

The Ecology of Forest Birds at Mo-Singto, Khao Yai

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Estimates of the density of territorial understorey birds at Mo-Singto, Khao Yai, during 2003-2005 obtained using Distance methods (line-transects and variable circular plots) were strongly correlated with those obtained from spot-mapping, but ranged from 71.4% lower to 64.8% higher among the seven species tested. Sample sizes of approximately 100 detections per species are desirable to minimise the coefficient of variation of density estimates.

Most smaller birds were generalists, taking both plant and animal foods. Breeding success appeared to be low, though some species were able to make multiple nesting attempts during the relatively long breeding season that spanned almost half the year.

Key words: biomass, bird community, density estimation, distance sampling

Introduction

In Southeast Asia, there are very few data on absolute numbers and densities of birds in forest habitats. Density estimates are critical for population monitoring and serve as a baseline against which future changes can be measured. The species density estimates also provide baseline indicators of forest integrity for comparing the relative “quality” of forests. However, in most cases, studies have barely progressed beyond inventorying species present. McClure (1974) used standardized walks/transects to record seasonality of birds in Khao Yai; Round and Brockelman (1998) produced estimates of species richness and diversity for some forest habitats in southern Thailand. Neither study attempted density estimates. Although Wells (1978), Zakaria and Francis (1999), Francis and Wells (2003), used intensive mist-netting to derive densities of understorey birds for lowland forest at Pasoh, Malaysia, this was combined with only limited visual sampling.

Such techniques for estimating density as have been used are very time consuming, or are aimed at particular species. Poonswad (1995), Poonswad and Tsuji (1994) estimated nest-densities of hornbills by locating all or most nests in a given area, while radio telemetry was used to identify home ranges of a small number of marked individuals. Marsden (1999) estimated parrot and hornbill densities from point-sampling.

In general seasonal, monsoonal forests have generally received less attention than equatorial rainforests. Here, we report our observations on the bird community in Khao Yai National Park during 2003-2005, in which we combined distance sampling (Buckland et al., 1993) with spot-mapping and colour marking to estimate populations. We also report some preliminary observations on nesting and feeding ecology.

Methodology

1. Study site

The Mo-singto Long Term Biodiversity Research Plot, (14°26'N, 101°22'E) covers an area of 30 ha in the contiguous ca. 2000 sq. km Khao Yai National Park. The plot has been surveyed and mapped on a 20-m grid, and the locations of all trees greater than 10 cm dbh plotted (Brockelman, 1998). The plot is dominated by series of ridges and valleys with an elevation range of 723–817 m. above sea level. The vegetation is mainly mature evergreen forest with small areas (< 0.5 ha) of

regenerating secondary forest at the northern edge of the plot. Precipitation is 2000–3000 mm/year (Bartlett, 1999), most of which falls during May to October.

2. Sampling methods

Distance sampling was implemented along eight 500 m-long transects, oriented north-south, at 80 m intervals; and on 20 variable circular plots (VCPs) spaced at 80-160 m intervals. Four observers each covered two line transects and 4-5 VCPs during three successive mornings, one time per month. Only one transect or one set of 4-5 VCPs was covered each morning, during 06:30-09:30 h. Observation distance was estimated for all birds seen or heard up to 80 m, and the bearing of each observation recorded with a sighting compass for line transects, while rough bearings were recorded for VCPs as they are not required for point sampling. Data were analysed using the DISTANCE program (Thomas et al., 2004).

In addition, birds were caught in mist-nets, set at heights up to c. 3 m above the forest floor and individually colour-banded with 2-3 colour rings and one numbered metal ring. Most netting was conducted along trails and over streams, where some species came to drink and bathe. Playback tapes were used on occasion in order to attract birds to the net. All birds handled were measured and weighed; examined for breeding condition and moult, and their faeces collected for analysis where possible.

Opportunistic searches were made for colour-ringed individuals throughout the entire year, and the positions of all individuals were recorded with reference to 20 m x 20 m grid-square and tree number. Nests were also searched for during the breeding season (mainly January to August) and were monitored in order to determine outcome.

Results

1. Community composition, biomass and species richness

A total of 159 species has been recorded on the Mo-Singto Plot (Appendix). Since the plot is almost entirely forested, it lacks many grassland and edge species that occur in the vicinity, and the total recorded on the plot is approximately 40 species fewer than known for the headquarters area of the park. 115 species (69%) were resident: most of the remainder were regular non-breeding visitors.

The estimated density (all species combined) obtained from line-transect-sampling, was 27.3 individuals per ha, and biomass 1.98 kg/ha (Table 1). Hornbills (Bucerotidae: four species) contributed 31.5% of the biomass, but only 2.8% of individuals.

The most abundant species was Puff-throated Bulbul, *Alophoixus pallidus* (3-4 individuals per ha). Most other species had densities of less than one individual per ha (Table 1). Using the criteria of Robinson et al. (2000), 15 (18.1 %) of the 83 resident or breeding species for which density figures are available were considered “rare” (having < 0.02 individuals per ha) while seven species (8.4%) were considered “superabundant” having > 0.95 individuals /ha.

Estimates of density obtained from distance methods were strongly correlated with those obtained from spot-mapping (Table 2; Fig. 1), though there was great variability among species. In White-browed Scimitar Babbler (*Pomatorhinus schisticeps*), for example, density estimates obtained from line-transect and VCP were 60.8% and 71.4 % lower respectively than those obtained by spot-mapping, whereas in Puff-throated Bulbul they were 24.1% and 64.8% higher (Table 2). Much may depend upon how behavioural idiosyncracies of individual species affect detectability. In general however, line-transects gave estimates closer to the “true” density than did VCPs.

Precision of the density estimates was related to the number of detections, though the coefficient of variation of density estimates did not markedly decrease once 100 sightings per species was reached (Fig. 2). At the present time, however, in only about 20% of species has this threshold been achieved.

