

Avifaunal diversity of Pakke Tiger Reserve in the Eastern Himalaya hotspot of Arunachal Pradesh, India

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Abstract

Fifty-two species of birds belonging to 29 families were recorded in Pakke Tiger Reserve, Arunachal Pradesh, India. The highest number of species belonged to the family Muscicapidae with eight, Accipitridae, Bucerotidae, Columbidae, Phasianidae, and Pycnonotidae each with three species, while Ardeidae, Campephagidae, Falconidae, Megalaimidae, Phylloscopidae and Scolopacidae with two species each. The remaining seventeen families *viz.*, Alcedinidae, Charadriidae, Chloropseidae, Coraciidae, Corvidae, Dicruridae, Eurylaimidae, Irenidae, Laniidae, Locustellidae, Motacillidae, Oriolidae, Phalacrocoracidae, Picidae, Strigidae, Sturnidae, and Vangidae with one species were recorded. IUCN (International Union for Conservation of Nature) conservation status of two species (*Rhyticeros undulatus* and *Buceros bicornis*), is categorised under VU (Vulnerable), two species *Vanellus duvaucelii* and *Treron phayrei* under NT (Near Threatened) while the remaining are categorized under LC (Least Concern).

Keywords: Arunachal Pradesh, Birds, Pakke tiger reserve, IUCN

Introduction

Birds are excellent indicators of ecosystem health, and fascinating and widely studied taxa. They are among the most diverse groups of vertebrates in tropical forests and because of their high local diversity and abundance, they are involved in key ecological processes such as arthropod control, pollination, and seed dispersal (Sekercioglu, 2006). The North-eastern

state of Arunachal Pradesh is part of two global biodiversity hotspots (the eastern Himalaya and Indo-Burmese biodiversity hotspots) (Mittermeier et al., 2004) as well as two 'Endemic Bird Areas' (the Eastern Himalaya and the Assam Plains) (Stattersfield et al., 1998). Pakke Tiger Reserve (PTR) (26°54'– 27°16' N and 92°36'–93°09'E) with a total area of 862km² is located in the foothills of Eastern Himalaya biodiversity hotspot in the East Kameng District of Western Arunachal Pradesh at the junction of the Palaearctic and Indo-Malayan zoogeographic realms. PTR is surrounded by a confluence of rivers viz., the Pakke River flowing East, Kameng River in the west and Papu River towards the northern margin. Other rivers include Nameri, Khari, East Kameng and Upper Dikroi with their tributaries. The area is characterized by lowland semi-evergreen, evergreen forests and Eastern Himalayan broadleaf forests and by undulating hilly terrain with altitudes ranging from 200 m to about 2000 m above sea level (Kumar and Solanki, 2008). This Protected area was declared as the 'Pakhui Wildlife Sanctuary' in 1977 and due to its large tiger population composition, it was declared 'Pakke Tiger Reserve' in 2002 (Chaudhry et al., 2016).

The PTR is also surrounded by major protected areas and forests; the Southern part lies adjacent to Nameri Tiger Reserve in Assam, the north with Tenga Reserve Forest, west by the Doimara Reserve Forest and east by Papum Reserve Forest. Topographically characterised by rugged mountains with a peak altitude of 2,000 meters above mean sea level, it has different forest types including Assam Valley tropical semi-evergreen forests, Sub Himalayan light alluvial semi-evergreen forests, Eastern Hollock Forests, Upper Assam Valley tropical evergreen forests, Tropical riverine forests and Secondary moist bamboo tracts (Datta *et al.*, 1998). Monitoring of avifaunal diversity by PTR has major frugivorous and granivorous birds and flowerpeckers facilitating ornithochory (Sethi and Howe, 2009; TCP, 2014). PTR is an Important Bird Area (IBA) (Islam and Rahmani, 2004) and studies on its avian diversity have been carried out earlier indicating a 282 as the highest count (Datta *et al.*, 1998; Birand and Panwar, 2004; Kumar 2014; Kumar, 2020). PTR is situated at the junction of the Palaearctic and Indo-Malayan zoogeographic realms.

Material and methods

Study area: The area covered during the present survey is the southeastern margin extending from Langka Village to Bhalukpung camp of the PTR and the different campsites around the survey area are indicated in Table 1 and Fig. 1.

