

IMPORTANT BIRD AND BIODIVERSITY AREAS IN INDIA

Priority sites for Conservation

Revised and updated 2nd Edition Vol. I



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Priority sites for conservation

**Second Edition: Revised and Updated
Volume I**

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GOA

IN-GA



PARAG RANGNEKAR

Netravali Wildlife Sanctuary has more than 180 species of birds. It has been recently identified as an IBA

Goa (14° 53' to 15° 48' N and 73° 40' to 74° 21' E) is one of the smallest states of the country with an area of 3,70,200 ha. It became the twenty-fifth state of the Indian Union on May 30, 1987.

Goa is quite hilly, wedged between the Arabian Sea in the west and the Western Ghats (Sahyadri) in the east. The State is flanked by Sindhudurg district of Maharashtra in the north, Belgaum district of Karnataka in the east and Karwar district of Karnataka in the south. The Western Ghats which run north–south form the entire eastern boundary where Evergreen and Semi-Evergreen forests provide a habitat to many threatened and restricted range species of birds. Moist Deciduous forests, mostly secondary and degraded, occur along the foothills of the Sahyadris. The altitude in the State varies from sea level to 1,022 m.

The State can be divided into three main physical divisions:

(i) The coastal belt which is 133 km long with sandy bays, beaches and rocky headlands broken by the wide estuaries of the Mandovi and Zuari rivers. This area is mainly covered by coconut farms, salt pans, and saline and freshwater marshes. About 2000 ha along the coast are mangroves which form creeks and estuaries.

(ii) The midland region which is mainly plateau (30–200 m high) adjoins the sea in many places. This area is famous

for cashew trees, thorny scrub and coarse grass, but some parts are still covered with Semi-Evergreen forest. Moreover, the area is used for intensive cultivation of coconut, spices, fruit and paddy, mainly in the valleys. The area is also irreversibly degraded by large-scale opencast and strip mining for iron and manganese ore (Lainer 1999a).

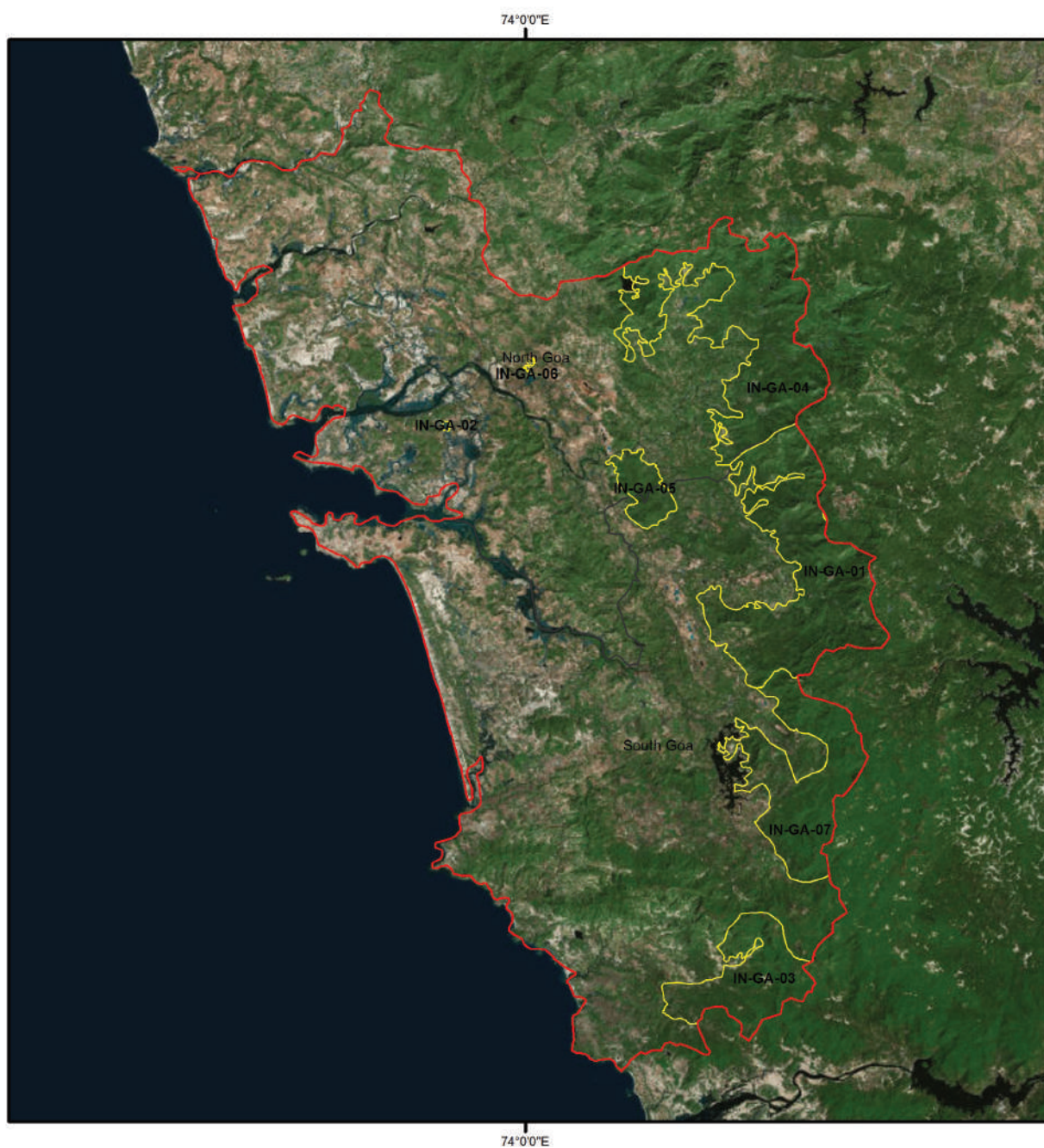
(iii) The Western Ghats, known as Sahyadris in the state, running on the eastern border of Karnataka and extending to about 125 km, form an arc. The Ghats are elevated up to 1,000 m. Here, Tropical Wet Evergreen forest and Tropical Moist Deciduous forest occur. Most parts of Goa come under the Endemic Bird Areas (Western Ghats EBA-123) identified by BirdLife International (Stattersfield *et al.* 1998), and some parts lie in the coastal plain.

Goa has an equable tropical climate. Winter temperatures range from 16 °C to 34 °C while in summer it is between 27 °C and 37 °C. The average annual rainfall is 3,100 mm, received mainly between June–September during the southwest monsoon period. The relative humidity is high. Even during the dry season, it is generally above 60%.

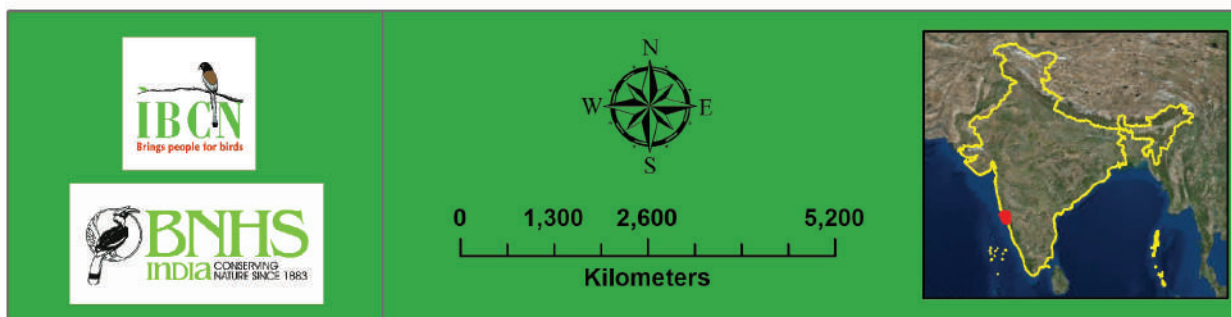
Despite its small size, Goa is extremely rich in flora and fauna. Sharma and Borker (2008) reported 251 species to which three species were added by Rangnekar and Dharwadkar (2009), taking the number tally to 254.

The total human population of the State is 14,57,723

Important Bird Areas in Goa



IN-GA



(2011 census), equally divided between the urban and rural areas. The population density is 390 persons per sq. km (2011 census). The literacy rate in the State is 88.70%. Goa has a large floating population of migrant workers and tourists.

Vegetation

There are three forest types in the State, namely Tropical Evergreen, Tropical Semi-Evergreen, and Littoral and Swamp forests. The recorded forest area of the State is 1,424 sq. km, which constitutes 38.47% of the geographical area. Of the total forest cover, about 86% belongs to the government and the remaining is privately-owned. According to legal classification, 16,500 ha is reserved forests and the remaining is unclassified (Ministry of Environment and Forests 2014). The State has two districts, North Goa (1,736 sq. km with 869 sq. km forest cover) and South Goa (1,966 sq. km with 1,226 sq. km forest cover).

The *Myristica* swamps of the Western Ghats are probably the remains of the ancient forests with a history of more than 140 million years (Chandran *et al.* 1999). These swamp forests are mainly described from southern Western Ghats in Karnataka, Tamil Nadu and Kerala. The northernmost *Myristica* swamp so far reported in the Western Ghats is from Bambar in Satari Taluk of Goa (Santhakumaran *et al.* 1995, 1996). Prabhugaonkar *et al.* (2014) have described three IUCN Red Listed plant species from a relic *Myristica* swamp at Brahma Karmali of Valpoi Taluka in Goa.

The State has more than 38% of its geographic area under government forests (1,224.38 sq. km.) of which about 62% has been brought under Protected Area Network (PAN). Since there is a substantial area under private forests and a large tract under plantations such as cashew, mango and coconut, the total forest and tree cover constitutes 56.6% of the geographic area.

IBAS AND PROTECTED AREAS

Goa has one national park and six wildlife sanctuaries covering an area of 75,496 ha and constituting 20.39% of the geographical area of the State (Rodgers *et al.* 2000). The protected areas are located mainly in the Western Ghats. In 2004, four IBAs were identified (Islam and Rahmani 2004). We have added three IBAs in this revised book: Bondla, Navelim and Netravali.

AVIFAUNA

The first ornithological study in Goa was conducted by Grubb and Ali (1976). During their 16-day survey in Molem, Canacona and Valpoi, they collected 150 specimens of 100 species and sight-recorded 54 species. Later, Rane (1984) added 33 species. Saha and Dasgupta (1992) compiled a checklist of 208 species. Based on 13 years of fairly intensive field studies and about 1300 field trips, Lainer (1999a, b) recorded 382 species. He covered all parts of Goa to study birds.



PARAG RANGNEKAR

Bondla Wildlife Sanctuary in north Goa is only 8 sq. km but it has Wet Evergreen, Semi-evergreen and Moist Deciduous Forest. It has 13 endemic species of the Western Ghats

IBAs of GOA		
IBA site codes	IBA site names	IBA criteria
IN-GA-01	Bhagwan Mahavir Wildlife Sanctuary	A1, A2, A3
IN-GA-02	Carambolim Lake & Dhado Wetlands	A1, A4i, A4iii
IN-GA-03	Cotigao Wildlife Sanctuary	A1, A2, A3
IN-GA-04	Mhadei Wildlife Sanctuary	A1, A2, A3
IN-GA-05	Bondla Wildlife Sanctuary	A1, A2, A3
IN-GA-06	Navelim Wetland	A1, A3, A4iii
IN-GA-07	Netravali Wildlife Sanctuary	A1, A2, A3

CRITICALLY ENDANGERED		
White-rumped Vulture	<i>Gyps bengalensis</i>	IN-GA-03
Long-billed Vulture	<i>Gyps indicus</i>	IN-GA-02, 03, 04

VULNERABLE		
Lesser Adjutant	<i>Leptoptilos javanicus</i>	IN-GA-01, 02, 03
Asian Woollyneck	<i>Ciconia episcopus</i>	IN-GA-01, 02, 03, 05, 06
Greater Spotted Eagle	<i>Clanga clanga</i>	IN-GA-02, 03
Indian Spotted Eagle	<i>Clanga hastata</i>	IN-GA-02, 03
Eastern Imperial Eagle	<i>Aquila heliaca</i>	Two records from Saligao in November 2005 and Pilerne Plateau in 2013
Nilgiri Wood-pigeon	<i>Columba elphinstonii</i>	IN-GA-01, 03, 04, 05, 07
Great Knot	<i>Calidris tenuirostris</i>	Most recent sightings have been from Morjim beach
Indian Skimmer	<i>Rynchops albicollis</i>	Only three records, two from Chapora in 1996 & one from Divar in 2007

NEAR THREATENED		
Painted Stork	<i>Mycteria leucocephala</i>	IN-GA-02, 03, 06
Black-headed Ibis	<i>Threskiornis melanocephalus</i>	IN-GA-02, 03, 06
Oriental Darter	<i>Anhinga melanogaster</i>	IN-GA-02, 03, 06
Pallid Harrier	<i>Circus macrourus</i>	IN-GA-02,
Black-tailed Godwit	<i>Limosa limosa</i>	IN-GA-02
Buff-breasted Sandpiper	<i>Tryngites subruficollis</i>	Single record from St. Cruz in November 2000, not from IBA
River Tern	<i>Sterna aurantia</i>	IN-GA-02
Alexandrine Parakeet	<i>Psittacula eupatria</i>	IN-GA-02, 03
Grey-headed Bulbul	<i>Pycnonotus priocephalus</i>	IN-GA-01, 04, 05, 07
Nilgiri Flycatcher	<i>Eumyias albicaudatus</i>	IN-GA-01, 04
Malabar Pied Hornbill	<i>Anthraceroceros coronatus</i>	IN-GA-01, 02, 03, 05, 06, 07

Restricted Range species

Stattersfield et al. (1998) identified 16 Restricted Range species in the Western Ghats, out of which nine were listed by Islam and Rahmani (2004) from the IBAs of Goa, mainly in Bhagwan Mahavir National Park, Mhadei WLS and Cotigao WLS. Rasmussen and Anderton (2005, 2012) and del Hoyo and Collar (2014) have made many taxonomic changes, with upgradation of many subspecies in to full species. Now, 26 endemic species are found in the Western Ghats. In Goa, which forms the Endemic Bird Area 123 of BirdLife International, 18 species have not been reported.