Table 1. Density, community composition and biomass of birds at Mo-Singto, obtained from Line-transect distance sampling

Species	density/ha	% of community (individuals)	% of community (weight)	Biomass (g/ha)
Phasianidae				
<i>Arborophila chloropus</i>	0.19	0.70	4.84	95.83
<i>Gallus gallus</i>	0.05	0.20	1.37	27.13
<i>Lophura nycthemera</i>	0.09	0.34	5.38	106.51
<i>Lophura diardi</i>	0.20	0.73	10.10	199.72
Picidae				
<i>Picus flavinucha</i>	0.04	0.13	0.09	1.76
<i>Picus vittatus</i>	0.08	0.30	0.12	2.44
<i>Chrysocolaptes lucidus</i>	0.10	0.37	0.25	5.04
<i>Meiglyptes jugularis</i>	0.00	0.01	0.00	0.05
<i>Hemicircus canente</i>	0.07	0.26	0.07	1.45
Megalaimidae				
<i>Megalaima australis</i>	0.15	0.56	0.23	4.62
<i>Megalaima faiostricta</i>	0.17	0.64	0.82	16.25
<i>Megalaima incognita</i>	0.66	2.40	2.92	57.79
<i>Megalaima sp.</i>	0.05	0.18	0.23	4.52
Bucerotidae				
<i>Anthracoceros albirostris</i>	0.57	2.09	19.70	389.66
<i>Anorrhinus tickelli</i>	0.13	0.48	5.31	105.00
<i>Buceros bicornis</i>	0.04	0.13	4.77	94.38
<i>Aceros undulatus</i>	0.02	0.06	1.75	34.62
Trogonidae				
<i>Harpactes oreskios</i>	0.18	0.65	0.54	10.67
<i>Harpactes erythrocephalus</i>	0.28	1.02	1.24	24.49
<i>Harpactes sp.</i>	0.05	0.18	0.18	3.58
Halcyonidae				
<i>Lacedo pulchella</i>	0.06	0.20	0.12	2.43
Meropidae				
<i>Nyctyornis athertoni</i>	0.04	0.15	0.21	4.06
<i>Merops leschenaulti</i>	0.45	1.63	0.79	15.59
Cuculidae				
<i>Clamator coromandus</i>	0.00	0.00	0.01	0.16
<i>Hierococcyx sparverioides</i>	0.00	0.00	0.01	0.13
<i>Surniculus lugubris</i>	0.00	0.01	0.00	0.08
<i>Phaenicophaeus tristis</i>	0.07	0.27	0.49	9.62
<i>Carpococcyx renauldi</i>	0.01	0.04	0.30	5.85
Psittacidae				
<i>Loriculus vernalis</i>	0.27	1.00	0.28	5.44
Strigidae				
<i>Glaucidium brodiei</i>	0.06	0.22	0.15	2.97
<i>Glaucidium cuculoides</i>	0.01	0.02	0.04	0.87
Columbidae				
<i>Macropygia unchall</i>	0.05	0.20	0.35	7.01
<i>Chalcophaps indica</i>	0.05	0.20	0.37	7.22
<i>Treron curvirostra</i>	0.12	0.46	0.63	12.45
<i>Ducula badia</i>	0.11	0.41	1.14	22.48
Accipitridae				
<i>Aviceda jerdoni</i>	0.00	0.00	0.07	1.29
<i>Spilornis cheela</i>	0.01	0.02	0.33	6.46
<i>Accipiter trivirgatus</i>	0.01	0.03	0.14	2.77

Table 1. (continued).

Species	density/ha	% of community (individuals)	% of community (weight)	Biomass (g/ha)
<i>Accipiter badius</i>	0.00	0.00	0.01	0.28
Ardeidae				
<i>Ardeola bacchus</i>	0.00	0.00	0.01	0.13
Pittidae			0.00	
<i>Anthocincla phayrei</i>	0.08	0.28	0.39	7.72
<i>Pitta cyanea</i>	0.06	0.22	0.35	6.90
<i>Pitta sordida</i>	0.01	0.03	0.03	0.64
Eurylaimidae				
<i>Eurylaimus javanicus</i>	0.08	0.29	0.24	4.71
<i>Serilophus lunatus</i>	0.19	0.69	0.33	6.59
<i>Psarisomus dalhousiae</i>	0.27	1.00	0.89	17.59
Irenidae			0.00	
<i>Irena puella</i>	0.97	3.56	3.33	65.87
<i>Chloropsis cochinchinensis</i>	0.55	2.01	0.83	16.50
Corvidae				
<i>Cissa chinensis</i>	0.09	0.33	0.56	11.13
<i>Crypsirina temia</i>	0.00	0.00	0.00	0.04
<i>Oriolus chinensis</i>	0.06	0.22	0.15	3.06
<i>Coracina melaschistos</i>	0.07	0.26	0.07	1.40
<i>Pericrocotus roseus</i>	0.00	0.00	0.00	0.03
<i>Pericrocotus cantonensis</i>	0.07	0.25	0.07	1.34
<i>Pericrocotus flammeus</i>	0.22	0.80	0.26	5.06
<i>Hemipus picatus</i>	0.19	0.69	0.10	1.90
<i>Dicrurus leucophaeus</i>	0.06	0.23	0.12	2.35
<i>Dicrurus remifer</i>	0.02	0.09	0.06	1.18
<i>Dicrurus hottentottus</i>	0.07	0.26	0.29	5.77
<i>Dicrurus paradiseus</i>	0.26	0.96	1.06	20.92
<i>Dicrurus</i> sp.	0.06	0.23	0.26	5.08
<i>Hypothymis azurea</i>	0.58	2.12	0.34	6.73
<i>Terpsiphone paradisi</i>	0.05	0.17	0.05	0.92
<i>Aegithina tiphia</i>	0.00	0.01	0.00	0.04
<i>Aegithina lafresnayei</i>	0.13	0.47	0.10	1.91
<i>Tephrodornis gularis</i>	0.03	0.12	0.04	0.73
Turdidae				
<i>Myophonus caeruleus</i>	0.01	0.02	0.04	0.77
<i>Zoothera citrina</i>	0.01	0.02	0.02	0.41
<i>Turdus obscurus</i>	0.05	0.19	0.04	0.78
Muscicapidae				
<i>Eumyias thalassina</i>	0.00	0.00	0.00	0.02
<i>Cyornis banyumas</i>	1.61	5.89	1.24	24.47
<i>Culicicapa ceylonensis</i>	0.14	0.50	0.06	1.16
<i>Luscinia cyane</i>	0.05	0.19	0.04	0.75
<i>Copsychus malabaricus</i>	0.48	1.76	0.67	13.25
<i>Enicurus schistaceus</i>	0.00	0.00	0.00	0.03
<i>Enicurus leschenaulti</i>	0.06	0.22	0.13	2.57
Sturnidae				
<i>Gracula religiosa</i>	0.18	0.67	0.88	17.37
Sittidae			0.00	
<i>Sitta frontalis</i>	0.02	0.06	0.01	0.21
Paridae				
<i>Melanochlora sultanea</i>	0.09	0.32	0.11	2.21

Table 1. (continued).

