PROSPECTS AND POTENTIALS OF ECOTOURISM IN BARNAWAPARA WILDLIFE SANCTUARY OF CHHATTISGARH WITH SPECIAL REFERENCE TO LIVELIHOODS OF TRIBES & CONSERVATION OF BIODIVERSITY

M. Sc. (Forestry) THESIS

by

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DEPARTMENT OF FORESTRY

COLLEGE OF AGRICULTURE

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"PROSPECTS AND POTENTIALS OF ECOTOURISM IN BARNAWAPARA WILDLIFE SANCTUARY OF CHHATTISGARH WITH SPECIAL REFERENCE TO LIVELIHOODS OF TRIBES & CONSERVATION OF BIODIVERSITY''

Thesis

Submitted to the

Indira Gandhi Krishi Vishwavidyalaya, Raipur

by

SIDDHARTH PANDEY

IN PARTIAL FULFILMENT OF THE REQUIREMENTS

FOR THE DEGREE OF

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in

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CERTIFICATE – I

This is to certify that the thesis entitled ***"Prospects and Potentials of Ecotourism in Barnawapara Wildlife Sanctuary of Chhattisgarh with Special Reference to Livelihoods of Tribes & Conservation of Biodiversity"*** submitted in partial fulfilment of the requirements for the degree of "**MASTER OF SCIENCE IN FORESTRY"** of the Indira Gandhi Agricultural University, Raipur (C.G.), is recorded of the bonafide research work carried out by **Mr. Siddharth Pandey** under my guidance and supervision. The subject of the thesis has been approved by the Students Advisory Committee and the Director of Instructions.

No part of the thesis has been submitted for any other degree or diploma (certificate awarded etc.) or has been published / published part has been fully acknowledged. All the assistance and help received during the course of the investigations have been duly acknowledged by him.

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CERTIFICATE – II

This is to certify that the thesis entitled ***"Prospects and Potentials of Ecotourism in Barnawapara Wildlife Sanctuary of Chhattisgarh with Special Reference to Livelihoods of Tribes & Conservation of Biodiversity"*** submitted by **Mr. Siddharth Pandey** to the Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.), in partial fulfilment of the requirements for the degree of the Master of Science in the Department of Forestry has been approved by the ***external evaluator*** and Student's Advisory Committee after oral examination, ***under the chairmanship of the head of the department.***

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LIST OF SYMBOLS/NOTATIONS

Notation/Symbol		Description
Indiv.	:	Individual
Occu	:	Occurrence
Freq.	:	Frequency
RA	:	Relative Abundance
RD	:	Relative Density
RF	:	Relative Frequency
BA	:	Basal Area
Ni	:	Basal Area for Individual Species
RBA	:	Relative Basal Area
IVI	:	Importance Value Index
Bd	:	Beta Diversity
B	:	Beta Diversity
A	:	Alpha Diversity
S	:	Total number of Species
H’	:	Plant Diversity Index
Cd	:	Concentration of Dominance
E	:	Equitability
D	:	Richness Index

LIST OF PLATES

ABBREVIATIONS

Notations	Description
%	Per cent
&	And
Cm	Centimetre
et al.	And co-worker/ and others
Etc.	So, on
Fig.	Figure
Ha	hectare
i.e.,	That is
Kg	Kilogram
Mm	Millimetre
M	Meter
viz.,	Namely
/	Per
No.	Number

THESIS ABSTRACT

a) Title of the Thesis:	"Prospects and Potentials of Ecotourism in Barnawapara Wildlife Sanctuary of Chhattisgarh with Special Reference to Livelihoods of Tribes & Conservation of Biodiversity"
b) Full name of the student:	Siddharth Pandey
c) Major Subject:	Forestry
d) Name and address of the Major Advisor:	Dr. Rajendra Kumar Prajapati, Professor, Department of Forestry, College of Agriculture, I.G.K.V., Raipur (C.G.)
e) Degree to be Awarded:	M.Sc. Forestry

Signature of the Student

Signature of Major Advisor

Signature of Head of the Department

Date: 05-01-2021

Abstract

The present research work entitled "**Prospects and Potentials of Ecotourism in Barnawapara Wildlife Sanctuary of Chhattisgarh with Special Reference to Livelihoods of Tribes & Conservation of Biodiversity**" conducted during 2018–19. The study area was Barnawapara Wildlife Sanctuary lies between 21^0 18' 45.00" to 21^0 30' 00.00" North latitude and 82^0 22' 30.00" to 82^0 37' 30.00" East longitude with an altitude of 376 meters above the sea level. The intensive

survey was conducted in four different study area (**Site-1-** South Eastern part of Sanctuary, **Site-2 -** North Eastern part of Sanctuary, **Site-3 -** North Western part of Sanctuary, **Site-4 -** South Western part of Sanctuary). In all-sites differences were apparent in several phytosociological indices. The variation in diversity and in different areas were quantified. The plants belong to 59 different families showed the diversity of plants covers 170 plant species in the sanctuary area in different forest stands.

In phytosociological study recorded 554 plants which consists of 353 number of trees (belongs to 36 genera consisting of 39 species), 103 shrubs (13 genera having 13 species), 58 herbs (21 genera having 21 species) is a good information and it will attract to tourists to see such a diversity between plants and animal also. The most dominant Tree species was observed *Cleistanthus collinus,* followed by *Terminalia tomentosa* and *Madhuca indica* with least dominating species was *Cordia dichotoma, Ficus recemosa, gardenia latifolia* and the dominant shrubs are; *Holarrhena antidysentrica* followed by *Helicteres isora* and *Antidesma and Embilla ribes a*long with these dominant herbs are; *Pogostemon benghalensis* followed by *Dodonoea viscosa.* found in all four sites.

The **Species Richness indices (D)** ranged for trees varies from 4.03 (site-4) to 6.06 (site-3) and for shrub's 1.56 (site-4) to 4.12 (site-1). The **Diversity index (H')** for tree ranged from 3.39 in site-2 to 3.71 in site-3 and for shrubs ranged from 1.19 (site-4) to 2.06 (site-2). The **Concentration of Dominance (Cd)** ranged from 0.11 in site-4 to 0.18 in site-2, For shrubs maximum values (0.57) was recorded in site-4 and the minimum value (0.30) in site-2. The **Equitability or Pielou Index (e)** for tree species highest (1.21) observed in site-4 and lowest (1.08) in site-2 and for the shrub's equitability ranged from 1.10 (highest in site-3) and 0.69 (lowest in site-1). The **Beta diversity (β diversity or Bd)** for Tree - 1.81, for shrub – 2.17 and for herb – 2.55.

The conservative approach of ecotourism has raised its value, but there is a very urgent need to create awareness among local people about ecotourism and how they will be benefited from it. Ecotourism has been successful in around the Barnawapara Wildlife Sanctuary of Baloda Bazar district of Chhattisgarh and has a

immense potential to develop as a excellent eco-tourist spot with conservation, economic well – being, poverty alleviation and sustainable development in Chhattisgarh as a role model. From all these observations, it is evident that as a result of ecotourism the opportunities for development have increased many folds in the state. Chhattisgarh is having 44 % forest cover and so many Sanctuaries, if the tourist spots of these sanctuary area are properly identified and the publicity made then the ecotourism industry will play a significant role in employment generation for local residents as well as to uplift their livelihood. Awareness among tourists along with local residents in relation to flora and fauna through the environmental education and conservation technique should be provided, so that the people could learn more and more about the importance of the biodiversity conservation in relation to their survival and livelihood of the local residents. The recommendations were worked out in this study will be submitted to govt. of Chhattisgarh for the improvement of facilities as needed by the tourists, local residents and forest officials.

Keywords: Barnawapara, Biodiversity, Chhattisgarh, Conservation, Ecotourism, Fauna and Flora, Livelihoods.

शोध ग्रंथ सारांश

अ) शोध ग्रंथ का शीर्षक :	जनजातियों की आजीविका और जैव विविधता के संरक्षण के संदर्भ में छत्तीसगढ़ के बारनवापारा वन्यजीव अभयारण्य मे पर्यावरणीय पर्यटन की संभावनाए
ब) विद्यार्थी का पूरा नाम :	सिद्धार्थ पाण्डेय
स) मुख्य विषय :	वानिकी
द) मुख्य सलाहकार का नाम एवं पता :	डॉ. आर. के. प्रजापति, प्राध्यापक, वानिकी विभाग, कृषि महाविद्यालय, इंदिरा गांधी कृषि विश्वविद्यालय रायपुर, छत्तीसगढ़
इ) उपाधि जिसमे सम्मानित किया जाना है :	वानिकी स्नातकोत्तर

छात्र का हस्ताक्षर

मुख्य सलाहकार का हस्ताक्षर

विभागाध्यक्ष के हस्ताक्षर

दिनांक : 05-01-2021

सारांश

"जनजातियों की आजीविका और जैव विविधता के संरक्षण के साथ छत्तीसगढ़ के बारनवापारा वन्यजीव अभयारण्य मे पर्यावरणीय पर्यटन की संभावनाए" का अध्ययन 2018-19 मे किया गया | अध्ययन बारनवापारा वन्यजीव अभयारण्य मे किया गया था जिसका फैलाव क्षेत्र 21^0 18' 45.00" से 21^0 30' 00.00" उत्तर अक्षांश एवं 82^0 22' 30.00" से 82^0 37' 30.00" पूर्वी देशान्तर तक है तथा समुद्र ताल से ऊंचाई 376 मीटर है | अध्ययन क्षेत्र को चार भागों (क्षेत्र-1 - अभयारण्य का दक्षिण पूर्वी भाग, क्षेत्र -2 - अभयारण्य का उत्तर पूर्वी भाग, क्षेत्र -3 - अभयारण्य का उत्तरी पश्चिमी भाग, क्षेत्र

-4 - अभयारण्य का दक्षिण पश्चिमी भाग) में बाटकर गहन सर्वेक्षण किया गया था | अभयारण्य के सभी क्षेत्रों में फाइटोसोसिओलॉगिकल इंडाईसेस अलग अलग है |

सभी क्षेत्र मे फाइटोसोसिओलॉगिकल इंडाईसेस में अंतर स्पष्ट थे। विविधता और विभिन्न क्षेत्रों में भिन्नता निर्धारित की गई। पौधों का संबंध 59 अलग-अलग फेमिली से है। पौधों की विविधता में अभयारण्य में 170 पौधों की प्रजातियों को शामिल किया गया है।

फाइटोसोसिओलॉगिकल अध्ययन में 554 पौधे जिनमें 353 पेड़ हैं (36 वंश से मिलकर 39 प्रजातियां शामिल हैं), 103 झाड़ी (13 जेनेरा की 13 प्रजातियां), 58 हर्ब (21 वंश के अंतर्गत 21 प्रजातियाँ) एक अच्छी जानकारी है और यह पर्यटकों को आकर्षित करेगी। वहाँ बहुतायत मात्रा में क्रमशः **क्लेस्टेन्थस कोलिनस**, **टर्मिनलिया टोमेंटोसा** और **मधुका इंडिका** (पेड़) प्रजाति थी, तथा **कॉर्डिया डिमोतोमा**, **फाईकस रिसीमोसा**, **गार्डेनिया लेटीफोलया** कम मात्र में थी | झाड़ियों में बहुतायत क्रमशः **हॉलरहाईना एंटीडायसेन्टररीका** उसके बाद **हेलिकटर्स इजोरा** और **एंटीडेस्मा घाएसेम्बईलल** थी और हर्ब के अंतर्गत अधिकतर **पोगोस्टेम बेंगालेंसिस** उसके बाद थी सभी चार क्षेत्रों में।

पेड़ों के लिए स्पीशीज़ रिचनेस (D) की विस्तार 4.03 (क्षेत्र- 4) से 6.06 (क्षेत्र-3) थी और झाड़ी के लिए 1.56 (क्षेत्र- 4) से 4.12 (क्षेत्र- 1) अलग अलग थे। पेड़ के लिए डाइवरसिटी इंडेक्स (H ') में 3.39 (क्षेत्र- 2) से 3.71 (क्षेत्र- 3) तक और झाड़ियों के लिए 1.19 (क्षेत्र- 4) से लेकर 2.06 (क्षेत्र- 2) तक है। कॉन्सेंट्रेशन आफ डोमिनेंस (Cd) का विस्तार क्षेत्र-4 में 0.11 से लेकर क्षेत्र-2 में 0.18 था और झाड़ियों के लिए अधिकतम 0.57 क्षेत्र- 4 में और न्यूनतम 0.30 क्षेत्र-2 में रहा | वृक्ष प्रजाति के लिए इक्विटाबिलिटी या पिलो इंडेक्स (e) क्षेत्र- 4 में सबसे ज्यादा (1.21) पाया गया और क्षेत्र- 2 में सबसे कम (1.08) और झाड़ियों के लिए इक्विटिबिलिटी 1.10 (उच्चतम, क्षेत्र- 3 में) और 0.69 (सबसे कम, क्षेत्र- 1 में)। वृक्ष के लिए बीटा डाइवरसिटी 1.81, झाड़ी के लिए - 2.17 और हर्ब के लिए - 2.55 पाया गया था।

पर्यावरणीय पर्यटन के संरक्षणात्मक दृष्टिकोण ने इसके मूल्य को बढ़ा दिया है, लेकिन स्थानीय लोगों में इसकी जागरूकता होनी जरूरी है की वे पर्यावरणीय पर्यटन से कैसे लाभान्वित हो सकते हैं। पर्यावरणीय पर्यटन अब तक छत्तीसगढ़ के बलौदा बाजार जिले के बरनवापारा वन्यजीव अभयारण्य के आसपास सफल रहा है और इस क्षेत्र में आर्थिक कल्याण, गरीबी उन्मूलन और सतत विकास के संरक्षण के वाहन के रूप में विकसित करने की क्षमता है। इन सभी टिप्पणियों से, यह स्पष्ट है कि राज्य में विकास के अवसर के रूप के परिणामस्वरूप पारिस्थितिकवाद में वृद्धि हुई है। छत्तीसगढ़ में 44% वन आवरण और इतने ही अभयारण्य हैं, अगर इन अभयारण्य क्षेत्र के पर्यटन स्थलों की सही पहचान की जाए और प्रचार किया जाए तो पर्यावरणीय पर्यटन उद्योग स्थानीय निवासियों के लिए रोजगार सृजन के साथ-साथ उनकी आजीविका को बढ़ाने में महत्वपूर्ण भूमिका निभाएगा। । पर्यावरण शिक्षा के माध्यम से वनस्पतियों और जीवों के संबंध में स्थानीय निवासियों के साथ पर्यटकों के बीच जागरूकता प्रदान की जानी चाहिए, ताकि लोग जैव विविधता संरक्षण के महत्व के बारे में अधिक से अधिक सीख सकें।

कीवर्ड: बारनवापारा, जैवविविधता, छत्तीसगढ़, संरक्षण, पर्यावरणीयपर्यटन, फौना और फ्लोरा, आजीविका।

CHAPTER – I

INTRODUCTION

The term 'ecotourism' was given by Hector Ceballos – Lascurainin 1983, and it was primarily used to describe nature travel to relatively undisturbed areas with an emphasis on educational important. Its early definition, while his modified term was officially adopted by IUCN (International Union for Conservation Nature and Natural Resources) in 1996. (Eco club International Ecotourism Monthly Oct. 06)

The ecotourism is described by the World Tourism Organization (WTO) as, "Tourism which involves travelling to relatively natural undisturbed areas with the specified object of studying, admiring and enjoying the natures scenery and its flora and fauna, as well as any existing cultural practices used in these areas."

Basically, ecotourism means- "tourism involving travel to areas of natural or ecological interest, typically under the guidance of a naturalist, for the purpose of observing wildlife and promotion of understanding and conservation of the environment." Through ecotourism travellers better understand the unique natural and cultural environments round the globe. The World Conservation Union (IUCN) describes ecotourism as, "responsible travel to nature which conserves the environment and improves the livelihood of local people. Moreover, it should contributed income and education to the contribution of ecosystems (Brown 1997).

Principles of ecotourism

- To generate employment and livelihood options for the local community.
- To promote the environmental conservation.
- To uplift the local population with regard to economic benefits

Eco-tourism can play a significant role to uplift the local population with regards to economic benefits and livelihood. There is a need to identify the good eco-tourism spots and develop the infrastructure to provide good hospitality and educate them regarding environmental conservation. In Chhattisgarh there is a lot

of scope for the eco-tourism industries to earn more revenues and play a significant role for conservation of nature and natural resources.

The present tourism is changing rapidly people wants to observe nature, heritage, and recreational destinations to enjoy , and conventional tourism is forced to meet a challenge to government and private parties to develop new venture to the tourism industries to cater better facilities . It is well known that Ecotourism is tourism where the natural beauty, local community and visitors will be benefitted. (Tiwari 2014) It is considered as a distinct form of tourism development by replacing the conventional tourism in sustainable and community-based efforts improving the living standards of local, host communities living on the fringes of forest areas.

In fact, ecotourism contributes to sustainability of all dimensions i.e. socio-culture, economic, political and environmental, fixing criteria for the purposes of evaluation and monitoring of project success (Christ *et al.*, 2003). Community based participative management of resources maximizes the benefit to the needy who sacrifice their resource for tourism development. This is achieved through the establishment and operationalization of committees, partnerships, and other resource sharing mechanism that provide local inputs to the public, like protected area managers, conservation groups etc. In ecotourism, often identified as locally initiated planning and management, the key factor for its success is this democratization process (Ross & Wall 1999).

As noticed in the empirical evidences, most of the tourism resources, particularly nature bound is located in remote and virgin settings where the indigenous communities reside. So tourism should be a source for their livelihood also. In certain regions it is considered as one of the prime sources for indigenous mountain communities to enjoy their rightful share in the exploitation of their exclusive resources. The cultural values of these remote areas which are inherent to the aboriginal communities are innumerable and are manifested in the form of community engagements (Williams *et al.,* 2001).

Sustainability is a very important aspect of all development initiatives. Ecotourism ultimately seeks to contribute to community both directly and

indirectly. This is achieved not necessarily by changing the traditional practices of livelihood like Agriculture, fisheries, local looms etc., but more often by improving such activities. If we consider all the facets of travel as an eco-tourism, we can see that it is more than a journey for rest, relaxation, and recreation. The other benefits of community-based ecotourism particularly in rural areas providing income to communities, discourage migration to other place, and conserving biodiversity etc., are widely acclaimed. It is also observed that ecotourism check the exploitation of local residents and resources. In case of Kenya and its national parks which are regarded as the world's foremost ecotourism destinations, meet the livelihood aspirations of good number of its local people (Edgar Allan Amador 2004).

Tourism development and conservation should meet at a point which will not compromise each other through proper planning by involving the local communities, government and the private sector. Hence an integrated framework of nature conservation and tourism development, which will combine the destination sustainability, and encourages the local community to support the conservation and livelihood programs needs to be framed. Ecotourism can support protected areas in conservation and livelihood requirements of destination communities if managed in a manner in which direct economic benefits will accrue to local communities (Manalel & Vinodan 2009). Rural communities are developing tourism as a source of new jobs and income.

Chhattisgarh is a newly formed state a part of Central Indian Plateau, on the Deccan trap situated in the centre of India. It has 1,35,153 Sq. km. Area bearing more than 1.761 crores of the human population. It is divided in 28 districts for better administration.

Chhattisgarh states place category with the GPS coordinates of 21° 17' 42.4752" N and 81° 49' 41.6352" E. Chhattisgarh surrounded with small hills and plans. The annual average rainfall of 60 inch. Rice is the principle crop of the state. Uttar Pradesh to the north, Jharkhand to the north east, Orissa to the east, Andhra Pradesh to the south-east and south, Maharashtra to the south-west, Madhya Pradesh to the west and north-west from its boundaries.

Chhattisgarh, ninth largest state of India, which was created from Madhya Pradesh, is a part of India that rarely hard comes up in the vocabulary of a beauty having rich cultural heritage from the frying eyes of a seasoned traveller. State contradiction exist harmoniously side-by side, landing the state a charm of its own. This is the perfect place for niche tourism, ethno-tourism, ecotourism and most significantly, sustainable tourism to unfold in its haritage value. To explore the yet to be widely documented treasure troves of intriguing cultural and relief feature at a cost that won't strain your budget at either, is a chance you should not miss.

In Chhattisgarh we have 44% of lush green forest. In this state we have 3 National Parks, 11 Wildlife Sanctuaries and 1 Biosphere Reserve. Indravati National Park, Kanger Ghati National Park, Barnawapara Sanctuary, Sitanadi Sanctuary etc. are the prominent ecotourism destinations in Chhattisgarh. These wildlife sanctuaries and national parks are home to the state animal (wild buffalo) and state bird (hill myna) and other endangered species of animal and bird such as spotted deer, four horned antelope, sloth bear, wild dog, jackal, wolf, hyena and bison. The Indian government has recognized Chhattisgarh as a "maximum tourist potential" state and will help its endeavours in establishing itself as ' a centre of Ecotourism.

Chhattisgarh has identified some regions having high potential for ecotourism with a lot of initiatives. Barnawapara Wildlife Sanctuary is one of the most beautiful and picturesque Sanctuary of Chhattisgarh. The Sanctuary located in northern part of Mahasamund, Chhattisgarh, and this Sanctuary is one of the beautiful and important sanctuaries in this region. It is established in 1976 the sanctuary is relatively a small one covering an area of only 245 sq km. the topography of the region comprises of flat and hilly terrain with altitudes ranging between 265-400 mts.

The specific objectives of the present study are:

1. To document the ecotourism activity in Barnawapara wildlife sanctuary.
2. Documentation of flora and fauna having commercial, aesthetic, medicinal and biodiversity value.

3. To find out the tourist attraction spots and their development strategies to increase the ecotourism.
4. To workout the impact of ecotourism on livelihoods of tribes.

CHAPTER –II

REVIEW OF LITERATURE

An attempt has been made in this chapter to study the work done on ecotourism in overseas, India and Chhattisgarh. However, very little work had been done in this aspect of ecotourism. The literature cited in this chapter is covering importance, livelihood of local residents and biodiversity conservation documentation of medicinal plants were worked out to study the potential of ecotourism in Chhattisgarh. Within the following targets, the literature is reviewed:

1. To document the ecotourism activity in Barnawapara wildlife sanctuary.
2. Documentation of flora and fauna having commercial, aesthetic, medicinal and biodiversity value.
3. To find out the tourist attraction spots and their development strategies to increase the ecotourism.
4. To workout the impact of ecotourism on livelihoods of tribes.

Objective wise review is given below:

2.1 To document the ecotourism activity in Barnawapara wildlife sanctuary.

2.2 Documentation of flora and fauna having commercial, aesthetic, medicinal and biodiversity value.

2.3 To find out the tourist attraction spots and their development strategies to increase the ecotourism.

2.4 To work out the impact of ecotourism on livelihoods of tribes.

2.1 To document the ecotourism activity in Barnawapara wildlife sanctuary.

Shrivastava *et al.* (2020) studied the ecotourism potential in Orchha, Central India community requires skill development and capacity building by training the youths of the village with tourism business skills. These youths can form village level institution to run the ecotourism business for capacity building of rural community, infrastructure development and benefit sharing. This is a first such extensive study of the floral and faunal diversity of OWS. According to him this is the first attempt to study the possible integration of ecotourism activities with community development activities of the Orchha area.

Bhatt *et al.* (2017) reported that the ecotourism value by Travel Cost Method (TCM) has been strictly adhered to estimate the ecotourism value of the Dachigam National Park which becomes the most modus operandi to the development of the park acquisition and its management policies. Results show that consumer surplus per visitor per visit in present study was equal to Rs. 23809 which translates into an annual aggregate value of Rs. 10, 39, 82,349.

Oruonye *et al.* (2017) examined the ecotourism potentials of GGNP. Field observation, interview and questionnaires were used to elicit information from the staff of (GGNP), tourist and enclave communities within the park. The study findings revealed that the huge ecotourism potentials of the park are under-utilized at the moment. Some of the challenges include poor funding, lack of adequate publicity, inadequate infrastructure and recreational facility and activities of poachers. The study recommends improvements in road network to and within the Park and stiffer sanctions to curb poaching so that the ecotourism activities would be increased.

Buslon *et al*. (2019) conducted experiment in Olango Island Wildlife Sanctuary, Aguinid Falls, and Bojo River. Using a random sampling technique, 70 respondents were residents and earning income from the ecotourism activities. The gathered data were treated using simple percentage, weighted mean, Chi-square test of independence and ANOVA. The findings revealed that meagre income for selling locally-made products, as tour guides, providing transportation services, and through fixed salaries per month.

Rana *et al.* (2009) find out the visitors profile study of protected area based tourist spots of Rema-Kalenga Wildlife Sanctuary (RKWS), Bangladesh to ascertain the potential of ecotourism. Study findings shows that 69% male constitute the visitors group while the maximum number of visitors was found in the age of below 30 years. Most of the visitors were literate and among them 43% visitors were student. Most (53%) visitors preferred to get recreation in holiday as they were employed. Visitors were highly preferred to come with friends group. About 92% respondents showed positive mind to come here in future while 89% respondents said that park has tourism potential. Most of the respondents reported

the presence of wildlife (48%) most notable followed by plant diversity and tribal community as recreational asset of the area.

Hongalad and Biradar (2019) carried out his experiment in the selective spots of Uttara Kannada in Western Ghats from June 2014 to May 2015. The study made significant observations regarding the tourism facilities at spot, the problems encountered and satisfaction level of tourists and provided the setting for analyzing the impact of ecotourism in Uttar Kannada and study revealed that ecotourism occupies a significant position in overall tourism development in this district and has an immense ecotourism potential. Participation of the local communities ensures economic benefits for them, which in the longer run can ensure a better status and an easier life. The study concluded that the ecotourism plays a remarkable role in the overall tourism development and also helps in uplifting the economic conditions of the local people

Bharti *et al.* (2014) the result of experiment conducted at Bandhavgarh National Park in Madhya Pradesh, which is one of the Tiger Reserves of India. Bandhavgarh is an ideal site for such a study as it is a tourism destination of international reputation with relatively high visitor influx and one in which the tourism infrastructure has been in existence for an extensive duration. The tourism activity has reduced the total caring capacity of this area by about 36% from its original state. Though the impact still remains within the low impact category, it is perilously close to the moderate impact level. Management initiatives are required to mitigate the adverse impacts arising from the tourism activities and special emphasis should be laid upon the sensitive components as Ecological and Facility caring capacity in this case.

Akash and Aram (2018) conducted his experiment in Kanyakumari District and find out which type of media creates sustainable tourism awareness among tourists in Kanyakumari district, Tamil Nadu, India. A questionnaire was administered to collect data from 100 tourists in Kanyakumari district during the time period January 2018 to February 2018. Respondents to the questionnaire were selected through stratified random sampling technique. The major finding of the study is that the ecotourism information through digital media is more persuasive,

though newspapers are more credible to enhance the ecotourism activities in this area.

Ranjith (2020) evaluated and reported that the positive and negative impacts of ecotourism developments in Neyyar, Agastyarvanam, and Ponmudi ecotourism destinations in Trivandrum and to assess the environmental and socio-cultural impacts of ecotourism development in these regions. The analysis of collected data reveals that environmental quality in terms of conserving natural resources, improving environmental quality Agastyarvanam, and Ponmudi achieving good status. The low status observed in negative environmental impacts like ecosystem damage and natural hazards.

Bhattacharya *et. al.* **(2006)** reported in his study for the assessment of awareness about implementation of the rules, regulations and guidelines with respect to the impact of ecotourism in the park. The study assessed the impacts of implementation of the operational guidelines and suggests measures for better visitor's management in the park.

Cristian (2002) reported about development of ecotourism in Chile. It was noted that, since 1990s the development of various ecotourism projects has been resulted in 350 thousand visitors, generating an annual 800 million dollars for the national economy of the country.

Davenport *et al.* (2002) reported as management tools that aid in planning and promoting ecotourism within parks. Some of the tools have been discussed including, visitor's impact management, increasing domestic tourism, optimizing user fee structure, revenue sharing, integrated conservation and development projects based on ecotourism; and investment in tourism infrastructure and interpretation.

Duim and Philipen (2002) worked out the contribution of eco-tourism in nature conservation taking example of a privet reserve (Monteverde) and a National Park (Manuel Antonio), Costa Rica and found contradictory results. On one side it provides financial assistance for maintenance; on the other tourism development activities in the immediate vicinity has led to negative impacts on

nature and environment. They also found that the local people were not benefited properly.

Gossling (1999) reported that ecotourism can contribute to safeguard biodiversity and ecosystem functions in natural forest. A cost-benefit analysis of those ecosystems richest in species diversity, i.e. tropical rain forests, leads to the conclusion that tourism and its direct use value can play an important role as an incentive for protection. Visiting in sensitive areas needs to be limited; education, management and control measures have to be integrated and money captured from tourists has to be increased. Tourism needs to go substantial changes in the long run.

Kumar and Rangaswamy (2002) studied about ecotourism in Karnataka and found that there is great potential of ecotourism. There is need for a separate Ecotourism policy for its better promotion.

Lindberg *et. al.* (1996) evaluated ecotourism potential of Cockscomb Basin Wildlife Sanctuary. The result indicated that tourism achieves the objectives of ecotourism as conservation, development and local economic benefits and support but it should be implemented of a modest user fee to enhance the ecotourism activities.

Mukerji (2006) revised the various policy measures for conservation and management of the biodiversity of Indian forests as provided in the Indian Forest Act, since1856 to 2003 aiming ecodevelopment around the protected areas. Supporting the ecodevelopment strategy around the protected areas and he concluded that people‟s participation is the best approach for it.

Obua (1997) reported the ecological impacts of ecotourism in a national park of Uganda. It was observed that development of campsites involve removal of vegetation which accounts for loss of woody species and reduces species composition in protected areas. Some recommendations have been made to prevent such vegetation loss.

Rawat and Sharma (2003), studied on development of stakeholder based ecotourism in Uttaranchal, India. Ecotourism holds a great potential for

conservation of fragile mountain ecology. The study revealed that the stakeholder participation can considerably increase the infrastructure for ecotourism sharing government burden.

Salam et. al. (2000), suggested that nature-oriented tourism can be one means to help achieve sustainability in the reserve forest as well as protecting the important world heritage site. Well-planned tourism could provide economic and political incentives for proper management and conservation and could bring additional benefit to local communities and regional economies of state and country.

Sayed and Langawi (2003) concluded that flora and fauna are the live resources which require the habitat characters to be preserved for their conservation. The paper discusses the application of ecotourism techniques that ensures biodiversity conservation and elaborates their effectiveness under the socio-climatic and socio-cultural condition of Kuwait. The result provides a systematic plan to identify the steps of Ecotourism development and the cost of biodiversity.

Serrano (1997) reported in his study and gave some principles for achieving sustainable tourism development. These principles can be adopted to avoid many of the negative impacts of tourism development, such as increased crime, economic inequality and negative impacts on local cultures.

Stem *et. al.* (2003) conducted a comparative case study. The research findings indicated that eco-tourism is an effective conservation strategy and community development tool. They illuminated legal restrictions as a control over deforestation and hunting but tour operators were insignificant in increasing environmental awareness. There were many indications of ecotourism dominating local economies and offered suggestions to improve ecotourism's potential

Tisdell (1997) reported in his study and illustrated a number of consequences of ecotourism development in Sunderbans. The problems involved in developing tourism include highly seasonal tourism, no local people involved in the tourism industry- so very few employment benefits to locals, permits are

required for entry both in Bangladesh and India which often causes delays which can frustrate tourists; and wild animals, especially tigers, are elusive in the protected area.

2.2 Documentation of flora and fauna having commercial, aesthetic, medicinal and biodiversity value.

Bist (2000) carried out a systematic study and showed the impact of changes in the forest cover in Nanda Devi Biosphere Reserve of India. The analysis showed that in the Reserve forest area, the forest cover has increased and showed a positive trend, which needs to be maintained in future.

Singh (2020) carried out Ecological Dynamics of Biodiversity in Landscape of Manglore and find out that *Terminalia paniculata* is the dominant species followed by *Xylia xylocarpa*. Data collected on regeneration of 315 tree species would help to predict their population trends in this forest which is the protected forest of Manglore. The Participatory Rural Appraisal conducted in villages adjacent to forests; prove the contemporary relevance and traditional use of 83 plant species found in the forest

Khushwah and Kumar (2000) studied and reported that the biodiversity indices for flora of Madhav National Park, Satpuda National Park, Indrāvati National Park, and Bandhavgarh National Park. The values of Shannon- Wiener indices as computed were found to be 2.508, 2.226, 1.842 and 1.815 respectively. They have calculated that Bandhavgarh, Indravati and Satpuda national park need to be given more attention for protection and conservation of biodiversity. According to them there is need to strictly follow the rules with legal and other provisions in order to minimize the biotic pressures in these National parks.

Rajendra et al. (2017) conducted his experimrnt in Aravalii hill and find out natural home 616 species that includes 9 orchids and 25 locally and globally endangered plant species. But this sanctuary not familiar for the ecotourism activities, very few people visits this sanctuary. Apart from conventional practices, the science and technology approaches will help the forest department to do a systematic plan for ecotourism activities. i.e developing tourism facilities, nature

trails, identifying more watching point, camping site, publicity, brochure and signage in this sanctuary

Maliya (2007) studied and observed that the rare species of Katrniyaghat Wildlife Sanctuary. The survey enlisted 41 rare species including plants from trees, small and medium sized trees, shrubs, herbs and climbers, out of which 23 had a wide range of Ayurvedic and Ethno-medicinal uses. Remaining 18 species were economically valuable.

Reddy *et. al.* (2006) studied the vegetation and floristic diversity of a National Park Bhitarkanika at Orissa which represents different vegetation in different habitats. Total 372species were identified belongs to 262 genera under 100 families. There is need to conserve the biodiversity of this park.

Shrivastava and Choudhary (2007) studied the floristic diversity in the various regions of Itanagar Wildlife Sanctuary. The study also provides phenological details of various plant species along with their local uses. The documentation help to know the available flora of this Sanctuary.

Singh (2004) studied the biodiversity of Ratanmahals Wildlife Sanctuary in Gujarat state and its surrounding area in Gujarat and Madhya Pradesh which is the last large block of surviving forests (515 km^2) in Malwa region for conservation in priority under a regional planning has been highlighted in his work. Majority of the forest is under dense forest and Ratanmahals, a small sanctuary, is an integral part of forest demarcated for conservation of biodiversity. This study reflects an overview on floral and faunal diversity and conservation need of the Malwa plateau between two states.

Singh (2007) reported in his study and given a general account of the vegetation pattern of Valmiki National Park. The author has enlisted the available plant species along with their utilization as economic, medicinal importance as well plants being locally utilized for many purposes. About 700 species spread over 459 genera and 117 families were reported.

Subramani *et. al.* (2007) studied the floristic diversity and life forms of the plant species available and prepared biological spectrum out of it. The species

documented included medicinal, aromatics, exotics. Ecological characterization of the vegetation has been made according to life forms. The biological spectrum revealed the ronano phanerophytic vegetation in the study area which was partly due to vegetation disturbance.

Sundriyal and Sundriyal (2003) studied small representative types and habitats in the Eastern Himalayas. Thus the total vegetation was identified and evaluated for evaluating the status of the vegetation the total 215 species recorded at all the sites, 26% have fodder value, 16% fuel, 10% timber, 10% wild edibles, 5% medicinal and another and 13% of miscellaneous uses. Thus 80% of the flora has some kind of economic use.

Everard *et al.* (2018) Reported in his experiment in Indian villages at middle Himalayan region, linkages between people and adjacent forest and river ecosystems. Interviews with local people and direct observations revealed low food availability and decreasing self-sufficiency, under the combined pressures of increasing foraging by wildlife (primarily pigs and monkeys) coupled with seasonal to permanent outmigration by younger men seeking more secure income and alternative livelihoods of the local people

2.3 To find out the tourist attraction spots and their development strategies to increase the ecotourism

Bhattacharya *et. al.* (2003) reported in his study and explored the community based ecotourism (CBE) in the Kerwa forest area (near Van Vihar National Park), Madhya Pradesh, India. A tourism potential survey was conducted to determine the tourism resource of the area and to access the potential stakeholders‟ interest in combining efforts to develop sustainable CBE in the location. It was concluded that the Kerwa area has adequate potential for small-scale ecotourism development and, with appropriate and organized planning and implementation, conservation and economic development in the area is possible.

Bradley (2004), conducted experiment and introduced a model of sustainable community-based ecotourism (CBET) implemented in Cambodia, by the NGO Mlup Baitong. CBET is a form of nature tourism managed by the

community of the destination, with direct benefit to itself while offering the visitor a unique experience. The Combodia Community-Based Ecotourism Network (CCBEN) is then introduced, and the closer cooperation between the various sectors working in tourism was proposed so the livelihood of the local inhabitants will be economically benefited.

Card and Vogelsong (1995) studied and reported that how ecotourism meets the sustainable development goal. It was argued that the inclusion of local labour and business is supreme to future development. It was concluded that while supporting conservation efforts, ecotourism emphasizes reciprocal social contact with communities and creates economic opportunity.

Chakravarty (2003) reported in his study that the resident's attitude towards the potential impacts of ecotourism. The analysis is based on data from 738 completed interview schedules. The case study indicates the critical role played by the local communities for their effective participation and aroused concern for their rights to use the zone. Alsosuggestions had been outlined for the proposed park, for the tourists and for the residents.

Corcoran (1996) found that some individuals are generating supplemental income from ecotourism and are optimistic about its future. Rural communities are developing tourism as a source of new jobs and income. Two models have been highlighted that provide a framework for community-based ecotourism strategies so the ecotourism activities will increase

Getzner (2002) reported the potential contribution of the Gesause National Park in the development of Austria. Using a regional multiplier model showed that employment could be increased significantly. About 50- 100 additional full-time jobs could be created; the unemployment rate which is 11% could be reduced by 10-25%.

Koch (1997) presented a political economy of nature tourism in South Africa. It has been argued that tourism can be used as a tool to reconstruct rural economy if obstacles that inhibit community participation are taken into consideration. Other sections discuss conservation reform, tourism based

development initiatives, involvement of tribal authorities, importance of utilizing local knowledge in park management.

Lindberg (1998) identified three economic aspects of ecotourism. Through tourism, the natural areas can be added values, user fees and revenue to support natural area protection and ecotourism and economic development of that area.

Maikhuri *et. al.* (2000), reported the history of expeditions and the impact on the local economy, identification of eco-tracking/ expedition routs and potential sites, and designing appropriate strategies/ action plans for sustainable ecotourism. This will not only help to resolve the local people policy conflicts and improve the local economy but will also help to achieve the biodiversity conservation goals.

Nelson (2004) reviewed how community-based ecotourism has evolved and how it contributes to both conservation and rural development. The rural communities are signing commercial agreements with private operators to develop ecotourism ventures on their land which offers them new economic opportunities.

Schoemann (2003) studied the socio-political aspects of establishing ecotourism in Qwa-Qwa National Park, South Africa. The study aimed to investigate the lack and problems of tourism development with emphasis on ecotourism. The disputes related to land tenure ship, inability of government to provide proper policies and directions for development of ecotourism, inefficient funding operations are some of the problems in park development which prevent the local community to share the ecotourism benefits.

Schulze (1998) conducted a study through community-based ecotourism development in Malaysia aimed to analyze link between socioeconomic systems with local natural resource base; social structure and village institutions; impact of gazetting of the Wildlife Sanctuary on the village economy and different approaches towards ecotourism development. The promotion of village based ecotourism development requires formal training and early involvement in planning avoids unnecessary conflict between local population and tourism development agency.

Stem, *et. al.* (2003) studied the community participation in ecotourism benefits and examined the ecotourism's effectiveness as a conservation strategy. The research conducted reveals that ecotourism is effective as a conservation strategy as well as for employment generation to the local inhabitants.

2.4 To workout the impact of ecotourism on livelihoods of tribes.

Bibi *et al.* (2013) studied the livelihood conditions of the peoples of three villages (Bait Qaimwala, Basti Allahwali and Jannu) and their dependency on biodiversity of Taunsa Barrage Wildlife Sanctuary, Pakistan from 2009 to 2011. For socio-economic status, Participatory Human Resource Interaction Appraisal method was used and for biodiversity assessment, direct census method and point count were used. Floral biodiversity contained 79 species of plants including; trees, herbs , shrubs , grasses ,reeds and Fauna included fish , amphibians , reptiles, mammals and birds species.

Fiseha (2013) worked out the contributions of protected area for local community livelihood was carried out in Senkele Swayne's Hartebeest sanctuary (SSHS). Primary data were collected through questionnaire, Key Informant Interview (KII), Focus Group Discussion (FGD) and direct field observation. Secondary data were collected through review of literature. Out of the 32 rural kebeles found in the Siraro district, four kebeles surrounding the sanctuary were purposively selected for the study. Regarding to manage current destruction of the sanctuary, 27.2 % of respondents supposed that, the sanctuary could be managed through ensuring protection and conservation while 13.9%, 11.9% and 11.3% respondents stated sanctuary destruction could be managed through benefit sharing, participatory wildlife management and controlling grazing respectively. Some other 10.6% and 9.9% of the respondents said the sanctuary destruction can be managed through to create awareness among people and control illegal activities in the protected area.

Sreerekha (2020) worked out Ecology and Economy impact on different parts of India in Thenmala forest. Ecotourism can play a significant contribution to development which is economically, ecologically and socially sustainable. This addresses the fundamental issues like conservation of nature, culture, society and

promotion of traditional knowledge by developing tourism through community participation. In the functioning of Thenmala ecotourism local people have significant role in conservation of forest biodiversity through peoples participation.

Adom *et al.* (2020) reviewed that Biodiversity project teams must fulfill their corporate social responsibility and pay the due compensations to local communities in winning their approval and support for the execution of the project Besides, alternative sources of livelihoods can be offered the local people through the establishment of ecotourism sites and the development of small scale enterprises from Non-timber forest products.

CHAPTER – III

MATERIALS AND METHODS

The present research entitled ***"Prospects and Potentials of Ecotourism in Barnawapara Wildlife Sanctuary of Chhattisgarh with Special Reference to Livelihoods of Tribes & Conservation of Biodiversity"*** Was conducted at Barnawapara Wildlife Sanctuary, Baloda Bazar Forest division of Chhattisgarh in the year 2017-2018. The specifics of the study site, climate, geology, soil, forest flora, fauna and other features of land along with the methodologies adopted are described below:

3.1 Study Site:

The study was carried out in the Bar and Kothari ranges of Barnawapara Wildlife Sanctuary of Baloda Bazar Forest Division. The geographical location, physiographic and other features of study site are given below.

