

Research Article

OBSERVATION OF DIFFERENT TYPES OF ANIMAL ASSOCIATION AND ADAPTATION IN CHITWAN NATIONAL PARK OF NEPAL

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ABSTRACT

Animal association and adaptation are the methods which are going on in nature from the very beginning almost since the time of the origin of the living organisms. Different species of animals are associated with one another in the different ways like mutualism (getting mutual benefit by association), commensalism (the association in which one species gets benefit but another one is neither getting benefit nor any harm). Some species are in the ways that one is killed by another for the food i.e. one species gets benefit but another one is harmed. Association also exists in the ways that animals are adapted by their own ways which enable them to adjust by adjusting their physiology and metabolism according to the need. The present study attempts to study the animal association and the pattern of animal adaptation with suitable example in the natural habitat within the Chitwan National Park and the community forest area adjoining the National Park of Nepal. The study also helps a lot to encourage the visitors and field researchers to make their visit of protected areas fruitful, encouraging and inspiring with direct observation of animal association and adaptation along with the enriched and attractive Bio-diversity of National Park. The study is intended to be not only informative but also adventurous and inspiring for those who are very much interested in the study of biodiversity. It also encourages the local people of the buffer zone and the protected area to create awareness and responsibility towards the conservation of existing bio-diversity which is directly related with their livelihood.

Keywords: Commensalism, Mutualism, Adaptation, Association, Bio-diversity, Jungle-safari.

INTRODUCTION

Animal association and adaptation are the ecological phenomena which are directly related with survival. These are the methods by which the animals are able to get their appropriate habitat, food, and the various other factors which they need during daily life in the surrounding environment. Living organisms are able to survive and adapt in the different types of changed environmental condition are selected by nature and are considered to be the new species who have the ability to survive (Lamarck, 1821). Animal biodiversity and their conservation in the special allocated part of the land-mass has been directly associated with the sustainable development of the nation as a whole. The survival of all the living beings including human beings is dependent on it. Due to the awareness created by the national and international communities of the world from the decades ago, Nepal has also allocated the different areas for the protection and the conservation of wild animals along with their surrounding environment.

The different types of protected areas like national parks, wildlife reserves, hunting reserves, conservation areas and buffer zones, which are present in the different parts of Nepal, exhibit their own characteristics in the composition and number of biodiversity (Majupuria and Kumar, 1998). Among the different protected areas of Nepal, Chitwan National park is the first established and oldest national park. It is very popular and convenient protected area. Having the altitudinal range of 100 meter to 330 meter and being popularly known as the Heart of the Jungle. It possesses a wide variety of wild animals like one horned rhino, wild elephant, leopards, sloth bear Pangolin, etc. It is also the reservoir of great many species of the resident and the migratory birds. Crocodyles and gharals are also abundant in the rivers and other wetlands of Chitwan National Park (Gurung, 1983; Banskota *et al.*, 1996; DNPWC, 2000; Clean and Straede, 2003. Paudel, 2005). Due to the opportunities for doing scientific study of wild animals and plants, different scientists and the researchers have visited this national park from time to time.

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Many researchers have studied the animals, plants, existing ecosystems, taxonomy of different fauna and flora. They have left no stone unturned in the taxonomy and the ecology of a great number of animals and birds also (Tamang, 1982. Gurung, 1983; Baral and Upadhyay, 1998. Dhungel and O'Gara, 1991; Sunquist, 1981). The taxonomic study of the mammals of Nepal started in earlier 1820's. Hodgson was the scientist who conducted the research work in the different parts of Nepal and India by making collection of flora and fauna. His study on mammals of Nepal included 80 papers in mammals in the different journals in which he described 39 new genera and species (Majupuria and Kumar, 1998). Survey of small mammals from the Central part of Nepal involving the taxonomy, ecology, habits and reproduction in which 4000 specimens of mammals were collected (Majupuria and Kumar, 1998). Animal association has been mentioned in the different text books which help to give knowledge about the different way of their relationship with other animals with the characteristic pattern of mutualism, commensalism, predation and other different methods of adaptation Observing the wild animals in the natural habitat is not only the adventurous thing but also a golden opportunity to study their adaptation methods, their unique way of life and interaction with the same and the other species. It is no less important to know how they show their association with a number of their own species, other species and with plants and the abiotic environment. It is also the matter of concern for those visitors of the national park who use to visit there with the help of jungle safari by riding the elephants, open vehicles and tourist guides during study and research. Observation of wild animals and their particular method of association with the other animals in their natural habitat is a matter of co-incidence which could be observed only fortunately in the dense forest of national park in a limited time as the time is directly related to climate and the sudden change in weather which will affect the wild animals as even the little noise cause disturbance due to which they runaway to hide with the threat of human disturbance. It is really an exciting as well as the interesting experience to observe them in their natural habitat and trap them in the camera and keenly observe their association with other animals to record and document in the research paper. Such a study is the unique one as it depends on the co-incidence of the jungle safari and the direct scene of wild animals associated with other ones. Such a type of observational study has its own charm and it will inspire the animal lovers as well as the other visitors also who do not belong to the scientific background. The present study was aimed to focus mainly on animal association and adaptation in Chitwan National Park, Nepal in a limited time.