Species	density/ha	% of community (individuals)	% of community (weight)	Biomass (g/ha)
Pycnonotidae				
<i>Pycnonotus atriceps</i>	0.03	0.10	0.03	0.67
<i>Pycnonotus melanicterus</i>	1.28	4.70	1.71	33.91
<i>Pycnonotus finlaysoni</i>	0.07	0.27	0.11	2.09
<i>Alophoixus pallidus</i>	4.13	15.12	9.23	182.59
<i>Iole propinqua</i>	0.89	3.25	1.17	23.16
<i>Hemixos flavala</i>	0.20	0.73	0.35	6.96
Sylviidae				
<i>Zosterops everetti</i>	0.06	0.21	0.03	0.53
<i>Zosterops</i> sp.	0.32	1.17	0.15	2.91
<i>Orthotomus atrogularis</i>	1.45	5.30	0.52	10.29
<i>Phylloscopus schwarzi</i>	0.02	0.06	0.01	0.19
<i>Phylloscopus inornatus</i>	0.41	1.49	0.12	2.28
<i>Phylloscopus plumbeitarsus</i>	0.09	0.32	0.03	0.61
<i>Phylloscopus tenellipes</i>	0.14	0.50	0.06	1.18
<i>Phylloscopus reguloides</i>	0.22	0.82	0.08	1.57
<i>Phylloscopus ricketti</i>	0.08	0.28	0.03	0.57
<i>Phylloscopus</i> sp.	0.02	0.06	0.00	0.09
<i>Seicercus omeiensis</i>	0.00	0.00	0.00	0.01
<i>Seicercus soror</i>	0.33	1.20	0.13	2.50
<i>Garrulax leucolophus</i>	0.40	1.46	2.57	50.93
<i>Garrulax monileger</i>	0.03	0.12	0.16	3.20
<i>Garrulax chinensis</i>	0.01	0.05	0.06	1.10
<i>Malacocincla abbotti</i>	0.85	3.11	1.14	22.61
<i>Pellorneum ruficeps</i>	0.06	0.22	0.07	1.44
<i>Pomatorhinus hypoleucos</i>	0.06	0.21	0.26	5.05
<i>Pomatorhinus schisticeps</i>	0.49	1.79	1.08	21.46
<i>Macronous gularis</i>	2.02	7.40	1.31	25.89
<i>Yuhina zantholeuca</i>	1.07	3.92	0.65	12.84
Nectariniidae				
<i>Dicaeum agile</i>	0.01	0.03	0.00	0.04
<i>Dicaeum ignipectus</i>	0.58	2.12	0.16	3.07
<i>Dicaeum</i> sp.	0.01	0.04	0.00	0.06
<i>Anthreptes singalensis</i>	0.01	0.03	0.00	0.05
<i>Aethopyga saturata</i>	0.40	1.46	0.11	2.23
<i>Arachnothera longirostra</i>	0.27	0.97	0.17	3.32
Biomass/ha (g)				1978.32
individuals/ha	27.33			

2. Feeding

A total of 81 species of flowering plants were identified as providing food for at least 21 species of smaller birds. These were mostly identified from seeds in faecal remains (sometimes from direct observations). Many smaller birds, even those species previously assumed to be largely insectivorous, including laughingthrushes, *Garrulax* spp., and scimitar babblers *Pomatorhinus* spp., appeared to be to some extent generalists, taking a significant proportion of plant food.

3. Seasonality

Most species nested during the late dry season and early wet season, with most nests being found during mid-March to the end of May (Fig. 3). The few nests found in August to October were

mostly those of doves (Columbidae) and Pittas (Pittidae). Pittas are exclusively ground-feeders and some doves feed to some extent terrestrially. Moults follows breeding and appears to be complete in most species by October. The breeding and moult seasons overlap, though so far as known individuals do not commence moult until breeding has ceased.

