

Preliminary observations of the home range size and behaviour of the Sumatran Laughingthrush *Garrulax bicolor*

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Summary. Indonesia ranks second to Brazil in the number of globally threatened bird species. The Sumatran Laughingthrush *Garrulax bicolor* was formerly abundant but has suffered population declines due to trapping for the pet trade, and now considered endangered. Despite knowledge gained from *in-situ* and *ex-situ* captive rearing programs, little is known about the biology and ecology of the species. Our study sought to redress this by undertaking a field study of its home range size and behaviour. One group of five individuals was located in North Sumatra province and observed from strategically positioned hides over three weeks to estimate the size of its home range using Minimum Convex Polygons (MCP). In total, we collected 70 GPS points representing either sight or call records. The inhabited area covered 1.07 km² with the most remote edge points being 1.9 km apart. The group occasionally joined mixed species feeding flocks which included Chestnut-capped Laughingthrush *Rhinocichla mitrata* and Black Laughingthrush *Melanocichla lugubris*.

Ringkasan. Indonesia peringkat kedua setelah Brazil dalam jumlah jenis burung yang secara global terancam punah. Poksai Haji *Garrulax bicolor* dulu melimpah tapi sekarang mengalami penurunan populasi akibat penangkapan untuk diperdagangkan, dan jenis ini sekarang dianggap berstatus Gending. Selain pengetahuan yang diperoleh dari program penangkaran *in-situ* dan *ex-situ*, hanya sedikit yang tersedia mengenai biologi dan ekologi jenis ini. Studi kami lakukan untuk mengisi kekurangan ini, yaitu dengan cara melaksanakan satu studi lapangan untuk memahami wilayah jelajah dan perilaku jenis ini. Satu kelompok terdiri dari lima individu yang terletak di provinsi Sumatra Utara dan diamati dari tempat persembunyian yang ditempatkan secara strategis selama lebih dari tiga minggu untuk mengetahui wilayah jelajahnya dengan menggunakan Minimum Convex Polygons. Secara total, kami mengumpulkan 70 titik GPS baik berupa laporan pengamatan maupun suara. Area yang ditempati meliputi 1,07 km² dengan titik-titik tepi terluar sebesar 1,9 km.

Introduction

Indonesia has the highest number (155) of globally threatened bird species after Brazil (BirdLife International 2016a). The main causes of this dreadful distinction are forest loss due to expanding agriculture (Brooks *et al.* 1997; Castelletta *et al.* 2000; Tomich *et al.* 2001) and a deeply rooted culture of bird-keeping creating a high demand for wildlife trade (Jepson & Ladle 2005; Shepherd 2006; Chng *et al.* 2015; Eaton *et al.* 2016). The Sumatran Laughingthrush *Garrulax bicolor* is one of many bird species often linked with insufficient protection of Indonesian avifauna (Shepherd 2013; Harris *et al.* 2015; Eaton *et al.* 2016). Although Sumatra has a well-developed network of protected areas (Gaveau *et al.* 2012) including IBAs and EBAs (BirdLife International 2016a) with sufficient legislation, the main threat for Sumatran Laughingthrush still remains illegal hunting for pet trade. Regrettably, persecution of poachers is minimal, and law enforcement in markets is ineffective. The law, which regulates wildlife trade through permits and quotas (Shepherd *et al.* 2004; Shepherd 2011; Owen *et al.* 2014); is fearlessly violated by vendors who openly sell the birds without any scruples (Chng *et al.* 2015; Eaton *et al.* 2015; Shepherd *et al.* 2016). Appropriate protection

of threatened species is complicated by our lack of knowledge of their biology and ecology (Collar & Robson 2007).

