

Bird survey of Madane Protected Forest, Gulmi District, West Nepal.



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June 2018

Summary

Madane Protected Forest is situated in Gulmi district in the mid-hills of West Nepal. A bird survey was carried out during March 8th-16th 2018 under the Programme “Integrating Livelihoods and Conservation – People Partner with Nature for Sustainable Living”. Mackinnon’s listing method was used supplemented with daily lists of all recorded bird species. A total of 184 bird species were recorded during the 9 days of survey. Cheer Pheasant, Asian Woollyneck, Egyptian Vulture, Red-headed Vulture, Steppe Eagle, Bearded Vulture and Himalayan Griffon are the globally threatened species. In total 69 bird species are under IBA criteria and category. Among them 5 species are A1: globally threatened species; 3 are A2: restricted-range species and 66 are A3: biome restricted species. Among the biome restricted assemblage 4 species of biome 05, 37 species of biome 07, 23 species biome 08 and 2 species of biome 011 were recorded.

Habitat destruction, overharvesting of natural resources such as vegetation and water, illegal hunting and forest fires are the threats facing birds in the Madane Protected Forest.

The two bird inventories carried out in Madane (January 2017 and March 2018) already make it clear that the area holds species of global importance. We recommend that the core area of the current protected forest should be designated as Important Bird Area (IBA) and that the protected forest boundary should be expanded to cover the whole Madane range. Additionally, it is recommended to carry out another bird survey after the migratory summer visitors have arrived to fully understand the species composition of Madane.

Acknowledgement

This bird survey of Madane Protected Forest was carried out under the Danida funded Programme “Integrating Livelihoods and Conservation – People Partner with Nature for Sustainable Living”, implemented by BCN in partnership with DOF. We would like to thank Thomas Lehmborg, Charlotte Mathiassen and Ishana Thapa for giving us this opportunity.

Mitra Pandey and Bharat Panthi helped us during the planning stage and the logistic arrangements during the field survey.

Yam Bahadur Sen, Lal Bahadur Aryal, Sarada Aryal, Kamala Aryal, Nim Lal Aryal, Khageshwor Ghimire, Upendra Bahadur Khadka, Krishna Prasad Panthi and Toplal Poudel were our local guides during the survey, they all deserve sincere thanks.

Mitra Pandey helped on data analysis and Prashid Kandel worked on the map of the study area.

Contents

Summary.....	i
Acknowledgement.....	ii
Background	1
Madane Protected Forest	1
Important Bird Area program	3
Objectives	4
Methods.....	5
Results	7
Species Richness.....	7
Distribution and Abundance	8
Birds under IBA criteria and category.....	10
Threats	13
Discussion	15
Recommendations	18
References	19
Annexes	20

Background

Madane Protected Forest

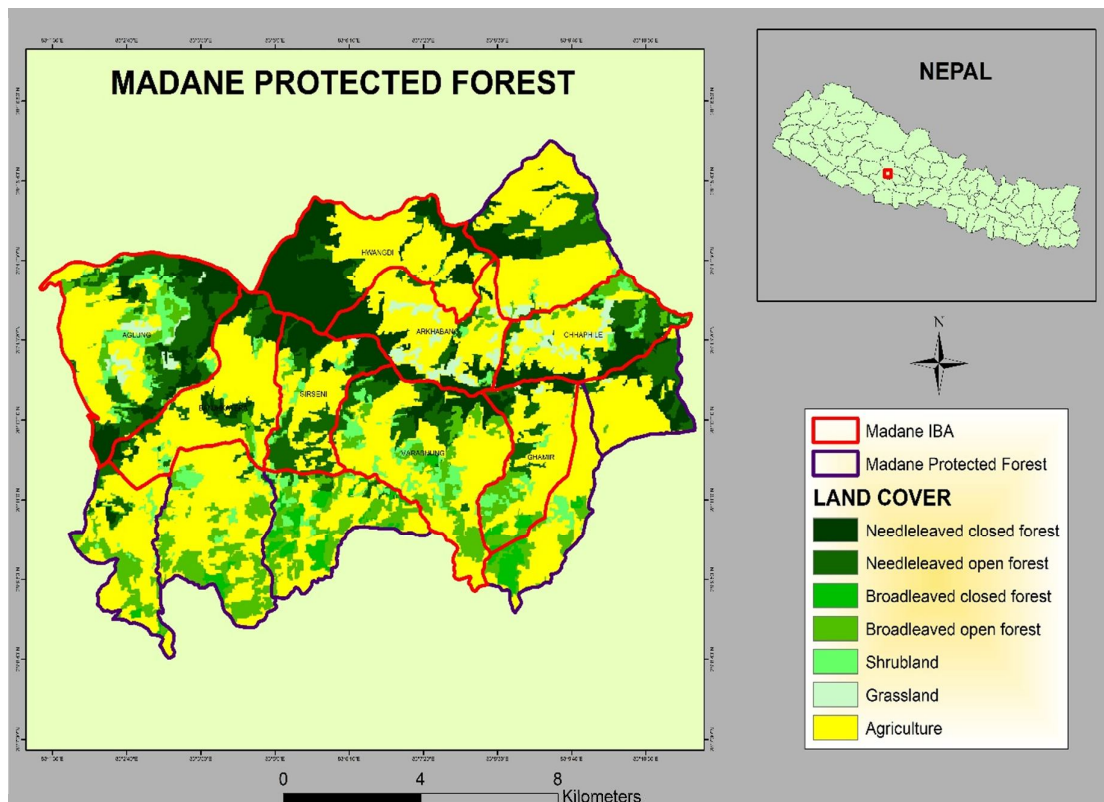
Madane Forest is situated in the Gulmi District of Lumbini zone in state no 5 of West Nepal (Map 1). It is located in latitude: 28°13'41" to 28°14'07" North and longitude: 83°03'21" to 83°09'21" East and covers an area of 13,761 ha within the altitudinal ranges of 975 m. to 2657 m. asl. According to the new administrative system, two rural municipalities such as Madane (five wards: Auglung, Maligaun, Mayalpokhari, Bajkateri and Sisneri) and Malika (six wards: Darling, Hwagdi, Arkhabhang, Chapahile, Ghamir and Marburg) are located within the Madane Protected Forest. The Government of Nepal declared this forest as "Madane Protected Forest" on 30th March 2011 under the article 23 of the Forest Act 2002 and named it after the highest peak, the Madane Lake also called "Mountain" (Department of Forest 2068 and Baral and Dulal 2073).

The Madane Protected Forest is known for the typical middle mountain forest ecosystem, that holds 38.62% (5315.12 ha) dense forest mostly at higher elevation and 7.75% (1066.73 ha) open forests at lower elevation. There are 3 types of forests: *Schima-Castanopsis*-Chirpine forest (45.98%), Lower Temperate Oak forest (50.64%) and Temperate Mountain Oak forest (3.38%). Major species of the *Schima-Castanopsis*-Chirpine Forest are *Schima wallichii*, *Castanopsis indica*, *Pinus roxburghii*, *Alnus nepalensis* and *Shorea robusta* at lower elevation. *Quercus sp*, *Rhododendron sp* are the main species of the Lower Temperate Oak Forest. Similarly, *Quercus sp*, *Pinus wallichiana*, *Acer oblongum* are main species of the Temperate Mountain Oak Forest (Department of Forest 2068 BS).

The forest is an important watershed, providing drinking water for the residents of 30 wards beyond the protected forest area. Tributaries of Kaligandaki River Badighad, Chhaldi, Panaha, Jhumruk, Bhujikola and Nisi Kola originated from the Madane Protected Forest. Purkot Malika, Marbhung Malika, Panchami Pokhari, Aurobido Ashram and Porkot Kot are renowned historical and religious places.

