

Flocking and foraging behaviour of the Sumatran Laughingthrush *Garrulax bicolor*

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The endemic Sumatran Laughingthrush *Garrulax bicolor*, classified as Endangered by BirdLife International (2017), occupies relatively inaccessible broadleaved evergreen forest areas along the mountainous spine of Sumatra, Indonesia. It is a little-known species with limited information available regarding its biology (Collar *et al.* 2017). Owing to intensive trapping for the bird trade (Eaton *et al.* 2015, Shepherd *et al.* 2016, Harris *et al.* 2017) and widespread habitat destruction (Margono 2013), the species is currently undergoing a major population decline (Shepherd *et al.* 2016, BirdLife International 2017). This short communication provides new information on the flocking and foraging behaviour of the species.

We used two techniques to assess home-range size and habitat use of Sumatran Laughingthrush (Bušina & Kouba 2017)—observations from hides (method I) for wild birds and radio-telemetry (method II) in the case of wild-caught Sumatran Laughingthrush which had been rehabilitated for return to the wild. However, both techniques also allowed us to observe their foraging behaviour, particularly with regard to their participation in mixed-species flocks. The formation of mixed-species flocks is a common phenomenon in the behaviour of tropical forest birds, and is generally considered to increase foraging efficiency and reduce the risk of predation (King & Rappole 2001, Srinivasan *et al.* 2012, Martínez & Robinson 2016).

We studied Sumatran Laughingthrush in remote locations in Karo regency and Deli Serdang regency, North Sumatra province (precise locations withheld for security reasons). Both sites were in rugged landscapes characterised by steep hills and deep valleys at an altitude of 1,200 to 1,500 m. Members of the tree families Fabaceae, Sterculiaceae, Euphorbiaceae, Moraceae, Melastomataceae and Malvaceae were common in both locations and formed a closed canopy up to 25 m high with a dense understorey. Using method I, a flock of five wild Sumatran Laughingthrush, regularly encountered in the same valley, was visually monitored from three observation hides during three periods between December 2014 and February 2015 for a total of 21 days. The hides were spaced 400 m apart at approximately the same altitude. Observations were carried out simultaneously from all three hides from 06h00 to 18h00 but were discontinued in heavy rain, when bird activity almost entirely ceased. Using method II, four pairs of wild-caught rehabilitated Sumatran Laughingthrush (8 individuals) were released, two pairs into the same valley where the wild individuals were observed and two pairs into a second area, and monitored using radio-telemetry for periods of 1–22 days between August 2015 and June 2016. These birds were fitted with a TW42 tail-mounted transmitter (Biotrack, Ltd., UK) weighing 1.99 g (< 3.0% of body weight, as suggested by Kenward 2001), and were tracked with a hand-held three-element Yagi antenna and AR 8200 MK3 receiver (AOR Inc, USA).

Sumatran Laughingthrush were occasionally seen in mixed-species foraging flocks. The wild individuals were observed joining mixed-species flocks in 4 out of 70 sightings (less than 6% of all cases). Similarly, radio-tracked rehabilitated individuals joined mixed-species flocks on 24 occasions out of a total of 328 records (7%). Thus, the bulk of the records (304) were observations of pairs or single individuals. The mixed-species flocks in question always held Chestnut-capped Laughingthrush *Garrulax mitratus* and Black Laughingthrush *G. lugubris*. Other flock members included Sumatran Drongo *Dicrurus sumatranus*, Sumatran Trogon *Apalharpactes mackloti* and Sumatran Treepie *Dendrocitta occipitalis*, but they occurred less frequently, whilst smaller-bodied species formed separate flocks, and we never saw them in flocks with Sumatran Laughingthrush. At 11h20 on 22 May 2015 we observed the biggest

mixed-species flock recorded over the whole monitoring period, made up of 12 species in total, 10 of them reliably identified (in descending order of numerical strength): 12 Chestnut-capped Laughingthrush, 6 Black Laughingthrush, 5 (wild) Sumatran Laughingthrush, 3 Sumatran Treepie, 3 Green-billed Malkoha *Phaenicophaeus tristis*, 2 Sumatran Drongo, 2 Common Green Magpie *Cissa chinensis*, 2 Sumatran Trogon, 2 Long-tailed Broadbill *Psarisomus dalhousiae* and 2 Greater Yellownape *Chrysophlegma flavinucha* (adult and juvenile). Similar mixed-species flock compositions were reported by King & Rappole (2001); in both cases, large flocks mainly comprised of laughingthrushes were joined by individuals or pairs of other species including drongos, which are reported as common companions of laughingthrushes in other parts of the Oriental Region (Rocamora & Yeatman-Berthelot 2009).

