

Diversity and richness of bird species in newly formed habitats of Chandoli National Park in Western Ghats, Maharashtra State, India

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ABSTRACT

The study of bird species diversity and richness in newly formed habitats of Chandoli National Park in Western Ghats (now declared as international heritage), Maharashtra State, India was carried out in early wet and dry seasons. Since richness and diversity of bird species are good indicators of the ecosystem quality, this paper focused on providing some information on the abundance, diversity and activities of various bird species occurring in Chandoli National Park. To this aim, line transect survey was used to generate data for ecological analysis. Birds observed included resident, migratory and palearctic species. A total of 151 species representing 15 orders and 45 families were recorded from September 2009 to August 2011, and a high value calculated for the Simpson's Index of Diversity (0.8291) indicated a marked richness and diversity of bird species in the area under examination.

KEY WORDS

Birds; Diversity; Richness; Western Ghats; Chandoli National Park.

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INTRODUCTION

The south-north hill range of Western Ghats lies on the Western side of Maharashtra state (India) from the border of Gujarat up to Kerala. It harbours, in its heart, the Chandoli National Park and Reservoir, recently declared as World heritage, which is very rich in biodiversity. The Western Ghats include several man-made reservoirs with the majority of streams running through it ultimately joining the Krishna and Kaveri rivers.

This area is also recognized internationally as the Western Ghats Endemic bird area and is known to host some rare and globally threatened bird species. It is one of the best birding hot spots in India for variety, beauty and ecofriendliness. About 508 bird species have been recorded recently. The Indian region is incredibly rich in birdlife. Over 1200 of the world's 8650 species of birds are found in the re-

gion. This number rises to over 2000 with subspecies included which makes the Indian check list twice the size of those of Europe and North America. This abundance is due to the variety of habitats and prevalent climate; altitude ranges from the sea level to the peak of the Himalaya.

Birds and their diversity constitute a main part of the natural environment and play a functional role as agents of flower pollination, seed dispersal, source of food chain and agents in breaking seed dormancy (Nason, 1992). Birds are good environmental indicators revealing the state of the ecosystems such as forest edges, wetlands and major river basins. They also act as dispersal agents in transferring nutrients and spores from one place to another during their migration and local movements (Niemi, 1985). The avian habitat is roughly divided into forest, scrub and wetlands, although many

species require a mixed type of habitat. After the snow fall, birds coming from sub tropical temperate region migrate in thousands up to North West corner of India and then radiate into local aquatic network of reservoirs of Western Ghats according to food availability in each habitat. Although this region is considered an important spot of biodiversity, nevertheless still little is known about the migrations of birds that inhabit the reserve throughout the year. Hence, this study was set out to obtain information on the presence, richness, diversity and activities of various bird species in Chandoli National Park both in favourable and adverse climatic conditions.

MATERIAL AND METHODS

Study area

The newly formed habitat of Chandoli National Park (Fig. 1) is at the junction area of four districts (Sangli, Kolhapur, Satara and Ratnagiri). It lies between longitudes 73°40' and 73°53'E and latitudes 17°03' and 17°20'N near Sangli in Western Maharashtra. A very distinct feature is the presence of numerous barren rocky lateritic plateaus locally called 'Sadas' devoid of any perennial vegetation and nu-

merous fallen boulders with dense thorny secondary vegetation. The area is about 308.97 Km². The maximum temperature during day time ranges from 30 °C to 38 °C. From October both day and night temperatures decrease progressively. In December or January the temperature often is up to 26 °C in day time. During rainy season maximum and minimum temperature range remains between 11-28 °C. The all area is characterized by humid and mild climate, there are heavy rains during the South West monsoon season, from June to September. Premonsoon starts in April. Therefore, this area has no notable dry season.

The cold season is from December to February, followed by the pleasant summer season from March to May. The forest types are tropical hill forest, semi- evergreen forest and mixed deciduous forest. Anjan (*Memecylon umbellatum*), Jambhual (*Syzygium cumini*) and Pisa (*Actinodaphna angustifolia*) are the most common species of this area. Due to high altitude, perennial snow, reservoirs and presence of evergreen vegetation, general climatic conditions are cool and humid, which provides a good habitat for wild fauna.

