RESEARCH NOTE

VEGETATION PROFILE OF THE FIREFLY HABITAT ALONG THE RIPARIAN ZONES OF SUNGAI SELANGOR AT KAMPUNG KUANTAN, KUALA SELANGOR

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A naturally functioning riparian zone is essential for the ecological health of a river, filtering pollutants, supplying organic matter and providing a structural habitat for wildlife (Scott *et al*., 2010). Many species, particularly insects, divide their life stages between the river and the riparian zone. One of the insect species is firefly. Land clearing is detrimental to the firefly population. Adult stages of these lampyrid beetles utilize the Berembang trees (*Sonneratia caseolaris*) that line the riverbanks of Sungai Selangor (Sg. Selangor) for mating sites and as a source of food due to the presence of sugar in the sap of the Berembang trees (Nada *et al*., 2009).

Despite the fact that Sg. Selangor and its riverbanks have been gazetted as a protection zone under the Selangor Waters Management Authority Enactment 1999, loss of the firefly habitats along Sg. Selangor has been reported since 2007. Gradual increase in loss had occurred throughout the year 2008 (Khoo *et al.*, 2009). In 2009, substantial land clearing was undertaken opposite the Kampung Kuantan Firefly Park jetty for the cultivation of oil palm and bananas. The main objective of this study was to determine the species composition of riparian vegetation along the riverbanks of Sg. Selangor and to portray the horizontal view of the vegetation profiles and describe the stand structure, which can indicate the effects of disturbance on the firefly habitats. This study is very important in supporting efforts to conserve the firefly habitats in Kuala Selangor.

A preliminary study of the vegetation profile was conducted at 10 locations along the riverbanks of Sg. Selangor between Kampung Kuantan and Kampung Telok Siam Baru (Fig. 1). A 50-meter line transect was constructed at each location to record the vegetation profile and species composition. Vegetations that observed were sketched on graph papers. Location, height and crown size of plants were estimated roughly to the nearest unit in meter. Then, the sketches were drawn with more detail on a new graph paper with a scale. The drawings were then copied on tracing papers with drawing pens (0.1 and 0.2 mm). The vegetation profiles drawings on the tracing papers were then photocopied and resized to fit the A4 size paper. The images were then scanned into digital images.

A total of 27 species from 26 genera and 18 families of riparian flora were recorded during the boat surveys. Palmae was identified as the largest family with six species, followed by Leguminosae with three species, Anacardiaceae and Moraceae, each with two species. Berembang was observed to be the most dominant tree species (12 species), followed by palms (6 species), climbers (5 species), herbs (3 species) and fern (1 species). Most of the plant species such as *S. caseolaris*, *Hibiscus tiliaceus*, *Nypa fruticans*, *Acrostichum aureum* and *Ficus* sp. found in this study area also occurred in the other riparian habitats of fireflies such as the Rembau-Linggi estuary of Negeri Sembilan and Sepetang estuary of Perak (Wan Faridah Akmal *et al*., 2010a; Wan Faridah Akmal, 2010b).

Many young Berembang trees with height of less than 5 m dominated the SL1 and SR1 (Fig. 2a & 2b). However, the mid-profile of the SL1 lacked the Berembang trees, most likely because the area was highly disturbed by the jetty structure and its activities. Coconut (*Cocos nucifera*), Nipah palms (*Nypa fruticans*) and banana trees (*Musa* sp.) occur behind the Berembang belt at the last 20 meters of the vegetation profile. The density of Berembang

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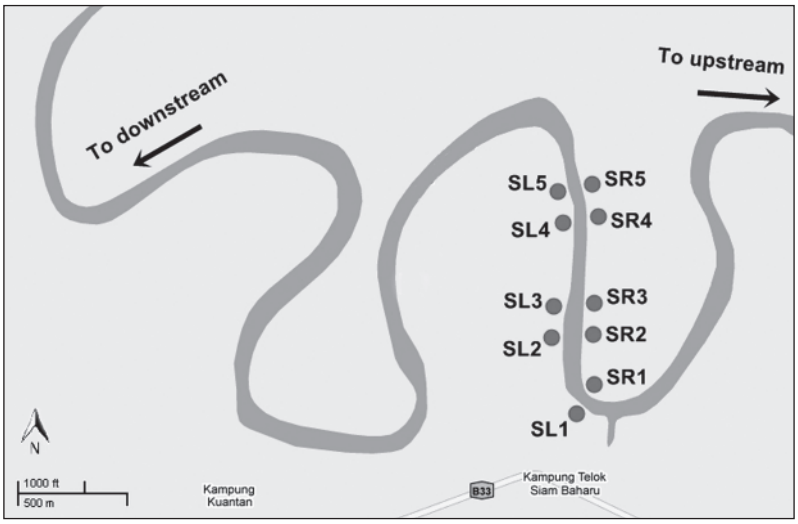

