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Resident Forest Bird Monitoring 2015

(15 Protected Areas in Bangladesh)



Bangladesh Forest Department

**Bangladesh bird club, Dhaka and
USAID's Climate-Resilient Ecosystems and Livelihoods (CREL) Project**

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Contents

<u>BACKGROUND.....</u>	<u>1</u>
<u>CONCEPTUAL FRAMEWORK.....</u>	<u>1</u>
<i>CONTEXT – NSP BIRD SURVEYS (2005-2008, 2012).....</i>	<i>4</i>
<i>CONTEXT – IPAC BIRD SURVEY (2009-2012)</i>	<i>4</i>
<u>METHODS.....</u>	<u>4</u>
<i>BIRD SURVEY</i>	<i>4</i>
<i>IDENTIFICATION OF NEW TRAILS.....</i>	<i>5</i>
<u>RESULTS AND DISCUSSION.....</u>	<u>9</u>
<i>CHITTAGONG REGION</i>	<i>9</i>
<i>COX’S BAZAR REGION</i>	<i>13</i>
<i>CENTRAL REGION.....</i>	<i>18</i>
<i>SYLHET REGION</i>	<i>19</i>
<u>CAPACITY BUILDING OF LOCAL SURVEYORS.....</u>	<u>22</u>
<u>CONCLUSION AND RECOMMENDATION</u>	<u>22</u>
APPENDIX 1: LOCAL SURVEYORS PROFILE AND PERFORMANCE ASSESSMENT.....	24
APPENDIX 2: INDICATOR RESIDENT BIRD SURVEY DATA SHEET 2015.....	30
DATA SHEET FOR BIRD SURVEY 2015	30
APPENDIX 3: LIST OF BIRDS RECORDED IN 15 FOREST PA SITES DURING APRIL-JULY/AUGUST 2015....	31
APPENDIX 4: PHOTOS TAKEN DURING CREL-BBC FOREST BIRD MONITORING 2015.	39

BACKGROUND

USAID's Climate-Resilient Ecosystems and Livelihoods (CREL) Project envisages promoting collaborative management of natural resources in selected 31 bio-diverse ecosystems including forest protected areas, wetlands and ecologically critical areas of Bangladesh. In this connection a significant result of the project is to develop a robust baseline of biophysical changes in these areas. Bangladesh Forest Department adopted collaborative management approach of protected areas in 2003-04 in five forest PA sites namely Lawachara National Park (NP), Satchari NP, Rema-Kalenga Wildlife Sanctuary (WS), Chunati WS and Teknaf WS under Nishorgo Support Project (NSP, 2003-2008) with financial support from the USAID. Later this approach was scaled-up to 17 forest PAs in the country through Integrated Protected Area Co-management (IPAC, 2008-2013) Project supported by USAID. Since October 2012 CREL has been working to consolidate, sustain and extend co-management in 21 forest PA/sites.

Surveys of selected resident forest birds have been taken up as a proxy indicator to measure biophysical changes in forest ecosystems since birds are more visible and responsive to habitat changes (Johnston 1956, Morrison 1986, Welsh 1987, Temple and Wiens 1989, Canterbury *et al.* 2000, Browder 2002). The pilot phase of indicator bird survey was conducted in initial five co-managed PAs (Lawachara NP, Satchari NP, Rema-Kalenga WS, Chunati WS and Teknaf WS) during 2005-2008. Later in IPAC project, another five forest PAs viz. Kaptai NP, Fasiakhali WS, Medakachapia NP, Modhupur NP and Khadimnagar NP were included in bird survey during 2009-2010. In all ten of these PAs follow up impact surveys were conducted in 2012. All of those bird surveys were conducted by Dr Monirul Khan, a professional wildlife biologist supported by his students, using strip transect sampling and complemented by opportunistic recording of other species. To test how bird monitoring could be made more sustainable and incorporate it into CMOs monitoring tool, IPAC took an initiative with Bangladesh bird club (Bbc) to undertake surveys through volunteers from the bird club and to train interested local people (CMO members) using the same methods, applying this to the same ten PAs and transects in 2011. The same approach is adopted by CREL project and Bbc to conduct participatory resident forest bird surveys during June-September 2014, with a greater emphasis on the surveys being undertaken by experienced birdwatchers from the club following the same methods as used by Dr. M. H. Khan, to ensure comparability in methods, as well as developing local capacity to conduct monitoring. The survey in 2014 covered 14 PAs including all ten previously monitored sites and four additional PAs (Inani Reserve Forests, Himchari NP, Hazarikhil WS and Dudpukuria-Dhopachari WS) where co-management has been adopted. The aim of this study is to establish biophysical baselines in the CREL sites, and to continue monitoring to determine change in forest health as a result of better NRM through collaborative management. This report highlights the results of April-July/August 2015 resident forest bird survey in 15 PAs (the 14 covered in 2014 plus one additional site Barayadhala NP where CREL introduced co-management in 2015) and draws comparisons with previous (2005-2012) systematic surveys of bird population density in these PAs.

CONCEPTUAL FRAMEWORK

Monitoring ecosystem health is a priority to determine the effectiveness of the shift to a co-management approach in forest PA sites in Bangladesh. Rigorous and scientifically valid indicators of changes in forest health are a challenge, but as noted earlier monitoring of populations of selected birds offers one measure of changes in forest condition. In addition co-management itself and recent interest in preparing for REDD+ funding mechanisms both emphasize the need for community based monitoring as a sustainable tool for PA management and for Monitoring Reporting and Verification

(MRV). While the co-management organizations are progressing with their institutional and managerial capacity building for conservation of unique natural resources in their protected areas, they are also expected to take initiative in monitoring the trends of resources and uses, and to make use of monitoring results. Hence the monitoring reported here also tried to develop greater community involvement in monitoring of indicator forest bird density.

Based on the nature of forests (e.g. tropical mixed evergreen and deciduous), 16 resident bird species dependent on different forest strata, relatively easy to detect and identify by call/song were selected by bird experts, with 10-11 of these species selected as indicators for each PA site (Table 1). The breakdown of indicator species by sites in past and current surveys is detailed in Table 2. Fifty four (54??) transects were monitored following the same monitoring protocol and are implemented in 15 PA sites (Table 4).

Table 1: List of indicator forest (resident) birds.

SL	Indicator Birds	Scientific name	Resident in forest strata
1	Oriental Pied Hornbill	<i>Anthracoceros albirostris</i>	Upper
2	Hill Myna	<i>Gracula religiosa</i>	Upper
3	Scarlet Minivet	<i>Pericrocotus flammeus</i>	Upper
4	Green-billed Malkoha	<i>Phaenicophaeus tristis</i>	Middle
5	White-rumped Shama	<i>Copsychus malabaricus</i>	Middle
6	Greater Racket-tailed Drongo	<i>Dicrurus paradiseus</i>	Middle
7	Crested Serpent Eagle	<i>Spilornis cheela</i>	Middle
8	Crimson Sunbird	<i>Aethopyga siparaja</i>	Middle
9	Red-headed Trogon	<i>Harpactes erythrocephalus</i>	Middle
10	Spangled Drongo	<i>Dicrurus hottentottus</i>	Middle
11	Black Crested Bulbul	<i>Pycnonotus melanicterus</i>	Middle
12	Puff-throated Babbler	<i>Pellorneum ruficeps</i>	Lower
13	Abbott's Babbler	<i>Malacocincla abbotti</i>	Lower
14	White-crested Laughingthrush	<i>Garrulax leucolophus</i>	Lower
15	Orange-headed Thrush	<i>Zoothera citrina</i>	Lower
16	Red Junglefowl	<i>Gallus gallus</i>	Lower

Table 2: Indicator species and protected areas

Sl	English Name	Scientific Name	Strata	Main Food	Kaptai NP	Hazari-khil WS	Dudpukuria WS	Baroiar dhala NP	Chunati WS	Fasia-khali WS	Medaka-chapia NP	Him-chari NP	Inani RF	Teknaf WS	Lawa-chara NP	Sat-chari NP	Rema-Kalenga WS	Khadim-nagar NP	Modhupur NP
1	Red Junglefowl	<i>Gallus gallus</i>	G	Seeds	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
2	Puff-throated Babbler	<i>Pellorneum ruficeps</i>	G	Insects	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
3	Abbott's Babbler	<i>Malacocincla abbotti</i>	L	Insects	Y	Y	Y	Y		Y	Y	Y	Y		Y	Y	Y	Y	
4	White-crested Laughingthrush	<i>Garrulax leucolophus</i>	L	Insects					Y					Y					
5	Orange-headed Thrush	<i>Zoothera citrina</i>	L	Insects															Y
6	White-rumped Shama	<i>Copsychus malabaricus</i>	L	Insects	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
7	Crested Serpent Eagle	<i>Spilornis cheela</i>	M	Snakes	Y					Y	Y							Y	Y
8	Red-headed Trogon	<i>Harpactes erythrocephalus</i>	M	Insects		Y	Y	Y	Y			Y	Y	Y	Y	Y	Y		
9	Green-billed Malkoha	<i>Phaenicophaeus tristis</i>	M	Insects	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
10	Greater Racket-tailed Drongo	<i>Dicrurus paradiseus</i>	M	Insects	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
11	Spangled Drongo	<i>Dicrurus hottentottus</i>	M	Insects															Y
12	Black-crested Bulbul	<i>Pycnonotus melanicterus</i>	M	Fruits															Y
13	Crimson Sunbird	<i>Aethopyga siparaja</i>	M	Nectar	Y	Y	Y			Y	Y	Y	Y					Y	Y
14	Oriental Pied Hornbill	<i>Anthracoceros albirostris</i>	U	Fruits	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
15	Hill Myna	<i>Gracula religiosa</i>	U	Fruits	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
16	Scarlet Minivet	<i>Pericrocotus flammeus</i>	U	Insects	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Total species				11	11	11	10	10	11	11	11	11	10	10	10	10	11	10

Grey indicates species not previously monitored (before 2014) in a given site.

Context – NSP bird surveys (2005-2008, 2012)

Indicator bird survey conducted in 5 pilot PA sites namely Lawachara NP, Satchari NP, Rema-Kalenga WS, Chunati WS and Teknaf WS during Feb-Aug of 2005-2008 and 2012 by Dr. Monirul H. Khan, Jahangirnagar University, Bangladesh, his students and local community members also took part in these surveys. The results of these survey shows increase of two birds viz. Red Junglefowl and Puff-throated Babbler, however, the population densities of remaining birds remained more or less unchanged over 2005-12.

Context – IPAC bird survey (2009-2012)

In five other PAs namely Medakachapia NP, Fasiakhali WS, Kaptai NP, Modhupur NP and Khadimnagar NP indicator bird surveys were conducted during 2009, 2010 and 2012 with the same expertise and methods. Almost constant results were found, except that the density of Red Junglefowl showed a slight increase.

METHODS

Bird Survey

The strip transect sampling method was applied at 15 PAs to conduct this bird survey. This method is a combination of quadrat sampling and line transect sampling where objects (birds) are counted from long and narrow strips. This is suitable for population estimation of visible and mobile organisms. In this method some permanent strips are selected where the total counts of the objects are made. The observer(s) slowly move (ca. 1.5 km/hr) along a relatively straight line - a trail (basal line) through the study area and count the objects (birds) from both sides. The observation-range (half-width of the strip) varies depending on the visibility of the study area. For these forest sites the average observation-range was estimated to be 25 m on either side of the transect line, so the width of transect was 50 m (but was treated as 20 m on each side with total width of 40 m in the case of five NSP sites, as had been done in the earlier surveys; Table 4). The initial location of the object was considered while counting, because the object often moves away after seeing the observer(s). If any object was sighted beyond the pre-decided observation-range, or if the object was seen coming from the back (in order to avoid duplication), the object was not counted. For birds documented on call/song it was estimated from experience by the observer if it was within the defined transect width, this aspect of method was not documented in the previous surveys. A standard data sheet was used to record the counts of indicator birds (Appendix 2).

The opportunistic survey method is suitable for recording species diversity, composition and other important information, whenever available, without following any systematic approach, lists of all species recorded opportunistically during the surveys in 2015 are given in Appendix 3.

Table 3: Sites and other details of 2015 resident forest bird survey, 2015.

No.	Region	Protected Areas	Projects	Previous surveys	# of Trails	Survey Duration	# of visits/site/year
1	Cox	Teknaf WS	NSP	2005-2008, 2012	5	April-July 2015	4
2	Cox	Inani RF	CREL	<i>New site</i>	2 Identified*	April-July 2015	4
3	Cox	Himchari NP	CREL	<i>New site</i>	2 Identified*	April-July 2015	4
4	Cox	Medakachapia	IPAC	2009-2012	2	April-July 2015	4
5	Cox	Fasiakhali	IPAC	2009-2012	2	April-July 2015	4
6	Ctg	Chunati	NSP	2005-2008, 2012	5	April-July 2015	4

7	Ctg	Kaptai	IPAC	2009-2012	5	April-July 2015	4
8	Ctg	DDWS	CREL	<i>New site</i>	4 Identified*	April-July 2015	4
9	Ctg	Hazarikhil	CREL	<i>New site</i>	4 Identified*	April-July 2015	4
10	Ctg	Baroiardhala	CREL	<i>New site</i>	3 Identified**	April-August 2015	5
11	Central	Modhupur	IPAC	2009-2012	4	April-July 2015	4
12	Sylhet	Rema-Kalenga WS	NSP	2005-2008, 2012	4	April-July 2015	4
13	Sylhet	Satchari NP	NSP	2005-2008, 2012	3	April-July 2015	4
14	Sylhet	Lawachara NP	NSP	2005-2008, 2012	6	April-July 2015	4
15	Sylhet	Khadimnagar	IPAC	2009-2012	3	April-July 2015	4

* trail identified and surveyed for 1st time in 2014 and documented here

** trail identified and surveyed for 1st time in 2015 and documented here

Identification of new trails

Two broad habitat types were taken into consideration while transects were selected. (1) Mature Forest: moderately dense natural forest mixed with evergreen trees, streams with undergrowth and riparian growth. (2) Degraded Forest: degraded forest with few trees, plantations, orchards, moderate undergrowth etc. The aim was to represent both of these habitats roughly to the extent that they exist in each PA.

Table 4: New strip transects at five PAs, identified during CREL surveys (2014-2015).