There are many wetlands in Goa that attract a large number of birds from November onwards (Shanbhag et al. 2001). Except for the Carambolim wetlands, where more than 25,000 waterbirds could be seen, other wetlands do not meet IBA criteria.

THREATS AND CONSERVATION ISSUES

The main threat is habitat loss and degradation. In the western part of the Western Ghats in Goa, the lowland

Evergreen and Semi-evergreen Rain forests probably once extended to the coastal plain but below 500 m almost all the forest has been cleared because of human encroachment. Livestock grazing and wood cutting in large quantities are the major threats to the forests. These threats lead to the shrinking of the habitat of the many threatened and restricted range species. Some parts of important habitats for birds are destroyed by mining (Lainer 1999a). Plantation which degrades the habitat of birds is another issue. In the Bhagwan Mahavir Wildlife Sanctuary and other IBAs, the State Government has opened many areas to tourists. Tourism needs to be regulated and controlled. Awareness programmes should be initiated with the collaboration of local NGOs and individuals, and widespread message about birds and biodiversity conservation should be initiated using the Indian Bird Conservation Network in Goa. Another conservation issue is the Mhadei Diversion Scheme proposed by the Karnataka Government. The diversion of the Mhadei River into the Malaprabha basin will have a devastating effect on the pristine forests of the Mhadei Valley. In this

ENDEMIC BIRD AREA 123: WESTERN GHATS

Nilgiri Wood-pigeon	<i>Columba elphinstonii</i>	IN-GA-01, 03, 04, 05, 07
Nilgiri Imperial-pigeon	<i>Ducula cuprea</i>	IN-GA-01, 04, 05, 07
Grey-fronted Green-pigeon	<i>Treron affinis</i>	IN-GA-01, 02, 03, 04, 05, 06, 07
Blue-winged or Malabar Parakeet	<i>Psittacula columboides</i>	IN-GA-01, 04, 05, 07
Malabar Grey Hornbill	<i>Ocyeros griseus</i>	IN-GA-01, 02, 03, 04, 05, 06, 07
Malabar Barbet	<i>Psilopogon (Megalaime) malabarica</i>	IN-GA-01, 04, 05, 07
Grey-headed Bulbul	<i>Pycnonotus priocephalus</i>	IN-GA-01, 04, 05, 07
Flame-throated Bulbul	<i>Pycnonotus gularis</i>	IN-GA-01, 04, 05, 07
Indian Rufous Babbler	<i>Turdoides subrufus</i>	IN-GA- 07
White-bellied Blue Flycatcher	<i>Cyornis pallipes</i>	IN-GA-01, 04, 05, 07
Nilgiri Flycatcher	<i>Eumyias albicaudatus</i>	IN-GA-01, 04
Wynaad Laughingthrush	<i>Garrulax (Dryonastes) delesserti</i>	IN-GA-01, 04
Small Sunbird	<i>Leptocoma minima</i>	IN-GA-01, 02, 03, 04, 05, 06, 07
Nilgiri Flowerpecker	<i>Dicaeum concolor</i>	IN-GA-01, 02, 03, 04, 05, 07
Vigor's Sunbird	<i>Aethopyga vigorsii</i>	IN-GA-05
Malabar Woodshrike	<i>Tephrodornis sylvicola</i>	IN-GA-01, 04, 05, 07
Malabar White-headed Starling	<i>Sturnia blythii</i>	IN-GA-01, 02, 03, 04, 05, 06, 07
White-bellied Treepie	<i>Dendrocitta leucogastra</i>	IN-GA-01, 04
Malabar Lark	<i>Galerida malabarica</i>	IN-GA-06

ecologically rich area, the Karnataka Government has planned a chain of seven diversion dams and three main dams for the Mhadei Hydroelectric Project. Besides these projects, Karnataka has plans to divert the Katka and Palna tributaries of the Dudhsagar/Khandepar river to the Supa and Kalinadi basins. This will affect the forest areas on the banks of these tributaries. Though there is a stay on the work by a court order, work on the dam site has progressed.

The Carambolim IBA has seen a lot of changes which have affected birdlife. The Konkan Railway Corporation is in the process of expansion and thus has filled up parts of the lake. A lot of real estate development in the catchment has lead to pollution of the lake and increased growth of *Salvinia molesta*. Though the growth has been controlled to a large extent, the water regime too seems to have been affected, first due to the construction of a bund and continuous impounding of water and secondly due to less use of the water by paddy farmers downstream, many of whom have abandoned farming completely. This has resulted in the collapse of the traditional system of draining and impounding water, a probable reason for less birds coming to the lake itself.

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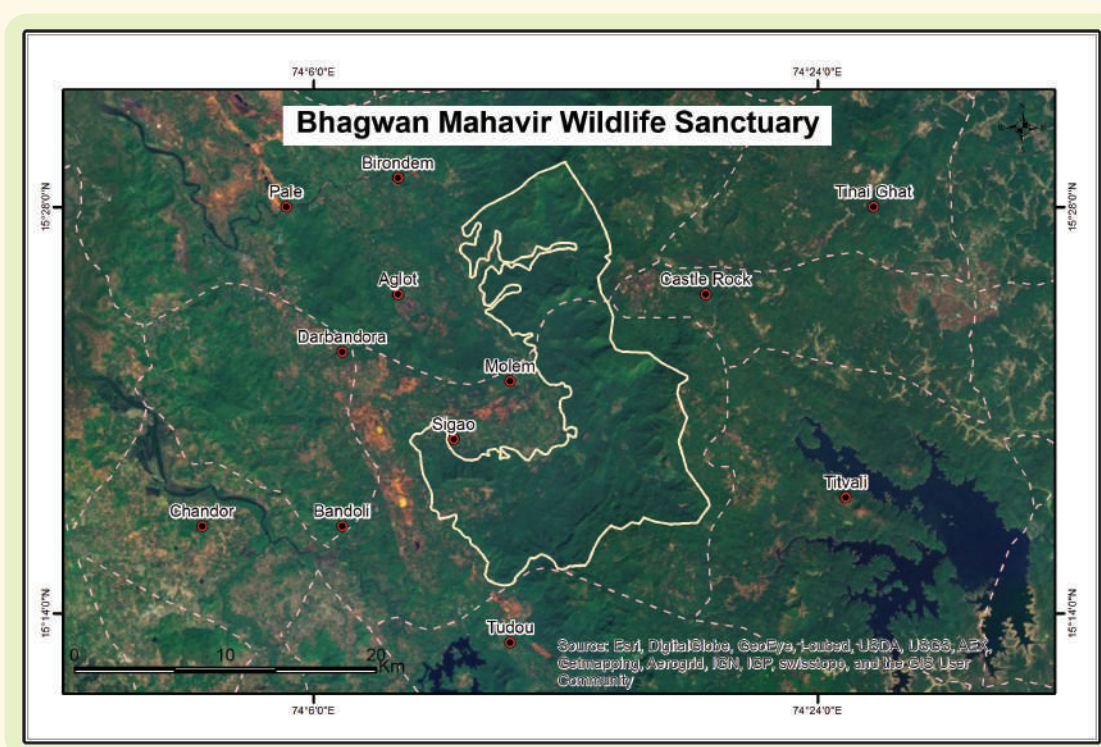
BHAGWAN MAHAVIR WILDLIFE SANCTUARY

IN-GA-01

IBA Site	: IN-GA-01	Altitude	: 780 msl
State	: Goa	Rainfall	: >3,000 mm
District	: South Goa	Temperature	: 15 °C to 35 °C
Coordinates	: 15° 19' 32" N, 74° 01' 27" E	Biogeographic Zone	: Western Ghats
Ownership	: State	Habitats	: Tropical Wet Evergreen Forest, Tropical Moist Deciduous Forest, Tropical Semi-evergreen Forest
Area	: 14,852 ha (WLS + NP)		

IBA CRITERIA : A1 (Threatened species), A2 (Endemic Bird Area 123: Western Ghats),
A3 (Biome 10: Indian Peninsula Tropical Moist Forest)

PROTECTION STATUS : Wildlife Sanctuary established in 1976, National Park established in 1978.



GENERAL DESCRIPTION

Bhagwan Mahavir Wildlife Sanctuary is located in the Dharbandhora *taluka* on the eastern border of Goa, along the Western Ghats. It was earlier called the Mollem Game Sanctuary but was renamed in 1976 after the Jain saint Bhagwan Mahavir. The core area of 107 sq. km was declared as Mollem National Park vide notification dated April 13, 1978. National Highway NH 4A and Mormugao-Londa railway line run through the sanctuary. Collem Railway Station lies within the sanctuary area.

Many small rivulets flow through the sanctuary in the monsoon, but dry up in summer. Dudhsagar, a perennial river, flows through the heart of the sanctuary. Besides

flora and fauna, there are many important geological and historical features in the sanctuary. Dudhsagar Falls, about an hour's journey from Collem Railway Station by train, is a popular tourist spot. The Devil Canyon is a splendid example of geological rock formation. The Shaiva Tambdi Surla Temple is about 13 km from Mollem.

Due to luxuriant tree growth in the forest, the canopy is almost closed and the availability of grass is very limited. Evergreen vegetation is mainly seen on higher altitudes and along the riverbanks. The main vegetation types are West Coast Tropical Evergreen Forest, West Coast Semi-evergreen Forest and Moist Deciduous Forest.



Bhagwan Mahaveer Wildlife Sanctuary earlier, known as Mollem Game Sanctuary, has luxurious vegetation mainly from the higher altitudes and along the river bank. The main vegetation types are West Coast Tropical Evergreen Forest, West Coast Semi-evergreen Forest and Moist Deciduous Forest

AVIFAUNA

Nearly 200 species of birds have been reported from this sanctuary, including Western Ghats endemics. The Malabar Pied Hornbill *Anthracoceros coronatus* is found all over the sanctuary. The Indian Black Woodpecker or White-bellied Woodpecker *Dryocopus javensis* can be seen in most parts of the sanctuary. It was seen nesting in Dudhsagar area (Harvey D'Souza, *pers. comm.* 2002).

According to Harvey D'Souza (*pers. comm.* 2003), the Nilgiri Wood-pigeon *Columba ephinstonii*, Blue-winged Parakeet or Malabar Parakeet *Psittacula columboides*, Malabar Grey Hornbill *Ocyrceros griseus*, Grey-headed Bulbul *Pycnonotus priocephalus*, Nilgiri Imperial-pigeon, *Dacula badia*, Nilgiri Flycatcher *Eumyias albicaudatus*, White-bellied Blue Flycatcher *Cyornis pallipes*, Wynaad Laughingthrush *Garrulax (Dryonastes) delesserti*, Grey-fronted Green-pigeon *Treron affinis*, and Small Sunbird *Nectarinia minima* are present in this IBA. The White-bellied Treepie *Dendrocitta leucogastra* is reported from Dudhsagar area, a popular tourist and birdwatching destination. These birds are listed as restricted-range by Stattersfield *et al.* (1998) under the Western Ghats Endemic Bird Area 123. It should be noted that earlier *Treron affinis* was considered as a subspecies of Pompadour Green Pigeon

Treron pompadora, till Rasmussen and Anderton (2005) elevated it to full species, endemic to the Western Ghats.