Fig. 1. Location of the sampling stations for vegetation profile (SL1-SL5 indicate left bank, SR1-SR5 indicate right bank) along the Sg. Selangor riverbank

trees was also low at the SR1. However, the density of herbs and climbers, particularly *Ischaemum muticum*, *Caesalpinia crista* and *Wollastonia biflora*, was very high here.

At station 2, Berembang dominated the SR2 but was sparsely represented on the SL2, the latter being a highly disturbed habitat planted with mainly oil palm (Fig. 2c & 2d). There were also several thickets of Bebaru (*Hibiscus tiliaceus*), *Caesalpinia crista* and *Cissus hastata*, *Uncaria* sp., *Canavalia rosea* and *Gmelina elliptica*. Other plants on the SL2 were typically represented by Sago palms (*Metroxylon sago*) and Putat trees (*Barringtonia racemosa*), whilst on the SR2 there was a predominance of Berembang and Rengas air trees (*Gluta velutina*).

At station 3, only the SL3 was highly represented by Berembang trees, while both banks were well represented mainly by Sago palms. Bebaru was well distributed between the Berembang trees and Sago palms on the SL3 (Fig. 2e). Rengas air dominated the bank fronting the Sago palms belt (Fig. 2f).

There were many mature Berembang trees (of height less than 5 m) along the SL4 (Fig. 2g), while groves of Sago palms and thickets of climbers (*C. crista* and *Uncaria* sp.) occurred behind the Berembang belt, and these species are indicative of a highly disturbed habitat. At the SR4, several Berembang trees were higher than 10 m of height, however, the majority was less than 5 m in height (Fig. 2h), followed by Sago palm groves behind the Berembang tree belt.

Berembang trees also predominated the SL5, the majority with height of less than 5 m (Fig. 2i), while Sago palms grew behind the Berembang belt at several sections of the riverbank. Climbers (*C. crista*) and *Gluta velutina* trees also thrived between the Sago palms and Berembang trees. The SR5 was cultivated with oil palm behind the Berembang belt (Fig. 2j).

Previous studies on the vegetation cover of the firefly habitat in Sepetang estuary, Perak indicated that there was an ecological relationship between the percentage of ground cover with specific display tree and/or plant assemblage and the abundance of firefly population (Wan Faridah Akmal *et al.*, 2010b). The fireflies mainly preferred *S. caseolaris* as their main display tree (Nada & Kirton, 2004; Nada *et al*., 2009; Wan Faridah Akmal *et al.*, 2010a). Streambank palms such as *Nypa fruticans* and *M. sago* are important as food sources for the snail preys that the firefly larvae feed upon (Nada & Kirton, 2004). The firefly larval density was reported to be higher in the Sago palms groves than the oil palm stands (Kirton *et al.*, 2006).

Most of the natural vegetation along the riverbanks of Sg. Selangor had been disturbed and this can be confirmed by the low density and distribution of the riparian plants, including the Berembang trees favoured by the fireflies. However, our recent surveys showed that Berembang is still the most dominant tree species along the riverbanks of Sg. Selangor, and followed by Sago palms (*M. sago*) and Rengas air (*Gluta velutina*).

In particular, the results of our study pointed to the need for protecting the many plant species utilized by the fireflies, and tree replanting (rehabilitation) efforts should be and have been partially implemented on the riverbanks of Sg. Selangor, especially *S. caseolaris,* that is important in completing the life cycle of the fireflies in their natural habitat. More intensified and structured conservation and replanting programs involving the Berembang trees can ensure the survival of fireflies in this unique habitat for ecotourism sustainability of this unique habitat well into the future.