Due to the diverse geography and vegetation the Madane Protected Forest is home to a varied wildlife and due to its location between Dhorpatan Hunting Reserve, Resunga Forest and Thaple Lake it can be an important corridor for wildlife. As many as 24 mammals e.g. Porcupine *Hystrix indica*, Common Leopard *Panthera pardus*, Himalayan Black Bear *Selenarctos thibetanus*, Barking Deer *Muntiacus muntajak*, Jungle Cat *Felis chaus*, Wild Boar *Sus scrofa* etc. has been recorded (Department of Forest 2068 BS). According to a five-day survey in Madane during January 2017 (Chaudhary 2017) a total of 125 bird species including Globally Threatened Red-headed Vulture *Sarcogyps calvus* and Steppe Eagle *Aquila nipalensis* and 53 bird species representing 4 biomes were recorded.

However, the Madane Mountain Range extends up to Baglung and Pyuthan Districts, but only the forest parts in Gulmi District are protected.



Map 1: Madane Protected Forest and proposed IBA

Important Bird Area program

Important Bird and Biodiversity Areas (IBAs) are places of International significance for the conservation of birds at global level. The IBA programme is a worldwide initiative by BirdLife International aimed at identifying, documenting, monitoring and working towards the conservation and sustainable development of a network of critical sites for the world's birds and other biodiversity.

The IBA criteria are internationally agreed, standardised, quantitative and scientifically defensible. The criteria are simple and robust enough that they can be applied uniformly and cost-effectively. Any area to be included under an IBA should qualify for at least one of the following criteria.

Category	Criterion
A1: Globally threatened species	The site regularly holds significant numbers of a globally threatened species,
A2: Restricted-range species	The site is known or thought to hold a significant component of the restricted-range species whose breeding distributions (less than 50,000 km ²) define an Endemic Bird Area (EBA) or Secondary Area (SA).
A3: Biome-restricted assemblage	The site is known or thought to hold a significant component of the group of species whose distributions are largely or wholly confined to one biome.
A4: Congregations	The site is known or thought to hold, on a regular basis, $\geq 1\%$ or $\geq 20,000$ water birds of a biogeographic population of a congregatory waterbird species.

Bird Conservation Nepal (BCN) is leading this initiative in Nepal. BCN together with BirdLife International have identified in total 37 IBAs and six potential IBAs including Madane Protected Forest (BCN and DNPWC in prep).

BCN is expanding the People Partner with Nature (PPN) Programme to include Madane Protected Forest as well. The Programme has been implemented in Resunga Forest IBA since 2015 in partnership with Dansk Ornitologisk Forening (DOF) and support from Danida. Therefore, a detailed bird survey was needed to evaluate the forest for an IBA qualification.

Objectives

- 1) Assess the species richness and abundance of birds of Madane Protected Forest.
- 2) Evaluate the Madane Protected Forest for IBA standards.
- 3) Record potential threats.

Methods

Survey sites identification

Staff of the District Forest Offices of Gulmi and Madane Protected Forest, local people and field staffs from Resunga were consulted to identify the survey sites. Further, Chadhary & Magar (2017) was also reviewed to ensure the current survey sites are repeated. The survey was carried out from 8th to 16th March 2018, mostly covering the core area. To cover the Sal Forest area one route at Simaltari area was also surveyed. The survey sites and itinerary of the survey is given in Annex II and map 2.

Mackinnon's Listing Method

Mackinnon's species richness counting method, Mackinnon and Phillips (1993) was used as described by Bibby *et al.* (2000) to know the species richness, abundance and distribution.

Species richness counting method was as follows:

1. Each new encountered (seen and heard) species was recorded until a list of 20 species was reached.
2. Then a new list (number 2) was started and another 20 species were recorded. Each list contained 20 different species, but subsequent lists could include species previously listed. During the survey, much care was taken not to repeat the same species in the same list, but to list the species in subsequent lists.
3. Then list number 3 was recorded.
4. A final running species total was obtained by extracting the number of species in list 2 that were not in list 1 and so on throughout all the lists recorded for that area.
5. Same process, 1-4 was repeated for all four visits separately and collectively.

By plotting the cumulative total of species detected against the number of lists, a species richness curve was produced. This species richness curve is a measure of species diversity.

The number of times a species reappears in subsequent lists can be converted into a frequency of occurrence, which gives some idea about the relative abundance of that species when compared with other species.

Relative Abundance = Frequency of occurrence in Lists

Listing was stopped during longer period of rest or lunch break, repeating sections of survey trails while travelling to survey sites and around accommodation locations (except the first day)

Cumulative list/daily lists

This method ensured the recording of seen or heard birds at any time during the survey period. A list of all birds recorded within the Madane Protected Forest was updated each evening as well as daily site-specific track lists.

Both methods were used independently.

Call Playback

Call playback was used in search for selected skulking and/or rare target species such as Cutia and Cheer Pheasant. When a target species was responding the playback was stopped immediately in order to minimise stress of the bird. Recording of mystery calls were used to identify the unfamiliar call later. www.xeno-canto.org was used as reference for call identification.

Field Guides and taxonomy

Grimmett et al. (2000, 2003, 2012 and 2016) were used as field guides. The final checklist follows the BirdLife International's systematic order (del Hoyo et al. 2014, 2016).

Threats assessment

To assess the threats direct observation along the survey sites was made. Additionally, the survey team had informal talks with local field guides and local people.

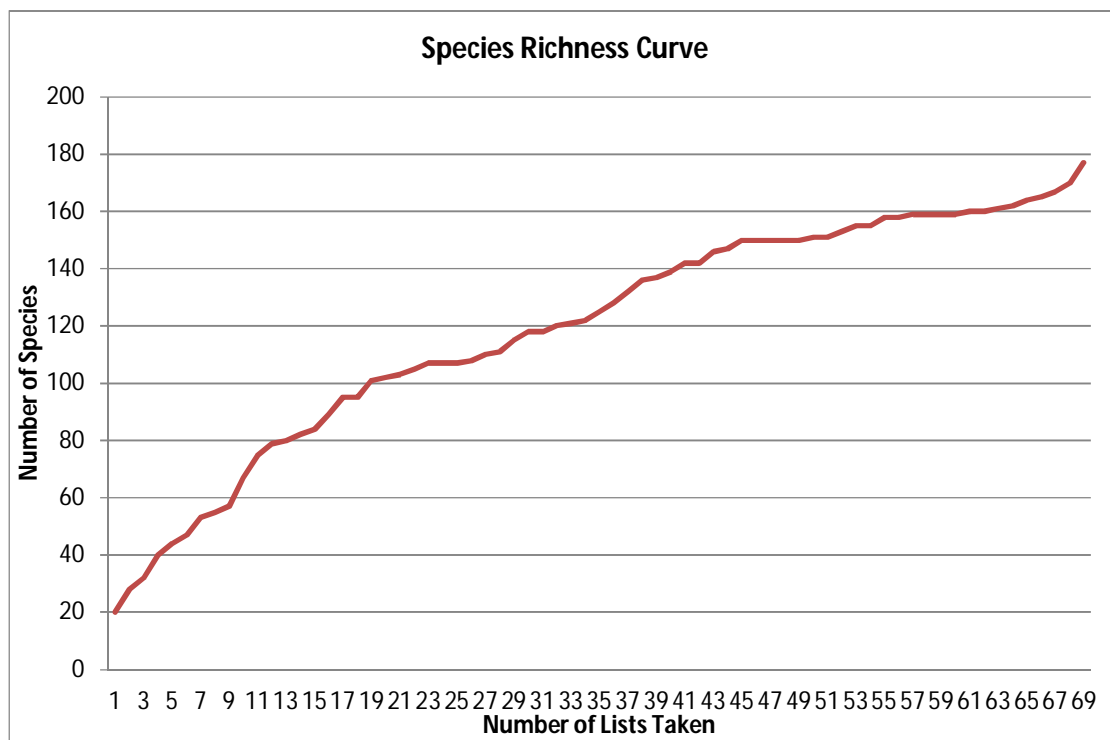


Map 2: Bird survey trails

Results

Species Richness

184 bird species were recorded from nine days' survey work. A total of 177 species was recorded under 69 Mackinnon's lists and an additional seven species was recorded outside the Mackinnon's List (Annex I). The species richness curve resulted from Mackinnon's Listing Method is as shown below.