Although the species composition of the observed flocks was variable, some of their characteristics remained constant. The members of particular species tended to form monospecific 'bird waves' and occupied their preferred station within the forest. Sumatran Laughingthrush flew from shrub to shrub in the understorey, one by one, at intervals of a few seconds, and rarely moved up to the subcanopy where the Chestnut-capped and/or Black Laughingthrushes foraged, and equally rarely visited the forest floor. We consider it improbable that the radio-tagged released birds were behaving atypically because of possible unfamiliarity with their environment, since their wild counterparts showed the same behaviour. However, we can only speculate whether the behaviour observed is common or rare, because our sample size is limited.

Collar *et al.* (2017) reported that there was no information on the diet of the Sumatran Laughingthrush, but overlooked Hoogerwerf (1950), who reported that five stomachs of specimens from Aceh contained seeds and the representatives of four families of beetle (Coleoptera). Based on our observations we conclude that most of its diet at our study sites consisted of Orthoptera, such as crickets and katydids, which were abundant at both locations and were observed to be eaten at least 10 times. Other observed insectivorous flock members, which generally dominate in mixed-species flocks (Kotagama & Goodale 2004, Sridhar *et al.* 2009), foraged for much the same size and type of prey as Sumatran Laughingthrush, probably also including beetles and other insects, but we were unable to confirm this. However, our impression is that these other species foraged higher in the forest strata when Sumatran Laughingthrush was present. Furthermore, Sumatran Laughingthrush was usually seen at the back of the flock, using a leaf-gleaning foraging technique and capturing insects flushed by other birds above them, as a rule after the insect had landed; no competition and/or kleptoparasitism (Satischandra *et al.* 2007) was noted. This is consistent with previous studies describing similar flock stratification and foraging behaviour of other laughingthrush species (Kotagama & Goodale 2004, Satischandra *et al.* 2007, Sridhar *et al.* 2009).

We also recorded Sumatran Laughingthrush feeding on fruit, plucking whole fruit straight from stems on trees and swallowing them. The trees in question were identified as Peacock Chaste Tree *Vitex altissima* (Lamiaceae) and Elephant Fever Nettle *Dendrocnide sinuata* (Urticaceae); the former grows to 20 m in height and produces a smooth 5 mm bluish drupe, while the latter is an evergreen shrub or tree, occasionally reaching 20 m, and produces 6 mm white glabrous achenes. Both species are typical understorey plants occurring across South-East Asia. The frugivorous activity was observed only outside mixed-species flocks, presumably due to the following foraging strategy: in mixed-species flocks

the Sumatran Laughingthrush adjusted their behaviour to match the optimal foraging speed of the entire flock, whereas in single-species groups they moved at their own pace, allowing them to stay longer in a fruiting tree (Valburg 1992). This could reflect the fact that frugivorous birds are usually in a minority in mixed-species flocks because their food resources are patchy in distribution and must be actively searched for, making it less beneficial to follow a flock (Powell 1985, Kotagama & Goodale 2004, Arbeláez-Cortés & Marín-Gomez 2012). Sumatran Laughingthrush may therefore be more frugivorous when foraging in single-species flocks and more insectivorous when part of mixed-species flocks. Given that well over 90% of our observations involved single-species flocks, it may be that fruits form a higher proportion of the diet of the species than we yet know.

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Records of Black-necked Stork *Ephippiorhynchus asiaticus* from the coastal areas of the Kutch district of Gujarat, India

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The Near Threatened Black-necked Stork *Ephippiorhynchus asiaticus* is found in South Asia, South-East Asia and Oceania. Its population has declined over the last two decades, largely because of loss of habitat and ongoing changes in land use (Dorfman *et al.* 2001, Sundar 2011). It inhabits freshwater marshes and lakes, pools in open forest, large rivers and flooded grassland (Clancy 2010) up to 1,200 m (Sharma 2007). It also occasionally uses coastal habitats such as estuaries and brackish lagoons and is known to frequent

man-made wetlands and reservoirs (Maheshwaran *et al.* 2004), sewage ponds and irrigation reservoirs (Sundar 2004). Although the species shows a preference for natural wetlands throughout the year, for short periods, particularly during and after the monsoon season when natural wetlands may become too deep for foraging, it uses irrigated crop fields, particularly rice paddies (Sundar 2004). The majority of the ecological information on this species in India has been obtained from inland freshwater wetlands and associated