3.1.1 General:

Barnawapara wildlife sanctuary was built in 27 July 1976. The name of the sanctuary derived from Bar and Nawapara forest villages. Which are situated in the heart of the Sanctuary and adjacent to each other. The Sanctuary lies at a distance of 100 km away from Raipur, 27 kilometres from Pithora, 28 kilometres from Patewa and Jhalap.

3.1.2 Geographical location and physiography:

The study was carried out in The Barnawapara wildlife sanctuary extend between 210 18' 45.00" to 210 30' 00.00" North latitude and 820 22' 30.00" to 820 37' 30.00" East longitude. The sanctuary consists of 244.66 km^2 of total area. The Barnawapara Sanctuary is encircled by reserved forest on all sides except part of the northern and eastern boundaries where Dharkhar forest village, Khurmuri, Phurphundi, Busripali and Pakrid revenue villages are situated. Upper western boundary is throughout formed by Balamdehi river. Sanctuary is connected to Nagpur-Raipur-Sambalpur national highway no. 06 (NH - 06) by all-weather roads

from Patewa (28 km), as well from Pithora (27 km). Fig. 3.1 show location information.

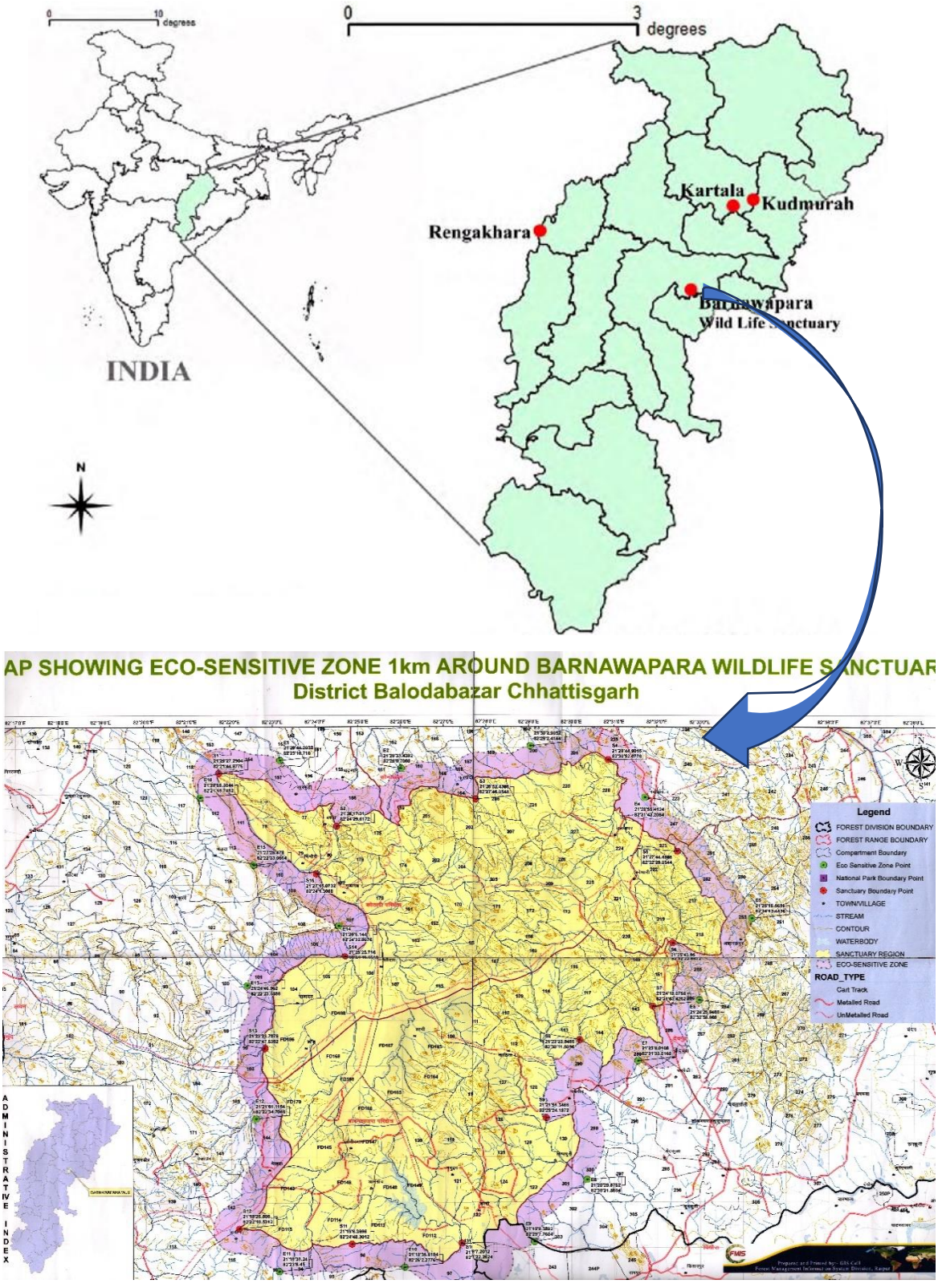


Fig. 3.1: Location map of Barnawapara Wildlife Sanctuary

The general topography of region is undulating with numerous low and high hill tops. The Sanctuary consists of 55% plain and 45% hilly area. There are a number of hillocks spread all over the place in the area adjacent to Nawapara forest village. The hillside slopes are moderate to steep. Tilsa plateau (pathar) is the highest with an approximate altitude of 463 m above mean of sea level. The stream and nalas flowing in the area have steep bank rich in alluvial soil and sustain a rich diversity of vegetation.

Dry deciduous forest, grasslands (Rangeland), agriculture lands and human habitations around the study area. In this study site so many forest villages and revenue villages are existing and these are categorised as forest villages and most of them are accessible to Kachcha roads, which is reachable only during dry season. The road network is unavailable in few hilly tracts of land, which are inaccessible due to dense forest and steep slops.

3.1.3 Zonation:

The Barnawapara Wildlife Sanctuary has been divided into core and buffer zone area as per norms of wildlife sanctuary. However, the buffer zone area has to be further divided into buffer and restoration zone.

3.1.3.1 Core zone:

The Barnawapara Wildlife Sanctuary has a care zone core zone of 44.08 km^2, which is 18% of total area (244.66 km^2). Out of this an area of 12.57 km^2 falls in Bar range and the rest of the area of 31.51 km^2 falls in Kothari Range of Barnawapara Sanctuary.

3.1.3.2 Buffer zone:

The Barnawapara Wildlife Sanctuary has a buffer zone core zone of 200.58 km^2, which is 82% of total area (244.66 km^2). Out of this an area of 113.48 km^2 falls in Bar range and the rest of the area of 87.1 km^2 falls in Kothari Range of Barnawapara sanctuary.

3.2 Climate:

The Sanctuary area has a dry humid tropical climate, with consists three major seasons viz. rainy, winter and summer. The rainy season begins in mid-June and lasts through the month of September. The winter season starts in November and lasts through to the end of February. The summer season begins at the beginning of March and lasts until mid-June.

3.2.1 Rainfall (Precipitation):

The total annual precipitation of the study area is estimated in the range of 1200-1300 mm. It decreases steadily from the south-east to the north-west directions. During June to September, about 80% of the annual precipitation is obtained from the southwest monsoon in the study region. In July, the maximum amount of rainfall takes place.

3.2.2 Temperature:

The average monthly (maximum temperature) ranges from January to May as 27.2^0 C to 41.9^0 C and average monthly (maximum temperature) ranges from December to May as 12.6^0 C to 27.5^0 C respectively. The annual average (minimum and maximum) temperature of study area is 20.4^0 C and 33.2^0 C respectively.

3.2.3 Humidity:

The study area's relative humidity rises with the start of the South-West monsoon and in July it normally becomes more than 80%. The relative humidity in the post-monsoon and winter seasons is between 50-60 percent in the morning (6:00-12:00 hours) and 30-40 percent in the afternoon (12:00-16:00 hours). During the summer, relative humidity is lowest and in April and May it falls below 30 percent in the afternoon.

3.3 Geology:

The site of study has 3 distinct geological formations like Chhattisgarh super group, Early Precambrian and Late Precambrian. Litho-logically the site is divided into 7 groups they are, Raipur Shale and limestone, Khairagarh sandstone,

Cuddapahas charmer limestone, Gunderdehi shale, Dharwar rocks, Chandrapur sand stone grit, Granite and genesis.

3.4 Soil:

Soils of the site of study are divided in to 3 classes like, Vertisols, Inceptisols, and Alfisols. The Inceptisols are not fully developed which are mostly sandy loam soil having shallow to moderate depth and light texture. They are lower in available nutrients and organic matter (O.M.), which mainly support degraded forests and grassland. These soils are generally found in the Southern and Eastern aspects. Alfisols occur in a relatively deep midland condition and thus have strong water holding capacity and carry luxuriant vegetation, on the other side Vertisols are deep clayey soils having strong water holding capacity and are promoting rich vegetation. Some of these lands are use for agricultural crop cultivation.

3.5 Forest type of flora

The various kinds of forest vegetation found at the site of the study. Northern and eastern direction is covered with luxuriant forest, whereas Teak plantation covers most of the area's in the southern direction. According to Champion and Seth (1968) the forest area is divided into four major forest type viz., (1) Southern Tropical Dry Deciduous Teak Forest ($5A/C_{1b}$), (2) Northern Tropical Dry Deciduous Sal Forest ($5B/C_{1c}$), (3) Northern Tropical Mixed Deciduous Sal Forest ($5B/C_2$), (4) Dry Bamboo Brakes ($5/E_9$). The major tree species of the study area or forest are *Cleistanthus collinus, Diospyros melanoxylon, Lagerstroemia lanceolata, Madhuca indica, Semecarpus anacardium, Tectona grandis,Terminalia tomentosa,Acacia catechu, Anogeissus latifolia, Boswellia serrata, Buchanania lanzan, Butea monosperma, Chloroxylon swietenia, Lannea coromandelica, Mitragyna parvifolia, Pterocarpus marsupium,Bridelia restusa, Careya arborea, Diospyrous montana, Phyllanthus emblica, Pongamia pinnata, Soymida febrifuga, Terminalia arjuna.*The important shrubs like *Holarrhena antidysenterica, Eupatorium odorotum, Helicteres isora, Antidesma ghaesembilla, Lantana camara, Tribulus terrestris, Woodfordia floribunda*etc. are also occur. The important herbs like*Alpuda mutica,*

Andrographis paniculate, Dodonoea viscosa, Aristida setacea, Bauhinia vahlii, Cyperus rotundus, Daedalacanthus perpurascens, Nicotiana plumbaginifolioa, Pogostemon benghalensis, Smilax zeylanica etc. are also found in the site of study. The Identification of flora (tree species) sample in the study site is mentioned in Plate – 6.

3.6 Fauna:

Various species of birds, mammals, reptiles along with scores of insects, amphibians, nematodes and other microorganisms occur in the site of study.

The important fauna, such as Indian bison, Sambhar, spotted deer, wild boar, barking dear and maximum number of birds and reptiles are generally seen. While there are few four horned antelopes also present on the site of study. Primary consumer such as hare, rabbit, sambhar, Indian bison, spotted deer, langur, chital, rhesus monkey, antelope, porcupine, whereas secondary consumer are panther, leopard, fox, hyena, wild bear etc. are generally found in these forests. A maximum diversity of birds population is viewed also and the most common among them, such as crows, sparrows, pigeons, peacocks, jungle fowl, ducks etc. Reptiles like kraits, cobras, vipers are generally found and a maximum number of amphibians such as frogs, toads, and salamanders are also found on forest. Among fishes' Grass carp, Common carp, Katla, Rohu, Mrugal etc. occur in the perennial and seasonal water bodies inside the sanctuary. Some fauna at the study area is mentioned in Plate: 7.

3.7 Other practices of land use:

3.7.1 Forest village:

Within the sanctuary, there are 18 woodland villages. Total population of local resident is 10275 within 2971 family. In Sanctuary the forest village is spread over an area of 2442.02-hectare.

3.7.2 Grassland:

117.20 hectare of grassland established in sanctuary area and these grasslands provide better habitat source of food material to the herbivores. Grasses

that are grown here are Aempicheri, Dinanath, Stylo, Red Marbl, White Marble, Shukla, Dub, Napier, Chipi grasses are found abundantly.

3.8 Interpretation centre:

At the tourist place Barnawapara, in order to attract the tourist, the information centre has been established by the Forest department for Ecotourism activity. In information centre complete information regarding flora, fauna, geomorphology and area description of Barnawapara wildlife sanctuary has been mentioned. There is a small **Museum** which has all the information about the sanctuary and in order to attract the tourist, the **open Theatre** has been open near the information centre where the videos are been played for the tourist to provide the information regarding wild-life sanctuary

Plate 1: Interpretation centre (Museum)

Plate 2: Open Theatre

3.9 Other attraction spots developed in sanctuary by the Forest Dept.:

In Barnawapara sanctuary the adaptation centre for Blackbuck, Wild Asian buffalo Breeding centre, Crocodile Rearing centre already developed. In this way the biodiversity of flora and fauna will be increased significantly and for research and development for academic benefit it will become the main attraction centre.

3.10 Tourist attraction spots Identified during the study:

In Barnawapara Wildlife Sanctuary there is a significant capacity to attract the tourist & visitors including Indian and Foreign tourists as there were many attractive tourists' places in and around the sanctuary area such as; Sirpur, Turturiya, Matagarh, Devdhara, Dev Hills Darshan, Siddhkhol, Shivrinarayana, Giroudhpuri and Chatapahaad.

3.11 Experimental Details:

3.11.1 Sampling:

The study for species composition and species diversity was conducted in Barnawapara wildlife sanctuary.The study area was divided into 4 sites (site-1, site-2, site-3, site-4) to cover the heterogeneity of the sanctuary for further detailed study.The site-1 covers the south eastern part of the sanctuary for analysis, site-2 covers the north eastern part of the sanctuary for analysis, site-3 covers the north western part of the sanctuary area for analysis then site-4 covers the south western part of the sanctuary area.

3.11.2 Method:

The stratified random sampling method (procedure) was taken for characterization of flora (vegetation). In each area, phytosociological analysis was performed out by randomly laying quadrates. The quadrates size was 10x10 m^2 for trees, 5x5 m^2 for shrubs and 1x1 m^2 for herbs. Randomly 10 quadrates taken in each site and data was taken for flora (trees, shrubs, herbs) from each quadrate. For basal area, the girth at breast height (GBH) of individual tree has been measured at 1.37 m height from ground level. For shrubs collar diameter measured via calliper. Number of individuals counted for herbs.

3.11.3 Phytosociological analysis:

The vegetation data in each site of forest quantitatively analysed for frequency, density and abundance by using following expressions (Curtis and Mc Intosh, 1950).

$$\text{Density (Stem/ha)} = \frac{\text{Total number of individuals of a species}}{\text{Total number of quadrates studied}}$$

$$\text{Frequency (\%)} = \frac{\text{Number of quadrates in which species occur}}{\text{Total number of quadrates studied}} \text{ X100}$$

$$\text{Abundance (\%)} = \frac{\text{Total number of individuals of the species in all quadrates}}{\text{Number of quadrates in which the Species occur}} \text{ X100}$$

Tree basal area

Basal area of tree was measured as circumference and further calculated with πr^2 then as cross-sectional area of stem at breast height i.e., 1.37 m from ground level and for shrubs the collar diameter was measured via digital calliper. The relative density (RD), relative frequency (RF), relative basal area (RBA) and relative abundance (RA) was measured by using following equation.

$$\text{Area} = \pi r^2$$

Where, r = radius (radius of girth at GBH) and π = 3.1459.

$$RD = \frac{\text{Density of individual species}}{\text{Total density of all species}} \times 100$$

$$RF = \frac{\text{Frequency of the individual species}}{\text{Total frequency of all species}} \times 100$$

$$RA = \frac{\text{Abundance of individual species}}{\text{Total abundance of all species}} \times 100$$

$$RBA = \frac{\text{Basal area of the individual species}}{\text{Total basal area of all species}} \times 100$$

The IVI (Importance Value Index) was measured as the total sum of RF (relative frequency), RD (relative density), RA (relative abundance or relative dominance) (Phillips, 1959). For herb relative dominance was used instead of relative basal area (RBA).

$$\mathbf{IVI = RF + RD + RBA}$$

Plate: 3 - Measurement and Data Collection at Study Area


Girth Measurement at Breast Height


Map Study


Data Collection | Collar Diameter Measurement

Data Collection at study area

GPS for Coordinate Measurement

Species Identification

Prepare Stick for Breast height measurement

3.11.4 Plant diversity analysis:

Plant diversity in different area was quantified via following diversity indices:

a) **Shannon Index** (Shannon & Weaver, 1963) was used for species diversity

$$\mathbf{H' = Pi \log 2}$$

Where,

Pi is the proportions of total stand basal area represent by the i^{th} species. The working formula given by smith (1974) was used here

$$\mathbf{H' = 3.3219\ [\log_{10} N - (\sum Ni \log_{10} Ni / N)]}$$

Where,

Ni was the entire basal cover of species, i and N was the whole basal area of all species. The factor 3.3219 was utilized to change the index value to $\log_2$.

b) **Concentration of dominance (Cd)** was calculate by Simpson Index (Simpson, 1949)

$$\mathbf{Cd = (Ni / N)^2}$$

Where,

Ni & N were same as explained above and it varies between 0-1.

c) **Equitability (e)** was calculated as suggested by Pielou (1966).

$$\mathbf{E = H'/lnS}$$

Where,

H' = Shannon Index and

S = Total number of species.

d) Species richness (d) was measured by given equation (Marglef, 1958).

$$\mathbf{d = S\text{-}1/lnN}$$

Where,

S = Total number of species.

N = Basal area of all species (m^2 hec^{-1})

e) Beta diversity (bd) was measured as (Whittaker, 1972)

Bd = Sc/S

Where,

Sc = total number of species in all site

S = average number of species in per site.

3.12 Sample and Sampling Procedure:

3.12.1 Selection of Respondent:

Three types of respondents were chosen for primary data collection. In each field of study through questionnaire developed for recording the data:

1. Tourist or Visitors,
2. Local Residents
3. Forest officers or Field Staff.

Primary data has been collected from 3 types of respondents. The main purpose for the selection of Visitors/Tourist is to obtain the information regarding the awareness about ecotourism and importance, expectations and shortfall for facilities and services required, if any along with the correct measure to correct the shortcomings for better facilities and infrastructure needed to increase the ecotourism of Chhattisgarh.

Local residents were selected in order to gather the information regarding the knowledge of ecotourism and regarding the benefits had been received through the ecotourism activities, weather they understand about the conservation of protected areas and its importance to conserve the biodiversity both floral and faunal.

Forest officer/ staff were selected to know about the opinions for the shortcomings of the flora & fauna, Resort facilities food availabilities and to know the ways how we increase the ecotourism at the Barnawapara sanctuary.

Plate: 4 – Interaction with Local Residents in different Villages

Plate: 5 – Interaction with Tourist/Visitors at Resort

Plate: 6 – Interaction with Staff/Forest officer

3.12.2: Method of enquiry and collection of data:

Enquiry method was carried out through survey method and primary data was taken for collection of information. The primary data collection was done by the separate interview & filling of the questionnaire by the respondent (visitors/tourist, local people and staff/ forest officer) itself. Different information collected are: source of income, occupation, knowledge about forest area, flora & fauna and their utilization pattern.

First of all, we tried to build good report with the villagers in the informal way &in friendly environment in order to obtain the true and actual honest information from them and then they were separately interviewed and also separate proforma was requested to fill by themselves to record the data to reach some concrete conclusion regarding ecotourism impact on their livelihood how and why important.

Plates: 7 - Identification of flora (tree species) Samples in My Study Area

Identification of Plant Samples in My Study Area

Adina cordifolia - Kalmi (Haldu)

Continue…

Albizzia procera, Benth (Karhi)


Alianthus excelsa (Mahaneem, Maharukh)

Anogeissus latifolia (Dhawda)

Continue in Appendices…

Plates: 8 – Fauna Sighted at Study Site

Bison

Nilgai

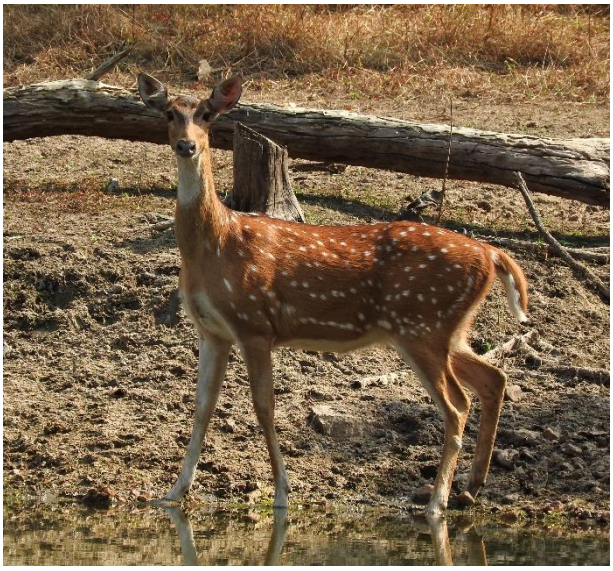
Indian Grey Wolf

Leopard (Camera trap)

Crocodiles

Barking Deer

Continue…



Spotted Deer

Black Shouldered Kite

Peacock & Pea Fowl

Pond Heron

Indian Roller

Night Heron

CHAPTER – IV

RESULTS AND DISCUSSION

The results of present research entitled ***"Prospects and Potentials of Ecotourism in Barnawapara Wildlife Sanctuary of Chhattisgarh with Special Reference to Livelihoods of Tribes & Conservation of Biodiversity"*** are discussed in this chapter. The results are presented in three separate parts on the basis of the objectives of study.

4.1 To Document the Ecotourism Activity in Barnawapara Wildlife Sanctuary, On different aspects, such as

Fees structure for tourist entry:

Information about prescribed fee structure for entry and excursion in sanctuary as shown in Table 4.1. The study conducted at Barnawapara Wildlife Sanctuary and the result for this study has been describes as follows: **Entry fees** – The entry fees for the tourist has been divided for Indian (30 rupees/person) and foreigners (200 rupees/person). **Safari fees**– Safari vehicle is also available for the visitors whose price are Adult fare- (25 rupees/person) and children fare- (15rupees/person). **Educational tour fees-** Educational tour fees were taken on the group basis having fare 250 rupees/group (20 members in each group). **Guide fees –** If a person wants a guide service that will charge for the 200 rupees per vehicle. **Vehicle fees – (**Gypsy) has been charged for 1300 rupees/ round, where 1 round consists for about 30 kilometre's which takes 1.5 hours to be covered. (Xenon) has been charged for 1800 rupees/ round, where 1 round consists for about 30 kilometres' which takes 1.5 hours to be covered. Bicycle for bird watching which is charged for 100 rupees/ round consisting for 5 kilometre's in one round. **Entry fees for vehicle in Sanctuary –** 4-Wheeler (Small) the entry fees are 60 rupees, another 4-wheeler having 150-300 rupees and bike entry fees is 30 rupees. **Photography fees:** There are 2 types of camera fee where digital camera charges of 30 rupees and video camera/ handy camera charges 300/- rupees only. In order to attract more visitors toward eco-tourism the present fee structure is best apart from the gypsy and xenon charges which is a little bit higher and need to improvise

and if the charges are to its minimum then there will be mouth to mouth promotion by the visitors and hence, we can attract a greater number of tourists this way.

Table 4.1: Information about prescribed fee structure for entry and excursion in sanctuary.

S.N.	Entry and Recourse	Fee structure	Suggestion
1	Entry fee	30 rupee/person (Indian)	In order to attract more visitors to ecotourism, the present fee structure is sufficient. After visiting the various sites, they will build awareness among other individuals about the conservation of natural resources.
		200 rupee/person (Foreigner)	
2	Safari fee	25 rupee/person	
		15 rupee/children (up to 12-year-old)	
3	Educational tour fee	250 rupee/group (20 member's single group)	
4	Guide fee	Per vehicle 200 rupee	
5	Safari vehicle	Gypsy – 22, Xenon – 2.	
6	Vehicle fee	1. Gypsy – 1300 rupee/round (30 km/1.5 hrs.) 2. Xenon – 1800 rupee/round (30 km/1.5 hrs.) 3. Bicycle for Bird watching – 100 rupees/round (5km/2:30 hrs.)	
7	Entry fees for vehicle in Sanctuary	1. Four-wheeler (small vehicle) – 60 rupees, 2. Another four-wheeler – 150 – 300 rupees, 3. Bike – 30 rupees	
8	Fee for Photography	1. Still/Digital Camera – 30 rupees, 2. Video Camera/Handy Cam – 300 rupees	

Bharti (2008) studied Prospects and potential of ecotourism in Achanakamar - Amarkantak Biosphere Reserve and found that the entrance fee of individual person was Rs 15/- for Indians and for foreigners Rs 150/- per head. The entry fee for a group was Rs. 200/-. The vehicle charges were Rs. 50/- for car, gipsy, station vegan, etc. however, for minibus and buses the charges were Rs. 200/, whereas the entry fees in our study site for the tourist has been divided for Indian (30 rupees/person) and foreigners (200 rupees/person) and the Vehicle fees **(**Gypsy) has been charged for 1300 rupees/ round, where 1 round consists for about 30 kilometre's which takes 1.5 hours to be covered. (Xenon) has been charged for 1800 rupees/ round, where 1 round consists for about 30 kilometre's which takes 1.5 hours to be covered. Bicycle for bird watching which is charged for 100 rupees/ round consisting for 5 kilometre's in one round. This variation in the entry fees in present investigation may be due to the difference in the unit of protected

area and forest wealth and diversity. Therefore, the fee structure is affordable whereas the charges of vehicle is higher if it may reduce up to certain extent then tourist intensity will be increased and local residents' livelihood will be increased many folds.

Lodging and Boarding:

Lodging and boarding facility available at Barnawapara sanctuary and the results under study are shown in Table 4.2. There is total 7 resorts and rest house available where 4 resorts and rest house are provided by the forest department, 2 private resorts (Muba machan and Moira resort), 1 resort is runned by the tourism board Raipur, (Eco-hareli resort, Mohda). Lodging consisting of total 89 rooms having capacity of 122 persons, 2 Dormitory is available with the capacity -8 beds/dormitory in this way we can accommodate total 16 persons in both the dormitory. Thus, we can say that total capacity of the persons accommodate is 138 persons. In case of food facility almost in every resort is having their separate restaurant such as; Chital restaurant at Barnawapara.

In 2014-15, 20758 numbers of tourist were visited during the month of December to April out of these 20748 numbers of tourist were Indians and rest 10 numbers of tourist are foreigner whereas, in the year of 2012 -13, 26 numbers of foreign tourist came from Germany, Australia, Nepal, visited to Barnawapara wildlife sanctuary. Table 4.3 represents number of tourist arrival at sanctuary area, this data disclose that tourist arrival rate was declining from year 2015 to 2019 this is due to expensive food rate and lodging fare so the need of the hour is to reduce the fare of lodging and to open some new restaurant so that more tourist will be attracted when there is competition between restaurant then rate of food will be low and more tourist may visit.

At the site of study, we have conducted a scheduled personal interview and also given a separate proforma for filling up the Questionnaire by the responded themselves. Table 4.13 (a) represents awareness among tourist for ecotourism in our study area. Few suggestions can be recommended to promote ecotourism in our study area are mentioned in table 4.4.

Table 4.2: Available infrastructure and facilities in Barnawapara Wildlife Sanctuary.

S.N.	Description of Rooms	Distance	Department	Number of Room/Set	Number of beds per room	Total Capacity (Person)	Rate (in rupee)	How to reach out	Facility for transportation	Food facilities
1	Dormitory – room no 1 & 2	In Paryatak (at Barnawapara)	Forest Department	2 (per set 8 bed)	8 Suite Single Bed	16	250/bed	**Nearest airport –** 100 km away from Sanctuary (Swami Vivekanand airport, Raipur). **Nearest Railway station –** Bagbahra (55 km), Mahasamund (55 km), Raipur (100 km), Bilaspur (145 km). **By road -** Sanctuary is connected to Nagpur-Raipur-Sambalpur national highway no. 06 (NH - 06) by all-weather roads from Patewa (28 km),as well from Pithora (27 km).	1. Tourist can use their own vehicle (like Jeep or car), 2. 22 gypsy and 2 xenon are available	There are separate restaurants in different resorts such as Chital restaurant in Paryatak (at Barnawapara)
2	Room no. 2 A. B. C.		Forest Department	3	1 Suite double bed	6	800			
3	Room no. 6 A.B. (Non AC/TV)		Forest Department	2	1 Suite double bed	4	1000			
4	Room – Bar Safari (TV)		Forest Department	1	1 Suite double bed	2	1500			
5	Room no. 7 A.B. (TV)		Forest Department	2	1 Suite double bed	4	2000			
6	Room no. 8 A.B. (TV)		Forest Department	2	1 Suite double bed	4	2000			
7	Room no. 1 to 12 (N cottage) (TV)		Forest Department	12	1 Suite double bed	24	2500			
8	Machan room no. 1 to 12 (M cottage) (TV, AC)		Forest Department	12	1 Suite double bed	24	3000			
9	Heritage		Forest Department	2	1 Suite double bed	4	6000			
10	Rest house		Forest Department	2	1 Suite double bed	4	-			
11	Devpur rest house	14 km	Forest Department	4	1 Suite double bed	8	-			
12	Devpur Inspection cottage	14 km	Forest Department	2	1 Suite Single Bed	2	-			
13	Dev Hill	24 km	Forest Department	6	1 Suite double bed	12				
14	Muba Machan	20 km	Privet	15	-	-	-			
15	Eco Hareli resort, Mohda	10 km	CG Tourism Board, Raipur	12	1 Suite double bed	24	2250			
16	Moira Resort	33 km	Privet	12	-	-	-			

Table 4.3: Number of tourists or visitors who visited Barnawapara Wildlife Sanctuary during different years (November to June in every year).

S.N.	Year	Indian	Foreigner	Total
1	2002-03	4957 (Lowest)	0 (No tourist)	4957 (Lowest)
2	2003-04	5066	3	5069
3	2004-05	6478	7	6485
4	2005-06	19130 (2nd Highest)	8	19138 (2nd Highest)
5	2006-07	17589 (3rd Highest)	5	17594 (3rd Highest)
6	2007-08	8462	6	8468
7	2008-09	13362	6	13368
8	2009-10	11073	2 (Lowest)	11075
9	2010-11	9045	-	9045
10	2011-12	10495	4	10499
11	2012-13	13987	**26** (Highest)	14013
12	2013-14	16864	18 (3rd Highest)	16882
13	2014-15	**20748** (Highest)	10	**20758** (Highest)
14	2015-16	17437	13	17450
15	2016-17	14746	19 (2nd Highest)	14765
16	2017-18	12888	12	12900
17	2018-19	10930	10	10940
Total				**208449**

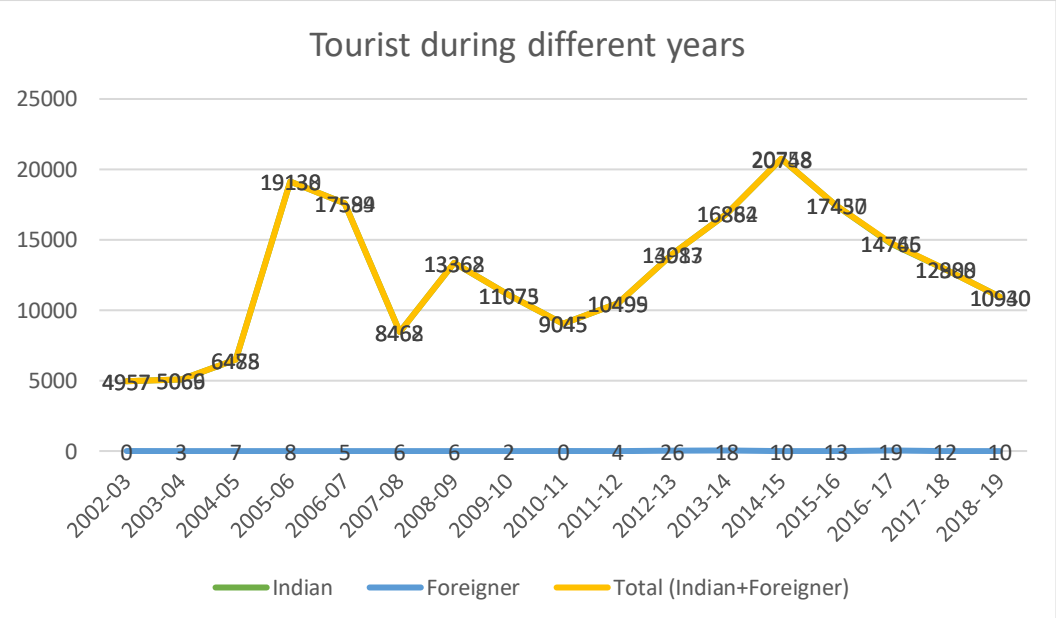


Fig 4.1 Tourist during different year in Sanctuary

Table 4.4: Important recommendations for increasing the ecotourism by making very comfortable, pleasant and luxurious stay for the tourist at Barnawapara wildlife sanctuary.

S. No.	Accommodation	Transportation facility	Food facility	Other infrastructure and facilities
1.	At the restaurant proper silence should be maintained so that the other guests would not get disturbed.	Roads outside the sanctuary should be improved and paved road is must. Inside the sanctuary the roads are very damp and needs to be regularly maintained on yearly basis before the rainy season.	The time period for the availability of the foods is very less and this needs to be increased, which created the problem to many visitors.	Emergency facilities / services should be here like -medical, general stores, ATM machine etc. on the routes and at the Barnawapara.
2.	More number of hotels should be there to attract the tourist.	Sign boards are required and should be installed on priority basis to ease the visitors and tourist in travelling.	There is shortage of the different menu as only few things are radially available there.	Proper sitting arrangements for adults should be there and also playing garden is needed for the children.
3.	The resorts are too much expensive and the middle-class family cannot afford this so the price needs to be decreased and within the visitor's budget and also hospitality needs to improve much better.	Battery operated vehicles should be used on regular basis which will solve the transportation problem and also will be eco-friendly.	Food facility is too-much expensive and which creates major problem for staying in the guest house, so needs to be more economic and tourist-friendly to attract them.	There is a lack of some adventure, tourist-friendly activities and other facilities to engage them and to get them relax and feel like home outside their own home.
4.	Total staff at the guest house is very less and thus needs to be increased.	-	There is not many restaurant facilities options available here and requires to increase its number.	Tennis, campfire, table tennis, carrom and other activities must be included there to make parents and their children happier.
5.	Door and interior maintenance should be regularly checked.	-	-	Properly trained guides within the guest budget-friendly should be available with all the knowledge regarding the useful trees of medicinal, timber, fuel etc.
6.	Room's availability should be on the instant basis.	-	-	-

Bharti (2008) found that Lodging and Boarding Facility in Udanti Wildlife Sanctuary were provided only by the Government. There are 6 Rest houses with 14 rooms, 5 dormitory and still some mud huts under construction. There were staying facilities available in which 50-60 people can be accommodated. No vehicle was provided by the forest department to visit inside. There were few shops inside the wildlife sanctuary; however, the food was prepared at the rest house, whereas in our study site the staying facility is much better as compared to Udanti Sancyuary, there is total 7 resorts and rest house available where 4 resorts and rest house are provided by the forest department, 2 private resorts (Muba machan and Moira resort), 1 resort is run by the tourism board Raipur, (Eco-hareli resort, Mohda). Lodging consisting of total 89 rooms having capacity of 122 persons, 2 Dormitory is available with the capacity -8 beds/dormitory in this way we can accommodate total 16 persons in both the dormitory. In case of Barnawapara sanctuary healthy completion between private and govt. sector is good so that if more no. of tourist come, they may be accommodated in private resorts. However, there is need that some more resorts may be permitted to increase the ecotourism activity in Chhattisgarh.

4.2 Documentation of flora and fauna having commercial, aesthetic, medicinal and biodiversity value.

Documentation of vegetation (flora):

Such documentation was carried out through Quadrant method by means of Stratified random sampling method. Documentation of different vegetation (tree, shrubs, and herbs) has been recorded at study site of Barnawapara sanctuary. In our study area total 170 species of flora belonging to 59 families were reported. Table 4.5 depict details about floristic composition and the most dominant families were Leguminoceae, Poaceae, Rubiaceae, Euphorbiaceae, Combretaceae, Moraceae and Rhamnaveae.

Phytosociological exercise conducted at Barnawapara wildlife sanctuary. has been divided into 4 parts,

Site-1 - South eastern part of Sanctuary,
Site-2 - North eastern part of Sanctuary,
Site-3 - North western part of Sanctuary,
Site-4 - South western part of Sanctuary

In this investigation there are total 554 numbers of plants (tree, shrub and herbs) are available which consists of 353 trees (belonging to 36 genera and 39 species), 103 shrubs (belonging to 13 genera and 13 species) and 58 herbs (21 genera and 21 species) were reported. Table 4.7 (a) and figure 4.2 represent number of plants encountered in study zone.

Subramani *et. al.* (2007) reported that the floristic composition, life-forms of Renuka Wildlife Sanctuary, Himachal Pradesh. She reported total of 395 species belonging to 316 genera and 115 families. Thirty-eight dominant families are Fabaceae, Asteraceae, Euphorbiaceae, Poaceae, Lamiaceae and Apocynaceae, Rubiaceae and Acanthaceae accounted for 137 species and 110 genera. In our study area the dominant plant families are Leguminoceae, Poaceae, Rubiaceae, Euphorbiaceae, Combretaceae, Moraceae and Rhamnaceae. The important medicinal plants that are sighted are *Barleria cristatat, Celastrus panuculata, Curcligo orchioides, and Costous spciosus.* The number of plants differs due to different agro-ecological area confirms the results of the above study.

Table 4.7 (a): Total number of Flora (trees, shrubs and herbs) recorded (α diversity) at different study sites of the Barnawapara Sanctuary.

S.N.	Site	Tree	Shrub	Herb	Total
1	Site 1	86	36	27	149
2	Site 2	81	25	23	129
3	Site 3	81	25	25	131
4	Site 4	105	17	23	145
Total		**353**	**103**	**98**	**554**

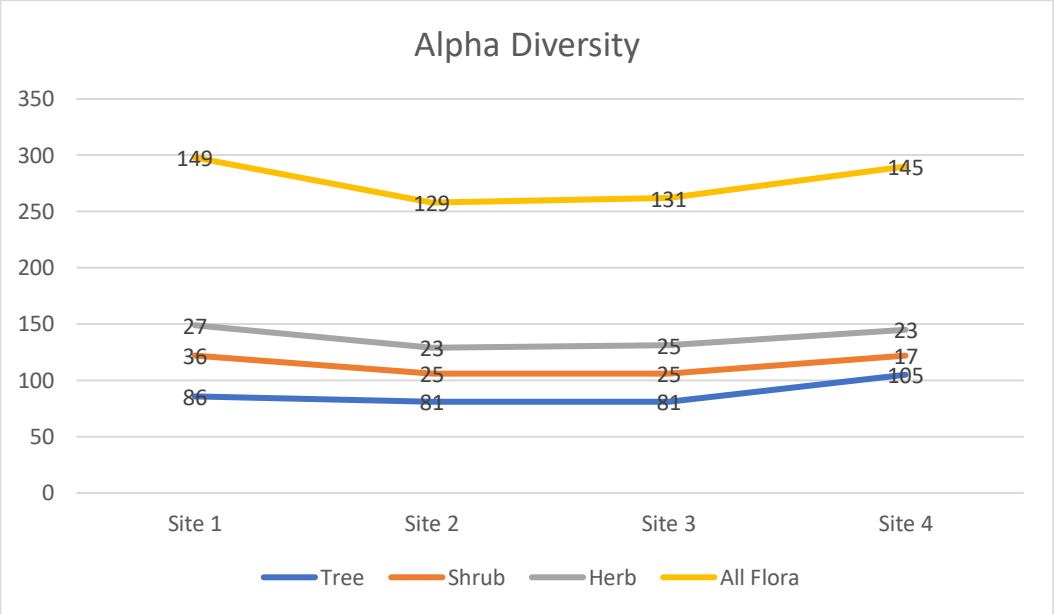


Fig. 4.2: Total numbers of flora recorded at different sites of Sanctuary.

The biodiversity indices were measured from the different sites of study area. The value of various vegetation layer and vegetation structure of Barnawapara wildlife sanctuary were given in table 4.6 (a), (b) and fig. 4.3 (a), (b). The **species Richness** for tree ranged from site-1 to site-4 which is having the value of 5.42, 5.44, 6.06 and 4.03, for shrubs the Richness indices varied from - 4.12, 2.47, 1.80 and 1.56 (from site 1 to site 4) respectively. This data represent that the tree diversity Richness is highest in site-3 and the shrub diversity Richness is highest in site-1 between sites studied.

The **diversity index (H')** for trees ranged from 3.45, 3.39, 3.71 and 3.42 (from site-1 to site-4) for shrubs the value ranged from 1.34, 2.06, 1.78 and 1.19 (from site-1 to site-4) respectively. This shows that overall evenness of distribution of individuals within each species is better for site-3 as compared to site-1 and

least at site-2. This data represent that the tree diversity index is highest in site-3 and the shrub diversity index is highest in site-2.

The **Concentration of dominance** (Cd) for tree ranged from 0.12, 0.18, 0.12 and 0.11, whereas Cd for shrubs ranged from 0.51, 0.30, 0.34 and 0.57 (from site-1 to site-4) respectively. This shows that concentration of dominance for tree was highest in site-2 and for shrubs was highest in site-4.

The **equitability** (e) for tree ranged from 1.13, 1.08, 1.15 and 1.21, whereas e for shrubs ranged from 0.69, 1.06, 1.10 and 0.74 (from site-1 to site-4) respectively. This shows that Pielou index/ equitability for tree was highest in site - 4 and for shrub it was in site-3.

Pathak *et al*. (1993) also reported the quantitative analysis of woody vegetation within an elevation range of 2100-2700 m in the Almora district of Central Himalaya. The results showed that species Richness ranged from 15- 23 per stand. Diversity index (H") and Concentration of dominance (Cd) ranged from 2.180 to 2.649 and 0.014 to 0.155, respectively. This is interested to note that the species Richness is higher at central Himalaya as compared to Tropical dry deciduous forest. The distribution pattern analysis showed that trees and sampling layers with a few exceptions were randomly distributed in all the stands. In our experiment it was found that species Richness ranged from 4.03 to 6.06 (in all site). Diversity index (H') and Concentration of dominance (Cd) of trees ranged from 3.39 to 3.71 and 0.11 to 0.18 respectively. This variation is due to diversity the floristic diversity is much rich in Himalayan region as compare to our study site. The results of present study and above worker differ due to agro-climatic variation confers the results.