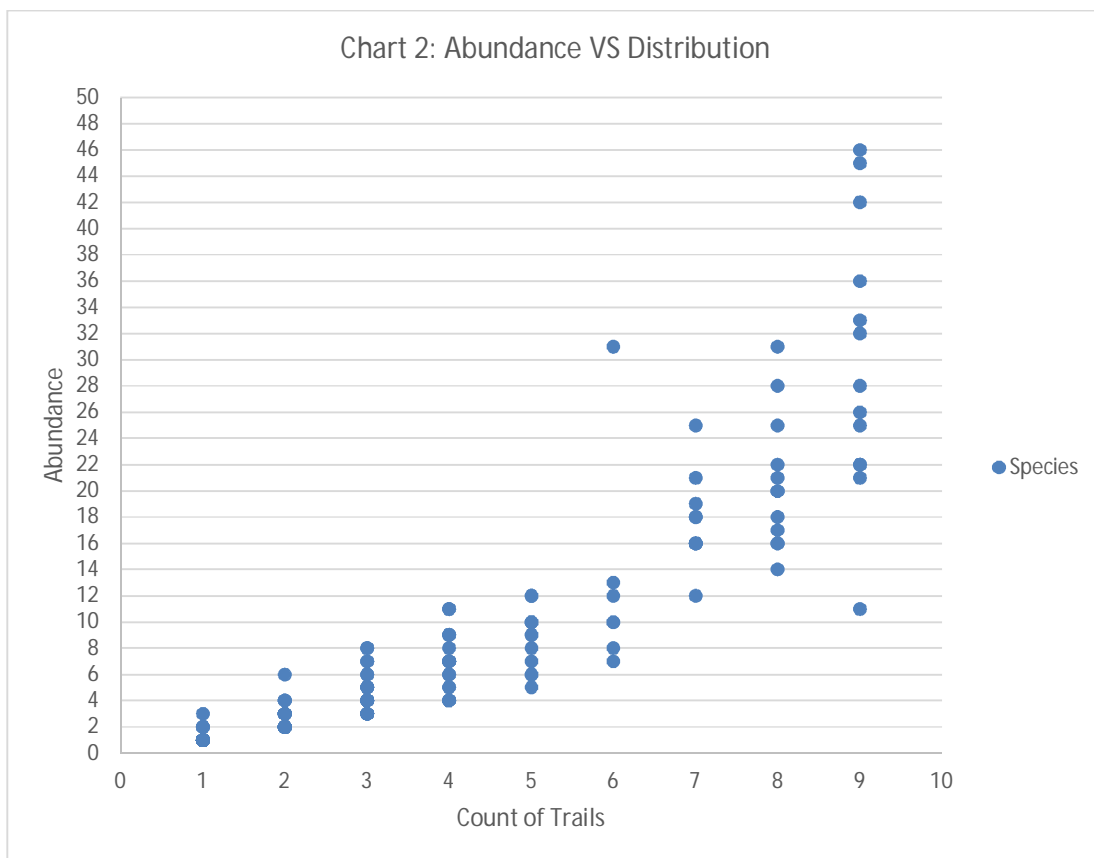


Among the total recorded 51 families, Muscipidae was best represented with 20 species followed by Accipitridae 15, Leiotrichidae and Phylloscopidae 12, Corvidae 8, Fringillidae 7, Paridae 6, Strigidae and Phasianidae 5, Phasianidae, Picidae, Campephagidae, Pycnonotidae, Scotocercidae, Timaliidae, Sittidae and Nectariniidae 4, Phasianidae, Columbidae, Cuculidae, Ardeidae, Megalaimidae, Cisticolidae, Zosteropidae, Passeridae and Motacillidae 3, Phasianidae, Apodidae, Vireonidae, Dicuridae, Laniidae, Stenostiridae, Pnoepygidae, Hirundinidae, Certhiidae, Turdidae and Prunellidae 2 and Phasianidae, Anatidae, Caprimulgidae, Ciconiidae, Phalacrocoracidae, Scolopacidae, Falconidae, Meropidae, Alcedinidae, Psittacidae, Oriolidae, Rhipiduridae, Sylviidae, Pellorneidae, Sturnidae, Chloropseidae, Dicaeidae and Emberizidae 1.

Cheer Pheasant *Catreus wallichii* (VU), Asian Woollyneck *Ciconia episcopus* (VU), Egyptian Vulture *Neophron percnopterus* (EN), Red-headed Vulture *Sarcogyps calvus* (CR), Steppe Eagle *Aquila nipalensis* (EN), Bearded Vulture *Gypaetus barbatus* (NT) and Himalayan Griffon *Gyps himalayensis* (NT) are globally threatened birds and Spiny Babbler *Turdoides nipalensis* (= *Turdoides nipalensis*), the only endemic bird of Nepal, recorded in Madane Protected Forest.

Distribution and Abundance

The distribution of birds at different survey trails and their abundance is shown in chart 2 and 3 below. 52 species were recorded from only 1 trail and are considered as rare species. Among them 47 species such as Cheer Pheasant, Eastern Goldfinch *Carduelis caniceps*, Speckled Piculet *Picumnus innominatus*, Green Shrike-babbler *Pteruthius xanthochlorus*, Lesser Whitethroat *Sylvia curruca*, Wallcreeper *Tichodroma muraria*, Little Forktail *Enicurus scouleri*, Himalayan Rubythroat, Scarlet Finch etc are abundant 1. Migrating Great Cormorant *Phalacrocorax carbo* and Ruddy Shelduck *Tadorna ferruginea* were recorded only once at a single trail, at 1 and 6. Four species; Koklass Pheasant, Red-billed Blue Magpie *Urocissa erythroryncha*, Common Green Magpie *Cissa chinensis* and Striated Laughingthrush *Grammatoptila striata* show abundance 2 and so is Grey-sided Bush-warbler 3 (Annex I).



A total of 13 species, Yellow-browed Tit *Sylviparus modestus*, Red-headed Tit *Aegithalos iredalei*, Oriental Turtle-dove *Streptopelia orientalis*, Rusty-cheeked Scimitar-babbler *Erythrogonys erythrogonys*, Fire-breasted Flowerpecker *Dicaeum ignipectus*, Blue-fronted Redstart *Phoenicurus frontalis*, Whiskered Yuhina *Yuhina flavicollis*, Verditer Flycatcher *Eumyias thalassinus*, Small Niltava *Niltava macgrigoriae*, Hume's Leaf-warbler *Phylloscopus humei*, Black Bulbul, Green-backed Tit *Parus monticolus* and Grey-hooded Warbler *Phylloscopus xanthoschistos* were the most common birds, distributed at all 9 survey trails and with high abundance 11 (Yellow-browed Tit) to 46 (Grey-hooded Warbler). A total of

seven species were recorded from six trails, among them Rufous Sibia has highest frequency of occurrence 31 and Chestnut-bellied Rock-thrush has least frequency of occurrence 7.