Methods

Some of the basic methods used in this study as described by Bibby et al. (1992) are: a) point counts: to determine abundance by undertaking a bird count from a fixed location for a fixed period of time. The bird species seen or heard are recorded, b) line transect: suitable for estimating density and abundance which involves moving along a fixed route (transect) and recording the bird species seen and heard on both sides of the transect.

The study was conducted from September 2009 to August 2011. The bird counts were carried out in the morning from 7.00 am to 10.00 am. and in the evening from 4.00 pm to 6.00 pm. A binocular (Olympus) was used to confirm the identification of the birds; nests were located by sight. For every bird species the following parameters were recorded: (i) activity of the bird when first sighted; (ii) the number of bird species at every sighting; (iii) location of nests and species involved; all the numbers were noted.

Data analysis

a. Species composition: abundance for each species was calculated by summing up the number of individuals recorded in all the transect.

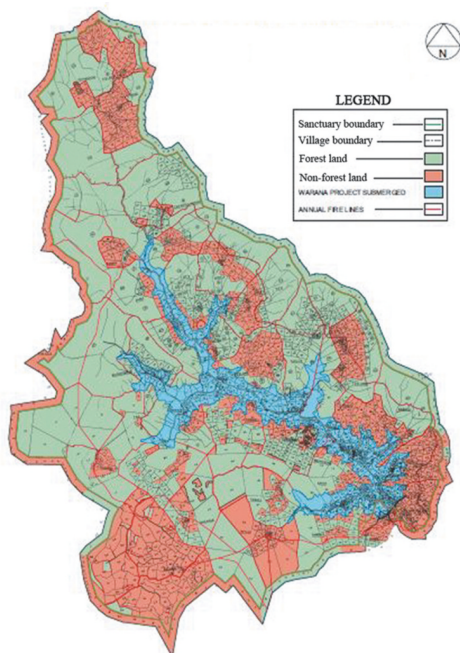


Figure.1 Map of Chandoli National Park, India.

b. Species diversity using Simpson index (D), Simpson Diversity index (1-D) and Simpsons Reciprocal index (1/D).

c. Activities of birds recorded during the survey period included calling, overflying, perching, walking, mobbing, bissy in the construction of nest, collection of grass materials, feeding and loafing. The frequency of each activity was summed up to give the activity rating and the percentages values of the frequency of each activity were calculated.

RESULTS AND DISCUSSION

A total of 151 species distributed in 15 orders and 45 families were recorded during the survey period. Sixteen families were represented only by one species each. Passeriformes was the most rich of species (63 species) followed by Ciconiiformes (39 species). Rosy starling (*Sturnus roseus*) was recorded in the months of January, February and March; whereas Baya Weaver (*Ploceus philippinus*) was more abundant in the months of July, August and September.

The Simpson's index (i.e. the probability that two randomly selected individuals in the community belong to the same category) was 0.1709 and the Simpson's diversity index (i.e. the probability that two randomly selected individuals in a community belong to different species) was 0.8291. A value of 5.8 was obtained as the reciprocal of Simpson index; a total number of 151 species was recorded during the survey.

A total of 253 nests belonging to species of 15 families were recorded, most of which were of House Swift (*Apus nipalensis*, 200 nests) and Baya Weaver (*Ploceus philippinus*, 180) (see Table 2).

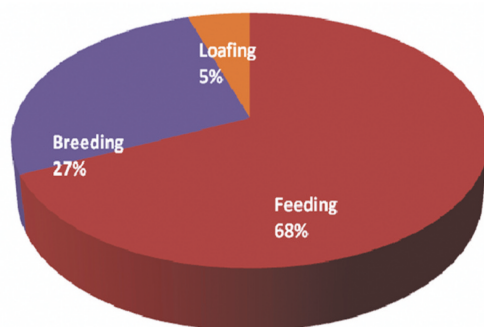


Figure 2. Activities of birds of the Chandoli National Park, India.

ACTIVITIES OF BIRD SPECIES	FREQUENCY %
FEEDING	68 %
BREEDING	27 %
LOAFING	5%

Table 1. Activities of bird species in newly formed habitat Chandoli National Park.

