Conservation of critically endangered White-bellied Heron and fostering community livelihood in Jigme Dorji National Park under Punakha district, Bhutan

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Presentation Outline

- Introduction
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- Results and discussion
- Conclusion
- Recommendations
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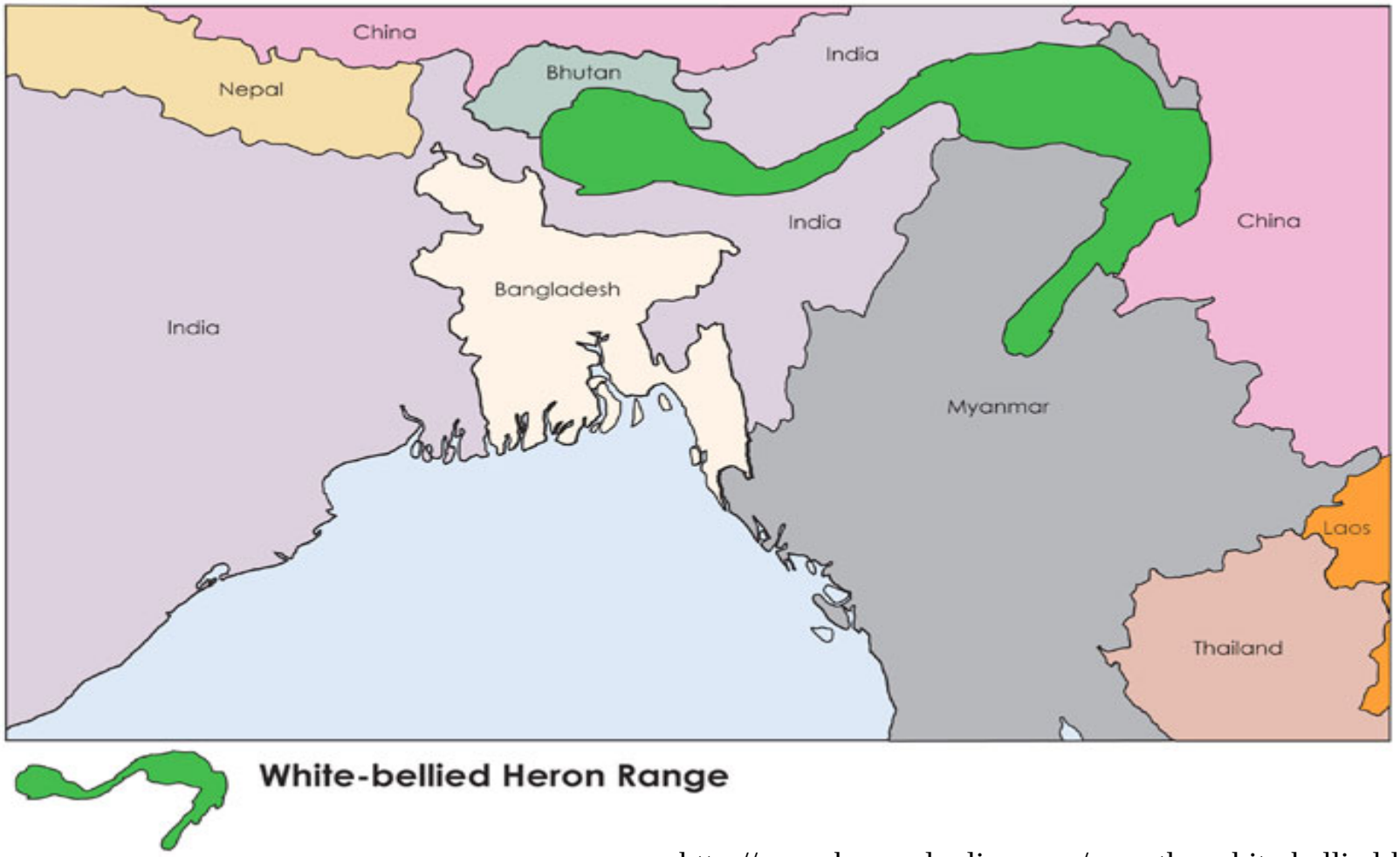
Introduction

- Forest vegetations are essential for life on earth.
- Many animals rely on forest resources as sites for foraging, nesting, and protection (Saara *et al*., 2003).
- WBH is classified as Critically Endangered in the IUCN Red List of Threatened Species (BirdLife International, 2013).
- World population: 200 individuals (WWF, 2015).
- Punakha workshop confirmed: 60 in Bhutan(Dorji, 2015).

Introduction

- Bhutan: 28 individuals (Dorji, 2015).