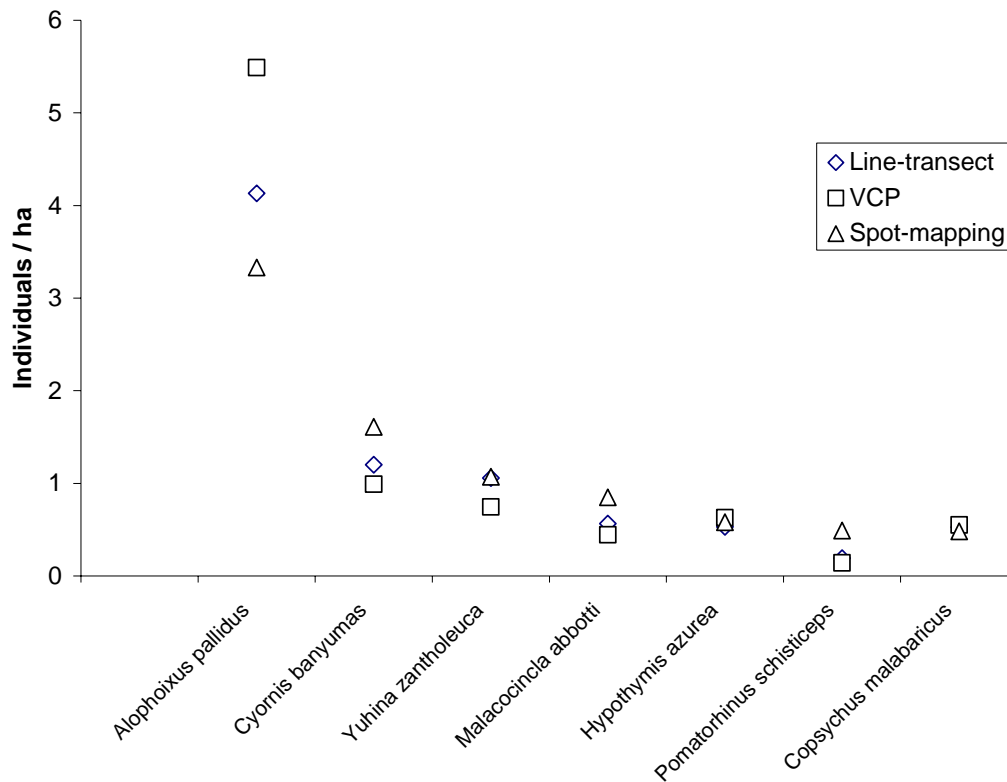


Figure 1. The relationship between density estimates from line transects and VCP's compared with the "true" estimates from spot-mapping. Line transects and VCP estimates are significantly correlated with the spot-mapping estimates ($r_{\text{Spearman}} = 0.96$, $p < 0.001$; $r_{\text{Spearman}} = 0.82$, $p = 0.02$ for line transects and VCP's respectively).

Table 2. Densities (per ha) of understory and middle storey territorial birds comparing estimates from line transect and VCP's with the "true" estimates from spot-mapping.

Species	Line-transect	VCP	Spot-mapping	% Difference	
				transect	VCP
<i>Alophoixus pallidus</i>	4.131	5.488	3.33	24.1	64.8
<i>Cyornis banyumas</i>	1.200	0.990	1.61	-25.5	-38.5
<i>Yuhina zantholeuca</i>	1.056	0.744	1.07	-1.3	-30.5
<i>Malacocincla abbotti</i>	0.565	0.443	0.85	-33.5	-47.9
<i>Hypothymis azurea</i>	0.530	0.630	0.58	-8.6	8.6
<i>Pomatorhinus schisticeps</i>	0.192	0.140	0.49	-60.8	-71.4
<i>Copsychus malabaricus</i>	0.528	0.550	0.48	10.0	14.6
			Mean	-13.7	-14.3
			SD	28.6	46.3

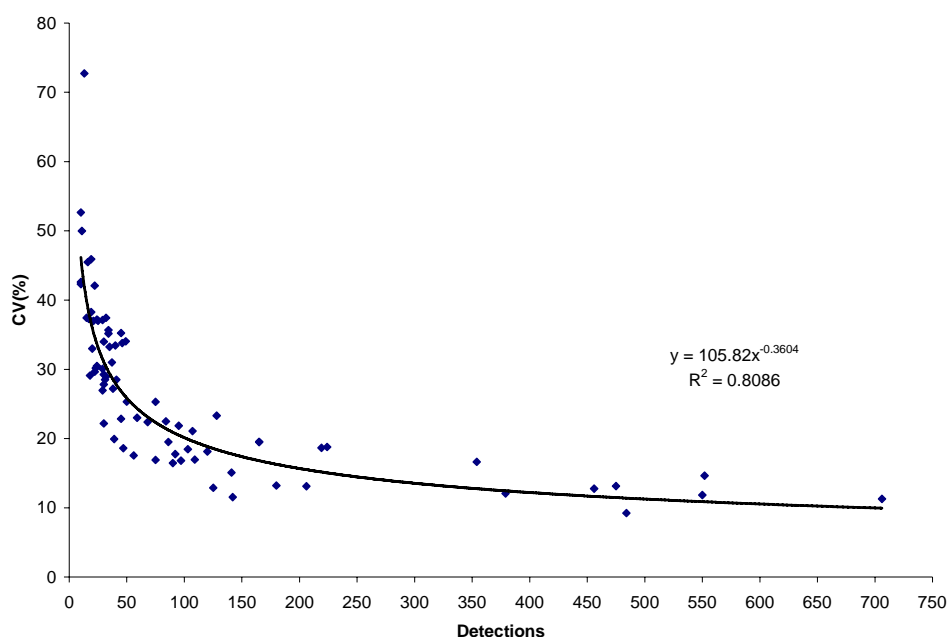


Figure 2. The relationship between number of detections and the coefficient of variation of density estimates derived from line transects.

Although the seasonality of breeding and moult is presumed to be related to fluctuations in food supply, neither was well correlated with either rainfall or with fruit abundance (Fig. 3). It is presumed that the availability of insect or other invertebrate food is the key factor influencing seasonality. Timing of breeding is likely to have evolved so that either key stages in the life-cycle, such as the provisioning of young in the nest or provisioning of young fledglings, is correlated with optimal food availability; or that both key events on the annual cycle (breeding and moult) are timed to avoid any seasonal “lean period”. There is little information on seasonal fluctuations in invertebrate abundance or availability for tropical Asia, but data from the Neotropics suggests that insect abundance is reduced during the dry season (Janzen, 1973).

4. Nesting success

A total of 395 nests of 39 species was found during 2003-2005. Overall (uncorrected) estimates of nesting success for all species combined ranged from 40% in 2003 to 24% in 2005.

The sample sizes of nests for two species, Puff-throated Bulbul and Abbott’s Babbler (*Malacocincla abbotti*) were large enough to yield corrected (Mayfield) estimates of nesting success. Nesting success for Puff-throated Bulbul in 2004 was 20.7% ±9.6 SE (n = 23) and 8.2% ±3.8 SE in 2005 (n = 56). For Abbott’s Babbler nesting success was 24.9 ±8.5 SE (n = 32) and 11.3% ±6.9, (n = 24) for 2004 and 2005 respectively (Table 3). The differences between the two years were not significant, though the coincidence in results for both species (nesting success in 2005 was only half that obtained in 2004) indicates that the difference was probably real.