Bird species	Nest condition	Nests	Birds recorded at nest
Red Vented Bulbul	New and Old	15	2
Hoopoe	New and Old	5	1
Oriental white eye	New	4	1
Baya Weaver	New	180	1
Paddy field Warbler	New	6	1
House Swift	New	200	2
Jungle Crow	New	4	1
Woolly-necked Stork	New	7	1
Glossy Ibis	New	11	1
Woodpecker	New and Old	19	2
Grey Hornbill	New	4	1
Spotted Dove	New	9	1
Black Kite	New	5	1

Table 2. Bird nests recorded in the newly formed habitat of Chandoli National Park, India.

BIRD SURVEY RESULTS

GALLIFORMES - PHASIANIDAE

Coturnix coturnix (Linnaeus, 1758)

Common Quail

Perdica asiatica (Latham, 1790)

Jungle Bush Quail

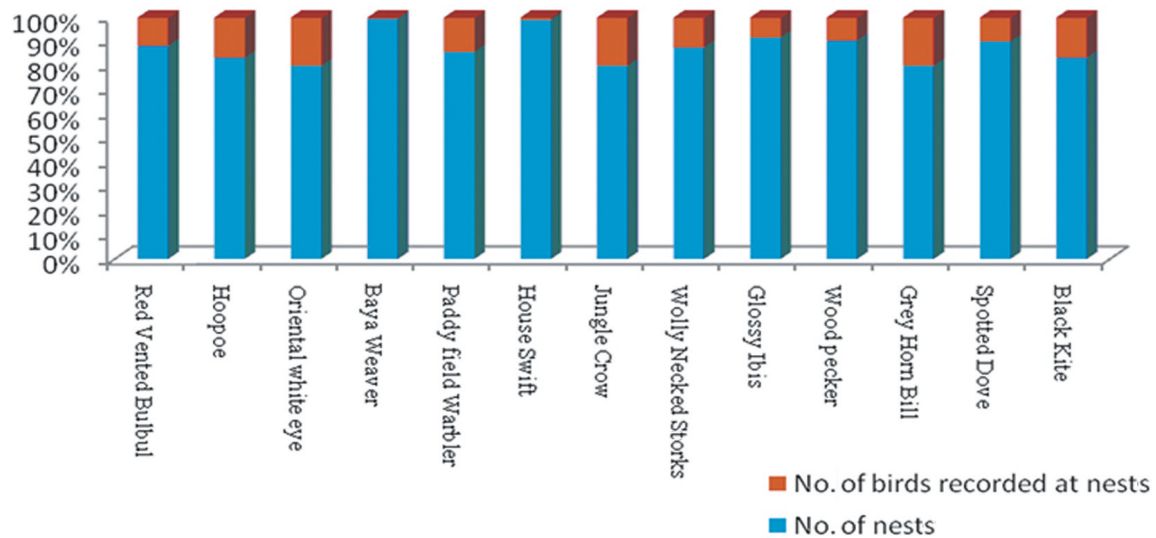


Figure 3. Number of nests and number of birds of the Chandoli National Park, India.

Francolinus pondicerianus (Gmelin J.F., 1789)

Grey Partridge

Pavo muticus Linnaeus, 1758

Indian Peafowl

ANSERIFORMES - ANATIDAE

Tadorna ferruginea Pallas, 1764

Ruddy Shelduck

Anas crecca Linnaeus, 1758

Common Teal

Anas acuta Linnaeus, 1758

Northern Pintail

Nettapus coromandelianus Gmelin, 1789

Cotton Teal

Anas poecilorhyncha J. R. Forster, 1781

Spot-billed Duck

Aythya ferina Linnaeus, 1758

Common Pochard

Anas clypeata Linnaeus, 1758

Shoveler

PICIFORMES - PICIDAE

Dinopium javanense (Ljungh, 1797)

Woodpecker (Indian Golden-backed)

MEGALAIMIDAE

Megalaima haemacephala (Statius Müller, 1776)

Coppersmith Barbet

Megalaima asiatica (Latham, 1790)