The Sumatran Laughingthrush, endemic to Sumatra, was elevated from a subspecies of White-crested Laughingthrush *Garrulax leucolophus* to a full species by Collar (2006) following taxonomic revision. Formerly a widely distributed species (Van Marle & Voous 1988; MacKinnon & Phillipps 1993), numbers are now in decline due to trapping, the only secure subpopulations being found in secluded parts of mountainous regions (Brickle 2009; Shepherd 2013). Until now, there has been no scientific study owing to the inaccessibility of such areas, as well as suspected low population density and related high demands of field research. Therefore, basic biological-ecological knowledge of this species is still missing (MacKinnon & Phillipps 1993; Strange 2001; Collar & Robson 2007). Although the species has been reported from the provinces of Aceh (Brickle 2009) and North Sumatra (R. Sembiring pers. comm. 2014; Harris *et al.* 2017), and other sites on the island (BirdLife International 2016b), most of these reports were brief and incidental.

The main aim of this study was to carry out the first-ever field monitoring of a selected Sumatran Laughingthrush group. We attempted to estimate the size of a home range based on movement patterns of observed birds. Additionally, our paper presents basic behavioural data, specifically flocking trends, gathered during these observations.

Material and Methods

Study area

The study area (Fig. 1) was located in the vicinity of the Sinabung volcano in Karo regency, North Sumatra, Sumatra (c. 1600 m asl; latitude and longitude coordinates available from the authors). The rugged montane landscape shaped by valleys with small rivulets is densely covered by trees, with a closed canopy height of up to 35 m. Trees belonging to families Fabaceae, Sterculiaceae, Euphorbiaceae, Moraceae, Melastomataceae and Malvaceae are common in this lower montane forest, as well as tree ferns and epiphytes (Plate 1). The area is seasonal, the rainy season usually falling between April and September.



Figure 1. Location of study area at foot of Bukit Barisan mountain range, North Sumatra.



Plate 1. Typical rainforest understorey habitat of Sumatran Laughingthrush (photo by Tomáš Bušina).

Data collection and assessment

Based on our previous observations and interviews with local trappers, we selected one area where a group of Sumatran Laughingthrushes had regularly been seen. The survey was conducted in three observation blocks between 13 December 2014 and 4 February 2015 for a total of 21 days. We planned to trap the birds using mist-nets, band them with colour rings and tag them with tail-mount transmitters (model Pip, Biotrack, UK). Unfortunately, mist-netting proved ineffective for this species and no individuals were caught. Furthermore, we were unable to track unmarked birds in heavily dense forest and record their movements throughout the day, so we chose an alternative method of data collection. Three observation hides were built in the valley where the Laughingthrush group was consistently spotted. Hides were spaced 400 m apart at approximately the same altitude and in similar habitat ($\pm 1,500$ m asl).

Observations were carried out simultaneously from all three hides from 06:00 to 18:00 hrs, except during heavy rain when there was almost no bird activity. The direction and distance of birds from the hide were estimated by each observer, based on his personal experience, and the observer in each hide remained unaltered during the study period. Due to the possibility of multiple recordings from neighbouring hides, coincidental records were taken as one. Where possible, the number of individuals sighted and/or heard, group structure and behaviour were recorded. Subsequently, these data were converted to GPS points by BaseCamp™ (Garmin) and home range was estimated using the Minimum Convex Polygon (MCP) method (Laver 2005). Data were analysed with the aid of ArcGIS version 9.3 by Hawth's Analysis Tools (free extension for ArcGIS).

Results

In total, we collected 70 GPS points for the group of Sumatran Laughingthrushes. The inhabited area covered 1.07 km² with the most remote edge points being 1.9 km apart (Fig. 2). The birds were detected at all times of day, but there were two main peaks of activity (Fig. 3). The majority of records were auditory, but over a third (n=25) were sight records, in which the number of birds never exceeded five individuals (Table 1). The group members moved quietly through the shrub layer, but maintained contact with each other using soft vocalisations. No individual was ever seen on the ground. The group was observed in mixed species feeding flocks with Black Laughingthrushes *Melanocichla lugubris* and/ or Chestnut-capped Laughingthrushes *Rhinocichla mitrata* four times (Table 1). However, group members always stayed together and did not mix with the other species. Sumatran Drongo *Dicrurus sumatranus* and Sumatran Trogon *Apalharpactes mackloti* were also observed in mixed species flocks, but such instances were not quantified.