Table 3. Corrected (Mayfield) estimates of breeding success for Puff-throated Bulbul and Abbott’s Babbler

	2003	2004	2005
<i>Alophoixus pallidus</i>	N/A	20.7% ±9.6 (n = 23)	8.2% ±3.8 (n = 56)
<i>Malacocincla abbotti</i>	36.2 ± 13.3 (n = 22)	24.9% ± 8.5 (n = 32)	11.3 ± 6.9 (n = 24)

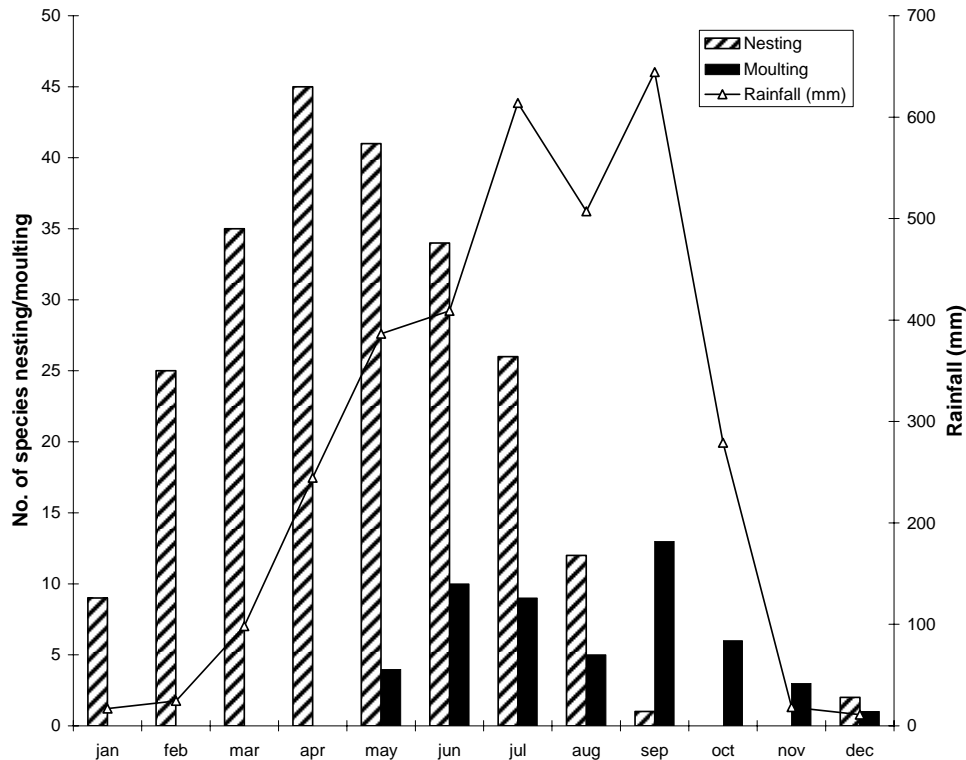


Figure 3. Seasonality of breeding and moulting

Predation was the main cause of nest failure (97% of nests), and it is likely that the differences in nesting success were due to differences in predation pressure. 2005 was markedly drier than 2004, and we hypothesize that macaques, one of the main nest predators, may focus more on depredate birds' nests in lower rainfall years, possibly due to reduced abundance of fruits or other resources.

Although we were able to study only a few species in detail, we speculate that multiple nesting and perhaps double-brooding is common given the long breeding season (often > 6 months) and the low nesting success rates (< 30%). Abbott's Babbler females made an average of 2.5 nesting attempts in the 2003-2004 nesting season, with some making as many as four nesting attempts and at least one pair successfully fledging two broods (Pobprasert, 2005).

Discussion

Species richness at Khao Yai was markedly lower than at the two neotropical sites: Terborgh et al. (1990) recorded 245 resident species in a 97 ha plot in lowland Amazonian rainforest, while Robinson et al. (2000) recorded 181 resident species in 104 ha in Panama.

The Khao Yai total was also lower than that in equatorial rainforest in SE Asia. Francis and Wells (2003) recorded 220 species, of which 195 species were resident, at Pasoh, Malaysia. Although this was over a much longer period (30 years), and in a very much larger area (600 ha), there is a well known gradient of declining bird species richness with increasing latitude in SE Asia, as elsewhere. Khao Yai supports only ten species of laughingthrushes and babblers compared with 24 species in Pasoh and scarcely fewer, 22 species in the forest interior at Khao Nor Chuchi, southern Thailand (Round and Treesucon, 1999).

Lower species richness appears to be correlated with higher populations (greater densities) per individual species. There were some similarities between Khao Yai and the Panama site, which had 8 superabundant species, and a density of 2.12 individuals/ha for its most abundant species. In the Amazon, in contrast, there were no superabundant species and the most common species had an abundance of only 0.3 individuals/ha. Wells and Francis (2003) estimated densities of 0.11-0.75

individuals per ha, and mean density of 0.29 individuals per ha for 11 species of babblers (Timaliinae) at Pasoh. There were more common species and fewer rare species at Khao Yai than at these other sites.

The estimates of density and biomass presented here are tentative. Our findings correspond with those of Buckland et al. (1993) who recommended 100 detections per species in order to model detection curves. Marsden (1999) surmised, that as many as 2,000 point counts might be needed to assess the abundance of rare species. Likewise, Robinson et al. (2000) suggested that large study areas (>500 ha) would be required to accurately estimate densities of rare species. Because Khao Yai was much less species-rich, the 30 ha Mo-singto plot was probably large enough to obtain reliable density estimates for most smaller birds. We are still evaluating census methods for scarcer species, and group-territorial species such as White-crested Laughingthrush *Garrulax leucolophus* that have large home ranges, apparently with overlap among different groups.

The investment already made in terms of colour-marking and mapping territories and movements offers opportunities for carrying out more detailed studies on population dynamics and social behaviour. Research topics now being pursued, including studies on nest-predation, cooperative breeding and kinship, group-size and territory quality, frugivory and the seasonality of insect and other invertebrate abundance. Continued emphasis on the routine of catching and marking birds, monitoring movements, finding and monitoring nests is a prerequisite for these studies.

Acknowledgements

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Appendix. List of bird species recorded on the Mo-Singto Study Plot.

Sequence, taxonomy and nomenclature follows Round (2000) except where marked *. R resident/presumed resident; B wet-season breeding visitor; N non-breeding (winter) visitor; P Passage migrant.