Name of the PA	Transect Name	GPS coordinates of two ends	Landmarks at Two Ends	Length (km)
Inani RF	Shilbuniar Chara	N 21°13.599' E 92°03.202' N 21°13.316 E 92°03.507'	Shilbuniar Chara gonammrmore, Lui Kum	1.46
	Boro Khal	N 21°13.300' E 92°03.509' N 21°13.385 E 92°03.108'	Lui Kum, Patakata	1.50
Himchari NP	Sagar Nibash	N 21°21.509' E 92°01.145' N 21°21.451 E 92°02.244'	Hill slope, Banyan tree	1.87
	Barachara	N 21°22.000' E 92°02.100' N 21°23.455 E 92°02.023'	Chainda slope, Barachara culvert	3.00
Dudpukuria-Dhopachara WS	Chapachari (Dhopachari)	N 22°13.508' E 92°06.536' N 22°13.499 E 92°06.537'	Open field near pond, End of stream	1.90
	Nikhonchari (Dhopachari)	N 22°13.866' E 92°06.810' N 22°14.160' E 92°06.507'	Mango tree, End of stream	1.10
	Forest Office (Dudpukuria)	N 22°18.634' E 92°09.138' N 22°18.179' E 92°09.008'	Beat office, End of the hill,	1.70
	Guard Box (Dudpukuria)	N 22°18.796' E 92°09.061' N 22°19.017' E 92°08.905'	Guard box, Large Gorjon tree	1.40
Hazarikhil WS	Tea Garden	N 22°42.255' E 91°41.346' N 22°42.599' E 92°41.108'	Billerjer para, End of stream	1.10
	Butiakholo	N 22°42.616' E 91°41.094' N 22°42.178' E 92°40.688'	Teak plantation, Hill top	1.70
	New Bridge	N 22°42.213' E 91°42.184' N 22°41.972' E 92°40.839'	New bridge, Wall of sedimentary rock	1.20
	Shabuddin	N 22°42.384' E 91°41.603' N 22°42.341' E 92°41.443'	Shabuddin's house, FD rest house	0.50
Baroiardhala National Park	Bauachara	N 22°42'43.0 E 91°37'34.9 N 22°43'23.7 E 91°37'32.5	Fisher lake, Hill stream	1.83
	Khaiyachara	N 22°46'20.0 E 91°36'15.6 N 22°46'09.0 E 91°37'32.5	Tea stall, waterfall	1.90
	Modhukhaiya	N 22°40'36.0 E 91°38'33.7 N 22°41'12.6 E 91°39'18.6	Beat office, end of brick soling road.	2.40

Table 5: Strip transects at 10 PAs where bird monitoring was conducted under NSP and/or IPAC (same transects continue to be used).

Name of Project Site	Name of Transect	Location in Project Site	Geographic Locations of Two Ends	Landmarks at Two Ends	Length (km)
<i>Kaptai National Park</i>	Rampahar Stream	SE (Ctg)	22°29.709' N, 92°11.123' E; 22°30.469' N, 92°10.440' E	Balurchar, intersection	1.80
	Rampahar Hill	SE (Ctg)	22°30.469' N, 92°10.440' E; 22°29.880' N, 92°10.583' E	Intersection, culvert	1.10
	Jamaichara	SE (Ctg)	22°29.668' N, 92°10.683' E; 22°29.345' N, 92°10.752' E	Karnaphuli south bank, narrow pass	0.61
	Rangamati Road	SE (Ctg)	22°30.663' N, 92°12.451' E; 22°30.937' N, 92°12.182' E	Milestone, forest end	0.69
	Bangchhari	SE (Ctg)	22°30.040' N, 92°11.697' E; 22°31.576' N, 92°11.138' E	Main road, Debachari	3.00
<i>Fasiakhali Wildlife Sanctuary</i>	Lama Road	SE (Cox's)	21°43.090' N, 92°05.516' E; 21°42.761' N, 92°06.408' E	Cox's Bazar Road, culvert	1.70
	Natunpahar East	SE (Cox's)	21°42.338' N, 92°04.765' E; 21°42.369' N, 92°05.315' E	Natunpahar mosque, Garzanbunia	0.95
<i>Meda-Kacchapia National Park</i>	Meda-Kacchapia East	SE (Cox's)	21°38.484' N, 92°04.402' E; 21°38.329' N, 92°05.080' E	Cox's Bazar road, Kurahari	1.20
	Meda-Kacchapia West	SE (Cox's)	21°38.632' N, 92°04.392' E; 21°38.783' N, 92°03.592' E	Cox's Bazar Road, Kacchapia office	1.40
<i>Khadimnagar National Park</i>	Kalagool Road	NE	24°57.248' N, 91°56.311' E; 24°56.673' N, 91°55.689' E	Khadimnagar office, Kalagool	1.50
	Khadimnagar Central	NE	24°56.677' N, 91°56.391' E; 24°57.248' N, 91°56.311' E	South border, Khadimnagar office	1.10
	Choragang Road	NE	24°57.248' N, 91°56.311' E; 24°56.975' N, 91°57.198' E	Hindur Jhiri, brick field	1.91
<i>Madhupur National Park</i>	Rasulpur	Central	24°41.342' N, 90°08.350' E; 24°41.488' N, 90°07.015' E	Rasulpur office, Koia Pukur	2.30
	Jalui	Central	24°41.342' N, 90°08.350' E; 24°40.779' N, 90°07.683' E	Rasulpur office, Jalui office	1.50
	Lahoria	Central	24°41.730' N, 90°06.283' E; 24°41.631' N, 90°05.760' E	Lahoria office, west intersection	0.90
	Monar Bide	Central	24°40.211' N, 90°06.287' E; 24°40.811' N, 90°06.137' E	Metalled road, Gaira	1.10
<i>Lawachara National Park</i>	Magurchara	Eastern	24°19.90 N, 91°47.60 E; 24°20.20 N, 91°47.50 E	Gasfield, stream	0.50
	Train Line	Central	24°19.70 N, 91°47.20 E; 24°19.80 N, 91°47.50 E	Signboard, metalled road	0.61
	Rest House	Central	24°19.80 N, 91°47.20 E; 24°20.20 N, 91°47.20 E	Sharp turn, culvert	0.50
	Tea Estate	Central	24°19.50 N, 91°47.20 E; 24°19.70 N, 91°47.60 E	Bus stand, tea estate	0.70
	Lawachara Punji	Western	24°19.20 N, 91°47.10 E; 24°19.40 N, 91°46.80 E	Three large trees, betel-leaf plantation	0.52
	Jankichara	Western	24°18.80 N, 91°46.40 E; 24°19.10 N, 91°46.90 E	Jankichara Forest Office, 'Mofi' Point	0.89
	Satchari West	Central	24°07.50 N, 91°26.70 E; 24°06.60 N, 91°27.20 E	'Wilderness' signboard, teak plantation	1.94

Name of Project Site	Name of Transect	Location in Project Site	Geographic Locations of Two Ends	Landmarks at Two Ends	Length (km)
Satchari National Park	Satchari East	Central	24°07.6' N, 91°27.0' E; 24°07.3' N, 91°27.2' E	Sloppy passage, open grassland	0.56
	Satchari North	Northern	24°07.4' N, 91°26.7' E; 24°07.5' N, 91°27.0' E	Lemon plantation, metalled road	0.50
Rema-Kalenga Wildlife Sanctuary	Watchtower	Northern	24°10.7' N, 91°37.6' E; 24°09.6' N, 91°38.0' E	Watchtower, Chharabari	2.02
	Chharabari	Central	24°09.6' N, 91°38.0' E; 24°09.8' N, 91°37.5' E	Chharabari, paddy field	0.78
	Chhanbari	Northern	24°10.2' N, 91°37.5' E; 24°10.3' N, 91°37.9' E	Chhanbari, slope	0.80
	Rema	Southern	24°06.9' N, 91°37.5' E; 24°06.4' N, 91°37.8' E	Large 'chupalish' tree, BDR camp	1.11
Chunati Wildlife Sanctuary	Two Towers	Eastern	21°55.4' N, 92°03.5' E; 21°55.3' N, 92°02.7' E	Metalled road, second tower	1.41
	Banyan Tree	Central	21°55.3' N, 92°02.7' E; 21°55.5' N, 92°02.3' E	Second tower, banyan tree	0.76
	Hindur Jhiri	Eastern	21°55.7' N, 92°02.5' E; 21°56.1' N, 92°03.5' E	Hindur Jhiri, brick field	1.91
	Banopukur South	Northern	21°57.3' N, 92°04.1' E; 21°57.2' N, 92°03.7' E	Mosque, western 'garjan'	0.65
	Banopukur North	Northern	21°57.2' N, 92°03.7' E; 21°57.4' N, 92°04.0' E	Western 'garjan', farm	0.65
Teknaf Wildlife Sanctuary	Kudum North	Northern	21°05.8' N, 92°09.8' E; 21°05.2' N, 92°10.2' E	NSP signboard, Kudum cave	1.25
	Kudum South	Northern	21°05.2' N, 92°10.2' E; 21°05.4' N, 92°09.5' E	Kudum cave, mahogany plantation	1.27
	Shukna Amtoli	Northern	21°06.3' N, 92°11.7' E; 21°05.5' N, 92°10.8' E	Dead banyan tree, 'jhum' cultivation	0.74
	Toynga	Central	21°05.2' N, 92°11.9' E; 21°03.9' N, 92°11.6' E	Wooden bridge, Toynga Hill peak	2.49
	Cooty	Central	21°03.9' N, 92°11.6' E; 21°04.5' N, 92°11.9' E	Toynga Hill peak, Cooty cliff	1.21

Maps of each PA showing the new transect details not documented previously

Figure 1: Detailed map of Inani Reserve Forest (right) and Himchhari NP (left), the white lines represent the transects, yellow and blue mark represent the start and end points of each transect.

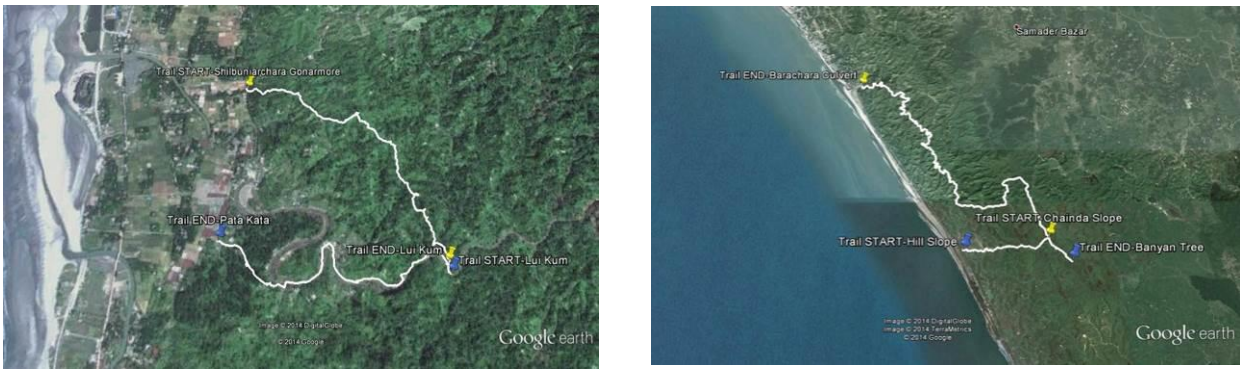


Figure 2: Detailed map of DDWS (left) and Hazarikhil WS (right) the white lines represent the transects, yellow and blue mark represent the start and end points of each transect.

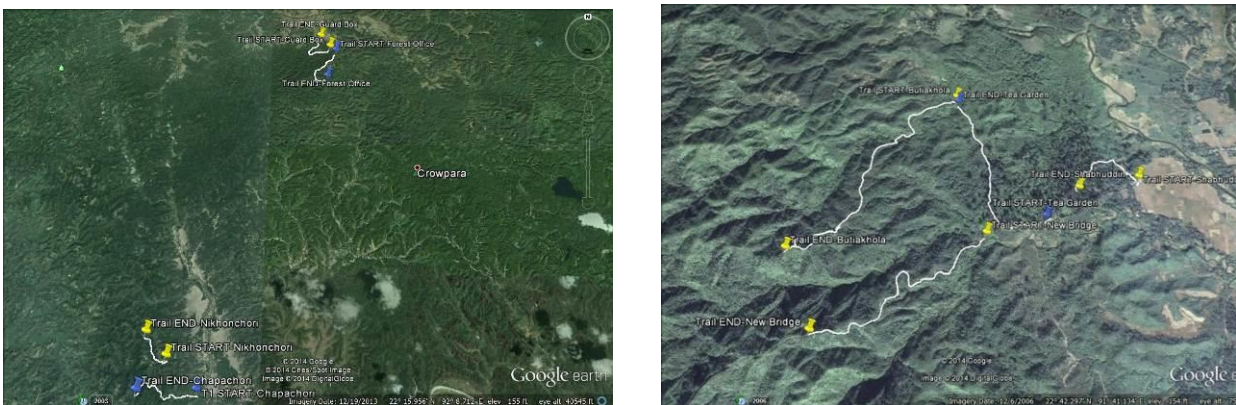
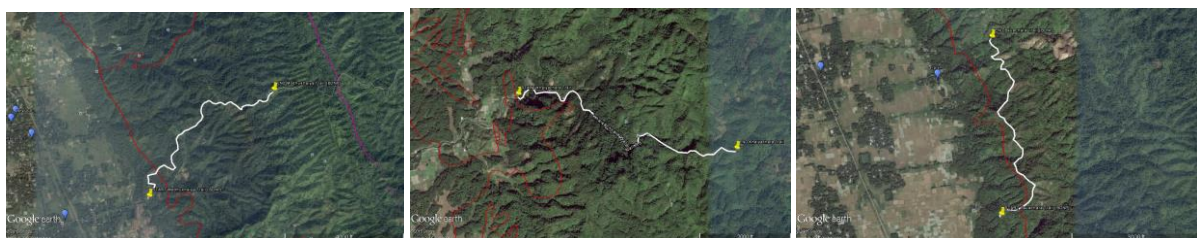


Figure 3: Detailed map of three trails: a. Modhukhaiya Trail (left), b. Khaiyachara Trail (middle), and c. Bauachara Trail (right) identified for Baroiardhala NP, The white lines represent the transects, yellow marks represent the start and end points of each transect.



a.

b.

c.