http://www.kuenselonline.com/save-the-white-bellied-heron/

Objectives

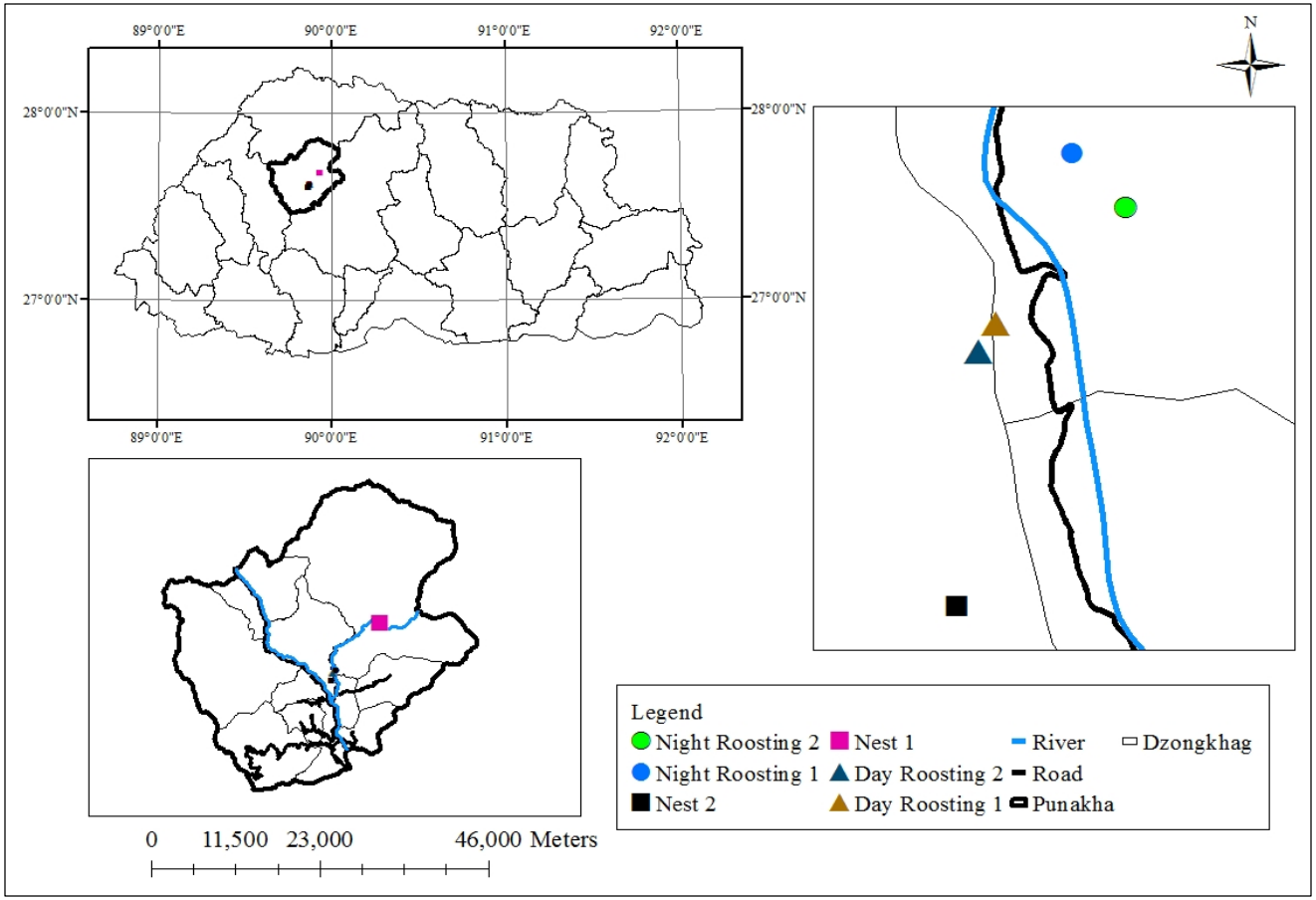
To assess the species composition and structure of vegetation preferred by WBH for nesting and roosting in order to assist in improving its conservation status and habitats. The specific objectives were:

- To assess the natural habitats preferred by heron for nesting and roosting.
- To assess the conservation threats and disturbances towards WBH and its habitats.

Methodology and Materials

Study area

Phochu area, Punakha, Altitude: 1260 m to 1464 m



Data collection and analysis

Vegetation survey

- Sampling plots were systematically established at an interval of every 50 m rise in altitude.
- Sampling plot sizes: 10 x 10 m for trees, 5 x 5 m for sapling and shrubs, and 2 x 2 m for herbs and ground flora.
- Total: 48 plots
- The distances to the settlements, roads, agriculture field and feeding ground were recorded.