Blue throated Barbet

BUCEROTIFORMES - BUCEROTIDAE

Ocyrceros birostris (Scopoli, 1786)

Indian Grey Hornbill

UPUPIFORMES - UPUPIDAE

Upupa epops Linnaeus, 1758

Common Hoopoe

CORACIIFORMES - CORACIIDAE

Coracias benghalensis (Linnaeus, 1758)

Indian Roller

ALCEDINIDAE

Alcedo atthis Linnaeus, 1758

Common Kingfisher

HALCYONIDAE

Halcyon smyrnensis (Linnaeus, 1758)

White-throated Kingfisher

CERLIDAE

Ceryle rudis (Linnaeus, 1758)

Pied Kingfisher

MEROPIDAE

- Merops orientalis* Latham, 1802
Green Bee-eater
Merops leschenaulti Vieillot, 1817
Chestnut headed Bee eater
Merops persicus Pallas, 1773
Blue-cheeked Bee-eater

CUCULIFORMES - CUCULIDAE

- Cuculus micropterus* Gould, 1838
Indian Cuckoo
Surniculus lugubris (Horsfield, 1821)
Drongo Cuckoo
Eudynamys scolopacea (Linnaeus, 1758)
Asian Koel

CENTROPODIDAE

- Centropus sinensis* (Stephens, 1815)
Greater Coucal
Centropus bengalensis (Gmelin, 1788)
Lesser Coucal

PSITTACIFORMES - PSITTACIDAE

- Psittacula krameri* (Scopoli, 1769)
Rose-ringed Parakeet
Psittacula columboides (Vigors, 1830)
Malabar Parakeet

APODIFORMES - APODIDAE

- Collocalia unicolor* (Jerdon, 1840)
Indian Swiftlet
Apus affinis (Gray J.E., 1830)
House Swift

ACCIPITRIFORMES - ACCIPITRIDAE

- Milvus migrans* (Boddaert, 1783)
Black Kite
Haliastur indus (Boddaert, 1783)
Brahminy Kite
Circus aeruginosus (Linnaeus, 1758)
Marsh Harrier
Accipiter badius (Gmelin J.F., 1788)
Shikra

STRIGIFORMES - TYTONIDAE

- Tyto alba* Scopoli, 1769
Barn Owl

- Tyto capensis* (Smith,A, 1834)
Grass Owl

STRIGIDAE

- Glaucidium radiatum* (Tickell, 1833)
Jungle Owlet

COLUMBIFORMES - COLUMBIDAE

- Columba livia* Gmelin, JF, 1789
Rock Pigeon
Streptopelia senegalensis (Linnaeus, 1766)
Little Brown Dove
Streptopelia chinensis (Scopoli, 1786)
Spotted Dove
Streptopelia decaocto (Frisvaldszky, 1838)
Eurasian Collared-Dove

GRUIFORMES - GRUIDAE

- Grus virgo* (Linnaeus, 1758)
Demoiselle Crane

RALLIDAE

- Porphyrio porphyrio* (Linnaeus, 1758)
Purple Moorhen
Gallinula chloropus (Linnaeus, 1758)
Common Moorhen
Fulica atra Linnaeus, 1758
Common Coot
Amaurornis phoenicurus (Pennant, 1769)
White-breasted waterhen
Gallicrex cinerea (Gmelin, 1789)
Watercock

CICONIIFORMES - PTEROCLIDAE

- Pterocles exustus* Temminck, 1825
Indian Sandgrouse

SCOLOPACIDAE

- Gallinago gallinago* (Linnaeus, 1758)
Common Snipe
Limosa limosa (Linnaeus, 1758)
Black-tailed Godwit
Limosa lapponica (Linnaeus, 1758)
Bar-tailed Godwit
Tringa erythropus (Pallas, 1764)
Spotted Redshank

Tringa stagnatilis (Bechstein, 1803)
Marsh Sandpiper
Tringa glareola Linnaeus, 1758
Wood Sandpiper
Calidris minuta (Leisler, 1812)
Little Stint
Philomachus pugnax (Linnaeus, 1758)
Ruff