RESULTS AND DISCUSSION

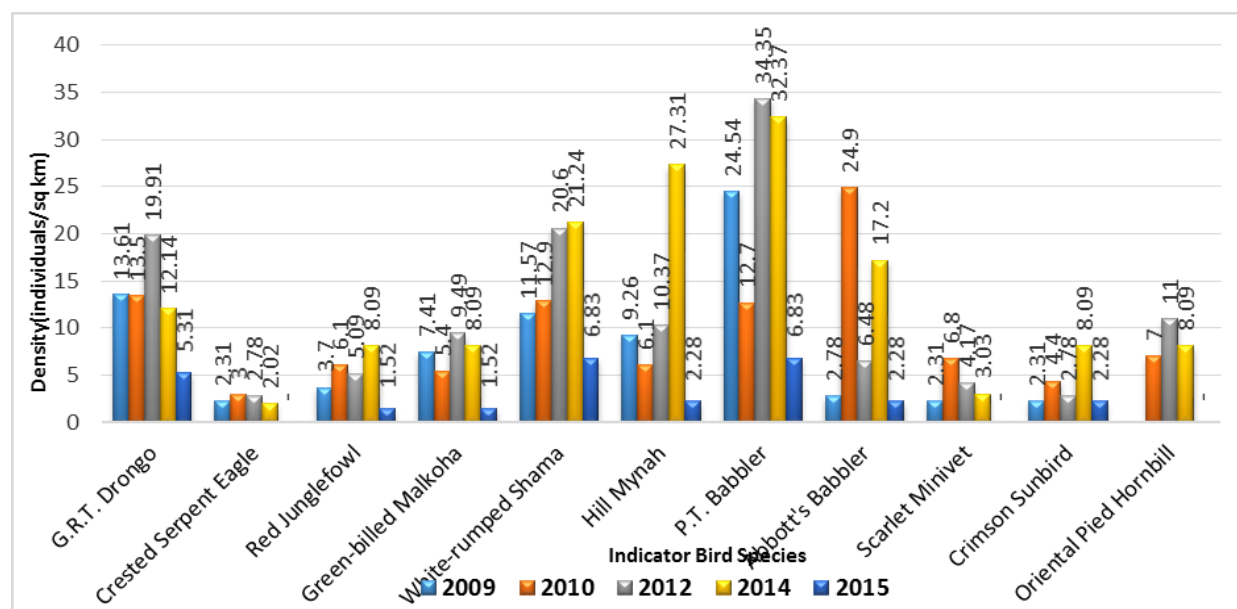
A total of 191 species were recorded including all the indicator species in 15 PAs between April and August 2015 of which 20 were rare in the country (Annex 3). Although the same survey method, indicator birds (with some additions) and transects were applied in 10 sites, some of the results show considerable differences from previous years of counts. Possible reasons could be: changes in bird populations associated with habitat changes or other factors (but changes between 2009 and 2012 were negligible); differences in bird identification and counting skills, differences in understanding of transects, and inconsistencies in actual method followed including computation method (but this is unlikely); or differences due to the 2014 and 2015 surveys covering a later period of year than the previous surveys (which generally covered April-July).

A comparison of indicator species density/km is presented below between this year's (April-July/August 2015) and NSP bird survey (2005-2008) results of Lawachara NP, Satchari NP, Rema-Kalenga WS, Chunati WS and Teknaf WS, and IPAC bird survey (2009-2011) namely Medakachapia NP, Fasiakhali WS, Kaptai NP, Modhupur NP and Khadimnagar NP, and IPAC impact survey of the ten PAs in 2012, and the results of our 2014 survey of 14 sites for CREL. These include the results of indicator bird survey at five PAs first surveyed under CREL: comprising Baroiardhala National Park, Dudpukuria-Dhopacharai Wildlife Sanctuary, Hazarikhil Wildlife Sanctuary, Himchari National Park and Inani Reserve Forest. Notable species sightings were mentioned as well for each site.

Chittagong Region

Kaptai National Park

Figure 3: Density of indicator birds (birds/km²) in Kaptai National Park during April-July 2015 compared to 2009-2012 & 2014.

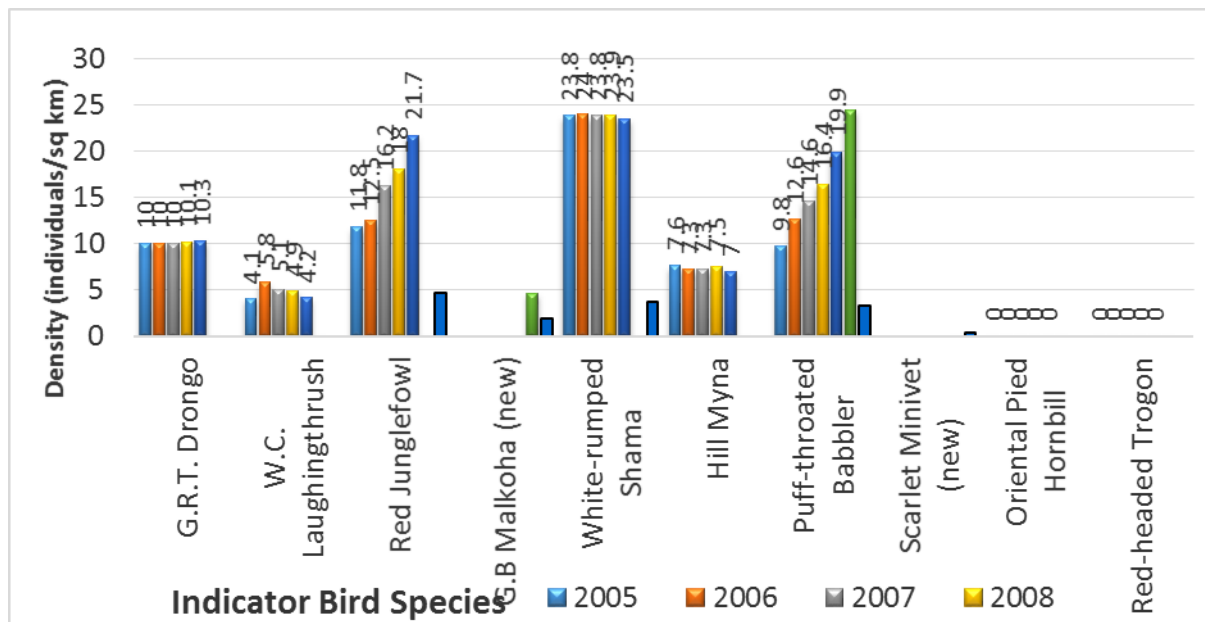


The density of most of the indicator species showed modest changes between years combined with some fluctuations. Overall there was rise in most indicator species in 2014 but considerably lower numbers were noted in 2015. Upper canopy species trend is unclear: Hill Myna showed a large increase in 2014 but steep fall in 2015, but over time the populations of Crested Serpent-eagle and Scarlet Minivet are little changed, but Oriental Pied Hornbill (not counted in some past years) may have declined - none seen in 2015 (this frugivore may be considered a keystone species important in

dispersal of fruiting trees). Among middle-lower canopy species Greater Racket-tailed Drongo and Green-billed Malkoha showed little change, and White-rumped Shama and Crimson Sunbird appeared to be increasing, until all declined in 2015. The general trend for all three undergrowth and ground dwelling birds – Red Junglefowl, Puff-throated Babbler and Abbott’s Babbler - has been for some increase in population (although estimated density of the two babbler has fluctuated between years) and this is presumed to indicate regrowth of undergrowth over this six year period; however in 2015 fewer of all these species were recorded suggesting a reversal of the population trend. Adverse weather conditions on some survey dates, visible loss of undergrowth might be the possible causes. A very rare vagrant - Egyptian Vulture (second record for Bangladesh) was spotted on 15 June 2015 near Kaptai Lake.

Chunoti Wildlife Sanctuary

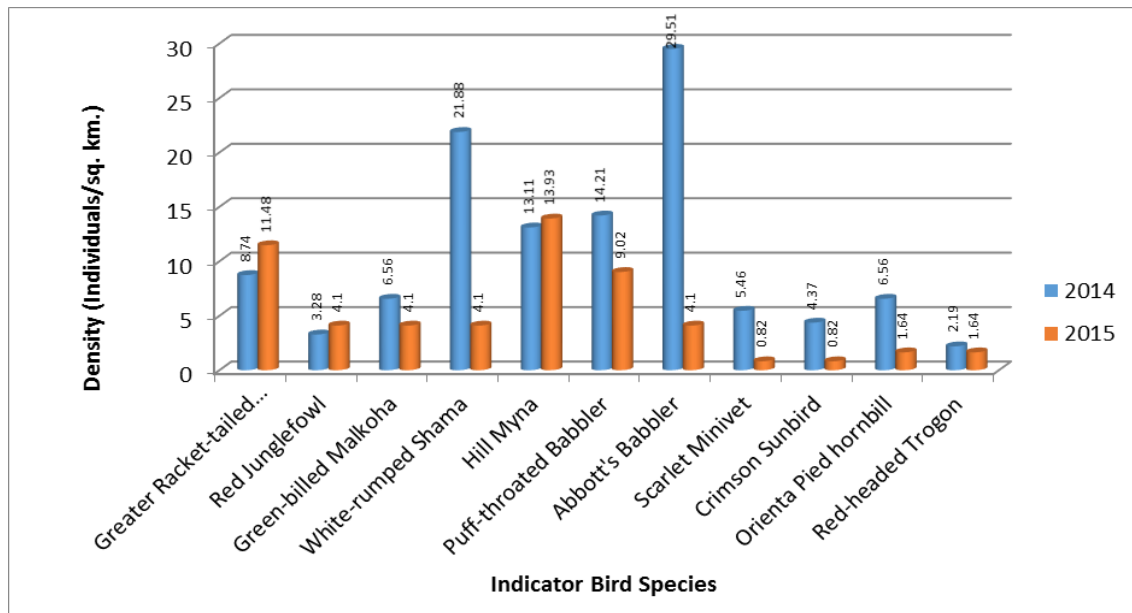
Figure 4: Density of Indicator birds (birds/km²) in Chunoti Wildlife Sanctuary during April-July 2015 in compare to 2005-2008 & 2014.



Out of 11 indicator birds, of which 7 were recorded in the past, only 4 were recorded in 2015. Presence of Puff-throated Babbler, Red Junglefowl, Green-billed Malkoha and White-rumped Shama indicates that ground stratum still supports scrub and bush dwelling birds, although the absence of indicator species of all other stratum is alarming. However, it is unclear why the decrease of the forest floor and bush dwelling birds occurred in 2015.

Dudpukuria-Dhopacharai Wildlife Sanctuary (new site)

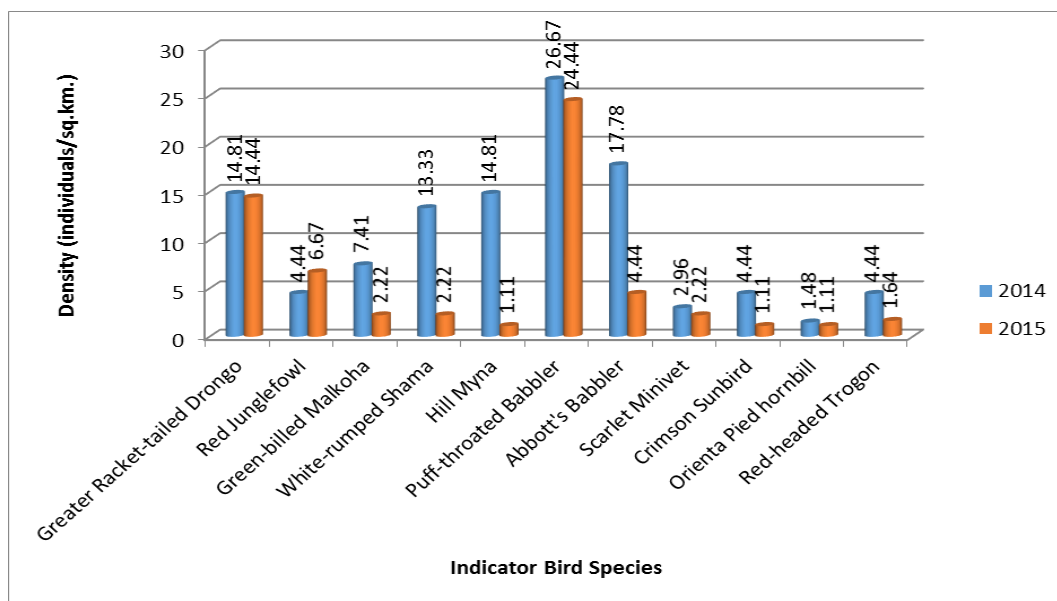
Figure 5: Density of Indicator birds (birds/km²) in Dudpukuria-Dhopacharai Wildlife Sanctuary during April-July 2015.



Four transects were established (two in Dudpukuria and two in Dhopachari) in June 2014 covering 6.1 km (length) and were re-surveyed in 2015. All indicator bird species were recorded. The slight increase in Greater Racket-tailed Drongo and Hill Myna density suggesting some improvement in middle canopy. However, decline in undergrowth dwelling birds i.e. Puff-throated Babbler, Abbott's Babbler and White-rumped Shama are alarming.

Hazarikhil Wildlife Sanctuary (new site)

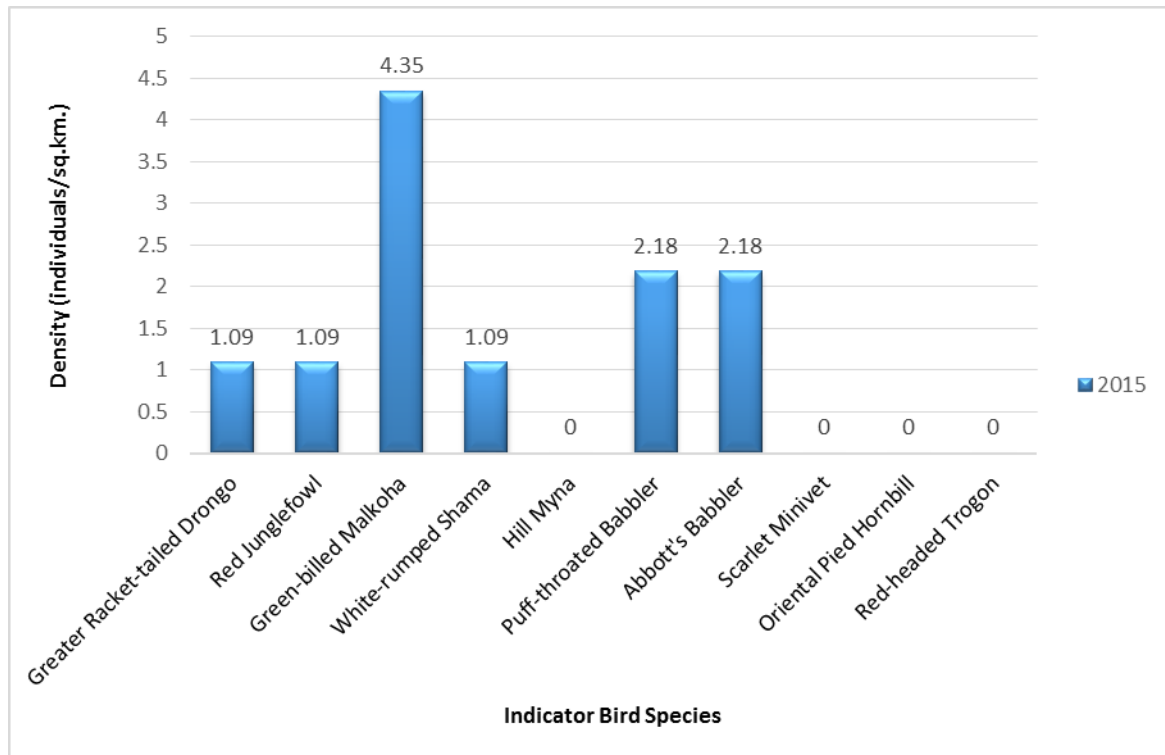
Figure 6: Density of Indicator birds (birds/km²) in Hazarikhil Wildlife Sanctuary during April –July 2015.



