Use of Mist-Netting Technique to Study Community Structure of Understory Birds at Lubok Tapah Base Camp, Endau-Rompin National Park, Johore, Malaysia

Rosli Ramli, R. Hashim and **B. Daicus**

Institute of Biological Sciences, Faculty of Science, University of Malaya, 50603 Kuala Lumpur, Malaysia

ABSTRACT   Mist netting technique was used to study the community structure of understory bird presence in Lubok Tapah base camp, Endau-Rompin National Park, Johore. Two hundred and six individuals who comprised 62 species from 16 families were captured. A majority of bird species that were captured after 1840 net-hours operation were residents (90.3%) and smaller birds (48.3%). Three families, namely Timalidae (babbler), Pycnonotidae (bulbuls) and Muscicapidae (flycatcher) were abundantly sampled. The most abundant species, however, were Yellow-Bellied Bulbul (*Criniger phaeocephalus*), Grey-headed Babbler (*Stachyris poliocephala*) and Rufous-collared Kingfisher (*Halcyon concreta*).

ABSTRAK   Teknik pemerangkapan jaring kabus telah digunakan untuk mengkaji struktur komuniti burung-burung di Lubok Tapah, Taman Negara Endau-Rompin, Johore. Dua ratus enam species yang boleh dikelaskan kepada 62 spesies atau 16 famili telah ditangkap setelah operasi pemerangkapan dijalankan selama 1840 jam. Kebanyakan daripada spesies yang ditangkap merupakan spesies residen (90.3%) dan bersaiz kecil (48.3%). Di antara burung yang paling banyak ditangkap adalah dari famili Timalidae (burung rimba), Pycnonotidae (burung merbah) dan Muscicapidae (burung sambar). Walau bagaiamanapun spesies yang paling abundan adalah Merbah perut kuning (*Criniger phaeocephalus*), Rimba kepala kelabu (*Stachyris poliocephala*) dan Pekaka Rimba besar (*Halcyon concreta*). pemerangkapan dan perbezaan musim.

(mist netting efficiency; forest birds; ornithological techniques; netting hours; community structure)

INTRODUCTION

The capture of birds in mist nets can give biologists an insight into the health and demographics of bird populations [1]. Mist netting is widely acceptable as a standard method in bird study. It can be used in many alternative experimental designs to address different research questions such as gathering information about reproductive patterns [2], monitoring demography [3, 4 and 5], estimating the composition and structure of a bird assemblages [6, 7], and studying population structure and habitat use [8].

Although the mist netting technique normally records less birds than the point counting method [1, 9], it is however, the method of choice for obtaining information on the various attributes of the population, for example, age and sex ratios, and physiological condition. This method also has the capability of exploring bird biology such as survivorship, productivity and recruitment [1]. Furthermore, it also allows for close examination of the study object, and any potential mistakes especially relating to identification can be minimised. Other advantage of mist netting technique is the opportunity to execute a thorough study regarding biological status of the study object. Mist netting also permits studies that are almost impossible through direct observation. Studies such as morphometric measurements, ectoparasite infestation, molting pattern, skull pneumatization, and breeding status can only be carried out whenever the bird is captured.

Mist netting has been widely used for the purpose of surveying understory bird community in tropical forests [7, 10 and 11]. Although there is skepticism regarding the effectiveness of this technique [9], it is the method of choice in providing information regarding understory birds of tropical forest [1, 12]. In this paper, we report the effectiveness of mist netting technique in determining community structure of understory birds.

MATERIALS AND METHODS

Mist-nettings were conducted at the western part of Endau Rompin National Park, Johore, Malaysia. The survey sites were located at longitude 103°15'E and latitude 02°26'N and at an altitude of 98m above sea level. A majority of the surveys were carried out around Lubok Tapah base camp and along the trekking path to Taka Tinggi waterfall, which is about two kilometers from base camp. Mist nets were erected at strategic sites along the trekking path or near river tributaries (Sungai Selai and Sungai Anak Batu).

Four visits were carried out from April 2002 to October 2002 (7 – 10 April 2002, 4 – 8 May 2002, 16 – 20 May 2002, and 27 – 28 October 2002) lasting for 16 days or the equivalent to 1840 netting hours. Ten mist nets (12 x 2.5 m, 35 mm mesh, five shelves) as recommended were used [1]. The nets were set-up approximately 0.5 m above ground level at the study area for two consecutive days. Nets were later moved to other study sites after two days to increase capture rates. Preliminary studies and past studies [10, 13] indicate that mist net positions at the same location for more than two consecutive days' leads to drastic reduction in capture rates.