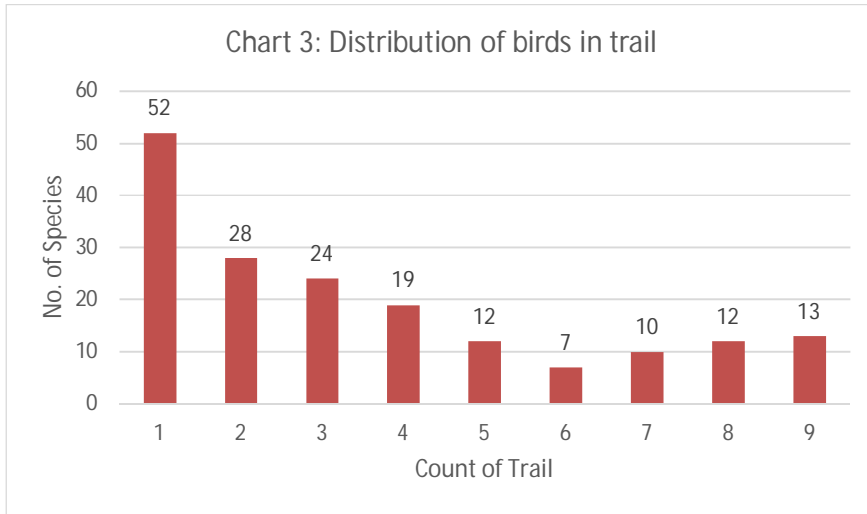


Chart 3 (supplementary to chart 2) shows the distribution of number of bird species only recorded at trails, such as 52 species were recorded from only one trail (any trail among 1 to 9) and 13 species from all 9 trails.

The distribution of bird species at survey trails was decreasing by 52, 28, 24, 19, 12 and 7 with increasing the combination of trails by 1, 2, 3, 4, 5 and 6. Total 22 species distributed in 7 and 8 trails in combine were also common with abundance range of 12 to 31. Some examples include Collared Owlet *Glaucidium brodiei*, Streak-breasted Scimitar-babbler *Pomatorhinus ruficollis*, Oriental White-eye *Zosterops palpebrosus*, White-tailed Nuthatch *Sitta himalayensis*, Whiskered Yuhina *Yuhina flavicollis*, Grey-headed Canary-flycatcher *Culicicapa ceylonensis* etc.

The distribution of bird species, number of lists taken and species recorded only from respective trails is shown in table 1 below.

Table 1: Distribution of birds in individual trails

Survey Trails	Number of lists	Number of species	Number of species only recorded on this trail
1. Saire-Topre	9	57	1
2. Ashram-Malika-Thulachaur	7	73	3
3. Thulachaur-Hwagdi/mahabhir-Gardhare	7	74	4
4. Gargara-Jugena	8	68	3
5. Saunapote-Deurali Thuladhunga-Tindhara	8	85	8
6. Arkhabang, Bhaisimela-Jaljala-Rangdi Khola	8	75	8
7. Hwangdi-Kukurgaade Duerali	7	65	5
8. Tikhechuli-Saunapote	7	64	3
9. Thulachaur-Simaltari	8	91	17

Highest number of birds only recorded in one trail were recorded at Thaulachaur to Simaltari trail, 19 species: Common Green Magpie, Asian Woollyneck, White-breasted Kingfisher *Halcyon smyrnensis*, Short-billed Minivet *Pericrocotus brevirostris*, Rufous Treepie *Dendrocitta vagabunda*, Slaty-blue Flycatcher *Ficedula tricolor* were some of the species recorded only from this trail. Among them two species were recorded outside the Mackinnon's lists.

However, the number of lists was highest in Saire-Topre area; the total number of bird species is the smallest and just only one species, Green-crowned Warbler *Phylloscopus burkii*, was recorded only from this area.

Birds under IBA criteria and category

A total of 69 bird species under IBA criteria and category were recorded. Among them 5 species were under A1: globally threatened species, 3 were under A2: restricted-range species and 66 species under A3: biome restricted assemblage. Among the biome-restricted assemblage 4, 37, 23 and 2 species were recorded under biome 5, biome 7, biome 8 and biome 11 respectively.

A1: Globally threatened species

Cheer Pheasant	<i>Catreus wallichii</i>	Vulnerable
Asian Woollyneck	<i>Ciconia episcopus</i>	Vulnerable
Egyptian Vulture	<i>Neophron percnopterus</i>	Endangered
Red-headed Vulture	<i>Sarcogyps calvus</i>	Critically Endangered
Steppe Eagle	<i>Aquila nipalensis</i>	Endangered

A2: Restricted-range species

Cheer Pheasant	<i>Catreus wallichii</i>
Nepal Cupwing	<i>Pnoepyga immaculata</i>
Spiny Babbler	<i>Acanthoptila nipalensis</i>

A3: Biome-restricted assemblage

BIOME 05: EURASIAN HIGH MONTANE(ALPINE AND TIBETIAN)

Himalayan Griffon	<i>Gyps himalayensis</i>
Grey-backed Shrike	<i>Lanius tephronotus</i>
Wallcreeper	<i>Tichodroma muraria</i>
Altai Accentor	<i>Prunella himalayana</i>

BIOME 07: SINO-HIMALAYAN TEMPERATE FOREST

Hill Partridge	<i>Arborophila torqueola</i>
Cheer Pheasant	<i>Catreus wallichii</i>
Koklass Pheasant	<i>Pucrasia macrolopha</i>
Speckled Woodpigeon	<i>Columba hodgsonii</i>

Green Shrike-babbler	<i>Pteruthius xanthochlorus</i>
Yellow-billed Blue Magpie	<i>Urocissa flavirostris</i>
Yellow-browed Tit	<i>Sylviparus modestus</i>
Grey-crested Tit	<i>Lophophanes dichrous</i>
Green-backed Tit	<i>Parus monticolus</i>
Nepal Cupwing	<i>Pnoepyga immaculate</i>
Scaly-breasted Cupwing	<i>Pnoepyga albiventer</i>
Spiny Babbler	<i>Acanthoptila nipalensis</i>
Buff-barred Warbler	<i>Phylloscopus pulcher</i>
Ashy-throated Warbler	<i>Phylloscopus maculipennis</i>
Grey-sided Bush-warbler	<i>Cettia brunnifrons</i>
Chestnut-headed Tesia	<i>Cettia castaneocoronata</i>
Aberrant Bush-warbler	<i>Horornis flavolivaceus</i>
Stripe-throated Yuhina	<i>Yuhina gularis</i>
Striated Laughingthrush	<i>Grammatoptila striata</i>
White-throated Laughingthrush	<i>Garrulax albogularis</i>
Streaked Laughingthrush	<i>Trochalopteron lineatum</i>
Rufous Sibia	<i>Heterophasia capistrata</i>
Bar-throated Minla (Bar-throated Siva)	<i>Chrysominla strigula</i>
Rusty-flanked Treecreeper	<i>Certhia nipalensis</i>
White-tailed Nuthatch	<i>Sitta himalayensis</i>
Himalayan Rubythroat	<i>Calliope pectoralis</i>
Golden Bush-robin	<i>Tarsiger chrysaeus</i>
Slaty-blue Flycatcher	<i>Ficedula tricolor</i>
Rufous-gorgeted Flycatcher	<i>Ficedula strophciata</i>
Ultramarine Flycatcher	<i>Ficedula superciliaris</i>
Fire-tailed Sunbird	<i>Aethopyga ignicauda</i>
Rufous-breasted Accentor	<i>Prunella strophciata</i>
Scarlet Finch	<i>Carpodacus sipahi</i>
Pink-browed Rosefinch	<i>Carpodacus rodochroa</i>
Red-headed Bullfinch	<i>Pyrrhula erythrocephala</i>
Dark-breasted Rosefinch	<i>Procarduelis nipalensis</i>
Yellow-breasted Greenfinch	<i>Chloris spinoides</i>