Kumar and Saika (2020) reported that the floristic composition in Sal forest of Ranchi and observed that tree density was Highest for Sal, with basal cover of 262.50 m^2 ha^{-1}, Whereas in our finding the Average basal area for all the Four sites was 50.65 m^2 ha^{-1}. The decline in Basal area in present experiment showed that density may be due to lack of Silvicultural Management, seed extraction, Insect pest incident etc. So, the need of the hour for enhancement of stem basal area may be done through maintaining good site condition and strong Enforcement

of forest Policies. The moisture is less as compared to above worker due to Sal tree is less in our experimental sites.

The floristic structure for the tree species in our study area are represented in table 4.6 (a), 4.6 (b), 4.6 (c) and fig. 4.3 (a), 4.3 (b), 4.3 (c). The data for Barnawapara Wildlife sanctuary shows that *Cleistanthus collinus remained* the dominant tree species followed by *Terminalia tomentosa* and *Madhuca indica* at all the four study sites. At site-1, site-2 and in site-4 *Cleistanthus collinus* is the dominant species whereas in Site-3 *Terminalia tomentosa* was the dominant one. Our data also reveals that the least dominant trees species were ***Cordia dichototoma, Ficus racemosa*** and ***Gardenia latifolia.***

Table 4.6 (a): Phytosociological Analysis of Tree's Barnawapara Wildlife Sanctuary (All Site)

S.N.	Analysis	Site 1	Site 2	Site 3	Site 4
1	Frequency	510	440	420	480
2	Abundance	31.23	39.73	49.42	32.65
3	Density (Stem/ha)	860	810	810	**1050**
4	Frequency	5.1	4.4	4.2	4.8
5	Relative Abundance (RA)	100	100	100	100
6	Relative Density (RD)	100	100	100	100
7	Relative Frequency (RF)	100	100	100	100
8	Basal Area (BA) (m^2/ha)	40.15	**57.20**	52.32	52.94
9	Relative Basal Area (RBA)	100	100	100	100
10	Importance Value Index (IVI)	300	300	300	300
11	Total Number of Species (S)	21	23	25	17
12	N	40.15	**57.20**	52.32	52.94
13	$Log_{10}N$	1.60	1.76	1.72	1.72
14	$\sum$ Ni Log_{10} Ni	22.71	42.21	31.51	36.73
15	Plant Diversity Index (Shannon-Wiener Index Value) (H')	3.45	3.39	**3.71**	3.42
16	Concentration of dominance (Cd)	0.12	**0.18**	0.12	0.11
17	Equability or Pielou Index (e)	1.13	1.08	1.15	**1.21**
18	Richness index (d)	5.42	5.44	**6.06**	4.03

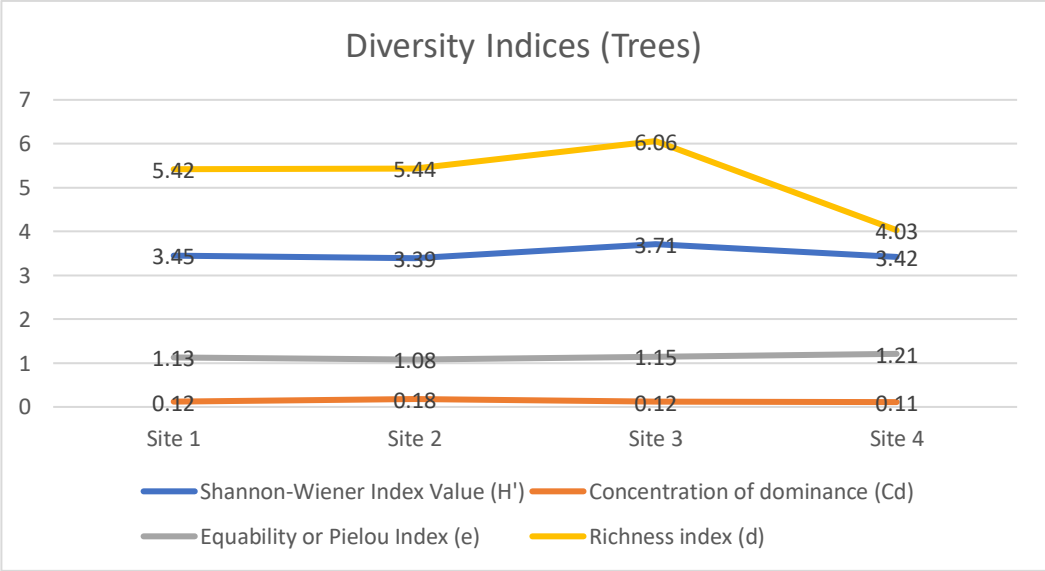


Fig. 4.3 (a): Diversity Index (Tree)

Table 4.6 (b): Phytosociological Analysis of Shrub's Barnawapara Wildlife Sanctuary (All Site)

S.N.	Analysis	Site 1	Site 2	Site 3	Site 4
1	Frequency	110	120	130	90
2	Abundance	17.83	13.50	10.67	7.25
3	Density (Stem/ha)	**1440**	1000	1000	680
4	Frequency	1.1	1.2	1.3	0.9
5	Relative Abundance (RA)	100	100	100	100
6	Relative Density (RD)	100	100	100	100
7	Relative Frequency (RF)	100	100	100	100
8	Collar Area (CA)	**0.23**	0.09	0.11	0.08
9	Relative Collar Area (RCA)	100	100	100	100
10	Importance Value Index (IVI)	300	300	300	300
11	Total Number of Species (S)	7	7	5	5
12	N	**0.23**	0.09	0.11	0.08
13	$Log_{10}N$	-0.63	-1.05	-0.96	-1.12
14	$\sum$ Ni Log_{10} Ni	-0.24	-0.15	-0.16	-0.11
15	Plant Diversity Index (Shannon-Wiener Index Value) (H')	1.34	**2.06**	1.78	1.19
16	Concentration of dominance (Cd)	0.51	0.30	0.34	**0.57**
17	Equability or Pielou Index (e)	0.69	1.06	**1.10**	0.74
18	Richness index (d)	**4.12**	2.47	1.80	1.56

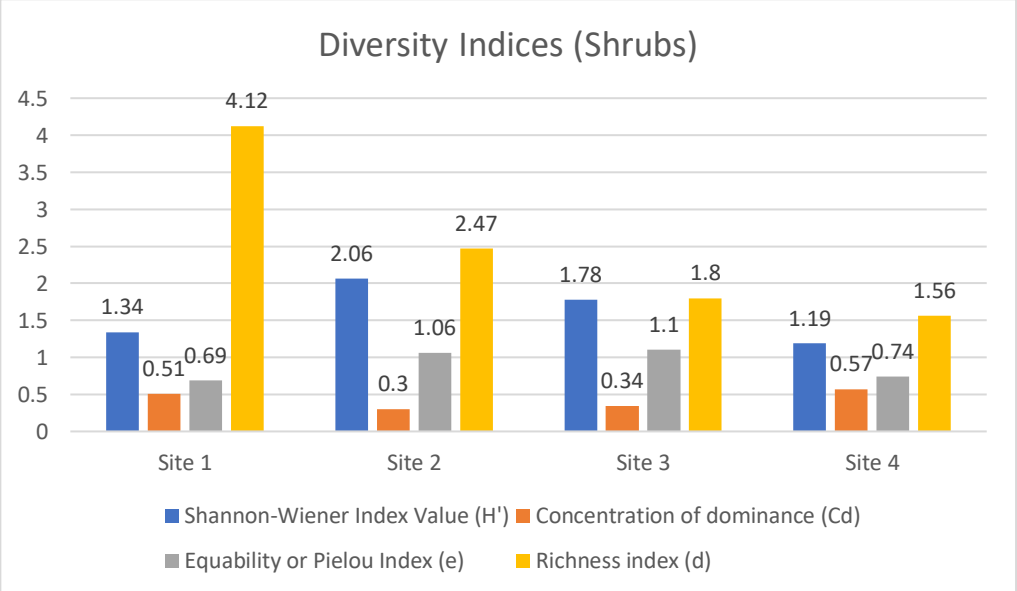


Fig. 4.3 (b): Diversity Index (Shrubs)

Table 4.6 (c): Phytosociological Analysis of Herb's at Barnawapara Wildlife Sanctuary (All Site)

S.N.	Analysis	Site 1	Site 2	Site 3	Site 4
1	Frequency	**170**	**150**	**190**	**210**
2	Abundance	**11.23**	**13.17**	**11.37**	**12.50**
3	Density (Stem/ha)	**27000**	**23000**	**25000**	**30000**
4	Frequency	**1.7**	**1.5**	**1.9**	**2.1**
5	Relative Abundance (RA)	**100**	**100**	**100**	**100**
6	Relative Density (RD)	**100**	**100**	**100**	**100**
7	Relative Frequency (RF)	**100**	**100**	**100**	**100**
8	Importance Value Index (IVI)	**300**	**300**	**300**	**300**

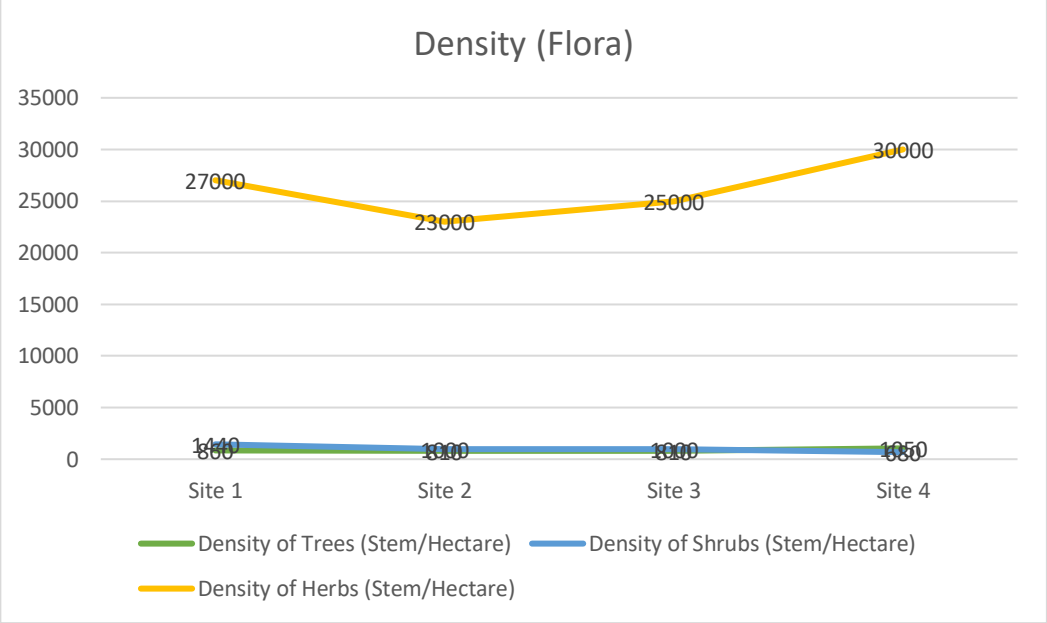


Fig. 4.3 (c): Density of Vegetation

The dominating shrub species was recorded *Holarrhena antidysenterica* followed by *Helicteres isora* and *Antidesma ghaesembilla.* Whereas the dominant herbaceous species was *Pogostemon benghalensis* and *Dodonoea viscosa.*

The Beta Diversity value of Barnawapara wildlife sanctuary was 1.81 for tree,2.17 for shrubs and 2.55 for herbaceous layer. The value of Beta diversity of Barnawapara wildlife sanctuary were given in table 4.7 (b).

Table 4.7 (b): Beta Diversity of Flora:

S.N.	Flora	Total number of Species in all site	Average number of species per site	β diversity
1	Trees	39	21.5	**1.81**
2	Shrubs	13	6	**2.17**
3	Herbs	21	8.25	**2.55**

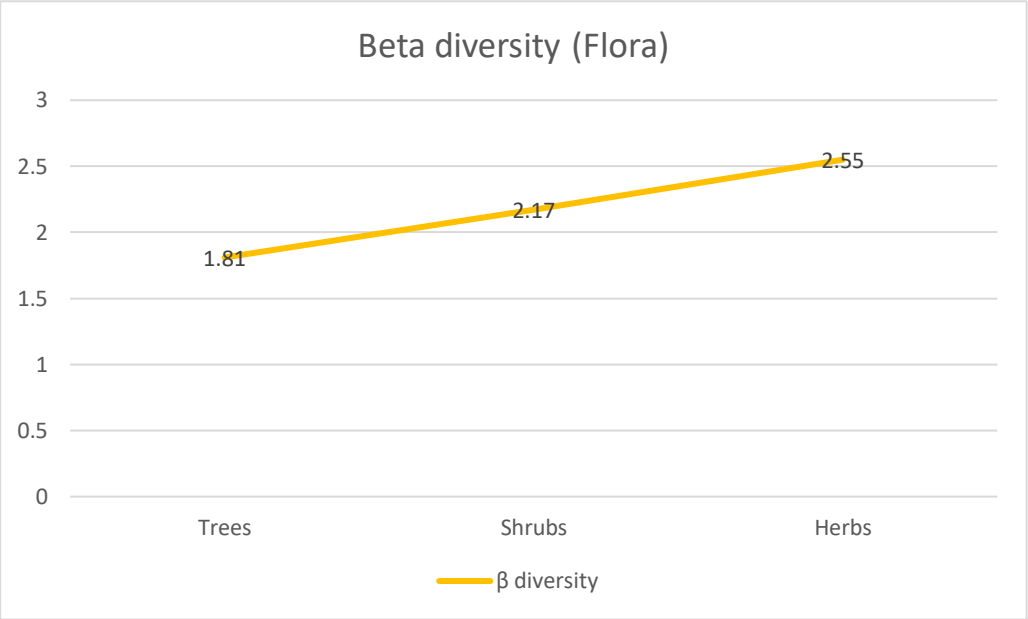


Fig. 4.4: Beta (β) Diversity (vegetation)

Singh 2020 studied the Floristic diversity Mangalore Forest division and reported that the dominant tree species was *Terminalia panicullata and Xylia xylocarpa.* Devi *et al*. (2006) also reported that the floristic diversity in tropical semi evergreen forest of Manipur *Dipterocarpus tuberculatus*is found the dominant tree of Indo-Myanmar Border.

Table 4.8 (a): Phytosociological Analysis of Tree's at Barnawapara Wildlife Sanctuary (Total Quadrate Study -10 Quadrate) Site: - 1

S. N.	Scientific Name	Species	Total No. of Indiv.	No. of Q. Occu	Freq. %	Abun-dance	Density (Stem/ha)	Freq.	RA	RD	RF	BA (Ni) (m^2/hac)	Ni Log_{10} Ni	$(Ni/N)^2$	RBA	IVI
1	*Acacia catechu*	Khair	1	1	10	1	10	0.1	3.20	1.16	1.96	0.16	-0.13	0.00002	0.40	6.33
2	*Anogeissus latifolia*	Dhwada	7	5	50	1.4	70	0.5	4.48	8.14	9.80	4.32	2.75	0.01159	10.76	22.43
3	*Bauhinia malabarica*	Aamri/Aamti	2	2	20	1	20	0.2	3.20	2.33	3.92	0.10	-0.10	0.00001	0.25	9.45
4	*Boswellia serrata*	Salai	2	2	20	1	20	0.2	3.20	2.33	3.92	1.62	0.34	0.00164	4.05	9.45
5	*Buchanania lanzan*	Chaar/Chironji	6	5	50	1.2	60	0.5	3.84	6.98	9.80	1.71	0.40	0.00181	4.25	20.62
6	*Butea monosperma*	Palas	1	1	10	1	10	0.1	3.20	1.16	1.96	0.16	-0.13	0.00002	0.40	6.33
7	*Chloroxylon swietenia*	Bhirra	5	3	30	1.67	50	0.3	5.34	5.81	5.88	0.89	-0.04	0.00050	2.23	17.03
8	*Cleistanthus collinus*	Karra	19	7	70	2.71	**190**	0.7	8.69	22.09	13.73	5.63	4.23	0.01966	14.02	**44.51**
9	*Dendrocalamus strictus*	Bamboo	1	1	10	1	10	0.1	3.20	1.16	1.96	0.04	-0.05	0.00000	0.09	6.33
10	*Diospyros melanoxyon*	Tendu	12	6	60	2	120	0.6	6.40	13.95	11.76	**9.38**	9.13	0.05463	23.37	32.12
11	*Lagerstroemia lanceolata*	Senha	4	2	20	2	40	0.2	6.40	4.65	3.92	0.73	-0.10	0.00033	1.82	14.98
12	*Lannea coromandelica*	Mode/Goonja	2	1	10	2	20	0.1	6.40	2.33	1.96	0.55	-0.14	0.00019	1.38	10.69
13	*Madhuca indica*	Mahua	7	4	40	1.75	70	0.4	5.60	8.14	7.84	6.35	5.09	0.02499	15.81	21.59
14	*Pongamia pinnata*	Karanj	1	1	10	1	10	0.1	3.20	1.16	1.96	0.73	-0.10	0.00033	1.83	6.33
15	*Pterocarpus marsupium*	Beeja	2	2	20	1	20	0.2	3.20	2.33	3.92	1.65	0.36	0.00168	4.10	9.45
16	*Semecarpus anacardium*	Bhelwa	1	1	10	1	10	0.1	3.20	1.16	1.96	0.76	-0.09	0.00036	1.90	6.33
17	*Shorea robusta*	Sal	4	2	20	2	40	0.2	6.40	4.65	3.92	3.03	1.46	0.00570	7.55	14.98
18	*Soymida febrifuga*	Rohan	1	1	10	1	10	0.1	3.20	1.16	1.96	0.23	-0.15	0.00003	0.58	6.33
19	*Tectona grandis*	Teak	2	1	10	2	20	0.1	6.40	2.33	1.96	0.64	-0.12	0.00026	1.61	10.69
20	*Terminalia chebula*	Harda	1	1	10	1	10	0.1	3.20	1.16	1.96	0.07	-0.08	0.00000	0.17	6.33
21	*Terminalia tomentosa*	Saja/Saaj	5	2	20	2.5	50	0.2	8.00	5.81	3.92	1.38	0.19	0.00118	3.43	17.74
	Total		**86**		**510**	**31.23**	**860**	**5.1**	**100**	**100**	**100**	**40.15**	**22.71**	**0.12**	**100**	**300**

In site-1 it is evident from the data presented in table 4.8 (a) that *Cleistanthus collinus* (IVI-44.51) was the most dominant tree followed by *Diospyros melanoxyon* (IVI-32.12), *Anogeissus latifolia* (IVI-22.43). Basal area and density of individual tree species varied from 0.04 – 9.38 m^2/ha and 10 – 190 stem/ha.

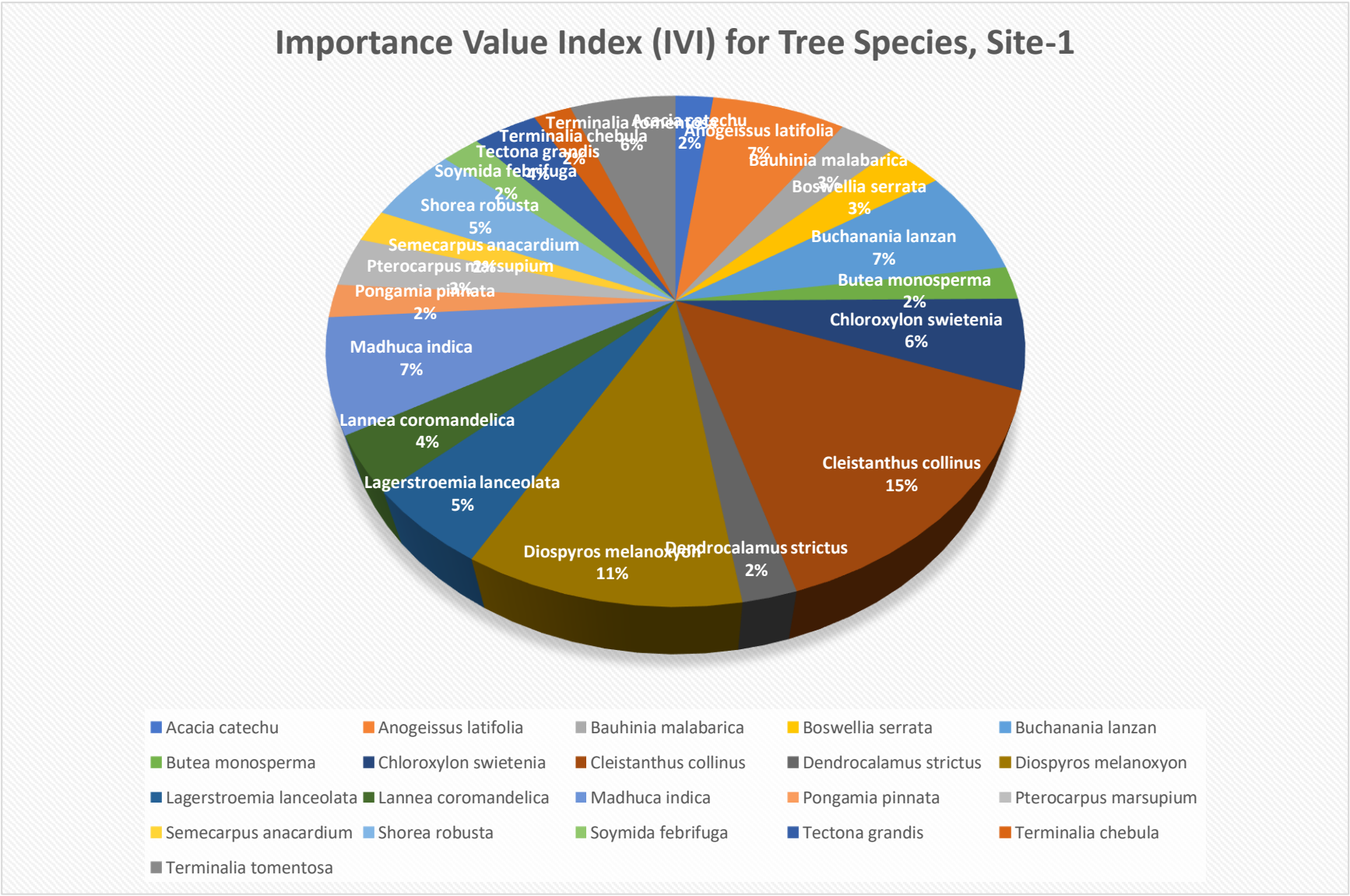

Importance Value Index (IVI) for Tree Species, Site-1
Acacia catechu 2%
Anogeissus latifolia 7%
Bauhinia malabarica 3%
Boswellia serrata 3%
Buchanania lanzan 7%
Butea monosperma 2%
Chloroxylon swietenia 6%
Cleistanthus collinus 15%
Dendrocalamus strictus 2%
Diospyros melanoxyon 11%
Lagerstroemia lanceolata 5%
Lannea coromandelica 4%
Madhuca indica 7%
Pongamia pinnata 2%
Pterocarpus marsupium 3%
Semecarpus anacardium 2%
Shorea robusta 5%
Soymida febrifuga 4%
Tectona grandis 2%
Terminalia chebula 6%
Terminalia tomentosa 6%
Acacia catechu
Anogeissus latifolia
Bauhinia malabarica
Boswellia serrata
Buchanania lanzan
Butea monosperma
Chloroxylon swietenia
Cleistanthus collinus
Dendrocalamus strictus
Diospyros melanoxyon
Lagerstroemia lanceolata
Lannea coromandelica
Madhuca indica
Pongamia pinnata
Pterocarpus marsupium
Semecarpus anacardium
Shorea robusta
Soymida febrifuga
Tectona grandis
Terminalia chebula
Terminalia tomentosa

Table 4.8 (b): Phytosociological Analysis of Tree's at Barnawapara Wildlife Sanctuary (Total Quadrate Study -10 Quadrate) Site: - 2

S. N.	Scientific Name	Species	Total No. of Indiv.	No. of Q. Occu	Freq. %	Abun - dance	Density (Stem /ha)	Freq.	RA	RD	RF	BA (Ni) (m^2/ha)	Ni Log10 Ni	$(Ni/N)^2$	RBA	IVI
1	*Adina cordifolia*	Kalmi	1	1	10	1	10	0.1	2.52	1.23	2.27	1.72	0.40	0.00090	3.01	6.02
2	*Anogeissus latifolia*	Dhwada	1	1	10	1	10	0.1	2.52	1.23	2.27	0.35	-0.16	0.00004	0.61	6.02
3	*Bauhinia variegata*	Bahonia	2	2	20	1	20	0.2	2.52	2.47	4.55	0.36	-0.16	0.00004	0.63	9.53
4	*Boswellia serrata*	Salai	1	1	10	1	10	0.1	2.52	1.23	2.27	0.83	-0.07	0.00021	1.45	6.02
5	*Bridelia restusa*	Kasi	1	1	10	1	10	0.1	2.52	1.23	2.27	0.48	-0.15	0.00007	0.85	6.02
6	*Butea nonosperma*	Palas	3	1	10	3	30	0.1	7.55	3.70	2.27	0.50	-0.15	0.00008	0.87	13.53
7	*Careya arborea*	Kumbhi	1	1	10	1	10	0.1	2.52	1.23	2.27	0.64	-0.12	0.00013	1.13	6.02
8	*Chloroxylon swietenia*	Birha	2	1	10	2	20	0.1	5.03	2.47	2.27	0.26	-0.15	0.00002	0.45	9.78
9	*Cleistanthus collinus*	Karra	15	6	60	2.5	**150**	0.6	6.29	18.52	13.64	5.71	4.32	0.00996	9.98	**38.45**
10	*Diospyros melanoxylon*	Tendu	8	5	50	1.6	80	0.5	4.03	9.88	11.36	5.26	3.79	0.00845	9.19	25.27
11	*Diospyrous montana*	Patwan	2	1	10	2	20	0.1	5.03	2.47	2.27	0.81	-0.07	0.00020	1.42	9.78
12	*Lagerstroemia lanceolata*	Senha	9	5	50	1.8	90	0.5	4.53	11.11	11.36	3.82	2.22	0.00445	6.67	27.00
13	*Lannea coromandelica*	Mode/Goonja	2	2	20	1	20	0.2	2.52	2.47	4.55	1.17	0.08	0.00042	2.05	9.53
14	*Madhuca indica*	Mahua	7	3	30	2.33	70	0.3	5.87	8.64	6.82	**22.01**	29.54	0.14802	38.47	21.33
15	*Mitragyna parvifolia*	Mundi	2	1	10	2	20	0.1	5.03	2.47	2.27	0.81	-0.07	0.00020	1.42	9.78
16	*Phyllanthus emblica*	Aonla	2	1	10	2	20	0.1	5.03	2.47	2.27	0.57	-0.14	0.00010	1.00	9.78
17	*Pterocarpus marsupium*	Beeja	6	2	20	3	60	0.2	7.55	7.41	4.55	2.80	1.25	0.00239	4.89	19.50
18	*Schleichera oleosa*	Kushum	2	1	10	2	20	0.1	5.03	2.47	2.27	2.17	0.73	0.00144	3.79	9.78
19	*Semecarpus anacardium*	Bhelwa	3	2	20	1.5	30	0.2	3.78	3.70	4.55	1.37	0.19	0.00057	2.39	12.02
20	*Sterculia urens*	Ganduli / Kulu	2	1	10	2	20	0.1	5.03	2.47	2.27	0.93	-0.03	0.00027	1.63	9.78
21	*Tectona grandis*	Teak	1	1	10	1	10	0.1	2.52	1.23	2.27	1.03	0.02	0.00033	1.81	6.02
22	*Terminalia arjuna*	Arjuna	3	2	20	1.5	30	0.2	3.78	3.70	4.55	1.43	0.22	0.00062	2.50	12.02
23	*Terminalia tomentosa*	Saja	5	2	20	2.5	50	0.2	6.29	6.17	4.55	2.17	0.73	0.00144	3.80	17.01
	Total		**81**		**440**	**39.73**	**810**	**4.4**	**100**	**100**	**100**	**57.20**	**42.21**	**0.18**	**100**	**300**

In site-2 it is evident from the data presented in table 4.8 (b) that *Cleistanthus collinus* (IVI-38.45) was the most dominant tree followed by *Lagerstroemia lanceolata* (IVI-27.00), *Madhuca indica* (IVI-21.33). Basal area and density of individual tree species varied from 0.26 – 22.01 m^2/ha and 10 – 150 stem/ha.

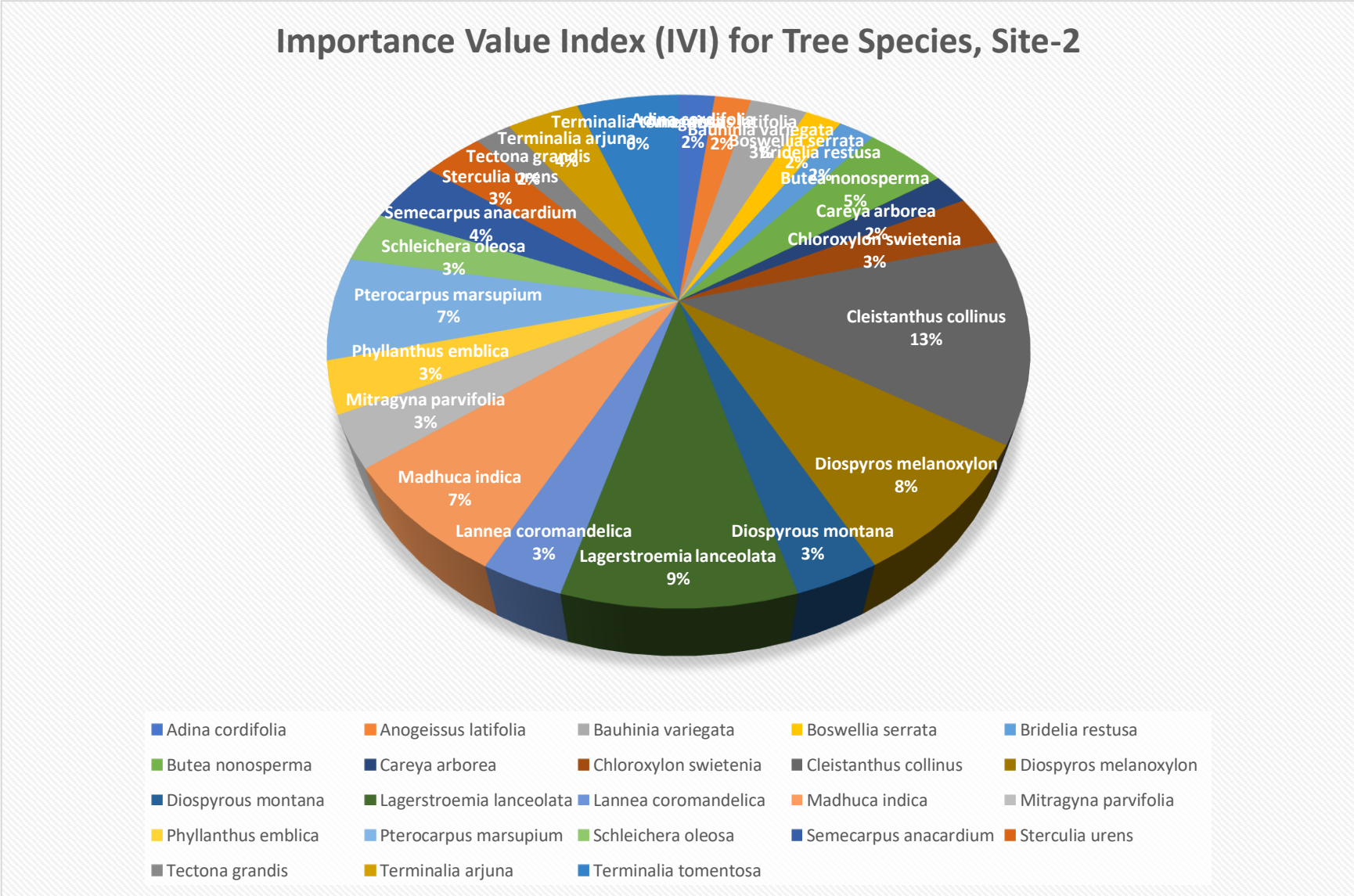

Importance Value Index (IVI) for Tree Species, Site-2
Terminalia arjuna 3%
Tectona grandis 4%
Sterculia urens 3%
Semecarpus anacardium 4%
Schleichera oleosa 3%
Pterocarpus marsupium 7%
Phyllanthus emblica 3%
Mitragyna parvifolia 3%
Madhuca indica 7%
Lannea coromandelica 3%
Lagerstroemia lanceolata 9%
Diospyrous montana 3%
Diospyros melanoxylon 8%
Cleistanthus collinus 13%
Chloroxylon swietenia 3%
Careya arborea 2%
Butea nonosperma 5%
Bridelia restusa 2%
Boswellia serrata 2%
Bauhinia variegata 2%
Adina cordifolia
Anogeissus latifolia
Bauhinia variegata
Boswellia serrata
Bridelia restusa
Butea nonosperma
Careya arborea
Chloroxylon swietenia
Cleistanthus collinus
Diospyros melanoxylon
Diospyrous montana
Lagerstroemia lanceolata
Lannea coromandelica
Madhuca indica
Mitragyna parvifolia
Phyllanthus emblica
Pterocarpus marsupium
Schleichera oleosa
Semecarpus anacardium
Sterculia urens
Tectona grandis
Terminalia arjuna
Terminalia tomentosa

Table 4.8 (c): Phytosociological Analysis of Tree's at Barnawapara Wildlife Sanctuary (Total Quadrate Study -10 Quadrate) Site: - 3

S. N.	Scientific Name	Species	Total No. of Indiv.	No. of Q. Occu	Freq. %	Abun - dance	Densi -ty (Stem /ha)	Fre q.	RA	RD	RF	BA (Ni) (m^2/ha)	Ni Log1 0 Ni	$(Ni/N)^2$	RBA	IVI
1	*Acacia catechu*	Khair	4	1	10	4	40	0.1	8.09	4.94	2.38	0.29	-0.16	0.00003	0.55	15.41
2	*Aegle marmelos*	Bel	1	1	10	1	10	0.1	2.02	1.23	2.38	0.41	-0.16	0.00006	0.79	5.64
3	*Anogeissus latifolia*	Dhwada	1	1	10	1	10	0.1	2.02	1.23	2.38	0.72	-0.10	0.00019	1.37	5.64
4	*Boswellia serrata*	Salai	1	1	10	1	10	0.1	2.02	1.23	2.38	0.84	-0.06	0.00026	1.61	5.64
5	*Buchananialanzan*	Chaar/Chironji	3	2	20	1.5	30	0.2	3.04	3.70	4.76	0.57	-0.14	0.00012	1.10	11.50
6	*Careya arborea*	Kumbhi	1	1	10	1	10	0.1	2.02	1.23	2.38	0.19	-0.14	0.00001	0.37	5.64
7	*Cleistanthus collinus*	Karra	10	4	40	2.50	**100**	0.4	5.06	12.35	9.52	4.59	3.04	0.00770	8.77	26.93
8	*Cordia dichotoma*	Lado/Lasoda	1	1	10	1.00	10	0.1	2.02	1.23	2.38	0.41	-0.16	0.00006	0.79	5.64
9	*Diospyros melanoxyon*	Tendu	5	4	40	1.25	50	0.4	2.53	6.17	9.52	2.92	1.36	0.00311	5.58	18.23
10	*Diospyros montana*	Patvan	2	2	20	1	20	0.2	2.02	2.47	4.76	0.25	-0.15	0.00002	0.47	9.25
11	*Eucalyptus tereticornis*	Nilgiri	3	1	10	3	30	0.1	6.07	3.70	2.38	2.30	0.83	0.00193	4.40	12.16
12	*Ficus recemosa*	Dumar	1	1	10	1	10	0.1	2.02	1.23	2.38	7.11	6.06	0.01849	13.60	5.64
13	*Flacourtia indica*	Kuhku/Kakayi/Kahayi	3	1	10	3	30	0.1	6.07	3.70	2.38	0.51	-0.15	0.00009	0.97	12.16
14	*Gardenia latifolia*	Papda	1	1	10	1	10	0.1	2.02	1.23	2.38	0.40	-0.16	0.00006	0.77	5.64
15	*Grewia tiliaefolia*	Dhamin/Dhaman/Dhankat	4	1	10	4	40	0.1	8.09	4.94	2.38	1.41	0.21	0.00073	2.70	15.41
16	*Lagerstroemia lanceolata*	Senha	5	2	20	2.5	50	0.2	5.06	6.17	4.76	2.00	0.60	0.00145	3.81	15.99
17	*Madhuca indica*	Mahua	3	2	20	1.5	30	0.2	3.04	3.70	4.76	1.54	0.29	0.00087	2.95	11.50
18	*Mitragyna parvifolia*	Mundi	5	3	30	1.67	50	0.3	3.37	6.17	7.14	2.22	0.77	0.00180	4.24	16.69
19	*Pongamia pinnata*	Karanj	1	1	10	1	10	0.1	2.02	1.23	2.38	0.59	-0.14	0.00013	1.12	5.64
20	*Semecarpus anacardium*	Bhelwa	2	1	10	2	20	0.1	4.05	2.47	2.38	0.73	-0.10	0.00019	1.39	8.90
21	*Soymida febrifuga*	Rohini/Rohan	2	1	10	2	20	0.1	4.05	2.47	2.38	0.75	-0.09	0.00020	1.43	8.90
22	*Syzygium cumini*	Jamun	1	1	10	1	10	0.1	2.02	1.23	2.38	0.51	-0.15	0.00009	0.97	5.64
23	*Tectona grandis*	Teak	6	1	10	6	60	0.1	12.14	7.41	2.38	2.53	1.02	0.00233	4.83	21.93
24	*Terminalia arjuna*	Arjun / Kahua	5	2	20	2.5	50	0.2	5.06	6.17	4.76	14.33	16.56	0.07496	27.38	15.99
25	*Terminalia tomentosa*	Saja	10	5	50	2	**100**	0.5	4.05	12.35	11.90	4.20	2.62	0.00645	8.03	**28.30**
	Total		**81**		**420**	**49.42**	**810**	**4.2**	**100**	**100**	**100**	**52.32**	**31.51**	**0.12**	**100**	**300**

In site-3 it is evident from the data presented in table 4.8 (c) that *Terminalia tomentosa* (IVI-28.30) was the most dominant tree followed by *Cleistanthus collinus* (IVI-26.93), *Tectona grandis* (IVI-21.93). Basal area and density of individual tree species varied from 0.19 – 14.33 m^2/ha and 10 – 100 stem/ha.