Within its 14,852 ha area, Bhagwan Mahavir Wildlife Sanctuary has excellent Wet Evergreen, Semi-evergreen, and Moist Deciduous forests. Based on BirdLife International's (undated) classification of biomes, this site would lie in Biome 10 (Indian Peninsula Tropical Moist Forest) in which 15 bird species have been identified as representatives of this biome's bird assemblages. Six of them have been located so far, perhaps more await discovery in this IBA.

Heinz Lainer (*pers. comm.* 2003) has seen Lesser Adjutant *Leptoptilos javanicus*.

This site qualifies for three IBA criteria: A1 (Threatened species), A2 (Restricted-range species) and A3 (Biome-restricted species).

OTHER KEY FAUNA

The Tiger *Panthera tigris* forms the apex trophic level in the sanctuary, followed by the Leopard *Panthera pardus*. Large herbivores include Gaur *Bos gaurus*, Sambar *Rusa unicolor*, Spotted Deer *Axis axis*, and Barking Deer *Muntiacus muntjak*. Indian Mouse Deer *Moschiola indica* is also found here. Other important mammals of the site are Indian Pangolin *Manis crassicaudata*, Slender Loris

VULNERABLE

Lesser Adjutant	<i>Leptoptilos javanicus</i>
Nilgiri Wood-pigeon	<i>Columba elphinstonii</i>
Asian Woollyneck	<i>Ciconia episcopus</i>

NEAR THREATENED

Grey-headed Bulbul	<i>Microtarsus priocephalus</i>
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ENDEMIC BIRD AREA 123: WESTERN GHATS

Nilgiri Wood-pigeon	<i>Columba elphinstonii</i>
Nilgiri Imperial-pigeon	<i>Dacula badia cupria</i>
Grey-fronted Green-pigeon	<i>Treron affinis</i>
Malabar Parakeet	<i>Psittacula columboides</i>
Malabar Grey Hornbill	<i>Ocyrceros griseus</i>
Malabar Barbet	<i>Megalaima malabarica</i>
Flame-throated Bulbul	<i>Pycnonotus gularis</i>
Small Sunbird	<i>Leptocoma minima</i>
Nilgiri Flycatcher	<i>Eumyias albicaudatus</i>
White-bellied Blue-flycatcher	<i>Cyornis pallipes</i>
Wynaad Laughingthrush	<i>Garrulax (Dryonastes) delesserti</i>
White-bellied Treepie	<i>Dendrocitta leucogastra</i>
Nilgiri Flowerpecker	<i>Dicaeum concolor</i>
Malabar Woodshrike	<i>Tephrodornis sylvicola</i>
Malabar Starling	<i>Sturnia blythii</i>

BIOME 10: INDIAN PENINSULA TROPICAL MOIST FOREST

Malabar Trogan	<i>Harpactes fasciatus</i>
Malabar Pied Hornbill	<i>Anthracoceros coronatus</i>
White-cheeked Barbet	<i>Megalaima viridis</i>
Indian Scimitar-babbler	<i>Pomatorhinus horsfieldii</i>
Loten's Sunbird	<i>Cinnyris lotenius</i>
Blue-faced Malkoha	<i>Phaenicophaeus viridirostris</i>
Jerdon's Nightjar	<i>Caprimulgus atripennis</i>
Yellow-browed Bulbul	<i>Acritillas indica</i>
Malabar Whistling-thrush	<i>Myophonus horsfieldii</i>
Black-headed Babbler	<i>Rhopocichla atriceps</i>
Black-throated Munia	<i>Lonchura kelaarti</i>
Sri Lanka Frogmouth	<i>Batrachostomus moniliger</i>

Loris lydekkerianus, Crested Porcupine *Hystrix indica*, Small Indian Civet *Viverricula indica*, and Indian Giant Flying Squirrel *Petaurista philippensis*. The King Cobra *Ophiophagus hannah* represents the main reptilian fauna.

The sanctuary also holds good diversity of insects, especially butterflies and dragonflies. The Malabar Tree Nymph *Idea malabarica*, Southern Birdwing *Triodes minos*, Malabar Banded Peacock *Papilio buddha*, Malabar Flash *Rapala lankana*, Five-bar Swordtail *Graphium antiphates*, Malabar Banded Swallowtail *Papilio liomedon*, Aberrant Oakblue *Arhopala abseus*, Tamil Oakblue *Arhopala bazaloides*, and Banded Royal *Rachana jalindra* have been

sighted in the sanctuary (Parag Rangnekar, *pers. comm.*). The sanctuary is very promising for dragonflies too and one species new to science, *Idionyx gomantakensis*, has been described from Collem (Subramanian *et al.* 2012).

LAND USE

- Nature conservation and research
- Tourism and recreation

THREATS AND CONSERVATION ISSUES

- Tourism and recreation

Presently, there is no major threat to this sanctuary as it is fully notified, and has very few settlements inside it. Dudhsagar waterfall, that originates in Karnataka, is within the boundary of the sanctuary. At Dudhsagar (*dudh* = milk, *sagar* = sea), the water descends from a height of 200 m, churning and foaming through a wide gorge, looking like a sea of milk. This is a major tourist attraction. Unfortunately, there is no attempt by the authorities to inform tourists that this sanctuary is a birdwatcher's paradise. Further, the total number of vehicles operating on the route exceeds 400, with more than 200 vehicles plying through the sanctuary every day, which exerts a lot of pressure.

At present, the sanctuary is inaccessible from June till November (monsoon period). Lately, plans have been announced by the Government to build an all-weather tar road for tourists. This will involve widening the existing road, building bridges on the numerous streams, and will result in more tourism-related impacts.

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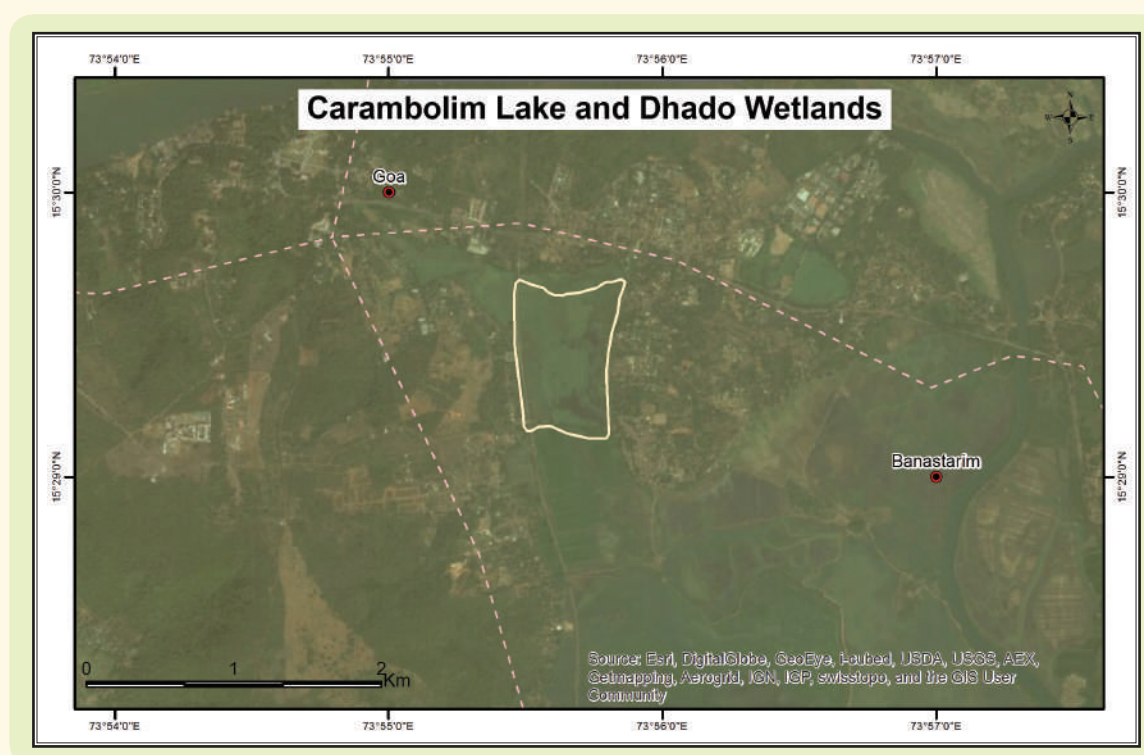
CARAMBOLIM LAKE AND DHADO WETLANDS

IN-GA-02

IBA Site Code	: IN-GA-02	Altitude	: 5–10 msl
State	: Goa	Rainfall	: Not available
District	: North Goa	Temperature	: Not available
Coordinates	: 15° 22' 60" N, 73° 49' 60" E	Biogeographic Zone	: Western Ghats
Ownership	: State, Community	Habitats	: Freshwater Lake,
Area	: 72 ha		Estuarine Swamp

IBA CRITERIA : A1 (Threatened species), A2 (Endemic Bird Area 123: Western Ghats), A3 (Biome-restricted species), A4i ($\geq 1\%$ of biogeographic population), A4iii ($\geq 20,000$ waterbirds)

PROTECTION STATUS : Not officially protected.



GENERAL DESCRIPTION

Carambolim Lake also known as Karmali is situated in Tiswadi *taluka*, c. 12 km from Panjim, the capital of Goa. It is spread over an area of 70 ha, of which 40 ha is under water for most of the year. This lake is one of the numerous minor irrigation tanks that have been developed in Goa for growing paddy. They are made by the impoundment of run-off during the monsoon. They are a natural source of fish, because every year, before the monsoon, the remaining water is drained out to empty the tanks and the fish are harvested. The sluice gates of Carambolim Lake at the southeastern side are kept closed from late July to early May next year. The impounded water is used for irrigation of paddyfields in the lower reaches on the southern side of the

lake (Shanbhag *et al.* 2001). The western embankment of the lake serves as the base for the recently laid Konkan railway track, while the eastern side has been partially cleared of its scrub forests, and mango and cashew groves, to pave the way for the construction of residential buildings. Coconut and mango trees fringe the remaining sides of the lake. The water depth is between 1.5 m to 3 m, depending upon the season. Southward of Carambolim Lake lies Dhado wetland, which extends over an area of 880 ha. This area is part of the estuarine zone of the Mandovi and Zuari rivers, connected by the Cumbarzua canal, which forms the western boundary of Dhado wetland. Being an estuarine zone between Mandovi and Zuari, the level of water depends on the tides and the flow rate of both the rivers. This area is highly productive

and is fringed by mangroves. Agricultural fields dot Dhado wetland on its northern and western sides.

The main vegetation at Carambolim Lake consists of *Nymphaea stellata*, a rooted plant with floating leaves, *Oryza rufipogon*, an emergent wild paddy, and submerged *Hydrilla verticillata*. At Dhado wetland, *Oryza rufipogon* and the sedge *Elaecharis* sp. dominate, while *Rhizophora mucronata* and *Avicennia officinalis* are the dominant mangrove species.

AVIFAUNA

Carambolim Lake has been monitored closely since the mid 1980s by Heinz Lainer, who reported over 75,000 waterfowl at Carambolim in the winter of 1987–1988, when large parts of India were affected by drought, while Goa had an adequate monsoon (Lainer 1999). Between January 1996 and June 1998, 92 species of birds including 17 winter visitors were reported from Carambolim Lake (Shanbhag *et al.* 2001). In 1997, they reported the presence of 25,590 waterfowl, of which Northern Pintail *Anas acuta* numbered 15,187, Lesser Whistling-duck *Dendrocygna javanica* numbered 4,957 and Eurasian Coot *Fulica atra* numbered 347. According to Lainer (1999), in a normal year, over 35,000 waterbirds could be found in this wetland.