Social survey

- Informal interviews with randomly selected households

Results and Discussion

Species, family composition and Important Value Index of tree species

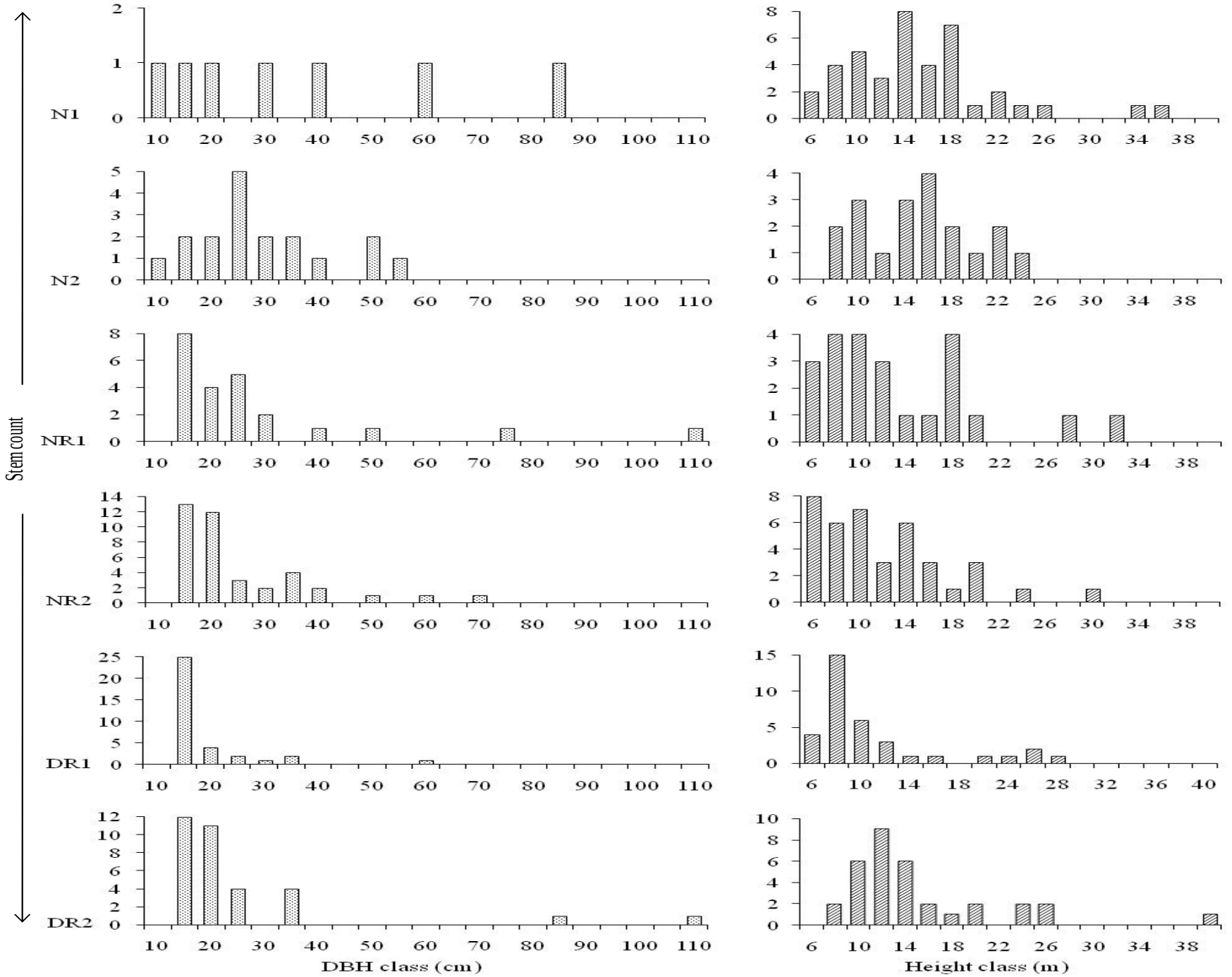
Species Name	No. of individuals	Frequency	Family	Relative density	Relative frequency	Relative dominance	IVI
Pinus roxburghii	164	6	Pinaceae	86.77	37.50	79.93	204.20
Quercus griffithii	7	1	Fagaceae	3.70	6.25	8.48	18.43
Quercus glauca	2	2	Fagaceae	1.06	12.50	0.30	13.86
Schima wallichii	5	1	Theaceae	2.65	6.25	3.40	12.30
Macaranga pustulata	5	1	Euphorbiaceae	2.65	6.25	0.98	9.87
Alnus nepalensis	1	1	Betulaceae	0.53	6.25	2.87	9.65
Docynia indica	1	1	Rosaceae	0.53	6.25	2.13	8.91
Quercus semecarpifolia	2	1	Fagaceae	1.06	6.25	1.01	8.32
Albizia lebbeck	1	1	Leguminosae	0.53	6.25	0.83	7.61
Lyonia ovalifolia	1	1	Ericaceae	0.53	6.25	0.07	6.85

- Total: 189 individuals/stems; 10 species; 6 families.
- WBH roosting and nesting: only *P. roxburghii*.

Structural characteristics of tree species

	Nesting	Night roosting	Day roosting
Mean DBH (cm)	25.25	23.68	19.86
Mean height (m)	14.8	11.98	12.53
Mean canopy cover (%)	15.25	12.01	11.91

Demographic characteristics: unimodal (emergent), sporadic and inverse-J types (Ohsawa, 1991). Inverted J shaped pattern: high distribution of individuals in the lower diameter classes and a gradual decrease towards the higher classes (Kuma and Shibru, 2015).


Stem count
N1
N2
NR1
NR2
DR1
DR2
DBH class (cm)
Height class (m)

Species composition and relative dominance of sapling species

Total: 47 individuals/stems; 7 species; 5 families

Species name	Stem count	Relative abundance	Family	BA (cm^2)	Relative dominance
Macaranga pustulata	2	4.26	Euphorbiaceae	90.62	4.75
Phyllanthus emblica	1	2.13	Euphorbiaceae	35.26	1.85
Pinus roxburghii	31	65.96	Pinaceae	1362.75	71.50
Quercus glauca	1	2.13	Fagaceae	58.09	3.05
Quercus griffithii	4	8.51	Fagaceae	155.93	8.18
Rhus chinensis	1	2.13	Anacardiaceae	20.43	1.07
Schima wallichii	7	14.89	Theaceae	182.96	9.60

Species composition of shrubs and regenerations

Total: 19 species with 14 families.

Species Name	Stem count	Relative abundance	Family	BA (cm^2)	Relative dominance
Aesandra butyracea	15	5.70	Sapotaceae	33.33	4.96
Berberis asiatica	11	4.18	Berberidaceae	34.80	5.18
Bridelia retusa	13	4.94	Euphorbiaceae	67.78	10.09
Cinnamomum sp.	7	2.66	Lauraceae	7.07	1.05
Desmodium elegans	19	7.22	Leguminosae	38.81	5.78
Ficus sp.	22	8.37	Moraceae	98.59	14.68
Indigofera dosua	23	8.75	Leguminosae	98.59	14.68
Lyonia ovalifolia	4	1.52	Ericaceae	4.04	0.60
Macaranga pustulata	10	3.80	Euphorbiaceae	10.10	1.50
Phyllanthus emblica	13	4.94	Euphorbiaceae	62.22	9.26
Pinus roxburghii	74	28.14	Pinaceae	153.20	22.81
Quercus glauca	4	1.52	Fagaceae	4.04	0.60
Quercus griffithii	5	1.90	Fagaceae	5.05	0.75
Quercus semecarpifolia	1	0.38	Fagaceae	1.01	0.15
Rapanea capitellata	24	9.13	Myrsinaceae	24.24	3.61
Rhus chinensis	8	3.04	Anacardiaceae	12.93	1.92
Schima wallichii	7	2.66	Theaceae	8.28	1.23
Wendlandia sp.	1	0.38	Rubiaceae	5.56	0.83
Yushania sp.	2	0.76	Gramineae	2.02	0.30