Table 1. Location of campsites in the study area during the survey

Sl. No.	Name of Location	GPS
1	Pakke Jungle Camp, Sejusa	26°59'05.9"N 93°01'55.5"E
2	West Bank Forest Camp	26°56'20.6"N 92°58'43.2"E
3	Golosa Camp	26°58'32.2"N 93°02'33.4"E
4	Mobusa Camp	26°58'58.2"N 93°03'31.5"E
5	Dibru	27°01'02.6"N 93°02'29.0"E
6	Langka	27°02'29.1"N 93°01'55.4"E
7	Pakke Nature Information Centre	26°56'15.6"N 92°58'45.3"E
8	Upper Dikroi/Tarzen camp	27°02'03.9"N 92°40'04.5"E
9	Khari	26°58'48.8"N 92°55'15.5"E
10	Anti-Poaching Camp east Nameri	27°02'38.8"N 92°46'06.7"E
11	Forest Camp near Balukpong	27°01'06.8"N 92°38'35.1"E

**Figure 1.** Pakke tiger reserve in Western Arunachal Pradesh (Source: Google Maps)

Species were recorded through direct visual observations and were classified using photographic methods for verification. The field surveys birds were done using a convenience sampling approach by foot between 01 to 10 December 2015. The observations were done during 5:00 -12 hrs and 19:00-21:00 hrs every day. Birds were photographed opportunistically using a Canon Nikon-D7100 camera and identified using field guides (Grimmett *et al.* 2011).

Results

Fifty-two species of birds belonging to 29 families were recorded during the present survey with the highest number of species (n=8) belonging to Muscicapidae. Muscicapidae is represented by 72 species a feature common to Northeast India (Datta *et al.* 1998). Accipitridae, Bucerotidae, Columbidae, Phasianidae, and Pycnonotidae each with three species, while Ardeidae, Campephagidae, Falconidae, Megalaimidae, Phylloscopidae and Scolopacidae with two species each. The remaining seventeen families *viz.*, Alcedinidae, Charadriidae, Chloropseidae, Coraciidae, Corvidae, Dicruridae, Eurylaimidae, Irenidae, Laniidae, Locustellidae, Motacillidae, Oriolidae, Phalacrocoracidae, Picidae, Strigidae, Sturnidae, and Vangidae with one species were recorded. However, the lesser number of species is attributed to opportunistic count and all the birds recorded have already been reported in earlier studies (Supplementary figures and table).

The Ashy-headed Green Pigeon *Treron phayrei* (Blyth, 1862) and River Lapwing, *Vanellus duvaucelii* (Lesson, 1826) are listed as 'Near threatened' as per the IUCN status. Two species *viz.*, Wreathed Hornbill, *Rhyticeros undulatus* (Shaw, 1811), Great Hornbill, *Buceros bicornis* (Linnaeus, 1758) are listed as 'Vulnerable', while the remaining are categorized under LC (Least Concern). Five species *viz.*, *Motacilla alba* Linnaeus, 1758, *Phoenicurus leucocephalus* (Vigors, 1831), *Phoenicurus fuliginosus* (Vigors, 1831), *Vanellus duvaucelii* (Lesson, 1826), *Phalacrocorax carbo* (Linnaeus, 1758) were recorded near aquatic ecosystem. Both the sexes of *Tephrodornis virgatus* and *Pericrocotus flammeus* (Forster, 1781) were also recorded. One species, *Oriolus traillii* (Vigors, 1832) was reported as in juvenile stage. *Treron phayrei* (Blyth, 1862), *Megalurus palustris* Horsfield, 1821 *Psilopogon zeylanicus* (Gmelin, 1788) *Phoenicurus hodgsoni* (Moore, 1854) *Saxicola leucurus* (Blyth, 1847) *Ficedula ruficauda* (Swainson, 1838) were infrequently sighted in the reserve area.

Discussion

The survey provided information on the avifauna observed opportunistically during a faunal survey on Ephemeropterans over a short duration. However, it's worthy of information considering not many follow-up studies have been undertaken after that. Also, considering the fact that North Eastern India with the highest avian diversity in India has many threatened species (Maheswaran and Alam, 2017). Interesting records have been obtained during the study, India has 17 out of the total 51 species of pheasants, and Arunachal Pradesh has 11 species, 80% of India's total pheasants (Selvan *et al.*, 2013). They are Himalayan or Impeyan