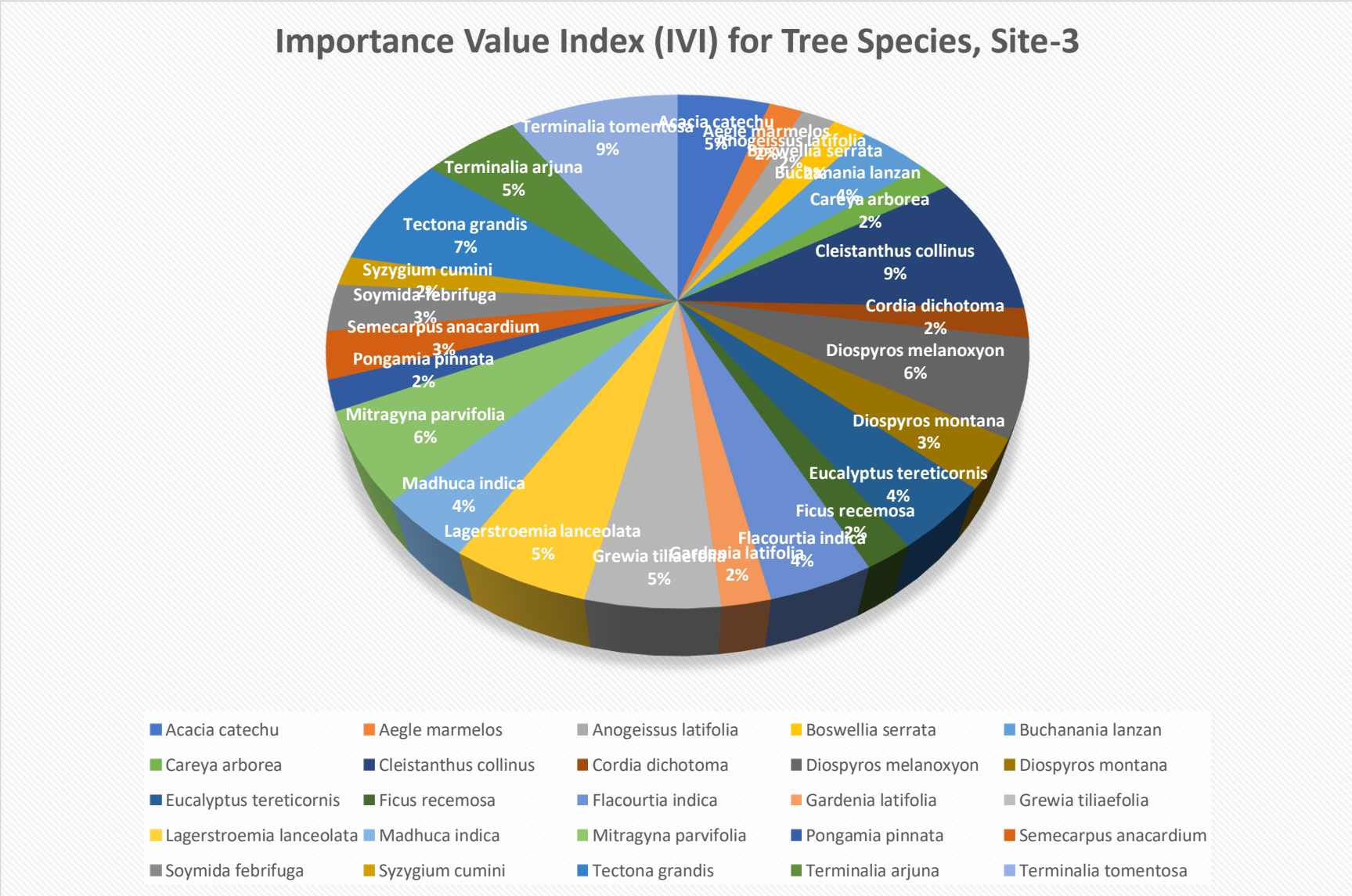

Importance Value Index (IVI) for Tree Species, Site-3
Acacia catechu 5%
Aegle marmelos 2%
Anogeissus latifolia 2%
Boswellia serrata 2%
Buchanania lanzan 4%
Careya arborea 2%
Cleistanthus collinus 9%
Cordia dichotoma 2%
Diospyros melanoxyon 6%
Diospyros montana 3%
Eucalyptus tereticornis 4%
Ficus recemosa 2%
Flacourtia indica 4%
Gardenia latifolia 2%
Grewia tiliaefolia 5%
Lagerstroemia lanceolata 5%
Madhuca indica 4%
Mitragyna parvifolia 6%
Pongamia pinnata 2%
Semecarpus anacardium 3%
Soymida febrifuga 3%
Syzygium cumini 2%
Tectona grandis 7%
Terminalia arjuna 5%
Terminalia tomentosa 9%
Acacia catechu
Aegle marmelos
Anogeissus latifolia
Boswellia serrata
Buchanania lanzan
Careya arborea
Cleistanthus collinus
Cordia dichotoma
Diospyros melanoxyon
Diospyros montana
Eucalyptus tereticornis
Ficus recemosa
Flacourtia indica
Gardenia latifolia
Grewia tiliaefolia
Lagerstroemia lanceolata
Madhuca indica
Mitragyna parvifolia
Pongamia pinnata
Semecarpus anacardium
Soymida febrifuga
Syzygium cumini
Tectona grandis
Terminalia arjuna
Terminalia tomentosa

Table 4.8 (d): Phytosociological Analysis of Tree's at Barnawapara Wildlife Sanctuary (Total Quadrate Study -10 Quadrate) Site: - 4

S. N.	Scientific Name	Species	Total No. of Indiv.	No. of Q. Occu	Freq. %	Abun-dance	Densi-ty (Stem/ ha)	Freq.	RA	RD	RF	BA (Ni) (m^2/ha)	Ni Log_{10} Ni	$(Ni/N)^2$	RBA	IVI
1	*Acacia catechu*	Khair	3	1	10	3	30	0.1	9.19	2.86	2.08	0.61	-0.13	0.0001	1.14	14.13
2	*Anogeissus latifolia*	Dhwada	5	3	30	1.67	50	0.3	5.10	4.76	6.25	4.49	2.93	0.0072	8.48	16.12
3	*Bridelia retusa*	Kasi/Kasayi/Kasahi	1	1	10	1	10	0.1	3.06	0.95	2.08	0.54	-0.15	0.0001	1.01	6.10
4	*Buchanania lanzan*	Chaar/Chironji	2	2	20	1	20	0.2	3.06	1.90	4.17	0.75	-0.09	0.0002	1.41	9.13
5	*Butea monosperma*	Palas	2	1	10	2	20	0.1	6.12	1.90	2.08	0.32	-0.16	0.0000	0.61	10.11
6	*Chloroxylon swietenia*	Birha	3	1	10	3	30	0.1	9.19	2.86	2.08	1.50	0.26	0.0008	2.83	14.13
7	*Cleistanthus collinus*	Karra	25	7	70	3.57	**250**	0.7	10.94	23.81	14.58	7.53	6.60	0.0202	14.23	**49.33**
8	*Diospyros melanoxyon*	Tendu	10	5	50	2.00	100	0.5	6.12	9.52	10.42	6.51	5.29	0.0151	12.30	26.07
9	*Lagerstroemia lanceolata*	Senha	10	5	50	2	100	0.5	6.12	9.52	10.42	4.59	3.04	0.0075	8.68	26.07
10	*Lannea coromandelica*	Mode/Goonja	11	4	40	2.75	110	0.4	8.42	10.48	8.33	6.18	4.89	0.0136	11.67	27.23
11	*Madhuca indica*	Mahua	5	3	30	1.67	50	0.3	5.10	4.76	6.25	7.93	7.14	0.0225	14.99	16.12
12	*Mitragyna parvifolia*	Mundi	1	1	10	1	10	0.1	3.06	0.95	2.08	0.46	-0.16	0.0001	0.87	6.10
13	*Phyllanthus emblica*	Aonla	1	1	10	1	10	0.1	3.06	0.95	2.08	0.34	-0.16	0.0000	0.64	6.10
14	*Pterocarpus marsupium*	Beeja	1	1	10	1	10	0.1	3.06	0.95	2.08	0.54	-0.15	0.0001	1.01	6.10
15	*Semecarpus anacardium*	Bhelwa	6	4	40	1.5	60	0.4	4.59	5.71	8.33	0.93	-0.03	0.0003	1.76	18.64
16	*Tectona grandis*	Teak	4	2	20	2	40	0.2	6.12	3.81	4.17	1.79	0.45	0.0011	3.39	14.10
17	*Terminalia tomentosa*	Saja	15	6	60	2.5	150	0.6	7.66	14.29	12.50	7.93	7.14	0.0225	14.99	34.44
	Total		**105**		**480**	**32.65**	**1050**	**4.8**	**100**	**100**	**100**	**52.94**	**36.73**	**0.11**	**100**	**300**

In site-4 it is evident from the data presented in table 4.8 (d) that *Cleistanthus collinus* (IVI-49.33) was the most dominant tree followed by *Terminalia tomentosa* (IVI-34.44), *Lannea coromandelica* (IVI-27.23). Basal area and density of individual tree species varied from -0.16 – 7.14 m^2/ha and 10 – 250 stem/ha.

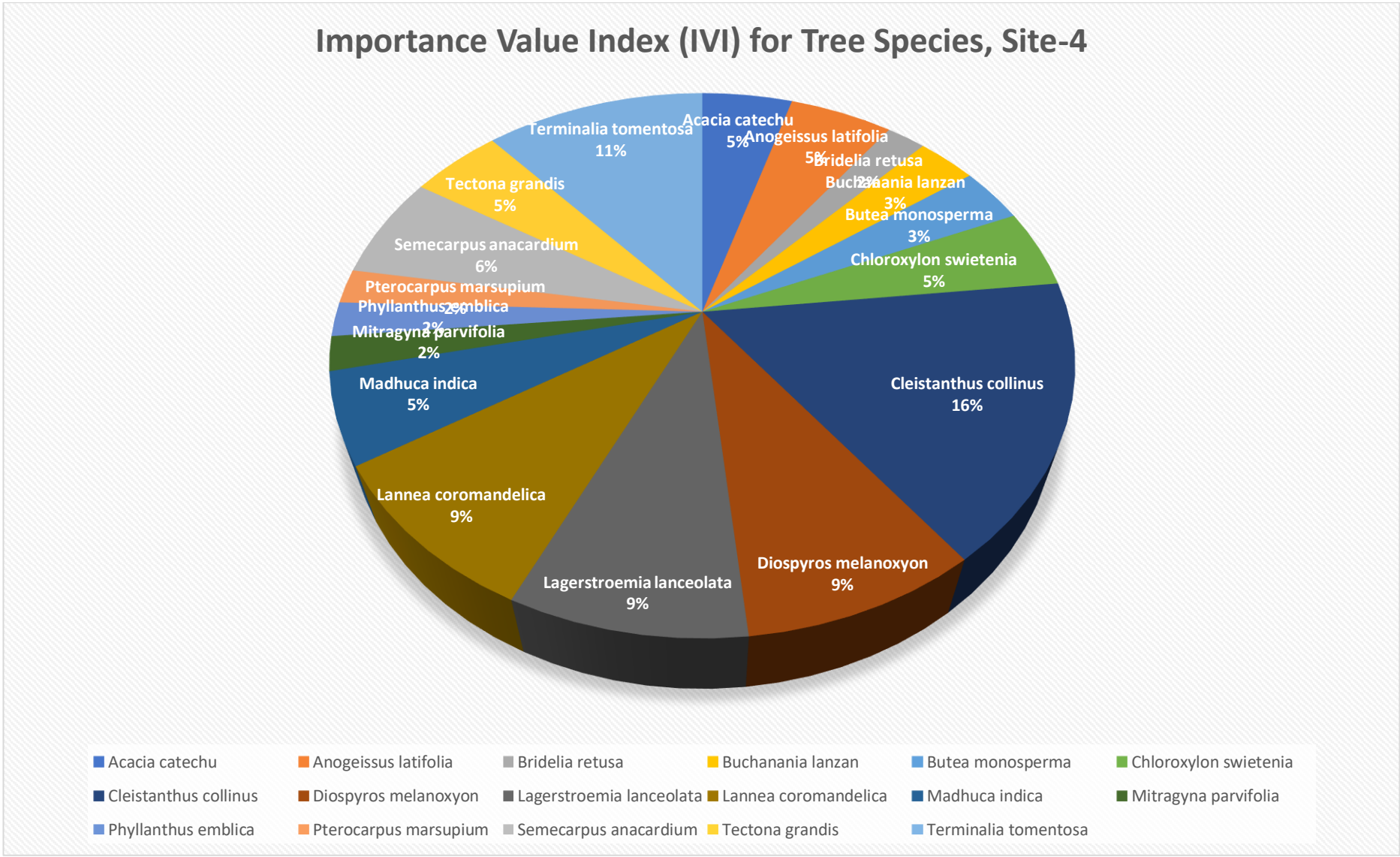

Importance Value Index (IVI) for Tree Species, Site-4
Acacia catechu 5%
Anogeissus latifolia 5%
Bridelia retusa
Buchanania lanzan 3%
Butea monosperma 3%
Chloroxylon swietenia 5%
Cleistanthus collinus 16%
Diospyros melanoxyon 9%
Lagerstroemia lanceolata 9%
Lannea coromandelica 9%
Madhuca indica 5%
Mitragyna parvifolia 2%
Phyllanthus emblica
Pterocarpus marsupium
Semecarpus anacardium 6%
Tectona grandis 5%
Terminalia tomentosa 11%
Acacia catechu
Anogeissus latifolia
Bridelia retusa
Buchanania lanzan
Butea monosperma
Chloroxylon swietenia
Cleistanthus collinus
Diospyros melanoxyon
Lagerstroemia lanceolata
Lannea coromandelica
Madhuca indica
Mitragyna parvifolia
Phyllanthus emblica
Pterocarpus marsupium
Semecarpus anacardium
Tectona grandis
Terminalia tomentosa

Table 4.9 (a): Phytosociological Analysis of Shrub's at Barnawapara Wildlife Sanctuary (Total Quadrate Study -10 Quadrate) Site: - 1

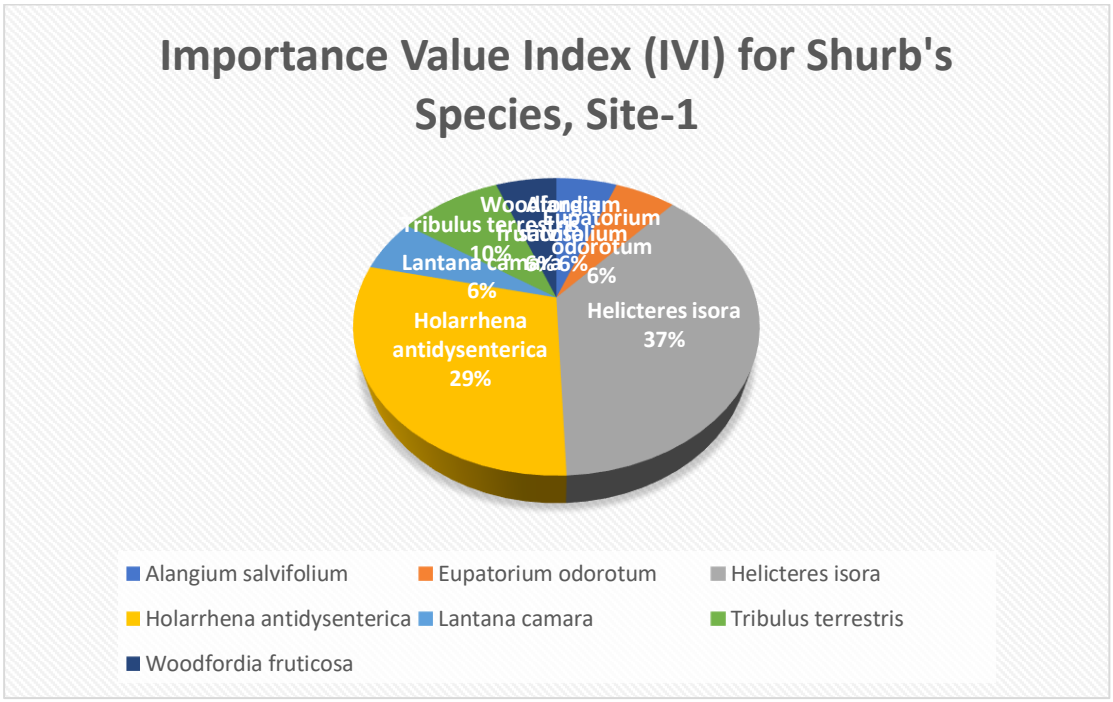
S. N.	Scientific Name	Species	Total No. of Indiv.	No. of Q. Occu	Freq. %	Abun - dance	Densi-ty (Stem /ha)	Freq.	RA	RD	RF	CA (Ni) (m2/h a)	Ni Log10 Ni	$(Ni/N)^2$	RCA	IVI
1	*Alangium salvifolium*	Akol	1	1	10	1	40	0.1	5.61	2.78	9.09	0.005	-0.012	0.00050	2.25	17.48
2	*Eupatorium odorotum*	Eupatorium	1	1	10	1	40	0.1	5.61	2.78	9.09	0.005	-0.012	0.00055	2.35	17.48
3	*Helicteres isora*	Atayan	17	2	20	8.5	**680**	0.2	47.66	47.22	18.18	0.153	-0.125	0.42924	65.52	**113.07**
4	*Holarrhena antidysenterica*	Korai	13	3	30	4.33	520	0.3	24.30	36.11	27.27	0.064	-0.076	0.07458	27.31	87.68
5	*Lantana camara*	Lentana/Raimuniya	1	1	10	1	40	0.1	5.61	2.78	9.09	0.002	-0.006	0.00011	1.07	17.48
6	*Tribulus terrestris*	Gokhru	2	2	20	1	80	0.2	5.61	5.56	18.18	0.002	-0.004	0.00005	0.69	29.34
7	*Woodfordia fruticosa*	Dhawai	1	1	10	1.00	40	0.1	5.61	2.78	9.09	0.002	-0.005	0.00007	0.82	17.48
	Total		**36**		**110**	**17.83**	**1440**	**1.1**	**100**	**100**	**100**	**0.23**	**-0.24**	**0.51**	**100**	**300**

In site-1 it is evident from the data presented in table 4.9 (a) that *Helicteres isora* (IVI-113.07) was the most dominant shrub species.

Table 4.9 (b): Phytosociological Analysis of Shrub's at Barnawapara Wildlife Sanctuary (Total Quadrate Study -10 Quadrate) Site: - 2

S. N.	Scientific Name	Species	Total No. of Indiv.	No. of Q. Occu	Freq. %	Abun - dance	Density (Stem/h a)	Freq.	RA	RD	RF	CA (Ni) (m2/h a)	Ni Log10 Ni	$(Ni/N)^2$	RCA	IVI
1	*Antidesma ghaesembilla*	Banmashuri	12	2	20	6	**480**	0.2	44.44	48.00	16.67	0.037	-0.053	0.1740	41.71	**109.11**
2	*Eupatorium odorotum*	Eupatorium	2	2	20	1	80	0.2	7.41	8.00	16.67	0.010	-0.019	0.0117	10.81	32.07
3	*Helicteres isora*	Atayan	1	1	10	1	40	0.1	7.41	4.00	8.33	0.004	-0.010	0.0024	4.93	19.74
4	*Holarrhena antidysenterica*	Korai	6	4	40	1.5	240	0.4	11.11	24.00	33.33	0.029	-0.045	0.1092	33.05	68.44
5	*Lantana camara*	Lentana	2	1	10	2	80	0.1	14.81	8.00	8.33	0.004	-0.010	0.0021	4.62	31.15
6	*Nyctanthes arbortristis*	Harsingar	1	1	10	1	40	0.1	7.41	4.00	8.33	0.004	-0.009	0.0017	4.08	19.74
7	*Tribulus terrestris*	Gokhru	1	1	10	1.00	40	0.1	7.41	4.00	8.33	0.001	-0.002	0.0001	0.79	19.74
	Total		**25**		**120**	**13.50**	**1000**	**1.2**	**100**	**100**	**100**	**0.09**	**-0.15**	**0.30**	**100**	**300**

In site-2 it is evident from the data presented in table 4.9 (b) that *Antidesma ghaesembilla* (IVI-109.11) was the most dominant shrub species.


Importance Value Index (IVI) for Shurb's Species, Site-1
Helicteres isora 37%
Holarrhena antidysenterica 29%
Lantana camara 6%
Tribulus terrestris 10%
Eupatorium odorotum 6%
Alangium salvifolium
Woodfordia fruticosa
Alangium salvifolium
Eupatorium odorotum
Helicteres isora
Holarrhena antidysenterica
Lantana camara
Tribulus terrestris
Woodfordia fruticosa

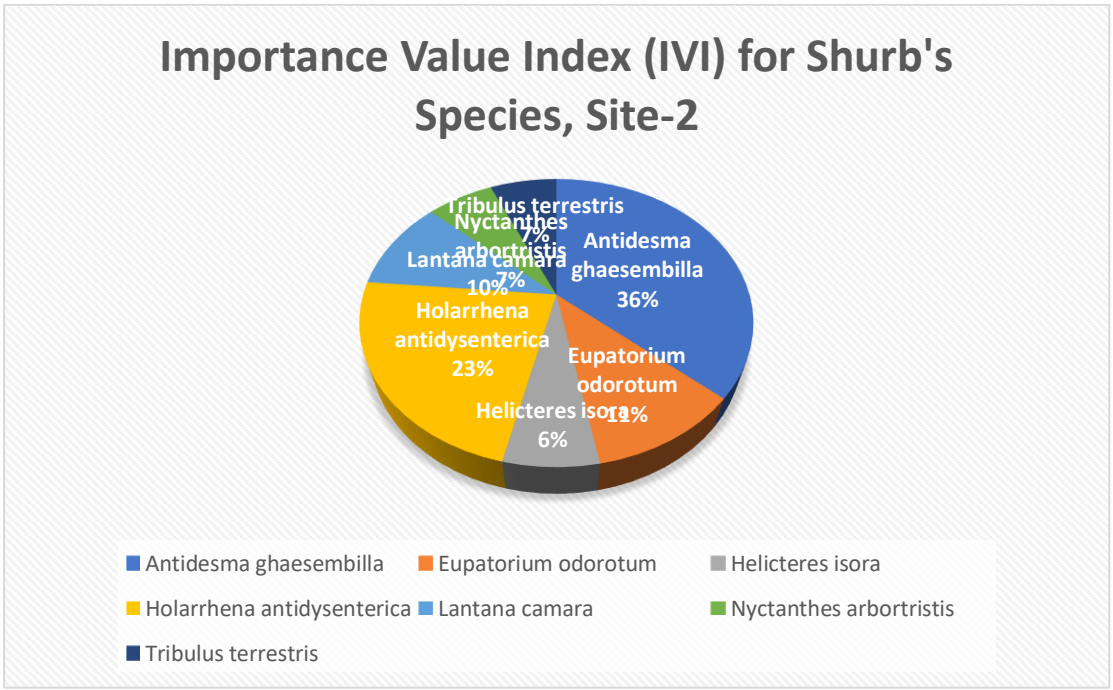

Importance Value Index (IVI) for Shurb's Species, Site-2
Antidesma ghaesembilla 36%
Eupatorium odorotum 11%
Helicteres isora 6%
Holarrhena antidysenterica 23%
Lantana camara 10%
Nyctanthes arbortristis 7%
Tribulus terrestris 7%
Antidesma ghaesembilla
Eupatorium odorotum
Helicteres isora
Holarrhena antidysenterica
Lantana camara
Nyctanthes arbortristis
Tribulus terrestris

Table 4.9 (c): Phytosociological Analysis of Shrub's at Barnawapara Wildlife Sanctuary (Total Quadrate Study -10 Quadrate) Site: - 3

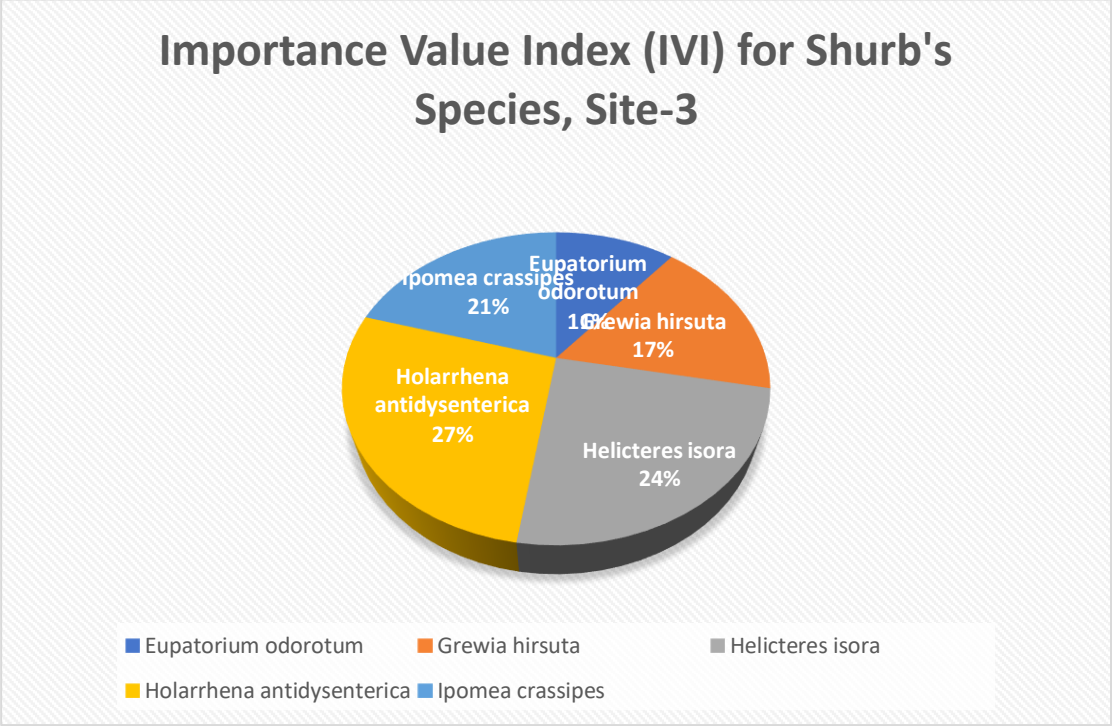
S. N.	Scientific Name	Species	Total No. of Indiv.	No. of Q. Occu	Freq. %	Abun - dance	Densi -ty (Stem /ha)	Freq.	RA	RD	RF	CA (Ni) (m2/h a)	Ni Log10 Ni	(Ni/N) ^{2}	RCA	IVI
1	*Eupatorium odorotum*	Eupatorium	2	2	20	1	80	0.2	9.38	8	15.38	0.005	-0.01	0.003	5.00	32.76
2	*Grewia hirsuta*	Gurshukhri	4	3	30	1.33	160	0.3	12.50	16	23.08	0.003	-0.01	0.001	2.73	51.58
3	*Helicteres isora*	Atayan	7	3	30	2.33	280	0.3	21.88	28	23.08	0.050	-0.07	0.214	46.27	72.95
4	*Holarrhena antidysenterica*	Korai	8	4	40	2	**320**	0.4	18.75	32	30.77	0.036	-0.05	0.111	33.38	**81.52**
5	*Ipomea crassipes*	Ipomea	4	1	10	4	160	0.1	37.50	16	7.69	0.014	-0.03	0.016	12.61	61.19
	Total		**25**		**130**	**10.67**	**1000**	**1.3**	**100**	**100**	**100**	**0.11**	**-0.16**	**0.34**	**100.00**	**300**

In site-3 it is evident from the data presented in table 4.9 (c) that *Holarrhena antidysenterica* (IVI-81.52) was the most dominant shrub species.

Table 4.9 (d): Phytosociological Analysis of Shrub's at Barnawapara Wildlife Sanctuary (Total Quadrate Study -10 Quadrate) Site: - 4

S. N.	Scientific Name	Species	Total No. of Indiv.	No. of Q. Occu	Freq. %	Abun - dance	Densi -ty (Stem /ha)	Freq.	RA	RD	RF	CA (Ni) (m2/h a)	Ni Log10 Ni	(Ni/N) ^{2}	RCA	IVI
1	*Antidesma ghaesembilla*	Banmashuri	1	1	10	1	40	0.1	13.79	5.88	11.11	0.002	-0.005	0.001	2.65	30.79
2	*Carissa opaca*	Karonda	1	1	10	1.00	40	0.1	13.79	5.88	11.11	0.003	-0.008	0.002	4.19	30.79
3	*Holarrhena antidysenterica*	Korai	11	4	40	2.75	**440**	0.4	37.93	64.71	44.44	0.056	-0.070	0.531	72.87	**147.08**
4	*Phoenix acaulis*	Chhind	1	1	10	1	40	0.1	13.79	5.88	11.11	0.001	-0.002	0.000	1.04	30.79
5	*Woodfordia fruticosa*	Dhawai	3	2	20	1.5	120	0.2	20.69	17.65	22.22	0.015	-0.027	0.037	19.25	60.56
	Total		**17**		**90**	**7.25**	**680**	**0.9**	**100**	**100**	**100**	**0.08**	**-0.11**	**0.57**	**100**	**300**

In site-4 it is evident from the data presented in table 4.9 (d) that *Holarrhena antidysenterica* (IVI-147.08) was the most dominant shrub species.


Importance Value Index (IVI) for Shurb's Species, Site-3
Eupatorium odorotum 16%
Grewia hirsuta 17%
Helicteres isora 24%
Holarrhena antidysenterica 27%
Ipomea crassipes 21%
Eupatorium odorotum
Grewia hirsuta
Helicteres isora
Holarrhena antidysenterica
Ipomea crassipes

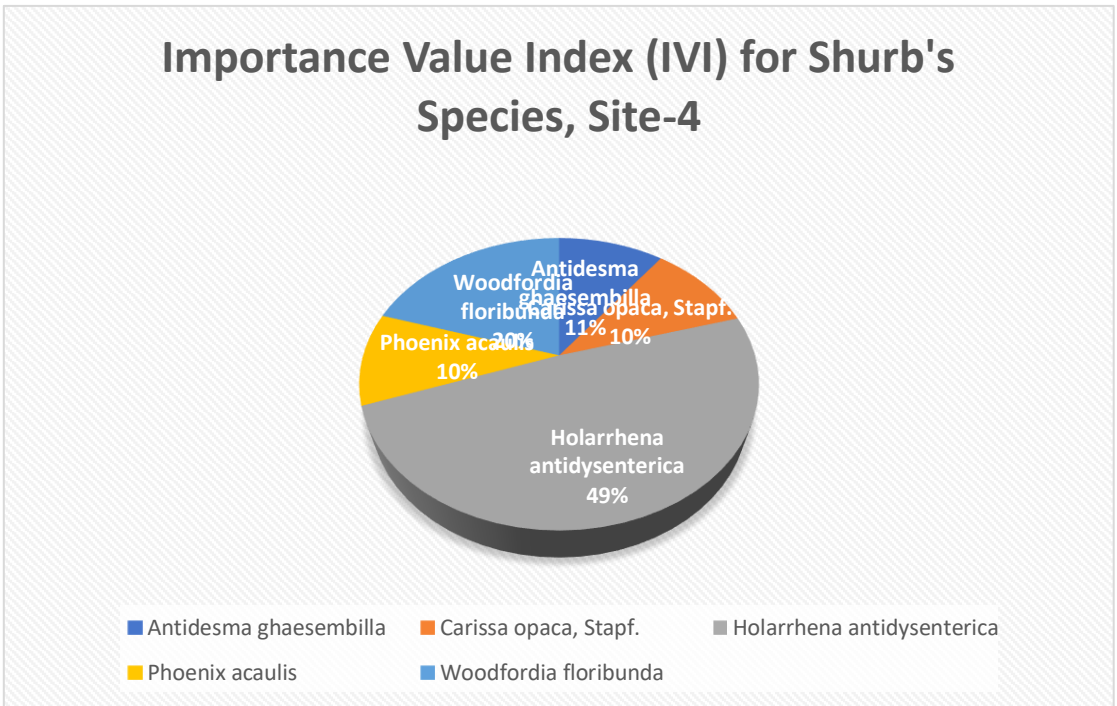

Importance Value Index (IVI) for Shurb's Species, Site-4
Antidesma ghaesembilla 11%
Carissa opaca, Stapf. 10%
Holarrhena antidysenterica 49%
Phoenix acaulis 10%
Woodfordia floribunda 20%
Antidesma ghaesembilla
Carissa opaca, Stapf.
Holarrhena antidysenterica
Phoenix acaulis
Woodfordia floribunda

Table 4.10 (a):Phytosociological Analysis of Herb's at Barnawapara Wildlife Sanctuary (Total Quadrate Study -10 Quadrate)
Site: - 1

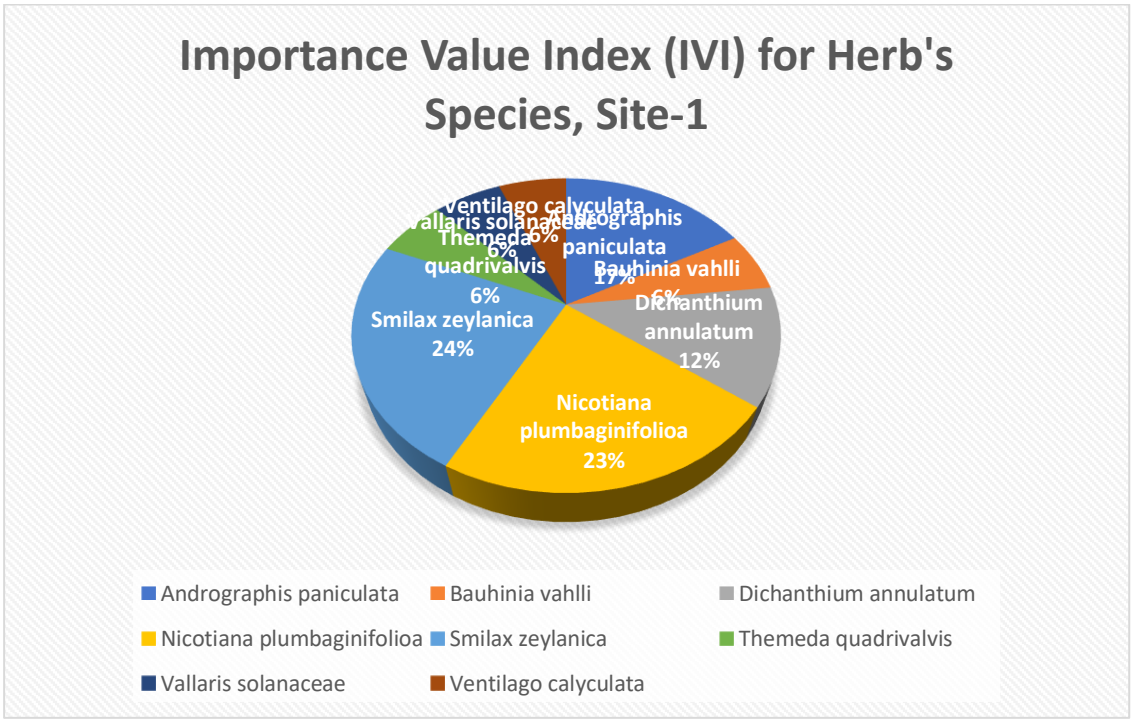
S. N.	Scientific Name	Species	Total No. of Indiv.	No. of Q. Occu	Freq. %	Abun - dance	Density (Stem/ha)	Freq.	RA	RD	RF	IVI
1	*Andrographis paniculata*	Bhuyineem/Chirayta	5	3	30	1.67	5000	0.3	14.84	18.52	17.65	51.00
2	*Bauhinia vahlli*	Siali/Mahul	1	1	10	1	1000	0.1	8.90	3.70	5.88	18.49
3	*Dichanthium annulatum*	Chhoti Marvel/Kail	3	2	20	1.5	3000	0.2	13.35	11.11	11.76	36.23
4	*Nicotiana plumbaginifolioa*	Jungli Tambakhu	7	5	50	1.4	7000	0.5	12.46	25.93	29.41	67.80
5	*Smilax zeylanica*	Smilax/Ramdatoun	8	3	30	2.67	**8000**	0.3	23.74	29.63	17.65	**71.02**
6	*Themeda quadrivalvis*	Gunher	1	1	10	1	1000	0.1	8.90	3.70	5.88	18.49
7	*Vallaris solanaceae*	Dudhibel	1	1	10	1.00	1000	0.1	8.90	3.70	5.88	18.49
8	*Ventilago calyculata*	Kevatinar	1	1	10	1.00	1000	0.1	8.90	3.70	5.88	18.49
	Total		**27**		**170**	**11.23**	**27000**	**1.7**	**100**	**100.00**	**100.00**	**300.00**

In site-1 it is evident from the data presented in table 4.10 (a) that *Smilax zeylanica* (IVI-71.02) was the most dominant herb species.

Table 4.10 (b):Phytosociological Analysis of Herb's at Barnawapara Wildlife Sanctuary (Total Quadrate Study -10 Quadrate)
Site: - 2

S. N.	Scientific Name	Species	Total No. of Indiv.	No. of Q. Occu	Freq. %	Abun-dance	Density (Stem/ha)	Freq.	RA	RD	RF	IVI
1	*Alpuda mutica*	Fulkigrass/Fulgigrass	3	2	20	1.50	3000	0.2	11.39	13.04	13.33	37.77
2	*Aristida setacea*	Ghadouch/Jhani	2	2	20	1	2000	0.2	7.59	8.70	13.33	29.62
3	*Bauhinia vahlii*	Siali/Mahul	1	1	10	1	1000	0.1	7.59	4.35	6.67	18.61
4	*Cynodon dactylon*	Dubi	7	3	30	2.33	**7000**	0.3	17.72	30.43	20.00	**68.16**
5	*Cyperus rotundus*	Nagarmotha	2	1	10	2.00	2000	0.1	15.19	8.70	6.67	30.55
6	*Daedalacanthus purpurascens*	Bantulshi	1	1	10	1	1000	0.1	7.59	4.35	6.67	18.61
7	*Dodonoea viscosa*	JungliMehandi	1	1	10	1.00	1000	0.1	7.59	4.35	6.67	18.61
8	*Nicotiana plumbaginifolioa*	JungliTambakhu	4	3	30	1.33	4000	0.3	10.13	17.39	20.00	47.52
9	*Zizyphus oenoplia*	Makoya/Makore	2	1	10	2.00	2000	0.1	15.19	8.70	6.67	30.55
	Total		**23**		**150**	**13.17**	**23000**	**1.5**	**100**	**100.00**	**100**	**300**

In site-2 it is evident from the data presented in table 4.10 (b) that *Cynodon dactylon* (IVI-68.16) was the most dominant herb species.


Importance Value Index (IVI) for Herb's Species, Site-1
Andrographis paniculata
Bauhinia vahlli
Dichanthium annulatum
Nicotiana plumbaginifolioa
Smilax zeylanica
Themeda quadrivalvis
Vallaris solanaceae
Ventilago calyculata
Andrographis paniculata 6%
Bauhinia vahlli 6%
Dichanthium annulatum 12%
Nicotiana plumbaginifolioa 23%
Smilax zeylanica 24%
Themeda quadrivalvis 6%
Vallaris solanaceae 6%
Ventilago calyculata 6%

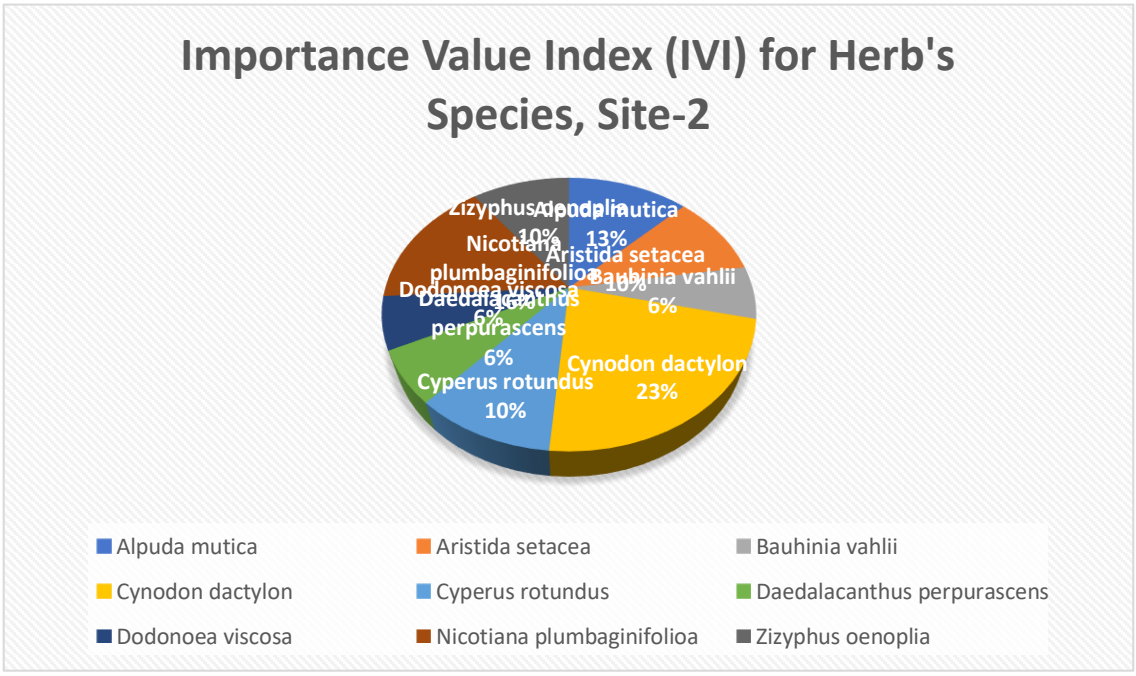

Importance Value Index (IVI) for Herb's Species, Site-2
Alpuda mutica
Aristida setacea
Bauhinia vahlii
Cynodon dactylon
Cyperus rotundus
Daedalacanthus perpurascens
Dodonoea viscosa
Nicotiana plumbaginifolioa
Zizyphus oenoplia
Alpuda mutica 13%
Aristida setacea 6%
Bauhinia vahlii 6%
Cynodon dactylon 23%
Cyperus rotundus 10%
Daedalacanthus perpurascens 6%
Dodonoea viscosa 6%
Nicotiana plumbaginifolioa 10%
Zizyphus oenoplia 10%

Table 4.10 (c): Phytosociological Analysis of Herb's at Barnawapara Wildlife Sanctuary (Total Quadrate Study -10 Quadrate) Site: - 3

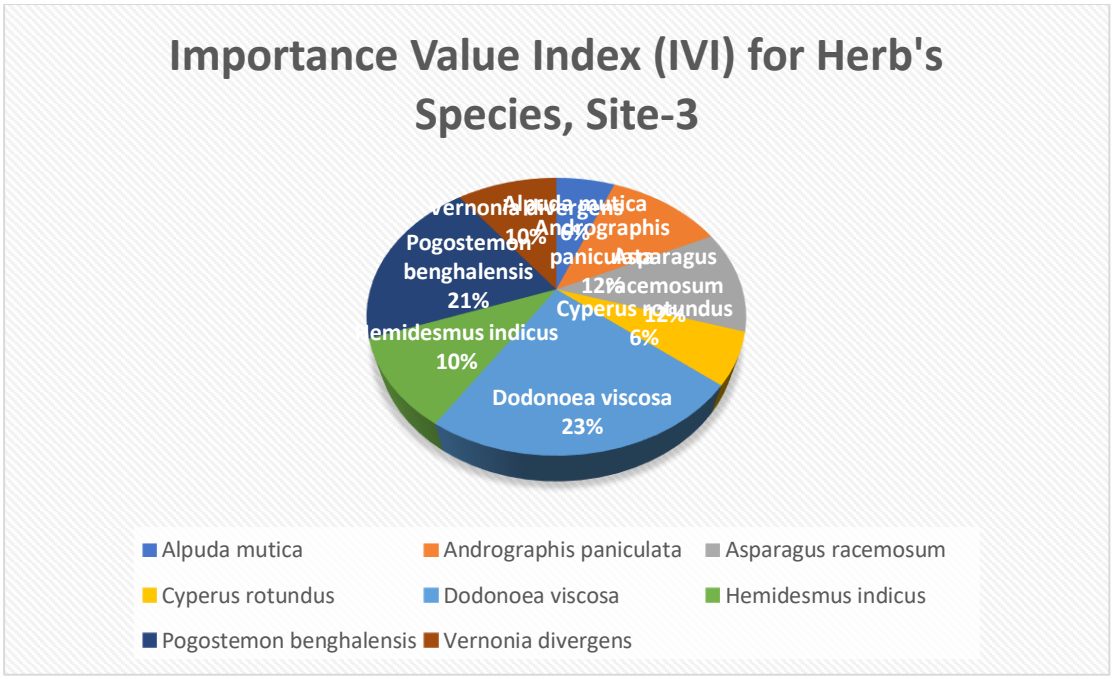
S. N.	Scientific Name	Species	Total No. of Indiv.	No. of Q. Occu	Freq. %	Abun - dance	Density (Stem/ha)	Freq.	RA	RD	RF	IVI
1	*Alpuda mutica*	Fulkigrass/Fulgigrass	1	1	10	1.00	1000	0.1	8.80	4.00	5.26	18.06
2	*Andrographis paniculata*	Bhuyineem/Chirayta	3	2	20	1.5	3000	0.2	13.20	12.00	10.53	35.72
3	*Asparagus racemosum*	Shatavari	3	2	20	1.5	3000	0.2	13.20	12.00	10.53	35.72
4	*Cyperus rotundus*	Nagarmotha	1	1	10	1	1000	0.1	8.80	4.00	5.26	18.06
5	*Dodonoea viscosa*	JungliMehandi	7	6	60	1.17	**7000**	0.6	10.26	28.00	31.58	**69.84**
6	*Hemidesmus indicus*	Anantmul	2	1	10	2	2000	0.1	17.60	8.00	5.26	30.86
7	*Pogostemon benghalensis*	Kora	6	5	50	1.20	6000	0.5	10.56	24.00	26.32	60.87
8	*Vernonia divergens*	Mohti	2	1	10	**2.00**	2000	0.1	17.60	8.00	5.26	30.86
	Total		**25**		**190**	**11.37**	**25000**	**1.9**	**100**	**100**	**100**	**300**

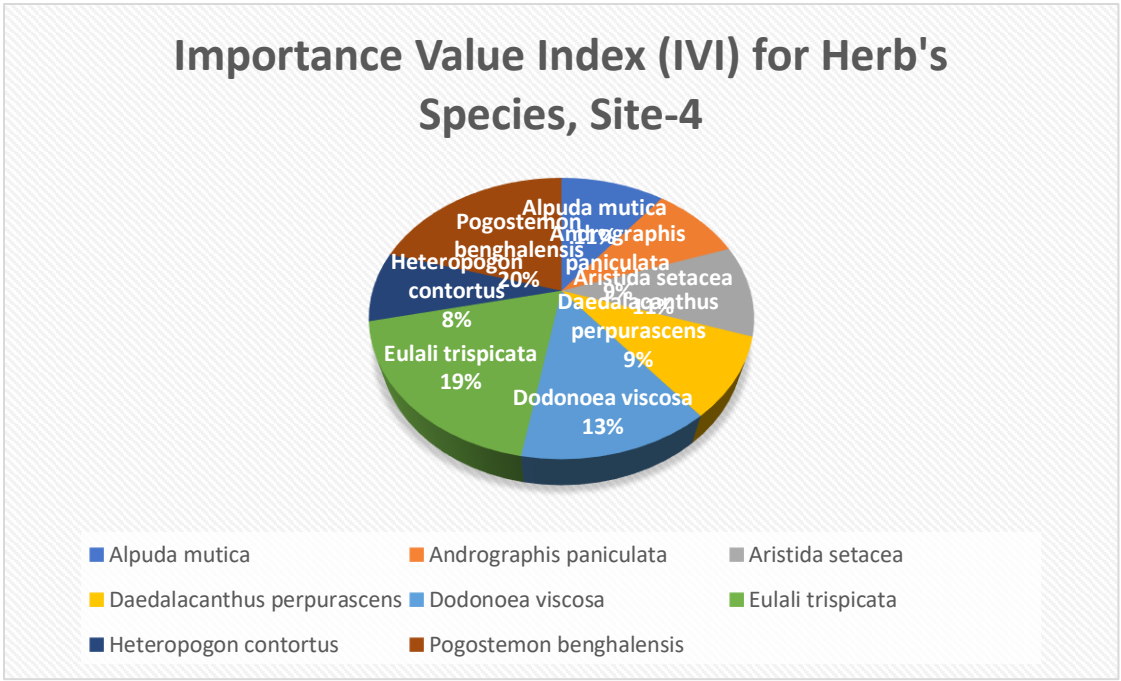
In site-1 it is evident from the data presented in table 4.10 (c) that *Dodonoea viscosa* (IVI-69.84) was the most dominant herb species.