BIOME 08: SINO-HIMALAYAN SUBTROPICAL FOREST

Golden-throated Barbet	<i>Psilopogon franklinii</i>
Blue-throated Barbet	<i>Psilopogon asiaticus</i>
Slaty-headed Parakeet	<i>Psittacula himalayana</i>
Maroon Oriole	<i>Oriolus traillii</i>
Short-billed Minivet	<i>Pericrocotus brevirostris</i>
Grey Treepie	<i>Dendrocitta formosae</i>
Black-headed Jay	<i>Garrulus lanceolatus</i>
Red-headed Tit (Black-throated Tit)	<i>Aegithalos iredalei</i>
Striated Prinia	<i>Prinia crinigera</i>
Mountain Bulbul	<i>Ixos mcclllandii</i>
Black Bulbul	<i>Hypsipetes leucocephalus</i>

Himalayan Bulbul	<i>Pycnonotus leucogenys</i>
Grey-hooded Warbler	<i>Phylloscopus xanthoschistos</i>
Black-faced Warbler	<i>Abroscopus schisticeps</i>
Rusty-cheeked Scimitar-babbler	<i>Erythrogenys erythrogenys</i>
Black-chinned Babbler	<i>Cyanoderma pyrrhops</i>
Nepal Fulvetta	<i>Alcippe nipalensis</i>
Red-billed Leiothrix	<i>Leiothrix lutea</i>
Blue-winged Minla	<i>Siva cyanouroptera</i>
Grey-winged Blackbird	<i>Turdus boulboul</i>
Small Niltava	<i>Niltava macgrigoriae</i>
Orange-bellied Leafbird	<i>Chloropsis hardwickii</i>
Black-throated Sunbird	<i>Aethopyga saturata</i>

BIOME 11: INDO-MALAYAN TROPICAL DRY ZONE

Red-headed Vulture	<i>Sarcogyps calvus</i>
Jungle Babbler	<i>Turdoides striata</i>



Green Shrike- Babbler



Pink-browed Rosefinch

Threats

Habitat destruction

Road construction in many areas seems to be a big problem for birds. The most affected species is probably Cheer Pheasant; near Aurobido Ashram area the recently upgraded/widened road has fragmented the small patch of suitable habitat for this bird. The negative impact was visible downhill, where a small lake at Tindhara was destroyed due to mudslides resulting from road construction.

There is a plan to build a road up to Hwagdi to Madane Chaur, this road will surely have negative impact on birds because of the inevitable felling of large parts of the dense oak forest.

On-going road construction work using excavators was also creating noise problem from morning to evening.

Overharvest of natural resources

Community Forest User Groups allocate plots for harvesting oak leaves and other fodder, however, uncontrolled harvesting was seen even in the core area. The difference between the protected (Gulmi) and unprotected (Pyuthan and Baglung) forest in Madane range was clearly visible; in unprotected sites the forest was heavily depleted. So, pressure was observed from Pyuthan and Baglung, where several groups of illegal fodder collectors were encountered during the survey period.

Most of the southern slopes were dry but the available springs and brooks at northern slopes were also heavily piped for drinking water leaving insufficient water for vegetation, birds and other wildlife.

Illegal hunting

A group of hunters with guns from Pyuthan District were encountered during the survey period. Furthermore, gunshots were heard from the forest during the evening. Speckled Pigeon (locally called Malewa hunting), Kalij Pheasant and Hill Partridge are likely the most hunted birds.

Forest Fires

Due to proximity to human settlement, farmland and people entering the forest with low awareness, the core area with slow growing oak forest at the slopes is susceptible to forest fires. Some patches of forest destroyed by fires a couple of years ago were seen and are still dead.



Cheer Pheasant habitat fragmentation at Aurobido Ashram



Forest fire on the way to Madane top



Illegal fodder collectors from Pyuthan District



Overtrapping of drinking water

Discussion

The Government of Nepal is committed to conserve its natural resources through providing different conservation status and management practices. Forest Act 2049 BS (1993) has provided the legal platform to declare and manage any national forest as a protected forest. The protected forest should have environmental, scientific, cultural or other significant importance. To date 10 forests have received the status of protected forest and Madane Forest was declared as such in 2012. The significance of the forest is considered for natural beauty and unique ecosystem conservation (Kafle *et al.* 2073) but it is equally important for water resources, birds and other wildlife and as a corridor for wildlife.

A bird survey of Madane Protected Forest was carried out from 8th-16th March 2018 using Mackinnon's Listing method. A total of 184 bird species among them 177 species was recorded from 69 Mackinnon's Lists. An additional seven species were recorded outside the lists: Himalayan Owl *Strix nivicolium* identified later using the recorded call, Short-eared Owl *Asio flammeus* identified by collected feathers from a dead bird, Common Raven *Corvus corax* seen flying over the ridge at our hotel at Thulachaur before the survey started, Brown-flanked Bush Warbler *Horornis fortipes* confirmed with call later, Hair-crested Drongo *Dicrurus hottentottus*, Rufous-bellied Woodpecker *Dendrocopos hyperythrus* and Barn Swallow *Hirundo rustica* were recorded during the break time. The species richness curve shows the steady increase at the end, which looks unnatural for the assumption of Mackinnon's Listing method. This is because the first 8 surveys were carried out in the core area in almost similar habitat and elevation (starting and ending) but the last survey started in Thaulachaur (2000 m) and ended at Simaltari (1035 m, the lowest elevation surveyed) covering different types of habitat. Another half-day survey would certainly normalize the upper end of the curve. Due to altitudinal and habitat variations, the number of bird species recorded from Thulachaur to Simaltari is also the highest with 17 new species for the survey period.

This survey recorded 54 new species from the previous survey carried out in January 2017 (Chaudhary and Magar 2017), hence the total number of bird species found in Madane Protected Forest is now 202. Both surveys represent the winter season, a summer season survey would certainly add more species for the area. However, the current survey recorded some early summer arrivals such as Chestnut-headed Bee-eater *Merops leschenaultia* and Large Hawk-cuckoo *Hierococcyx sparverioides*.

Madane Protected Forest represents a middle mountain forest ecosystem of Nepal. Most of the birds are forest dependent including some hill stream birds such as Little Forktail, Spotted Forktail, Plumbeous Water-redstart and White-capped Water-redstart. Altitudinal variations, the different types of forest, and tropical to temperate forests result in high diversity of bird species. The bird community was dominated by a large number of rare species: 52 species were found in only one area with 1 to 3 frequency of occurrence followed by 28 species from

two sites, 24 species from 3 sites and 19 species from 4 sites. A relatively smaller number of species were widely distributed and included common birds: 13 species were distributed all over the area followed by 12 species from 8 sites, 10 species from 7 sites, 7 species from 6 sites and 12 species from 5 sites.

The Madane Protected Forest is located in Kali Gandaki Valley, the major bird migratory corridor. Two species, Ruddy Shelduck and Great Cormorant were seen migrating northward. A call of Crane, probably Demoiselle Crane was also heard once in the sky above Thulachaur but we could not locate the bird, since the sky was clear they may have taking high flight. According to local people, Demoiselle Crane make autumn migration in large numbers at the time of the monitoring conducted at Upper Mustang (BCN 2017 and 2018) but the spring migration was less known among them.