Syngenta Biosciences Pvt. Limited, a manufacturer of insecticides, pesticides, and related chemical formulations, is located close to Carambolim Lake. There are two shallow ponds within the premises of this factory, where one of Goa's well documented heronries exists. These two ponds are also a safe haven to quite a number of migrant and vagrant Ciconiidae and Threskiornithidae (Lainer 1999). Lainer reports 200 pairs of Little Cormorant *Phalacrocorax niger*, 35 pairs of Purple Heron *A. purpurea*, and Large Egret *Ardea alba* breeding at this heronry, while Painted Stork *Mycteria leucocephala*, Asian Woollyneck *Ciconia episcopus*, and White Stork *Ciconia ciconia* have been found roosting.

Historically, Dhado wetland has received very little attention primarily because of its inaccessibility. Recent construction of a motorable road facilitates birdwatchers to visit this wetland more often. The dry fields on the northern side of Dhado wetland are well known for raptors. There are historical records of the Critically Endangered Long-billed Vulture *Gyps indicus* from this site. The Eurasian Marsh Harrier *Circus aeruginosus*, Pallid Harrier *Circus macrourus*, and Greater Spotted-eagle *Clanga clanga* have been regularly reported from this wetland (Parag Rangnekar *in litt.* 2014). On November 2012, Paresch Gosavi reported Pied Avocet *Recurvirostra avosetta* from Dhado wetland, which is a new record for the state. On January 2013, a large congregation of Small Pratincole *Glareola lactea* numbering 220 individuals was reported from Dhado wetland (Pronoy Baidya, *pers. comm.* 2014). This wetland is also an excellent wintering ground for other members of Recurvirostridae,

Charadriidae, Scolopacidae, and Glareolidae. The site is one of the few known breeding and nesting sites of the Streaked Weaver *Ploceus manyar* in Goa. The eastern edge of Dhado wetland, towards Cumbarzua canal, is the domain of the Collared Kingfisher *Todiramphus chloris* which is endemic to Goa and possibly distinct from other races (Praveen Jayadevan, *pers. comm.* 2014).

Till date, 213 avian species have been reported from the Carambolim-Dhado wetland complex, which include one Critically Endangered (historical record), four Vulnerable and five Near Threatened species (A1: Threatened species), five restricted-range species of Western Ghats (A2: Range-restricted species), five Biome 10 species of Indian Peninsula

CRITICALLY ENDANGERED

Long-billed Vulture	<i>Gyps indicus</i>
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VULNERABLE

Lesser Adjutant	<i>Leptoptilos javanicus</i>
Asian Woollyneck	<i>Ciconia episcopus</i>
Greater Spotted Eagle	<i>Clanga clanga</i>
Indian Spotted Eagle	<i>Clanga hastata</i>

NEAR THREATENED

Oriental Darter	<i>Anhinga melanogaster</i>
Black-headed Ibis	<i>Threskiornis melanocephalus</i>
Malabar Pied Hornbill	<i>Anthraceroceros coronatus</i>
Alexandrine Parakeet	<i>Psittacula eupatria</i>
Painted Stork	<i>Mycteria leucocephala</i>

ENDEMIC BIRD AREA 123: WESTERN GHATS

Grey-fronted Green-pigeon	<i>Treron affinis</i>
Small Sunbird	<i>Leptocoma minima</i>
Nilgiri Flowerpecker	<i>Dicaeum concolor</i>
Malabar Starling	<i>Sturnia blythii</i>

BIOME 10: INDIAN PENINSULA TROPICAL MOIST FOREST

Malabar Pied Hornbill	<i>Anthraceroceros coronatus</i>
White-cheeked Barbet	<i>Psilopogon viridis</i>
Black-throated Munia	<i>Lonchura kelaarti</i>
Long-billed Sunbird (Loten's Sunbird)	<i>Cinnyris lotenius</i>
Blue-faced Malkoha	<i>Phaenicophaeus viridirostris</i>

BIOME 11: INDO-MALAYAN TROPICAL DRY ZONE

Indian Peafowl	<i>Pavo cristatus</i>
Plum-headed Parakeet	<i>Psittacula cyanocephala</i>
Ashy Prinia	<i>Prinia socialis</i>
Jungle Babbler	<i>Turdoides striata</i>
Tawny-bellied Babbler	<i>Dumetia hyperythra</i>
Indian Robin	<i>Copsychus fulicatus</i>
Brown-headed Barbet	<i>Psilopogon zeylanicus</i>
Common Woodshrike	<i>Tephrodornis pondicerianus</i>
White-bellied Drongo	<i>Dicrurus caerulescens</i>
Black-rumped Flameback	<i>Dinopium benghalense</i>
Small Minivet	<i>Pericrocotus cinnamomeus</i>
Black-headed Cuckooshrike	<i>Lalage melanoptera</i>
Ashy Woodswallow	<i>Artamus fuscus</i>

Tropical Moist Forest, and 13 Biome 11 species of the Indo-Malayan Tropical Dry Zone (A3: Biome-restricted species).

Carambolim-Dhado wetland complex qualifies for A4iii criteria (the site is known or thought to hold, on a regular basis, 20,000 waterbirds), and A4i criteria (the site is known or thought to hold, on a regular basis >1% of a biogeographical population of a congregatory waterbird species). Over 4,000 Garganey *Anas querquedula* regularly winter at this IBA (Lainer 1999), the 1% threshold being 2,500 (Wetlands International 2012).

OTHER KEY FAUNA

The Smooth-coated Otter *Lutrogale perspicillata* is one of the regular mammal resident of this wetland (Atul S. Borkar, *pers. comm.*) and is protected under Schedule II, Part II of the Wildlife (Protection), Act 1972. The Indian Flapshell Turtle *Lissemys punctata*, Mugger Crocodile *Crocodylus palustris*, Indian Rock Python *Python molurus* (listed in Schedule I, Part II), and Indian Cobra *Naja naja* (listed in Schedule II, Part II) are some of the important reptiles found in this region.

LAND USE

- Irrigation
- Fishing

THREATS AND CONSERVATION ISSUES

One of the biggest threats faced by Carambolim Lake in the past was the construction of the railway track of the Konkan Railway Project, very close to the lake. Facing stiff resistance from environmentalists, Konkan Railway Corporation Ltd agreed to shift the line, so as to minimize damage to the wetland. The railway project commenced in 1990 and took eight years to complete. During the construction period in 1995–1996, there was a lot of disturbance near Carambolim Lake as nearly 200 labourers, and 20–30 trucks moved per hour, but once the railway track was completed, birds started returning, and now they have become used to the movement of trains (Shanbhag *et al.* 2001). Under pressure from conservationists, Konkan Railway Ltd planted a large number of trees on the track

embankments, to muffle the sounds of moving trains, and declared the areas as ‘no hooting zone’. These steps have helped to restore the birdlife of this important IBA of Goa. In mid 2012, Konkan Railway Corporation Ltd started laying a second track by filling up part of the lake and cutting down the trees on the western end of the lake, which was a roosting site for Little Cormorant. Till the end of 2013, the entire area was highly disturbed.

There is long-term and irreversible disturbance from private encroachment at the northern end of Carambolim Lake. Sewage, solid waste generated by the local population, and silt deposition are the other major threats being faced by the lake. Dhado wetland is comparatively less disturbed than the lake, primarily due to the lack of proper access roads, but pollution caused upstream is causing damage to the mangrove sections of the wetland. To protect the area from further encroachment and development threats, Carambolim Lake needs to be protected under the new category of Community Reserve in the modified Indian Wildlife (Protection) Act.

The traditional systems of management of this man-made lake, such as regular draining of the water during monsoon, cultivation on the base of the lake, and later use of water for irrigation for the winter crop, are not being followed since the community around has begun to abandon paddy cultivation. The lack of these management systems seems to be having a negative impact on the health of the lake itself, which in turn affects bird numbers.

KEY CONTRIBUTORS

Heinz Lainer, A.B. Shanbhag, Parag Rangnekar, Pronoy Baidya

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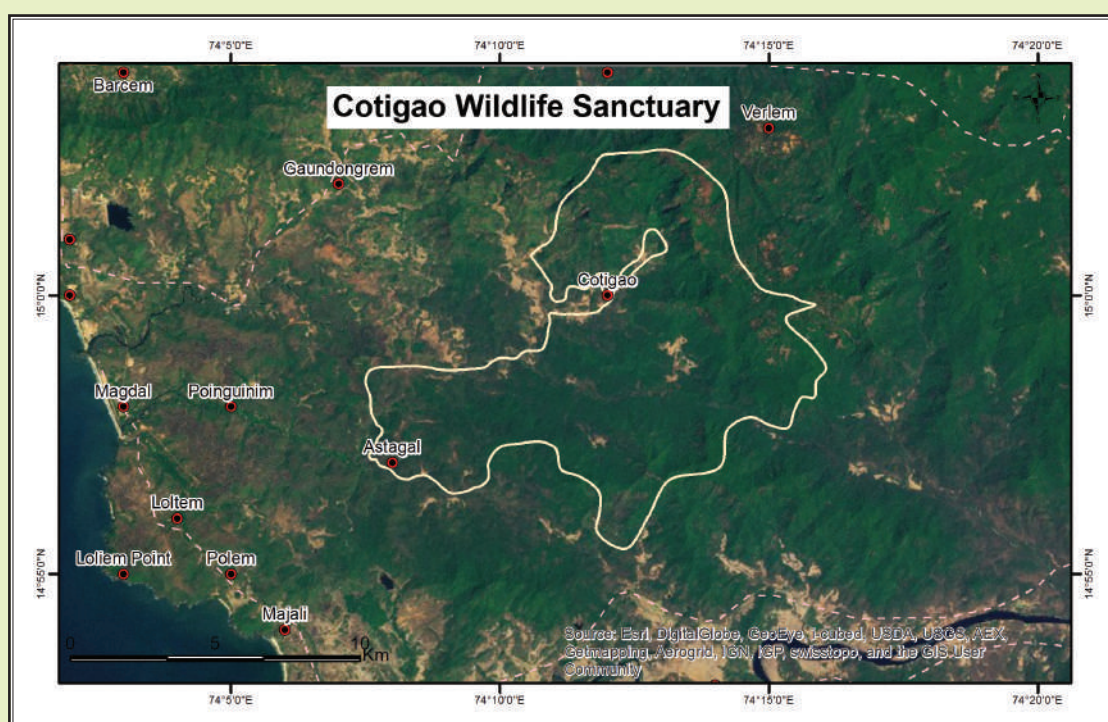
COTIGAO WILDLIFE SANCTUARY

IN-GA-03

IBA Site Code	: IN-GA-03	Area	: 8,565 ha
State	: Goa	Altitude	: 500 msl
District	: South Goa	Rainfall	: 2,500 mm
Coordinates	: 14° 59' 04" N, 74° 12' 13" E	Temperature	: 21 oC to 35 oC
Ownership	: State	Biogeographic Zone	: Western Ghats
		Habitats	: Tropical Wet Evergreen Forest

IBA CRITERIA : A1 (Threatened species), A2 (Endemic Bird Area 123: Western Ghats),
A3 (Biome 10: Indian Peninsula Tropical Moist Forest)

PROTECTION STATUS : Wildlife Sanctuary, established in December 1967.



GENERAL DESCRIPTION

The Cotigao Wildlife Sanctuary, in Canacona *taluka*, is 10 km southeast of Chaudi. The IBA lies partly in the Western Ghats. It was established in 1969 to protect a remote and vulnerable area of forest lining the Goa-Karnataka interstate border. The terrain is hilly and includes undulating uplands. Many small rivulets flow through the sanctuary in the monsoon, but dry up in summer. The ancient Jeevottam Partagal Math, noted for Vedic studies, lies in the vicinity of the sanctuary. Both the Galgibaga and Talpona rivers of Canacona *taluka* originate from the sanctuary.

The main vegetation types are West Coast Tropical Evergreen Forest, West Coast Semi-evergreen Forest, and Moist Deciduous Forest. The evergreen forests are mainly present at higher altitudes and on riversides.

AVIFAUNA

Not much is known about the birdlife of Cotigao, but Anil Pinto (*pers. comm.* 2002) has reported Nilgiri Wood-pigeon *Columba elphinstonii*, a globally Threatened species (BirdLife International 2001). White-rumped Vulture *Gyps bengalensis* used to occur about 20 years ago, but now there is no confirmed record. The site lies in the Western Ghats Endemic Bird Area (EBA 123) in which Stattersfield *et al.* (1998) listed 16 species as restricted range. Due to recent changes in bird classification (*see* Rasmussen & Anderton 2012), 28 species are now listed as endemic to the Western Ghats. Six of these have been seen in Cotigao, but more are likely to be found once detailed studies are conducted.