MATERIALS AND METHODS

Study area

Chitwan National Park, formerly called as the Royal Chitwan National Park is the first and the oldest National

Park of Nepal established in 1973 and located in the southern central inner Terai lowlands of Nepal in the Chitwan district. It covers an area of 932 km² (360 sq mi) and is located in the subtropical region. The altitude ranges from about 100 m (330 ft) in the river valleys to 815 m (2,674 ft) in the Churia Hills. In the north and west of the protected area there is the Rapti river, in the east of Chitwan National Park is the Parsa wildlife reserve (Figure 1-2). It covers the four districts, Chitwan, Nawalparasi, Parsa and Makwanpur. The core area of the national park is located in between the two famous rivers, Narayani and Rapti rivers to the north and Reu River and Madi settlements and Nepal- India international border in the south. It also consists of the Kasara breeding center which is famous for gharial population in Nepal found in Kasara village of Chitwan district. The protected area of 2075 km² represents the Tiger Conservation Unit (Figure 3).

The area of 75000 hectares (750 km²) surrounding the park and consisting of the forests and private lands was declared as the buffer Zone in 1996 with Beeshazar and associated lakes within the buffer zone designated as the wetland of international importance under the Ramsar convention. The park and the local people jointly initiate and involved in the community development activities and manage natural resources in the buffer zone. The government of Nepal has made a provision of plowing back 30- 50 percent of the park revenue for community development in the buffer zone.

The national park is recognized and declared as the World Heritage Site in 1984 by UNESCO due to its unique biological resources, exceptional natural beauty, conservation of biodiversity and several other point of view of conservation.

It lies between 27°16.56'- 27°42.14' Latitudes and 83°50.23'-84°46.25' Longitudes. The altitude ranges from 110 m to 850 m above sea level. The physiography of the park consists of the Terai and Siwaliks. The three rivers Narayani, Rapti and Reu and their floodplains and several lakes and pools are the major water resources of the park. Chitwan national park has average temperature of 25°C from March to June and may reach as high as 43 degree C especially in monsoon season from late June to September. Mean average rainfall of the park is recorded 2150 mm.

The Chitwan is a valley characterized by tropical and subtropical forests with 70 percent of park vegetative cover of Sal (*Shorea robusta*) forest, a moist deciduous vegetation type of the terai region. The remaining vegetation types include grassland, riverine forest and Sal with Chir pine *Pinus roxburghii*. The later occurs at the top of the Churia range. The riverine forests consist of Khair (*Acacia catechu*), Sissoo (*Dalbergia sisoo*) and Simal (*Bombax ceiba*). The grasslands are mainly located in the flood - plains of the rivers and form a diverse and complex community with over 50 different types of grasses including the elephant grass (*Saccharum spp.*) with the 8 meter height. The protected Wildlife of Nepal under the NPWC Act, 1973 is given in the Table 1.