Species	Thai name	Status
Scaly-breasted Partridge <i>Arborophila chloropus</i>	นกกระทาดงแข้งเขียว,	R
Red Junglefowl <i>Gallus gallus</i>	ไก่ป่า	R
Silver Pheasant <i>Lophura nycthemera</i>	ไก่ฟ้าหลังขาว	R
Siamese Fireback <i>Lophura diardi</i>	ไก่ฟ้าพญาลอ	R
Rufous Woodpecker <i>Celeus brachyurus</i>	นกหัวขวานสีตาล	R
Greater Yellownappe <i>Picus flavinucha</i>	นกหัวขวานใหญ่หงอนเหลือง	R
Laced Woodpecker <i>Picus vittatus</i>	นกหัวขวานเขียวป่าไผ่	R
Grey-headed Woodpecker <i>Picus canus</i>	นกหัวขวานเขียวหัวดำ	R
Greater Flameback <i>Chrysocolaptes lucidus</i>	นกหัวขวานสีน้ำตาลทอง	R
Black-and-buff Woodpecker <i>Meiglyptes jugularis</i>	นกหัวขวานดำท้องดำ	R
Heart-spotted Woodpecker <i>Hemicircus canente</i>	นกหัวขวานแครงจุดรูปหัวใจ	R
Great Slaty Woodpecker <i>Mulleripicus pulverulentus</i>	นกหัวขวานใหญ่สีเทา	R
Green-eared Barbet <i>Megalaima faiostrica</i>	นกโพระดกหูเขียว	R
Moustached Barbet <i>Megalaima incognita</i>	นกโพระดกคอสีฟ้าเคราดำ	R
Blue-eared Barbet <i>Megalaima australis</i>	นกโพระดกหน้าผากดำ	R
Oriental Pied Hornbill <i>Anthracoceros albirostris</i>	นกแก๊ก, นกแกง	R
Great Hornbill <i>Buceros bicornis</i>	นกกก, นกกาฮัง	R
Brown Hornbill <i>Anorrhinus tickelli</i>	นกเงือกสีน้ำตาลคอขาว	R
Wreathed Hornbill <i>Aceros undulatus</i>	นกเงือกกรมช้าง	R
Orange-breasted Trogon <i>Harpactes oreskios</i>	นกขุนแผนอกสีส้ม	R
Red-headed Trogon <i>Harpactes erythrocephalus</i>	นกขุนแผนหัวแดง	R
Dollarbird <i>Eurystomus orientalis</i>	นกตะขาบดง	R
Blue-eared Kingfisher <i>Alcedo meninting</i>	นกกระเต็นน้อยหลังสีน้ำเงิน	R
Black-backed Kingfisher <i>Ceyx (e.) erithacus</i>	นกกระเต็นน้อยหลังดำ	P
Banded Kingfisher <i>Lacedo pulchella</i>	นกกระเต็นลาย	R
Blue-bearded Bee-eater <i>Nyctyornis athertoni</i>	นกจาบคาเคราน้ำเงิน	R
Chestnut headed Bee-eater <i>Merops leschenaulti</i>	นกจาบคาหัวสีส้ม	R
Chestnut-winged Cuckoo <i>Clamator coromandus</i>	นกคัคคูหงอน	P
Large Hawk Cuckoo <i>Hierococcyx sparveroides</i>	นกคัคคูเหยี่ยวใหญ่	N
Hodgson's Hawk Cuckoo <i>Hierococcyx fugax</i>	นกคัคคูเหยี่ยวอกแดง	R
Indian Cuckoo <i>Cuculus micropterus</i>	นกคัคคูพันธุ์อินเดีย	R
Banded Bay Cuckoo <i>Cacomantis sonneratii</i>	นกคัคคูลาย	R
Drongo Cuckoo <i>Surniculus lugubris</i>	นกคัคคูแสลงแซว	R
Green-billed Malkoha <i>Phaenicophaeus tristis</i>	นกบั้งรอกใหญ่	R
Coral-billed Ground Cuckoo <i>Carpococcyx renauldi</i>	นกโกโรโกโส	R
Greater Coucal <i>Centropus sinensis</i>	นกกระปูดใหญ่	R
Vernal Hanging Parrot <i>Loriculus vernalis</i>	นกหกเล็กปากแดง	R
Brown-backed Needletail <i>Hirundapus giganteus</i>	นกแอ่นใหญ่หัวตาขาว	R
Asian Palm Swift <i>Cypsiurus balasiensis</i>	นกแอ่นตาล	R

Appendix. (continued)

