breed around the Geronggang tree areas. One of such predators is Sycanus sp. Conservation of biological resources is considered as a strategy to support integrated pest management. Sycanus sp. has been used by several forestry companies in Indonesia to manage different pests. It is reared for controlling endemic pests of several Acacia and Eucalyptus plantations.
such as *Helopeltis* spp. (mosquito), *Alcides* sp. shoot borer, and stem borer *Zeuzera coffeae* [5]. In addition to the above-mentioned pests, plantation forests, both in mineral and peat areas, also get frequent attacks from leaf roller and bagworms.

Pest outbreaks in plantation forests might be the result of decreasing diversity of natural enemies due to poor quality of the habitat in the agroecosystem [6]. The decreasing biodiversity of natural enemies has prevented many herbivorous insects from parasitization [6] and predation [7].

Internal reports of some forestry companies in Indonesia noted that Geronggang could be used to attract some natural enemies including *Sycanus* sp. [7–9]. This observations aims to understand the potency of Geronggang as habitat for *Sycanus* sp. by counting the population size of the insect in the area.

2. Methods
Observation of the Geronggang tree role in conserving *Sycanus* sp. was conducted for 1 year from January to December 2020.

2.1. Location
This research was conducted in Siak Regency, Riau Province, Indonesia. The observed 432 m² area has been planted with 72 Geronggang trees (currently 9 years old) (Figure 1).

![Figure 1. Geronggang trees in the observed area.](image)

2.2. Insect collection
Visiting *Sycanus* onto Geronggang trees were collected using sweep net from each tree area on the site. The insects of the Geronggang sites were collected in the morning for at least 3 hours (08:00–11:00 am) to match the insects’ activity. Sampling was taken during fine weather (days without rains). The collection was carried out continuously at the average interval of 4.8 days with the total 77 collecting days.

Insect population size was calculated using the following formula.

\[
\text{Population size} = \frac{\text{Number of insects collected}}{\text{Area}}
\]
3. Results and discussion

Results indicated that the number of *Sycanus* sp. was ca. 26.09 individuals per 100 m$^2$ of the Geronggang tree area with standard deviation 15.45, maximum number 77.08, and minimum number 5.56 (Table 1). The results imply that Geronggang can be a good habitat for *Sycanus* conservation.

**Table 1.** Descriptive statistics of population size per 100 m$^2$ of Sycanus collected from Geronggang in 2020.

| Statistics              | Population size |
|-------------------------|-----------------|
| Count                   | 77              |
| Means                   | 26.09           |
| Standard Deviation      | 15.45           |
| Maximum                 | 77.08           |
| Minimum                 | 5.56            |

The highest population of *Sycanus* sp. was recorded in May and June 2020 (Figure 2). It indicates that May and June are the best time for the insect to breed and multiply. This might be related to the early flowering period occurring in May [10]. The availability of floral nectar is also needed by predatory insects, such as *Sycanus* sp. which is omnivorous, to enhance their life [11].

![Figure 2. Population dynamics of Sycanus sp. collected from Geronggang in 2020.](image)

In nature, *Sycanus* is frequently observed sucking the gum of Geronggang (Figure 3a). Geronggang is reported to produce a number of secondary metabolites. Xanthone, anthraquinone, triterpenoid, steroid, flavonoid, phenolic acid, vismione, benzophenone, and tocotrienol have been isolated from some species of the *Cratoxylon* genus [12]. Some of the chemical compounds could be favored by *Sycanus*. Similarly, the insect completes the copulation at the Geronggang tree (Figure 3b).
Providing insect conservation areas in forestry is an essential strategy to assist the development of natural enemies and to avoid insecticide threats. When the condition of plantation forest environment does not support, the natural enemies could breed and multiply in the insect conservation areas. The goal of conservation by biological control is to enhance conditions for natural enemy survival and their relative reproduction to pests so that pest population growth rates are lowered, and pest densities reduced over time [13]. *Sycanus* is a natural enemy in a forest, helping to reduce *Helopeltis* incidence from 30% to 10% in *Acacia* plantations and leaf roller incidence from 60% to 10% in *Melaleuca* plantations three months after release (Figure 4a and 4b) [14].

**Figure 3.** a. A *Sycanus* male is sucking the gum of Geronggang, b. A couple of *Sycanus* are copulating.

**Figure 4.** A *Sycanus* is sucking *Helopeltis* on *Acacia* (a) and leaf roller on *Melaleuca* (b).

The conservation of *Sycanus* in Geronggang tree areas is a single-species approach to insect conservation. The approach has a role to play when individual species can be presented as flagships for the general cause of insect conservation [15]. Since 2019, the Geronggang tree functioned as the collecting point of *Sycanus* in Riau, followed with rearing and multiplying processes in the laboratory.

Sinarmas Forestry as a company committed to succeed sustainable forestry by developing “capture, develop and release” strategy to support the concept of integrated pest management (IPM) in forestry. “Capture” could be done in the Geronggang tree areas, then “develop” in the laboratories or artificial habitats, and then “release” it to infested plantation and Geronggang tree areas. In summary, the method may be applied to develop potential natural enemies.
4. Conclusion
Geronggang has great potentials to conserve Sycanus sp. as natural enemy of insect pests in peat areas. The “capture, develop and release” strategy in the development of natural enemies should be implemented to support the concept of integrated pest management (IPM) in forestry. Further work is demanded to comprehend supportive environments towards Sycanus development not only in peat areas, but also in mineral areas.

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