Hazarikhil Wildlife Sanctuary is a new site where forest bird monitoring scheme was introduced and four transects were established in June 2014 covering 4.5 km (length), and these were re-surveyed in 2015. Presence of good number of Puff-throated Babbler and Abbott’s Babbler were recorded indicating healthy scrubby vegetation. Increasing of Red Junglefowl density in 2015 suggests forest floor is still in good condition. The apparent decline in other species densities cannot be regarded as a trend, as more years of monitoring are needed.

Baroiardhala National Park

Figure 7: Density of Indicator birds (birds/km²) in Baroiardhala National Park during April –August 2015.

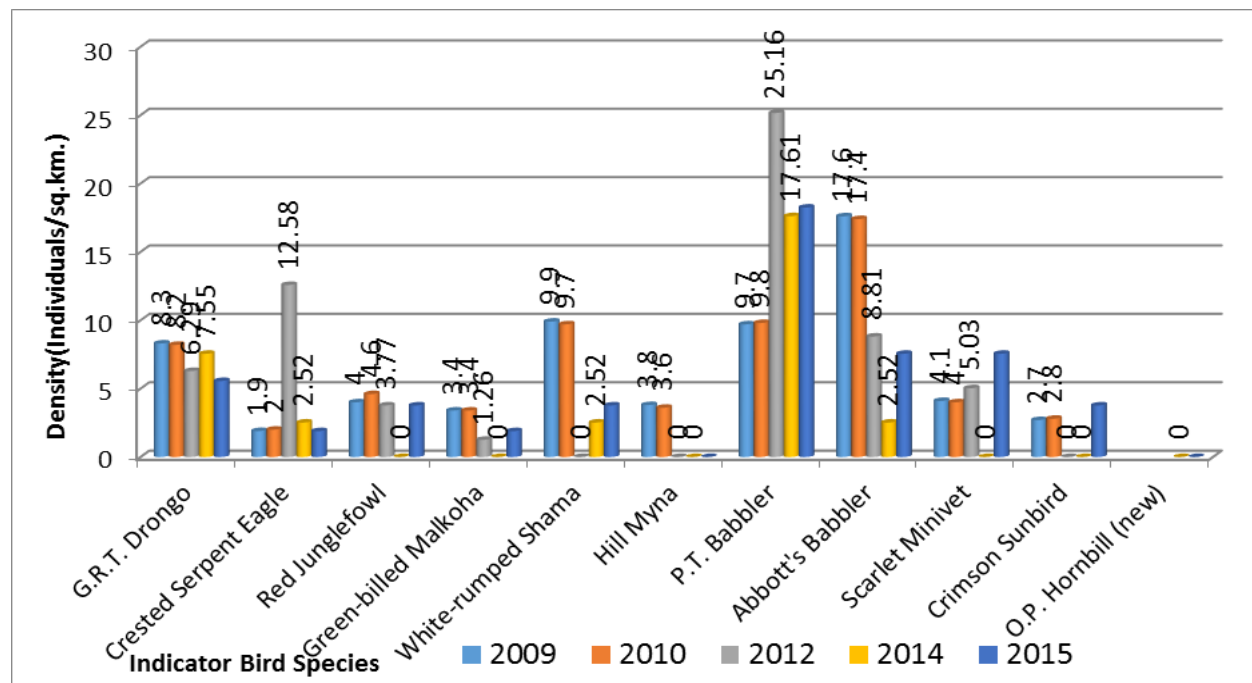


Baroiardhala National Park is two new site under bird monitoring scheme in Chittagong region. Two transects were established in April 2015 covering 6.13 km (length). Six out of ten indicator birds were recorded in 2015. The Presence of Red Junglefowl, Puff-throated Babbler, Abbott’s Babbler, White-rumped Shama and high number of Green-billed Malkoha suggest that the area primarily holds scrubby vegetation with medium layer of middle canopy. Absence of Oriental Pied Hornbill, Scarlet Minivet and Hill Myna indicates that there is little top canopy remaining. Survey was delayed due to heavy rain in this site.

Cox's Bazar Region

Fashiakhali Wildlife Sanctuary

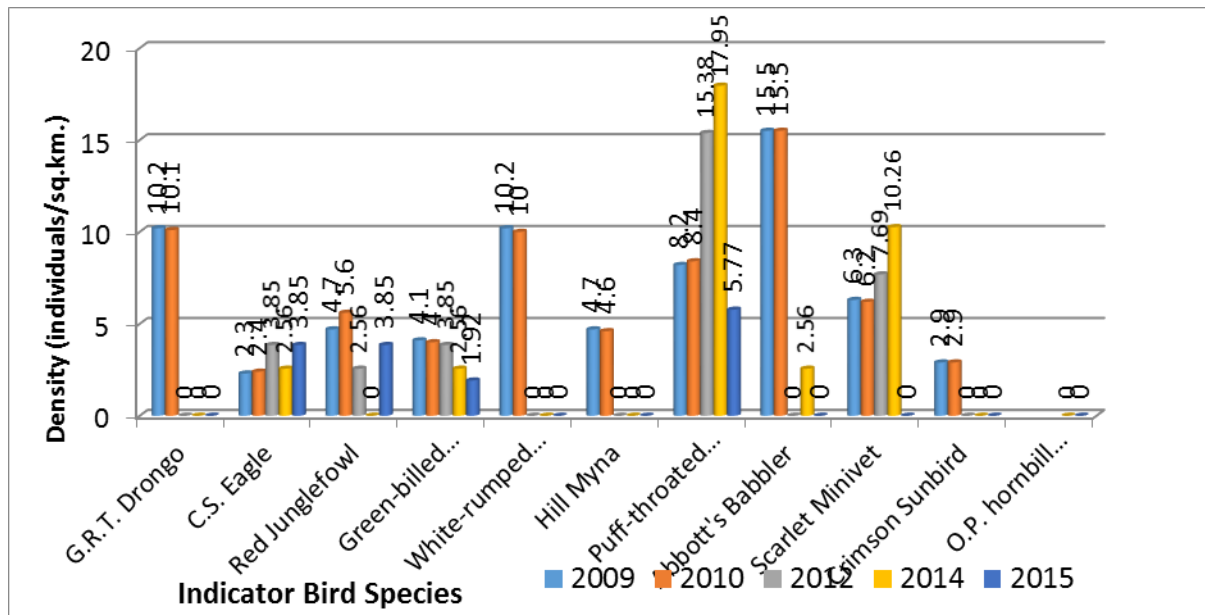
Figure 8: Density of Indicator birds (birds/km²) in Fashiakhali Wildlife Sanctuary during April-July 2015 in compare to 2009-2012 and 2014.



Out of 11 indicator birds 9 were recorded in 2015. A good comeback of Red Junglefowl, Green-billed Malkoha, Scarlet Minivet, and Crimson Sunbird were noted in 2015 compared with 2014. Increase of Puff-throated Babbler and Abbot's Babbler density towards past levels suggests that undergrowth and scrubby vegetation remains in reasonable condition. Absence of Hill Myna and Oriental-Pied Hornbill indicates lack of enough tall trees and possibly continued illegal logging. Notably one Red-headed Falcon, a scarce and localized species, was spotted in Notun Moshjid trail in July 2015.

Medhakacchapia National Park

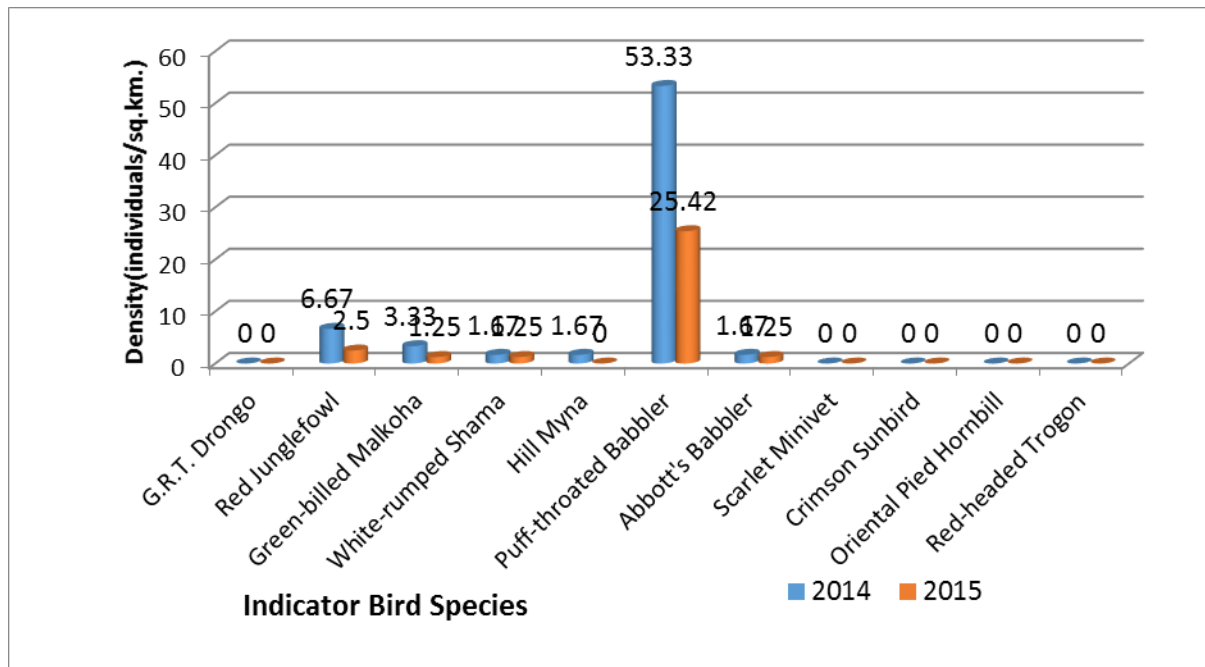
Figure 9: Density of Indicator birds (birds/km²) in Medhakacchapia National Park during April-July 2015 in compare to 2009-2012 and 2014.



The population of two undergrowth species - Puff-throated Babbler and Abbott’s Babbler - dropped compared with 2014, but Red Junglefowl and Crested Serpent Eagle population increased; therefore it is difficult to speculate the health of forest undergrowth. The absence of Greater Racket-tailed Drongo and Crimson Sunbird suggest the quality of the middle strata has been degraded since 2010. The increase of Scarlet Minivet and the decrease or disappearance of Hill Myna and no record of Oriental Pied Hornbill make it difficult to determine the status of the upper strata. Of note three Grey Herons were recorded in June 2015

Himchari National Park (new site)

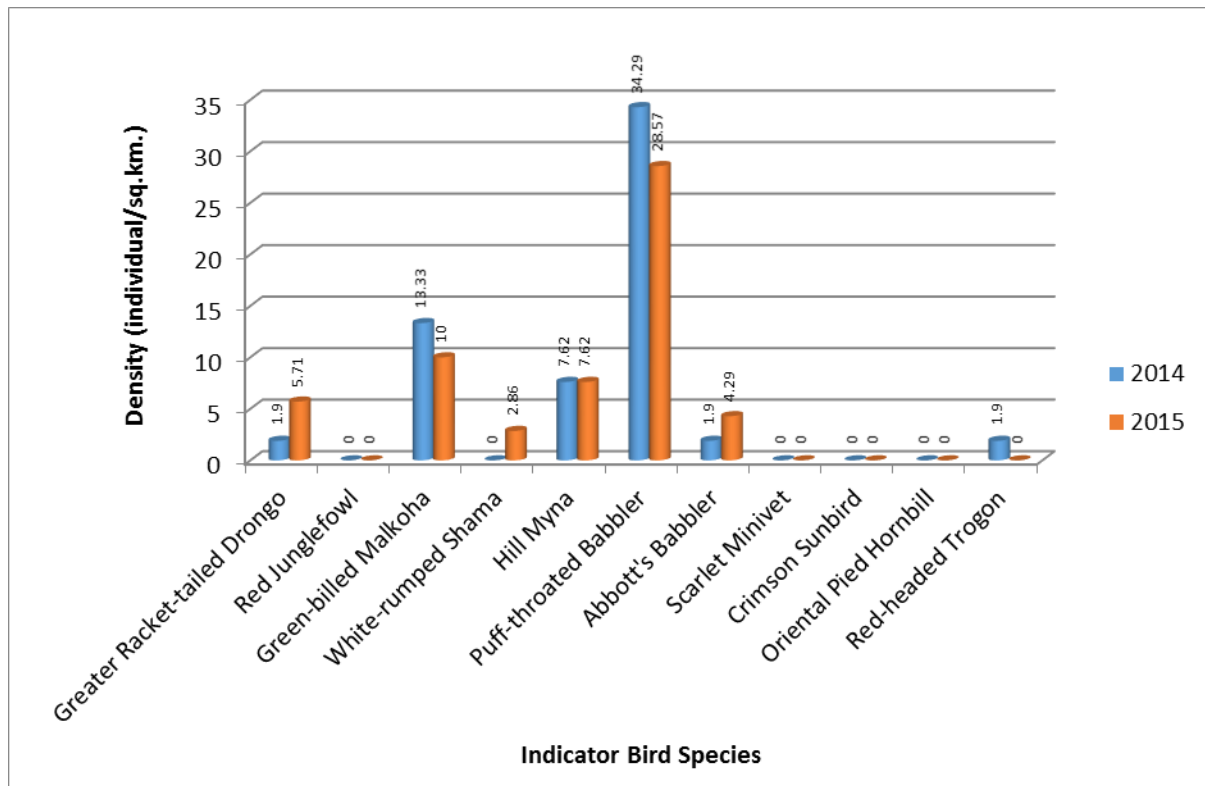
Figure 10: Density of Indicator birds (birds/km²) in Himchari National Park during June-September 2015 compared to 2014.



Himchari National Park is one of two new sites under bird monitoring scheme in Cox’s Bazar region. Two transects were established in June 2014 covering 4.87 km (length). Five out of eleven indicator birds were recorded both in 2014 and 2015. The high density of Puff-throated Babbler and low density of all other indicator species is consistent with the area primarily holding scrubby vegetation with very thin tree cover. However, decline in all six species between two years suggests that even the scrubby vegetation needs more protection. A rare vagrant or resident Burmese Shrike was observed in Himchari NP in July 2015. Also a pair of White-browed Scimitar Babbler and a Grey Treepie was observed and ringed between May and June 2015.