Monal *Lophophorus impejanus*, Sclater's Monal *L. sclateri*, Blyth's *Tragopan Tragopan blythii*, Satyr Tragopan *T. satyra*, Temminck's Tragopan *T. temminckii*, Blood Pheasant *Ithaginis cruentus*, Mrs. Hume's Pheasant *Syrnaticus humiae*, Tibetan Eared Pheasant *Crossoptilon harmani*, Grey Peacock Pheasant *Polyplectron bicalcaratum*, Kaleej Pheasant *Lophura leucomelanos* and Red Jungle fowl *Gallus gallus*. The latter three were recorded during the present survey. Existence of birds is determined by their habitat owing to the availability of food and shelter and most pheasant species are considered 'indicator species' due their sensitivity to habitat changes. The grey peacock pheasant, *P. bicalcaratum* recorded during the survey was found entangled in the trap set by hunters, it was safely retrieved and released into wild. Three (Great Hornbill, Oriental Pied Hornbill and Wreathed Hornbill) of the four hornbill species (Oriental pied hornbill, wreathed hornbill, the rufous-necked hornbill and the great hornbill) occurring in the reserve were recorded in this survey. The great hornbill is the state bird of Arunachal Pradesh, a reduction in hunting hornbills and protection due to increased awareness among the local Nishi community has conservation implications in the region (Datta, 1998, Datta *et al.* 2008). PTR has a special attribute as IBA, particularly good for raptors since seventeen including rarities such as the Pallas's Fish-Eagle are recorded hereof the 66 species reported from the Indian subcontinent (BirdLife International, 2023). Three have been observed during this study *viz.*, *Spilornis cheela* (Latham, 1790), *Circus cyaneus* (Linnaeus, 1766) and *Milvus migrans* (Boddaert, 1783). Although the present survey was undertaken in December 2015, very few surveys/online portals enumerating avifaunal diversity have been undertaken in PTR except 221 species of bird by Kumar, 2020 and 290 species reported in eBird (2021). The latter is enabled with a reporting system based on checklists provided by birders and is regularly updated.

Conclusion

The present data would contribute to the body of avifaunal diversity records of PTR. Conservation initiatives concerning protected areas with flagship species like Tiger in the present case is strongly influenced by involving local communities. Regular diversity records would serve as crucial assessments to conservation initiatives undertaken in a protected area like PTR present in the Eastern Himalayas, one of the four biodiversity hotspots in India.