Table 4.10 (d): Phytosociological Analysis of Herb's at Barnawapara Wildlife Sanctuary (Total Quadrate Study -10 Quadrate) Site: - 4

S. N.	Scientific Name	Species	Total No. of Indiv.	No. of Q. Occu	Freq. %	Abun - dance	Density (Stem/ha)	Freq.	RA	RD	RF	IVI
1	*Alpuda mutica*	Fulkigrass/Fulgigrass	3	2	20	1.50	3000	0.2	12.00	10.00	9.52	31.52
2	*Andrographis paniculata*	Bhuyineem/Chirayta	2	1	10	2	2000	0.1	16.00	6.67	4.76	27.43
3	*Aristida setacea*	Ghadouch/Jhani	3	2	20	1.5	3000	0.2	12.00	10.00	9.52	31.52
4	*Daedalacanthus purpurascens*	Bantulshi	2	1	10	2	2000	0.1	16.00	6.67	4.76	27.43
5	*Dodonoea viscosa*	JungliMehandi	4	4	40	1.00	4000	0.4	8.00	13.33	19.05	40.38
6	*Eulali trispicata*	Chhind/Chunai	7	3	30	**2.33**	**7000**	0.3	18.67	23.33	14.29	56.29
7	*Heteropogon contortus*	Kusul/Lapa	2	2	20	1.00	2000	0.2	8.00	6.67	9.52	24.19
8	*Pogostemon benghalensis*	Kora	7	6	60	1.17	**7000**	0.6	9.33	23.33	28.57	**61.24**
	Total		**30**		**210**	**12.50**	**30000**	**2.1**	**100**	**100**	**100**	**300**

In site-1 it is evident from the data presented in table 4.10 (d) that *Pogostemon benghalensis* (IVI-61.24) was the most dominant herb species.


Importance Value Index (IVI) for Herb's Species, Site-3
Pogostemon benghalensis 21%
Dodonoea viscosa 23%
Cyperus rotundus 6%
Asparagus racemosum 12%
Andrographis paniculata 6%
Hemidesmus indicus 10%
Vernonia divergens 10%
Alpuda mutica
Andrographis paniculata
Asparagus racemosum
Cyperus rotundus
Dodonoea viscosa
Hemidesmus indicus
Pogostemon benghalensis
Vernonia divergens


Importance Value Index (IVI) for Herb's Species, Site-4
Alpuda mutica
Pogostemon benghalensis 20%
Heteropogon contortus 8%
Eulali trispicata 19%
Dodonoea viscosa 13%
Daedalacanthus perpurascens 9%
Aristida setacea
Andrographis paniculata
Alpuda mutica
Andrographis paniculata
Aristida setacea
Daedalacanthus perpurascens
Dodonoea viscosa
Eulali trispicata
Heteropogon contortus
Pogostemon benghalensis

Documentation of Fauna:

The fauna documentation was worked out from the records available in Forest Range office at Barnawapara as well as from direct sighting and camera trap pictures. There are 34 species of animals whichresembles7 different orders and there is an area known as 'Pakshi vihaar' which is having the 149 bird species as per the official records. Some of the wild animals of Barnawapara Wildlife sanctuary are Leopard, Spotted deer, Sambhar, Barking deer, Python, Wild dog, Sloth bear, Rhesus monkey, Common langur, Flying squirrel, Peacock, etc. List of fauna species found in the study site are given in table 4.11 (a) and 4.11 (b).

Chandra and Pandey (2004) studied the Anuran Fauna of Achanakmar Wildlife Sanctuary and reported nine species of animals pertaining to nine genera and four Families. In present investigation the Anuran fauna (Frogs) divergence was very low because of dry type of forest as compared with the Achanakmar.

Venkatraman et al. **(2016**) also reported a total of 420 species belonging to five Phylum's under 14 classes (Nematoda, Annelida, Mollusca, Arthropoda and Vertebrates) were recorded during the study period. Among all, bird species were recorded high (264). Though many checklists of faunal species of Bhitarkanika are available, but still there is lacking on the various aspects of ecological studies. In our study area there are 34 species of animals belongs to 7 different orders were reported, this variation was due to the Climatic and Physiographic factors as Bhitarkanika National Park is located in coastal zone of Odisha and the diversity is much higher than Barnawapara Wildlife Sanctuary because of agro-climatic zone.

Sayed and Langawi (2003) reported that flora and fauna are live resources which require the habitat characters to be preserved for their conservation. The paper discusses the application of ecotourism techniques that ensures biodiversity conservation and elaborates their effectiveness under the socio-climatic and socio-cultural condition of Kuwait. The result provides a systematic plan to identify the steps of Ecotourism development and the cost of biodiversity. Similar work has been done in the present investigation to create awareness among people for ecotourism this confirm the objective of the above study.

4.3 To find out the tourist attraction spots and their development strategies to increase the ecotourism.

There were many attraction spots in the Barnawapara sanctuary like: Black-bug adaptation centre, Buffalo breeding centre, Crocodile rearing centre.

Nearby places of the study area of Barnawapara wildlife sanctuary there were 8 tourist spots which are as follows: **Sirpur, Turturiya, Matagarh, Devdhara, Dev Hills Darshan, Siddhkhol, Shivrinarayana, Giroudhpuri and Chatapahaad**. Which has been shown in **Table 4.12**. To develop the tourist attraction spots we need to make the proper attention for the Advertisement (Newspaper, video telecast, pamphlets, leaflets and fair), the signboards inside and outside of the Barnawapara sanctuary must be available elaborating the distance, pathways and direction of the path must be mentioned. The outside roads in Barnawapara sanctuary should be paved and well maintained to attract the tourist which faces many problems during their travelling. There is a lack of restaurant in terms of both economically and facility wise. In this investigation suggestions have been received through the personal interview by filling the questionnaire which was filled by themselves separately by the respondents incorporated (Forest officers / staff) has been shown under the Table 4.13 (c).

Bharti *et al.* (2014) experimented Bandhavgarh National Park in Madhya Pradesh, which is one of the Tiger Reserves of India. Bandhavgarh is an ideal site for such a study as it is a tourism destination of international reputation with relatively high visitor influx and one in which the tourism infrastructure has been in existence for an extensive duration. The tourism activity has reduced the total caring capacity of the area by about 36% from its original state. Though the impact still remains within the low impact category, it is perilously close to the moderate impact level. Management initiatives are required to mitigate the adverse impacts arising from the tourism activities and special emphasis should be laid upon the sensitive components as Ecological and Facility caring capacity in this case.

Table 4.12: Tourist attraction spot in Barnawapara Wildlife Sanctuary.

S. No.	Tourist attraction spot	Detailed Information and Special features of the attractive spots in Barnawapara Sanctuary
1.	**Sirpur**	It is situated at 40 k.m. distance from the Barnawapara in the ghats of Mahanadi river. It is the only archaeological place where we get the shiva, Vaishnava and buddh community relic at the same place. In the seventh century lord shiva temple, laxman and gandheshwar temple were made-up of bricks and "bouddh-vihar" is one of the famous places here.
2.	**Turturiya**	Is situated at a boundary of the Barnawapara and at a distance of 13 kilometre where the archaeological evidences have been found. Here the complete dense forest vegetation is present and also a lake which continue flows round the year which is also name as "suri-suri ganga" by the local residentials. An old 8th century temple of ram is situated along with the Valmiki ashram. According the ancient accreditation it is believed that 'sita-mata' has spent the time during her 'vanvas' and also this is the birth place of 'luv-Kush'.
3.	**Matagarh**	At the distance of 2 km from Turturiya on the western hills an ancient temple of "devi maa" is situated. The main reason behind coming to place is for the sake of childless parents to pray for having the baby and when the which is get fulfilled, they again visit the temple and they used to tonsure of the child.
4.	**Devdhara**	It is situated at a distance of 22 km of Barnawapara and in attached to the eastern boundary of Barnawapara where the "devpuri hills" is situated where a lake surrounded by the bamboo and mixed forest is also a main attraction center and also used as a picnic spot.
5.	**Dev-hills**	The devpuri hills mount is one of the exciting places for tracking which fills a person with the thrill and excitement. This is the highest elevated point of the Raipur district. The Shivrinarayan and Mahanadi can be can easily visible from this point.
6.	**Siddhkhol**	The siddhkhol waterfall is very popular within the tourist community and situated around 32 kms from barnavapara. The average height of the waterfall is around 150 foot.
7.	**Shivrinarayan**	It is situated at the 50 kilometres away at the coastal area of the Mahanadi river which is one of the ancient temples. Here is the conjunction of shivnath, jonk, and Mahanadi river which forms the "Terveni Sangam". According to the ancient accreditation lord ram, laxman & sitamata have been stayed here for some part of their 'vanvas period' and also a lady named as 'sabri' had given the defiled ber fruit to the lord ram. A shiv temple is also situated at 3 kms from kharod. Laxman kund is available which is filled with water round the year.
8.	**Giddhpuridhaam and Chhatapahad**	Situated at a distance of 40 kms from Barnawapara which is the birthplace of "guru Ghasidas". Another place Chhatapahad is a huge stone where the guru ghasidas has acquired the knowledge and the visitors visit here.

4.4 To work out the impact of ecotourism on livelihoods of tribes.

In the present study area of Barnawapara wildlife sanctuary there were total 18 villages and from there we have been recorded the GPS co-ordinates (as an address) of that area and at the same time we have received all the suggestions from all the 18 different villages through the personal interview by filling the questionnaire which was filled by themselves separately by the respondents itself and all such data were mentioned in the Table 4.13 (b). There was different suggestions given by the respondents as some of them gets benefited and others do not receive any profit by the ecotourism activity and the benefits received by the local people is employment being received through the driving of vehicle (gypsy). The major problem they faced is the non-disposal of the polybags and glass bottles in the runway and inside the sanctuary which creates major problems to the environment and to the animals. Thus, there were many suggestions regarding these problems such as the jobs should be given to the local residentials by providing the formal training to them, polybags and the glass bottles (radially available inside the sanctuary) must be totally banned so as to protect the environment and the animals completely, afforestation should be done, dustbin must be radially available within every equidistant point and inside every vehicle so as to reduce the pollution and nuisance being created.

Bibi *et al.* (2013) determined the livelihood conditions of the peoples of three villages (Bait Qaimwala, Basti Allahwali and Jannu) and their dependency on biodiversity of Taunsa Barrage Wildlife Sanctuary, Pakistan from 2009 to 2011. For socio-economic status, Participatory Human Resource Interaction Appraisal method was used and for biodiversity assessment, direct census method and point count were used. Floral biodiversity contained 79 species of plants including; trees, herbs, shrubs, grasses, reeds and Fauna included fish, amphibians, reptiles, mammals and birds species. Similar observation were found in the present investigation confirms the results.

Fiseha (2013) reported that the contributions of protected area for local community livelihood were carried out in Senkele Swayne's Hartebeest sanctuary (SSHS). Primary data were collected through questionnaire, Key Informant

Interview (KII), Focus Group Discussion (FGD) and direct field observation. Secondary data were collected through review of literature. Out of the 32 rural kebeles found in the Siraro district, four kebeles surrounding the sanctuary were purposively selected for the study. Regarding to managing current destruction of the sanctuary, 27.2 % of respondents supposed that, the sanctuary could be managed through ensuring protection and conservation while 13.9%, 11.9% and 11.3% respondents stated sanctuary destruction could be managed through benefit sharing, participatory wildlife management and controlling grazing respectively. Some other 10.6% and 9.9% of the respondents said the sanctuary destruction can be managed through awareness creation and controlling illegal activities.

Rajendra *et al.* (2017) reported in his experiment at Aravalli hill and find out natural home of 616 species that includes 9 orchids and 25 locally and globally endangered plant species. But this sanctuary not familiar for the ecotourism activities, very few people visits this sanctuary. Apart from conventional practices, the science and technology approaches will help the forest department do a systematic plan for ecotourism activities. i.e. developing tourism facilities, nature trails, identifying more watching point, camping site, publicity, brochure and signage in this sanctuary.

Ranjith (2020) evaluated the positive and negative impacts of ecotourism developments in Neyyar, Agastyarvanam, and Ponmudi ecotourism destinations in Trivandrum and to assess the environmental and socio-cultural impacts of ecotourism development in these regions. The analysis of collected data reveals that environmental quality in terms of conserving natural resources, improving environmental quality Agastyarvanam, and Ponmudi achieving good status. The low status observed in negative environmental impacts like ecosystem damage and natural hazards.

CHAPTER –V

SUMMARY, CONCLUSION AND SUGGESTION FOR FUTURE RESEARCH WORK

The present investigation entitled ***"Prospects and Potentials of Ecotourism in Barnawapara Wildlife Sanctuary of Chhattisgarh with Special Reference to Livelihoods of Tribes & Conservation of Biodiversity"*** was carried out at Barnawapara Wildlife Sanctuary of Baloda Bazar Forest Division, Baloda Bazar District in year 2017-18.

The findings under this study are given below points:

- The first objective represents the activity of ecotourism activity in order to know about the potentials of ecotourism at the study area.
- The entry fees were reasonable but the vehicle fees for Gypsy (Rs 1300/round) and xenon (Rs 1800/round) was too high and needs to revise as low.
- Lodging and boarding facilities are sufficient but the prices are too high and not visitor's budget friendly and the restaurant (food) facility was very expensive viz; Chital Restaurant, etc. having high rates of food there must be subsidized rates increases the more no of tourist due to higher food rates visitors are in decreasing order as after 2014-15 it was significantly decreasing in number till today.
- As there was no ATM machine available more than 30-kilometre radius, thus many visitors were requesting to provide this service at nearby location.
- If a person does not have his/her own vehicle then there is only one local transport (bus facility) at 4pm – 4:30pm only from Jhalap to Barnawapara (28 km away from Barnawapara sanctuary) There is need to increase the bus frequency in this rout so the tourist no. will be increase in future.
- At the sanctuary area various plastic products and glass bottles were thrown everywhere by the visitors which cause harm to the wild animals by eating

these residues. So, the dustbin should be made available inside the vehicles and at the regular distance of the sanctuary.

- The wine shop and cigarettes were available in the premises and this needs to be totally banned in the sanctuary area and strict rules should be fallowed if anyone was found with the glass bottles then he/she should be heavily charged.
- The sign boards were not at the proper point of direction to indicate the visiting person, so it needs to be properly fitted in appropriate place.
- The documentation of flora and fauna will be educated to the tourists to know the species richness and biodiversity.
- The documentations of vegetation and its value in terms of aesthetic, medicinal, commercial and other uses create awareness among tourists that these plants and animals are important to make equilibrium in ecosystem.
- The plants belong to 59 different families showed the diversity of plants covers 170 plant species in the sanctuary.
- In the phytosociological study 554 plants which consists of 353 number of trees (belongs to 36 genera consisting of 39 species), 103 shrubs (13 genera having 13 species), 58 herbs (21 genera having 21 species) are good information and it will attract to tourists.
- The most dominant Tree species was *Cleistanthus collinus*, followed by *Terminalia tomentosa* and *Madhuca indica* with least species of *Cordia dichotoma, Ficus recemosa, gardenia latifolia* and the dominant shrubs are; *Holarrhena antidysentrica* followed by *Helicteres isora* and *Antidesma ghaesembilla*. Along with these dominant herbs are; *Pogostemon benghalensis* followed by *Dodonoea viscosa* found in all four sites.
- The **Species Richness (d)** was found highest in site-3 and the value was 6.06 and the lowest value was in site-4 and the value was 4.03 for trees. For shrub's the species richness (d) was highest in site-1 and the value was -4.12 and the lowest value was in site-4 and the value was 1.56.
- The **Diversity index (H')** of trees was highest at site-3 and lowest in site-2, the values are found 3.71 and 3.39 respectively. For shrubs the maximum

plant diversity index was recorded for site-2 (2.06) and minimum (1.19) recorded in site-4.

- Highest **Concentration of Dominance (Cd)** for tree species was found in site-2 and the lowest in site-4 and the values are 0.18 & 0.11 respectively. For shrubs maximum values (0.57) was recorded in site-4 and the minimum value (0.30) in site-2.
- The **Equitability or Pielou Index (e)** for tree species highest (1.21) observed in site-4 and lowest (1.08) in site-2. For the shrub's equitability ranged from 1.10 (highest in site-3) and 0.69 (lowest in site-1).
- For the herbs layer density was highest (30,000 stem/ha) for the site-4 and lowest (23,000 stem/ha) for the site -2.
- The **Beta diversity (β diversity or Bd)** for Tree - 1.81, for shrub – 2.17 and for herb – 2.55.
- The secondary data recorded from Forest department, direct sighting and camera trap pictures there were 34 animal species which belongs to the 7 orders. Some of the wild animals available there was; leopard, spotted deer, sambhar, barking dear, python, deer, wild dog, sloth bear, Rhesus monkey, common langur, flying squirrel, peacock these animals are main attraction of tourists.
- Tourist attraction spots near Barnawapara Sanctuary are; Sirpur, Turturiya, Matagarh, Devdhara Devhills Darshan, Siddhkhol, Shivrinarayan, Giroudhpuri and Chatapahaad. There is need to devolve the tea snacks facilities/ Lunch dinner will be facilitates and enhances the ecotourism.
- Jobs of guide should be given to locals in order to involve their participation in the ecotourism and to increase their income.

Conclusions:

The results of present investigation on ***"Prospects and Potentials of Ecotourism in Barnawapara Wildlife Sanctuary of Chhattisgarh with Special Reference to Livelihoods of Tribes & Conservation of Biodiversity"*** was carried out at Barnawapara Wildlife Sanctuary, Baloda Bazar Forest Division, Baloda Bazar District. The study was carried out on one-year data. There is need to replicate such studies in different areas of Chhattisgarh particularly in protected areas. To arrive on sound conclusion on prospects and potentials of ecotourism has very wide scope in Chhattisgarh.

It is concluded that:

- Chhattisgarh is having 44 % forest cover and so many Sanctuaries. If the tourist spots of these sanctuary area are properly identified and the publicity made then the ecotourism industry will play a significant role in employment generation for local residents as well as to uplift their livelihood.
- Awareness among tourists along with local residents in relation to flora and fauna through the environmental education should be provided, so that the people could learn more and more about the importance of the biodiversity conservation.
- Comparing the density with other forest, there is a need for proper input management and social security.
- ***Cleistanthus collinus*** is the major dominating species with higher potential of regeneration along with some other species.
- Ecological restoration is much essential for better growth, especially in terms of density of the vegetation. Management of under storey is very much needed for promoting natural regeneration of future growth.

Suggestions for future research work:

Based upon the study the following suggestions and recommendations are given below: -

- Introduction of fast-growing native species in the degraded lands is very much essential to improve the diversity of both flora and fauna.
- Further improvement in plant growth by specific silvicultural practices is also suggested.
- Institutional facilities like provision of infrastructure to the tourists for their comfortable stay, good number of economic stay hotels, restaurants should be increased.
- Proper guide with scientific knowledge should be provided for each group to learn and know the ecotourism importance flora and fauna in different study areas in Chhattisgarh to promote ecotourism.
- Various movie shows have to be conducted for tourists in relation to environmental awareness activities as well knowledge. Local available handicrafts and articles should be made available to sold from local people in relation to their Livelihood.

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पर्यटक/आगंतुक के लिए प्रोफार्मा

1. नाम – .....
2. जन्मतिथि / उम्र – .....
3. योग्यता – .....
4. व्यवसाय – .....
5. स्थायी पता – .....

संपर्क

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1. गांव/शहर एवं पिन – .....
2. जिला – .....
3. राज्य – .....
4. देश – .....

6. किस साधन से आए है – .....

7. पर्यटन यात्रा के लिए सूचना स्त्रोत – .....

8. कितने दिनो के लिए पर्यटन यात्रा मे आए है – .....

9. आपके पर्यटन यात्रा का उद्देश्य –

1. वनसपति ☐ 2. वन्यजीव ☐ 3. आदिवासी संस्कृति ☐ 4. जल निकाय ☐

5. अन्य .....

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10. वन्यजीव के लिए विकल्प या दिलचस्पी –

1. शेर ☐ 2. भालू ☐ 3. हिरन ☐

4. अन्य .....

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11. वन के लिए विकल्प –

1. मिश्रित वन ☐ 2. लघु वनोपज प्रजाती ☐ 3. औषधीय पौधे ☐

4. इमारती लकड़ी के वन ☐ 5. चारा वृक्ष वन ☐

6. अन्य – .....

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12. किसके साथ आए है –

1. परिवार के साथ ☐
2. मित्रो के साथ ☐
3. अन्य .....

कुल आगन्तुक की संख्या ☐

13. संतुष्टी स्तर (पर्यटन) ✔ {चिन्ह लगाये} 0 से 5 अंक प्रदान करें (0 = असंतुष्ट, 5 = पूर्ण संतुष्ट)

1. वन्यजीव –	0	1	2	3	4	5	
2. वन –	0	1	2	3	4	5	
3. जैवविविधता –	0	1	2	3	4	5	
4. जल निकाय –	0	1	2	3	4	5	
5. परिस्थितिक पर्यावरण –	0	1	2	3	4	5	

6. अन्य – .....

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14. संतुष्टि स्तर (सुविधाओ का) ✔ {चिन्ह लगाये} 0 से 5 अंक प्रदान करें (0 = असंतुष्ट, 5 = पूर्ण संतुष्ट)

1. रहने की जगह –	0	1	2	3	4	5	
2. बोंडिग –	0	1	2	3	4	5	
3. रोड –	0	1	2	3	4	5	
4. कर्मचारी व्यवहार –	0	1	2	3	4	5	

5. अन्य – .....

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15. पर्यटन यात्रा मे आए समस्याए –

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16. पर्यटन गतिविधि के सुधार लिए सुझाव –

1. वन्यजीव – .....

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2. वन – .....

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3. जैव विविधता – .....

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4. जल निकाय – .....

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5. परिस्थितिक पर्यावरण – .....

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6. रहने की जगह – .....

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7. बोर्डिंग – .....

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8. रोड – .....

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9. कर्मचारी व्यवहार – .....

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10. अन्य – .....

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स्थानीय निवासी हेतु प्रोफार्मा

1. नाम – .....
2. जन्मतिथि / उम्र – .....
3. योग्यता – .....
4. परिवार में सदस्यो कि संख्या – .....
5. स्थायी पता – .....
   गांव /शहर एंव पिन कोड – .....

   .....

6. सामाजिक आर्थिक स्थिति –

   संपर्क

   1. जमीन – ....
   2. घर – ....

7. आमदनी एवं आजिविका मे वन का महत्व –
   1. औषधि – .....

      .....
   2. ईधंन – .....

      .....
   3. चारा – .....

      .....
   4. इमारती वन – .....

      .....
   5. अन्य – .....

      .....

      .....

8. सचांर / जानकारी का स्त्रोत –
   1. टी. वी. – ☐
   2. रेडियो – ☐
   3. फोन – ☐
   4. समाचार पत्र – ☐
   5. अन्य – .....

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9. परिवार का आय एवं व्यय –

1. आय – .....
2. व्यय – .....

10. आमदनी मे पर्यटन का महत्व –

1. पर्यटक से होने वाले लाभ

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2. पर्यटक से आनी वाली समस्या यदि है तो

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सुझाव – .....

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11. पर्यटको कि संख्या –

1. बसंत रितु – .....
2. गर्मी – .....
3. शरद रितु – .....
4. सर्दी – .....

12. पर्यटन गतिविधि के सुधार लिए सुझाव –

1. वन्यजीव – .....

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2. वन – .....

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3. जैव विविधता – .....

.....

4. जल निकाय – .....

.....

5. परिस्थितिक पर्यावरण – .....

.....

6. रहने की जगह – .....

.....

7. बोर्डिंग – .....

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8. रोड – .....

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9. कर्मचारी व्यवहार – .....

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10. अन्य – .....

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अधिकारी / कर्मचारी के लिए प्रोफार्मा

1. कर्मचारी / अधिकारी की श्रेणी
   - रेंज अधिकारी – ☐
   - रिसॉर्ट्स – ☐
   - नाका – ☐
   - अन्य – .....

संपर्क

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पता .....

2. नाम – .....
3. जन्मतिथि या उम्र – .....
4. योग्यता – .....
5. जैव विविधता – .....
   1. वन प्रकार .....
   2. प्रजाति रचना / स्पीसीज कम्पोजिसन – .....

      .....
   3. जलाशय – .....

      .....
   4. जलबंध – .....

      .....
   5. भौगोलिक क्षेत्र – .....

      .....
   6. वन्यजीव – .....

      .....

6. समय – खुलने ..... बन्द होने .....

7. पर्यटको की संख्या

1. बसंत रितु – .....
2. गर्मी – .....
3. शरद रितु – .....
4. सर्दी – .....

8. पर्यटको को प्रदान की जाने वाली सुविधाए –

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9. कनेक्टिविटी एवं नेटवर्क (संचार)

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10. पर्यटको से होने वाली समस्याए –

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सझाव – .....

11. पर्यटन गतिविधि के सुधार लिए सुझाव –

1. वन्यजीव – .....

....

2. वन – .....

.....

3. जैव विविधता – .....

.....

4. जल निकाय – .....

.....

5. परिस्थितिक पर्यावरण – .....

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6. रहने की जगह – .....

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7. बोर्डिंग – .....

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8. रोड – .....

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9. कर्मचारी व्यवहार – .....

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10. अन्य – .....

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Table 4.5 (a): Documentation of Flora (Tree with their uses) at Barnawapara Wildlife Sanctuary.

Flora (only Tree)					Utilization			
S.No.	**Local Name**	**Standard Hindi Name**	**Botanical Name**	**Family**	**Medicinal**	**Commercial**	**Aesthetic**	**Other uses**
1	Achar	Achar (Chironji)	*Buchanania lanzan*	Anacardiceae		Wood used for small beams and rafters, door and window frames, cheap furniture, mining timber, match boxes.		Fruits are edible. Seeds are having high commercial value as „chironji".
2	Arjun	Arjun, Kahua	*Terminalia arjuna*	Combretaceae	Bark powder is used to relieve hypertension, is diuretic and tonic in cirrhosis of liver, given internally with milk in bone fractures. The decoction is used as wash in ulcers and cancer. Bark ash is prescribed for scorpion sting.	The wood is used for making boat, general carpentry, carving, etc.	It is planted as Avenue tree.	The bark yields dye for tanning of leather.
3	Aam	Aam	*Mangifera indica*	Anacardiceae	-	-	-	Fruit are edible
4	Aonla	Aonla	*Emblica offcinalis,gaertn*	Euphorbiaceae	Root, bark, leaf, flower and fruits are used in toothache, sores, fever, anaemia, epilepsy, pimples, gonorrhoea. Fr- an ingredient of „triphala" and „chyavanprash".	Wood used for medium grade furnitures, building etc.	-	The tree is worshiped by hindus.
5	Imlee	Imlee	*Tamarindus indica*	Caesealpiniaceae	-	-	-	Fruit
6	Kathgular	Kathumer	*Ficus hispida*	Moraceae	-	-	-	-
7	Kalla	Korkut	*Dillenia pentagyna*	Dilleniaceae	-	-	-	Edible fruit
8	Kasayi	Kasayi,	*Bridelia retusa*	Euphorbiaceae	Root and bark is used as astringent.	Wood used for	-	-

		Kasahi			Bark used in rheumatism, extract is antiviral, hypotensive and anticancer, decoction for diarrhoea and earache. Paste is applied on wounds and taken internally in snakebite.	building work, carts, yokes, agricultural implements.		
9	Kaari	Kaari	*Miliusa tomentosa*	Annonaceae	-	Wood yields small beams, rafters, knees of boats, agricultural implements, spoons and other utensils.	-	-
10	Kala Siris	Kala Siris	*Albizzia lebbek*	Leguminosae (Mimosaeae)				Fuel wood
11	Kumbhi	Bhuyi, Kumbhi	*Careya arborea*	Myrtaceae	-	Wood used for house building, planking, bridge-piles, furniture, cabinet work.	The whitered flowers give ornamental value to the tree.	-
12	Kullu	Kullu	*Sterculia urens*	Sterculiaceae	-	The tree yields kulu gum for industrial utilization.	-	-
13	Kusum	Kusum	*Schleichera oleosa*	Sapindaceae	-	The tree rears silkworm insect which provides silk for textiles.	-	-
14	Karpot	Karpot	*Garuga pinnata*	Burseraceae	-	Inferior building, planks.	-	-
15	Kaith	Kaitha	*Limonia*	Rutaceae	-	-	-	-

			acidissinca					
16	Kem (Mundi)	Mundi	*Mitragyna parvifolia*	Rubiaceae	-	Construction work	-	-
17	Khair	Khair	*Acacia catechu*	Leguminosae (Mimoseae)	-	Kutch & Kattha Making	-	-
18	Gamari	Khamhar, Khamher	*Gmelina arborea*	Verbenaceae	-	Construction work	-	-
19	Gular	Dumar	*Ficus glomerata*	Moraceae	-	-	-	-
20	Chichava	Chichava	*Albizzia odoratissima*	Legumenosae (Mimoseae)	-	-	-	-
21	Chirol	Chirhol	*Holoptelea integrifolia*	Legumenosae (Mimoseae)	-	-	-	-
22	Jamun	Jamun, Jam	*Syzygium cumini*	Myrataceae	Bark is astringent used specifically for dysen-tery, cures haemorrhages, burning sensation, diarrh-oea, diabetes, cough and asthma, in preparation of gargles and washes. Seed used in diabetes.	Wood is used for house building, common furniture, common furniture, agricultural impleme-nts, railway sleepers, carving and turnery.	-	Fruits are edible.
23	Broken Bones Tree	Bhut vriksha	*Oroxylum indicum*	Bignoniaoeae	Medicinal use for Diarrhoea (from root), fruit – use for stomach pain.	-	-	-
24	Jhingan	Jhingan	*Lannea coromandelica*	Anacardiaceae	Gums having medicinal value (wounds healing)			Gums have edible value
25	Tinsa	Tinsa, Tilaav	*Ougeinia oojeinensis*	Leguminosae (Papilionaceae)		Wood used for building (chiefly posts), carriage		

						building, furniture, ploughs and other implements, boat building, handles of axes and other tools.		
26	Tun	Tun	*Cedrela toona*	Meliaceae	-	-	-	-
27	Tendu	Tendu	*Diospyros melanoxylon*	Ebenaceae	-	-	-	Edible fruit
28	Dhahpalas	Dhahman	*Cordia macleodii*	Boraginaceae	ethnomedicinal plant has been highlighted for its wound healing, aphrodisiac and hepatoprotective activities	-	-	-
29	Dhaman	Dhaman, Dhankat	*Grewia tiliaefolia*	Tiliacea		Wood used for making boats, masts, door and window frames.		
30	Dhwada	Dhwada	*Anogeissus latifolia*	Combretaceae	-	Poles and rafters, cart building, axels and shafts, agricultural implements, tool handles, spinning wheels, furniture, boat building and mining timbe	The dry inflorescenc e becomes golden yellow and looks beautiful and can be used for dry decoration.	-
31	Dhobin	Dhobin	*Dalbergia paniculata*	Leguminosae (Papilioneae)	-	-	-	-
32	Nilgiri	Nilgiri	*Eucalyptus*	Myrtaceae	A decoction of the leaf serves to			used for

			tereticornis		reduce fever and alleviates pulmonary problems			reforestation, shelter-belts and shade
33	Neem	Neem	*Azadirachta indica*	Meliaceae	Neem leaf is used for leprosy, eye disorders, bloody nose, intestinal worms, stomach upset, loss of appetite, **skin** ulcers, diseases of the heart and blood vessels (cardiovascular disease), fever, diabetes, gum disease (gingivitis), and **liver** problems. The leaf is also used for birth control and to cause abortions.	-	-	-
34	Palas	Palas	*Butea monosperma*	Leguminosae (Papilionaceae)	used in Ayurvedic medicine to treat various symptoms	It is used for timber, resin, fodder, medicine, and dye. it is used for well-curbs and water scoops.		
35	Pakar	Padar	*Ficus tsiela*	Moraceae	The bark of the tree is a natural anti-diabetic and anti-oxidant medicine, reducing blood glucose levels.	-	-	-
36	Padar	Padar	*Stereospermum suaveolens*	Bignoniaceae	used in folk medicine for the treatment of diabetes, pain, fever, inflammations and asthma.	-	-	-
37	Pangara	Hadua	*Erythrina suberosa*	Leguminosae (Papilionaceae)	Different parts of the plant have been **used** in traditional medicine as nervine sedative, collyrium in opthalmia, antiasthmatic, antiepileptic, antiseptic, and as an astringent.	-	-	-
38	Pipal	Pipal	*Ficus religiosa*	Moraceae	used traditionally as antiulcer, antibacterial, antidiabetic, in the	Packing cases and	The grand tree is	-

					treatment of gonorrhea and skin diseases	occasionally used for felloes of wheels.	planted as an ornamental tree in home, gardens etc. Bonsai is prepared easily.	
39	Pula	Bargarh	*Kydia calycina*	Malvaceae		Inferior building, ploughs, matchsticks	-	-
40	Bad	Bargad, Bar	*Ficus benghalensis*	Moraceae	useful in treatment of biliousness, **ulcers**, erysipelas, vomiting, vaginal complaints, fever, inflammations, leprosy etc.	-	-	-
41	Bahera	Baheda	*Terminalia belerica*	Combretaceae	Dried fruis are used in stomach disorders. Given as brain tonic and applied as a soothing lotion. Useful in piles, leprosy, dropsy and fever	The wood keeps well under water and is used for making boats, etc. also for miscellaneous agricultural tools.	-	Fruit yields tannin for leather tann-ing, making inks and dyi-ng cloth and leather for.
42	Beejasal	Beeja	*Pterocarpus marsupium*	Legumenosae (Papilionaceae)	It is a reputed drug for treatment of leprosy, and other skin diseases. It is an esteemed remeady for diabetes. Plant and gum- laxative, anthelmintic, useful in diseases of blood, eruptions on body, leprosy, urinary discharges also in eye troubles and elephantiasis.	Wood used for house building, furniture, agricultural implements, railway wagons, boat building.	-	-

43	Bel	Bel	*Aegle marmelos*	Rutaceae	used extensively in the treatment of **dysentery** and diabetes.	--	-	-
44	Birra	Birra, Birha	*Chloroxylon swietenia,D.C.*	Meliaceae	treatment of various ailments like fungal infection of skin, rheumatism, common cold, cough, ophthalmic infection and cataract, wounds and as an astringent.	-	-	-
45	Bhoransal	Bharkut	*Hymenodictyon excelsum*	Rubiaceae	raditional **medicine** for a wide range of ailments related to digestive, endocrine, reproductive, and respiratory systems.	-	-	-
46	Mahua	Mahua	*Madhuca indica*	Sapotaceae	-	Wood used for house building, ship, boats, oilmills, drums, cart axles.		Flower is used for preparation of liquor. Edible oil is extracted from seeds called „kori".
47	Mokha	Mokha, Ghatha	*Schrebera swietenioides*	Oleaceae	The roots, bark and leaves are bitter, acrid, appetising, digestive, thermogenic, stomachic, depurative, constipating urinary astringent and anthelmintic	-	-	-
48	Reunsha	Reunsha	*Acacia leucophloea*	Leguminosae (Mimoseae)	Traditionally the bark is used as astringent, bitter, thermogenic, styptic, alexeteric, antihelmintic, vulnerary, demulcent, constipating, expectorant and antipyretic, vulnerary, demulcent, constipating, bronchitis, cough, vomiting, wounds, ulcers, diarrhoea, dysentery, internal and external haemorrhages, dental caries, oral ulcers, proctoptosis, stomatitis and intermittent fevers.	-	-	-

49	Rohan	Roahan, Rohina	*Soymida febrifuga*	Meliaceae	Bark used as astringent, bitter tonic; prescribed in malaria, general debility, intermittent fever, diarrhoea and dysentery. Applied to rheumatic swelling, used as gargle in stomatitis and as vaginal douch in leucorrhoea.	-	-	-
50	Lasoda	Labher, Lasuda	*Cordia dichotoma,Frost,F*	Boraginaceae	used for the treatment of cough, asthma, skin diseases, **fever**, diarrhea, intestinal worms and wounds.	-	-	-
51	Shisham	Kala Shisham	*Dalbergia latifolia,Roxb*	Leguminosae (Papilionaceae)	-	Timber wood	-	It is also planted as a roadside tree and shade tree in coffee plantations. The foliage is used as **fodder**.
52	Safed Siras	Karhi	*Albizzia procera, Benth*	Legminosae (Mimoseae)	useful in treating problems of pregnancy and for stomach-ache. The bark is given with salt to water buffalo as a medicine. In India, **leaves** are poulticed onto **ulcers**.	-	-	-
53	Sagoun	Sagaun	*Tectona grandis*	Verbenaceae	Superior timber used for furniture as well as building, ship industries, etc.	-	-	Sal dhoopexudated from wounds on stem is used for making agarbatis and dhoop.
54	Saj	Saja	*Terminalia tomentosa,W&A*	Combretaceae	-	House building, rough articles of furnitures,	-	-

						ploughs, harrows, shafts and axles, boat and ship building.		
55	Sal	Saraie	*Shorea robusta,Garetn*	Depterocarpaceae	-	Timber is the best in the country. Used for carving, building construction, furnitu-re making and gener-al carpentry, etc. Seed provides edible oil.	-	Sal dhoopexudated from wounds on stem is used for making agarbatis and dhoop.
56	Saalayi	Salayi, Saalenh	*Boswellia serrata*	Burseraceae	Flowers and seeds used in diarrhoea, dysentery, asthma. Oleo-gum resin for impotency.	Inferior planking, cheap furniture, cases, rough packing, match sticks.	-	-
57	Seja	Seja, Lediya, Senha	*Legerstroemia parviflora*	Lythraceae	-	**Lagerstroemia parviflora** is a valuable tree species for its timber.	-	-
58	Semal	Semara	*Salmalia malabarica*	Malvaceae	• Roots of salmalia are used for treating **dysentery**, **diarrhea**, and menorrhagia,are styptic and also useful for treating **wounds**.	-	-	-
59	Sonpakar	Kadbar	*Ficus tomentosa*	Moraceae	-	-	-	-
60	Sonpadar	Kotari	*Radermachera*	Bignoniaceae	-	-	-	-

			xylocarpa					
61	Harra	Harra, Harad	*Terminalia chebula*	Combretaceae	Dried fruits can be applied on ulcers, wounds and scalds; as gargle in inflammation of mucous membrane of mouth. Used as laxative. Have effect on blood pressure as cardiac tonics. Powder used as dentifrice for the strength of gums.	Wood is used for making agricultural implements.	-	Fruit yields tannin for dying leather and cloth.
62	Haldu	Haldu, Kalmi	*Adina cordifolia*	Rubiaceae	-	Wood is used for building, planking of river boats,	-	-

Table 4.5 (b): Documentation of Flora (all flora except than tree) at Barnawapara Wildlife Sanctuary.