Inani Reserve Forest (new site)

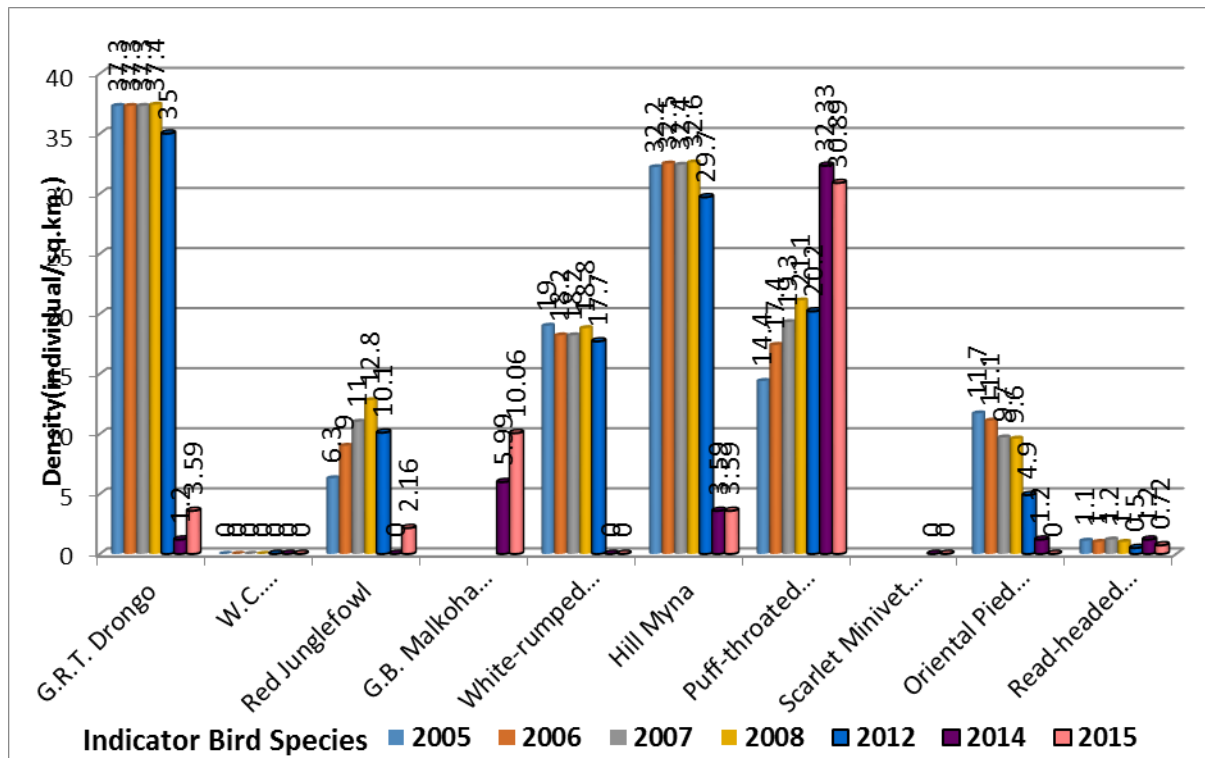
Figure 11: Density of Indicator birds (birds/km²) in Inani Reserve Forest during April-July 2015 compared to 2014.



Two transects were established in this new site in Cox’s Bazar region in June 2014 covering 4.87 km (length) and were re-surveyed in 2015. Six out of eleven indicator birds were recorded between April and July 2015. Records of top and middle strata species such as Hill Myna, Green-billed Malkoha, Greater Racket-tailed Drongo and White-rumped Shama indicate that the forest holds some taller trees with moderate understory. The high number of Puff-throated Babbler indicates rich scrubby vegetation, although absence or low number of Red Junglefowl imply uncertain status of the ground vegetation or hunting pressure. One rare presumed winter visitor Large Hawk Cuckoo was observed in April 2015 near Luikum Trail.

Teknaf Wildlife Sanctuary

Figure 12: Density of Indicator birds (birds/km²) in Teknaf Wildlife Sanctuary during June-September 2015 in compare to 2005-2008, 2012 and 2014.

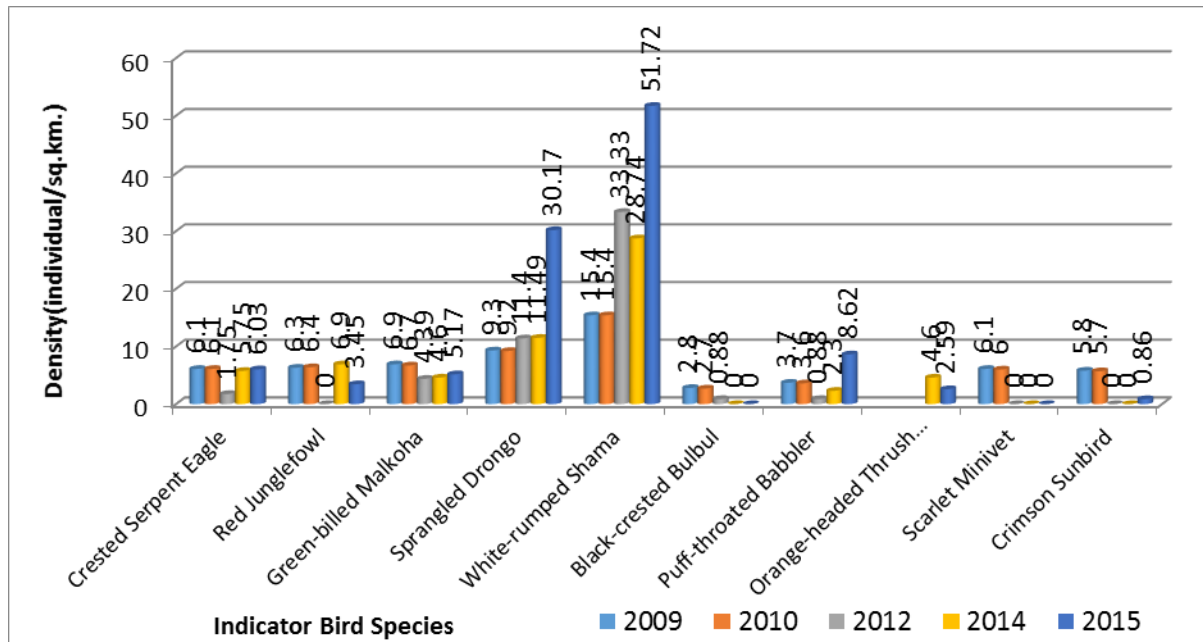


A sharp decline in all indicator species that were counted during 2005-2008 and 2012 has been observed in 2014 and 2015, except for an increase in Puff-throated Babbler. The absence or high reduction in density of Greater Racket-tailed Drongo, White-rumped Shama; Hill Myna and Oriental Pied Hornbill indicate serious recent loss of middle and higher strata. Moreover, the increase in Puff-throated Babbler number further demonstrates a reduction of forest cover and an expansion of bushy vegetation.

Central Region

Modhupur National Park

Figure 13: Density of Indicator birds (birds/km²) in Modhupur National Park during April-July 2015 in compare to 2009-2011, 2012 & 2014.

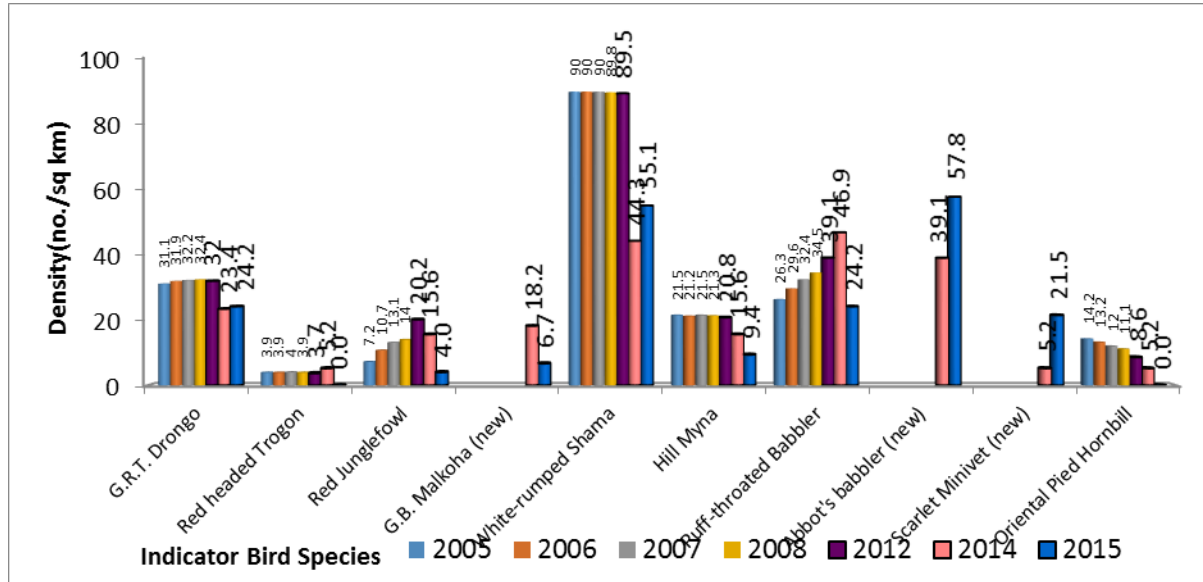


The higher density of middle and lower strata species - White-rumped Shama, Spangled Drongo and Puff-throated Babbler could indicate better health of the lower strata of the forest, but the decline in the nectar feeder (Crimson Sunbird), suggests a lack of flowering species. Continuous presence of ground dwellers such as Red Junglefowl and Orange-headed Thrush indicates a stable trend of the ground vegetation. An absence or reduction in top strata species such as Scarlet Minivet and Black-crested Bulbul is observed over the years since 2010 indicating loss of large trees.

Sylhet Region

Lawachara National Park

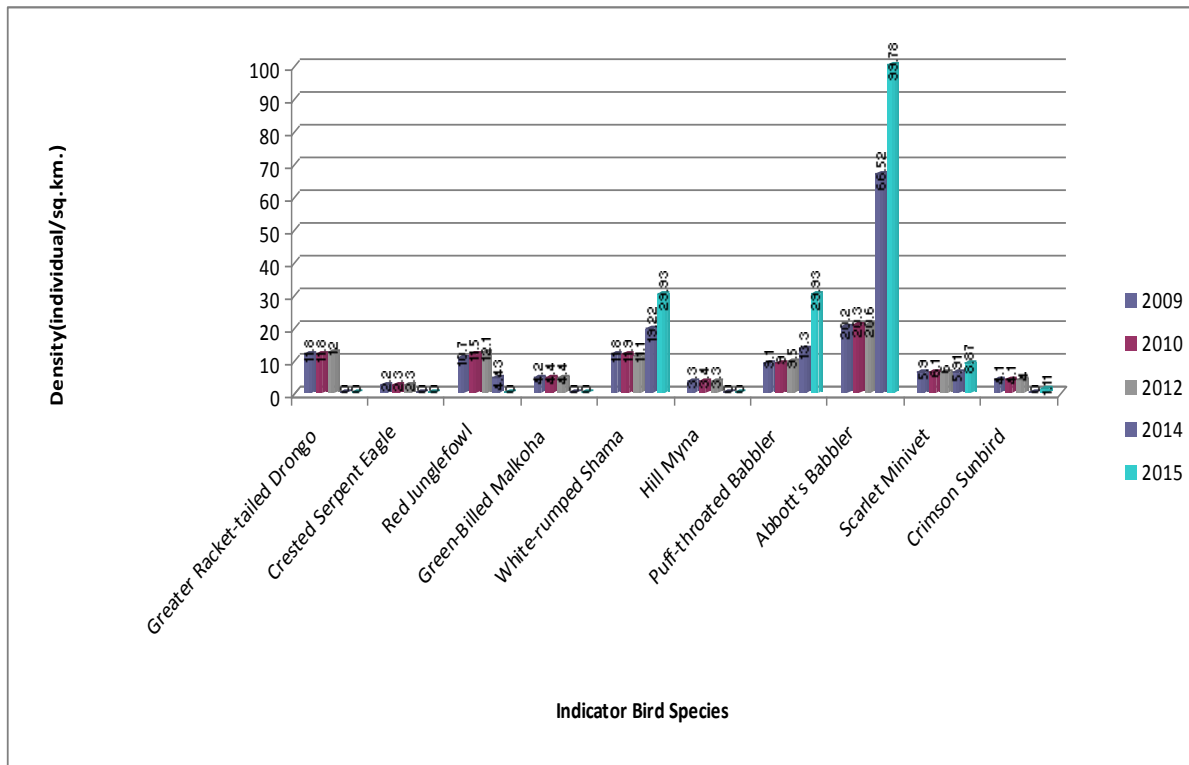
Figure 14: Density of Indicator birds (birds/km²) in Lawachara National Park during April-July 2015 in compare to 2005-2008, 2012 & 2014.



All but two indicator species were recorded at Lawachara National Park in 2015 survey. Overall, most of the indicator species either show negligible decline except that Red-headed Trogon and Oriental Pied Hornbill were for the first time not recorded in 2015, and White-rumped Shama fell in 2014 and 2015 to about half the numbers in 2005-2012.. Red Junglefowl had shown an increasing trend till 2014 but sharp decline in. The health of upper strata is unclear based on the increase in Scarlet Minivet but no sighting of Oriental Pied Hornbill and decrease in Hill Myna population, which had previously been stable.

