Understorey Bird Species Composition in Primary and 10-Year-Old Logged Forest at Sungai Lalang Forest Reserve, Semenyih, Selangor

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Introduction

Logging activity will alter the distribution and abundance of food sources (Zakaria et al. and Nordin et al 2000a) and thus influence the behaviour of many species of birds and other animals (Zakaria and Nordin et al.1998, Leighton et al.1982). One of the significant impacts of primary forest destruction on bird populations is a decrease in species number and change of bird community (Nordin et al. and Zakaria et al. 1997, Zakaria and Francis, in press, Blankespoor et al. 1991). Understorey species have been suggested to be affected the most when the forest structure was altered (Nordin et al.and Zakaria et al.1997). This is because understorey species are highly sensitive to high temperature or light intensity. A number of large bird species such as hornbills has also been shown to decline in logged forest (Johns et al. 1988). This was probably due to the decrease in their preferred big trees that supply them with food and nesting sites. In the process of timber felling and extracting many mature fruit bearing trees were cut down or likely to be damaged.

However, certain groups of bird are able to tolerate disturbance such as that caused by logging. These groups were normally belonged to small size birds of insectivore/frugivore (e.g. bulbuls) and nectarivore (e.g. spiderhunters; Zakaria et al.and Nordin et al. 2000b). These species are referred to as secondary or colonising species since they were more common in logged than in primary forest. They are able to tolerate high temperature or light intensity better than the primary species such as babblers, bluebirds and broadbills. Moreover, the colonising species could survive well in logged forest because of their ability to move through the thick regenerating vegetation and consume the small fruits.

The main objectives of this study were to determine the composition of understorey bird species in old logged forest (i.e.10-year-old logged forest). The composition would then be compared with that in primary forest (VJR) to determine factors that affecting the differences.

Materials and Methods

The study was conducted at Sg. Lalang Forest Reserve, situated in Semenyih, Selangor. Two study sites were chosen namely Compartment 24 (82 ha.) that is primary forest and Compartment 33 (387 ha.), which was about 10-year-old logged forest when the study started.

The technique used in obtaining information on understorey bird species composition was by mist-netting method. Thirty standard 4.0m x 10.0m mist-nets with mesh sizes of 2.0, 2.5 and 3.0cm were used in both study sites. Nets placement was based on Fogden (1972), Karr et al. (1980) and Wong et al. (1986) where the nets were placed at or near the ground in linear sequences or scattered at right angles to a rootpath and follow the grid (to make sure the area was covered) between the range, which has been determined in the study site.

Nets were opened just before sunrise (around 07:00hr) and closed one hour before sunset (around 18:00hr). The nets were checked about every two-hour interval. Birds that were caught were carefully removed from the nets, placed in small sacks and then brought to the base camp for the purpose of identification and measurement. After the identification and measurement was completed, the birds were tagged and released. Netting was carried out for 57 days in each study site for a total of approximately 10,000 net-hours. The unit net-hour was used as a standard measure of capture effort, whereby one net hour is equivalent to one standard mist net of 10 meters long opened for one hour.

Microclimate data measurement such as temperature, light intensity and humidity were also recorded at each location of the. These measurements were taken in the early morning (06:00hr), noon (12:00hr) and evening (17:30hr) before the nets were closed. To analyze bird species composition between 10-year-old logged and primary forests, diversity indices were employed. The most common diversity indices used are the species richness indices, species diversity indices, and species evenness indices.

Results and Discussion

The study had captured a total of 737 birds with 348 individuals in primary and 389 individuals in 10-year-old logged forests (Table 1). The study indicated that primary forest contained higher diversity of understorey species (66 species) than in logged forest (55 species; Table 2). This means that both forest types contained slightly different species composition. Results have clearly showed that secondary or colonising species such as bulbuls, bee-eaters and spiderhunters have increased in number significantly in logged forest. On the other hand, primary forest species such as babblers and flycatchers decreased in logged forest.

Although the number of species found in primary forest was higher, the total number of birds captured in 10-year-old logged forest was almost double than the number of birds captured in primary forest. This was most probably due to the increased in the number of forest edges and number of dominant colonising species. The edge effect was higher in logged forest due mainly to fragmentation of forest habitats produced during logging activities. Forest edges have been shown to attract higher number of birds due to increase

variability of microhabitats and food resources (Zakaria et al. and Nordin et al.2000b). It was expected that an increased in the edge (ecotone) effects would increase the number of rapid growth secondary plants that frequently produced flower nectar and fruits. Thus, this in turn might attract the insectivore/frugivore (e.g. bulbuls) and nectarivore birds (e.g. spiderhunters) or other colonising species.