1. Medium Tree species				
1	Amaltaas	Dhanbaher, Karkacha	*Cassia flstula*	Leguminosea (Caesatpinleae)
2	Aamta	Aamta	*Bauhinia malabarica*	Legminosae (Caesalrplnieae)
3	Aashta	Kathmahua	*Bauhinia racemosa*	Legminosae (Caesapinicae)
4	Kakayi	Kahayi	*Flacourtia indica*	Flaeourtiaceae
5	Kachnar	Kachnar	*Bauhinia variegata*	Leguminosae (Caesatpinieae)
6	Kathjamun	Kathjamun	*SYzygium heyneanum*	Mytraceae
7	Kevlaar	Kevlaar	*Bauhinia perpurea*	Leguminosae (Caesapinicae)
8	Galgal	Gabandi	*Cochlospermum religiosum,*	Bixaceae
9	Gilchi	Barri	*Casearia graveclens*	Samyoaceae
10	Ghont	Ghontahar	*Zizyphus xylopyra*	Rhamnaceae
11	Jamrasi	Jamrasi	*Elaeodendron glaucum*	Celastraceae
12	Dikamali	Dikamali, Paprel	*Gardenia resinifera*	Rubiaceae
13	Tilwan	Tilwan	*Wendiandia exserta*	Rubiaceae
14	Papda	Papda	*Gardenia latifolia*	Rubiaceae
15	Fetara	Kharhar	*Gardenia turgida*	Rubiaceae
16	Ber	Ber	*Zizyhus jujuba*	Rhamnaceae
17	Bilsena	Bilsedha	*Limonia acidissima*	Rutaceae
18	Bhilma	Bhilma	*Semecarpus anacardium*	Anacardiaceae
19	Maida Lakdi	-	*Litsea glutinosa*	Lauraceae
20	Mainfal	Mainhar	*Randia dumetorum*	Rpbiaceae
21	Roli	Sinduri, Rori	*Mallotus philippensis*	Euphorbiaceae
22	Lokhandi	Lokhandi	*Lxora arborea*	Rubiaceae
23	Sehara	-	*Bauhinia retusa, Ham*	Leguminosae (Caesalpinieae)
2. Shrubs and Climbers recorded at study area				
24	Akol	Akola	*Alangium salvifolium*	Cornaceae
25	Adusa	Adusa	*Adhatoda vasica*	Acanthaeae
26	Apamarg	Chirchita	*Achyranthes aspera*	Amaranthaceae
27	Aarandi	Arandi	*Ricinus communis*	Euphobiaceae
28	Aak	Aak	*Calotropis gigantea*	Asclepiaceae
29	Karonda	Karonda	*Carissa opaca,Stapf.*	Apocynaceae
30	Kalabonsa	Ameda	*Clebrookia oppositifolia*	Labiatae
31	Kurchi	Kurchi, Keriya	*Holarrhena antidysenterica*	Apocynoeae
32	Kora	Kora	*Pogostemon benghalensis*	Labiatae
33	Kali Mushli	Kali Mushli	*Curculigs orchioides*	Amoniyllidaceae
34	Kela Jungali	Jungali Kela	*Musa sapientam*	Musaieae
35	Kukra	Kukra	*Gardenia gummifera*	Rubiaiere
36	Khatua	Khatua	*Antidesma diandrum*	Euphorbiaceae
37	Khurshi	Khurashi	*Gredenia rothii*	Tiliaceae
38	Khareta	Jungali	*Dodonoea viscosa*	Saoindaceae

		mehandi		
39	Gudsakari	-	*Grewia hirsuta*	Tiliaceae
40	Gokharu	Gokharu	*Tribulus terrestris*	Zygophyllaceae
41	Gokharu	-	*Xanthium strumarium*	compositae
42	Chipati	Chepati	*Desomodium pulchellum*	Leguminosae (Papilionaceae)
43	Chireta	Chirayta	*Andrographis paniculata*	Acanthaceae
44	Jondharli	Vanmashuri	*Antidesma ghaesembilla*	Euphobiaceae
45	Jhadberi	Jhakeri	*Zizyphus nummularia*	Rhamnaceae
46	Jhau	Jhadu, Jhau	*Tamarix dioica*	Tamaricaceae
47	Tulsi	Tulsi	*Ocimum sanctum*	Labialae
48	Thuar	Thuar	*Euphorbia neriifolia*	Euphobiaceae
49	Dhawayi	Dhawayi	*Woodfordia fruticosa*	Lythraceae
50	Nirgudi	Nirgudi	*Vitex negundo*	Verbenaceae
51	Nil	Birhul	*Lndigofera pulchella*	Leguminosae Papelionaceae
52	Pawar	Charot, Chakouda	*Cassia tora*	Leguminosae (Caesalpinleae)
53	Bankapas	Jungali Bhindi	*Azanza lampas*	Malvaceae
54	Banrahar	Bansahar	*Moghania semialata*	Leguminosae (Papilionaceae)
55	Baayvirang	Baayvirang	*Embelia robusta*	Myrsinaceae
56	Besharam	Besharam	*lpomoea pes-caprae*	Convolvulaceae
57	Bhatkataiya	Bhatkataiya	*Solanum nigrum*	Solanaceae
58	Bhringraj	Dhamira	*Eclipta prostrata*	Compositae
59	Bharorfali	Aenthi	*Helicteres isora*	Sterculiaceae
60	Mohti	Mohti	*Vernonia divergens*	Compositae
61	Lentana	Raimuniya	*Lantana camara*	Verbenaceae
62	Shatavari	Shatavar	*Asparagus recemosus*	Liliaceae
63	Shitafal	Shitafal	*Anona squamosa*	Anonaceae
64	Harsingar	Sehrua	*Nyctanthes arbortristis*	Oleacaae
65	Van Tulsi	Van Tulsi	*Daedalacanthus Perpurascens*	Abanthaceae
66	Makor	Makor	*Zizyphus Oenoplia*	Rhamnaceae
67	Ratanjot	Ratanjot	*Jatropha curcas*	Evphorbiaceae
68	Lentana	Raimuniya	*Latana acuteata*	Verbenaceae
3. Climbers				
69	Kiwach	Kewach	*Mucuna prurita*	Leguminosae (Papilionaceae)
70	Kevti	Kyoti	*Ventilago calyculata*	Rhamnaceae
71	Gunja	Kevati	*Abrus precatorious*	Leguminosae (Papilionaceae)
72	Gouj	Gurad, Gurdi, Gohrani	*Millettia auriculata*	Leguminosae (Papilionaceae)
73	Donkrabel	Donkarabel	*Ampelocissus latifolia*	Vitaceae
74	Dhimerbel	Dhimerbel	*Hchnocarpus frutescens*	Apooynaceae
75	Tupbel	Amajin	*Derris scandens*	Leguminosae
76	Dudhbel	Dudhbel	*Vallaris solanacea*	Apooynaceae
77	Nuserbal	Mourian	*Butea parviflora,Roxb*	Leguminosae (Papilionaceae)
78	Nagbel	Dudhi	*Cryptolepis buchanani*	Combretaecae
79	Palashbel	Baderosin	*Butea superba*	Leguminosae (Papilionaceae)
80	Pasaaran	Dudhi	*Clematis smilacifolia*	Ranunculacese

81	Bechandi	Baichandi	*Dioscorea daemona*	Dioscoreaceae
82	Makore	Makore	*Zizyphus oenoplia*	Rhamnaceae
83	Malkangani	Kukandan	*Celastrus paniculata*	Cela
84	Mahul	Mohlaien	*Bauhinia vahlii*	Leguminosae (Papilionaceae)
85	Ramdatoun	Ser Datoun	*Smiliax Zeylanica*	Liliacae
86	Rouni	Aile	*Acacia pennata*	Leguminosae (Mimoseae)
4. Grasses				
87	Kansus	Kans	*Saccharum spontaneum*	Gramineae
88	Kush	Kusha	*Desmostachya bipinnata*	Gramineae
89	Kusul	Kusul, Lampa	*Heteropogon contortus*	Gramineae
90	Khus	Urai	*Vetiverla zizanioldes*	Gramineae
91	Gunher	Chhirsh Ghod	*Themeda quadrivalvis*	Gramineae
92	Chheer	Chhir	*Imperata cylindrica*	Gramineae
93	Jhaani	Ghadauch	*Aristida setacea*	Gramineae
94	Dub	Dub	*Cynodon dactylon*	Gramineae
95	Fulbahari	Fujbari	*Thysanolaena maxima*	Gramineae
96	Fuli	Fulhara	*Apluda mutica*	Gramineae
97	Bahyadanda	Barru	*Arundo donax*	Gramineae
98	Bhurbhushi	Bhurbhushi	*Eragrostis tenella*	Gramineae
99	Bhurbhushi	Chhoti Bhurbhushi	*Eragrostis interrupta*	Gramineae
100	Chhoti Marvel	Kail	*Dichanthium annulatum*	Gramineae
101	Muj	Munj	*Erianthus munja*	Gramineae
102	Moya	Moya	*Pennisetum hohenackeri*	Gramineae
103	Rusa	Rusa	*Cymbopogon martinii*	Gramineae
104	Sabai	Bagai	*Eulaliopsis binata*	Gramineae
105	Amerbel	Amerbel	*Cuscuta reflexa*	Convolvulaceae
106	Chhind	Chhind	*Phoenix acaulis*	Palmae
107	Bundha	Bundha	*Dendrophthoe falcata*	Loranthaceae
108	Baas	Baas	*Dendrocalamus strictus*	Gramineae

Table 4.11 (a): Documentation of Fauna (Wild animal) at Study Site.

S.No.	Family	Scientific Name	Local Name	English Name
Animal (Class – Mannallia)				
1. Order - Primates				
1.	Colobidae	*Presbytis entellus*	Langur	Common Langur
2.	Circopthecidae	*Macaca mulatta*	Bandar	Rhesus macaque
2. Order - Insectivora				
3.	Erinaceidae	*Hemiechinus auritus collaris*	-	Hedgehog
4.	Tupaiidae	*Suncus murinus*	Chhachhunder	Musk-Shrew
3. Order - Chiroptera				
5.	Pteropodidae	*Cynopterus sphinx*	Chamgadad	Short nosed fruit bat
6.	-	*Pteropus giganteus*	-	Flying fox
4. Order - Pholidota				
7.	Manidae	*Manis crossicaudata*	Silu	Indian, Pangolin
	-	*Crassicandata*	Bajra Keet	Scaly ant eater
5. Order - Canrnivora				
8.	Ursidae	*Melursus ursinus*	Bhalu, Reechh	Sloth bear
9.	Felidae	*Panthera tigris*	Ser, Nahar Bagh	Tiger
10.	Felidae	*Panthera pardus*	Gulbagh, Tendua	Panther or Leopard
11.	Felidae	*Felis chaus*	Jungali billi	Common Jungle cat
12.	Hyaenidae	*Hyaena Hyaena*	Lakadbaggha	Striiped hyena
13.	Herpestidae	*Herpestes edwardsi*	Nevla	Common Mongoose
14.	Mustelidae	*Mellivara capensis*	Bijju	Indian Ratel or Honey Badger
15.	Canidae	*Canis aureus*	Gidad, Siyar	JackWal
16.	Canidae	*Vulpes bengalensis*	Lomdi	Indian Fox
17.	Canidae	*Cuon alpinus*	Sonkutta, Vankutta	Wild dog
6. Order - Rodentia				
18.	Sciuridae	*Funambulus pennanti*	Gilahari	Common five Striped squirrel
19.	Muridae	*Bandicota bengalensis*	Chuha	Indian Male rat
20.	Muridae	*Bandicota indica*	Chuha	Bandicoot rat
21.	Muridae	*Rattus rattus*	Chuha	Common house rat
22.	Muridae	*Colunda ellioti*	Chuha	The Indian bush rat
23.	Hystricidae	*Hystrix Indica*	Saahi	Common Indian Porcupine
24.	Leporidae	*Lepus nigricollis*	Ghargosh	Common Indian hare
7. Order - Ungulata				
25	Suidae	*Sus scrofa*	Suar	Indian Wild Boar
26	Tragulidae	*Tragulus meminna*	Pisora	Mouse deer
27	Bovidae	*Bos gaurus*	Gaur	Indian Bison
28	Antilopinae	*Antilope cervicapra*	Krishna Mrig	Black buck, Indian antelope
29	Antilopinae	*Gazella gazella*	Chinkara	Indian gazelle

30	Antilopinae	*Boselaphus-tragocamelus*	Neegaay	Blue bull
31	Antilopinae	*Tetracerus quadricornis*	Chousingha	Four horned antelope
32	Cervidae	*Muntiacus muntijak*	Kotari	Indian Muntijac
			Bhedki	
33	Cervidae	*Cervus unicolor*	Sambhar	Sambhar
34	Cervidae	*Axis axis axis (Erxl)*	Chital	Spotted deer

Table 4.11 (b): Documentation of Fauna (Birds) at Barnawapara Wildlife Sanctuary

S.N.	Hindi Name	English Name	Scientific Name	Family
1.	Vankauwa	Little Cormorant	*Phalcrocoraxrizer*	Phalacrocoracidae
2.	Anjan	Gray Heron	*Ardea cinerea*	Ardeidae
3.	Andha Bagla	Paddy Bird or Pond Heron	*Paddy grayii*	-
4.	Gaay Bagla	Cattle Egret	*Bubulcus ibis*	-
5.	Bada Bagla	Large Egret	*Egretta alba*	-
6.	Kilchiya Bagla	Little Egret	*Egretta garzetta*	-
7.	Dokh, Janghil	Painted stork	*lbis leucocephalus*	Ciconiidae
8.	Modhila	Openbilled stork	*Anastomus oscitans*	-
9.	Galgal	Whiteneck	*Ciconia episcpus*	-
10.	Galgal	White stork	*Ciconia Ciconia*	-
11.	Harjila Dhenk	Adjutant stork	*Leptoptilos dubius*	-
12.	Safed Baaz	White lbis	*Threskiornis melanocephala*	
13.	Silhi	Threskiomithidae		
14.	Surkhab	Lesser Whistling Teal	*Dendrocygna Javanica*	Anatidae
15.	Kera	Braminy Duck	*Tadoma ferruginea*	-
16.	Khera	Commonteal	*Anas crecea*	Anatidae
17.	Panao tilari	Blue winged Teal	*Anas querquedula*	-
18.	Losir	Shoveller	*Anas Clypeata*	-
19.	Kurchiya	Pochard	*Arthya nyrola*	-
20.	Gurguri, Pandubbi	White eyed Cotton Teal	*Nettapus coromondelianus*	-
21.	Nakta	Nukta duckar Combduck	*Sarkidiornis melanotos*	-
22.	Dubaru	Tuftedpochard, Tufted duck	*Anthya fuligula*	-
23.	Kapaasi	Blackwinged kite	*Elanus caeruleus*	Accipitridae
24.	Chil	Common pariah Kite	*Milvus migrans*	-
25.	Shikara	Shikra	*Accipiter badius*	-
26.	Shahbaaj	Crested Hawk Eagle	*Spizaetus Cirrhatus*	-
27.	Okab	Towny egale	*Aquila refax*	-
28.	Geed	Bengal Vulture	*Gyps Bengalensis*	-
29.	Safed gid	White scaveanger or Vulture	*Neophron percnopterus*	-
30.	Rajgid	King Vulture	*Torgas Calvus*	Accipitridae
31.	Korutia	Kestreel	*Falcotinnunculus*	-
32.	Dogarbil	Crested Serpent Eagle	*Spilornis Cheela*	-
33.	Kala Titar	Black Partridge	*Francolinus franedinas*	Phasianidae
34.	Safed Titar	Grey partridge	*Francolinus pondicerianus*	-
35.	Bater	Common or gray	*Coturnix Coturnix*	-
36.	Kala Titar	Painted Patridge	*Francolinus Pictus*	-
37	Lava	Jungle Brush Quail	*Perdual ascatica*	-
38.	Chhoti Jungali Murgi	Red spur fowl	*Galloperdix spondica*	-
39.	Jungali Murgi	Red Jungle fowl	*Gallus gallus*	-
40.	Mor, Mayur	Common pea fowl	*Pavo cristatus*	-
41.	Bagla, Saras	Common crane	*Grus grus*	cruidae

42.	Saras, Crane	Saras Crane	*Grus antigone*	-
43.	Klim	Purple Moorhen	*Porphyrio*	Rallidae
44	Jal Murgi	Whitebreasted Waterhen	*Amaurorais*	-
45.	Pihua	Pheasant tailed Jacana	*Hydrophasianus Chirurgus*	Jacanidae
46.	Pipi	Bronze winged Jacana	*Metopidius indicus*	Jacanidae
47.	Ohadri	Painted Snipe	*Rostratula benghalensis*	Rostratuladae
48.	Gajpin	Black winged Stilts	*Himantopus himantopus*	Recurvirostdae
49.	Barsiri	Stone curlew	*Burhinus oedicnemus*	Burhinidae
50.	Chhota batan	Eastern golden plover	*Pluvialia dominica*	Charadridae
51.	Surma	Red shank	*Tringa totanus*	-
52.	Tituri	Red watted lapwing	*Vanellus indicus*	-
53.	Tirdi	Yellow watted lapwing	*Vanellus malabaricum*	-
54.	Chaha	Fontail snipe	*Capelle gelliango*	-
55.	Tehri, Kukari	Indian Whiskered Tern	*Chlidonias hybrida*	Laricum
56.	Hariyal	Common green pigeon	*Treron Phoenicoptera*	Columbidae
57.	Kabutar	Blue rock pigeon	*Columba livia*	-
58.	Gharfakhta	Indian ring dove	*Streptopelia decaocto*	-
59.	Chitta Fakhta	Spotted dove	*Streptopelia chinensis*	-
60.	Chitta Fakhta	Red turtle dove	*Streptopelia tranquevarica*	Columbidae
61.	Ram Tota	Large Indian Parakeet	*Psittacula eupatria*	Psittacidae
62.	Tota	Roseringed parakeet	*Psittacula Krameri*	-
63.	Tuieya Tota	Blossom headed parakeet	*Psittacula Cyanocephala*	
64.	Papiha	Cuckoo] Brain Fever bira	*Cuculus varius*	Cuculidae
65.	Koyal	Cuckoo	*Eudynamys scolopacea*	-
66.	Mokha	Coucal	*Centropus Sinensis*	-
67.	Papiha Chatak	Pied crested Cuckoo	*Clamator Jacobinus*	Cuculidae
68.	Ullu	Great Horned Owl	*Bubo bubo*	Strigidae
69.	Jungali Choghad	Spotted Owlet	*Athene brama*	-
70.	Chipak	Common Indian night jar	*Caprimulgus asiaticus*	Caprimulgidae
71.	Bada Batasi	Alpine swift	*Apus melba*	Apodidae
72.	Babilo, Batasi	House swift	*Apus affinis*	-
73.	Kilkila	Pied king-fisher	*Ceryle rudis*	Alcedinidae
74.	Chhota KIlkila	Small blue king fisher or Common king fisher	*Alcedo atthis*	Alcedinidae
75.	Kilkila	White breasted king fisher	*Halcyon Smyrnensis*	-
76.	Korila	Black capped king fisher	*Haleyan Pileata*	
77.	Bada Patringa	Blue Cheeked bee eater	*Merops Superciliosus*	Meropidae
78.	Patringa	Small Green bee eater	*Merops orientalis*	-
79.	Bada	Blue tailed bee eater	*Merops philippinus*	-

	Patringa			
80.	Neelkanth	Indinan roller or Blue jay	*Coracias benghalensis*	Coraciidae
81.	Hudhud	Indian Hoopoe	*Upupa epops*	Upudidae
82.	Chalotara	Common hornbill	*Tokus birostris*	Bucerotidae
83.	Dhanchuri	Malabar pied hornbill	*Anthracoceros coronatus*	-
84.	Chhota Baas	Crimsonbreastedbarbet or Coppersmith	*Megalaima-haemacephala*	Capitonidae
85.	Kathfoda	Golden Backed-woodpecker	*Dinopium benghalense*	Picidae
86.	Kathfoda	Mahratta Woodpecker	*picoides mahrattensis*	-
87.	Kathfoda	Heart spotted Wood pecker	*Hermicrcusconente*	-
88.	Navrang	Indian pitta	*Pitta brachyuran*	Pittade
89.	Diyora	Black bellied finch lark	*Ermopterixgrisea*	Alaudidae
90.	Aagiya	Rufous tailed	*Ammomanes*	-
91.	Lesra	Indiancliftswallon	*Hirundo fluvicola*	Hirundindae
92.	Lesra	Wiretailed swallow	*Hirundo smithii*	-
93.	Kagla Latora	Rufous backed Shrike	*Lanius schach*	Laniidae
94.	Pilak	Golden Oriole	*Oriolus oriolus*	Oriolidae
95.	Pilak	Black headed oriole	*Oriolus*	-
96.	Bhujang	King crow or Black Drongo	*Dicrurus adsimilis*	Dicruridae
97.	Pahadi Bhujang	White bellied Drongo	*Dicrurus Caerulescens*	-
98.	Bhimraj	Large Racket tailed drongo	*Dicrurus paradiseus*	-
99.	Tagria Babil	Aahy Shollow shrike	*Artamus fusus*	Diccuidae
100.	Pavayi	Grayheaded myna	*Sturnus malabaricus*	Sturnidae
101.	Brahman Maina	Black hended or Brahminy myna	*Strumas pagodarum*	-
102.	Tilyar	Rosy pastor	*Sturnus roseus*	-
103.	Ablak Maina	Pied Myna	*Sturnus Contra*	-
104.	Maina	Common myna	*Acridotheres tristis*	-
105.	Jungali Maina	Jungle myna	*Acridotheres fuscus*	-
106.	Kauwa	House crow	*Corvus splendens*	Corvidae
107.	Jungali Kauwa	Jungle crow	*carvus*	-
108.	Mahalat	Tree Pie	*Dendrocitta Vegabunda*	-
109.	Bulal	Small minivet	*Pericrocotus Cinnmomeus*	Campeghagidae
110.	Pahadi Bulbul Chashm	Scarlet minivet Pericrocotus	*Pericrocotus flammeus*	-
111.	Kasya	Large Cuckoo	*Coracina novachollandiae*	-
112.	Shanbiji	Common lora	*Aegithina tiphia*	lrenidae
113.	Reva	Greenmantled	*Chloropsis*	-
114.	Hareva	Glod melted Chloropsis	*Chloropsis Cochinchinensis*	-
115.	Pahadi, Bulbul	Red whiskered bulbul	*Pucnonotus jocosus*	Pycnonotidae

116.	Bulbul	Redvented bulbul	*Pucnonotus cafer*	-
117.	Saat Bahan	Slaty heated Scimitar bulvular	*Pomatorhinus Schisticeps*	Muscicapidae Timaliinae
118.	Saat Bhaayi	Jungle babbler	*Turdoidesstriatus*	-
119.	Saat Bhaayi	Quaker Babbler	*Alcippe-Poioicephala*	-
120.	Shama	Tickell's bule flycatcher	*Muscicapatickelline muscicapidae*	Muscicapidae
121.	Shah Bulbul, Dudhraj	Paradise	*Terpsiphonr paradise*	-
122.	Bulbul Dudhraj	Black napped Blue flycatcher	*Monarcha azurea-azurea*	-
123.	Chakdil	White spotted-Fantail flycatcher	*Rhiipidura- albogularis*	-
124.	Chakdil	White browed fantail flycatcher	*Rhiipidura- albogularis*	-
125.	Futki	Ashy wren warbler	*Prinia socialis*	Muscicapidae
126.	Shama	Shama	*copsychus-malabaricus*	Muscicapidae Turdinae (sub family)
127.	Tirtira	Red start	*Phoenicurusochruros*	-
128	Kharpinda	Collared Bushchat	*Saxicola torquata Turdinae*	Muscicapidae
129.	Kala Pidda	Pied Bushchat	*Saxicola caprata*	-
130.	Shama	Blue Headed	*Monticola*	-
131.	Shama	Blue Headed	*Monticola*	-
132.	Daiya	Magpie Robin	*copsychus-saularis*	Muscicapidae Turdinae
133.	Kalchuri	Indian Robin	*Saxicoloides fulicata*	-
134.	Ram Gangara	Grey Tit	*Parus Major Paridae*	-
135.	Ram Gangara	Yellow checked Tit	*Parus xanthogenys*	-
136.	Kathfodia	ChestnutBellied Nuthatch	*Sitta castanea*	Sittidae
137.	Kathfodia	Velvet fronted Nuthatch	*Sitta frontalis*	-
138.	Pilkiya	Grey wagtail	*Motacilla caspica*	Motacillidae
139.	Dhowan	Pied or White Wagtail	*Motacilla alba*	-
140.	Khanjan	White wagtail	*Motacilla-alba*	-
141.	Pilakh	Yellow Wagtaill	*Motacilla glava*	-
142.	Fulchuki	Tickells flower Pecker	*Dicaeum-erythrarthynchas*	Dicaeidae
143.	Fulchuki	Fire Breasted Flower peaker	*Dicaeum-lgnipectus*	-
144.	Shankar Khora	Purple sun Bird	*Nectarinia asiatica*	Nectarinidae
145.	Gauraiya	House Sparrow	*Passer-domesticus*	Ploceidae Passerinae
146.	Baya	Weaver bird	*Ploceus philippinus*	Ploceidae Passerinae
147.	Lal Muniya	Red munia	*Estrilda amandava*	Ploceidae Estrildinae
148.	Nakal Nar	Black Headed Munia	*Lonchura Malacca*	-
149.	Patthar Chitara	Crested Bunting	*Melophus Lathami*	Emberizidae

Table 4.13 (a): Awareness among tourists regarding ecotourism and their suggestions for improvement in facilities made available for comfortable stay.

S. N.	Name of Tourist of Tourist,	Eligibility	Means of transport	Purpose for Tourism	Interest in type of forest	Satisfaction level for Tourism *	Problem face for your visit	Suggestion for Tourism
	Date of Birth / Age	Occupa-tion	Duration of Stay (in Day's)	Interest's in Wildlife	Accompanying person (number of visitor)	Satisfaction level for facilities ** (Note: Satisfaction level count in range between 0 – 5 Rating)		
	Address of Tourist (Resort)		Information source for tourism					
1	**Dr. Ketan Shah**	MS, Orthope-dician	By Car	Flora and Fauna	Mixed forest	A-4, B-4, C-4, D-2, E- 1.	1. Road is Bad, 2. Sign boards not placed properly	1. Saucer must be used in every pond for long water retention, in this way, many animals will not have to come in 1-2 ponds and likewise animals could be saved from people who try to kill animals by putting poison via any medium. 2. Fruit trees should be planted so that animals can get fruits in the forest itself. 3. Remove people from utilizing the forest resources like (Chironji and Mahua) plant which could may lead to the forest fire as a resultant from the dry residual branches and leaves after the cutting of tree. 4. The people of the village should be removed from the forest at the earliest who were destroying many resources within.
	29/09/1972		2 Days	Lion, Deer, Bear All wildlife animals				
	Mova, Raipur (CG) (Paryatak)	Surgeon	Phone		With Family (8 Person)	F-4, G-4, H-1, I-3.		

								5. Those who are fond of drinking liquor and eating wild chicken and animals etc. should have a provision of harsh punishment upon doing such activity by coming here. 6. Use of solar powered vehicles. 7. At least graduate staff should be hired so that they can conduct a very good behavior and also, they should be very well trained. 8. Tourists visiting here should have been charged separately so that the regular maintenance & development of the forest. 9. Under PPP (public private partnership), receive money from a private institution, but at the same time complete the work yourself within stipulated period of time 10. There should be a provision for punishment if the visitor's time period to the forest is not followed. 11. Many informants should be established in the village so that no one can dissolve poison in the water to kill the wildlife. 12. Due to installation Jio 4G (or) other network connection, birds are likely to suffer a lot of damage, that is, connectivity of 4G network should not be brought here.
2	**Kamal Sheel** 35-year-old Durg, (Mohda Resort)	BE Service	By Car 1 Day Friends	Wildlife Lion	Medicinal Plants With Friends (5 person)	A-2, B-2, C-2, D-2, E-3. F-5, G-5, H-3, I-4.	Hareli Eco resort and Mohda different name of same resorts that confuse	1. Need Lion and Lion for Wildlife, 2. Need more dense forest and require water body, 3. At resort door lock was not work properly, 4. Please maintained peace and make safe environment for other tourist which get affected due to aggressive behavior by some local young ones.
3	**Jitendra Ku. Verma** 28-year-old Durg, 491001.	ME Teacher	By Car 2 Days Friends	Flora and Fauna, Secluded place Lion,	Mixed Forest, Medicinal Plant. With friends	A-3, B-4, C-3, D-3, E-4, F-4, G-3, H-4, I-3,	Noise produced by the boys who came in large numbers,	1. The criteria for the protection of the animal should be established and visible via notice board, 2. The plantation should be done on the basis of food habit of animal, 3. Lion and deer population should be increase, 4. Door maintenance should be properly checked.

	(Mohda resort)						Lack of CCTV Camera	5. Roads outside the Sanctuary should be improved, 6. Institutional vehicle should only be permitted. 7. Guide should have dress code with ID.
4	**Dr. Ravish Kumar** 30-year-old	MBBS, MD, Radiodia-gnosis	By Car 1 day	Flora and Fauna,	Mixed forest	A-3, B-2, C-3, D-2, E-3.	Sign board, Indicators should be increased for	1. Provision for food and water for wildlife, 2. Diversity requirement for ecosystem, 3. More water tank pound required, 4. Required more sign board.
	Raipur (CG), (Paryatan resort)	Doctor	Internet	Any kind of Flora and Fauna,	With family	F-3, G-4, H-3, I-4.	convenienc e.	
5	**Pritesh Ku.** 01/08/1988	Graduation	By Bike 1 day	Wildlife Bear, Bilds	Mixed forest	A-4, B-4, C-3, D-3, E-4.	-	1. Required more diversity in wildlife, 2. Along with increasing the number of ponds, the ponds should be deepened, 3. There can be more hotels to attract tourist, 4. Need Improvement in road.
	Raipur, 492001. (Mohda resort)	Service	Internet		With friends (9 Person)	F-4, G-4, H-4, I-5.		
6	**Vikrant Vishvakar-ma** 02/09/1986	MCA Service	Own vehicle 1 day CG tourism website & friend	Flora and Fauna, tribs culture, water body, to feel nature	Small Forest Produce Species, Medicinal Plants	A-2, B-4, C-4, D-4, E-5.	-	1. The forest tour must be guided with the help of well - trained guide to improve quality. 2. Tree plantation by every willing tourist, 3. More new species to be introduced to be improve biodiversity, 4. Increase area of water reservoir, 5. Ban non biodegradables, 6. approach road must be with proper sign board.
	Mova Raipur, (Mohda)			Lion, Deer	With fam - ily, fri- ends (13)	F-5, G-5, H-3, I-5.		
7	**Avinash Prajapati** 31-year-old	PGDM Service	By Car 1 day	Wildlife, For Pollution and Noise free environment.	- With family and Friends	A-3, B-4, C-3, D-3, E-3.	Lack of basic amenities like – water food medicine	1. Human interventions should be restricted to the extent that it does not cause any harm to the animals. 2. The sanctuary should be prevented by the human interference which could be extremely fatal. 3. Sufficient emergency services like medical, fire-safety, etc. should be made available in route.
	Raipur, 492008		Friends, Internet.	Lion, bear, deer, leopard		F-5, G-4, H-4, I-5.		

	(Mohda)			etc.			etc.**,**	
8	**Sandeep Patel**	B.E.	Personal vehical	Peaceful environment & attractive resort	Interested in all type of trees /forest	A-5, B-5, C-5, D-5, E-5.	-	1. The surveillance should be increased in order to protect from the Hunters. 2. Strict vigilance should be done to prevent from the deforestation. 3. The ponds must need to increase its depth for increasing the capacity. 4. Rooms availability should be on the instant basis.
	04/01/1987	Thekedaar	1 Day	Bear, Deer, leopard and wild buffalo	With family and Friends (07)	F-5, G-5, H-5, I-5.		
	Pithora, Mahasamund (Paryatak)		Friends & Website					
9.	**Neeraj Kumar Pandey**	B.C.A.	By Car	To see tribal cultures	Mixed forest & Medicinal plants	A-4, B-5, C-5, D-5, E-5.	-	1. Beer & leopard population is very less. 2. Shortage of fruiting tress. 3.Unavailability of proper Instruction board. 4. Under developed roads.
	03/07/1990	Privet job	1 Day	Lion, Bear, Deer	Not mentioned	F-5, G-5, H-3, I-5.		
	Mandir - hasaud, Raipur (Paryatak)		Family					
10	**Dileep Patel**	B.E. (Mech.)	By Car	To see tribal cultures	Mixed forest	A-4, B-3, C-4, D-3, E-4.	Satisfactory	1**.** Water facility needs improvement because ponds were dry. 2. Some places are there which needs precautions for the fire management. 3. Road needs some repairing work.
	16/12/1983 (36 years)		1 Day					
	Balco, korba (pin - 495684) (Paryatak)		Friends	Lion, Bear, Deer, Birds (Peacock)	Friends (05)	F-4, G-4, H-4, I-5.		
11	**Swati Jain**	M.A.	By Car	Flora and Fauna	Mixed forest	A-2, B-4, C-3, D-2, E-4.	Lack of signboard on roads, Resorts no. are very	1.Pvt. vehicles should be restricted & numbers of safari vehicles should be fixed. 2.Strict rules should be obeyed regarding the use of plastic wrappers, cups & other non- biodegradable items. 3.Awareness should be increased among the villagers about
	14/07/1976		1 Day	Lion, Bear,	Family	F-4, G-5,		

	Raipur (Mohda)	Housewife	By internet	Deer	(04)	H-3, I-4.	less, No sports, adventure activities.	the facilities available near the cities to promote them to live in. 4.Battery operated vehicles should be used and the eatables item should be prohibited.
12	**Dr. Prankur Pandey**	(MD-Pediatrics)	Personal vehical	To see tribal cultures & to take a break from the routine works	Mixed forest & Medicinal plants	A-4, B-4, C-3, D-4, E-4.	No problem	1. Lion and leopard are rarely visible. 2. Establishment of the Information center in order to disseminate the awareness regarding the local flora & fauna. 3.Children park should be improved. 4. Maintain the -No Entry for all the mobile network (4 G) because they cause harm to bird population.
	15/01/1984 Raipur (492014) (Paryatak)	Doctor	1 Day Family member		Family	F-5, G-5, H-5, I-5.		
				Lion, Bear, Deer				
13	**Rashmi singh**	B. Tech. in Agricultur e	Personal vehicle	Wildlife	Medicinal plant	A-4, B-4, C-4, D-4, E-4.	No Network & Poor constructed roads	1. Plastics should be collected 2.ATM & swipe machine should be installed.
	18/08/1995 Bhilai , 490026 (Paryatak)	Student	2 Days -	Lion	Other (3)	F-4, G-4, H-0, I-4.		
14	**Kajesh ghosh**	Graduate, D.Ed.	By Car	Wildlife, Tribes culture	Mixed forest	A-2, B-3, C-3, D-1, E-4.	Lack of Sign board on roads.	1. Lion, leopard, wild buffalo population should increase. 2.Fruiting & vegetative trees should be planted. 3. Swimming pool and boats should be here. 4. WIFI required at resorts.
	28/06/1972 Ambikapur, Surguja (Mohda)	Teacher	2 Days Brother	Lion, leopard	Family,4	F-5, G-4, H-2, I-5.		
15	**Satyendra Pradhan**	B.Sc.	By Car	Wildlife, Tribes culture	Medicinal plants	A-2, B-5, C-5, D-3, E-5.	NIL	1. Water resources must be improved. 2. On the main path the RCC road (or) permanent roads

	29/12/1980 Raipur, 492001 (Paryatak)	Business	1 Day -	Deer	With friends	F-5, G-5, H-5, I-5.		should be made to attract the visitors. 3.Needs to improve the telephone & internet connectivity
16	**Somesh Bhowmick** 27 years old Pune, 411014 (Mohda)	MBA Service	By Car 1 Day By internet	Wildlife Lion, Bear	Mixed forest Family,	A-1, B-3, C-3, D-3, E-3. F-5, G-5, H-3, I-4.	Road condition was bad and Mobile network is poor	1. Provide natural habitat for the growth of Wildlife. 2. Living place needs to be neater & cleaner. 3. Sign board should be plotted. 4. Hospitality needs to be much better. 5. Food & supply needs to improvised & there is limited stocks.
17	**J.S. Dheer** 51-year-old Durg, C.G.	M.Sc, B.Ed. Govt. Service	Own vehicle 2 Days Friends	Flora & fauna Lion, bear, deer ,peacock, wild buffalo	Mixed forest, Medicinal plants, Timber wood forest Family (08)	A-4, B-3, C-3, D-2, E-4. F-4, G-4, H-3, I-3.	Catering facility needs to Improvise	1. Human activity should be regulated on a limited number. 2. Forest needs to be more dens. 3. Food- chain population should be maintained. 4. This resort is too much expensive & the middle-class person cannot afford easily. 5. Food is also too much expensive here. 6. Staff is very less & needs to be increased & also will increase the employment for the local people.
18	**Pranav Roy** 24/10/1969 Durg, 490020 (Mohda)	PG Business + wildlife photography	Car 2 Days Friends	Wildlife Lion	Mixed forest (other- make strict rules for forest conservation) Family (04)	A-1, B-5, C-4, D-5, E-4. F-4, G-4, H-5, I-5. Cleanliness & wifi required in room service	Nil	1. In order to increase the wildlife population some strict rules should be made & followed. 2. Number of Surveillance camera should be increased in the forest area to reduce the deforestation. 3. Tiger should be introduced and Breeding center must be established. 4. Entry & exit Timing should be strictly followed for ecofriendly environment. 5. The Utensils should be wash immediately because of the reason the dog used to come & lipped food.
19	**Priyanka Somesh Boumik** 25 years old	M.B.A. House wife	By Car 1 Day	Wildlife Lion, bear,	Mixed forest Family	A-3, B-4, C-, D-5, E-5. F-5, G-4,	Road and no mobile network	1. Lots of Insects (mosquitoes, etc.) inside the room & needs UV traps in rooms. 2. Sign board and road should be much better for old people & pregnant ladies.

	Pure, M.H. (Mohda)		Internet	deer.		H-3, I-4.		3. Proper sitting arrangements & playing garden is needed.
20	**Rahul Ajmaani**	B.A. (L.L.B.)	By Car	Flora & fauna	Mixed, Timber wood forest, Rangeland forest	A-4, B-5, C-3, D-3, E-4.	Nil	1. Strict actions should be taken for the protection of the wild-life animals. 2. Forest should be protected from the woodcutter & from the local peoples. 3. Biodiversity should be increased in order to maintain the eco-system. 4. Pond depth must be increase. 5. To maintain the eco-friendly environment the modern advance technology needs to be restricted.
	27 years old	Advocate	1 Day	Lion				
	Pithora, Mahasamund (Mohda)		Sanctuary advertisement		Friends (04)	F-3, G-4, H-3, I-5.		

*Where; A =Wildlife, B = Forest, C= Biodiversity, D = Waterbody, E = Ecological environment. And ** F = Stay, G =Boarding, H = Road, I = Staff Behavior.

Table 4.13 (b): Awareness of ecotourism, forest conservation and importance of protected area among local inhabitants of Barnawapara Wildlife Sanctuary.

S.N.	Name Date of Birth or Age Coordinates or Location (North & East), Accuracy 3m	Qualification Number of family member Socio economic status (Land, House)	Role of forest in their sustainable income and livelihood	Communication/ Information Source Income in rupee (Annual)	Benefit from Tourist	If there are problem coming from the tourist and suggestion	Suggestion for improvement Tourism activities
1. Village - Barnawapara							
1	Laxmi Narayan Thakur 09/05/1992 **21^0 24' 13.91"N 82^0 25' 24.31"E**	12^{th} class, DCA 6 Landless, Mud House	Medicinal plant (Chirayata). Fuel wood (Karra, Senha, Kurru). Fruit tree – (Char, Tendu, Mahua, Aonla)	TV, Radio, Phone, News Paper. 50,000	Gipsy provides profit, and we get employment as guide and watchman	Polythene does not degrade, which pollutes the environment.	1. Develop **rangeland** forest for animals with forestation of fruit tree. 2. Solar water system should be installed to overcome the water scarcity **during summer season**. 3. Glass bottles & polythene material cause **pollution** which should be restricted. **4**.**Wine shop not be permitted within forest premises**
2	Shiv Prashad Thakur 03/06/1982 **21^0 24' 07.49"N 82^0 25' 22.65"E**	BA 5 Land- 2 acre, Mud House	Medicinal Plant (Harra, Bahera, Vantulshi, Marod fali, Airi Jadi, Chirota etc), Fuel wood – Karra, Senha, Saja, Papda.	TV, Phone, News paper 30000	We get some income by business	The roads are narrow and also have paved road. Paved road required.	1. **Lion** should be bought in this sanctuary. 2.Reduced number of Medicinal & fruiting plants should be protected with the help of awareness. 3. The **local people** should have given the **job** opportunity after the formal training. 4.**Tree cutting** should be stopped.
2. Village - Dond							
3	Bijesingh Nagvanshi 55-year-old **21^0 23' 33.0"N 82^0 23' 23.3"E**	2^{nd} Class 6 Land- 3 acre, Mud House	Medicinal plant (Bhuyineem, Balray, Sabbhan), Fuelwood (Saja, Sarai), other tree (Mahua)	TV 75000	No benefits from Tourists,	Pollutants- plastic, glass bottles must be banned in area.	1. Need to increase the pond availability. 2.We should have the **'Black buck'**. 3. Need funds to build the **paved roads**.