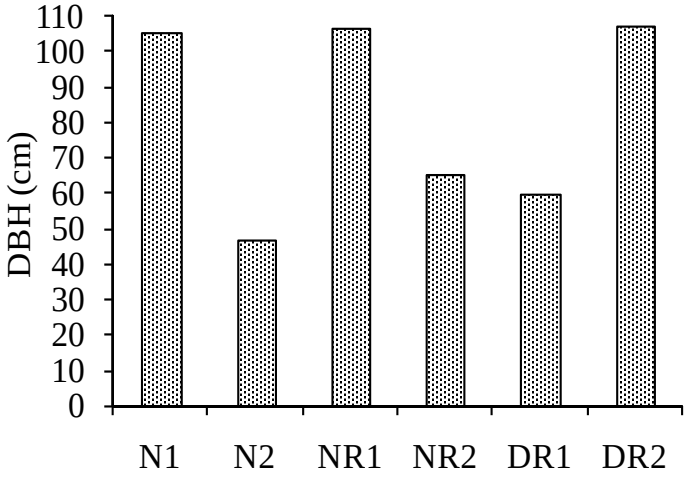
Species composition of herbs and ground flora

Total: 38 species of 20 families.

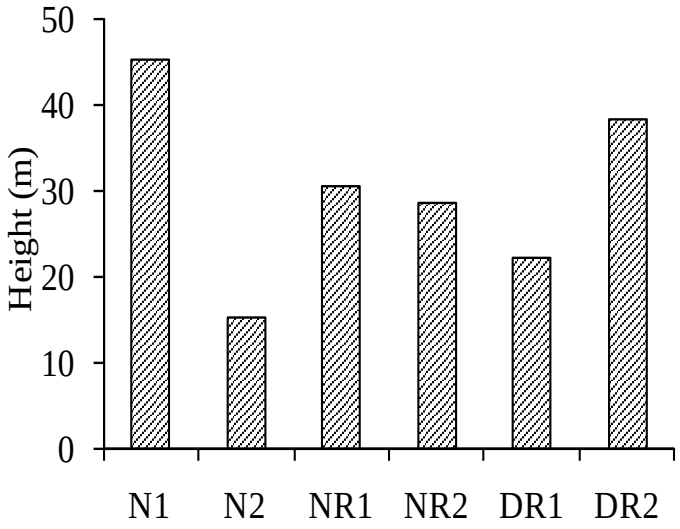
Species Name	Stem count	Relative abundance	Family	Relative volume (cm^3)	Relative dominance
Acmella uliginosa	10	0.34	Compositae	0.07	0.01
Aconogonon molle	20	0.69	Polygonaceae	5.63	0.94
Ageratina adenophora	50	1.72	Compositae	10.52	1.75
Ageratum conyzoides	153	5.27	Compositae	21.91	3.65
Argyreia roxburghii	13	0.45	Convolvulaceae	3.26	0.54
Artemisia myriantha	79	2.72	Compositae	14.86	2.48
Bidens pilosa	25	0.86	Compositae	0.91	0.15
Boehmeria platyphylla	12	0.41	Urticaceae	0.63	0.10
Carex sp.	75	2.58	Cyperaceae	1.69	0.28
Chromolaena odorata	933	32.15	Compositae	297.14	49.52
Clematis sp.	15	0.52	Ranunculaceae	2.25	0.38
Crassocephalum crepidoides	6	0.21	Compositae	0.10	0.02
Curcuma sp.	102	3.51	Zingiberaceae	8.89	1.48
Cymbopogon sp.	617	21.26	Gramineae	167.83	27.97
Cynoglossum furcatum	13	0.45	Boraginaceae	0.14	0.02
Cyperus sp.	19	0.65	Cyperaceae	2.39	0.40
Daphne involucrata	4	0.14	Thymelaeaceae	0.42	0.07
Desmodium elegans	19	0.65	Leguminosae	1.50	0.25
Desmodium sp.	13	0.45	Leguminosae	0.80	0.13
Duhaldea cappa	177	6.10	Compositae	17.39	2.90
Fern 1	12	0.41	Polypodiaceae	2.78	0.46
Fern 2	28	0.96	Polypodiaceae	4.21	0.70
Fern 3	15	0.52	Polypodiaceae	1.25	0.21
Fern 4	19	0.65	Polypodiaceae	3.75	0.63
Galinsoga parviflora	14	0.48	Compositae	0.21	0.03
Galium aparine	1	0.03	Compositae	0.01	0.00
Gnaphalium affine	2	0.07	Compositae	0.02	0.00
Hedychium sp.	13	0.45	Zingiberaceae	3.38	0.56
Hyparrhenia sp.	238	8.20	Poaceae	11.28	1.88
Indigofera heterantha	3	0.10	Leguminosae	1.88	0.31
Jasminum nepalense	5	0.17	Oleaceae	0.46	0.08
Oxalis corniculata	105	3.62	Oxalidaceae	1.00	0.17
Piper sp.	6	0.21	Piperaceae	1.25	0.21
Pteracanthus urticifolia	36	1.24	Acanthaceae	5.50	0.92
Rubia cordifolia	5	0.17	Rubiaceae	1.88	0.31
Rumex nepalensis	22	0.76	Polygonaceae	0.25	0.04
Spergula arvensis	8	0.28	Caryophyllaceae	0.07	0.01
Woodwardia unigemmata	15	0.52	Blechnaceae	2.50	0.42

Characteristics of particular nest and roost trees

Nesting and roosting were recorded only on chir pine trees as observed by RSPN (2011).