Species	Thai name	Status
Oriental Bay Owl <i>Phodilus badius</i>	นกแสกแดง	R
Mountain Scops Owl <i>Otus spilocephalus</i>	นกเค้าภูเขา	R
Collared Scops Owl <i>Otus bakkamoena</i>	นกฮูก, นกเค้ากู่	R
Spot-bellied Eagle Owl <i>Bubo nipalensis</i>	นกเค้าใหญ่พันธุ์เนปาล	R
Collared Owlet <i>Glaucidium brodiei</i>	นกเค้าแคระ	R
Asian Barred Owlet <i>Glaucidium cuculoides</i>	นกเค้าโมง, นกเค้าแมว	R
Brown Boobook <i>Ninox scutulata</i>	นกเค้าเหยี่ยว	R
Great Eared Nightjar <i>Eurostopodus macrotis</i>	นกตบยุงยักษ์	R
Spotted Dove <i>Streptopelia chinensis</i>	นกเขาใหญ่, นกเขาหลวง	R
Barred Cuckoo Dove <i>Macropygia unchall</i>	นกเขาลายใหญ่	R
Emerald Dove <i>Chalcophaps indica</i>	นกเขาเขียว	R
Thick-billed Pigeon <i>Treron curvirostra</i>	นกเขาเปลา	R
Mountain Imperial Pigeon <i>Ducula badia</i>	นกมูม	R
Eurasian Woodcock <i>Scolopax rusticola</i>	นกปากซ่อมตง	N
Jerdon's Baza <i>Aviceda jerdoni</i>	เหยี่ยวกิ้งก่าสีน้ำตาล	B
Black Baza <i>Aviceda leuphotes</i>	เหยี่ยวกิ้งก่าสีดำ	N, R
Oriental Honey-buzzard <i>Pernis ptilorhynchus</i>	เหยี่ยวผึ้ง	N, R
Crested Serpent Eagle <i>Spilornis cheela</i>	เหยี่ยวรุ้ง	R
Crested Goshawk <i>Accipiter trivirgatus</i>	เหยี่ยวนกเขาหงอน	R
Shikra <i>Accipiter badius</i>	เหยี่ยวนกเขาชิดรา	R
Besra <i>Accipiter virgatus</i>	เหยี่ยวนกระจอกเล็ก	R
Mountain Hawk Eagle <i>Spizaetus nipalensis</i>	เหยี่ยวภูเขา	R
Chinese Pond Heron <i>Ardeola bacchus</i>	นกยางกรอกพันธุ์จีน	N
Malayan Night Heron <i>Gorsachius melanolophus</i>	นกยางลายเสือ	R
Eared Pitta <i>Anthocincla phayrei</i> *	นกแต้วแล้วหูยาว	R
Blue Pitta <i>Pitta cyanea</i>	นกแต้วแล้วสีน้ำเงิน	R
Hooded Pitta <i>Pitta sordida</i>	นกแต้วแล้วอกเขียว	B
Dusky Broadbill <i>Corydon sumatranus</i>	นกพญาปากกว้างสีดำ	R
Banded Broadbill <i>Eurylaimus javanicus</i>	นกพญาปากกว้างลายเหลือง	R
Silver-breasted Broadbill <i>Serilophus lunatus</i>	นกพญาปากกว้างอกสีเงิน	R
Long-tailed Broadbill <i>Psarismus dalhousiae</i>	นกพญาปากกว้างหางยาว	R
Asian Fairy Bluebird <i>Irena puella</i>	นกเขี้ยวคราม	R
Blue-winged Leafbird <i>Chloropsis cochinchinensis</i>	นกเขี้ยวก้านทองปีกสีฟ้า	R
Grey-backed Shrike <i>Lanius tephronotus</i>	นกอีเสือหลังเทา	N
Green Magpie <i>Cissa chinensis</i>	นกสาลิกาเขียว	R
Racket-tailed Treepie <i>Crypsirina temia</i>	นกกาแวน	R
Large-billed Crow <i>Corvus macrorhynchos</i>	อีกา	R
Black-naped Oriole <i>Oriolus chinensis</i>	นกขมิ้นท้ายทอยดำ	N
Silver Oriole <i>Oriolus mellianus</i>	นกขมิ้นขาว	N
Black-winged Cuckooshrike <i>Coracina melaschistos</i>	นกเขี้ยวมั่งใหญ่	N
Rosy Minivet <i>Pericrocotus roseus</i>	นกพญาไฟสีกุหลาบ	N

Appendix. (continued)

Species	Thai name	Status
Brown-rumped Minivet <i>Pericrocotus cantonensis</i>	นกพญาไฟตะโพกสีน้ำตาล	N
Scarlet Minivet <i>Pericrocotus flammeus</i>	นกพญาไฟใหญ่	R
Bar-winged Flycatcher-shrike <i>Hemipus picatus</i>	นกเขนน้อยปีกแถบขาว	R
Ashy Drongo <i>Dicrurus leucophaeus</i>	นกแขงแขวสีเทา	R,N
Bronzed Drongo <i>Dicrurus aeneus</i>	นกแขงแขวเล็กเหลือบ	R
Lesser Racket-tailed Drongo <i>Dicrurus remifer</i>	นกแขงแขวหางปวงเล็ก	N
Hair-crested Drongo <i>Dicrurus hottentottus</i>	นกแขงแขวหงอนขน	N
Greater Racket-tailed Drongo <i>Dicrurus paradiseus</i>	นกแขงแขวหางปวงใหญ่	R
Black-naped Monarch <i>Hypothymis azurea</i>	นกจับแมลงจุกดำ	R
Asian Paradise-flycatcher <i>Terpsiphone paradisi</i>	นกแขวสวรรค์	N,R
Japanese Paradise-flycatcher <i>Terpsiphone atrocaudata</i>	นกแขวสวรรค์หางดำ	P (vagrant)
Common Iora <i>Aegithina tiphia</i>	นกขมิ้นน้อยธรรมดา	R
Great Iora <i>Aegithina lafresnayeii</i>	นกขมิ้นน้อยปีกสีเขียว	R
Large Woodshrike <i>Tephrodornis gularis</i>	นกเฉีวตงหางสีน้ำตาล	R
White-throated Rock Thrush <i>Monticola gularis</i>	นกกระเบื้องคอขาว	N
Blue Whistling Thrush <i>Myophonus caeruleus</i>	นกเอี้ยงถ้ำ	N
Orange-headed Thrush <i>Zoothera citrina</i>	นกเดินตงหัวสีส้ม	N
Siberian Thrush <i>Zoothera sibirica</i>	นกเดินตงสีเทาดำ	P
Scaly Thrush <i>Zoothera dauma</i>	นกเดินตงลายเสือ	N
Grey-sided Thrush <i>Turdus feae</i>	นกเดินตงอกเทา	N (vagrant)
Eyebrowed Thrush <i>Turdus obscurus</i>	นกเดินตงสีคล้ำ	N
Dark-sided Flycatcher <i>Muscicapa sibirica</i>	นกจับแมลงสีคล้ำ	N
Asian Brown Flycatcher <i>Muscicapa dauurica</i>	นกจับแมลงสีน้ำตาล	N
Mugimaki Flycatcher <i>Ficedula mugimaki</i>	นกจับแมลงคออกสีส้ม	N
Verditer Flycatcher <i>Eumyias thalassinus</i>	นกจับแมลงสีฟ้า	N
Hainan Blue Flycatcher <i>Cyornis hainanus</i>	นกจับแมลงอกสีฟ้า	R
Hill Blue Flycatcher <i>Cyornis banyumas</i>	นกจับแมลงคอกน้ำตาลแดง	R
Grey-headed Flycatcher <i>Culicicapa ceylonensis</i>	นกจับแมลงหัวเทา	N
Siberian Blue Robin <i>Luscinia cyane</i>	นกเขนน้อยไซบีเรีย	N
White-rumped Shama <i>Copsychus malabaricus</i>	นกกาขงเขนดง	R
Slaty-backed Forktail <i>Enicurus schistaceus</i>	นกกาขงเขนน้ำหลังเทา	R
White-crowned Forktail <i>Enicurus leschenaulti</i>	นกกาขงเขนน้ำหัวขาว	R
Golden-crested Myna <i>Ampeliceps coronatus</i>	นกเอี้ยงหัวสีทอง	R
Hill Myna <i>Gracula religiosa</i>	นกขุนทอง	R
Velvet fronted Nuthatch <i>Sitta frontalis</i>	นกไต่ไม้หน้าผากกำมะหยี่	R
Sultan Tit <i>Melanochlora sultanea</i>	นกตีตีสูลต่าน	R
Barn Swallow <i>Hirundo rustica</i>	นกนางแอ่นบ้าน	N
Red-rumped Swallow <i>Hirundo daurica</i>	นกนางแอ่นตะโพกแดง	N
Asian House Martin <i>Delichon dasypus</i>	นกนางแอ่นมาตินพันธุ์เอเชียใต้	N
Black-headed Bulbul <i>Pycnonotus atriceps</i>	นกปรอดทอง	R
Black-crested Bulbul <i>Pycnonotus melanicterus</i>	นกปรอดเหลืองหัวจุก	R