Nets were opened at 0700 hours and were closed at 1800 hours except for raining days, where the nets were closed early. Net units were calculated from the total number of netting hours multiplied by the number of mist-net deployed which was equivalent to one 12 m x 2.5 m mist-net activated for one hour. Nets were checked every hour to reduce mortality due to predators (monitor lizards, ground squirrel, macaques, and mongoose) and stress. Captured birds were identified, weighed, measured, and banded with numbered metal bands, and released later to minimize disruption of their daily activity [14, 15

and 16] were used in resolving any dispute regarding bird identification.

We grouped birds based on families, abundance, migratory status, and body size categories, while family status was based on [16] species were grouped into several categories such as abundance (abundant, captured > 10 individuals; common, captured 3 – 10 individuals; uncommon, captured less than 3 individuals), status (migratory, resident, migratory or resident) and body size (small < 22.5 g, medium, 22.5 - 51 g, and large >51 g) [9].

RESULTS AND DISCUSSION

Two hundred and six individuals comprising 62 species from 16 families were recorded in 1840 netting hour operations. Of the 62 species, most were residents (193 individuals, 93.6% of total), three species were migrant and the remaining species were either residents or migrants. All migrant species belonged to the flycatcher group. They included Brown-chested flycatcher (*Rhinomyias brunneata*), Mugimaki flycatcher (*Ficedula mugimaki*) and Narcissus flycatcher (*Ficedula narcissina*). The presence of more resident birds in the mist nets was expected since the study conducted outside their migratory season.

The number of bird species recorded by the mist netting technique was highly influenced by netting hours and duration of the study. Extended study periods successfully record more species [10, 11 and 7] while shorter netting hours capture less species [17 and 18].The number of species generally levels off at about 3,600 net hours, after which additional netting effort does not yield new taxa [9]. Prolonged study periods do not necessarily increase capture rates. Where studies show that shorter [17 and 18] periods records higher capture rates [10]. The former studies showed a capture rate of 0.026 and 0.02 respectively, while the latter study showed a capture rate of 0.003. Other mist net studies [7, 19]showed a higher capture rate of 0.043 and 0.097 respectively, and represented the highest capture rates. For the present study, we recorded a captured rate of 0.034, which was slightly lower than recorded by [7]

The three most abundant species of birds in Lubok Tapah were: Yellow-Bellied Bulbul (*Criniger phaeocephalus*) (27 individuals), Grey-

headed Babbler (*Stachyris poliocephala*) (15 individuals), and Rufous-collared Kingfisher (*Halcyon concreta*) (11 individuals). They represented 25% of total birds captured in the present study. In contrast, only single individuals were captured for most species (26 species, 41.9%). Lower capture rates for a majority of bird species is normal for mist net study as has been shown from previous studies [7, 17].

In term of body size, a larger number of small birds were captured (30 species, 49%) compared to medium sized birds (23 species, 37%) and large sized birds (9 species, 14%). This can probably be explained by the presence of smaller sized birds at understory level in tropical rainforest. Netting birds at this level would capture smaller birds than larger birds that usually occupy the canopy or at ground level.

The present study shows that the mist netting technique has the capability of elucidating the community structure of understory birds and its effectiveness of capture and should only be limited to the study of understory birds. Neither the mist netting, point counting nor combination of both methods has the capability to detect all bird species presence in a particular area [9]. Although the point counting normally records more species, some birds can only be detected by mist netting. The mist netting technique is therefore not a perfect method in studying bird community. Several factors such as nets location, seasonal variation, food availability and netting hours may be involved in determining efficiency of the mist netting technique [1, 3 and 9]. Therefore, it is wise to undertake a combination of methods in studying tropical birds' community structure.

REFERENCES

1. Ralph C.J., Geupel, G., Pyle, P., Martin, T. and DeSante, D. (1993). *Handbook of field methods for monitoring landbirds*. Pacific Southwest Research Station, Forest Service, US Department of Agriculture, Albany, California.

2. Matlock J.R., Rogers D., Edwards P. and Martin S. (2002). Avian communities in forest fragments and reforestation areas associated with banana plantations in Costa Rica. *Agriculture, Ecosystems & Environment* **91**: 199-215.