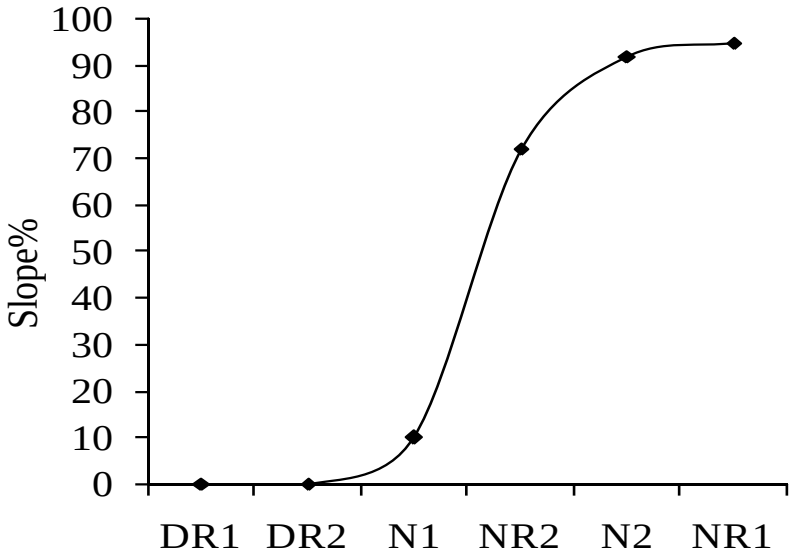


Highest DBH: 106.50 cm (night roosting tree 1).
Least DBH: 46.90 cm (nesting tree 2)
Mean DBH: 81.92 cm

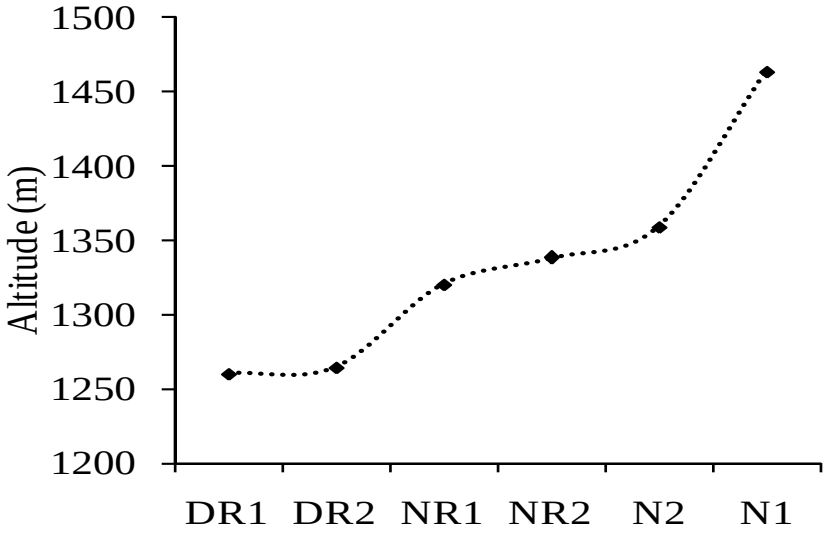


Maximum height: 45.29 m (nest tree 1)
Minimum height: 15.45 m (nest tree 2)
The mean height: 30.23 m (Figure 4)

Characteristics of particular nest and roost trees

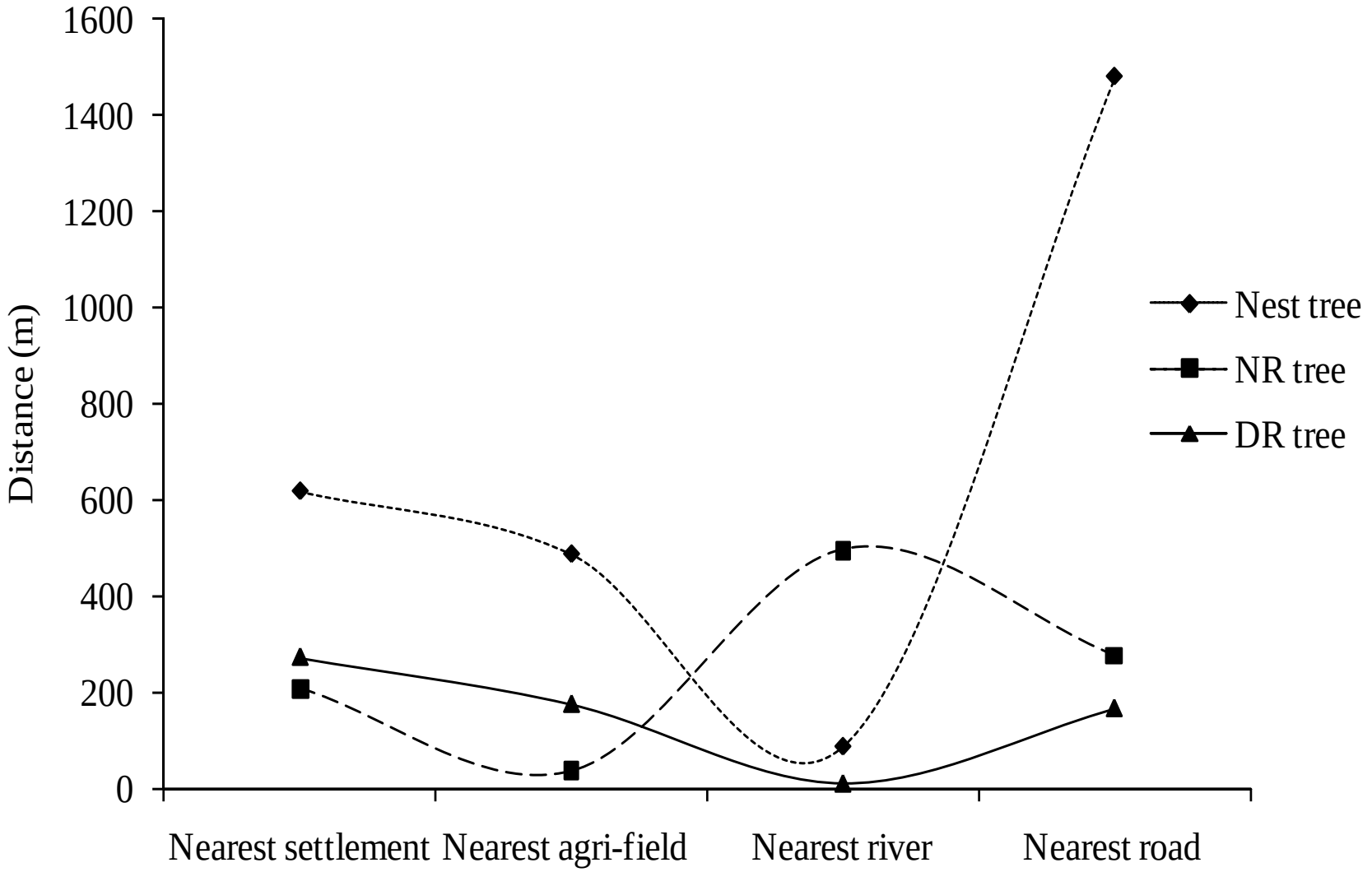


The mean slope percent: 44.83%.