Discussion

Although we were unable to determine whether the membership of the focal group remained the same for the duration of the study because of no tagging, knowledge of territoriality of laughingthrushes (Coles 2007; Wang *et al.* 2011; Vivek Chandran & Praveen 2013) and previous studies of tropical bird territoriality (Munn & Terborgh 1979; King & Rappole 2001), as well as our interviews with local bird trappers suggest that the study area was occupied by only one group during the research period. This is further supported by the consistent number of individuals being observed. During this study, and at other sites in the same regency, we observed Sumatran Laughingthrushes at elevations of up to c. 1,600 m asl, usually in valleys with steep hillsides. The same trend was observed by Brickle (2009) and A. Nurza (2014 pers. comm.) in Aceh province where groups were observed at an approximate altitude of 1,700 m asl.

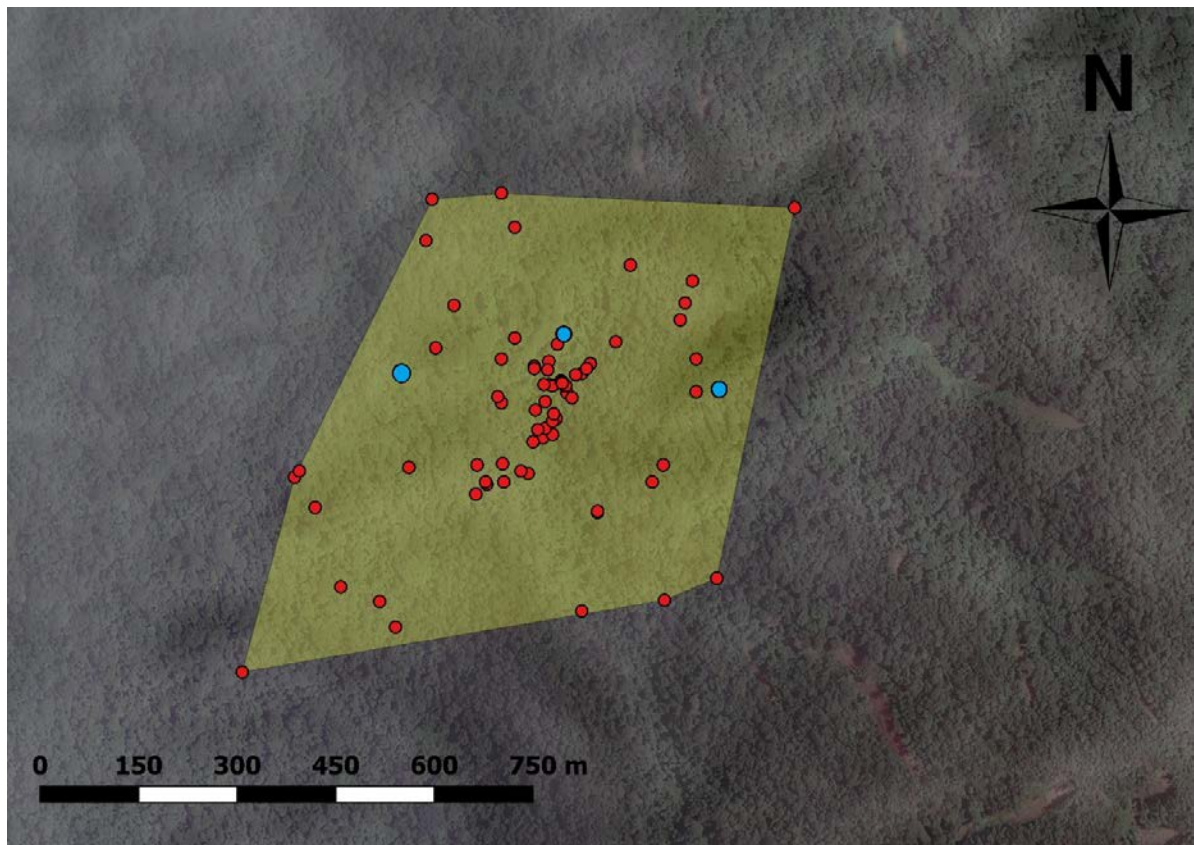


Figure 2. Delineated home range of studied Sumatran Laughingthrush group. Red marks represent particular GPS records, blue marks showing the position of hides.

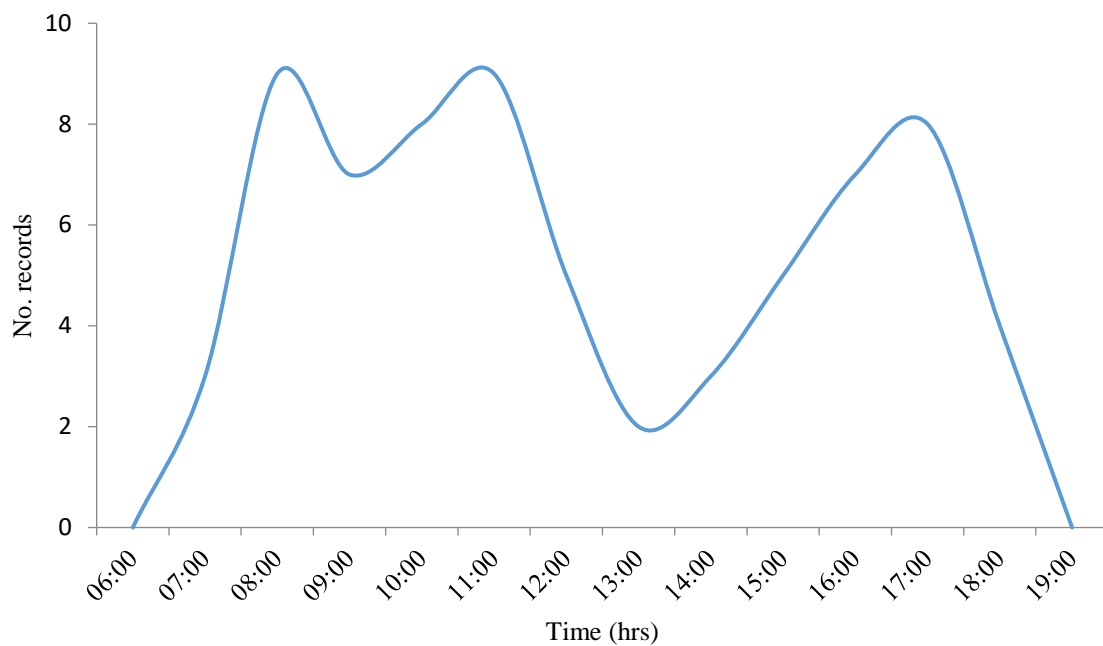


Figure 3. Activities of Sumatran Laughingthrushes related to time of day, based on the number of records (sighting and hearing) within monitored area over 21 days (n=70)

Table 1. Summary of observations from all three hides (n=70). Rec. type: O, observed; H, heard. No. birds: values refer to Sumatran Laughingthrushes; letters refer to mixed species flocks, containing Chestnut-capped Laughingthrush (C) and/ or Black Laughingthrush (B).