CHARADRIIDAE

Himantopus bimantopus (Linnaeus, 1758)
Black-winged Stilt
Charadrius dubius Scopoli, 1786
Little Ringed Plover
Charadrius alexandrinus Linnaeus, 1758
Kentish Plover
Vanellus malabaricus (Boddaert, 1783)
Yellow-wattled Lapwing
Vanellus gregarius (Pallas, 1771)
Red-wattled Lapwing
Cursorius coromandelicus (Gmelin, 1789)
Indian Courser

LARIDAE

Sterna aurantia Gray, JE, 1831
River Tern
Sterna hirundo Linnaeus 1758
Common Tern

PODICIPEDIDAE

Tachybaptus ruficollis (Pallas, 1764)
Little Grebe

ARDEIDAE

Egretta garzetta (Linnaeus, 1766)
Little Egret
Egretta gularis (Bosc, 1792)
Indian Reef Heron
Ardea cinerea Linnaeus, 1758
Grey Heron
Ardea goliath Cretzschmar, 1829
Giant Heron
Ardea purpurea Linnaeus, 1766
Purple Heron
Casmerodius albus Linnaeus, 1758
Great Egret

Mesophoyx intermedia (Wagler, 1829)
Intermediate Egret
Bubulcus ibis (Linnaeus, 1758)
Cattle Egret
Ardeola grayii (Sykes, 1832)
Indian Pond Heron
Nycticorax nycticorax (Linnaeus, 1758)
Black-crowned Night Heron

THRESKIORNITHIDAE

Plegadis falcinellus (Linnaeus, 1766)
Glossy Ibis
Threskiornis melanocephalus (Latham, 1790)
Black-headed Ibis
Pseudibis papillosa (Temminck, 1824)
Black Ibis
Platalea leucorodia Linnaeus, 1758
Spoonbill

CICONIIDAE

Mycteria leucocephala (Pennant, 1769)
Painted Stork
Anastomus oscitans (Boddaert, 1783)
Asian openbill
Ciconia episcopus (Boddaert, 1783)
Woolly-necked Stork
Ciconia ciconia (Linnaeus, 1758)
White Stork

PHALACROCORACIDAE

Phalacrocorax niger (Vieillot, 1817)
Little Cormorant
Phalacrocorax fuscicollis Stephens, 1826
Indian Cormorant
Phalacrocorax carbo (Linnaeus, 1758)
Great Cormorant

PASSERIFORMES - PITTIDAE

Pitta brachyura (Linnaeus, 1766)
Indian Pitta

LANIIDAE

Lanius isabellinus Hemprich et Ehrenberg, 1833
Rufous-tailed shrike
Lanius vittatus Valenciennes, 1826
Bay backed shrike

CORVIDAE

- Corvus splendens* Vieillot, 1817
House Crow
Corvus macrorhynchos Wagler, 1827
Large-billed Crow
Pericrocotus roseus (Vieillot, 1818)
Rosy Minivet
Pericrocotus cinnamomeus (Linnaeus, 1766)
Small Minivet
Pericrocotus erythropygius (Jerdon, 1840)
White-bellied Minivet
Rhipidura hypoxantha Blyth, 1843
White-throated Fantail
Dicrurus macrocercus Vieillot, 1817
Black Drongo
Tephrodornis pondicerianus (Gmelin, JF, 1789)
Common Woodshrike
Aegithina tiphia (Linnaeus, 1758)
Common Iora

MUSCICAPIDAE

- Monticola solitarius* (Linnaeus, 1758)
Blue Rock Thrush
Zoothera citrina (Latham, 1790)
Orange-headed Thrush
Muscicapa muttui (Layard, EL, 1854)
Brown-breasted Flycatcher
Luscinia brunnea (Hodgson, 1837)
Indian Blue Robin
Copsychus saularis (Linnaeus, 1758)
Oriental Magpie-Robin
Saxicoloides fulicata (Linnaeus, 1766)
Indian Robin
Saxicola torquata (Linnaeus, 1766)
Common Stonechat
Oenanthe oenanthe (Linnaeus, 1758)
Pied Chat