Of the 15 Biome 10 species (BirdLife International, *undated*), 12 are reported from Cotigao. Of the remaining

CRITICALLY ENDANGERED

Long-billed Vulture	<i>Gyps indicus</i>
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VULNERABLE

Lesser Adjutant	<i>Leptoptilos javanicus</i>
Asian Woollyneck	<i>Ciconia episcopus</i>
Greater Spotted Eagle	<i>Clanga clanga</i>
Indian Spotted Eagle	<i>Clanga hastata</i>

NEAR THREATENED

Oriental Darter	<i>Anhinga melanogaster</i>
Black-headed Ibis	<i>Threskiornis melanocephalus</i>
Malabar Pied Hornbill	<i>Anthraceroceros coronatus</i>
Alexandrine Parakeet	<i>Psittacula eupatria</i>
Painted Stork	<i>Mycteria leucocephala</i>

ENDEMIC BIRD AREA 123: WESTERN GHATS

Grey-fronted Green-pigeon	<i>Treron affinis</i>
Small Sunbird	<i>Leptocoma minima</i>
Nilgiri Flowerpecker	<i>Dicaeum concolor</i>
Malabar Starling	<i>Sturnia blythii</i>

BIOME 10: INDIAN PENINSULA TROPICAL MOIST FOREST

Malabar Pied Hornbill	<i>Anthraceroceros coronatus</i>
White-cheeked Barbet	<i>Psilopogon viridis</i>
Black-throated Munia	<i>Lonchura kelaarti</i>
Long-billed Sunbird (Loten's Sunbird)	<i>Cinnyris lotenius</i>
Blue-faced Malkoha	<i>Phaenicophaeus viridirostris</i>

BIOME 11: INDO-MALAYAN TROPICAL DRY ZONE

Indian Peafowl	<i>Pavo cristatus</i>
Plum-headed Parakeet	<i>Psittacula cyanocephala</i>
Ashy Prinia	<i>Prinia socialis</i>
Jungle Babbler	<i>Turdoides striata</i>
Tawny-bellied Babbler	<i>Dumetia hyperythra</i>
Indian Robin	<i>Copsychus fulicatus</i>
Brown-headed Barbet	<i>Psilopogon zeylanicus</i>
Common Woodshrike	<i>Tephrodornis pondicerianus</i>
White-bellied Drongo	<i>Dicrurus caeruleus</i>
Black-rumped Flameback	<i>Dinopium benghalense</i>
Small Minivet	<i>Pericrocotus cinnamomeus</i>
Black-headed Cuckooshrike	<i>Lalage melanopecta</i>
Ashy Woodswallow	<i>Artamus fuscus</i>

three, the Sri Lanka Frogmouth *Batrachostomus moniliger* too occurs in the thick Tropical Evergreen Forest of the IBA. The Indian Edible-nest Swiftlet *Collocalia unicolor* “may be encountered anywhere in Goa, but most frequently in c. 5 km deep strip along the coast” (Lainer 1999). It is also likely to occur in Cotigao, although it has not been reported from here. The Hill Swallow *Hirundo domicola* (called Pacific Swallow *H. tahitica* by Grimmett *et al.* 1999, House Swallow by Lainer 1999), a bird of the southern Western Ghats, is reported as stray in Goa.

OTHER KEY FAUNA

The Leopard *Panthera pardus* is the apex predator in this small sanctuary, feeding mainly on Sambar *Rusa unicolor*, Barking Deer *Muntiacus muntjak*, and Mouse

Deer *Moschiola indica*. Gaur *Bos gaurus* is also found, but the adult is too large a prey for a leopard. The Indian Giant Flying Squirrel *Petaurista philippensis* is present. Slender Loris *Loris lydekkerianus* and Indian Pangolin *Manis crassicaudata* are present, but difficult to see due to their nocturnal habit. Small Indian Civet *Viverricula indica* and Golden Jackal *Canis aureus* are the smaller predators. Cotigao has many interesting reptiles, including King Cobra *Ophiophagus hannah*, but not much is known about them. Similarly, the freshwater fish have not been adequately surveyed.

The sanctuary is also home to a diverse invertebrate population including lepidopterans, odonates, and arachnids. A species of butterfly endemic to the southern Western Ghats, the Tamil Catseye *Zipaetis saitis* documented for the first time from the state, was sighted only in this sanctuary (Parag Rangnekar *pers. comm.* 2013, *paper in prep.*).

LAND USE

- Nature conservation

THREATS AND CONSERVATION ISSUES

- Encroachment
- Livestock Grazing

Despite the fact that Cotigao is a fully notified wildlife sanctuary, livestock grazing is still a problem, due to some hamlets which are within the sanctuary boundary.

KEY CONTRIBUTORS

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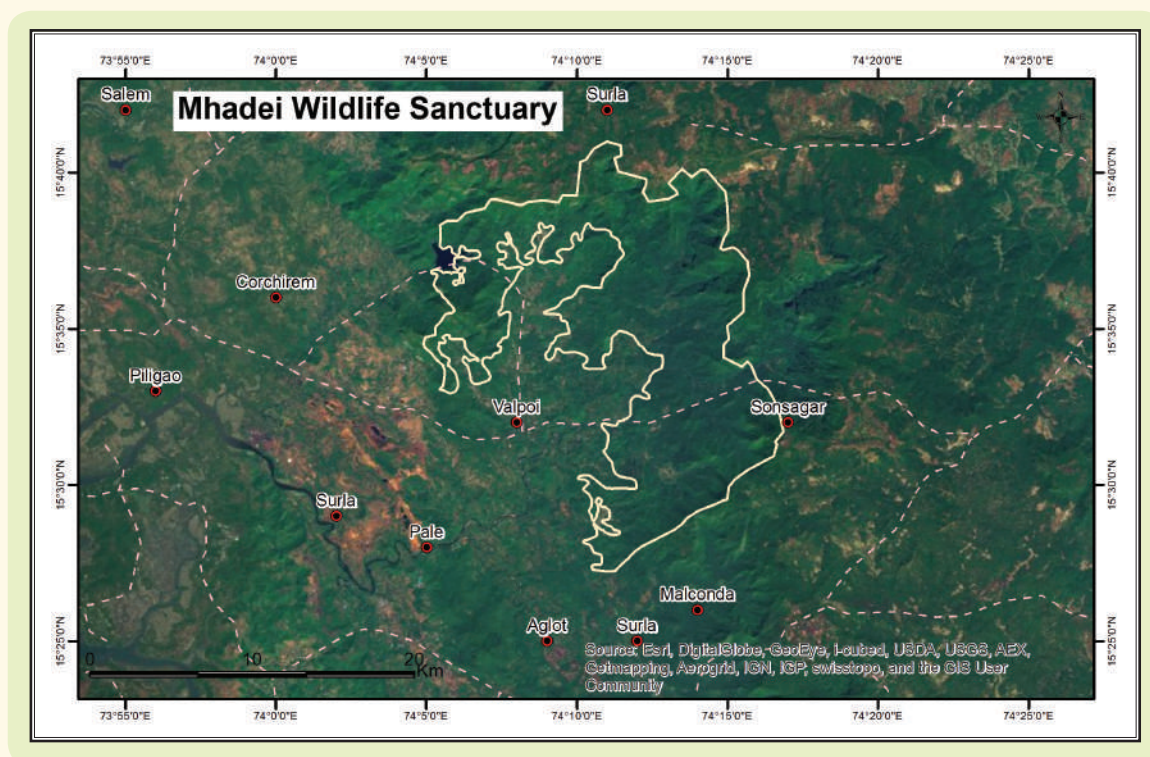
MHADEI WILDLIFE SANCTUARY

IN-GA-04

IBA Site Code	: IN-GA-04	Altitude	: 800 msl
State	: Goa	Rainfall	: 3,000 mm
District	: North Goa	Temperature	: 17 °C to 34°C
Coordinates	: 15° 37' 34" N, 74° 12' 22" E	Biogeographic Zone	: Western Ghats
Ownership	: State	Habitats	: Riverine Vegetation, Littoral Forest
Area	: 20,848 ha		

IBA CRITERIA : A1 (Threatened species), A2 (Endemic Bird Area 123: Western Ghats),
A3 (Biome 10: Indian Peninsula Tropical Moist Forest)

PROTECTION STATUS : Wildlife Sanctuary, established in May 1999.



GENERAL DESCRIPTION

This IBA site was named after the river Mhadei (Mandovi) which is considered to be the lifeline of Goa, and is a major abiotic factor in 43% of the geographical area of Goa state. Mhadei Wildlife Sanctuary, with an area of 20,848 ha, is part of the Mhadei river basin. It is considered ecologically rich and pristine. The Mhadei is an interstate river, with its catchment area spread over Goa, Karnataka, and Maharashtra. The IBA lies in the Western Ghats. The forest types include Moist Deciduous, Semi-evergreen, and Secondary Scrub. An annual rainfall of 3,000 mm spread roughly over five months, and high relative humidity between 70% to 80%, create ideal conditions for plant growth and diversity. Thus, thick forests, humid climate, and moist

soil have contributed to the species richness in this region.

This IBA site is of great cultural significance as most of the sacred groves of Goa are located here. The sacred grove Nirankarachi Rai is a swamp forest dominated by Malabar Nutmeg *Myristica malabarica*, which is listed as Vulnerable by IUCN (2014).

AVIFAUNA

The Mhadei Valley has more than 160 species of birds. A large number of endemic and biome-restricted species are known to occur in the site, which is an important part of the Western Ghats Endemic Bird Area. Of the 16 endemic bird species of this EBA (Stattersfield *et al.* 1998), seven have been recorded from Mhadei Valley.

The Flame-throated Bulbul *Pycnonotus gularis* is restricted to the Western Ghats and its geographical range starts from Goa southwards, specifically from the forests of Mhadei. It has the distinction of being the State Bird of Goa.

BirdLife International (undated) has listed 15 species in Biome 10, of which 13 are reported from Mhadei.

OTHER KEY FAUNA

The ecological conditions of this site are especially suited to reptilian fauna. More than 45 species of snakes are known to occur in the region. Of the 14 pit vipers found in India, eight are reported, including the Green Pit Viper *Trimeresurus gramineus*, and Hump-nosed Pit Viper *Hypnale hypnale*. Apart from snakes, the thick forests of Mhadei provide ideal habitats for agamids, skinks, and geckos.

The highly endemic Wroughton's Freetailed Bat *Otomops wroughtoni* is found in one of the Barapeda caves near Talewadi of Khanapur on the Goa-Karnataka border. Krishnapur caves are one of the three habitats worldwide of another rare bat *Taphozous theobaldi*. Another species of bat, *Megaderma spasma*, that inhabits the Talewadi caves, is localized in the Indian subcontinent (Bates & Harrison 1997).

The sanctuary is the type locality of *Gegeniophis goaensis* and *Gegeniophis mhadeiensis*, two caecilians described from the site (Bhatta *et al.* 2007a, b)

There are confirmed reports of the presence and movement of Tiger *Panthera tigris* in the area, which is contiguous to Mollem, Dandeli, and Netravati wildlife sanctuaries.

Similarly among invertebrates, endemism is high, and hundreds of species are found. Butterflies range from the Malabar Tree Nymph *Idea malabarica*, and Southern Birdwing *Troides minos*, India's largest butterfly, to the Grass Jewel *Freyeria putli*, India's smallest. The Atlas Moth *Attacus atlas*, the world's largest, is also recorded here.