Khadimnagar National Park

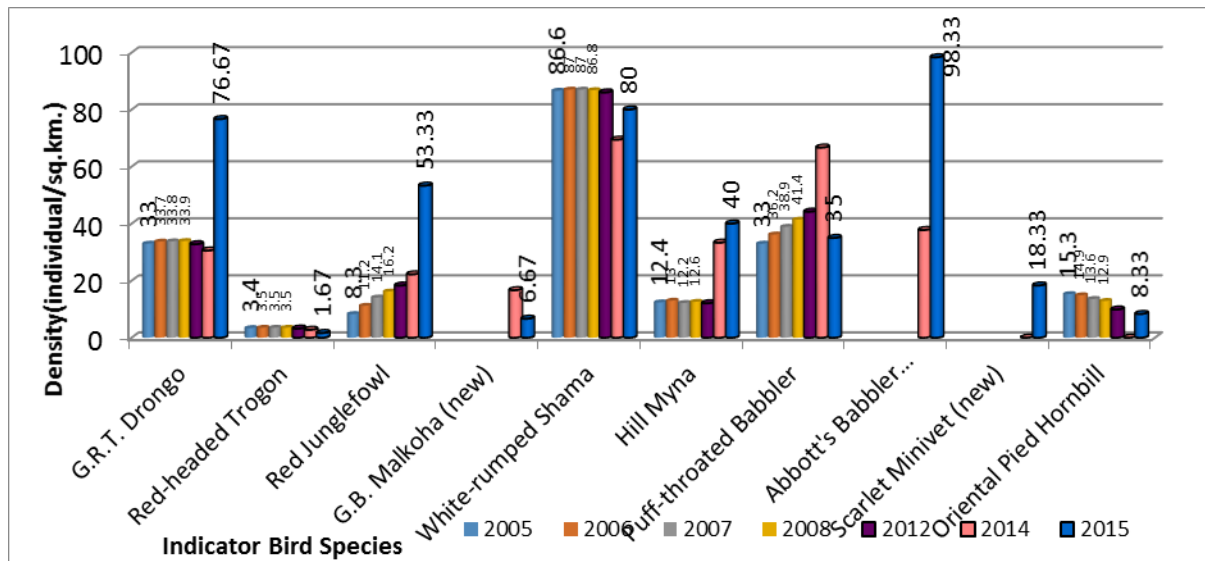
Figure 15: Density of Indicator birds (birds/km²) in Khadimnagar National Park during April –July 2015 in compare to 2009-2011, 2012 and 2014.



The increase in Puff-throated Babbler, Abbott's Babbler and White-rumped Shama in 2014 and 2015 compared with earlier years suggests an improvement of scrubby and bushy habitat continues. However, no sighting of Green-billed Malkoha, Greater Racket-tailed Drongo, Crested Serpent Eagle and Hill Myna indicated that lack of enough middle and top forest canopy. The significance of the lack of Red Junglefowl records in 2015 is unclear but could indicate hunting pressure or intolerance of dense undergrowth.

Satchari National Park

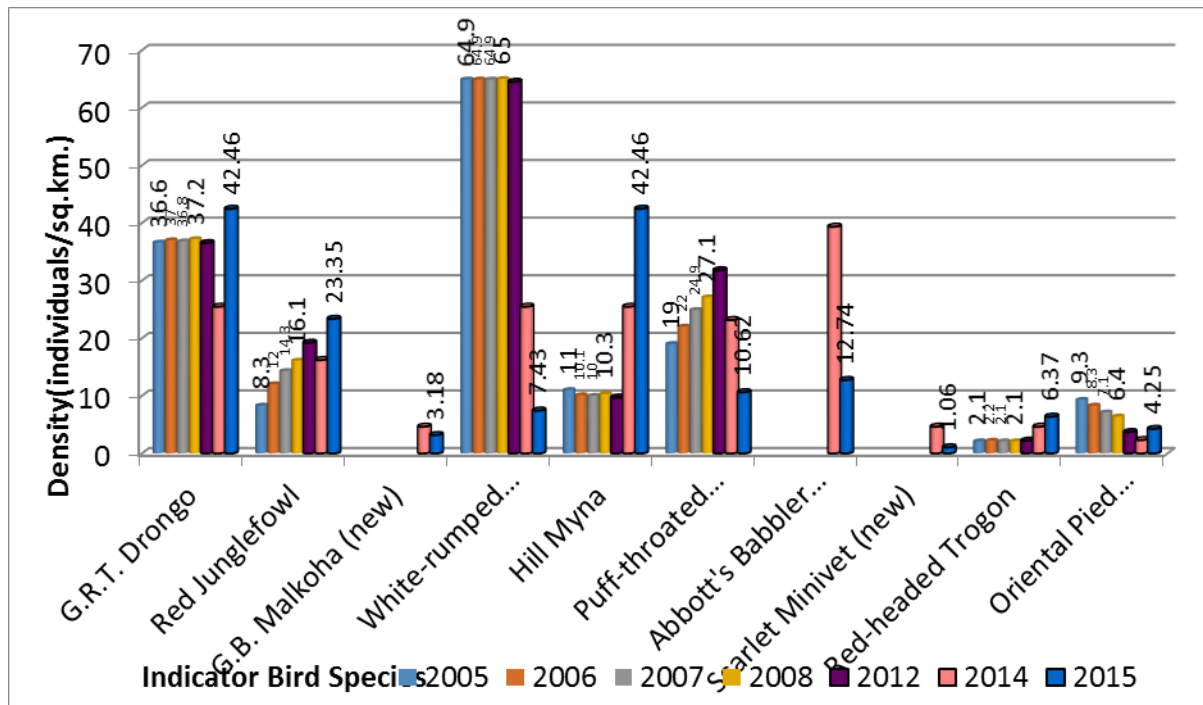
Figure 16: Density of Indicator birds (birds/km²) in Satchari National Park during April-July 2015 in compare to 2005-2008, 2012 and 2014.



The 2015 survey findings showed an increasing trend in Red Junglefowl, Abbott’s Babbler, White-rumped Shama, Greater Racket-tailed Drongo and Scarlet Minivet population compared with 2014, 2012 and 2005-2008. The increasing densities of ground-understory dwellers (Red Junglefowl and Abbott’s Babbler) indicate possible regeneration and improved ground vegetation. The health of the understory or middle strata is uncertain given that different species representing this canopy show different trends. The population of Hill Myna and Scarlet Minivet shows an increasing trend, while the other species of the higher or top strata (Oriental Pied Hornbill) was recorded in 2015 after absence in 2014, so the condition of top canopy may be stable.

Rema-Kalenga Wildlife Sanctuary

Figure 17: Density of Indicator birds (birds/km²) in Rema-Kalenga Wildlife Sanctuary during April-July 2015 in compare to 2005-2008, 2012 and 2014.



A major decline is apparent in the two understory babblers - Puff-throated Babbler and Abbott's Babbler - and White-rumped Shama which is alarming, although Red Junglefowl continue to increase. Middle strata species like Greater Racket-tailed Drongo and Red-headed Trogon are stable or increasing, and one of the canopy species Hill Myna showed a substantial increase in population.. One of the critically endangered Slender-billed Vulture was observed in April 2015.

CAPACITY BUILDING OF LOCAL SURVEYORS

A total of 37 local surveyors (selected by CREL) were trained by Bbc experts. These individuals were trained (with orientation, hands-on orientation and resource materials) to identify the indicator species as well as other common forest birds and were introduced to the survey method. Their performances were assessed based on the following criteria: 1. Leadership; 2. Skill (bird identification); 3. Interest (birds, bird survey and wildlife in general); 4. Punctuality and 5. Communication. A bird champion for each PA will be selected based on the performance of the above mentioned criteria. Moreover, a CD with indicator bird calls and a guidebook were provided to the local participants.

CONCLUSION AND RECOMMENDATION

Loss of habitat through illegal felling, collection of firewood and conversion of mature forest to monoculture is the primary threat to the birds. Broadly, these threats were identified earlier and are still relevant for all 15 PAs. It is important to note that illegal tree fellers are targeting many fruiting trees including Chapalish (*Artocarpus chaplasha*) and this poses a huge threat to frugivorous birds and mammals if it continues.

It would be useful to prepare a list of native fruiting and flowering trees for each of the PAs and their habitat types and organize replanting/restoration of these trees in the PAs and in forest and other lands around the protected areas.





It appears that three or ideally four counts along each transect is sufficient to give reasonable annual population estimates, this considerably reduces the task for volunteers whether from the bird club or from the local community. Further monitoring should be conducted in early period of the breeding season once each month ideally between March and June as the activity of the birds reduces during later months and surveys are interrupted by rain and some areas are inaccessible from June onward with the onset of monsoon.

Involving local community members in bird monitoring is a positive approach for birds and their habitat conservation. Last year (2014) CREL-Bbc provided an indicator bird identification guidebook and CD with bird calls to all local surveyors and this year we continued with the same material. These will assist the locals to carry out the surveys on their own without the support from Bbc volunteers. However, to make it sustainable, the local volunteers need further motivation to form their own bird watching group and carry out surveys on their own with limited resources. By involving them with local university and school students for joint field trips, where the locals volunteer will show their area and the birds will create further attachments to the monitoring. If further training takes place then separate sessions focused on birds and their importance for the forest and wetlands ecosystems should also be designed to keep them interested and involved. Two potential ways of strengthening this are: a) focusing on eco-guides so that they enhance their skills by showing visitors birds and can conduct transects as part of their time in the forest; b) developing links between Bbc and local nature clubs or CMOs directly.





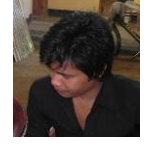
Appendix 1: Local surveyors profile and performance assessment.





PA	Name	Age	Institution	Cell	Performance					Photo
					Leadership	Skill	Interests	Punctuality	Communication	
Fasiakhali WS	Rahim Uddin	30	Eco-tour guide	01811858617	High	High	High	High	High	
Fasiakhali WS	Shah Alam		Beat Officer, Fasiakhali Beat							
Fasiakhali WS	Jamal Hossain		Forest Guard, Fasiakhali Beat							
Fasiakhali WS	Nurul Huda Manik		CPG, Fashakhali Beat							
Medakacchapia NP	Md. Nurul Afsar	32	Eco-tour guide	01811804142	Medium	Medium	High	High	Medium	
Medakacchapia NP	Abu Sayed Zakaria		Beat Officer, Medakacchapia Beat							
Medakacchapia NP	Ali Akber		CPG, Medakacchapia Beat							
Medakacchapia NP	Osman Gani		CPG, Medakacchapia Beat							
Himchari NP	Golam M. Kibria		Forest Guard, Himchari Beat							
Himchari NP	Md. Mofidul Islam	27	Forest Conservation club	01819821684	High	High	High	High	High	

PA	Name	Age	Institution	Cell	Performance					Photo
					Leadership	Skill	Interests	Punctuality	Communication	
Himchari NP	Md. Rafiqul Islam	25	Forest Conservation club	01856504677	Medium	High	High	High	High	
Inani NP (proposed)	Abdul Awal		Forest Guard, Inani Beat							
Inani NP (proposed)	Md. Sona Mia	32	Eco-tour guide	01828408449	High	High	High	High	High	
Teknaf WS	Md. Idris Ali	25	Eco-tour guide, Whykeong	01829355671	High	High	High	High	High	
Teknaf WS	Md. Saiful Islam	25	Eco-tour guide, Whykeong	01811111468	High	High	High	High	High	
Teknaf WS	Md. Imam Hossain		Eco-tour guide/CPG, Teknaf							
Teknaf WS	Golam Sarif		CPG & Eco-tour guide							
Chunoti WS	Md. Ziaul Haque	21	Freelance	01834731667	High	Medium	High	High	Medium	
Chunoti WS	Md. Sadik	21	Freelance	01838709470	Medium	High	High	High	Medium	
Chunoti WS	Md. Moazzem	23	Freelance		High	High	High	Medium	Medium	
Hazarilkhi WS	Md. Sahabuddin Mannan	41	Guide	01815382431	High	High	High	High	High	

PA	Name	Age	Institution	Cell	Performance					Photo
					Leadership	Skill	Interests	Punctuality	Communication	
Hazarilkhi WS	Shunil De	40	Freelance	01826533430	Medium	Medium	Medium	Medium	Medium	
Hazarilkhi WS	Noni Sharma	41	Freelance	01812800380	Low	Medium	Medium	Medium	Medium	
Kaptai NP	Md. Kamrujja man	35	FD-FG – Kaptai	01828804475	Medium	Medium	Medium	Medium	Medium	
Kaptai NP	Md. Nazim Uddin	22	Freelance	01828435821	High	High	High	High	High	
Baroiardhal a NP	Md. Asaduzza man	35	FD-FG	01818189626	High	High	High	High	High	
Baroiardhal a NP	Md. Mamun	25	Guide		High	High	High	High	High	
DDWS-Dudpukuria	Kasrul Amin		Beat Officer, Dudpukuria beat	01834-078121						
DDWS-Dudpukuria	Md. Khorsed Alom	28	VCF member, Dudhpukuria	01819365602	Medium	High	Medium	Medium	Medium	
DDWS-Dudpukuria	Md. Abu Zafar	65	CPG (Ex), Dudhpukuria	01838-056315	Medium	High	Medium	Medium	Medium	
DDWS-Dudpukuria	Nepal Chandra Das		Forest Guard, Dudpukuria beat	01862-103743						
DDWS-Dudpukuria	Md. Babul Khan	35	CPG (Ex), Dudhpukuria	01834468904;	Medium	Medium	Medium	Medium	Medium	
DDWS-Dhopachari	Md. Abdus Sattar		Forest Guard, Dhopachari beat							

PA	Name	Age	Institution	Cell	Performance					Photo
					Leadership	Skill	Interests	Punctuality	Communication	
DDWS-Dhopachari	Md. Mahabub	45	CPG+ Guide	01850889286	High	High	High	High	High	
DDWS-Dhopachari	Md. Touhidul Islam Taher	18	VCF Member	01832712019	Medium	Medium	Medium	Medium	Medium	
DDWS-Dhopachari	Forak Ahmed	42	VCF Member	01821455337	Medium	Medium	Medium	Medium	Medium	
DDWS-Dhopachari	Abu Taher		PM, Dhopachari Beat	01874-474657						
DDWS-Dhopachari	Md. Mannan		FG, Dhopachari Beat	01832-981016						
DDWS-Dhopachari	Helal Karim		CPG member	01831-736829						
Khadimnagar NP	Basir Ahmed		Forest Guard, Khadimnagar beat							
Khadimnagar NP	Ataur Rahman		Forest Guard, Khadimnagar beat							
Khadimnagar NP	Suel Das	19	Eco Tour Guide (new)	01768137203	Newly Joined	Medium	High	High	High	
Khadimnagar NP	Mr. Bilash Banarjee	27	Eco Tour Guide	01728968279	High	High	High	High	High	
Khadimnagar NP	Mr. Shipon Goala	25	Forest Villager	01733607750	Low	Medium	High	Medium	High	

PA	Name	Age	Institution	Cell	Performance					Photo
					Leadership	Skill	Interests	Punctuality	Communication	
Lawachara	Mr. Santosh Kol	38	Eco Tour Guide LNP	01199366121	Medium	Medium	High	High	High	
Lawachara	Mr. Syamol Devbarma	34	Eco Tour Guide LNP	01727298921	High	High	High	High	High	
Satchari NP	Munir Ahmed		Range Officer, Satchari range							
Satchari NP	Bashir Ahmed	31	Eco-tour guide	01748957625	High	Medium	High	Medium	High	
Satchari NP	Masud Mostafa Khan		Beat Officer, Satchari beat							
Satchari NP	Masuk Mia	27	Eco-tour guide	01722318426	High	High	High	High	High	
Satchari NP	Rasel Deb Barma	25	CPG & Eco-tour guide	01190751879	High	High	High	Medium	High	
Rema-Kalenga WS	Md. Mahbubur Rahman		Beat Officer, Kalenga beat							
Rema-Kalenga WS	Tofazzal Hossain		Beat Officer, Rema Beat							
Rema-Kalenga WS	Ataur Rahman		Forest Guard, Kalenga beat							

PA	Name	Age	Institution	Cell	Performance					Photo
					Leadership	Skill	Interests	Punctuality	Communication	
Rema-Kalenga WS	Monirul Islam Sujon	25	Freelance	01719190436	High	Medium	High	High	High	
Rema-Kalenga WS	Abdur Rahim	32	Eco-tour guide	01741144174	High	High	High	Medium	High	
Rema-Kalenga WS	Tajul Islam Shopon	34	Freelance	017156914460	Medium	Medium	High	Medium	High	
Modhupur NP	Md. Abul Kalam Azad	28	NS, CFW, CMC Member, Sainamari	01740550356	High	High	High	Medium	High	
Modhupur NP	Lojesh Mree	29	CFW, Chunia	01780581763	High	High	High	High	High	
Modhupur NP	Md. Julhash Mia	47	CFW, Gachabari	01710696557	High	Medium	High	Medium	High	
Modhupur NP	Md. Abdul Hakim		CFW, Gachabari							
Modhupur NP	Md. Rois Uddin		CFW, Gachabari	01706 664131						

Appendix 2: Indicator resident bird survey data sheet 2015.