The survey was able to document a good number of bird species under the IBA criteria i.e. 5 globally threatened species, 3 restricted-range species and 66 biome-restricted species. Some species such as Cheer Pheasant, Red-headed Vulture, Nepal Cupwing and Spiny Babbler falls into more than one category. The number and type of trigger species is similar to other mid-hill IBAs of Nepal e.g. Resunga Forest, Phulchowki Mountain Forest, Khandbari Num Forest and Panchase Protected Forest (BCN and DNPWC 2018 in prep.).

The Madane Protected Forest is managed through different approaches. There are 56 community forests, 8 leasehold forest, many private forests and the core area at higher elevation is managed as a core protected zone (Baral and Dulal 2073). However, there are many forested areas at lower elevations and there is high pressure on the core area for fodder harvesting, especially oak. Even though there is a mechanism for controlling fodder cutting through plots, some uncontrolled cutting was seen in the core zone. Illegal fodder cutting and collection by people from neighbouring districts is high. The oak forest is important for the watershed, fodder, leaf litter, firewood and timber. Oak is one of the most over-exploited species in Nepal. It fails to regenerate adequately and plantation has not been successful, so it is important to manage natural forest more effectively and sustainably (Shrestha 2003). Along with the pressure of fodder collection, there is illegal hunting from the neighboring districts and evidence of hunting from locals was also noticed during the survey. According to local people Kalij Pheasant hunting and trapping is common practice, Cheer Pheasant located in small patches of habitat may face the same problem, in addition to already facing habitat fragmentation and degradation thorough road construction.

Therefore, to conserve this forest it is important to work with the District Forest Office and local Community Forest User Groups to address the conservation threats.

Recommendations

Designate as an IBA: Considering the number of triggering species, BCN should identify this area as an IBA. The IBA boundary should exclusively cover the core area and work with local communities in the fringe areas for its conservation and sustainable management.

Protected forest extension: The Madane mountain range extends into Pyuthan and Baglung districts and the protected forest boundary should also cover these districts.

Further survey: A bird survey during spring/summer season is necessary to document the birds from all seasons. A bird survey in the same trails as this survey is highly recommended. Allocating one or two mornings for call count at Aurobido Ashram would establish the status of Cheer Pheasant.

Sustainable resource use: Help local Forest User Groups to establish better and more sustainable fodder collection schemes. Make initiatives to conserve water in nearby villages, thereby providing more water to the forest.

Locally-based monitoring: Establishing an LBM-scheme as in Resunga will enable repeated monitoring of selected biological indicators, resources and resource uses as well as building awareness on these factors among local users and administrators.

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Annexes

Annex I: Checklist of Birds

Common Name	Scientific name	Abundance	Distribution	IBA Criteria
Phasianidae				
Hill Partridge	<i>Arborophila torqueola</i>	18	1,2,3,5,6,7,8	B07
Black Francolin	<i>Francolinus francolinus</i>	3	5,6,9	
Koklass Pheasant	<i>Pucrasia macrolopha</i>	2	2	B07
Cheer Pheasant	<i>Catreus wallichii</i>	1	2	RR, VU, B07
Kalij Pheasant	<i>Lophura leucomelanos</i>	6	1,2,5,7,8	
Anatidae				
Ruddy Shelduck *	<i>Tadorna ferruginea</i>	1	6	
Columbidae				
Speckled Woodpigeon	<i>Columba hodgsonii</i>	3	1,5,8	B07
Oriental Turtle-dove	<i>Streptopelia orientalis</i>	22	1,2,3,4,5,6,7,8,9	
Wedge-tailed Green-pigeon	<i>Treron sphenurus</i>	1	6	
Caprimulgidae				
Grey Nightjar	<i>Caprimulgus jotaka</i>	2	2,3	
Apodidae				
Alpine Swift	<i>Tachymarptis melba</i>	3	5,8,9	
Pacific Swift	<i>Apus pacificus</i>	1	9	
Cuculidae				
Greater Coucal	<i>Centropus sinensis</i>	2	5,9	
Large Hawk-cuckoo	<i>Hierococcyx sparverioides</i>	2	3,4	
Common Hawk-cuckoo	<i>Hierococcyx varius</i>	2	2,5	
Ciconiidae				
Asian Woollyneck	<i>Ciconia episcopus</i>	1	9	VU
Ardeidae				
Indian Pond-heron	<i>Ardeola grayii</i>	1	9	
Cattle Egret	<i>Bubulcus ibis</i>	1	9	
Little Egret	<i>Egretta garzetta</i>	1	9	
Phalacrocoracidae				
Great Cormorant *	<i>Phalacrocorax carbo</i>	1	1	
Scolopacidae				
Eurasian Woodcock	<i>Scolopax rusticola</i>	1	8	
Strigidae				
Collared Owlet	<i>Glaucidium brodiei</i>	12	1,2,3,4,5,6,9	
Asian Barred Owlet	<i>Glaucidium cuculoides</i>	4	1,5	
Mountain Scops-owl	<i>Otus spilocephalus</i>	2	2,6	
Himalayan Owl	<i>Strix nivicolium</i>		2	
Eurasian Eagle-owl	<i>Bubo bubo</i>	1	6	
Short-eared Owl	<i>Asio flammeus</i>			
Accipitridae				
Bearded Vulture	<i>Gypaetus barbatus</i>	4	2,5,8,9	
Egyptian Vulture	<i>Neophron percnopterus</i>	5	2,3,8,9	EN
Crested Serpent-eagle	<i>Spilornis cheela</i>	16	2,3,4,5,6,7,8,9	
Red-headed Vulture	<i>Sarcogyps calvus</i>	3	1,9	CR, B11
Himalayan Griffon	<i>Gyps himalayensis</i>	10	1,2,7,8,9	B05