3. Silkey M., Nur N., Geupel G. (1999). The use of mist-net capture rates to monitor annual variation in abundance: a validation study. *Condor* **101**: 288-298.

4. Gardali T., Ballard G., Nur N. and Geupel G.R. (2000). Demography of a declining population of Warbling Vireos in Coastal California. *Condor* **102**: 601-609.

5. Quillfeldt P., Schmoll T. and Peter H.-U. (2000). The use of foot web coloration for the estimation of prebreeder numbers in Wilson's storm-petrels, *Oceanites oceanicus*. *Polar Biology* **23**: 802-804.

6. Poulin B., Lefebvre G. and Pilard P. (2000). Quantifying the breeding assemblage of reedbed passerines with mist-net and point-count surveys. *Journal of Field Ornithology* **71**: 443-454.

7. Zakaria M., Amri K. and Nasir J. (2002). Comparison of understorey bird species composition in a primary and logged hill dipterocarp forest in Peninsular Malaysia. *Malayan Nature Journal* **56**: 153-167.

8. Murphy M., Pierceb A., Shoena J., Murphya K., Campbellc J. and Hamilton D. (2001). Population structure and habitat use by overwintering neotropical migrants on a remote oceanic island. *Biological Conservation* **102**: 333-345.

9. Whitman A., Hagan III J. and Brokaw N. (1997). A Comparison of Two Bird Survey Techniques Used in a Subtropical Forest. *Condor* **99**: 955-965.

10. Wong M. (1986). Trophic organization of understory birds in a Malaysian dipterocard forest. *Auk* **103**: 100-116.

11. Karim-Dakog A., Shahrim-Senik M., Zubaid A. and Davison G.W. (1997). Understorey avifauna of the UKM forest reserve, a fragmented and disturbed lowland rainforest. *Malayan Nature Journal* **50**: 337-346.

12. Karr J. (1981). Surveying birds with mist nets. *Studies in Avian Biology* **6**: 62-67.

13. Schemske D. and Brokaw N. (1981). Treefalls and the distribution of understory

birds in a tropical forest. *Ecology* **62**: 938-945.

14. King B., Woodcock M. and Dickinson E. (1975). *A field guide to the birds of South-East Asia*. Collins, London.

15. Lekagul B. and Round P. (1991). *A Guide to the birds of Thailand*. Saha Karn Bhaet, Bangkok,

16. Jeyarajasingam A. and Pearson A. (1999). *A field guide to the birds of West Malaysia and Singapore*. Oxford University Press, Oxford.

17. Mohd Sah S.A., Baharuddin M. and Muthaiya G. (2002). A brief survey of bird species at Mahua basecamp and Ulu Senagang, Crocker Range National Park, Sabah. *ASEAN Review of Biodiversity and Environmental Conservation [ARBEC]*. July-September.

18. Rahman M.A., Salleh M. and Tuen A. (2002). Bird diversity of the Crocker Range National Park, Sabah, Malaysia. *ASEAN Review of Biodiversity and Environmental Conservation [ARBEC]* July-September.

19. Nagata H., Akbar Z. and Idris H.I. (1997). The effect of forest disturbance on avian community structure at two lowland forests in Peninsular Malaysia. In: *The effect of forest disturbance on avian community structure at two lowland forests in Peninsular Malaysia* (eds. Hasan Z. and Akbar Z.) pp 93-101. Penerbit Universiti Kebangsaan Malaysia, Bangi.

Appendix : List of understory bird captured by mist nets at Lubok Tapah Basecamp

Note: A series of letters follows each species according to the categories;
[i] Bird status; residents species [R], migrant species [M],
[ii] Incidence of abundance; Abundant [A], Common [C], and Uncommon [U]
[iii] Body size; small [S], medium [M], large [L]