4	Rajkumar Netam 29/04/1982 **21^0 23' 34.4"N** **82^0 23' 18.5"E**	BA 10 Land- 2 acre, Mud House	Use medicinal plant, fuelwood,. Rangeland useful for animal,. Mahua and Tendupata.	TV, Radio, News paper; 50000	No benefits from Tourists,	No problem (The guidelines for visitors should be strictly followed.	**1.Grazing land, water facility should maintain here.** 2.Mixed forest should be encouraged. 3.**Paved roa**d is needed. 4.The visiting boundary for tourist should be increased.
3. Village - Mudpar							
5	Nohar Singh 60-year-old **21^0 24' 41.4"N** **82^0 24' 07.5"E**	Saksharta Mission Pass 2 Land– 7 acre, Mud House	Medicinal plant (Kalmegh, Adusha), fuel wood – all plant debris, grazing land used for animal.	Radio 18000	No benefits from Tourists,	The forest area gets polluted by the tourist	1. **Restrictions upon hunting of animals.** 2. '**Black buck'** should made available here. 3. **Afforestation** needed & picknick spot should be made available to avoid from getting pollutants here & there. 4.**Polythene** should be banned within premises. 5.Paved road is a must. 6.**Job** should be given to local residentials after formal training.
6	Vishwanath Thakur 11/09/1970 **21^0 24' 42.0"N** **82^0 24' 06.7"E**	8^{th} Class 5 Land- 0.35acre, Permanent dwelling	Medicinal Plant (Kalmegh). fuelwood use. Forage for animal from grazing land. Mahua tendu char etc. tree useful.	Radio 20000	No benefits from Tourists,	• Visitors create pollution by throwing the glass bottles & Plastic. No picknick spots should be here & hence no pollution will be as well.	1. Water source should be made **proper maintained.** 2.**Afforestatioon** should be done and **deforestation** should be **restricted**. 3.**Leopard** should be bought at sanctuary. 4.Ponds should be **recharged** and dams be made available the water facility. **5.Roads are in a very bad condition which is a major reason we are still backward.**
4. Village - Padadah							
7	Jagdishvar Nagvanshi 03/11/1990 **21^0 24' 27.1"N** **82^0 23' 17.1"E**	9^{th} class 14 1.55-acre land, Mud house,	Medicinal plant (Bhuyineem, Harra, Bahera). Fuel wood – Karra Senha. Other tree like Char, Mahua.	No communica tion source 60000	No benefits from Tourists,	• Visitors create pollution by throwing the glass bottles & Plastic. • Plastics & other pollutants should be banned here & hence no pollution	1.The sanctuary must be pollution free for animals. 2**. Illegal deforestation must be stopped.** 3. Dart tracks are there, which needs to improved. 4. Lack of co-operation within the staff. 5. Water facility is needed in the kitchen for cook & the situation gets worse during Summer season.

						will be as well	
8	Santram Satnami 54-year-old **21^0 24' 19.7"N 82^0 23' 09.3"E**	- 17 Landless, Awas Yojna	Medicinal Plant (Bhuyineem). Fuelwood use. Grazing grass for animal	No communication source 20000	No benefits from Tourists, instead we have loss from them.	-	1.Control the deforestation by forest department. 2.No good condition road facility is available. 3. The officer's behavior is always very rude with us.
5. Village - Bafara							
9	Lachchhiram Dhruw 03/08/1995 **21^0 28' 33.00"N 82^0 22' 31.47"E**	12th class 5 15-acre land, Mud house	Fuelwood use (Senha Karra, Birha), other tree - Tendu	TV, Phone 50000	We run a shop & we get the customer by the visitors	Polythene bag creates the pollution	1**. Roads are very damp & needs to pay attention.** 2. **Lion** should bring here to maintain the 'food web' in the ecosystem.
10	Manaram Diwan 63-year-old **21^0 28' 30.98"N 82^0 22' 31.89"E**	3rd Class 13 3.5-acre land, Mud House	Medicinal Plant (Bhuyineem) Fuelwood, other tree - Mahua	Phone 52000	No benefits from Tourists,	No problem	1.The **local people** should have given the **job** opportunity after the formal training. 2. **Paved roa**d is needed. 3. **water availability** is required for wildlife,
6. Village - Bhimbhouri							
11	Maheshram Yadav 75-year-old **21^0 27' 29.62"N 82^0 23' 35.60"E**	- 2 1.5-acre land, Mud House	Medicinal Plant (Harra, Bahera, Bhuyineem, Bijanva Aonla). Fuelwood (Karra Senha)	TV 50000	No benefits from Tourists.	No problem from tourist but having problem for travelling by the forest department	1. **Roads** are very damp & needs to pay attention. 2.Prevent **deforestation** 3. Wild elephants should be prevented to enter the forest.
12	Kalesh Diwan 20/08/1988 **21^0 27' 31.07"N 82^0 23' 32.98"E**	12th Class 4 1.9-acre land, Permanent dwelling	Medicinal Plant (Bhuyineem), Fuelwood (Karra), Rangeland useful for livestock	TV, Phone, Newspaper, another person 25000	Visitors use the firewood thus we get benefited.	No problem but if we cut one tree then in place of it, we should plant 11 trees.	1.**'Water plastic pouches'** should not be thrown here & there which animals used to eat but unable to digest. 2.**'Cigrates'** etc. should not be used within jungle **could leads to fire.** 3. **Cart tract** is there & needs attention.
7. Village - Gudagarh							
13	Firtu Ram Chauhan	-	Medicinal plant (Bhuyineem),	Radio, another	No benefits from Tourists.	Tourist spread their **polythene**	1. **Heavy vehicles** from the **sanctuary routes** should be completely **restricted** so that the animals

	65-year-old **21^0 26' 53.94"N** **82^0 24' 21.65"E**	- Landless, Mud House	Fuelwood (Karra Saja), another tree (Mahua, Tendu)	people 12000		**& plastic bottles** everywhere and this should be stopped.	could freely move within sanctuary. 2.Deforestation should be stopped. 3.'Neel gaaey' is not present & is required here. 4.Cart roads are here which needs to be improved.
14	Subhash Thakur 45-year-old **21^0 26' 55.15"N** **82^0 24' 17.79"E**	MA(Hindi) 15 10-acre land, Permanent dwelling	Medicinal plant (Balraj, Tejraj,Bhojraj), fuelwood (Karra, Kasahi, Semhal, Harra etc.), Forage for animal.	TV, Radio, News paper 50000	-	Heavy vehicles should be restricted	1. Restrict the **heavy vehicles** in the sanctuary area 2.Restriction over **deforestation.** 3.**Roads** construction needs to be focus.
8. Village - Kothari							
15	Ghan Sing Bariha 44-year-old **21^0 27' 13.66"N** **82^0 31' 15.39"E**	- 5 3-acre land, Mud House	Medicinal Plant (Bhuyineem Balraay), Another tree - Mahua, Bansera Kand.	Phone 32000	-	In the tourist center, preference should be given to the local people for job.	1. The place of stay for the visitors needs to be improved more. 2. **Dart track** needs to be corrected. 3. **Swampy ponds** should be cleaned and new borewell should be installed.
16	Sahettar Ram Binjhwar 01/01/1936 **21^0 27' 10.70"N** **82^0 31' 16.53"E**	- 6 6.25-acre land, Permanent dwelling	Medicinal Plant (Balraay, Hinglaj), Fuelwood (Karra, Senha, Bahera). Grasses for livestock. Another tree – Mahua, Tendu, Harra, Bahera.	TV, Phone. 12000	No benefits from Tourists.	No	1. Pond needs to dig deeper. 2. **Road construction** is required.
9. Village - Taldaadar							
17	Setu Kumar Chauhan 22/08/1970 **21^0 28' 16.72"N** **82^0 31' 19.76"E**	12th Class 7 5-acre land, Mud House	Medicinal plant (Balraay, Bhuyineem, Harra, Maidachhilka), Fuelwood (Karra,Senha), Another tree- Tendu, Mahul, Mahua, Char.	TV, Phone 50000	No benefits from Tourists.	There are many problems like- loss in agriculture & threat to life.	1.Rangeland and water facility should be available everywhere for the animals. 2.**New ponds** should be developed. 3.**Fruiting trees** should be planted around the pathway.
18	Harichandra Bhoyi 46-year-old	5th class 7	Medicinal plant (Balraay, Bhuyineem), Fuelwood	TV	Yes	-	1. **Water facility** for animals is needed. 2. The pond is having the **scarcity of water**. 3.The plants should be planter along the roads.

	21^0 28' 16.35"N **82^0 31' 16.35"E**	3-acre land, Mud House	(Karra,Senha, Saja), Grasses for livestock.	30000			
10. Village - Hardi							
19	Santosh Bariha 47-year-old **21^0 23' 48.83"N** **82^0 26' 04.75"E**	5th Class 3 5.5-acre land, Mud House	Medicinal plant (Bhuyineem, Banhaldi), another tree (Mahua, Tendu, Char)	Phpne 60000	No benefits from Tourists.	No problem	1.Plants should be prevented from the **fire**. 2. The pond is having **the scarcity of water.** 3.There should be the **caves & bushes** for the animals. 4. Dart track needs to be corrected.
20	Kundan Lal Kaiwart 53 year old **21^0 23' 41.77"N** **82^0 26' 16.04"E**	MA, B.Ed. 7 3.5-acre land, Permanent dwelling	Medicinal Plant (Chirayta, Patal Khohda), Fuelwood (Karra, Paprel, Saja, Dhwada), another tree (Mahua, Siyal, Char, Tendu)	TV, Phone, News Paper. 62000	No benefits from Tourists.	No problem	1. Plants should be prevented from the **fire**. 2. Restriction over **deforestation.** 3.**Water facility** for animals is needed. 4.The forest officials should need to be in the regular contact with the local residentials so as to get informed in case of fire.
11. Village - Loritkhar							
21	Kandarpo Pradhan 04/02/1969 **21^0 21' 16.55"N** **82^0 24' 39.74"E**	11th Class 4 1-acre land, Mud House	Medicinal Plant (Balraj), Grasses for livestock, another tree (Mahua, Tendu, Aonla)	Radio, Phone 30000	No benefits from Tourists.	No problem but if in case for the coming of the relatives of the local peoples they should not be charged. (in marriage etc.)	1. **Water scarcity for animals.** 2.**Roads** should be made in such a way that it does not create any problems during the rainy season. 3.**Jobs** should be given to **the local peoples on priority basis.**
22	Jaikrishna Barik 50-year-old **21^0 21' 16.27"N** **82^0 24' 36.56"E**	4th Class 2 3.5-acre land, Mud House	Medicinal plant (Airy-Jairy, Balraay, Bhuyineem), Fuelwood (Senha, Karra, Saja, Kurru,)	Phone 25000	No problem	We get disturb by the dusts which arises due to the dart track by the vehicles.	1.Rangeland should be planted. 2. Restriction over **deforestation.** 3. Plants should be prevented from the **fire**. 4.Tourist spread their **polythene & plastic bottles** everywhere and this should be stopped. 5. **Dart track** needs to be corrected.
12. Village - Amgaon							
23	Amol Sing Diwan 01/12/1968	12th Class 5	Medicinal Plant (Aonla, Harra), Fuelwood (Saja, Karra, Parsa),	Radio, Phone	No benefits from Tourists.	No problem	1. **Water facility** for animals is needed. 2.Plantation should be done with a range of variety. 3. Plants should be prevented from the **fire**.

	21^0 20' 25.14"N 82^0 25' 01.03"E	1-acre land, Mud House	Grasses for livestock, another tree – Mahua, Tendu, Char etc.	40000			4. **Rangeland** should be planted.
24	Gangaram Dhruw 04/02/1982 **21^0 20' 23.02"N 82^0 24' 57.66"E**	8^{th} Class 4 1-acre land, Mud House	Medicinal Plant (Aonla, Harra), Fuelwood (Karra, Saliha), Grasses for livestock, another tree – Mahua, Tendu, Char etc.	Radio 30000	No benefits from Tourists.	No problem	1. **Rangeland** should be planted for deer, pig etc. 2. **Fruiting plants** should be planted in the free space. 3.Tourist spread their **polythene & plastic bottles** everywhere and this should be stopped. 4. **Dart track** needs to be corrected.
13. Village - Akaltara							
25	Rajau Ram 55-year-old **21^0 21' 19.11"N 82^0 25' 58.10"E**	8^{th} Class 4 2-acre land, Mud House	Medicinal Plant (Charouta, Fud-har), Fuelwood (Saja, Senha Karra, Tinsa), Grasses for livestock.	TV, Phone 55000	No benefits from Tourists.	No problem	1.**Lion** should bought here. 2. **Dart track needs to be corrected.**
26	Ramratan Netam 16/08/1971 **21^0 21' 22.46"N 82^0 26' 01.77"E**	12^{th} Class 6 6.74-acre land, Mud House	Medicinal Plant (Arjun, Maida, Airy-Jairy, Fud-har), Fuelwood (Senha Karra, Dhwada), Grasses for livestock, another tree (Mahua, Char, Tendu)	TV, Radio 70000	No benefits from Tourists.	No problem	1.**Water facility** for animals is needed. 2.**More pond is required** in the sanctuary 3.The staff has a very rude behavior with the local people.
14. Village - Gabaudh							
27	Parmeshwar Thakur 60-year-old **21^0 20' 40.91"N 82^0 26' 54.64"E**	- 10 2-acre land, Mud House	Medicinal Plant (Harra, Bhuyineem, Balraay), Fuelwood (Karra), Grasses for livestock. Another tree (Mahua, Char)	Phone, friends 30000	No benefits from Tourists.	-	1.**Black bug** should be here. 2.Ponds depth should be increased. 3.**Camera surveillance** should be here by fixing a greater number of cameras.
28	Jaisingh/ Baldusingh 95-year-old **21^0 20' 35.23"N 82^0 27' 00.52"E**	Educated 25 10.5-acre land	Medicinal Plant (Airy Balraay, Rakat Bedar), Fuelwood (Karra, Aonla, Saja), Grasses for livestock	TV, Phone, News Paper 65000	No benefits from Tourists.	No problem	1.Medicinal plants should be planted here. 2.Pond beautification is necessary. 3.The forest product such as (Tendupata, harra, bahera, chironji) are being Encroached by the outsiders.

15. Village - Devgaon							
29	Bhimsen Patel 61-year-old **21^0 20' 03.46"N** **82^0 26' 29.52"E**	5th Class 6 2-acre land, Mud House	Medicinal Plant (Bhuyineem, Tilayi), Fuelwood (Karra, Senha, Saja), Another tree (Mahua, Char,Tendu)	Phone, from Neighbor's house 48000	No benefits from Tourists.	No problem	1.Instead of saagon and bamboo**, other beneficial trees species** should be planted which are beneficial for animals. 2. Dart track needs to be corrected. 3.We are unable to get permission for the harvesting of tendupatta.
30	Dharam Singh Thakur 50-year-old **21^0 20' 03.83"N** **82^0 26' 33.09"E**	4th Class 9 0.5-acre land, Mud House	Medicinal plant (Bhuyineem), Fuelwood (Saja, Karra, Senha), Grasses for livestock, Another tree (Mahua, Char, Tendu)	TV, Phone 55000	No benefits from Tourists.	No problem	1. **Water facility and Rangeland** for animals is needed. 2. **Dart track** needs to be corrected. 3.**Fruiting tress** should be planter on the alley of roads. 4.**Animal breeding center** should be established here. 5. **Dart track** needs to be corrected. 6. **Camera surveillance** should be here by fixing a greater number of cameras.
16. Village - Chraoda							
31	Vishram Ratrey 75-year-old **21^0 19' 47.49"N** **82^0 28' 04.41"E**	- 8 4-acre land, Mud House	Medicinal Plant (Airy Jairy). Fuelwood – (Karra, Karai, Saja, Aam), Another tree (Mahua, Char,Tendu)	Tv, Phone, News Paper 45000	No benefits from Tourists.	No problem	1.Lion should bring here. 2.The trees which **are beneficial for animals** should **only be planted** here. 3. **Dart track** needs to be corrected. 4. **Rangeland** should be planted.
32	Ganesh Ram Bariha 60-year-old **21^0 19' 48.16"N** **82^0 28' 01.36"E**	5th Class 7 2-acre land, Mud House	Medicinal Plant (Chirayta, Tilayi). Fuelwood – (Dhwada, Saja, Karra), Grasses for livestock, Another tree (Mahua, Char, Tendu, Bel)	TV, Phone 50000	No benefits from Tourists.	No problem	1.**Girraff** should be here. 2. **Camera surveillance** should be here by fixing a greater number of cameras. 3.**Aonla, ber, bel,** should be planted here. 4. **Dart track** needs to be corrected. 5. **Fruiting tress** should be planter on the vacant lands.
17. Village - Dhebikhar							
33	Shreeram Bariha 79-year-old	8th Class 5	Medicinal Plant (Chirayta). Fuelwood – (Senha, Saja, Karra),	Phone	-	-	1.**Rabbit & lion** should bring here. 2.**Aonla, ber, bel, ameli** should be planted here. 3.**Polythere and glasses** should be banned here.

	21^0 20' 16.52"N **82^0 23' 12.60"E**	4-acre land, Mud House	Grasses for livestock, Another tree (Mahua, Char, Tendu)	40000			4.**Paved track** is needed.
34	Sukhdev 01/01/1973 **21^0 20' 16.77"N** **82^0 23' 11.44"E**	- 5 5-acre land, Mud House	Medicinal Plant (Chirayta). Fuelwood – (Dhwada, Karra), Grasses for livestock	TV, Phone 50000	No benefits from Tourists.	-	1.**Rabbit, leopard and fox** should bought here. 2.**Pond reclamation** should be done so that it would remain fresh to use by animals. 3.**Paved road is a must.** 4.**Bank & ATM facility** is needed to overcome money problem.
18. Village - Dheba							
35	Dularuram Yadav 31/01/1978 **21^0 19' 26.06"N** **82^0 23' 28.24"E**	8^{th} Class 6 3-acre land, Mud House	Medicinal Plant (Airy Jairy). Fuelwood – (Karra, Saja, Aonla), Grasses for livestock, Another tree (Mahua, Char, Tendu, Aonla)	TV, Phone 60000	-	-	1.**Rangeland and water** facility for animals is needed. 2. **Aonla, saja, vidya** should be planted here. 3.**Lion, kangaroo, girraf** should bought here. 4. **Paved road** should be constructed here. 5.**Electricity is a must, not the tower.**
36	Gaitram Diwan 01/01/1954 **21^0 19' 25.76"N** **82^0 23' 26.93"E**	Educated 10 5-acre land, Mud House	Medicinal Plant (Airy Jairy). Fuelwood – (Karra, Saja, Dhwada), Grasses for livestock, Another tree (Mahua, Char, Tendu, Aonla)	TV, Phone 80000	-	-	1. **Rangeland and water facility** for animals is needed. 2.**Plastic** must be banned within the sanctuary premises. 3.**Paved road** is a must, 4.**Electricity** is required.
19. Village – Rampur (Displaced Village)							
37	Ujjal Cherkiya 70-year-old **21^0 23' 16.85"N** **82^0 28' 19.16"E**	2^{nd} Class (Oriya medium) 11 10-acre land, Mud House	Medicinal Plant (Bhuyineem, Balraay). Fuelwood – (Karra, Paprel), Grasses for livestock, Another tree (Mahua)	Radio, Phone 45000	No benefit from the tourist.	No problem	1.**Animals destroy the field crops, so kindly make a separate Rangeland for them.** 2.**Lack of co-operation** from the forest department.

4.13 (c): Collective information by the forest staff/officer on problems facing and their valuable suggestions to improve ecotourism.

S. N.	Name Date of Birth/Age Qualification	Category of employee or officer Connectivity & Network (Communication)	Problems from tourists. Suggestion.	Suggestion for improvement Tourism activities
1	**Arun Das Manikpuri** 20/06/1970 12th Class	Forest Guard Radio, TV, Mobile	Polythene and disposable plastics being spread everywhere by the tourists. The tourist must use the dustbin for disposure of such items.	1.We need **to organize the meeting in order to create the awareness** for the punishment given for the hunting of the wild animals, which will create the fear among the locals and in such a way the hunting will reduce to a greater extent. 2.**Illegal deforestation** is being done which needs to be stopped & **fruit trees and Rangelands** should be grown here for the animals. 3.The **awareness** should be created among the locals for the **tress and medicinal plants which are in a shortage.** 4. To create the **awareness among the visitors** and for **extension** of the **knowledge about the sanctuary the boards should be installed**. 5.**Paved roads** are **needed till the guest house** for the visitors to get ease in travelling. 6.The **visitors and local people** should made aware about the **drawbacks of hunting and for the necessity of the cleanliness.**
2	**Shirish Kumar Sinha** 26/01/1958 MSc (Botany)	ACF By road from Raipur (100 km)	-	1.**The plastics should be totally banned in the sanctuary.** 2.The **motorbikes** travelling at night on a high speed should only be permitted in case of **emergency** only.
3	**Amar Nath Prasad** 46-year-old MSc (Forestry) **IFS**	CCF Wireless (Departmental), Mobile network also works in some place.	The spread of the waste products everywhere is a major problem here. Do's and Dont's should be pasted everywhere and the persons making too much noise and spreading the pollution must return the amount and send back to home.	1. The roads are in good condition, paved road is not needed, only **regular general maintenance is required**. 2.**Animal tracking report must be prepared and check on regular interval.** 3.**Tour guide** must elaborate the tree species names in Hindi, Chhattisgarhi, Scientific name also with the importance and its usage in daily life.

				4.Roads are good, but **annual maintenance is needed.**
4	**Deepak Yadav** 26 July 1989 10th Class	Guide Radio, TV.	Spread of the polybags by the visitors, which creates a problem for us. Dustbin must be used by the visitors.	1.To develop the **breeding center/area** and needs to increase the population. 2.The rural people should be **restricted to enter the forest** are from the populated area. 3.**Rangeland** should be established and the unwanted inedible weeds should be destroyed. 4.The **ponds requires to dug deeper & stop dam** should be formed. 5.The **facility in the room** should be increased. 6. **Bus facility** should be provided to facilitate the greater number of visitors.
5	**Khileshwari Baghel** 05/07/1995 BA	Resort TV, Radio	The Visitors come by the online & offline booking should be closed after 6 PM.	1.The **fruiting trees** must be planted within the forest area. 2.The water tank should be **made in every 500 meters** so that the animals may no need to suffer for the water. 3.**Number of rooms & the number of staffs must be increased.** 4.The garden plantation must be done which would be **favorable for the Birds & butterfly** which consist of the flowering **nectar enriched plants.**
6	**Pyarelal Mishra** 08/09/1953 B. Com	Manager (Resort) Mobile, Wireless (Departmental),	Smoking and polythene should be banned which can cause fire and pollution respectively.	1.During the breeding period **the visitor's tours must be stopped** as they become more aggressive. 2.The domestic animals of the local people **should not be allowed to entered in the forest area.** 3.Tendupatta, chaar, mahua, sal, beej **should be restricted** which may harbor the **animal breeding** as well. 4.Needs to increase the area of Rangeland. 5.Number of animals is very less in sanctuary which needs **augmentation**. 6.The **government canteen & catering tender should be given on the experience basis.** 7**. Solar generated electricity** is needed here, otherwise underground electricity line should be given.
7	**S R Dadsena** 54-year-old	Sahayak Parikshetra Adhikari Mobile, Wireless	Glass bottles, polybags, pouches like (guthka, ciggrates, beedi etc.) must be banned here, & ciggrates could leaf to fire many time during the	1.The **Rangeland** should be increased by installation of **the borewell & sprinkler system** for the summer season in order to grow the grasses during the water scarcity.

	BA	(Departmental),	summer season. In the entry point only such things must be kept & restricted.	2.(Mahua, chaar etc.) products collection by the locals should be restricted. 3.To maintain the food web we need to introduce the **lion & tiger** in the forest. 4. We should **install** the **non-flash cameras** which do not flash, because due to the flashlight **the anti-social elements** used to destroy. 5.Only covered wires should be used inside & outside the sanctuary & should also promote for the solar power for the domestic usage.
8	**Vijay Kumar Nishad** 12/09/1973 12th Class	Forest Guard Mobile network also works in some place.	Glass bottles, polybags, pouches like (guthka, ciggrates, beedi etc.) must be banned here which the visitors used to throw everywhere and the animals used to eat which affects them. Instead of throwing in the jungle they should make a dustbin inside the vehicle & throw there.	1.**Water source in every 1 kilometer** should be available. 2.No deforestation should be made to construct the roads, there are already pathways. 3
9	**Rajesh Kumar Patel** 31-year-old 12th Class	Resort -	Glass bottles, polybags, pouches like (guthka, ciggrates, beedi etc.) must be banned here & also the wine shop at barnavapara should also be closed.	1.**Rangeland** is required 2.**Fruiting trees** is required. 3.The **street dogs** must be dragged to another place or their population must be controlled. 4.**Servillance camera** is needed **on every check-post**. 5. **ATM facility** is needed in the barnavapara.
10	**Goverdhan Prashad Chaudhary** 18/03/1985 MA, PGDCA	Computer Operator Wireless Device (Departmental),	Smoking and polythene causes fire and pollution respectively. Plastic use should be banned and a well-trained tourist guide should be made available for the visitors.	1.**Rangeland** is required. 2.**Irrigation facility** is needed in the summer season. 3.The **roads** need to be maintained on yearly basis. 4.C.B.O. work should be stopped in the forest due to which the trees are dying. 5 For the sake of rangeland **the trees are being cut** on regular basis, which also leads to the **no shade area for the animals** during the **summer** season and also many oviparous animals which lays eggs beneath the land surface also not getting proper space for that due to deforestation.
11	**S K Manjhi** 52-year-old 8th Class	Sahayak Parikshetra Adhikari Wireless (Departmental), Mobile	Smoking and polythene leads to fire and pollution respectively during the summer season mainly.	1. For summer season, the **borewell** is required to provide the green fodder to the animals. 2.The **ponds required** to be more deeper in order to increase the water holding capacity for the summer season mainly.

				3.**The 'trap camera'** which used to install in the forest are being **destroyed by the anti-social elements**, thus required **another type of camera which are without flash.**
12	**TS Dhruw** 58-year-old MA	Ranger -	Visitors used to spread the various products made up of polythene here & there. The visitors should not spread these waste products everywhere, & the dustbin should be installed everywhere so that they could collect it in the dustbin only.	1.**Lion** should bring to the sanctuary & the necessary steps should be taken in order to conserve them. 2.**Ranchland** should be established for the animals & **fruiting trees** must be grown. 3.Pond requires to **increase its depth** & **also solar pump** should be installed. 4.The guest house must be at least 5 kilometer away from the sanctuary. 5.**Only battery operated vehicles** should be permitted and also **dustbin must be preinstalled** within the vehicles to reduce pollution everywhere.
13	**Ajit Verma** 14/11/1962 12th Class	Forest Guard Radio, Tv	Spread of the polybags by the visitors, which creates a problem for us. Dustbin must be used by the visitors.	1.The extension of **the wild animals** is needed. 2.We should **restrict the domestic animals & rural people** to the forest. 3.The **unwanted weeds** should be removed & the **rangeland** must be establish which will be useful for the animals . 4.**More number is guest house** is required for the stay of visitors. 5.Roads need to be **paved** & **the bus facility should be started**. 6. The rural people must be **transfer** to somewhere else along with the domestic animals because due to **the communicable diseases it could be spread to the wild animals.**
14	**Jagesh Ku. Bandhe** 08/09/1992 MA (Previous)	Forest Guard No	-	1.**Water facility & rangeland** must be established. 2. **Numbers of camera** should be increased to ensure the more tight security. 3.The **fruiting trees** must be planted in the **free/vacant area**. 4. In order to main the **food web we need to introduce the lion** to the sanctuary. 5. **Borewell** must be installed.
15	**Suresh Panigrahi** 05/03/1962	Ranger Radio, TV	No awareness regarding the cleanliness amount the visitors is a major problem. Visitors should use the dustbin to throw the	1. We should **restrict the domestic animals & rural people** to the forest. 2. The **unwanted weeds** should be removed & the **rangeland** must

	12th Class		polybags & other waste products.	be establish which will be useful for the animals . 3. Pond requires to **increase its depth** & **also solar pump** should be installed. 4.There is **not so much entertainment & relaxing things** here for the visitors **which needs to be increased**. 5.The roads of the core area **are very dart** and it needs to be **repaired on annual basis.** 6. The rural people must be **transfer** to somewhere else along with the domestic animals because due to **the communicable diseases it could be spread to the wild animals.**
16	**Yudhisthir Ku. Dadsena** 05/06/1993 BA	Forest Guard No	-	1. **Water facility & rangeland** must be established. 2. The **fruiting trees** must be planted in the **free/vacant area** 3. **Pond and saucer should be made here.** 4**. Those trees** must be planted which **can be feed** upon by the **animals**. 5. **Dustbin** should be installed everywhere.
17	**Mahendra Lal Yadav** 08/01/1966 12th Class	Forester (Vanpal) Radio, TV	Dispersal of the waste products by the visitors everywhere is a big problem. A **separate Biodegradable bag** must be **given** to the **visitors** to collect the waste products.	1. The **rural people** must be **transfer** to somewhere else along with the domestic animals. 2. **Lion** must be introduced here to increase the diversity. 3.**Breeding center** must be open here. 4.Under **the Sal tree** the vegetation doesn't grow, therefore we need to established the forage area **more instead of the sal tree.** **5.Survillance camera must be increased & ATM facility should be provided.** 6**. Medical center is required.**
18	**Sudama Paleshwar** 24/03/1991 12th Class	Beat Guard Monitoring	The plastic bags, glass bottles, pouches etc. are being spread everywhere. These products must be **collected** in a specific **dustbin**.	1. **Water facility & rangeland** must be established. 2. **Awareness** among the villagers should be spread by the **posters, pumplets, leaflets etc. for the importance and use of the forest.** 3. Pond requires to **increase its depth** & **also solar pump** should be installed. 4.**Repairing of the dart track.**
19	**Gauri Shankar Chouhan**	Forest Guard	Spread of the polybags by the visitors, which creates a problem for us.	1.The **rural people** must be **transfer** to somewhere else along with the domestic animals.

	11/07/1979 MPhil (Rajneeti)	TV, Radio, Newspaper, Mobile network also works in some place.	Dustbin must be used by the visitors.	2. The **unwanted weeds** should be removed & the **rangeland** must be establish which will be useful for the animals . 3.**Seasonal repairing of the dart trac is needed.** 4.**A veterinary doctor must be appointed at the barnavapara** on the **regular basis.**
20	**Gauri Singh Yadav** 02/03/1982 12th Class	Guard (Chaukidar) In the outer area of Sanctuary Network facility is Available but at the Sanctuary the network signal is very week	Spread of the polybags by the visitors, which creates a problem for us. Dustbin must be used by the visitors.	1. **Water facility & rangeland** must be established. 2. **The food material must be made available on the basis of the feeding habit of the various animals, so that no one die of hunger.** 3. **The locals totally depend on the forest for their livelihood, which leads to the extinction of many tree species inside the forest.** 4. The **rural people** must be **transfer** to somewhere else along with the domestic animals.

Plates: 6 - Identification of flora (tree species) Samples in My Study Area
(Continue from Material Method remaining Plate)

Antidesma acidum (Amurri)

*Azadirachta indica (*Neem)

Bauhinia malabarica (Aamti)

Continue…

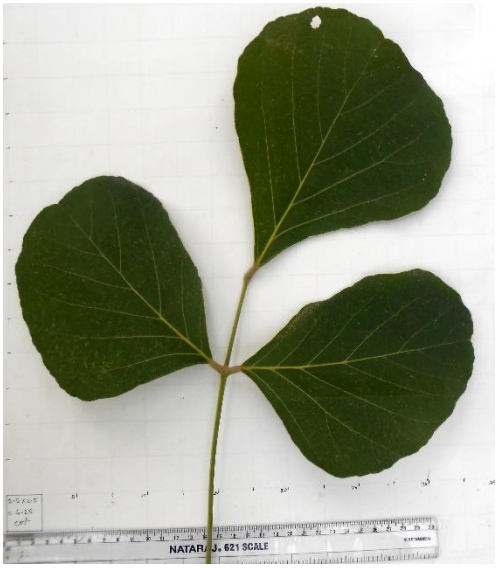

Bauhinia vahlii (Mahul)

Boswellia serrata (Salai, Saliha)

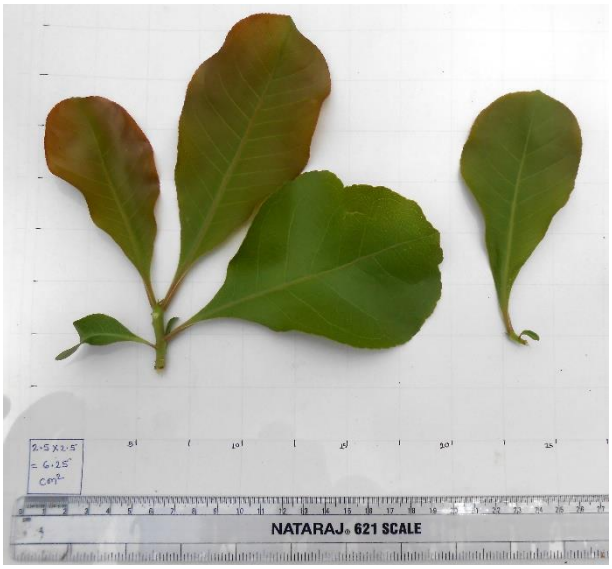
Bridelia retusa (Kasahi)

Continue…

Buchanania lanzan (Chaar Chironji)




Butea monosperma (Palas)



Careya arborea (Kumbhi)

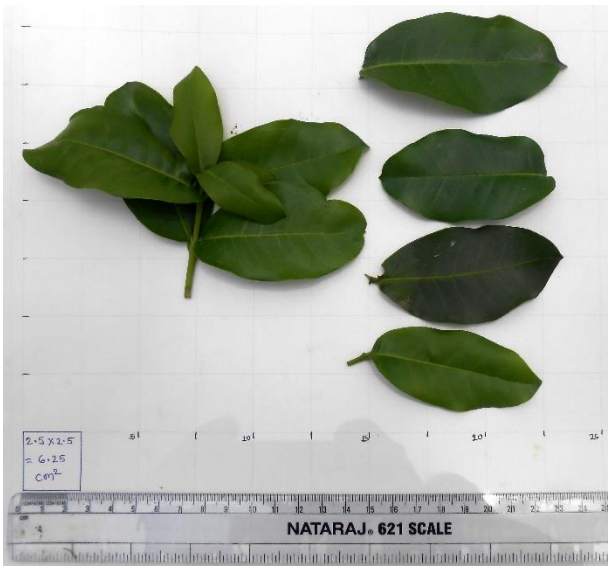
Continue…

Cassia flstula (Amaltas Dhanbaher or Sonari)

Chloroxylon swietenia (Birha)

Cleistanthus collinus (Karra)

Continue…



Cordia dichotoma (Lado or Lasoda or Lodo)

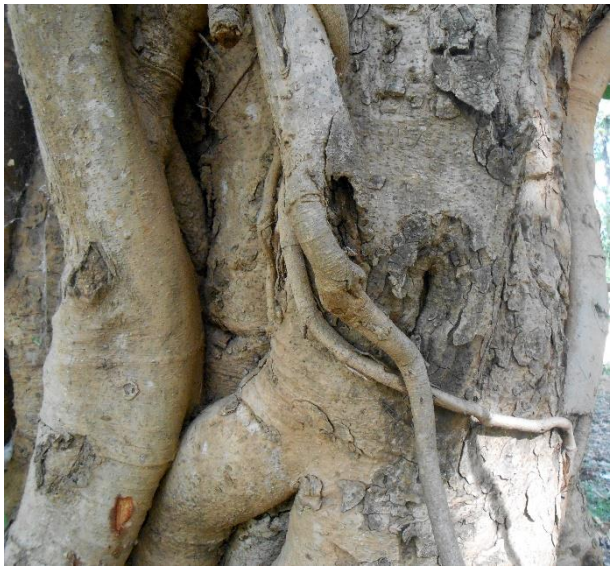
Dalbergia lanceolaria (Dhamasi or bitthua or Bohar)

Diospyros melanoxylon (Tendu)

Continue…

Diospyros montana (Patvan)

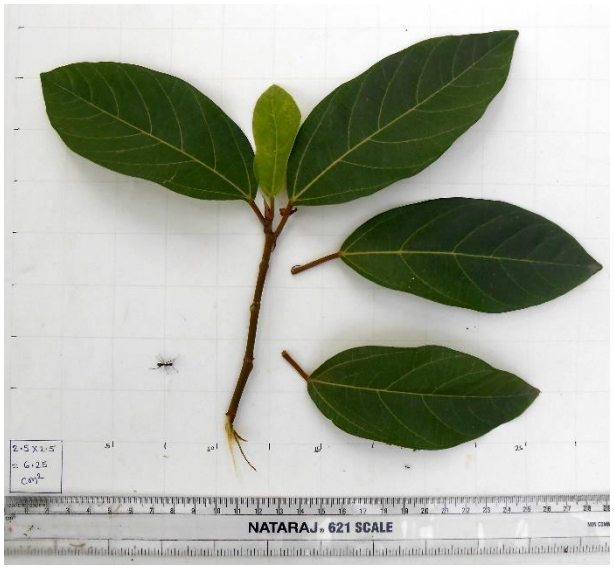
Eriolaena hookeriana (Bothi)



Ficus benghalensis (Bar or Bad or Bargad)

Continue…

Ficus lambertiana (Minjouna or Piprani)



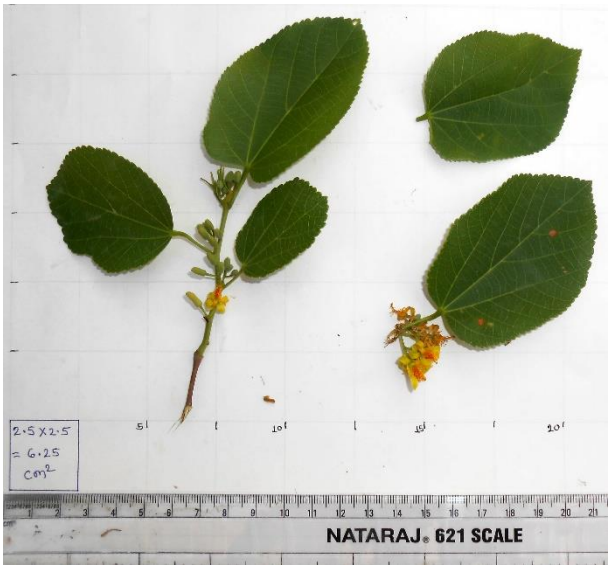
Ficus recemosa (Dumar)

Ficus religiosa (Pipal)

Continue…

Ficus tinctoria (Gasti)


Gardenia resinifera (Paprel or Kurru or Dikamali)



Grewia tiliaefolia (Dhaman)

Continue…

Gymnosporia senegalensis (Kaker or Mekar or Danta)

Hymenodictyon orixense (Bhormal, Bhairy manjh)

Lagerstroemia lanceolata (Senha)

Continue…

Lannea coromandelica – (Mode or Gunja)

Madhuca indica (Mahua)

Mallotus philippensis (Sinduri)

Continue…

Mitragyna parvifolia – (Mundi or Mudahi)

Ougeinia oojeinensis (Tinsa, Tilaav)


Phyllanthus emblica (Aonla)

Continue…

Pongamia pinnata (Karanj)

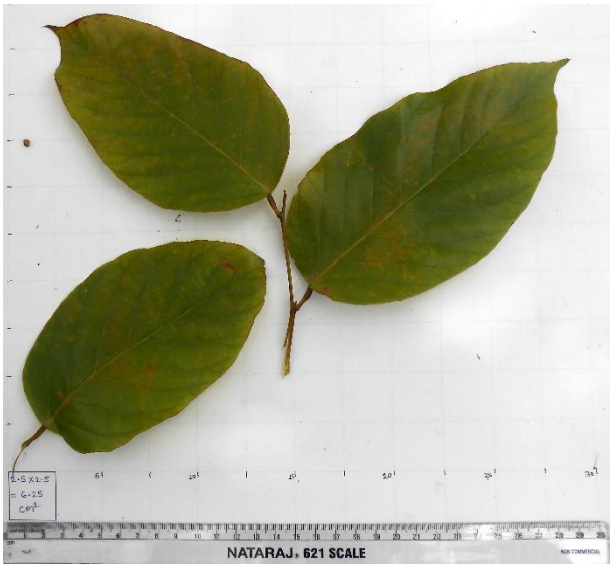
Pterocarpus marsupium (Beeja)

Salmalia malabarica (Semal)

Continue…

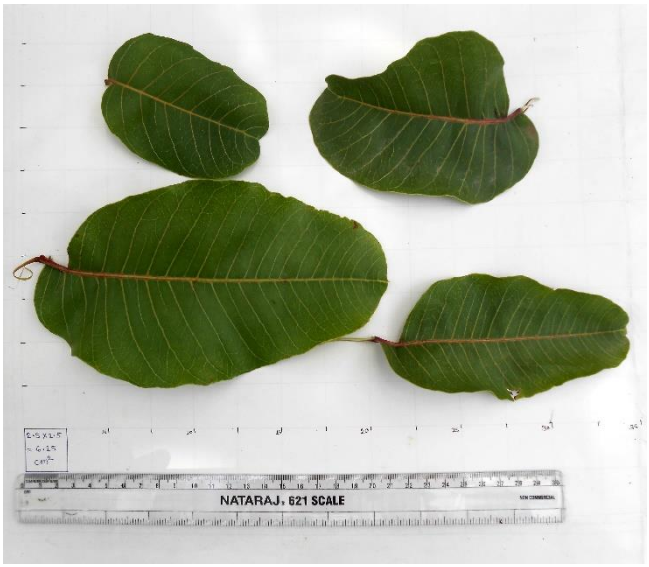
Schleichera oleosa (Kushum)

Semecarpus anacardium (Bhelwa)



Shorea robusta,Garetn (Saraie or Sal)

Continue…



Soymida febrifuga (Rohan Rohini)

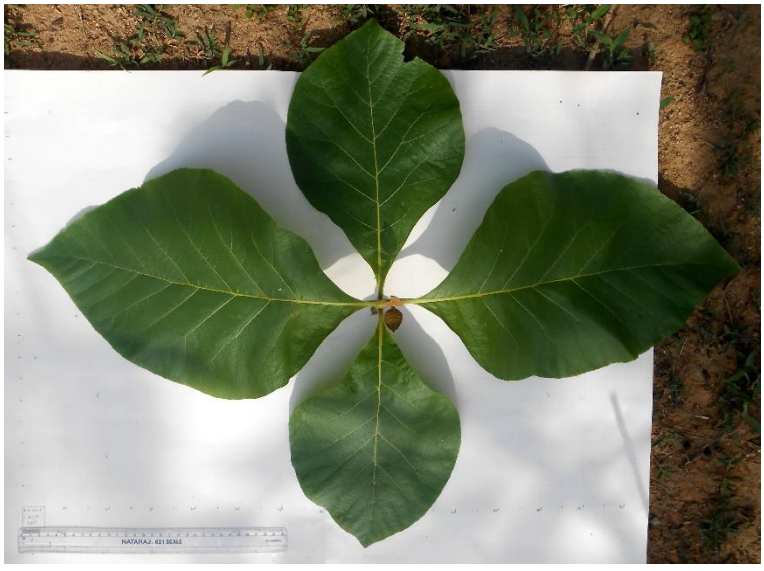
Sterculia urens – [Ganduli (Kulu)]

Strychnos potatorum (Kaya)

Continue…

Syzygium cumini (Jamun)

Syzygium cuminii (Chirayi Jam)

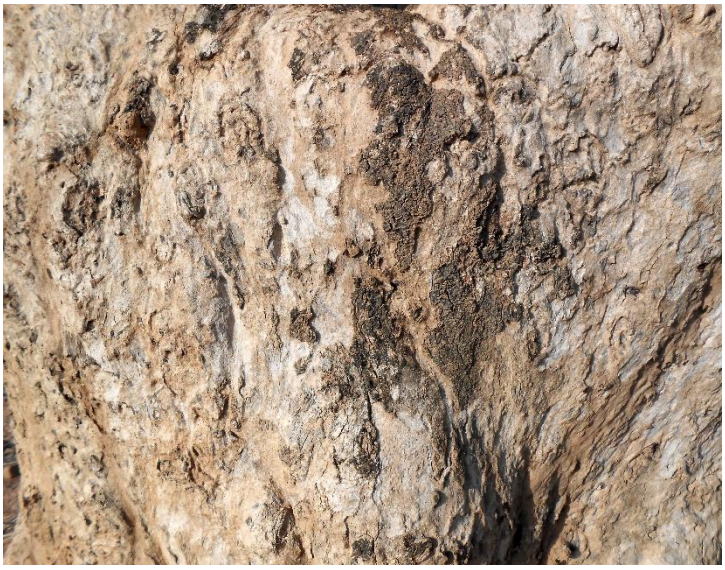



Tactona grandis (Sagaun)

Continue…

Tamarindus indica (Imli)

Terminalia arjuna (Arjun Kahua)



Terminalia belerica (Bahera)

Continue…

Terminalia chebula (Harra, Harad)

Terminalia tomentosa (Saja)

RESUME

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Ecotourism potentials in Barnawapara wildlife sanctuary of Chhattisgarh with special reference to livelihoods of tribes

Siddharth Pandey, Dr. RK Prajapati and Amit Prakash Nayak

Abstract
The study on the Ecotourism Potentials in Barnawapara Wildlife Sanctuary of Chhattisgarh with Special Reference to Livelihoods of Tribes. Primary data were collected through questionnaire from tourist/visitors, Local residents, Forest officers/staff. Secondary data were collected through review of literature. Out of the 18 villages studied in Barnawapara Wildlife Sanctuary few suggestions are collected from the forest dependent communities like – Development of rangelands in forest area so that proper food material should be available to the herbivore animals, Solar water system should be installed to overcome the water scarcity during summer season, the local people should have given the job opportunity in management of tourist spots, so that their income can be improved. As Barnawapara wildlife sanctuary is rich with attractive beauty of flora and fauna and located at the eastern part of Chhattisgarh, these areas endowed with varieties of temples (Sirpur, Turturiya, Matagarh Shivrinarayana, Giroudhpuri and Chatapahaad), waterfalls (Siddhkhol), hill resorts (Dev Hills Darshan) and Picnic spot etc., Chhattisgarh is a must visit state in India for all tourist enthusiasts. These paper focuses community's dependency on different forest product and ecotourism destination located in an around Barnawapara wildlife sanctuary of Chhattisgarh.