Mountain Hawk-eagle	<i>Nisaetus nipalensis</i>	1	8	
Black Eagle	<i>Ictinaetus malaiensis</i>	8	2,3,4,8	
Steppe Eagle	<i>Aquila nipalensis</i>	7	1,3,8,9	EN
Bonelli's Eagle	<i>Aquila fasciata</i>	3	1,2,8	
Booted Eagle	<i>Hieraaetus pennatus</i>	2	5,9	
Besra	<i>Accipiter virgatus</i>	1	6	
Eurasian Sparrowhawk	<i>Accipiter nisus</i>	2	4,9	
Northern Goshawk	<i>Accipiter gentilis</i>	1	9	
Black Kite	<i>Milvus migrans</i>	2	8,9	
Himalayan Buzzard	<i>Buteo refectus</i>	4	4,8,9	
Falconidae				
Common Kestrel	<i>Falco tinnunculus</i>	10	1,2,3,4,5,9	
Meropidae				
Chestnut-headed Bee-eater	<i>Merops leschenaulti</i>	1	9	
Alcedinidae				
White-breasted Kingfisher	<i>Halcyon smyrnensis</i>	1	9	
Megalaimidae				
Great Barbet	<i>Psilopogon virens</i>	25	1,2,3,4,5,6,9	
Golden-throated Barbet	<i>Psilopogon franklinii</i>	5	1,2,3,5,7	B08
Blue-throated Barbet	<i>Psilopogon asiaticus</i>	7	2,5,9	B08
Picidae				
Speckled Piculet	<i>Picumnus innominatus</i>	1	9	
Black-naped Woodpecker	<i>Picus guerini</i>	16	1,2,3,4,5,6,8	
Brown-fronted Woodpecker	<i>Leiopicus auriceps</i>	3	3,4,5	
Scarlet-breasted Woodpecker	<i>Dryobates cathpharius</i>	1	3	
Rufous-bellied Woodpecker	<i>Dendrocopos hyperythrus</i>			
Psittacidae				
Slaty-headed Parakeet	<i>Psittacula himalayana</i>	3	5,6	B08
Oriolidae				
Maroon Oriole	<i>Oriolus traillii</i>	11	2,4,6,9	B08
Vireonidae				
White-browed Shrike-babbler	<i>Pteruthius aeralatus</i>	7	6,7,8	
Green Shrike-babbler	<i>Pteruthius xanthochlorus</i>	1	7	B07
Campephagidae				
Short-billed Minivet	<i>Pericrocotus brevirostris</i>	1	9	B08
Long-tailed Minivet	<i>Pericrocotus ethologus</i>	25	2,3,4,5,6,7,8,9	
Scarlet Minivet	<i>Pericrocotus flammeus</i>	5	2,6,9	
Indian Cuckooshrike	<i>Coracina macei</i>	1	3	
Rhipiduridae				
White-throated Fantail	<i>Rhipidura albicollis</i>	11	5,6,7,8	
Dicruridae				
Ashy Drongo	<i>Dicrurus leucophaeus</i>	2	8,9	
Lesser Racquet-tailed Drongo	<i>Dicrurus remifer</i>	1	5	
Hair-crested Drongo	<i>Dicrurus hottentottus</i>		9	
Laniidae				
Long-tailed Shrike	<i>Lanius schach</i>	9	2,3,4,5	
Grey-backed Shrike	<i>Lanius tephronotus</i>	3	3,9	B05
Corvidae				
Rufous Treepie	<i>Dendrocitta vagabunda</i>	1	9	
Grey Treepie	<i>Dendrocitta formosae</i>	19	2,3,5,6,7,8,9	B08

Yellow-billed Blue Magpie	<i>Urocissa flavirostris</i>	3	1,2	B07
Red-billed Blue Magpie	<i>Urocissa erythroryncha</i>	2	5	
Common Green Magpie	<i>Cissa chinensis</i>	2	9	
Black-headed Jay	<i>Garrulus lanceolatus</i>	7	2,3,4,7	B08
Common Raven	<i>Corvus corax</i>		2	
Large-billed Crow	<i>Corvus macrorhynchos</i>	16	1,2,3,5,7,8,9	
Stenostiridae				
Yellow-bellied Fairy-fantail	<i>Chelidorhynch hypoxanthus</i>	9	3,4,5,6,7	
Grey-headed Canary-flycatcher	<i>Culicicapa ceylonensis</i>	31	1,2,4,5,6,7,8,9	
Paridae				
Yellow-browed Tit	<i>Sylviparus modestus</i>	11	1,2,3,4,5,6,7,8,9	B07
Grey-crested Tit	<i>Lophophanes dichrous</i>	1	7	B07
Green-backed Tit	<i>Parus monticolus</i>	45	1,2,3,4,5,6,7,8,9	B07
Great Tit	<i>Parus major</i>	2	5,9	
Black-lored Tit	<i>Machlolophus xanthogenys</i>	10	2,4,5,7,8,9	
Red-headed Tit	<i>Aegithalos iredalei</i>	21	1,2,3,4,5,6,7,8,9	B08
Cisticolidae				
Striated Prinia	<i>Prinia crinigera</i>	21	2,3,4,5,6,7,8,9	B08
Grey-breasted Prinia	<i>Prinia hodgsonii</i>	1	5	
Common Tailorbird	<i>Orthotomus sutorius</i>	6	3,4,5,9	
Pnoepyidae				
Nepal Cupwing	<i>Pnoepyga immaculata</i>	1	4	RR, B07
Scaly-breasted Cupwing	<i>Pnoepyga albiventer</i>	6	4,6	B07
Hirundinidae				
Barn Swallow	<i>Hirundo rustica</i>		9	
Red-rumped Swallow	<i>Cecropis daurica</i>	5	3,6,8,9	
Eurasian Crag Martin	<i>Ptyonoprogne rupestris</i>	2	5,9	
Pycnonotidae				
Mountain Bulbul	<i>Ixos mcclllandii</i>	16	1,2,4,5,6,7,8,9	B08
Black Bulbul	<i>Hypsipetes leucocephalus</i>	42	1,2,3,4,5,6,7,8,9	B08
Himalayan Bulbul	<i>Pycnonotus leucogenys</i>	16	2,4,5,6,7,8,9	B08
Red-vented Bulbul	<i>Pycnonotus cafer</i>	8	2,4,5	
Phylloscopidae				
Yellow-browed Warbler	<i>Phylloscopus inornatus</i>	5	1,4,5	
Hume's Leaf-warbler	<i>Phylloscopus humei</i>	36	1,2,3,4,5,6,7,8,9	
Lemon-rumped Leaf-warbler	<i>Phylloscopus chloronotus</i>	12	1,6,7,8,9	
Buff-barred Warbler	<i>Phylloscopus pulcher</i>	20	1,2,3,4,6,7,8,9	B07
Ashy-throated Warbler	<i>Phylloscopus maculipennis</i>	5	1,4,7	B07
Siberian Chiffchaff	<i>Phylloscopus tristis</i>	1	3	
Green-crowned Warbler	<i>Phylloscopus burkii</i>	1	1	
Whistler's Warbler	<i>Phylloscopus whistleri</i>	9	6,7,8,9	
Chestnut-crowned Warbler	<i>Phylloscopus castaniceps</i>	4	1,7,8	
Greenish Warbler	<i>Phylloscopus trochiloides</i>	4	1,7,	
Blyth's Leaf-warbler	<i>Phylloscopus reguloides</i>	4	1,3,6,8	
Grey-hooded Warbler	<i>Phylloscopus xanthoschistos</i>	46	1,2,3,4,5,6,7,8,9	B08
Scotocercidae				
Brownish-flanked Bush-warbler	<i>Horornis fortipes</i>		5	
Grey-sided Bush-warbler	<i>Cettia brunnifrons</i>	3	5	B07