Data sheet for bird survey 2015

Climate-Resilient Ecosystems and Livelihoods (CREL) Project
Participatory Forest Resident Bird Survey 2015
 to Assess the Protected Area Management Impacts

Name of the Site:
 Name of the Transect:
 GPS Coordinates of Two Ends:
 Visible Landmarks of Two Ends:
 Length of the Transect: km Width of the Transect: km
 Date: Time – Start:, End:
 Name of Surveyors:
 Name of Supervisor(s):

Indicator Bird Species Count			Total Bird Species (Including indicator species) (Names)	Miscellaneous Notes (Any important information recorded at any time while in the field)
Sl. No.	Name	Tally Count		
1	Oriental Pied Hornbill (উদয়ি পাকরা ধনেশ)			
2	Crested Serpent Eagle (তিলা নাগ ঈগল)			
3	Scarlet Minivet (সিঁদুরে সাহেলি)			
4	Greater Racket-tailed Drongo (বড় র্যাকেট ফিঙ্গে)			
5	Hill Myna (পাহাড়ি ময়না)			
6	Crimson Sunbird (সিঁদুরে মৌটুসি)			
7	Green-billed Malkoha (সবুজ ঠোঁট মালকোহা)			
8	White-rumped Shama (ধলাকোমর শামা)			
9	Red-headed Trogon (লাল মাথা কুচকুচি)			
10	White-crested Laughingthrush (ধলা ঝুঁটি পেঙ্গা)			
11	Abbott's Babbler (অ্যাবটের ছাতারে)			
12	Puff-throated Babbler (গলাফলা ছাতারে)			
13	Red Junglefowl (লাল বনমুরগি)			

NB. Species in Bold font are common in all PAs.

Appendix 3: List of birds recorded in 15 forest PA sites during April-July/August 2015.

SI	English Name	Genus	Species	Th	St.	Ha	R	Lawa-chara NP	Satchari NP	Rema Kalenga WS	Khadi mnagar NP	Modh upur NP	Baroi adhal a NP	Dudhp ukuria-Dhopa chari NP	Kapta i Np	Hazari khil WS	Chun ati WS	Meda kachh apia NP	Fashik hali WS	Himch ari NP	Inan i WS	Tekn af WS	
1	White-cheeked Partridge	<i>Arborophila</i>	<i>atroregularis</i>	NT	r	Fe	R		√	√				√									
2	Red Junglefowl	<i>Gallus</i>	<i>gallus</i>		r	F		√	√	√		√	√	√	√	√			√	√	√	√	√
3	Kalij Pheasant	<i>Lophura</i>	<i>leucomelanos</i>		r	Fe		√		√					√								
4	Lesser Whistling Duck	<i>Dendrocygna</i>	<i>javanica</i>		W/r	W								√						√			√
5	Cotton Pygmy-goose	<i>Nettapus</i>	<i>coromandelianus</i>		r	Wp								√									
6	Rock (Feral) Pigeon	<i>Columba</i>	<i>livia</i>		R	V						√								√	√	√	√
7	Oriental Turtle-Dove	<i>Streptopelia</i>	<i>orientalis</i>		r	Fe				√													
8	Eurasian Collared Dove	<i>Streptopelia</i>	<i>decaocto</i>		R	V									√	√		√	√	√	√	√	√
9	Red Turtle-Dove	<i>Streptopelia</i>	<i>tranquebarica</i>		R	V						√	√				√	√	√				
10	Western Spotted Dove	<i>Spilopelia</i>	<i>suratensis</i>					√		√		√				√	√	√	√				√
11	Grey-capped Emerald Dove	<i>Chalcophaps</i>	<i>indica</i>		R	F			√			√			√								
12	Orange-breasted Green Pigeon	<i>Treron</i>	<i>bicinctus</i>		r	Fe								√									
13	Grey-fronted Green Pigeon	<i>Treron</i>	<i>affinis</i>		r	Fe								√								√	√
14	Thick-billed Green Pigeon	<i>Treron</i>	<i>curvirostra</i>		r	Fe																√	
15	Yellow-footed Green Pigeon	<i>Treron</i>	<i>phoenicopterus</i>		R	F		√		√		√	√	√								√	
16	Wedge-tailed Green Pigeon	<i>Treron</i>	<i>sphenurus</i>		v	Fe	R		√	√													
17	Green Imperial Pigeon	<i>Ducula</i>	<i>aenea</i>		w	Fe									√								
18	Grey Nightjar	<i>Caprimulgus</i>	<i>jotaka</i>		r	F	R							√									
19	Asian Palm-Swift	<i>Cypsiurus</i>	<i>balasiensis</i>		R	V					√	√				√	√	√	√	√	√	√	√
20	Greater Coucal	<i>Centropus</i>	<i>sinensis</i>		R	V		√		√	√	√		√		√	√	√	√	√	√	√	√
21	Lesser Coucal	<i>Centropus</i>	<i>bengalensis</i>		R	B													√	√	√	√	√
22	Green-billed Malkoha	<i>Phaenicophaeus</i>	<i>tristis</i>		R	F		√	√	√		√	√	√	√	√	√					√	
23	Jacobin (Pied) Cuckoo	<i>Clamator</i>	<i>jacobinus</i>		S	V						√											√

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24	Chestnut-winged Cuckoo	<i>Clamator</i>	<i>coromandus</i>		s	Fe			√													
25	Western Koel	<i>Eudynamys</i>	<i>scolopacea</i>		R	V						√						√	√	√	√	√
26	Banded Bay Cuckoo	<i>Cacomantis</i>	<i>sonneratii</i>		r	Fe	R	√	√													
27	Plaintive Cuckoo	<i>Cacomantis</i>	<i>merulinus</i>		R	V						√						√	√	√	√	√
28	Square-tailed Drongo-Cuckoo	<i>Sumiculus</i>	<i>lugubris</i>		R	Fe		√	√							√						
29	Common Hawk Cuckoo	<i>Hierococcyx</i>	<i>varius</i>		R	V						√					√					
30	Indian Cuckoo	<i>Cuculus</i>	<i>micropterus</i>		R	V			√	√	√	√	√	√	√		√	√	√	√	√	√
31	Ruddy-breasted Crake	<i>Zapornia</i>	<i>fusca</i>		r	W											√					
32	White-breasted Waterhen	<i>Amauromis</i>	<i>phoenicurus</i>		r	W						√								√		√
33	Cinnamon Bittern	<i>Ixobrychus</i>	<i>cinnamomeus</i>		R	Wp														√		
34	Malayan Night Heron	<i>Gorsachius</i>	<i>melanolophus</i>		r	Fe	R								√							
35	Black-crowned Night Heron	<i>Nycticorax</i>	<i>nycticorax</i>		R	Wp																√
36	Green-backed (Striated) Heron	<i>Butorides</i>	<i>striatus</i>		R	W							√									
37	Indian Pond Heron	<i>Ardeola</i>	<i>grayii</i>		R	W				√		√	√	√	√		√	√	√	√	√	√
38	Chinese Pond Heron	<i>Ardeola</i>	<i>bacchus</i>		v	W	R															
39	Cattle Egret	<i>Bubulcus</i>	<i>ibis</i>		R	W				√			√			√						√
40	Grey Heron	<i>Ardea</i>	<i>cinerea</i>		Wr	W												√	√			
41	Great (White) Egret	<i>Ardea</i>	<i>albus</i>		R	W						√										√
42	Little Egret	<i>Egretta</i>	<i>garzetta</i>		R	W								√			√			√	√	√
43	Little Cormorant	<i>Microcarbo</i>	<i>niger</i>		R	W											√		√	√	√	√
44	River Lapwing	<i>Vanellus</i>	<i>duvaucelii</i>		r	Wr											√					
45	Yellow-wattled Lapwing	<i>Vanellus</i>	<i>malarbaricus</i>		r	WV	R					√										
46	Red-wattled Lapwing	<i>Vanellus</i>	<i>indicus</i>		R	W					√	√										√
47	Common Sandpiper	<i>Actitis</i>	<i>hypoleucos</i>		W	Wr															√	√
48	Barred Buttonquail	<i>Turnix</i>	<i>suscitator</i>		r	Fe														√		

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49	Oriental Pratincole	<i>Glareola</i>	<i>maldivarum</i>		r	C															√	
50	Asian Barred Owlet	<i>Glaucidium</i>	<i>cuculoides</i>		R	Fe		√	√	√			√	√					√			
51	Spotted Owlet	<i>Athene</i>	<i>brama</i>		R	V													√	√	√	√
52	Osprey	<i>Pandion</i>	<i>haliaetus</i>		w	W					√											
53	Oriental Honey-buzzard	<i>Pernis</i>	<i>ptilorhynchus</i>		r	F						√	√									
54	Black Baza	<i>Aviceda</i>	<i>leuphotes</i>		w	Fe				√				√								
55	Egyptian Vulture	<i>Neophron</i>	<i>percnopterus</i>	EN	v	V	R								√							
56	Crested Serpent Eagle	<i>Spilornis</i>	<i>cheela</i>		R	FV		√	√			√		√								√
57	Slender-billed Vulture	<i>Gyps</i>	<i>tenuirostris</i>	CR	r	V	R			√												
58	Changeable Hawk Eagle	<i>Nisaetus</i>	<i>cirrhatius</i>		r	F						√										
60	Shikra	<i>Accipiter</i>	<i>badius</i>		R	V					√	√	√		√							√
61	Besra	<i>Accipiter</i>	<i>virgatus</i>		r	Fe							√									
62	Brahminy Kite	<i>Haliastur</i>	<i>indus</i>		R	V					√	√										
63	Red-headed Trogon	<i>Harpactes</i>	<i>erythrocephalus</i>		r	Fe		√	√	√				√								
64	Great Hornbill	<i>Buceros</i>	<i>bicornis</i>	NT	v	Fe	R															
65	Oriental Pied Hornbill	<i>Anthracoceros</i>	<i>albirostris</i>		r	Fe			√	√				√	√	√						
66	Common Hoopoe	<i>Upupa</i>	<i>epops</i>		r	V						√							√	√	√	√
67	Blue-bearded Bee-eater	<i>Nyctornis</i>	<i>athertoni</i>		r	Fe				√												
68	Asian Green Bee-eater	<i>Merops</i>	<i>orientalis</i>		R	V						√		√			√		√			√
69	Chestnut-headed Bee-eater	<i>Merops</i>	<i>leschenaulti</i>		r	Fe		√	√	√	√	√			√	√	√					√
70	Blue-tailed Bee-eater	<i>Merops</i>	<i>philippinus</i>		r	V								√			√					√
71	Indian Roller	<i>Coracias</i>	<i>benghalensis</i>		R	V						√		√		√			√		√	√
72	(Oriental) Dollarbird	<i>Eurystomus</i>	<i>orientalis</i>		ps	Fe								√	√							
73	Common Kingfisher	<i>Alcedo</i>	<i>atthis</i>		R	W														√	√	√
74	Pied Kingfisher	<i>Ceryle</i>	<i>rudis</i>		R	Wr															√	

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75	Stork-billed Kingfisher	<i>Pelargopsis</i>	<i>capensis</i>		R	W				√		√				√	√		√			√	
76	White-breasted Kingfisher	<i>Halcyon</i>	<i>smyrnensis</i>		R	V		√			√	√		√		√	√	√	√	√	√	√	
77	Black-capped Kingfisher	<i>Halcyon</i>	<i>pileata</i>		w	C																√	
78	Collared Kingfisher	<i>Todiramphus</i>	<i>chloris</i>		r	C																√	
79	Coppersmith Barbet	<i>Psilopogon</i>	<i>haemacephalus</i>		R	VFd						√	√	√					√	√	√	√	
80	Blue-eared Barbet	<i>Psilopogon</i>	<i>cyanotis</i>		r	Fe			√	√													
81	Lineated Barbet	<i>Psilopogon</i>	<i>lineatus</i>		R	F		√	√	√		√	√	√	√	√							
82	Blue-throated Barbet	<i>Psilopogon</i>	<i>asiaticus</i>		R	Fe		√	√		√												
83	White-browed Piculet	<i>Sasia</i>	<i>ochracea</i>		r	Fe					√			√									
84	Greater Flameback (Goldenback)	<i>Chrysocolaptes</i>	<i>guttacristatus</i>		R	F		√	√					√	√							√	√
85	Black-rumped (Lesser) Flameback (Goldenback)	<i>Dinopium</i>	<i>benghalense</i>		R	V						√								√	√	√	
86	Rufous Woodpecker	<i>Microptemus</i>	<i>brachyurus</i>		R	Fe			√			√	√			√							
87	Greater Yellownappe	<i>Chrysophlegma</i>	<i>flavinucha</i>		R	Fe		√	√	√												√	√
88	Grey-capped Pygmy Woodpecker	<i>Picoides</i>	<i>canicapillus</i>		r	Fd					√	√											
89	Fulvous-breasted Woodpecker	<i>Dendrocopos</i>	<i>macei</i>		R	V					√	√							√	√	√	√	
90	Red-headed Falcon	<i>Falco</i>	<i>chicquera</i>		r	V	R												√				
91	Amur Falcon	<i>Falco</i>	<i>amurensis</i>		p	V	R		√	√													
92	Vernal Hanging Parrot	<i>Loriculus</i>	<i>vernalis</i>		r	FeB			√										√		√		
93	Blossom-headed Parakeet	<i>Psittacula</i>	<i>roseata</i>		r	F			√					√									
94	Red-breasted Parakeet	<i>Psittacula</i>	<i>alexandri</i>		R	FeB		√		√		√		√	√	√	√	√	√		√	√	
95	Rose-ringed Parakeet	<i>Psittacula</i>	<i>krameri</i>		R	V						√	√		√		√	√	√			√	
96	Blue-naped Pitta	<i>Pitta</i>	<i>nipalensis</i>		r	Fe	R		√													√	
97	Hooded Pitta	<i>Pitta</i>	<i>sordida</i>		s	Fe		√	√		√					√							
98	Indian Pitta	<i>Pitta</i>	<i>brachyura</i>		s	Fd						√											