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Appendix

Supp. table 1. List of avifauna recorded during the study in PTR

Sl. No.	Scientific Name	Common Name	Family	IUCN Status	
1.	<i>Spilornis cheela</i> (Latham, 1790)	Crested Serpent-Eagle	Accipitridae	LC	
2.	<i>Circus cyaneus</i> (Linnaeus, 1766)	Hen Harrier			
3.	<i>Milvus migrans</i> (Boddaert, 1783)	Black Kite			
4.	<i>Halcyon smyrnensis</i> (Linnaeus, 1758)	White-Throated Kingfisher	Alcedinidae	LC	
5.	<i>Bubulcus ibis</i> (Linnaeus, 1758)	Cattle Egret	Ardeidae	LC	
6.	<i>Egretta garzetta</i> (Linnaeus, 1766)	Little Egret			
7.	<i>Anthracoceros albirostris</i> (Shaw & Nodder, 1807)	Oriental Pied Hornbill	Bucerotidae	LC	
8.	<i>Rhyticeros undulatus</i> (Shaw, 1811)	Wreathed Hornbill		VU	
9.	<i>Buceros bicornis</i> (Linnaeus, 1758)	Great Hornbill		VU	
10.	a.) <i>Pericrocotus flammeus</i> (Forster, 1781) b) <i>Pericrocotus flammeus</i> (Forster, 1781)	Scarlet Minivet	Campephagidae	LC	
11.	<i>Coracina macei</i> (Lesson, 1831)	Large Cuckoo Shrike		LC	
12.	<i>Vanellus duvaucelii</i> (Lesson, 1826)	River Lapwing	Charadriidae	NT	
13.	<i>Chloropsis aurifrons</i> (Temminck, 1829)	Golden-Fronted Leaf Bird	Chloropseidae	LC	
14.	<i>Chalcophaps indica</i> (Linnaeus, 1758)	Common Emerald Dove	Columbidae	LC	
15.	<i>Spilopelia chinensis</i> (Scopoli, 1786)	Eastern Spotted Dove			
16.	<i>Treron phayrei</i> (Blyth, 1862)	Ashy-headed Green Pigeon		NT	
17.	<i>Coracias benghalensis</i> (Linnaeus, 1758)	Indian Roller	Coraciidae	LC	
18.	<i>Cissa chinensis</i> (Boddaert, 1783)	Common Green Magpie	Corvidae	LC	
19.	<i>Dicrurus bracteatus</i> (Gould, 1842)	Spangled Drongo	Dicruridae	LC	
20.	<i>Serilophus lunatus</i> (Gould, 1834)	Silver-Breasted Broadbill	Eurylaimidae	LC	
21.	<i>Microhierax melanoleucos</i> (Blyth, 1843)	Pied Falconet	Falconidae	LC	
22.	<i>Falco tinnunculus</i> (Linnaeus, 1758)	Common Kestrel		LC	
23.	<i>Irena puella</i> (Latham, 1790)	Asian Fairy-Bluebird	Irenidae	LC	
24.	<i>Lanius schach</i> (Linnaeus, 1758)	Long-Tailed Shrike	Laniidae	LC	
25.	<i>Megalurus palustris</i> (Horsfield, 1821)	Striated Grass Bird	Locustellidae	LC	
26.	<i>Psilopogon australis</i> (Horsfield, 1821)	Blue-Eared Barbet	Megalaimidae	LC	
27.	<i>Psilopogon zeylanicus</i> (Gmelin, 1788)	Brown-Headed Barbet		LC	
28.	<i>Motacilla alba</i> (Linnaeus, 1758)	White Wagtail	Motacillidae	LC	
29.	<i>Phoenicurus fuliginosus</i> (Vigors, 1831)	Plumbeous Water-redstart	Muscicapidae	LC	
30.	<i>Phoenicurus hodgsoni</i> (Moore, 1854)	Hodgson's Redstart		LC	
31.	<i>Copsychus saularis</i> (Linnaeus, 1758)	Oriental Magpie-Robin		LC	
32.	<i>Ficedula westermanni</i> (Sharpe, 1888)	Little Pied Flycatcher		LC	
33.	<i>Saxicola leucurus</i> (Blyth, 1847)	White-Tailed Stonechat		LC	
34.	<i>Saxicola torquatus</i> (Linnaeus, 1766)	Common Stonechat		LC	
35.	<i>Phoenicurus leucocephalus</i> (Vigors, 1831)	White-Capped Redstart		LC	
36.	<i>Ficedula ruficauda</i> (Swainson, 1838)	Rusty-Tailed Flycatcher		LC	
37.	<i>Oriolus traillii</i> (Vigors, 1832)	Maroon Oriole (juvenile)		Oriolidae	LC

38.	<i>Phalacrocorax carbo</i> (Linnaeus, 1758)	Great Cormorant	Phalacrocoracidae	LC
39.	<i>Lophura leucomelanos</i> (Latham, 1790)	Kalij Pheasant	Phasianidae	LC
40.	<i>Gallus gallus</i> (Linnaeus, 1758)	Red Jungle Fowl		LC
41.	<i>Polyplectron bicalcaratum</i> (Linnaeus, 1758)	Grey Peacock-Pheasant		LC
42.	<i>Phylloscopus intermedius</i> (La Touche, 1898)	White-Spectacled Warbler	Phylloscopidae	LC
43.	<i>Phylloscopus xanthoschistos</i> (Gray, 1846)	Grey-Hooded Warbler		LC
44.	<i>Picus chlorolophus</i> (Vieillot, 1818)	Lesser Yellow Nape	Picidae	LC
45.	<i>Pycnonotus cafer</i> (Linnaeus, 1766)	Red-Vented Bulbul	Pycnonotidae	LC
46.	<i>Alophoixus flaveolus</i> (Gould, 1836)	White-Throated Bulbul		LC
47.	<i>Pycnonotus melanicterus</i> (Gmelin, 1789)	Black-Capped Bulbul		LC
48.	<i>Tringa ochropus</i> (Linnaeus, 1758)	Green Sandpiper	Scolopacidae	LC
49.	<i>Actitis hypoleucos</i> (Linnaeus, 1758)	Common Sandpiper		LC
50.	<i>Glaucidium cuculoides</i> (Vigors, 1831)	Asian Barred Owlet	Strigidae	LC
51.	<i>Sturnia malabarica</i> (Gmelin, 1789)	Chestnut-tailed starling	Sturnidae	LC
52.	a.) <i>Tephrodornis virgatus</i> (Temminck, 1824) Male b.) <i>Tephrodornis virgatus</i> (Temminck, 1824) Female	Large Wood-Shrike	Vangidae	LC

Note: LC=Least Concern, VU=Vulnerable, NT=Near Threatened



1. *Spilornis cheela* (Latham, 1790)