LAND USE

- Nature conservation

THREATS AND CONSERVATION ISSUES

- Deforestation
- Poaching
- Encroachment

Extensive habitat degradation and loss are a constant problem at the site. Altering the habitat structure has resulted in reduction in abundance and range of several bird species. The reasons for habitat alterations are:

- a) *Kumeri* (shifting cultivation) which involves clearance of pristine forest and is doing irreparable damage. There has been some reduction in this practice, but the conversion of forest into cashew plantations continues unabated.
- b) Plantation of exotic species such as *Acacia* and *Eucalyptus* in natural forest openings. The monoculture plantations result in loss of plant diversity, which in turn affects the abundance of avian and other fauna.
- c) The most important conservation issue is the Mhadei Diversion Scheme proposed by the Karnataka government. The diversion of Mhadei into the Malaprabha basin will



PARAG RANGNEKAR

The river Mhadei (Mandovi) which is the lifeline of Goa originates from this wonderful sanctuary

CRITICALLY ENDANGERED

Long-billed Vulture *Gyps indicus*

VULNERABLE

Nilgiri Wood-pigeon *Columba elphinstonii*

NEAR THREATENED

Grey-headed Bulbul *Microtarsus proiocephalus*

Small Sunbird *Leptocoma minima*

ENDEMIC BIRD AREA 123: WESTERN GHATS

Nilgiri Wood-Pigeon	<i>Columba elphinstonii</i>
Malabar (Blue-winged) Parakeet	<i>Psittacula columboides</i>
Malabar Grey Hornbill	<i>Ocyroceros griseus</i>
White-bellied Treepie	<i>Dendrocitta leucogastra</i>
Nilgiri Imperial-pigeon	<i>Dacula badia cupria</i>
Nilgiri Flycatcher	<i>Eumyias albicaudatus</i>
White-bellied Blue Flycatcher	<i>Cyornis pallipes</i>
Wynaad Laughingthrush	<i>Garrulax (Dryonastes) delesserti</i>
Grey-fronted Green-pigeon	<i>Treron pompadora</i>
Malabar Barbet	<i>Psilopogon malabarica</i>
Flame-throated Bulbul	<i>Pycnonotus gularis</i>
Plain (Nilgiri) Flowerpecker	<i>Dicaeum concolor</i>
Malabar Woodshrike	<i>Tephrodornis sylvicola</i>
Malabar Starling	<i>Sturnia blythii</i>

BIOME 10: INDIAN PENINSULA TROPICAL MOIST FOREST

Blue-faced Malkoha	<i>Phaenicophaeus viridirostris</i>
Jerdon's Nightjar	<i>Caprimulgus atripennis</i>
Malabar Trogon	<i>Harpactes fasciatus</i>
Malabar Pied Hornbill	<i>Anthracoceros coronatus</i>
White-cheeked Barbet	<i>Megalaima viridis</i>
Malabar Barbet	<i>Megalaima malabarica</i>
Yellow-browed Bulbul	<i>Acritillas indica</i>
Malabar Whistling-thrush	<i>Myophonus horsfieldii</i>
Indian Scimitar-babbler	<i>Pomatorhinus horsfieldii</i>
Black-headed Babbler	<i>Rhopocichla atriceps</i>
Loten's Sunbird	<i>Cinnyris lotenius</i>
Black-throated Munia	<i>Lonchura kelaarti</i>
Sri Lanka Frogmouth	<i>Batrachostomus moniliger</i>

have a devastating effect on the pristine forests of the Mhadei Valley.

In this ecologically rich area, the Karnataka Government has planned a chain of seven diversion dams and three main dams for the Mhadei Hydroelectric Project. Besides these projects, Karnataka has plans to divert Katka and Palna tributaries of Dudhsagar or Khandepar river to Supa and Kalinadi basins. This will affect the whole forest area on the banks of these tributaries.

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Sri Lanka Frogmouth *Batrachostomus moniliger* once considered rare is found to be fairly common in Goa. This has been proved by call playback method

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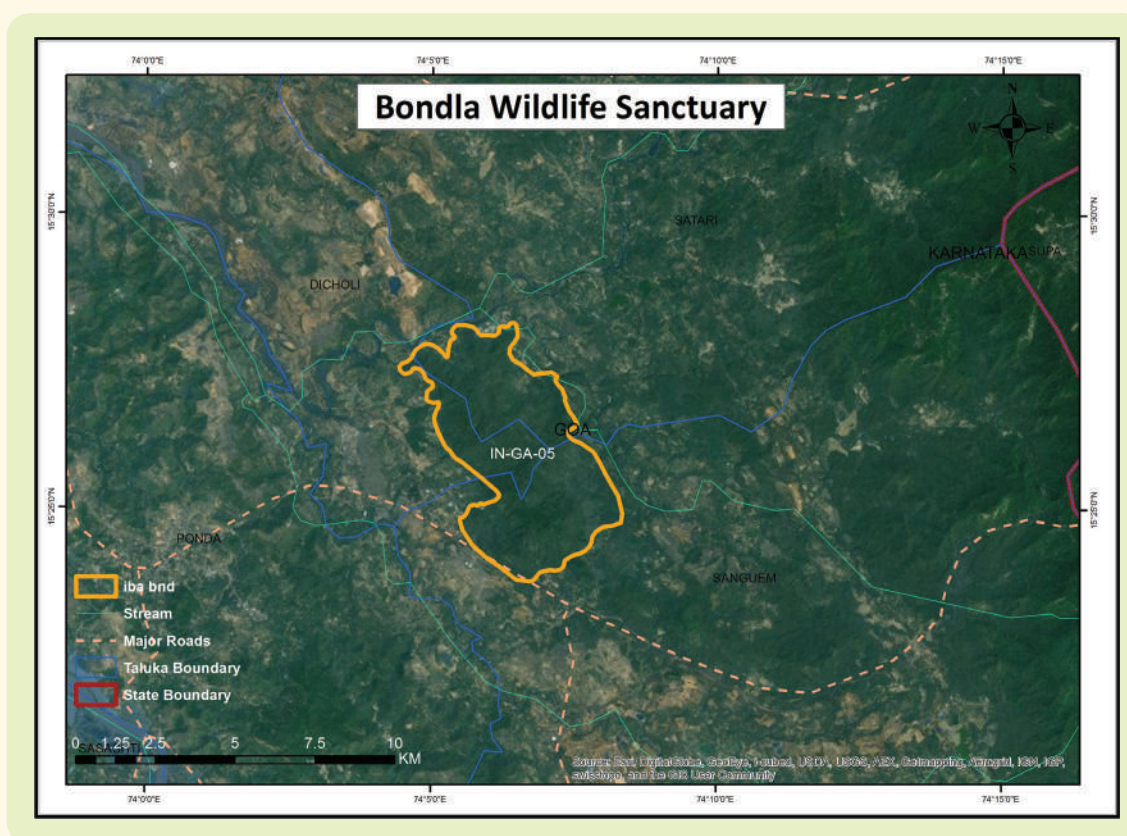
BONDLA WILDLIFE SANCTUARY

IN-GA-05

IBA Site	: IN-GA-05	Altitude	: 216 m
State	: Goa	Rainfall	: >3,000 mm
District	: North Goa	Temperature	: 15 °C to 35 °C
Coordinates	: 15°26'26.66"N 74° 6'11.31"E	Biogeographic Zone	: Western Ghats
Ownership	: State	Habitats	: Tropical Wet Evergreen Forest, Tropical Moist Deciduous Forest, Tropical Semi Evergreen Forest
Area	: 798 ha		

IBA CRITERIA : A1 (Threatened species), A2 (Endemic Bird Area 123: Western Ghats), A3 (Biome Restricted species)

PROTECTION STATUS : Wildlife Sanctuary established in 1969.



GENERAL DESCRIPTION

Bondla Wildlife Sanctuary is located in the Ponda *taluka* 16 km from the city of Ponda. It is the smallest wildlife sanctuary in Goa with an area of just 798 ha. It was initially notified as the Bondla Game Sanctuary in January 1968 vide section 18 of Wild animals and Wild Birds Protection Act 1965, but was declared as a wildlife sanctuary in March 1969 vide Order No. DF-894-FOR/67. The Bondla wildlife sanctuary houses a Mini Zoo, Deer Park, Botanical Garden and a Nursery. Of the total area, 119 ha of the sanctuary are set aside for visitors while the remaining area forms the core of the sanctuary. Many small rivulets and streams flow through the Sanctuary in the monsoon and join the

Ragda River which is a tributary of the Mhadei River. This network of streams and rivulets has created stretches of riparian vegetation patches.

Evergreen vegetation is mainly seen along the streams, while the major vegetation type belongs to the West Coast Semi-Evergreen Forest and Moist Deciduous Forest. *Dalbergia sp*, *Terminalia sp*, *Sterculia vilosa*, *Garcinia indica*, *Caryota urens* and *Saraca asoca* are some of the dominant tree species found in Bondla. The majority of the forest structure in Bondla is three storied with good liana diversity and under story vegetation. There are also intermittent patches of bamboo within the sanctuary.

VULNERABLE

Asian Woollyneck	<i>Ciconia episcopus</i>
Indian Spotted Eagle	<i>Aquila hastata</i>

NEAR THREATENED

Malabar Pied Hornbill	<i>Anthracoceros coronatus</i>
Grey-headed Bulbul	<i>Microtarsus priocephalus</i>

ENDEMIC BIRD AREA 123: WESTERN GHATS

Malabar (Blue-winged) Parakeet	<i>Psittacula columboides</i>
Malabar Grey Hornbill	<i>Ocyrceros griseus</i>
Nilgiri Imperial-pigeon	<i>Dacula badia cupria</i>
Grey-headed Bulbul	<i>Microtarsus priocephalus</i>
White-bellied Blue-flycatcher	<i>Cyornis pallipes</i>
Small (Crimson-backed) Sunbird	<i>Nectarinia (Leptocoma) minima</i>
Grey-fronted Green-pigeon	<i>Treron pompadora</i>
Malabar Barbet	<i>Psilopogon malabaricus</i>
Flame-throated Bulbul	<i>Pycnonotus gularis</i>
Plain (Nilgiri) Flowerpecker	<i>Dicaeum concolor</i>
Vigor's Sunbird	<i>Aethopyga vigorsii</i>
Malabar Woodshrike	<i>Tephrodornis sylvicola</i>
Malabar Starling	<i>Sturnia blythii</i>

BIOME-10: INDIAN PENINSULA TROPICAL MOIST FOREST

Blue-faced Malkoha	<i>Phaenicophaeus viridirostris</i>
Sri Lanka Frogmouth	<i>Batrachostomus moniliger</i>
Jerdon's Nightjar	<i>Caprimulgus atripennis</i>
Indian Swiftlet	<i>Collocalia unicolor</i>
Malabar Trogon	<i>Harpactes fasciatus</i>
Malabar Pied Hornbill	<i>Anthracoceros coronatus</i>
White-cheeked Barbet	<i>Megalaima viridis</i>
Yellow-browed Bulbul	<i>Acritillas indica</i>
Malabar Whistling-thrush	<i>Myiophonus horsfieldii</i>
Indian Scimitar-babbler	<i>Pomatorhinus horsfieldii</i>
Dark-fronted Babbler	<i>Rhopocichla atriceps</i>
Loten's Sunbird	<i>Cinnyris lotenius</i>
Black-throated Munia	<i>Lonchura kelaarti</i>

BIOME-11: INDO-MALAYAN TROPICAL DRY ZONE

Jungle Bush-quail	<i>Perdica asiatica</i>
Indian Peafowl	<i>Pavo cristatus</i>
Plum-headed Parakeet	<i>Psittacula cyanocephala</i>
Indian Grey Hornbill	<i>Ocyrceros birostris</i>
Brown-headed Barbet	<i>Megalaima zeylanica</i>
Yellow-fronted Pied Woodpecker	<i>Dendrocopos mahrattensis</i>
Black-rumped Flameback	<i>Dinopium benghalense</i>
Malabar Crested Lark	<i>Galerida malabarica</i>
Black-headed Cuckooshrike	<i>Coracina melanoptera</i>
Small Minivet	<i>Pericrocotus cinnamomeus</i>
White-browed Bulbul	<i>Pycnonotus luteolus</i>
Indian Robin	<i>Saxicoloides fulicata</i>
Jungle Babbler	<i>Turdoides striatus</i>
Ashy Prinia	<i>Prinia socialis</i>
White-browed Fantail	<i>Rhipidura aureola</i>
Grey-headed Starling	<i>Sturnia malabaricus</i>
White-bellied Drongo	<i>Dicrurus caerulescens</i>
Ashy Woodswallow	<i>Artamus fuscus</i>

AVIFAUNA

Till date 182 species of birds have been reported from this Sanctuary, including two vulnerable and two near threatened species (A1: Threatened species), 13 Restricted Range species of Western Ghats (A2: Range restricted species), 13 Biome-10 species of Indian Peninsula Tropical Moist Forest and 18 Biome-11 species of the Indo-Malayan Tropical Dry Zone (A3: Biome Restricted species). Bondla wildlife sanctuary is an important nesting and breeding ground for many resident species of birds. The streams in the sanctuary are perfect habitats for the Blue-eared Kingfisher *Alcedo meninting* and the Oriental Dwarf Kingfisher *Ceyx erithaca* which are regularly reported from this site. There are breeding records of the Oriental Dwarf Kingfisher from the sanctuary (Omkar Dharwardkar pers. comm. 2014). This site also holds a good population of the near threatened and Western Ghats endemic Grey headed Bulbul *Pycnonotus priocephalus*.