Chestnut-headed Tesia	<i>Cettia castaneocoronata</i>	8	2,4,5,6,8,9	B07
Black-faced Warbler	<i>Abroscopus schisticeps</i>	4	4,6	B08
Aberrant Bush-warbler	<i>Horornis flavolivaceus</i>	1	5	B07
Sylviidae				
Lesser Whitethroat	<i>Sylvia curruca</i>	1	5	
Zosteropidae				
Stripe-throated Yuhina	<i>Yuhina gularis</i>	1	7	B07
Whiskered Yuhina	<i>Yuhina flavicollis</i>	28	1,2,3,4,5,6,7,8,9	
Oriental White-eye	<i>Zosterops palpebrosus</i>	21	1,2,3,4,5,6,8	
Timaliidae				
Streak-breasted Scimitar-babbler	<i>Pomatorhinus ruficollis</i>	16	1,2,4,5,6,7,8	
Rusty-cheeked Scimitar-babbler	<i>Erythrognys erythrognys</i>	22	1,2,3,4,5,6,7,8,9	B08
Grey-throated Babbler	<i>Stachyris nigriceps</i>	4	1,3,4	
Black-chinned Babbler	<i>Cyanoderma pyrrhops</i>	20	2,3,4,5,6,7,8,9	B08
Pellorneidae				
Rufous-winged Fulvetta	<i>Schoeniparus castaneiceps</i>	4	1,3,6,7	
Leiostrichidae				
Nepal Fulvetta	<i>Alcippe nipalensis</i>	6	4,7,8	B08
Striated Laughingthrush	<i>Grammatoptila striata</i>	2	4	B07
Spiny Babbler	<i>Acanthoptila nipalensis</i>	1	6	RR, B07
Jungle Babbler	<i>Turdoides striata</i>	2	5,9	B11
White-crested Laughingthrush	<i>Garrulax leucolophus</i>	7	2,3,5,7,9	
White-throated Laughingthrush	<i>Garrulax albogularis</i>	14	1,2,3,5,6,7,8,9	B07
Streaked Laughingthrush	<i>Trochalopteron lineatum</i>	6	2,5,7	B07
Chestnut-crowned Laughingthrush	<i>Trochalopteron erythrocephalum</i>	7	3,4,5,9	
Rufous Sibia	<i>Heterophasia capistrata</i>	31	1,2,4,6,7,9	B07
Red-billed Leiothrix	<i>Leiothrix lutea</i>	3	5,9	B08
Blue-winged Minla	<i>Siva cyanouroptera</i>	8	1,3,5,6,7	B08
Bar-throated Minla	<i>Chrysominla strigula</i>	17	1,2,3,4,6,7,8,9	B07
Certhiidae				
Rusty-flanked Treecreeper	<i>Certhia nipalensis</i>	1	6	B07
Hodgson's Treecreeper	<i>Certhia hodgsoni</i>	3	6,7	
Sittidae				
Chestnut-bellied Nuthatch	<i>Sitta cinnamoventris</i>	1	9	
White-tailed Nuthatch	<i>Sitta himalayensis</i>	28	1,2,3,4,5,6,7,9	B07
Velvet-fronted Nuthatch	<i>Sitta frontalis</i>	1	5	
Wallcreeper	<i>Tichodroma muraria</i>	1	5	B05
Sturnidae				
Common Myna	<i>Acridotheres tristis</i>	9	4,5,6,9	
Turdidae				
Grey-winged Blackbird	<i>Turdus boulboul</i>	1	3	B08
Black-throated Thrush	<i>Turdus atrogularis</i>	1	8	
Muscicapidae				
Oriental Magpie-robin	<i>Copsychus saularis</i>	2	5,9	
Small Niltava	<i>Niltava macgrigoriae</i>	33	1,2,3,4,5,6,7,8,9	B08
Verditer Flycatcher	<i>Eumyias thalassinus</i>	32	1,2,3,4,5,6,7,8,9	
Himalayan Rubythroat	<i>Calliope pectoralis</i>	1	9	B07
Orange-flanked Bush-robin	<i>Tarsiger cyanurus</i>	18	1,2,4,5,6,7,8	
Golden Bush-robin	<i>Tarsiger chrysaeus</i>	4	2,3,8,9	B07

Little Forktail	<i>Enicurus scouleri</i>	1	4	
Spotted Forktail	<i>Enicurus maculatus</i>	2	4,9	
Blue Whistling-thrush	<i>Myophonus caeruleus</i>	22	1,2,3,4,5,6,7,9	
Slaty-blue Flycatcher	<i>Ficedula tricolor</i>	1	9	B07
Snowy-browed Flycatcher	<i>Ficedula hyperythra</i>	3	4,6	
Rufous-gorgeted Flycatcher	<i>Ficedula strophciata</i>	7	1,3,5,8	B07
Ultramarine Flycatcher	<i>Ficedula superciliaris</i>	6	1,6,7,8,9	B07
Blue-fronted Redstart	<i>Phoenicurus frontalis</i>	26	1,2,3,4,5,6,7,8,9	
White-capped Water-redstart	<i>Phoenicurus leucocephalus</i>	4	3,5,6	
Plumbeous Water-redstart	<i>Phoenicurus fuliginosus</i>	4	3,5,6	
Chestnut-bellied Rock-thrush	<i>Monticola rufiventris</i>	7	1,2,3,4,5,7	
Grey Bushchat	<i>Saxicola ferreus</i>	18	1,2,4,5,6,7,8,9	
Pied Bushchat	<i>Saxicola caprata</i>	1	9	
Common Stonechat	<i>Saxicola torquatus</i>	10	2,3,4,5,9	
Chloropseidae				
Orange-bellied Leafbird	<i>Chloropsis hardwickii</i>	12	1,2,4,8,9	B08
Dicaeidae				
Fire-breasted Flowerpecker	<i>Dicaeum ignipectus</i>	25	1,2,3,4,5,6,7,8,9	
Nectariniidae				
Fire-tailed Sunbird	<i>Aethopyga ignicauda</i>	13	1,2,3,5,7,8	B07
Black-throated Sunbird	<i>Aethopyga saturata</i>	4	2,6,7	B08
Green-tailed Sunbird	<i>Aethopyga nipalensis</i>	12	1,2,3,7,8,9	
Gould's Sunbird	<i>Aethopyga gouldiae</i>	1	7	
Prunellidae				
Altai Accentor	<i>Prunella himalayana</i>	2	2,5	B05
Rufous-breasted Accentor	<i>Prunella strophciata</i>	3	2,5	B07
Passeridae				
House Sparrow	<i>Passer domesticus</i>	1	9	
Russet Sparrow	<i>Passer cinnamomeus</i>	8	3,4,6	
Eurasian Tree Sparrow	<i>Passer montanus</i>	5	3,6,9	
Motacillidae				
Olive-backed Pipit	<i>Anthus hodgsoni</i>	10	2,4,5,8,9	
Upland Pipit	<i>Anthus sylvanus</i>	7	2,3,5,6	
Grey Wagtail	<i>Motacilla cinerea</i>	6	3,6,7,9	
Fringillidae				
Common Rosefinch	<i>Carpodacus erythrinus</i>	1	6	
Scarlet Finch	<i>Carpodacus sipahi</i>	1	7	B07
Pink-browed Rosefinch	<i>Carpodacus rodochroa</i>	3	2,9,	B07
Red-headed Bullfinch	<i>Pyrrhula erythrocephala</i>	2	3,7	B07
Dark-breasted Rosefinch	<i>Procarduelis nipalensis</i>	5	1,3,4	B07
Yellow-breasted Greenfinch	<i>Chloris spinoides</i>	4	3,4	B07
Eastern Goldfinch	<i>Carduelis caniceps</i>	1	6	
Emberizidae				
Rock Bunting	<i>Emberiza cia</i>	9	1,3,5,7,9	

Key

A1: Globally Threatened Species

VU: Vulnerable

EN: Endangered

CR: Critically Endangered

A2: Restricted-range species

RR: Restricted-range species

A3: Biome-restricted assemblage

B05: Biome 05: Eurasian High Montane

B07: Biome 07 Sino-Himalayan Temperate Forest

B08: Biome 08: Sino-Himalayan Subtropical Forest

B11: Biome 11: Indo-Malayan Tropical Dry Zone

*= on migration

Annex II: Survey site and Itinerary

Survey Trails	Date
1:Saire-Topre	8-Mar-18
2: Ashram-Malika-Thulachaur	9-Mar-18
3:Thulachaur- Hwagdi/mahabhir-Gardhare	10-Mar-18
4: Gargara-Jugena	11-Mar-18
5: Saunapote-Deurali Thuladhunga-Tindhara	12-Mar-18
6:Arkhabang, Bhaisimela-Jaljala-Rangdi Khola	13-Mar-18
7:Hwangdi-Kukurgaade Duerali	14-Mar-18
8: Tikhechuli-Saunapote	15-Mar-18
9:Thulachaur, Bhanjyang-Simltari	16-Mar-18