STURNIDAE

- Sturnus roseus* (Linnaeus, 1758)
Rosy Starling
Acridotheres tristis (Linnaeus, 1766)
Common Myna
Acridotheres ginginianus (Latham, 1790)
Bank Myna
Acridotheres fuscus (Wagler, 1827)
Jungle Myna
Sturnus pagodarum (Gmelin, JF, 1789)
Black Headed Myna

PARIDAE

- Parus major* Linnaeus, 1758
Great Tit

HIRUDINIDAE

- Hirundo smithii* Leach, 1818
Wire-tailed Swallow
Hirundo daurica (Laxmann, 1769)
Red-rumped Swallow
Hirundo fluviicola (Blyth, 1855)
Indian Cliff Swallow

PYCNONOTIDAE

- Pycnonotus cafer* (Linnaeus, 1766)
Red-vented Bulbul

CISTICOLIDAE

- Prinia hodgsonii* Blyth, 1844
Franklin's Wren Warbler
Prinia gracilis (Lichtenstein, 1823)
Streaked Wren Warbler
Prinia sylvatica Jerdon, 1840
Jungle Prinia

ZOSTEROPIDAE

- Zosterops palpebrosus* (Temminck, 1824)
Oriental White-eye

SYLVIIDAE

- Acrocephalus bistrigiceps* Swinhoe, 1860
Paddy field Warbler
Acrocephalus stentoreus (Hemprich et Ehrenberg, 1833)
Indian Great Reed Warbler
Orthotomus sutorius (Pennant, 1769)
Common Tailorbird
Graminicola bengalensis Jerdon, 1863
Large Grass Warbler
Macronous gularis (Horsfield, 1822)
Yellow-breasted Babbler
Turdoides caudatus (Dumont, 1823)
Common Babbler
Turdoides striatus (Dumont, 1823)
Jungle Babbler
Alcippe poioicephala (Jerdon, 1841)
Quaker Babbler

ALAUDIDAE

- Mirafra erythroptera* Blyth, 1845
Indian Bush lark
Calandrella raytal (Blyth, 1845)
Sand lark

NECTARINIIDAE

- Nectarinia zeylonica* (Linnaeus, 1766)
Purple rumped Sunbird
Nectarinia minima (Sykes, 1832)
Crimson-backed Sunbird
Nectarinia asiatica (Latham, 1790)
Purple Sunbird
Nectarinia lotenia (Linnaeus, 1766)
Loten's Sunbird
Aethopyga siparaja (Raffles, 1822)
Crimson Sunbird
Arachnothera longirostra (Latham, 1790)
Little Spiderhunter

PASSERIDAE

- Passer domesticus* (Linnaeus, 1758)
House Sparrow
Dendronanthus indicus (Gmelin, 1789)
Forest Wagtail
Motacilla alba Linnaeus, 1758
White Wagtail
Motacilla citreola Pallas, 1776
Yellow headed Wagtail
Motacilla flava Linnaeus, 1758
Yellow Wagtail
Anthus hodgsoni Richmond, 1907
Indian Tree Pipit
Ploceus benghalensis (Linnaeus, 1766)
Black-throated Weaver
Ploceus philippinus (Linnaeus, 1766)
Baya Weaver
Ploceus megarhynchus Hume, 1869
Finns Baya
Amandava amandava (Linnaeus, 1758)
Red Munia
Lonchura malabarica (Linnaeus, 1758)
Indian Silverbill

Lonchura punctulata (Linnaeus, 1758)

Spotted Munia

FRINGILLIDAE

- Melophus lathami* (Gray J.E., 1831)
Crested Bunting

CONCLUSION

The high value of the Simpson's index of diversity (0.8291) is an indication of richness of bird diversity in the Chandoli National Park. Some endemic species were recorded in this area such as Green Barbet (*Stactolaema olivacea*), Forest Warbler (*Artisornis moreau*), Small Sunbird (*Leptocoma minima*) and Rock Pigeon. Such a richness in birds species can largely be explained by the particular characteristics of the area. In fact, it includes a network of man-made reservoirs as feeding ground for both migratory and residential birds in the winter period. In addition, the secure and dense mixed forest made of big and thick trees provide good habitat and forage for bird species; and, finally, some sugar factories provide shelter for Swifts and Red vented Bulbuls (Nason, 1992).

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