OTHER KEY FAUNA

The Leopard *Panthera pardus* is at the apex of the trophic level in the Sanctuary followed by the Dhole *Cuon alpinus*. Large herbivores include Gaur *Bos frontalis*, Sambar *Cervus unicolor*, Spotted Deer, *Axis axis* and Barking Deer *Muntiacus muntjak*. Mouse Deer *Moschiola meminna* is also found in the sanctuary. Other important mammals of the site are Slender Loris *Loris tardigradus*, Porcupine *Hystrix indica*, Small Indian Civet *Viverricula indica*, Brown Palm Civet *Paradoxurus jerdoni* and Indian Giant Squirrel *Ratufa indica*.

The Indian Cobra *Naja naja*, Indian Rock Python *Python molurus* and Southern Flying Lizard *Draco dussumieri* represents the main reptilian fauna.

The sanctuary also holds good diversity of insects especially butterflies. 91 species of butterflies have been reported from the sanctuary, with Malabar Tree Nymph *Idea malabarica*, Southern Birdwing *Triodes minos* and Malabar Banded Peacock *Papilio buddha* being some of the key butterfly species (Borkar & Komarpant, 2004).

LAND USE

- Nature conservation and research
- Tourism and recreation

THREATS AND CONSERVATION ISSUES

Presently, there is no major threat to this Sanctuary as it is fully notified.

KEY CONTRIBUTORS

Pronoy Baidya, Parag Rangnekar and Amit Bandekar

KEY REFERENCES

Borkar. M. R. and Komarpant. N, (2004) Diversity, Abundance and Habitat associations of butterfly species in Bondla Wildlife Sanctuary of Goa, India. *Zoos' Print Journal* 19(10): 1648-1653.

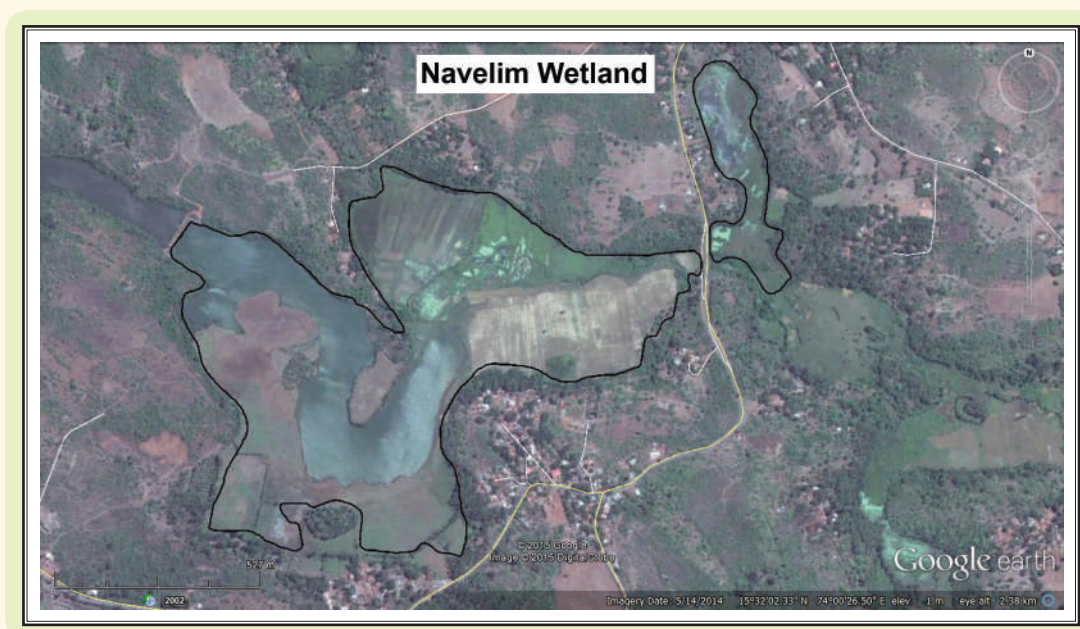
NAVELIM WETLAND

IN-GA-06

IBA Site Code	: IN-GA-06	Area	: 82 ha
State	: Goa	Altitude	: 3 msl
District	: North Goa	Rainfall	: 2,900 mm
Coordinates	: 15° 32' 06" N, 74° 00' 23" E	Temperature	: 15 °C to 39 °C
Ownership	: Community	Biogeographic Zone	: Western Ghats
		Habitats	: Freshwater Swamp

IBA CRITERIA : A1 (Threatened species), A2 (Range-restricted species),
A3 (Biome-restricted species), A4iii (≥20,000 waterbirds)

PROTECTION STATUS : Not officially protected.



GENERAL DESCRIPTION

Navelim wetland is situated in Bicholim taluka, c. 24 km from Panjim, the capital of Goa. It is spread over an area of 82 ha, most of which is shallowly inundated for about seven months of the year. About 45 ha of this wetland is recovered for growing paddy in what is known traditionally as *vaingan* system of agriculture during late January. A check dam at the eastern end of the wetland (15° 32' 7.98" N, 74° 00' 39.89" E) ensures that 15 ha of the eastern part of the wetland holds water throughout the year, and acts as an irrigation tank. Another check dam at the western end (15° 32' 10.16" N, 73° 59' 52.76" E), locally called Navelim Bandar, remains partially open throughout the year, ensuring that a constant flow of water is maintained to the Cudnem river which joins the Mandovi river at Virdi. Towards the eastern side, just 2 km from this wetland, a chain of hills with a mean height of 90 msl extends up to the Bondla Wildlife Sanctuary. This unique system of agriculture performed by the local community, coupled

with its geographical location, ensures a constant input of nutrients into this wetland and hence makes it highly productive. *Pandanus tectorius* and *Oryza rufipogon* cover the eastern side of the wetland, while the northern side is fringed with a mix of tree species representing Indian Peninsular Tropical Moist Deciduous forest (*Terminalia* sp., *Tectona grandis*, *Caryota urens*, and *Bombax ceiba*). A plantation is maintained on the western side of this wetland by villagers of Cudnem village, where Coconut, Areca Nut, Jackfruit and Mango are grown. *Nymphaea stellata* and *Hydrilla verticillata* dominate the shallow edges of the irrigation tank. The water depth is between 2 m to 3 m in the irrigation tank, depending upon the season, while the depth in the major part of the wetland is 0.5 m during the monsoon, which becomes even less in the winter.

AVIFAUNA

Navelim wetland attracts thousands of birds, especially waterfowl. During a year-long monitoring of this wetland in

PRIMOY BAIYA



Navelim Wetland is a part of the traditional agricultural system of Goa. It is spread over an area of 82 ha, most of which is shallowly inundated for about seven months of the year

2012–2013, 165 species of birds including 46 winter visitors were documented.

Till date two Vulnerable and four Near Threatened species (A1: Threatened species), five restricted-range species of the Western Ghats (A2: Range-restricted species), four Biome 10 species (Indian Peninsular Tropical Moist Forest) and 16 Biome 11 species (Indo-Malayan Tropical Dry Zone) (A3: Biome-restricted species) have been recorded from this site.

During 2012–2013, a total of 20,374 waterfowl representing 42 species were recorded from this wetland (A4iii: the site is known or thought to hold, on a regular basis, 20,000 waterbirds), of which the migrant Common Teal *Anas crecca* numbered 9,106 and Garganey *Anas querquedula* numbered 1,364. Among the residents, Lesser Whistling Duck *Dendrocygna javanica* numbered 3,008. This wetland also hosted a good population of the migrant Glossy Ibis *Plegadis falcinellus* and Black-headed Ibis *Threskiornis melanocephalus* (977 and 181 individuals recorded in 2012–2013 respectively). This wetland was one of the three sites from which Ruff *Philomachus pugnax* was reported in 2012–2013 from the state. On December 2012, a flock of Red Munia or Avadavat *Amandava amandava* was reported from this wetland and has become the latest addition to the checklist of the birds of Goa (Baidya *et al.* 2014). In

January 2013, huge mixed flocks of Wire-tailed Swallow *Hirundo smithii* and Barn Swallow *Hirundo rustica* were recorded from this location, numbering approximately 500 individuals. Navelim Wetland is also an important breeding and nesting ground for the Streaked Weaver *Ploceus manyar*, Baya Weaver *Ploceus philippinus*, and Wire-tailed Swallow *Hirundo smithii*, besides other resident species.

OTHER KEY FAUNA

The Smooth-coated Otter *Lutrogale perspicillata* is one of the most charismatic and regular mammal residents of this wetland and is protected under Schedule II, Part II of the Wildlife (Protection) Act, 1972. Wild Boar *Sus scrofa* are also frequent visitors to the plantations and areas adjoining this wetland. Village fishermen describe up to 15 species of freshwater fish that are found in this wetland and are commercially exploited. The Indian Flapshell Turtle *Lissemys punctata*, Mugger or Marsh Crocodile *Crocodylus palustris*, Indian Rock Python *Python molurus*, listed in Schedule I, Part II and Indian Cobra *Naja naja* listed in Schedule II, Part II are some of the important reptiles found in this region. This wetland also holds good diversity of insects, including 53 species of butterflies, 18 species of odonates, and 49 species of ants.

VULNERABLE

Asian Woollyneck	<i>Ciconia episcopus</i>
Greater Spotted Eagle	<i>Aquila clanga</i>

NEAR THREATENED

Painted Stork	<i>Mycteria leucocephala</i>
Black-headed Ibis	<i>Threskiornis melanocephalus</i>
Oriental Darter	<i>Anhinga melanogaster</i>
Malabar Pied Hornbill	<i>Anthraceroceros coronatus</i>

ENDEMIC BIRD AREA 123: WESTERN GHATS

Grey-fronted Green-pigeon	<i>Treron pompadora</i>
Malabar Grey Hornbill	<i>Ocyroceros griseus</i>
Malabar Starling	<i>Sturnia blythii</i>
Malabar Crested Lark or Malabar Lark	<i>Galerida malabarica</i>
Small (Crimson-backed) Sunbird	<i>Leptocoma minima</i>

BIOME 10: INDIAN PENINSULAR TROPICAL MOIST FOREST

Blue-faced Malkoha	<i>Phaenicophaeus viridirostris</i>
Malabar Pied Hornbill	<i>Anthraceroceros coronatus</i>
White-cheeked Barbet	<i>Megalaima viridis</i>
Loten's Sunbird	<i>Cinnyris lotenius</i>

BIOME 11: INDO-MALAYAN TROPICAL DRY ZONE

Indian Peafowl	<i>Pavo cristatus</i>
Yellow-wattled Lapwing	<i>Vanellus malabaricus</i>
Plum-headed Parakeet	<i>Psittacula cyanocephala</i>
Brown-headed Barbet	<i>Megalaima zeylanica</i>
Black-rumped Flameback	<i>Dinopium benghalense</i>
White-naped Woodpecker	<i>Chrysocolaptes festivus</i>
Black-headed Cuckooshrike	<i>Coracina melanoptera</i>
Small Minivet	<i>Pericrocotus cinnamomeus</i>
White-browed Bulbul	<i>Pycnonotus luteolus</i>
Indian Robin	<i>Saxicoloides fulicata</i>
Tawny-bellied Babbler	<i>Dumetia hyperythra</i>
Jungle Babbler	<i>Turdoides striatus</i>
Ashy Prinia	<i>Prinia socialis</i>
White-browed Fantail	<i>Rhipidura aureola</i>
Grey-headed Starling	<i>Sturnia malabarica</i>
White-bellied Drongo	<i>Dicrurus caerulescens</i>

LAND USE

- Agriculture
- Fishing
- Irrigation

THREATS AND CONSERVATION ISSUES

One of the biggest threats faced by this wetland is its close proximity to open-cast iron mines. During the monsoon, there is heavy runoff from these mines which has



BHASMANG MEHTA

During 2012–2013, a total of 20,374 waterfowl representing 42 species were recorded from this IBA. One of them is the Near Threatened Black-headed Ibis *Threskiornis melanocephalus*

led to the silting of the irrigation tank. If cleaning is not done, the depth of the tank will be reduced and the habitats for resident and migrant waterfowl will be endangered. Another cause for concern is the use of chemical fertilizers and pesticides to boost crop yield in the neighbouring fields. Recently, steps have been taken to inform the villagers of the negative effects of such practices and to discourage them from the reckless use of these agrochemicals. A pig iron plant is in close proximity to this wetland and there have been reports of pollution from it.