DATE	Time	Rec. type	No. birds	DATE	Time	Rec. type	No. birds	DATE	Time	Rec. type	No. birds
13.12.2014	8:30	O	2, C	18.1.2015	16:02	O	4	29.1.2015	14:18	H	
13.12.2014	14:00	O	4	19.1.2015	7:00	O	3	29.1.2015	15:33	H	
14.12.2014	7:53	H		19.1.2015	9:15	O	4	29.1.2015	16:40	H	
14.12.2014	9:04	H		19.1.2015	13:15	O	5	30.1.2015	9:50	H	
14.12.2014	16:26	H		25.1.2015	16:59	H		30.1.2015	10:31	H	
15.12.2014	8:10	H		26.1.2015	7:30	O	2	30.1.2015	12:30	H	
15.12.2014	10:30	H		26.1.2015	11:33	O	3, C, B	31.1.2015	7:30	H	
15.12.2014	15:26	H		26.1.2015	15:04	O	5	31.1.2015	7:50	H	
15.12.2014	17:01	H		27.1.2015	7:02	H		1.2.2015	8:10	H	
16.12.2014	7:26	H		27.1.2015	8:18	O	3	1.2.2015	10:06	H	
16.12.2014	9:54	O	4	27.1.2015	9:30	H		1.2.2015	10:36	H	
16.12.2014	11:00	H		27.1.2015	10:00	H		1.2.2015	11:44	H	
16.12.2014	14:30	H		27.1.2015	14:15	O	2	1.2.2015	12:00	O	5
16.12.2014	16:47	H		27.1.2015	16:40	H		2.2.2015	13:15	O	3, B
17.12.2014	7:30	O	1	27.1.2015	17:21	O	4, B	3.2.2015	8:32	H	
17.12.2014	10:02	O	5	28.1.2015	6:10	H		3.2.2015	9:34	H	
17.12.2014	15:05	H		28.1.2015	10:00	H		3.2.2015	10:09	H	
17.12.2014	17:30	H		28.1.2015	15:00	H		3.2.2015	12:00	H	
15.1.2015	17:00	O	3	28.1.2015	15:15	H		3.2.2015	15:04	H	
16.1.2015	9:00	O	5	29.1.2015	6:54	H		3.2.2015	17:38	O	4
16.1.2015	13:00	O	4	29.1.2015	7:49	H		4.2.2015	8:00	H	
16.1.2015	16:30	O	1	29.1.2015	8:09	H		4.2.2015	10:30	H	
17.1.2015	15:30	O	4	29.1.2015	10:45	H					
18.1.2015	14:07	O	3	29.1.2015	11:30	O	2				

We suspect that the central hide was located in the middle of the presumed home range of the focal group, because this is where the number of records was greatest. Also, frequent overflying in all directions was often observed from the middle hide. Although we were unable to gather movement activity data for all group members or throughout each day, our records were sufficient for MCP analysis and home range estimation. Nevertheless due to possible differences in biases of each observer in estimates of distance and direction our estimate of home range should be considered indicative rather than definitive.

The small number of direct observations did not allow us to assess interspecific aggregation trends of Sumatran Laughingthrushes for comparisons with existing information (Collar & Robson 2007) or findings from captivity (Coles 2007). Nevertheless, aggregation into mixed species flocks is common for tropical birds (King & Rappole 2001; Goodale & Kotagama 2005; Sridhar *et al.* 2009; Zou *et al.* 2011). Several studies indicate that laughingthrushes often join mixed species feeding flocks, with drongos as a “core” or “nucleus” species (King & Rappole 2001; Kotagama & Goodale 2004; Satischandra *et al.* 2007; Zou *et al.* 2011). While Black Laughingthrushes and Chestnut-capped Laughingthrushes were often seen in mixed species feeding flocks, Sumatran Laughingthrushes were usually (84% of the time) in a monospecific group.

This paper reports the first-ever detailed observations of the elusive Sumatran Laughingthrush. Our findings provide new information on its biology and ecology, which may be useful in designing effective protection for the species (Shepherd 2013). Our results could be valuable in evaluating its habitat and minimum area requirements (Shaffer 1981). However, as our findings pertain to a single group, further research regarding population biology, for instance metapopulation and source-sink dynamics, is desirable.



Plate 2. Foraging wild Sumatran Laughingthrush (photo by Tomáš Bušina).

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