Species	Status	Abundance	Body size
Family Timalidae	R	C	M
Abott's Babbler, *Trichastoma abotti*	R	U	M
Black-throated Babbler, *Stachyris nigricolis*	R	U	M
Chestnut-rumped Babbler, *Stachyris maculate*	R	U	M
Chestnut-winged Babbler, *Stachyris erythroptera*	R	A	M
Ferruginous Babbler, *Trichastoma bicolour*	R	C	S
Grey-headed Babbler, *Stachyris poliocephala*	R	C	S
Fluffy-backed Tit-Babbler, *Macronotus ptilosus*	R	U	S
Grey-throated Babbler, *Stachyris nigriceps*	R	U	S
Horsfield's Babbler, *Trichastoma sepiarium*	R	C	M
Moustached Babbler, *Malacopteron magnirostre*	R	C	S
Buff-breasted Babbler, *Trichastoma tickelli*	R	C	S
Rufous-crowned Babbler, *Malacopteron magnum*	R	C	M
Scaly-crowned Babbler, *Malacopteron cinereum*	R	C	S
Short-tailed Babbler, *Trichastoma malaccense*	R	U	S
Brown Fulvetta, *Alcippe brunneicauda*			
White-bellied Yuhina, *Yuhina zantholeuca*			
Family Monarchidae	R/M	C	S
Asian Paradise Flycacther, *Terpsiphone paradise*	R	C	S
Rufous-winged Flycacther, *Philentoma pyrhopterum*	R	U	S
Black-naped Monarch, *Hypothymis azurea*			
Family Muscicapidae	M	U	S
Brown-chested Flycacther, *Rhinomyias brunneata*	R	U	S
Grey-headed Flycacther, *Culicicapa ceylonensis*	R	U	S
Little Pied Flycacther, *Ficedula westermanni*	M	U	S
Mugimaki Flycacher, *Ficedula mugimaki*	M	U	S
Narcissus Flycacther, *Ficedula narcissina*	R	U	S
Rufous-chested Flycacther, *Ficedula dumetoria*	R	U	M
White-tailed Flycacther, *Cyornis concreta*			
Family Rhipiduridae	R	U	S
Spotted Fantail, *Rhipidura perlata*			

Family Turdidae

White-rumped Shama, *Copsychus malabaricus*	R	U	M
Chestnut-naped Forktail, *Enicurus ruficapillus*	R	U	M

Family Pycnonotidae

Ashy Bulbul, *Hypsipetes flavala*	R	U	M
Black and White Bulbul, *Pycnonotus melanoleucos*	R	U	M
Flavescent Bulbul, *Pycnonotus flavescens*	R	U	M
Grey-bellied Bulbul, *Pycnonotus cyaniventris*	R	U	M
Grey-cheeked Bulbul, *Criniger bres*	R	C	M
Hairy-backed Bulbul, *Hypsipetes criniger*	R	C	M
Olive-winged Bulbul, *Pycnonotus plumosus*	R	U	S
Red-eyed Bulbul, *Pycnonotus brunneus*	R	C	M
Spectacle-eyed Bulbul, *Pycnonotus erythropthalmos*	R	C	S
Streaked Bulbul, *Hypsipetes malaccensis*	R	U	M
Yellow-Bellied Bulbul, *Criniger phaeocephalus*	R	A	M

Family Alcedinidae

Banded Kingfisher, *Lacedo pulchella*	R	U	M
Blue-banded Kingfisher, *Alcedo euryzonia*	R	C	M
Oriental Dwarf Kingfisher, *Ceyx erithacus*	R/M	C	S
Rufous-backed Kingfisher, *Ceyx rufidorsus*	R	U	S
Rufous-collared Kingfisher, *Halcyon concreta*	R	A	L

Family Picidae

Banded Woodpecker, *Picus miniaceus*	R	U	L
Buff-necked Woodpecker, *Meiglyptes tukki*	R	U	L
Maroon Woodpecker, *Blythipicus rubiginosus*	R	U	L
Rufous Piculet, *Sasia ochracea*	R	U	S

Family Dicruridae

Bronzed Drongo, *Dicrurus aeneus*	R	U	L
Greater Racket Tailed Drongo, *Dicrurus paradiseus*	R	C	L

Family Sylviidae

Common Tailorbird, *Orthotomus sutorius*	R	C	S
Rufous-tailed Tailorbird, *Orthotomus sericeus*	R	U	S

Family Nectariniidae

Crimson Sunbird, *Aethopyga siparaja*	R	U	S
Purple-naped Sunbird, *Hypogramma hypogrammicum*	R	U	S
Little Spiderhunter, *Arachnothera longirostra*	R	C	S

Family Dicaeidae

Orange-bellied Flowerpecker, *Dicaeum melanoxanthum*	R	U	S
Yellow-breasted Flowerpecker, *Prionochilus maculates*	R	C	S

Family Chloropseidae

Greater Green Leafbird, *Chloropsis sonnerati*	R	U	M

Family Eurylaimidae

Green Broadbill, *Calyptomena viridis*	R	U	L

Family Pittidae

Hooded Pitta, *Pitta sordida*	R/M	U	L