Appendix. (continued)

Species	Thai name	Status
Stripe-throated Bulbul <i>Pycnonotus finlaysoni</i>	นกปรอดคอลาย	R
Puff-throated Bulbul <i>Alophoixus pallidus</i>	นกปรอดโง่งเมืองเหนือ	R
Grey-eyed Bulbul <i>Iole propinqua</i>	นกปรอดเล็กตาขาว	R
Ashy Bulbul <i>Hemixos flavala</i>	นกปรอดสีซี้เถ้า	R
Chestnut-flanked White-eye <i>Zosterops erythropleurus</i>	นกแว่นตาขาวข้างแดง	N
Everett's White-eye <i>Zosterops everetti</i>	นกแว่นตาขาวหลังเขียว	R
Asian Stubtail <i>Urosphena squameiceps</i>	นกแว่นตาขาวสีเหลืองปากมีใต้	N
Common Tailorbird <i>Orthotomus sutorius</i>	นกกระจิบธรรมดา	R
Dark-necked Tailorbird <i>Orthotomus atrogularis</i>	นกกระจิบคอดำ	R
Radde's Warbler <i>Phylloscopus schwarzi</i>	นกกระจิบปากหนา	N
Yellow-browed Warbler <i>Phylloscopus inornatus</i>	นกกระจิบธรรมดา	N
Arctic Warbler <i>Phylloscopus borealis</i>	นกกระจิบขั้วโลกเหนือ	N,P
Two-barred Warbler <i>Phylloscopus plumbeitarsus</i>	นกกระจิบเขียวปากสองแถบ	N
Pale-legged Leaf Warbler <i>Phylloscopus tenellipes</i>	นกกระจิบขาสีเนื้อ	N
Eastern Crowned Warbler <i>Phylloscopus coronatus</i>	นกกระจิบหัวมงกุฏ	N,P
Blyth's Leaf Warbler <i>Phylloscopus reguloides</i>	นกกระจิบหางขาวใหญ่	N
Sulphur-breasted Warbler <i>Phylloscopus ricketti</i>	นกกระจิบคิ้วดำท้องเหลือง	N
Omei Spectacled Warbler <i>Seicercus omeiensis</i> *	นกกระจอยวงตาสีทอง	N
Plain-tailed Warbler <i>Seicercus soror</i>	นกกระจอยวงตาสีทอง	N
White-crested Laughingthrush <i>Garrulax leucolophus</i>	นกกระรางหัวหงอก	R
Lesser Necklaced Laughingthrush <i>Garrulax monileger</i>	นกกระรางสร้อยคอเล็ก	R
Black-throated Laughingthrush <i>Garrulax chinensis</i>	นกกระรางคอดำ, นกขอฮู้	R
Abbott's Babbler <i>Malacocincla abbotti</i>	นกกินแมลงป่าฝน	R
Puff-throated Babbler <i>Pellorneum ruficeps</i>	นกจาบดินนกอลาย	R
Scaly-crowned Babbler <i>Malacopteron cinereum</i>	นกกินแมลงหัวแดงเล็ก	R
Large Scimitar Babbler <i>Pomatorhinus hypoleucos</i>	นกกระวังไพโรปากยาว	R
White-browed Scimitar Babbler <i>Pomatorhinus schisticeps</i>	นกกระวังไพโรปากเหลือง	R
Striped Tit Babbler <i>Macronous gularis</i>	นกกินแมลงอกเหลือง	R
White-bellied Yuhina <i>Yuhina zantholeuca</i>	นกภูหงอนท้องขาว	R
Thick-billed Flowerpecker <i>Dicaeum agile</i>	นกกาฝากปากหนา	R
Yellow-vented Flowerpecker <i>Dicaeum chrysorrheum</i>	นกกาฝากกันเหลือง	R
Buff-bellied Flowerpecker <i>Dicaeum i. cambodianum</i>	นกกาฝากอกสีเนื้อ	R
Ruby-cheeked Sunbird <i>Anthreptes singalensis</i>	นกกินปลีแก้มสีทับทิม	R
Olive-backed Sunbird <i>Nectarinia jugularis</i>	นกกินปลีอกเหลือง	R
Black-throated Sunbird <i>Aethopyga saturata</i>	นกกินปลีหางยาวคอดำ	R
Crimson Sunbird <i>Aethopyga siparaja</i>	นกกินปลีคอแดง	R
Little Spiderhunter <i>Arachnothera longirostra</i>	นกปลีกล้วยเล็ก	R
Pin-tailed Parrotfinch <i>Erythrura prasina</i>	นกกระดัดเขียว, นกไผ่	R
White-rumped Munia <i>Lonchura striata</i>	นกกระดัดตะโพกขาว	R