Keywords: Barnawapara, biodiversity, Chhattisgarh, conservation, ecotourism, fauna and flora, livelihoods

1. Introduction
The term 'ecotourism' was given by Hector Ceballos – Lascurainin 1983, and it was primarily used to describe nature travel to relatively undisturbed areas with an emphasis on educational important. Its early definition, while his modified term was officially adopted by IUCN (International Union for Conservation Nature and Natural Resources) in 1996. (Eco club International Ecotourism Monthly Oct. 06) Basically, ecotourism means- "tourism involving travel to areas of natural or ecological interest, typically under the guidance of a naturalist, for the purpose of observing wildlife and promotion of understanding and conservation of the environment." Through ecotourism travelers better understand the unique natural and cultural environments round the globe. The World Conservation Union (IUCN) describes ecotourism as, "responsible travel to nature which conserves the environment and improves the livelihood of local people. Moreover, it should contribute income and education to the contribution of ecosystems (Brown 1997) [2]. Eco-tourism can play a significant role to uplift the local population with regards to economic benefits and livelihood. There is a need to identify the good eco-tourism spots and develop the infrastructure to provide good hospitality and educate them regarding environmental conservation. In Chhattisgarh there is a lot of scope for the eco-tourism industries to earn more revenues and play a significant role for conservation of nature and natural resources. The present tourism is changing rapidly people wants to observe nature, heritage, and recreational destinations to enjoy, and conventional tourism is forced to meet a challenge to government and private parties to develop new venture to the tourism industries to cater better facilities. It is well known that Ecotourism is tourism where the natural beauty, local community and visitors will be benefitted. Tiwari *et al.,* 2014 [3] considered as a distinct form of tourism development by replacing the conventional tourism in sustainable and community-based efforts improving the living standards of local, host communities living on the fringes of forest areas. Sustainability is a very important aspect of all development initiatives. Ecotourism ultimately seeks to contribute to community both directly and indirectly. This is achieved not necessarily by changing the traditional practices of livelihood like Agriculture, fisheries, local looms etc., but more often by improving such activities. If we consider all the facets of travel as an eco-tourism, we can see that it is more than a journey for rest, relaxation, and recreation.

The other benefits of community-based ecotourism particularly in rural areas providing income to communities, discourage migration to other place, and conserving biodiversity etc., are widely acclaimed. It is also observed that ecotourism check the exploitation of local residents and resources. In case of Kenya and its national parks which are regarded as the world's foremost ecotourism destinations, meet the livelihood aspirations of good number of its local people (Edgar Allan Amador 2004). Chhattisgarh has identified some regions having high potential for ecotourism with a lot of initiatives. Barnawapara Wildlife Sanctuary is one of the most beautiful and picturesque Sanctuary of Chhattisgarh. The Sanctuary located in northern part of Mahasamund, Chhattisgarh, and this Sanctuary is one of the beautiful and important sanctuaries in this region. It is established in 1976 the sanctuary is relatively a small one covering an area of only 245 sq km. the topography of the region comprises of flat and hilly terrain with altitudes ranging between 265-400 mts.

Ecotourism has become an emerging form of alternative tourism and it provides authentic experiences to nature lovers and enthusiasts. It is an accountable visit to study, enjoy and admire the natural beauty together with wild animals, plants, and native culture. The first objective of introducing and promoting ecotourism is to conserve the setting and therefore the social and economic well-being of native individuals. Conservation of multifariousness and cultural diversity is one of the necessary principles of ecotourism. It promotes the property use of natural resources and provides ample opportunities for financial gain and employment within the touristy destinations.

Laarman and Durst (1987) [5] outline it as a natural commercial enterprise within which the traveler is drawn to a destination as a result of his or her interest in one or additional options of that destination's natural history.

The International Ecotourism Society in 1991 produced one of the earliest definitions -"Ecotourism is responsible travel to natural areas that conserves the environment and sustains the well-being of local people".

1.1 Significance of ecotourism

Ecotourism offers opportunities to the people in the backward and remote areas to take the economic benefits. The main goal of ecotourism is to strengthen the cause of conservation by providing informed wilderness experience to visitors and it enables the visitors to study and enjoy the forest, wildlife, people, and their culture by providing additional employment opportunities for local communities. As a result, resource dependency can be reduced to a larger extent. At the same time, it can be a powerful means for protecting and promoting the unique biodiversity along with landscapes and seascapes provided the principles of ecotourism are implemented. With the percolation effects of tourist expenditures, local people play the role of crusaders for the protection of flora and fauna. Thus, ecotourism provides paid employment to villagers and the types of employment being generated included guides, porters, conservation workers, small shopkeepers. The ecotourism policy is to develop a sustainable community-oriented and managed approach to enforce rules for the visitors, service providers, and community members.

2. Materials and Methods

2.1.1 Study site

The study was carried out in the Bar and Kothari ranges of Barnawapara Wildlife Sanctuary of Baloda Bazar Forest Division. The geographical location, physiographic and other features of study site are given below. Barnawapara wildlife sanctuary was built in 27 July 1976. The name of the sanctuary derived from Bar and Nawapara forest villages. Which are situated in the heart of the Sanctuary and adjacent to each other. The Sanctuary lies at a distance of 100 km away from Raipur, 27 kilometers from Pithora, 28 kilometers from Patewa and Jhalap.

2.1.2 Geographical location and physiography

The study was carried out in The Barnawapara wildlife sanctuary extend between 210 18' 45.00" to 210 30' 00.00" North latitude and 820 22' 30.00" to 820 37' 30.00" East longitude. The sanctuary consists of 244.66 km2 of total area. The Barnawapara Sanctuary is encircled by reserved forest on all sides except part of the northern and eastern boundaries where Dharkhar forest village, Khurmuri, Phurphundi, Busripali and Pakrid revenue villages are situated. Upper western boundary is throughout formed by Balamdehi river. Sanctuary is connected to Nagpur-Raipur-Sambalpur national highway no. 06 (NH - 06) by all-weather roads from Patewa (28 km), as well from Pithora (27 km). Fig 1 show location information.

2.1.3 Climate

The Sanctuary area has a dry humid tropical climate, with consists three major seasons *viz*. rainy, winter and summer. The rainy season begins in mid-June and lasts through the month of September. The winter season starts in November and lasts through to the end of February. The summer season begins at the beginning of March and lasts until mid-June.

2.1.4 Rainfall (Precipitation)

The total annual precipitation of the study area is estimated in the range of 1200-1300 mm. It decreases steadily from the south-east to the north-west directions. During June to September, about 80% of the annual precipitation is obtained from the southwest monsoon in the study region. In July, the maximum amount of rainfall takes place

2.1.5 Temperature

The average monthly (maximum temperature) ranges from January to May as 27.2-41.9 °C and average monthly (maximum temperature) ranges from December to May as 12.6-27.50 °C respectively. The annual average (minimum and maximum) temperature of study area is 20.4 °C and 33.2 °C respectively.

2.2 Data collection and analysis

Three types of respondents were chosen for primary data collection. In each field of study through questionnaire developed for recording the data.

Tourist or Visitors,
Local Residents
Forest officers or Field Staff.

Primary data has been collected from 3 types of respondents. The main purpose for the selection of Visitors/Tourist is to obtain the information regarding the awareness about ecotourism and importance, expectations and shortfall for facilities and services required, if any along with the correct measure to correct the shortcomings for better facilities and infrastructure needed to increase the ecotourism of Chhattisgarh. Local residents were selected in order to gather

the information regarding the knowledge of ecotourism and regarding the benefits had been received through the ecotourism activities, weather they understand about the conservation of protected areas and its importance to conserve the biodiversity both floral and faunal. Forest officer/staff were selected to know about the opinions for the shortcomings of the flora & fauna, Resort facilities food availabilities and to know the ways how we increase the ecotourism at the Barnawapara sanctuary.

2.3 Method of enquiry and collection of data

Enquiry method was carried out through survey method and primary data was taken for collection of information. The primary data collection was done by the separate interview & filling of the questionnaire by the respondent (visitors/tourist, local people and staff/forest officer) itself. Different information collected are: source of income, occupation, knowledge about forest area, flora & fauna and their utilization pattern. First of all, we tried to build good report with the villagers in the informal way &in friendly environment in order to obtain the true and actual honest information from them and then they were separately interviewed and also separate proforma was requested to fill by themselves to record the data to reach some concrete conclusion regarding ecotourism impact on their livelihood how and why important.

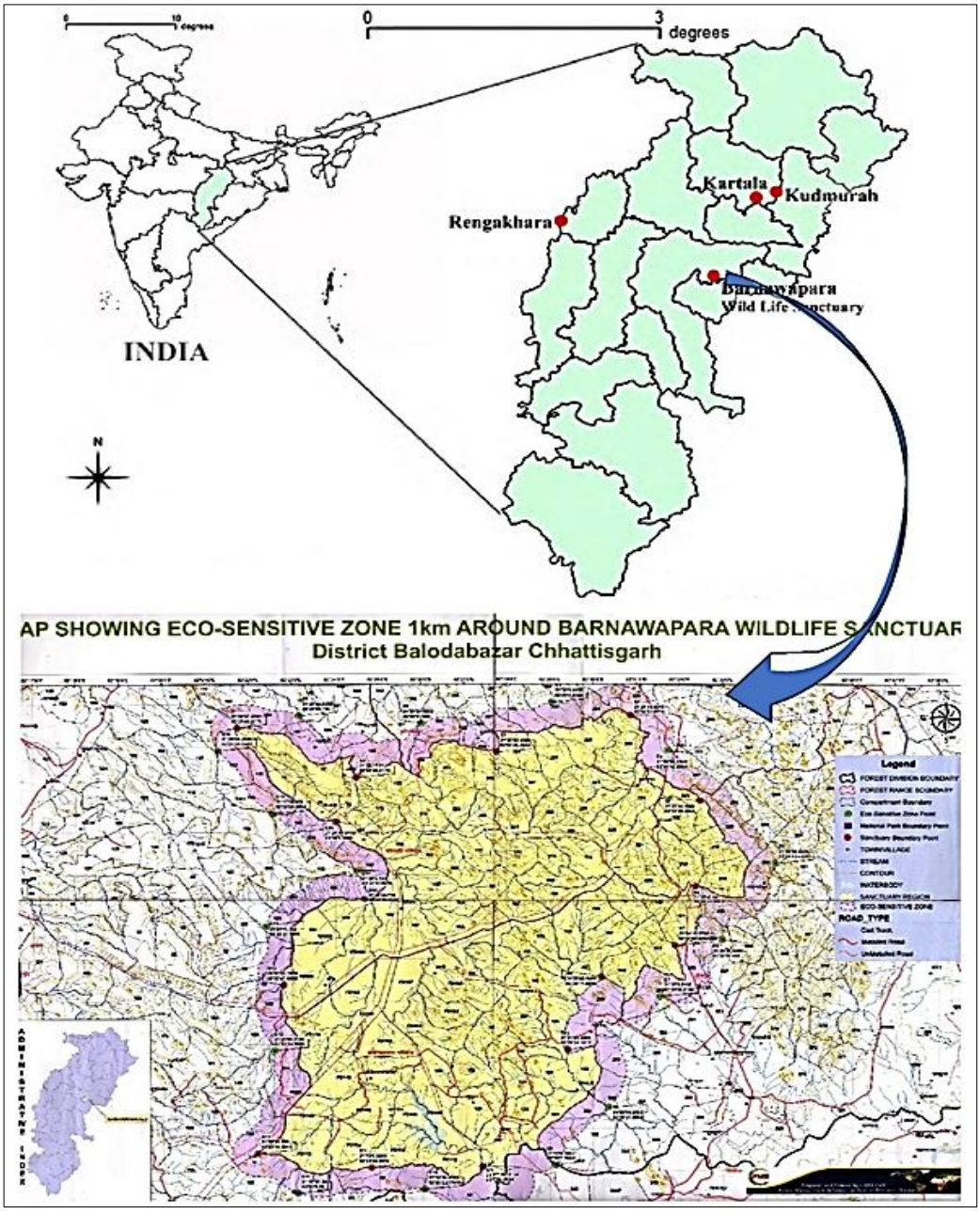

Fig 1: Location map of Barnawapara wildlife sanctuary

3. Result and Discussion

3.1 To work out the impact of ecotourism on livelihoods of tribes

In the present study area of Barnawapara wildlife sanctuary there were total 18 villages and from there we have been recorded the GPS co-ordinates (as an address) of that area and at the same time we have received all the suggestions from all the 18 different villages through the personal interview by filling the questionnaire which was filled by themselves separately by the respondents itself and all such data were mentioned in the Table no. 1. There were different suggestions given by the respondents as some of them gets benefited and others do not receive any profit by the ecotourism activity and the benefits received by the local

people is employment being received through the driving of vehicle (gypsy). The major problem they faced is the non-disposal of the polybags and glass bottles in the runway and inside the sanctuary which creates major problems to the environment and to the animals. Thus, there were many suggestions regarding these problems such as the jobs should be given to the local residential by providing the formal training to them, polybags and the glass bottles (radially available inside the sanctuary) must be totally banned so as to protect the environment and the animals completely, afforestation should be done, dustbin must be radially available within every equidistant point and inside every vehicle so as to reduce the pollution and nuisance being created

Bibi *et al*. (2013) [1] determined the livelihood conditions of the peoples of three villages (Bait Qaimwala, Basti Allahwali and Jannu) and their dependency on biodiversity of Taunsa Barrage Wildlife Sanctuary, Pakistan from 2009 to 2011. For socio-economic status, Participatory Human Resource Interaction Appraisal method was used and for biodiversity assessment, direct census method and point count were used. Floral biodiversity contained 79 species of plants including; trees, herbs, shrubs, grasses, reeds and Fauna included fish, amphibians, reptiles, mammals and birds species. Similar observation were found in the present investigation confirms the results.

Fiseha (2013) reported that the contributions of protected area for local community livelihood were carried out in Senkele Swayne's Hartebeest sanctuary (SSHS). Primary data were collected through questionnaire, Key Informant Interview (KII), Focus Group Discussion (FGD) and direct field observation. Secondary data were collected through review of literature. Out of the 32 rural kebeles found in the Siraro district, four kebeles surrounding the sanctuary were purposively selected for the study. Regarding to managing current destruction of the sanctuary, 27.2% of respondents supposed that, the sanctuary could be managed through ensuring protection and conservation while 13.9%, 11.9% and 11.3% respondents stated sanctuary destruction could be managed through benefit sharing, participatory wildlife management and controlling grazing respectively. Some other 10.6% and 9.9% of the respondents said the sanctuary destruction can be managed through awareness creation and controlling illegal activities.

Rajendra *et al*. (2017) reported in his experiment at Aravalli hill and find out natural home of 616 species that includes 9 orchids and 25 locally and globally endangered plant species. But this sanctuary not familiar for the ecotourism activities, very few people visits this sanctuary. Apart from conventional practices, the science and technology approaches will help the forest department do a systematic plan for ecotourism activities. i.e. developing tourism facilities, nature trails, identifying more watching point, camping site, publicity, brochure and signage in this sanctuary.

Ranjith (2020) [7] evaluated the positive and negative impacts of ecotourism developments in Neyyar, Agasthyarvanam, and Ponmudi ecotourism destinations in Trivandrum and to assess the environmental and socio-cultural impacts of ecotourism development in these regions. The analysis of collected data reveals that environmental quality in terms of conserving natural resources, improving environmental quality Agasthyarvanam, and Ponmudi achieving good status. The low status observed in negative environmental impacts like ecosystem damage and natural hazards.

Table 1: Awareness of ecotourism, forest conservation and importance of protected area among local inhabitants of Barnawapara wildlife sanctuary

S.N.	Name Date of birth or age Coordinates or location (North & east), accuracy 3m	Qualification Number of family member Socio economic status (Land, house)	Role of forest in their sustainable income and livelihood	Communication/ information source Income in rupee (Annual)	Benefit from tourist	If there are problem coming from the tourist and suggestion	Suggestion for improvement tourism activities
1. Village - Barnawapara							
1	Laxmi Narayan Thakur 09/05/1992 21^0 24' 13.91"N 82^0 25' 24.31"E	12th class, DCA 6 Landless, Mud House	Medicinal plant (Chirayata). Fuel wood (Karra, Senha, Kurru). Fruit tree – (Char, Tendu, Mahua, Aonla)	TV, Radio, Phone, News Paper. 50,000	Gipsy provides profit, and we get employment as guide and watchman	Polythene does not degrade, which pollutes the environment.	1. Develop rangeland forest for animals with forestation of fruit tree. 2. Solar water system should be installed to overcome the water scarcity during summer season. 3. Glass bottles & polythene material cause pollution which should be restricted. 4.Wine shop not be permitted within forest premises
2	Shiv Prashad Thakur 03/06/1982 21^0 24' 07.49"N 82^0 25' 22.65"E	BA 5 Land-2 acre, Mud House	Medicinal Plant (Harra, Bahera, Vantulshi, Marod fali, Airi Jadi, Chirota etc), Fuel wood – Karra, Senha, Saja, Papda.	TV, Phone, News paper 30000	We get some income by business	The roads are narrow and also have paved road. Paved road required.	1. Lion should be bought in this sanctuary. 2. Reduced number of Medicinal & fruiting plants

							should be protected with the help of awareness. 3. The local people should have given the job opportunity after the formal training. 4. Tree cutting should be stopped.
2. Village - Dond							
3	Bijesingh Nagvanshi 55-year-old 21^0 23' 33.0"N 82^0 23' 23.3"E	2nd Class 6 Land- 3 acre, Mud House	Medicinal plant (Bhuyineem, Balray, Sabbhan), Fuelwood (Saja, Sarai), other tree (Mahua)	TV 75000	No benefits from Tourists,	Pollutants- plastic, glass bottles must be banned in area.	1. Need to increase the pond availability. 2. We should have the 'Black buck'. 3. Need funds to build the paved roads.
4	Rajkumar Netam 29/04/1982 21^0 23' 34.4"N 82^0 23' 18.5"E	BA 10 Land-2 acre, Mud House	Use medicinal plant, fuelwood, Rangeland useful for animal, Mahua and Tendupata.	TV, Radio, News paper; 50000	No benefits from Tourists,	No problem (The guidelines for visitors should be strictly followed.	1. Grazing land, water facility should maintain here. 2. Mixed forest should be encouraged. 3. Paved road is needed. 4. The visiting boundary for tourist should be increased.
3. Village - Mudpar							
5	Nohar Singh 60-year-old 21^0 24' 41.4"N 82^0 24' 07.5"E	Saksharta Mission Pass 2 Land– 7 acre, Mud House	Medicinal plant (Kalmegh, Adusha), fuel wood – all plant debris, grazing land used for animal.	Radio 18000	No benefits from Tourists,	The forest area gets polluted by the tourist	1. Restrictions upon hunting of animals. 2. 'Black buck' should made available here. 3. Afforestation needed & picknick spot should be made available to avoid from getting pollutants here & there. 4. Polythene should be banned within premises. 5. Paved road is a must. 6. Job should be given to local residential after formal training.
6	Vishwanath Thakur 11/09/1970 21^0 24' 42.0"N 82^0 24' 06.7"E	8th Class 5 Land-0.35 acre, Permanent dwelling	Medicinal Plant (Kalmegh). fuelwood use. Forage for animal from grazing land. Mahua tendu char etc. tree useful.	Radio 20000	No benefits from Tourists,	Visitors create pollution by throwing the glass bottles & Plastic. No picknick spots should be here & hence no pollution will be as well.	1. Water source should be made proper maintained. 2. Afforestation should be done and deforestation should be restricted. 3. Leopard should be bought at sanctuary. 4. Ponds should be recharged and dams be made available the water facility. 5. Roads are in a very bad condition which is a major reason we are still backward.
4. Village - Padadah							
7	Jagdishvar Nagvanshi	9th class	Medicinal plant (Bhuyineem, Harra,	No communication	No benefits from Tourists,	Visitors create pollution by throwing	1. The sanctuary must be pollution

	03/11/1990 21⁰ 24' 27.1"N 82⁰ 23' 17.1"E	14 1.55-acre land, Mud house,	Bahera). Fuel wood – Karra Senha. Other tree like Char, Mahua.	source 60000		the glass bottles & Plastic. Plastics & other pollutants should be banned here & hence no pollution will be as well	free for animals. 2. Illegal deforestation must be stopped. 3. Dart tracks are there, which needs to improved. 4. Lack of co-operation within the staff. 5. Water facility is needed in the kitchen for cook & the situation gets worse during Summer season.
8	Santram Satnami 54-year-old 21⁰ 24' 19.7"N 82⁰ 23' 09.3"E	- 17 Landless, Awas Yojna	Medicinal Plant (Bhuyineem). Fuelwood use. Grazing grass for animal	No communication source 20000	No benefits from Tourists, instead we have loss from them.	-	1. Control the deforestation by forest department. 2. No good condition road facility is available. 3. The officer's behavior is always very rude with us.
	5. Village - Bafara						
9	Lachchhiram Dhruw 03/08/1995 21⁰ 28' 33.00"N 82⁰ 22' 31.47"E	12th class 5 15-acre land, Mud house	Fuelwood use (Senha Karra, Birha), other tree - Tendu	TV, Phone 50000	We run a shop & we get the customer by the visitors	Polythene bag creates the pollution	1. Roads are very damp & needs to pay attention. 2. Lion should bring here to maintain the 'food web' in the ecosystem.
10	Manaram Diwan 63-year-old 21⁰ 28' 30.98"N 82⁰ 22' 31.89"E	3rd Class 13 3.5-acre land, Mud House	Medicinal Plant (Bhuyineem) Fuelwood, other tree - Mahua	Phone 52000	No benefits from Tourists,	No problem	1. The local people should have given the job opportunity after the formal training. 2. Paved road is needed. 3. water availability is required for wildlife,
	6. Village - Bhimbhouri						
11	Maheshram Yadav 75-year-old 21⁰ 27' 29.62"N 82⁰ 23' 35.60"E	- 2 1.5-acre land, Mud House	Medicinal Plant (Harra, Bahera, Bhuyineem, Bijanva Aonla). Fuelwood (Karra Senha)	TV 50000	No benefits from Tourists.	No problem from tourist but having problem for travelling by the forest department	1. Roads are very damp & needs to pay attention. 2.Prevent deforestation 3. Wild elephants should be prevented to enter the forest.
12	Kalesh Diwan 20/08/1988 21⁰ 27' 31.07"N 82⁰ 23' 32.98"E	12th Class 4 1.9-acre land, Permanent dwelling	Medicinal Plant (Bhuyineem), Fuelwood (Karra), Rangeland useful for livestock	TV, Phone, Newspaper, another person 25000	Visitors use the firewood thus we get benefited.	No problem but if we cut one tree then in place of it, we should plant 11 trees.	1.'Water plastic pouches' should not be thrown here & there which animals used to eat but unable to digest. 2.'Cigrates' etc. should not be used within jungle could leads to fire. 3. Cart tract is there & needs attention.
	7. Village - Gudagarh						
13	Firtu Ram Chauhan 65-year-old 21⁰ 26' 53.94"N	- - Landless,	Medicinal plant (Bhuyineem), Fuelwood (Karra Saja), another tree (Mahua, Tendu)	Radio, another people 12000	No benefits from Tourists.	Tourist spread their polythene & plastic bottles everywhere and this should be stopped.	1. Heavy vehicles from the sanctuary routes should be completely restricted

	82^0 24' 21.65"E	Mud House					so that the animals could freely move within sanctuary. 2. Deforestation should be stopped. 3.'Neel gaaey' is not present & is required here. 4. Cart roads are here which needs to be improved.
14	Subhash Thakur 45-year-old 21^0 26' 55.15"N 82^0 24' 17.79"E	MA(Hindi) 15 10-acre land, Permanent dwelling	Medicinal plant (Balraj, Tejraj,Bhojraj), fuelwood (Karra, Kasahi, Semhal, Harra etc.), Forage for animal.	TV, Radio, News paper 50000	-	Heavy vehicles should be restricted	1. Restrict the heavy vehicles in the sanctuary area 2. Restriction over deforestation. 3. Roads construction needs to be focus.
8. Village - Kothari							
15	Ghan Sing Bariha 44-year-old 21^0 27' 13.66"N 82^0 31' 15.39"E	- 5 3-acre land, Mud House	Medicinal Plant (Bhuyineem Balraay), Another tree - Mahua, Bansera Kand.	Phone 32000	-	In the tourist center, preference should be given to the local people for job.	1. The place of stay for the visitors needs to be improved more. 2. Dart track needs to be corrected. 3. Swampy ponds should be cleaned and new borewell should be installed.
16	Sahettar Ram Binjhwar 01/01/1936 21^0 27' 10.70"N 82^0 31' 16.53"E	- 6 6.25-acre land, Permanent dwelling	Medicinal Plant (Balraay, Hinglaj), Fuelwood (Karra, Senha, Bahera). Grasses for livestock. Another tree – Mahua, Tendu, Harra, Bahera.	TV, Phone. 12000	No benefits from Tourists.	No	1. Pond needs to dig deeper. 2. Road construction is required.
9. Village - Taldaadar							
17	Setu Kumar Chauhan 22/08/1970 21^0 28' 16.72"N 82^0 31' 19.76"E	12th Class 7 5-acre land, Mud House	Medicinal plant (Balraay, Bhuyineem, Harra, Maidachhilka), Fuelwood (Karra,Senha), Another tree- Tendu, Mahul, Mahua, Char.	TV, Phone 50000	No benefits from Tourists.	There are many problems like- loss in agriculture & threat to life.	1. Rangeland and water facility should be available everywhere for the animals. 2. New ponds should be developed. 3. Fruiting trees should be planted around the pathway.
18	Harichandra Bhoyi 46-year-old 21^0 28' 16.35"N 82^0 31' 16.35"E	5th class 7 3-acre land, Mud House	Medicinal plant (Balraay, Bhuyineem), Fuelwood (Karra,Senha,Saja), Grasses for livestock.	TV 30000	Yes	-	1. Water facility for animals is needed. 2. The pond is having the scarcity of water. 3. The plants should be planter along the roads.
10. Village - Hardi							
19	Santosh Bariha 47-year-old 21^0 23' 48.83"N 82^0 26' 04.75"E	5th Class 3 5.5-acre land, Mud House	Medicinal plant (Bhuyineem, Banhaldi), another tree (Mahua, Tendu, Char)	Phpne 60000	No benefits from Tourists.	No problem	1. Plants should be prevented from the fire. 2. The pond is having the scarcity of water. 3. There should be the caves & bushes for the animals. 4. Dart track needs to be corrected.
20	Kundan Lal Kaiwart 53 year old 21^0 23' 41.77"N	MA, B.Ed. 7 3.5-acre land,	Medicinal Plant (Chirayta, Patal Khohda), Fuelwood (Karra, Paprel, Saja,	TV, Phone, News Paper. 62000	No benefits from Tourists.	No problem	1. Plants should be prevented from the fire. 2. Restriction over

	82^0 26' 16.04"E	Permanent dwelling	Dhwada), another tree (Mahua, Siyal, Char, Tendu)				deforestation. 3. Water facility for animals is needed. 4. The forest officials should need to be in the regular contact with the local residentials so as to get informed in case of fire.
11. Village - Loritkhar							
21	Kandarpo Pradhan 04/02/1969 21^0 21' 16.55"N 82^0 24' 39.74"E	11th Class 4 1-acre land, Mud House	Medicinal Plant (Balraj), Grasses for livestock, another tree (Mahua, Tendu, Aonla)	Radio, Phone 30000	No benefits from Tourists.	No problem but if in case for the coming of the relatives of the local peoples they should not be charged. (in marriage etc.)	1. Water scarcity for animals. 2. Roads should be made in such a way that it does not create any problems during the rainy season. 3. Jobs should be given to the local peoples on priority basis.
22	Jaikrishna Barik 50-year-old 21^0 21' 16.27"N 82^0 24' 36.56"E	4th Class 2 3.5-acre land, Mud House	Medicinal plant (Airy-Jairy, Balraay, Bhuyineem), Fuelwood (Senha, Karra, Saja, Kurru,)	Phone 25000	No problem	We get disturb by the dusts which arises due to the dart track by the vehicles.	1. Rangeland should be planted. 2. Restriction over deforestation. 3. Plants should be prevented from the fire. 4. Tourist spread their polythene & plastic bottles everywhere and this should be stopped. 5. Dart track needs to be corrected.
12. Village - Amgaon							
23	Amol Sing Diwan 01/12/1968 21^0 20' 25.14"N 82^0 25' 01.03"E	12th Class 5 1-acre land, Mud House	Medicinal Plant (Aonla, Harra), Fuelwood (Saja, Karra, Parsa), Grasses for livestock, another tree – Mahua, Tendu, Char etc.	Radio, Phone 40000	No benefits from Tourists.	No problem	1. Water facility for animals is needed. 2. Plantation should be done with a range of variety. 3. Plants should be prevented from the fire. 4. Rangeland should be planted.
24	Gangaram Dhruw 04/02/1982 21^0 20' 23.02"N 82^0 24' 57.66"E	8th Class 4 1-acre land, Mud House	Medicinal Plant (Aonla, Harra), Fuelwood (Karra, Saliha), Grasses for livestock, another tree – Mahua, Tendu, Char etc.	Radio 30000	No benefits from Tourists.	No problem	1. Rangeland should be planted for deer, pig etc. 2. Fruiting plants should be planted in the free space. 3. Tourist spread their polythene & plastic bottles everywhere and this should be stopped. 4. Dart track needs to be corrected.
13. Village - Akaltara							
25	Rajau Ram 55-year-old 21^0 21' 19.11"N 82^0 25' 58.10"E	8th Class 4 2-acre land, Mud House	Medicinal Plant (Charouta, Fud-har), Fuelwood (Saja, Senha Karra, Tinsa), Grasses for livestock.	TV, Phone 55000	No benefits from Tourists.	No problem	1. Lion should bought here. 2. Dart track needs to be corrected.
26	Ramratan Netam 16/08/1971 21^0 21' 22.46"N 82^0 26' 01.77"E	12th Class 6 6.74-acre land, Mud House	Medicinal Plant (Arjun, Maida, Airy-Jairy, Fud-har), Fuelwood (Senha Karra, Dhwada),	TV, Radio 70000	No benefits from Tourists.	No problem	1. Water facility for animals is needed. 2. More pond is required in the

			Grasses for livestock, another tree (Mahua, Char, Tendu)				sanctuary 3. The staff has a very rude behavior with the local people.
14. Village - Gabaudh							
27	Parmeshwar Thakur 60-year-old 21^0 20' 40.91"N 82^0 26' 54.64"E	- 10 2-acre land, Mud House	Medicinal Plant (Harra, Bhuyineem, Balraay), Fuelwood (Karra), Grasses for livestock. Another tree (Mahua, Char)	Phone, friends 30000	No benefits from Tourists.	-	1. Black bug should be here. 2. Ponds depth should be increased. 3. Camera surveillance should be here by fixing a greater number of cameras.
28	Jaisingh/ Baldusingh 95-year-old 21^0 20' 35.23"N 82^0 27' 00.52"E	Educated 25 10.5-acre land	Medicinal Plant (Airy Balraay, Rakat Bedar), Fuelwood (Karra, Aonla, Saja), Grasses for livestock	TV, Phone, News Paper 65000	No benefits from Tourists.	No problem	1. Medicinal plants should be planted here. 2. Pond beautification is necessary. 3. The forest product such as (Tendupata, harra, bahera, chironji) are being Encroached by the outsiders.
15. Village - Devgaon							
29	Bhimsen Patel 61-year-old 21^0 20' 03.46"N 82^0 26' 29.52"E	5th Class 6 2-acre land, Mud House	Medicinal Plant (Bhuyineem, Tilayi), Fuelwood (Karra, Senha, Saja), Another tree (Mahua, Char,Tendu)	Phone, from Neighbor'shouse 48000	No benefits from Tourists.	No problem	1. Instead of saagon and bamboo, other beneficial trees species should be planted which are beneficial for animals. 2. Dart track needs to be corrected. 3. We are unable to get permission for the harvesting of tendupatta.
30	Dharam Singh Thakur 50-year-old 21^0 20' 03.83"N 82^0 26' 33.09"E	4th Class 9 0.5-acre land, Mud House	Medicinal plant (Bhuyineem), Fuelwood (Saja, Karra, Senha), Grasses for livestock, Another tree (Mahua, Char, Tendu)	TV, Phone 55000	No benefits from Tourists.	No problem	1. Water facility and Rangeland for animals is needed. 2. Dart track needs to be corrected. 3. Fruiting tress should be planter on the alley of roads. 4. Animal breeding center should be established here. 5. Dart track needs to be corrected. 6. Camera surveillance should be here by fixing a greater number of cameras.
16. Village - Chraoda							
31	Vishram Ratrey 75-year-old 21^0 19' 47.49"N 82^0 28' 04.41"E	- 8 4-acre land, Mud House	Medicinal Plant (Airy Jairy). Fuelwood – (Karra, Karai, Saja, Aam), Another tree (Mahua, Char,Tendu)	Tv, Phone, News Paper 45000	No benefits from Tourists.	No problem	1. Lion should bring here. 2. The trees which are beneficial for animals should only be planted here. 3. Dart track needs to be corrected. 4. Rangeland should be planted.
32	Ganesh Ram Bariha	5th Class	Medicinal Plant (Chirayta, Tilayi).	TV, Phone	No benefits from Tourists.	No problem	1. Girraff should be here.

	60-year-old 21^0 19' 48.16"N 82^0 28' 01.36"E	7 2-acre land, Mud House	Fuelwood – (Dhwada, Saja, Karra), Grasses for livestock, Another tree (Mahua, Char, Tendu, Bel)	 50000			2. Camera surveillance should be here by fixing a greater number of cameras. 3. Aonla, ber, bel, should be planted here. 4. Dart track needs to be corrected. 5. Fruiting tress should be planter on the vacant lands.
17. Village - Dhebikhar							
33	Shreeram Bariha 79-year-old 21^0 20' 16.52"N 82^0 23' 12.60"E	8th Class 5 4-acre land, Mud House	Medicinal Plant (Chirayta). Fuelwood – (Senha, Saja, Karra), Grasses for livestock, Another tree (Mahua, Char, Tendu)	Phone 40000	-	-	1. Rabbit & lion should bring here. 2. Aonla, ber, bel, ameli should be planted here. 3. Polythere and glasses should be banned here. 4. Paved track is needed.
34	Sukhdev 01/01/1973 21^0 20' 16.77"N 82^0 23' 11.44"E	- 5 5-acre land, Mud House	Medicinal Plant (Chirayta). Fuelwood – (Dhwada, Karra), Grasses for livestock	TV, Phone 50000	No benefits from Tourists.	-	1. Rabbit, leopard and fox should bought here. 2. Pond reclamation should be done so that it would remain fresh to use by animals. 3. Paved road is a must. 4. Bank & ATM facility is needed to overcome money problem.
18. Village - Dheba							
35	Dularuram Yadav 31/01/1978 21^0 19' 26.06"N 82^0 23' 28.24"E	8th Class 6 3-acre land, Mud House	Medicinal Plant (Airy Jairy). Fuelwood – (Karra, Saja, Aonla), Grasses for livestock, Another tree (Mahua, Char, Tendu, Aonla)	TV, Phone 60000	-	-	1. Rangeland and water facility for animals is needed. 2. Aonla, Saja, vidya should be planted here. 3. Lion, kangaroo, girraf should bought here. 4. Paved road should be constructed here. 5. Electricity is a must, not the tower.
36	Gaitram Diwan 01/01/1954 21^0 19' 25.76"N 82^0 23' 26.93"E	Educated 10 5-acre land, Mud House	Medicinal Plant (Airy Jairy). Fuelwood – (Karra, Saja, Dhwada), Grasses for livestock, Another tree (Mahua, Char, Tendu, Aonla)	TV, Phone 80000	-	-	1. Rangeland and water facility for animals is needed. 2. Plastic must be banned within the sanctuary premises. 3. Paved road is a must, 4. Electricity is required.
19. Village – Rampur (Displaced Village)							
37	Ujjal Cherkiya 70-year-old 21^0 23' 16.85"N 82^0 28' 19.16"E	2nd Class (Oriya medium) 11 10-acre land, Mud House	Medicinal Plant (Bhuyineem, Balraay). Fuelwood – (Karra, Paprel), Grasses for livestock, Another tree (Mahua)	Radio, Phone 45000	No benefit from the tourist.	No problem	1. Animals destroy the field crops, so kindly make a separate Rangeland for them. 2. Lack of co-operation from the forest department.

3.2 Ecotourism destination in our study site

Table 2: Tourist attraction spot in Barnawapara wildlife sanctuary

S. No.	Tourist attraction spot	Detailed information and special features of the attractive spots in Barnawapara sanctuary
1.	Sirpur	It is situated at 40k.m. distance from the Barnawapara in the ghats of Mahanadi river. It is the only archaeological place where we get the shiva, Vaishnava and Buddh community relic at the same place. In the seventh century lord shiva temple, Laxman and gandheshwar temple were made-up of bricks and "Bouddh-Vihar" is one of the famous places here.
2.	Turturiya	Is situated at a boundary of the Barnawapara and at a distance of 13 Kilometre where the archaeological evidences have been found. Here the complete dense forest vegetation is present and also a lake which continue flows round the year which is also name as "Suri-suri ganga" by the local residentials. An old 8th century temple of ram is situated along with the Valmiki ashram. According the ancient accreditation it is believed that 'Sita-mata' has spent the time during her 'vanvas' and also this is the birth place of 'luv-Kush'.
3.	Matagarh	At the distance of 2 km from Turturiya on the western hills an ancient temple of "devi maa" is situated. The main reason behind coming to place is for the sake of childless parents to pray for having the baby and when the which is get fulfilled, they again visit the temple and they used to tonsure of the child.
4.	Devdhara	It is situated at a distance of 22 km of Barnawapara and in attached to the eastern boundary of Barnawapara where the "devpuri hills" is situated where a lake surrounded by the bamboo and mixed forest is also a main attraction center and also used as a picnic spot.
5.	Dev-hills	The devpuri hills mount is one of the exciting places for tracking which fills a person with the thrill and excitement. This is the highest elevated point of the Raipur district. The Shivrinarayan and Mahanadi can be can easily visible from this point.
6.	Siddhkhol	The siddhkhol waterfall is very popular within the tourist community and situated around 32 kms from barnavapara. The average height of the waterfall is around 150 foot.
7.	Shivrinarayan	It is situated at the 50 kilometres away at the coastal area of the Mahanadi river which is one of the ancient temples. Here is the conjunction of shivnath, jonk, and Mahanadi river which forms the "Terveni Sangam". According to the ancient accreditation lord ram, laxman & sitamata have been stayed here for some part of their 'vanvas period' and also a lady named as 'sabri' had given the defiled ber fruit to the lord ram. A shiv temple is also situated at 3 kms from kharod. Laxman kund is available which is filled with water round the year.
8.	Giddhpuridhaam and Chhatapahad	Situated at a distance of 40 kms from Barnawapara which is the birthplace of "guru Ghasidas". Another place Chhatapahad is a huge stone where the guru ghasidas has acquired the knowledge and the visitors visit here.

Out of these above areas best place for visiting the tourist are Sirpur, Turturiya, Dev Hills, Siddhkhol.

3.3 Impact of tourism industry on environment

The quality of the environment, both natural and man-made, is essential to tourism. However, tourism's relationship with the environment is complex. It involves many activities that can have adverse environmental effects. Many of these impacts are linked with the construction of general infrastructures such as roads and airports and of tourism facilities, including resorts, hotels, restaurants, shops, golf courses and marinas. The negative effects of tourism growth can gradually destroy the ecological resources on which it depends. On the other hand, tourism has the probable to create advantageous effects on the environment by causative to environmental safeguard and preservation. It is a mode to raise attentiveness of environmental principles and it can serve as a tool to finance the protection of natural areas and increase their economic importance. The opinion of the tourists about the impact of the tourism industry on the environment

Fig 2: Plates (a, b, c, d, e, f): Interaction with local residents of Barnawapara wildlife sanctuary

4. Conclusions

Chhattisgarh is having 44% forest cover and so many Sanctuaries. If the tourist spots of these sanctuary area are properly identified and the publicity made then the ecotourism industry will play a significant role in employment generation for local residents as well as to uplift their livelihood. Awareness among tourists along with local residents in relation to flora and fauna through the environmental education should be provided, so that the people could learn more and more about the importance of the biodiversity conservation.

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6. Reference

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