KEY CONTRIBUTORS

Pronoy Baidya, Hanuman Gawas, Harshada Gauns, Sandesh Gawas.

KEY REFERENCE

Baidya, P., Chindarkar, V., Gauns, H., Gawas, H., Gawas, S., Dicholkar, V., Pinto, C., Luis, E. and Gawas, R.(2014) Status of Red Avadavat *Amandava amandava* in Goa, India. *Indian BIRDS* 9(5&6): (in press).

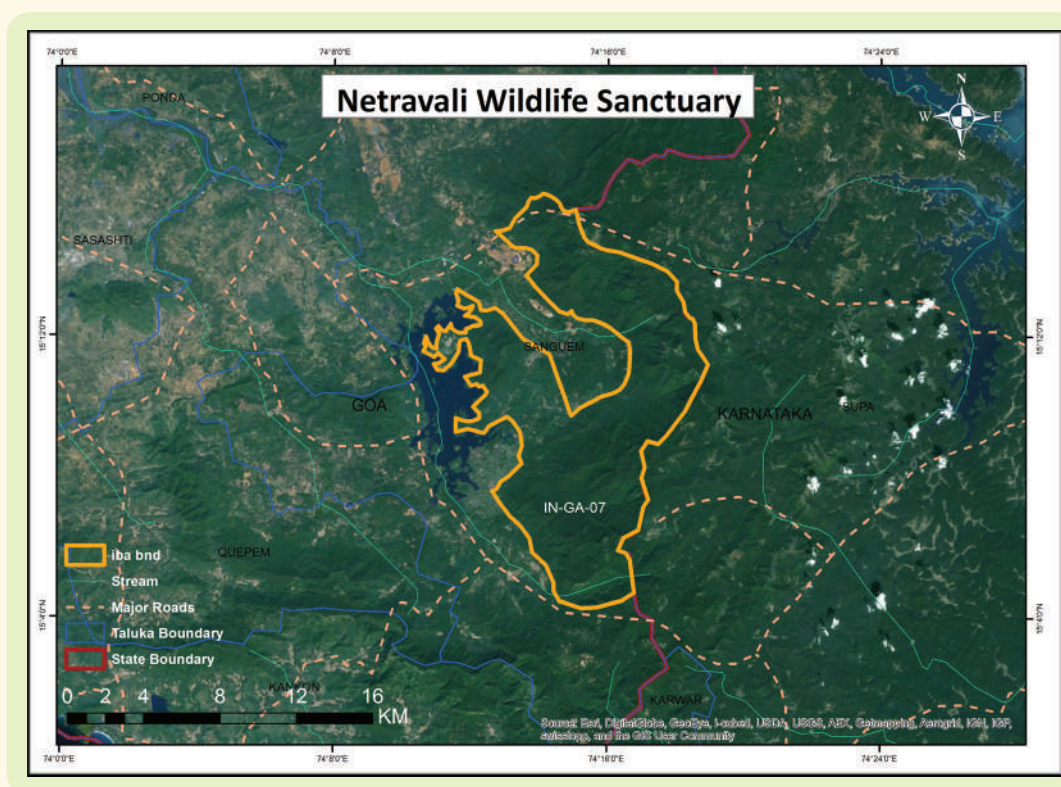
NETRAVALI WILDLIFE SANCTUARY

IBA Site	: IN-GA-07	Altitude	: 796 m (max)
State	: Goa	Rainfall	: >3,000 mm
District	: South Goa	Temperature	: 15 °C to 35 °C
Coordinates	: 15° 05' 74" N, 74° 30' 14" E	Biogeographic Zone	: Western Ghats
Ownership	: State	Habitats	: Tropical Wet Evergreen Forest, Tropical Moist Deciduous Forest, Tropical Semi Evergreen Forest
Area	: 211.05 sq.km		

IN-GA-07

IBA CRITERIA : A1 (Threatened species), A2 (Endemic Bird Area 123: Western Ghats),
A3 (Biome-10: Indian Peninsula Tropical Moist Forest)

PROTECTION STATUS : Wildlife Sanctuary established in 1999.



GENERAL DESCRIPTION

Netravali Wildlife Sanctuary is located in the Sanguem taluka on the eastern border of Goa and is the largest sanctuary in the State. It was declared as a wildlife sanctuary in 1999 during the Presidents rule in 1999 by Lt Gen (Retd) J F R Jacob. It is bounded on the North by Bhagwan Mahaveer Wildlife Sanctuary and on the South by Cotigao Wildlife Sanctuary, both IBA's. The Kushawati (Zuari) River originates in the Dighi Ghat at the northern border of the sanctuary and various other tributaries too originate within the Sanctuary. Mines existing before the Sanctuary was declared were closed down by an order of the Supreme Court in 2003.

The Sanctuary is gaining prominence as one of the best birding and butterflying destinations within the State, while the many waterfalls that dot the sanctuary attract the general tourist. Evergreen Forest, West Coast Semi-Evergreen Forest and Moist Deciduous Forest is seen in the sanctuary, while many mountain tops are grassland clad. Dr. Janarthanam believes that these grassland clad mountains represent the northern limits of the Shola Forests which are common in the Southern Western Ghats.

AVIFAUNA

More than 180 species of birds are reported from the Sanctuary, including Western Ghats endemics.



More than 180 species of birds are reported from Netravali Sanctuary, including Blue-eared Kingfisher

According to Parag Rangnekar (*pers. comm.* 2014) the Nilgiri Wood-Pigeon *Columba ephinstonii*, Blue-winged Parakeet or Malabar Parakeet *Psittacula columboides*, Malabar Grey Hornbill *Ocyrceros griesus*, Grey-headed Bulbul *Microtarsus priocephalus*, Nilgiri Imperial Pigeon, *Dacula badia*, White-bellied Blue Flycatcher *Cyornis pallipes*, Grey-fronted Greenpigeon *Treron pompadora*, Indian Rufous Babbler *Turdoides subrufa* and Small Sunbird *Leptocoma minima* are present in this IBA. The sanctuary is also home to the Blue-eared Kingfisher *Alcedo meninting*, Oriental Dwarf Kingfisher *Ceyx erithaca*, Malayan Night Heron *Grosachius melanolophus*.

Prasanna Parab (*pers. Comm.* 2014) has reported and photographed the Wynaad Laughingthrush *Garrulax (Dryonastes) delesserti* from the Karnataka forests adjoining the sanctuary, while Heinz Lainer (*per. Comm.* 2014) has sighted the White-bellied Treepie, *Dendrocitta leucogastra* in the same area.

This site qualifies three IBA criteria: A1 (Threatened species), A2 (Restricted Range species) and A3 (Biome Restricted species).

OTHER KEY FAUNA

The Tiger *Panthera tigris* forms the apex trophic level in the Sanctuary followed by the Leopard *Panthera pardus*. Large herbivores include Gaur *Bos gaurus*, Sambar

VULNERABLE

Nilgiri Wood-pigeon	<i>Columba ephinstonii</i>
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NEAR THREATENED

Malabar Pied Hornbill	<i>Anthracoceros coronatus</i>
Grey-headed Bulbul	<i>Microtarsus priocephalus</i>

ENDEMIC BIRD AREA 123: WESTERN GHATS

Nilgiri Wood-Pigeon	<i>Columba ephinstonii</i>
Malabar (Blue-winged) Parakeet	<i>Psittacula columboides</i>
Malabar Grey Hornbill	<i>Ocyrceros griseus</i>
Grey-headed Bulbul	<i>Microtarsus priocephalus</i>
Small (Crimson-backed) Sunbird	<i>Leptocoma minima</i>
Nilgiri Imperial-pigeon	<i>Dacula badia cupria</i>
White-bellied Blue-flycatcher	<i>Cyornis pallipes</i>
Grey-fronted Green-pigeon	<i>Treron pompadora</i>
Malabar Barbet	<i>Megalaima malabarica</i>
Flame-throated Bulbul	<i>Pycnonotus gularis</i> .
Plain (Nilgiri) Flowerpecker	<i>Dicaeum concolor</i>
Malabar Woodshrike	<i>Tephrodornis sylvicola</i>
Malabar Starling	<i>Sturnia blythii</i> .
Indian Rufous Babbler	<i>Turdoides subrufa</i>

BIOME-10: INDIAN PENINSULA TROPICAL MOIST FOREST

Malabar Trogon	<i>Harpactes fasciatus</i>
Malabar Pied Hornbill	<i>Anthracoceros coronatus</i>
White-cheeked Barbet	<i>Megalaima viridis</i>
Malabar Barbet	<i>Megalaima malabarica</i>
Indian Scimitar-babbler	<i>Pomatorhinus horsfieldii</i>
Loten's Sunbird	<i>Cinnyris lotenius</i>
Blue-faced Malkoha	<i>Phaenicophaeus viridirostris</i>
Jerdon's Nightjar	<i>Caprimulgus atripennis</i>
Yellow-browed Bulbul	<i>Acritillas indica</i>
Malabar Whistling-thrush	<i>Myiophonus horsfieldii</i>
Dark-fronted Babbler	<i>Rhopocichla atriceps</i>
Black-throated Munia	<i>Lonchura kelaarti</i>
Sri Lanka Frogmouth	<i>Batrachostomus moniliger</i>
Jerdon's Nightjar	<i>Caprimulgus atripennis</i>

BIOME-11: INDO-MALAYAN TROPICAL DRY ZONE

Jungle Bush-quail	<i>Perdica asiatica</i>
Indian Peafowl	<i>Pavo cristatus</i>
Plum-headed Parakeet	<i>Psittacula cyanocephala</i>
Brown-headed Barbet	<i>Megalaima zeylanica</i>
Yellow-fronted Pied Woodpecker	<i>Dendrocopos mahrattensis</i>
Black-rumped Flameback	<i>Dinopium benghalense</i>
Malabar Crested Lark	<i>Galerida malabarica</i>
Black-headed Cuckooshrike	<i>Coracina melanoptera</i>
Small Minivet	<i>Pericrocotus cinnamomeus</i>
Indian Robin	<i>Saxicoloides fulcata</i>
Jungle Babbler	<i>Turdoides striatus</i>
Ashy Prinia	<i>Prinia socialis</i>
White-browed Fantail	<i>Rhipidura aureola</i>
Grey-headed Starling	<i>Sturnia malabarica</i>
White-bellied Drongo	<i>Dicrurus caerulescens</i>
Ashy Woodswallow	<i>Artamus fuscus</i>

Cervus unicolor, Spotted Deer, *Axis axis* and Barking Deer *Muntiacus muntjak*. Mouse Deer *Moschiola indica* is also found in the sanctuary. Other important mammals of the site are Slender Loris *Loris tardigradus*, Crested Porcupine *Hystrix indica*, Small Indian Civet *Viverricula indica*, Brown Palm Civet *Paradoxurus jerdoni* and Indian Giant Squirrel *Ratufa indica*.

PARAG RANGNEKAR



The grassland clad mountains of Netravali represent the northern limits of the shola forest zone. Thanks to the thick vegetation, grasslands, and mountain streams, Netravali is becoming a birding and butterflying destination

The King Cobra *Ophiophagus hannah*, Indian Cobra *Naja naja*, Indian Rock Python *Python molurus* and Southern Flying Lizard *Draco dussumieri* represents the main reptilian fauna.

The Malabar Tree Nymph, *Idea malabarica*, Southern Birdwing *Triodes minos*, Malabar Banded Peacock *Papilio buddha*, Malabar Flash *Rapala lankana*, Malabar Banded Swallowtail *Papilio liomedon*, Banded Royal *Rachana jalindra* have been sighted in the sanctuary (Parag Rangnekar *per.comm.* 2014). The Sanctuary is very promising for dragonflies too

LAND USE

- Nature conservation and research
- Tourism and recreation

THREATS AND CONSERVATION ISSUES

Presently, there is no major threat to this Sanctuary as it is fully notified. There are few settlements inside the Sanctuary. Hinterland and ecotourism is gaining prominence leading to littering at sites of tourist importance. Though the Wildlife Division of the Dept. of Forest is putting in some controls, involving local population in promoting tourism with a long-term goal of conservation should be followed.

KEY CONTRIBUTORS

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KEY REFERENCES

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