2. *Circus cyaneus* (Linnaeus, 1766)



3. *Milvus migrans* (Boddaert, 1783)



4. *Halcyon smyrnensis* (Linnaeus, 1758)



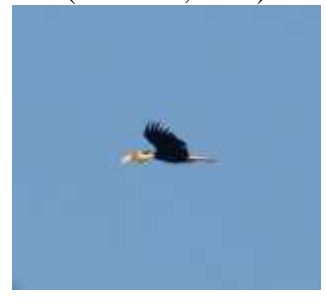
5. *Bubulcus ibis* (Linnaeus, 1758)



6. *Egretta garzetta* (Linnaeus, 1766)



7. *Anthracoceros albirostris* (Linnaeus, 1758)



8. *Rhyticeros undulatus* (Shaw, 1811)



9. *Bucerus bicornis*
Linnaeus, 1758



10. a) *Pericrocotus flammeus* (Forster, 1781)
Female



10. b) *Pericrocotus flammeus* (Forster, 1781) Male



11. *Coracina macei*
(Lesson, 1831)



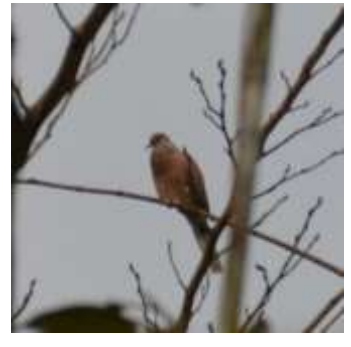
12. *Vanellus duvaucelii*
(Lesson, 1826)



13. *Chloropsis aurifrons*
(Temminck, 1829)



14. *Chalcophaps indica*
(Linnaeus, 1758)



15. *Spilopelia chinensis*
(Scopoli, 1786)



16. *Treron phayrei* (Blyth, 1862)



17. *Coracias benghalensis* (Linnaeus, 1758)



18. *Cissa chinensis*
(Boddaert, 1783)



19. *Dicrurus bracteatus*
(Gould, 1842)



20. *Serilophus lunatus*
(Gould, 1834)



21. *Microhierax melanoleucos* (Blyth, 1843)



22. *Falco tinnunculus*
Linnaeus, 1758



23. a) *Irena puella*
(Latham, 1790) (Female)



23.b) *Irena puella* (Latham, 1790)-Juvenile Male



24. *Lanius schach* (Linnaeus, 1758)



25. *Megalurus palustris* (Horsfield, 1821)



26. *Psilopogon australis* (Horsfield, 1821)



27. *Psilopogon zeylanicus* (Gmelin, 1788)



28. *Motacilla alba* (Linnaeus, 1758)



29. *Phoenicurus fuliginosus* (Vigors, 1831)



30. *Phoenicurus hodgsoni* (Moore, 1854)



31. *Copsychus saularis* (Linnaeus, 1758)



32. *Ficedula westermanni* (Sharpe, 1888)



33. *Saxicola leucurus* (Blyth, 1847)



34. a. *Saxicola torquatus* – Male (Linnaeus, 1766)



34. b. *Saxicola torquatus* – female (Linnaeus, 1766)



35. *Phoenicurus leucocephalus* (Vigors, 1831)



36. *Ficedula ruficauda* (Swainson, 1838)



37. *Oriolus traillii* (Vigors, 1832)-Juvenile



38. *Phalacrocorax carbo*
(Linnaeus, 1758)



39. *Lophura leucomelanos* (Latham, 1790)



40. *Gallus gallus* (Linnaeus, 1758)



41. *Polyplectron bicalcaratum* (Linnaeus, 1758)



42. *Phylloscopus intermedius*
(La Touche, 1898)



43. *Phylloscopus xanthoschistos* (Gray, 1846)



44. *Phylloscopus xanthoschistos* (Gray, 1846)



45. *Pycnonotus cafer*
(Linnaeus, 1766)



46. *Alophoixus flaveolus*
(Gould, 1836)



47. *Pycnonotus melanicterus* (Gmelin, 1789)



48. *Tringa ochropus*
(Linnaeus, 1758)



49. *Actitis hypoleucos*
(Linnaeus, 1758)



50. *Glaucidium cuculoides*
(Vigors, 1831)



51. *Sturnia malabarica*
(Gmelin, 1789)



52. a) *Tephrodornis virgatus*
(Temminck, 1824) Female



52. b) *Tephrodornis virgatus*
(Temminck, 1824) Male

Sup. figures 1-52. Birds identified during the present survey