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99	Ashy Woodswallow	<i>Artamus</i>	<i>fuscus</i>		R	V				√	√	√				√					√	√
100	Common Iora	<i>Aegithina</i>	<i>tiphia</i>		R	FV		√	√		√	√	√	√		√	√	√	√			√
101	Common Woodshrike	<i>Tephrodornis</i>	<i>pondicerianus</i>		R	Fd						√							√		√	
102	Large Cuckooshrike	<i>Coracina</i>	<i>macei</i>		R	F		√		√	√											
103	Black-winged Cuckooshrike	<i>Coracina</i>	<i>melaschistos</i>		w	F							√									
104	Rosy Minivet	<i>Pericrocotus</i>	<i>roseus</i>		w	Fe											√					
105	Small Minivet	<i>Pericrocotus</i>	<i>cinnamomeus</i>		r	Fd				√	√	√		√				√	√	√	√	√
106	Scarlet Minivet	<i>Pericrocotus</i>	<i>flammeus</i>		R	Fe		√	√		√			√		√	√		√			
107	Bar-winged Flycatcher-shrike	<i>Hemipus</i>	<i>picatus</i>		r	Fe		√														
108	Burmese Shrike	<i>Lanius</i>	<i>collurioides</i>		v	V	R													√		
109	Long-tailed Shrike	<i>Lanius</i>	<i>schach</i>		R	V						√										√
110	Eurasian Golden Oriole	<i>Oriolus</i>	<i>oriolus</i>		r	FV			√													
111	Black-naped Oriole	<i>Oriolus</i>	<i>chinensis</i>		r	F	R		√													
112	Black-hooded Oriole	<i>Oriolus</i>	<i>xanthornus</i>		R	V		√	√	√		√	√	√	√		√	√	√	√	√	√
113	Black Drongo	<i>Dicrurus</i>	<i>macrocerus</i>		R	V			√	√	√	√	√	√		√	√	√	√	√	√	√
114	Bronzed Drongo	<i>Dicrurus</i>	<i>aeneus</i>		R	F			√		√	√	√	√		√	√		√	√	√	√
115	Lesser Racket-tailed Drongo	<i>Dicrurus</i>	<i>remifer</i>		w	F							√									
116	Hair-crested Drongo	<i>Dicrurus</i>	<i>hottentotus</i>		R	F		√	√	√		√	√		√	√						
117	Greater Racket-tailed Drongo	<i>Dicrurus</i>	<i>paradiseus</i>		R	Fe		√	√	√	√		√	√	√	√			√		√	√
118	White-throated Fantail	<i>Rhipidura</i>	<i>albicollis</i>		r	V						√										
119	Black-naped Monarch	<i>Hypothymis</i>	<i>azurea</i>		R	F		√	√	√	√	√		√	√				√		√	
120	Asian Paradise-flycatcher	<i>Terpsiphone</i>	<i>paradisi</i>		r	F			√		√	√							√			
121	(Common) Green Magpie	<i>Cissa</i>	<i>chinensis</i>		r	Fe							√	√	√	√						
122	Rufous Treepie	<i>Dendrocitta</i>	<i>vagabunda</i>		R	VFd						√	√	√		√	√	√	√	√	√	√
123	Grey Treepie	<i>Dendrocitta</i>	<i>formosae</i>		R	Fe			√											√		

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124	House Crow	<i>Corvus</i>	<i>splendens</i>		R	V												√	√	√	√	√
125	Jungle (Large-billed) Crow	<i>Corvus</i>	<i>macrorhynchos</i>		R	V		√	√			√	√				√					
126	Great Tit	<i>Parus</i>	<i>major</i>		r	Fd									√				√	√	√	√
127	Sand Martin	<i>Riparia</i>	<i>riparia</i>		w	Wr													√	√	√	
128	Plain (Brown-throated) Martin	<i>Riparia</i>	<i>paludicola</i>		R	Wr											√					
129	Barn Swallow	<i>Hirundo</i>	<i>rustica</i>			Wr	V										√		√	√	√	√
130	Bengal (Rufous-winged) (Bush) Lark	<i>Mirafra</i>	<i>assamica</i>		R	B						√					√					√
131	Rufescent Prinia	<i>Prinia</i>	<i>rufescens</i>		r	GB							√									√
132	Grey-breasted Prinia	<i>Prinia</i>	<i>hodgsonii</i>		R	B										√		√	√			
133	Black-headed Bulbul	<i>Pycnonotus</i>	<i>atriceps</i>		R	Fe			√						√							
134	Black-crested Bulbul	<i>Pycnonotus</i>	<i>melanicterus</i>		R	F		√	√	√					√							√
135	Red-whiskered Bulbul	<i>Pycnonotus</i>	<i>jocosus</i>		R	FB		√	√	√	√	√	√		√	√	√			√	√	√
136	Red-vented Bulbul	<i>Pycnonotus</i>	<i>cafer</i>		R	VB		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
137	Olive Bulbul	<i>Iole</i>	<i>virescens</i>		r	Fe								√	√	√						
138	White-throated Bulbul	<i>Alphoixus</i>	<i>flaveolus</i>		R	Fe		√	√	√				√	√	√						
139	Common Tailorbird	<i>Orthotomus</i>	<i>sutorius</i>		R	VB		√	√	√	√	√		√	√	√	√	√			√	√
140	Dark-necked Tailorbird	<i>Orthotomus</i>	<i>atrogularis</i>		R	Fe		√	√	√					√				√	√	√	√
141	Striated Grassbird	<i>Megalurus</i>	<i>palustris</i>		R	W											√		√	√		
142	Dusky Warbler	<i>Phylloscopus</i>	<i>fuscatus</i>		W	B	R													√		√
143	Inornate (Yellow-browed) Warbler	<i>Phylloscopus</i>	<i>inornatus</i>		W	F														√	√	√
144	Greenish Warbler	<i>Phylloscopus</i>	<i>trochiloides</i>		W	F																√
145	Yellow-vented Warbler	<i>Phylloscopus</i>	<i>cantator</i>		W	F									√							
146	Yellow-bellied Warbler	<i>Abroscopus</i>	<i>superciliaris</i>		r	Fe			√		√											
147	Puff-throated Babbler	<i>Pellorneum</i>	<i>ruficeps</i>		R	F		√	√	√	√	√	√	√	√	√	√		√	√	√	√
148	Abbott's Babbler	<i>Malacocincla</i>	<i>abbotti</i>		R	Fe		√	√	√	√	√	√	√	√	√	√					

SI	English Name	Genus	Species	Th	St.	Ha	R	Lawa- chara NP	Satch ari NP	Rema Kalen ga WS	Khadi mnag ar NP	Modh upur NP	Baroi adhala NP	Dudhp ukuria- Dhopa chari NP	Kapta i Np	Hazari khil WS	Chun ati WS	Meda kachh apia NP	Fashik hali WS	Himch ari NP	Inan i WS	Tekn af WS
149	White-browed Scimitar Babbler	<i>Pomatorhinus</i>	<i>schisticeps</i>		r	Fe			√		√									√		
150	Pin-striped Tit Babbler	<i>Macronous</i>	<i>gularis</i>		R	Fe		√	√	√	√	√		√	√	√				√	√	√
151	Chestnut-capped Babbler	<i>Timalia</i>	<i>pileata</i>		r	BG												√	√	√	√	√
152	Striated Babbler	<i>Turdoides</i>	<i>earlei</i>		R	B			√						√					√		
153	Jungle Babbler	<i>Turdoides</i>	<i>striata</i>		R	V						√										
154	White-crested Laughingthrush	<i>Garrulax</i>	<i>leucolophus</i>		r	Fe									√				√	√		
155	Lesser Necklaced Laughingthrush	<i>Garrulax</i>	<i>monileger</i>		r	Fe			√				√									
156	Greater Necklaced Laughingthrush	<i>Garrulax</i>	<i>pectoralis</i>		R	Fe		√	√	√			√	√	√	√						
157	Rufous-necked Laughingthrush	<i>Garrulax</i>	<i>ruficollis</i>		R	B							√				√					
158	Oriental White-eye	<i>Zosterops</i>	<i>palpebrosus</i>		R	F					√	√						√	√	√	√	√
159	Asian Fairy Bluebird	<i>Irena</i>	<i>puella</i>		R	Fe		√	√	√												√
160	Velvet-fronted Nuthatch	<i>Sitta</i>	<i>frontalis</i>		r	F						√										
161	Asian Glossy Starling	<i>Aplonis</i>	<i>panayensis</i>		r	Fe	R														√	√
162	(Common) Hill Myna	<i>Gracula</i>	<i>religiosa</i>		R	Fe		√	√	√	√		√	√	√	√					√	√
163	Common Myna	<i>Acridotheres</i>	<i>tristis</i>		R	V				√	√	√				√	√	√	√	√	√	√
164	Jungle Myna	<i>Acridotheres</i>	<i>fuscus</i>		R	V						√	√	√		√	√	√	√	√	√	√
165	Chestnut-tailed Starling	<i>Sturnus</i>	<i>malabaricus</i>		R	V						√						√	√	√	√	√
166	Asian Pied Starling	<i>Sturnus</i>	<i>contra</i>		R	V						√					√	√	√	√	√	√
167	Blue Whistling Thrush	<i>Myophonus</i>	<i>caeruleus</i>		w	F							√									
168	Orange-headed Thrush	<i>Zoothera</i>	<i>citrina</i>		r	F						√										
169	Oriental Magpie-Robin	<i>Copsychus</i>	<i>sularis</i>		R	V		√	√		√	√	√			√	√	√				
170	White-rumped Shama	<i>Copsychus</i>	<i>malabaricus</i>		R	F		√	√	√	√	√		√	√	√	√					
171	Black-backed Forktail	<i>Enicurus</i>	<i>immaculatus</i>		r	Fe									√							√
172	Pied Bush Chat	<i>Saxicola</i>	<i>caprata</i>		r	B								√						√		
173	Pale-chinned Blue Flycatcher	<i>Cyornis</i>	<i>poliogenys</i>		r	Fe		√	√		√			√								

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174	Blue-winged Leafbird	<i>Chloropsis</i>	<i>cochinchinensis</i>		r	Fe							√	√	√	√						
175	Golden-fronted Leafbird	<i>Chloropsis</i>	<i>aurifrons</i>		R	F	√	√	√	√	√										√	√
176	Pale-billed Flowerpecker	<i>Dicaeum</i>	<i>erythrorhynchos</i>		R	VF	√		√							√			√	√	√	√
177	Scarlet-backed Flowerpecker	<i>Dicaeum</i>	<i>cruentatum</i>		R	Fe	√		√	√			√	√	√	√		√	√	√	√	√
178	Ruby-cheeked Sunbird	<i>Anthreptes</i>	<i>singalensis</i>		R	F	√							√	√						√	√
179	Purple-rumped Sunbird*	<i>Nectarinia</i>	<i>zeylonica</i>		R	V					√					√				√		
180	Purple-throated Sunbird	<i>Nectarinia</i>	<i>sperata</i>		R	Fe	√		√						√							√
181	Purple Sunbird	<i>Nectarinia</i>	<i>asiatica</i>		R	VB					√		√				√	√				
182	Crimson Sunbird	<i>Aethopyga</i>	<i>siparaja</i>		R	F	√	√		√	√	√	√	√								√
183	Little Spiderhunter	<i>Arachnothera</i>	<i>longirostra</i>		R	Fe	√	√	√	√			√	√							√	√
184	House Sparrow	<i>Passer</i>	<i>domesticus</i>		R	V					√					√	√	√	√			
185	Baya Weaver	<i>Ploceus</i>	<i>philippinus</i>		R	V					√								√			
186	White-throated Munia (Indian Silverbill)	<i>Lonchura</i>	<i>malabarica</i>		r	V										√						
187	White-rumped Munia	<i>Lonchura</i>	<i>striata</i>		r	Fe				√										√		√
188	Scaly-breasted Munia	<i>Lonchura</i>	<i>punctulata</i>		R	V					√								√			
189	Forest Wagtail	<i>Dendronanthus</i>	<i>indicus</i>		p	F			√													
190	Yellow Wagtail	<i>Motacilla</i>	<i>flava</i>		W	VW							√								√	√
191	Paddyfield Pipit	<i>Anthus</i>	<i>rufulus</i>		R	VG					√											√
	No of species recorded							50	63	50	43	78	41	59	47	44	46	31	57	56	68	83

Status	
resident	r
winter	w
passage	p
summer (monsoon)	s
extirpated	ex

Appendix 4: Photos taken during CREL-Bbc forest bird monitoring 2015.



Figure 18. Survey team with Bbc team leader (Enam Ul Haque) at Himchari NP, June 2015



Figure 19. Local surveyors (FD, CPG, Eco-Guide and Bbc volunteer) at Inani Reserve Forest, July 2015



Figure 20. Bird surveyors team at Fashiakhlai WS, July 2015



Figure 21. Bird surveyors team at Chunati WS, April 2015



Figure 22. Bird surveyors team at Dudpukuri-Dhopachari WS, May 2015



Figure 23. Bird surveyors team at Kaptai NP, June 2015



Figure 23. Resident Forest Bird Monitoring survey team at Baroiardhala NP, April 2015



Figure 24. Bird survey training at Baroiardhala NP (a new site for 2015).



Figure 25. Lecture session at Satchari National Park, April 2015



Figure 26. Bird surveyors team at Khadimnagar NP, June 2015



Figure 27. Bird surveyors team at Satchari NP, July 2015



Figure 28. Bird surveyors team at Lawachara NP, July 2015



Figure 29. Bird surveyors team at Rema-Kalenga WS, April 2015



Figure 30. Bird identification training at Modhupur NP, May 2015



a. **Crimson Sunbird**



b. **Thick-billed Green Pigeon**



c. **Vernal Hanging Parrot**



d. **Oriental Pied Hornbill**



e. **White-rumped Shama**



f. **White Crested Laughingthrush**



g. **Chestnut-headed BeeEater**

Figure 31. Few bird photos (a-g) from the field survey.