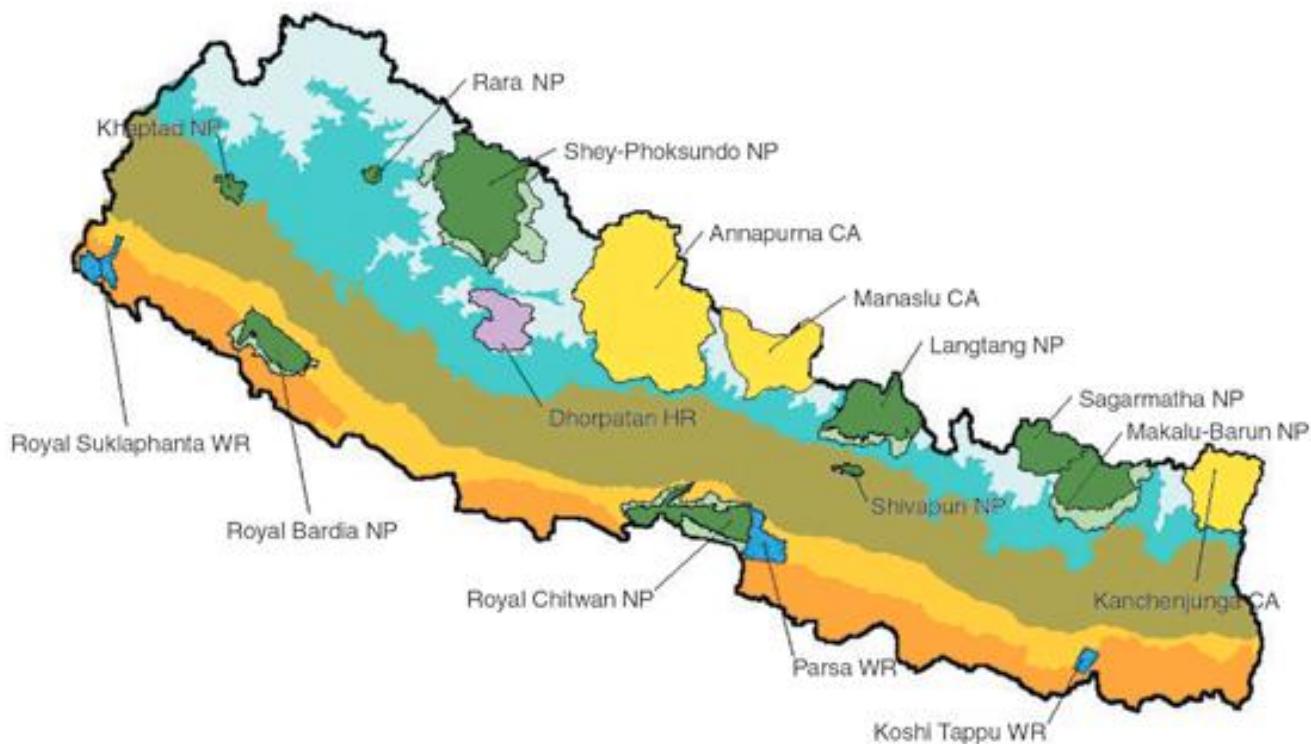


Figure 1. Protected areas of Nepal.