Species composition analysis showed that the bulbuls (Pycnonotidae) and spiderhunters (Nectariniidae) were the two most common and abundant groups captured in logged forest. Altogether 113 individuals from 11 species of bulbuls were recorded in 10-year-old logged forest compared to only 53 individuals from seven species in primary forest. The four species namely *Pycnonotus goiavier, P. finlaysoni, P. atriceps* and *Criniger pallidus* were found only in the 10-year-old logged forest (Table 3). The bulbuls were the largest groups found in the forest edge described earlier and have been known to be able to tolerate changes in microclimate condition (Zakaria et al. and Nordin et al. 1998). They are also noted as generalists that capable of exploiting both insects and fruits.

The spiderhunter abundance was also significantly higher in the logged forest with 119 individuals compared to only 38 in primary forest. Even though there were only two species of spiderhunters captured, each species was represented by high number of individuals particularly in the logged forest. The most common species was *Arachnothera longirostra* and it seemed to dominate the logged area. The logged forest was overgrown with secondary plants such as wild banana. The flowers of wild banana might have attracted the nectarivore spiderhunters.

Previous study has found that the understorey babblers were common in primary forest and fewer in 2-year-old and 5-year-old logged forest (Nordin et al. and Zakaria 1997, Zakaria *et al.* 1999). This study clearly showed that even in 10 year-old logged forest the babblers were still significantly reduced. There were only 45 individuals from 12 species captured in logged forest compared to 117 individuals from 19 species in primary forest. Seven of the species namely *Pellorneum capistratum, Malacopteron cinereum, Alcippe brunneicauda, Pomatorhinus schisticeps, Trichastoma rostratum, Stachyris leucotis* and *S. rufifrons* were captured only in primary forest (Table 3). The babblers are known to be highly sensitive to high temperature or high light intensity since they were the inhabitants of the forest understorey. Although the area was considered old logged forest when the study began, the microclimate condition was still different than in primary forest (Table 4). In addition, the vegetation had not fully recovered as that in primary forest. Bare soils and old logging roads could still be seen. Even though secondary trees (e.g. *Macaranga* sp.) and thick shrubs had grown, patches of large gaps were still presence.

There might be other unknown factors that could also influence the bird species composition in either forest site. It is interesting to note that even in primary forest the colonising species such as bulbuls and spiderhunters were also common. It is difficult to assess why there were many colonising birds in the primary forest. One of the possibilities might be due the primary forest being surrounded by logged over forests. It is obvious that more indepth study is needed in order to understand clearly the effects of logging and the recovery of bird species in logged forest.

Conclusions

In conclusion, the study has shown that the species diversity was lower in logged than in primary forest. The species distribution (in terms of the number of individuals per species) was more even for most species in primary than in 10-year-old logged forest. The presence of very dominant colonising species such as bulbuls and spiderhunters indicated that the forest habitat has been altered and thus, affecting many primary forest bird species particularly the understorey babblers. Ten years might not be sufficient for the forest birds to recover and return to condition as that in the primary forest.

However, the study suggested that logged forest could play important roles in bird conservation. The forest might still contain many understorey birds provided that the damaged done by logging was not extensive. Primary forest patches left untouched within the logged forest could act as crucial remnant habitats for primary forest birds. Birds survived in the remnant patches will be the source for recolonisation. Therefore, it is important to carefully plan the logging activities so that large patches of primary forest will be left intact within the logged forest. It is important for the logged forest to be protected from further disturbance. Continuous monitoring of the area is also crucial in order to give us more insight of the recovery patterns and processes of understorey birds in tropical forest.

Benefits from the study

The study provides information on the bird species composition in our tropical rain forest. It provides also detail information on the effects of habitat disturbance such as logging activities on the avifauna. The findings will be used in the preparation of guideline manual on methods of forest extraction in order to reduce the adverse effects of logging on avifauna populations. The manual will be useful for the Ministry of Primary Industry that acts as an agency to ensure the country practices sustainable forestry. The study has also produced at least nine well-trained graduate and 10 undergraduate students.

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