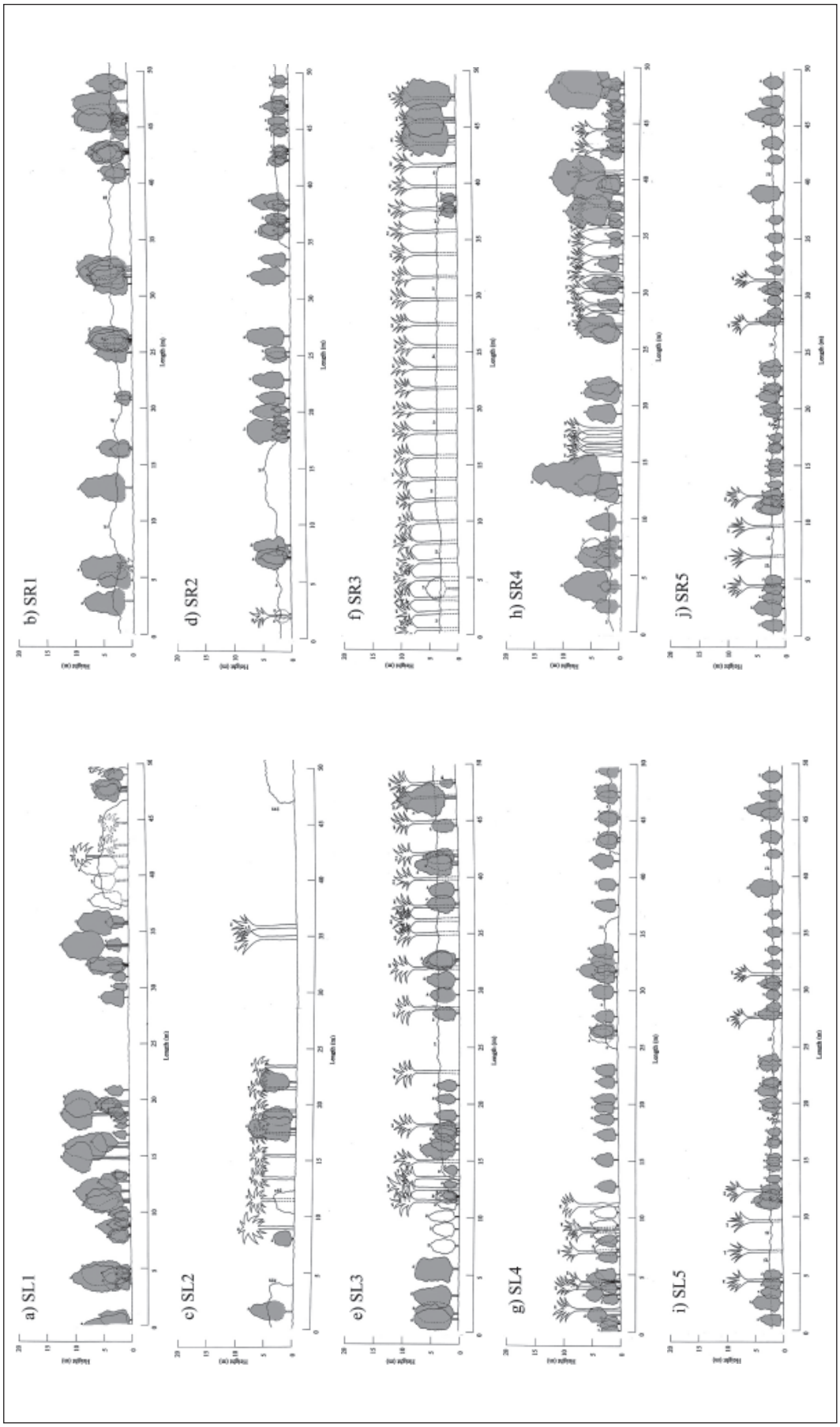

Fig. 2. Horizontal view of the vegetation profile at the five sampling stations (SL1-SL5 indicate left bank, SR1-SR5 indicate right bank) along the Sg. Selangor riverbank (Abbreviations for species in alphabetical order: AC- *Acacia* sp.; AA- *Acrostichum aureum*; BR- *Barringtonia racemosa*; BC- *Bruguiera cylindrica*; CC- *Caesalpinia crista*; CR- *Canavalia rosea*; CM- *Caryota mitis*; CO- *Cerbera odollam*; CH- *Cissus hastata*; CN- *Cocos nucifera*; EG- *Elaeis guineensis*; FF- *Ficus fistulosa*; FM- *Ficus microcarpa*; GV- *Gluta velutina*; GE- *Gmelina elliptica*; HT- *Hibiscus tiliaceus*; HI- *Horsfieldia irya*; IM- *Ischaemum muticum*; MT- *Macaranga triloba*; MI- *Mangifera indica*; MS- *Metroxylon sago*; MU- *Musa* sp.; NF- *Nypa fruticans*; OT- *Oncosperma tigillarium*; SC- *Sonneratia caseolaris* (shaded in grey); UN- *Uncaria* sp.; and WB- *Wollastonia biflora*)

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