Altitude: 1260 to 1464 m.a.s.l.

Mean distances to nearest settlements, agri-field, river and road side from nesting and roosting trees.

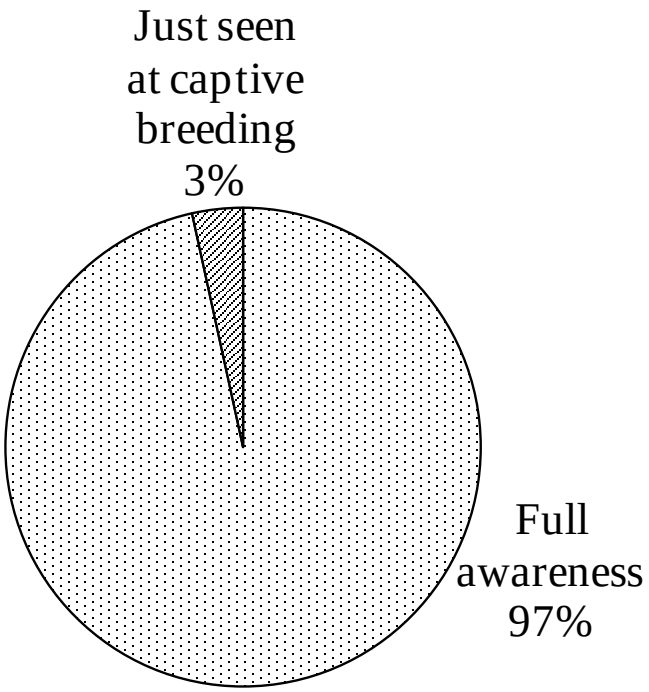


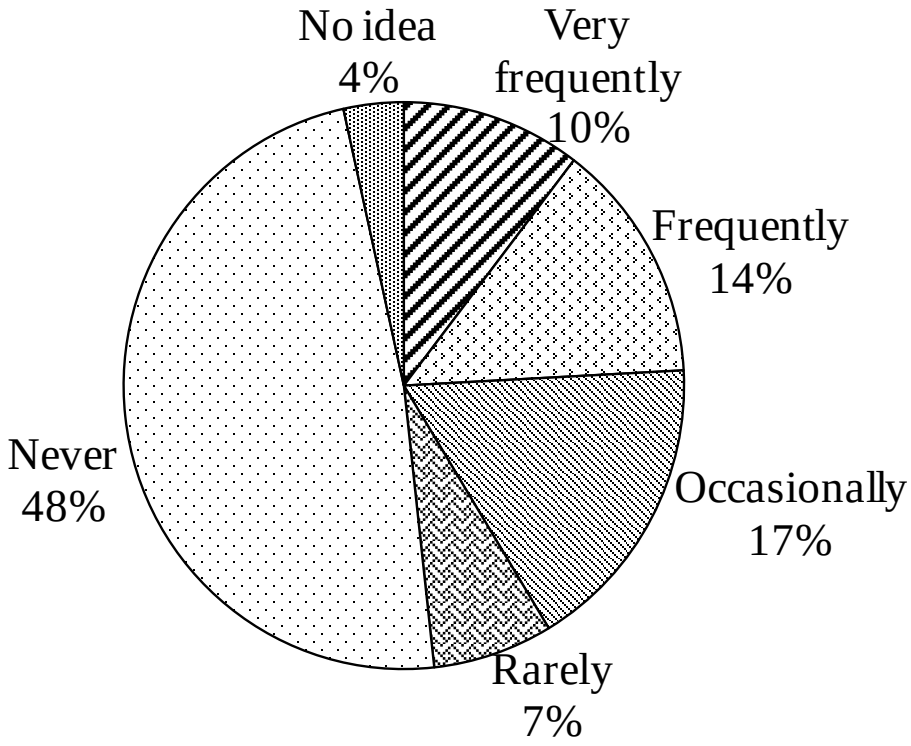
Degree of awareness and people's perception

Field sample size: 58 households (40.27% response rate).

Male: 30 (51.7%)

Female: 28 (48.3%)

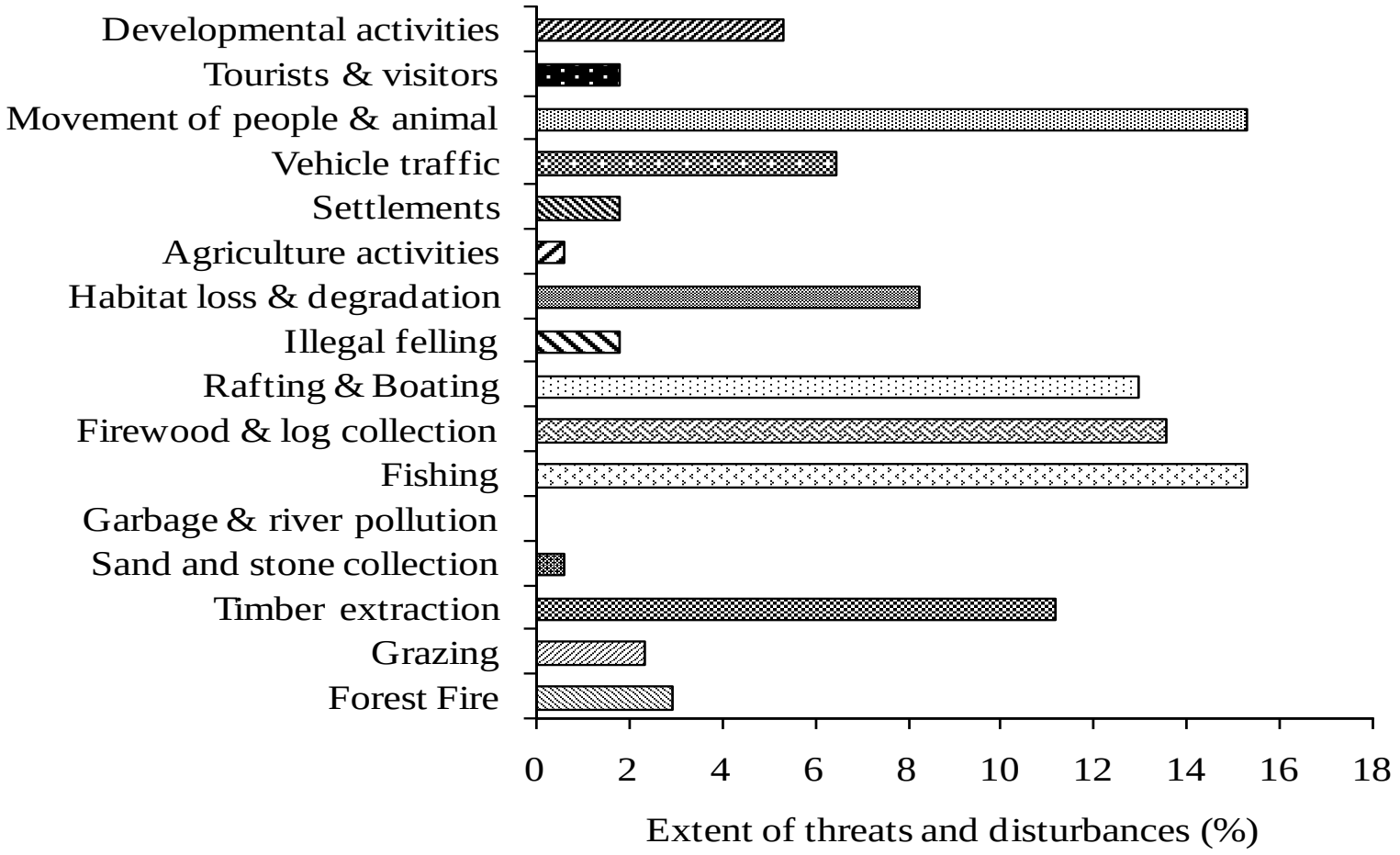




Conservation threats and disturbances

Direct threats and disturbances

- Direct killing, hunting, poaching and predation of birds including disturbances like fishing, forest fire, etc.



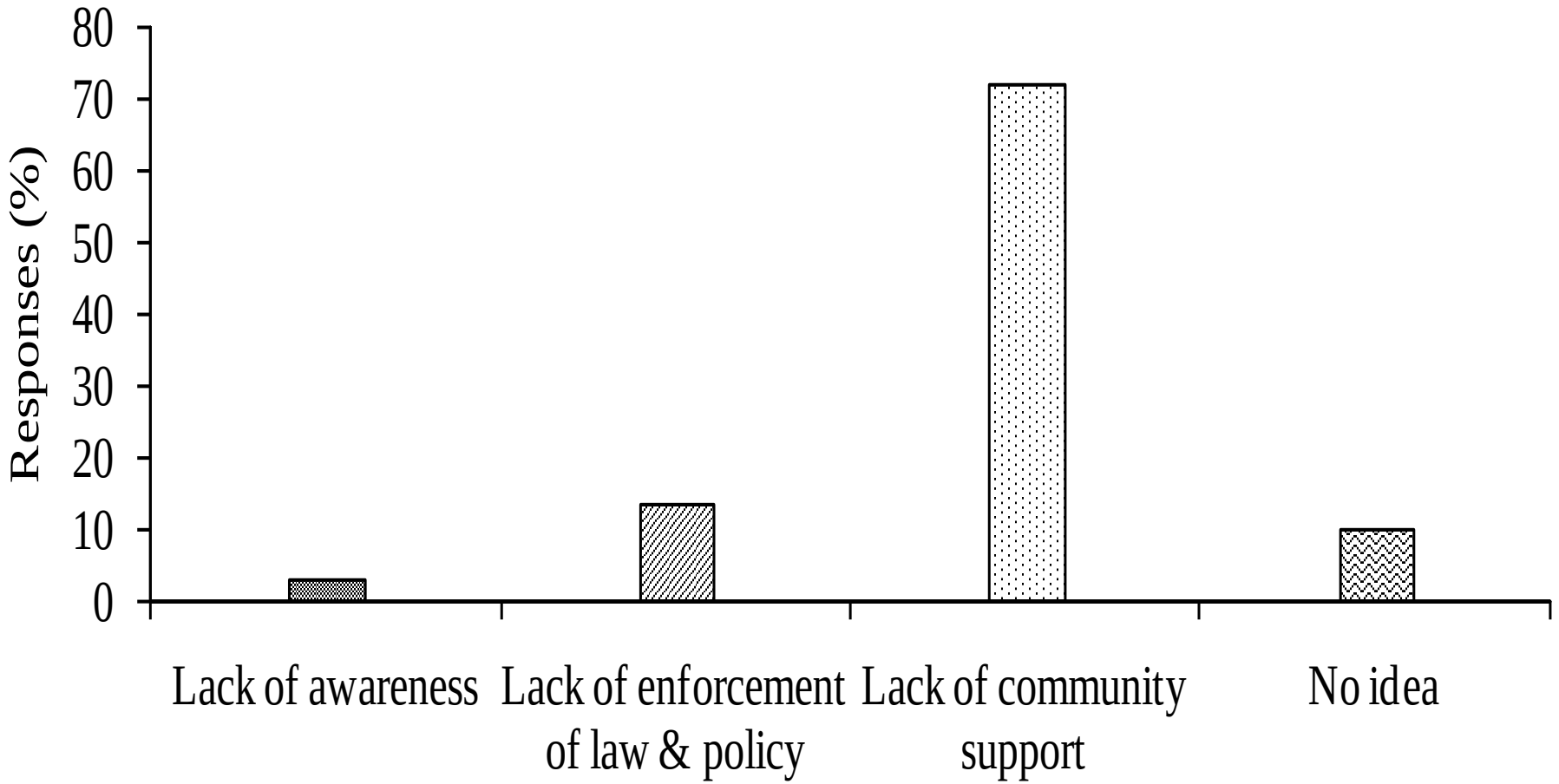
Conservation threats and disturbances

Direct threats and disturbances

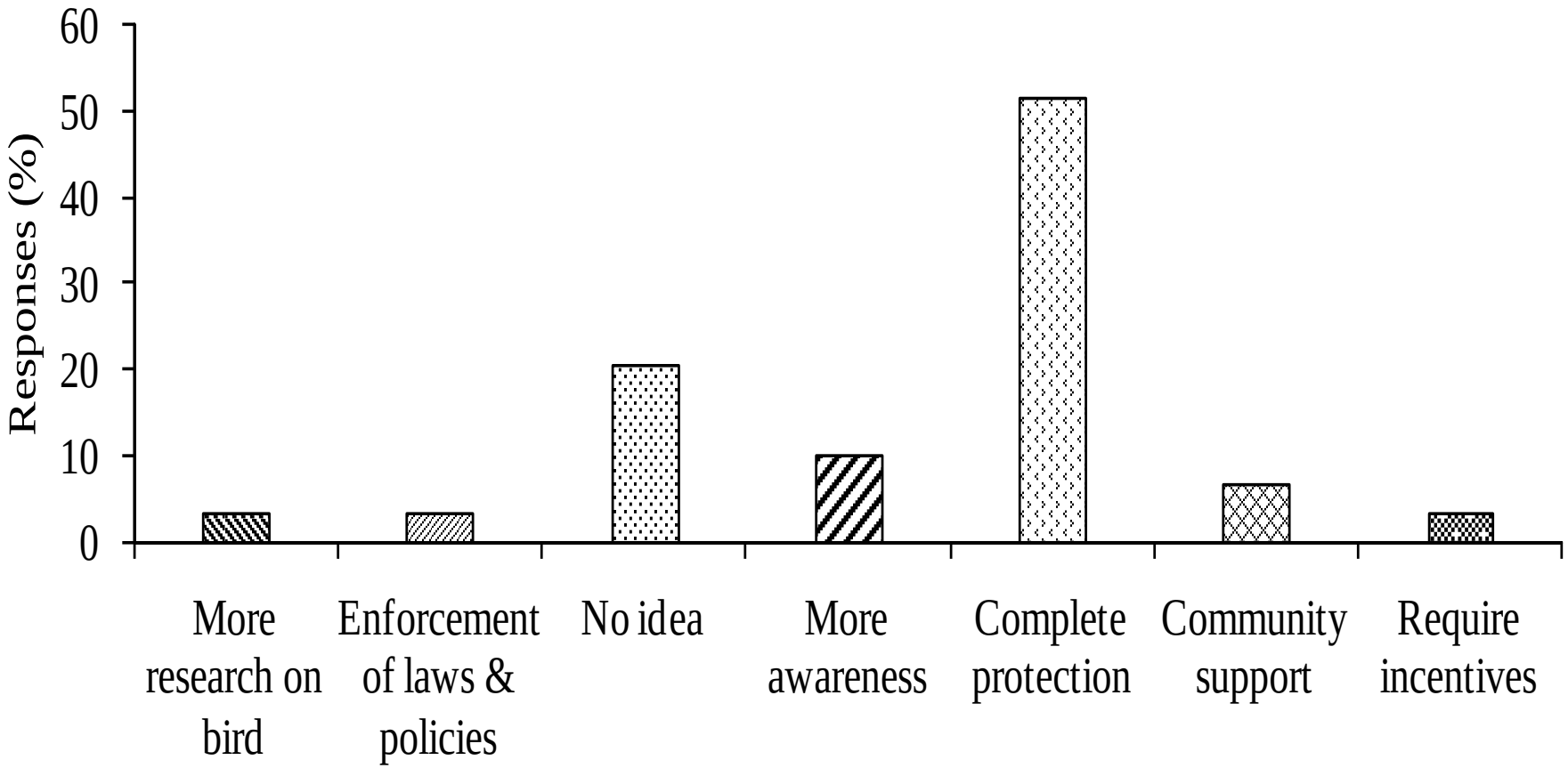
- No evidence of direct killing and hunting the birds by human.
- However, carcasses of the birds were found. The causes of the death of birds are unknown.
- RSPN (2011): The disturbance by human was a fairly common event observed along the Phochu river.

Conservation threats and disturbances

Indirect threats



Conservation action required



Conclusion

- Floristically, 59 species from 33 families.
- *P. roxburghii*, most dominant and important tree species.
- *P. roxburghii* dominant at sapling, shrub and regeneration layers.
- *Chromolaena odorata*, most common ground flora.
- WBH found roosting and nesting only on *P. roxburghii*.
- Removal and changes of chir pine forest will have the greatest influence on birds.
- More disturbances in roosting habitats than nesting habitats.
- Threats and disturbances by human were common.

Recommendations

- Needed further investigation on vegetation structure and composition covering more areas for better understanding of bird's nesting and roosting habitats.
- The constant and regular monitoring of bird and comprehensive research on predation is highly required.
- Continuous raising awareness programs are required.

Acknowledgement

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