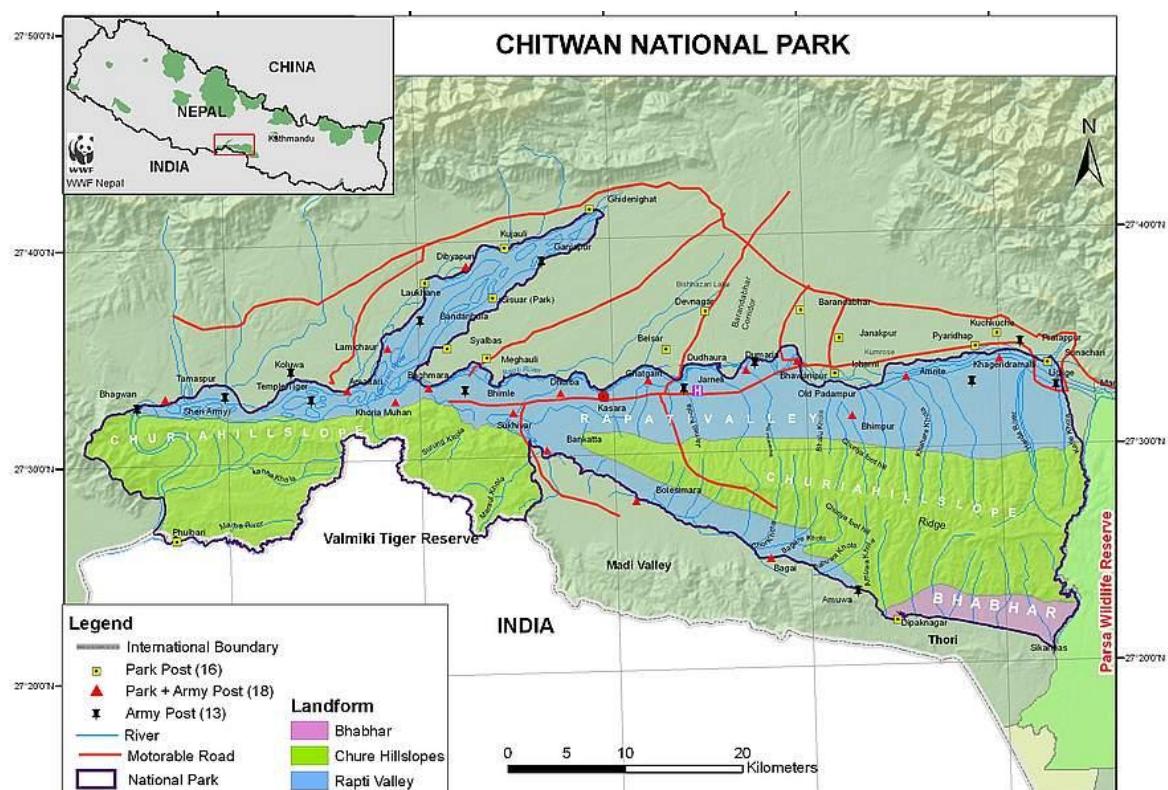


Figure 2. Map of Chitwan National Park in Nepal.

Table 1. Protected Wildlife of Nepal under the NPWCAct, 1973.

Scientific name	Local name	Common name
Mammals		
<i>Sus salvanius</i>	Sanu bandel	Pigmy hog
<i>Ailurus fulgens</i>	Habre	Red panda
<i>Antilope cervicapra</i>	Krishnasar	Black buck
<i>Bos gaurus</i>	Gor budson	Gaur bison
<i>Bos mutus</i>	Yok nak	Wild yak
<i>Bubalus bubalis</i>	Arna	Wild water buffalo
<i>Canis lupus</i>	Bwanso	Grey wolf
<i>Caprolagus hispidus</i>	Hispid kharayo	Hispid hare
<i>Cervus duvauceli</i>	Barasinghe	Swamp deer
<i>Elephas maximus</i>	Jangali hatti	Asiatic elephant
<i>Felis lynx</i>	Lynx	Lynx
<i>Hyaena hyaena</i>	Hundar	Striped hyena
<i>Macaca assamensis</i>	Asamese rato Bandar	Asamese monkey
<i>Manis crassicaudata</i>	Salak	Indian pangolin
<i>Manis pentadactyla</i>	Salak	Chinese pangolin
<i>Moschus chrysogaster</i>	Kasturi mriga	Himalayan musk deer
<i>Neofelis nebulosa</i>	Dhwanse chituwa	Clouded leopard
<i>Ovis ammon</i>	Nayan	Great Tibetan sheep
<i>Panthera tigris</i>	Bagh	Bengal tiger
<i>Panthera uncia</i>	Hiun chituwa	Snow leopard
<i>Pantholops hodgsoni</i>	Chiru	Tibetan antelope
<i>Platanista gangetica</i>	Sauns	Gangetic dolphin
<i>Prionailurus bengalensis</i>	Chari bagh	Leopard cat
<i>Prionodon pardicolor</i>	Lingsang	Spotted lingsang
<i>Rhinoceros unicornis</i>	Gainda	One -horned rhinoceros
<i>Tetraceros quadricornis</i>	Chauk	Four-horned antelope
<i>Ursus arctos</i>	Himali bhalu	Brown bear
Birds		
<i>Buceros bicornis</i>	Thulo dhanesh	Great-horned hornbill
<i>Catreus wallichii</i>	Cheer	Cheer pheasant
<i>Ciconia ciconia</i>	Seto stork	White stork
<i>Ciconia nigra</i>	Kalo stork	Black stork
<i>Grus grus</i>	Sarus	Common crane
<i>Haubaropsis bengalensis</i>	Khar mujur	Bengal florican
<i>Lophophorus impejanus</i>	Danphe	Lmpeyan pheasant
<i>Syphoetides indica</i>	Sano khar mujur	Lesse florican
<i>Tragopan satyra</i>	Monal	
Reptiles		
<i>Gavialis gangeticus</i>	Ghadiyal gohi	Crimsom pheasant
<i>Python molurus</i>	Azingar	Gharial
<i>Varanus</i>	Sungohoro	Asiatic rock python

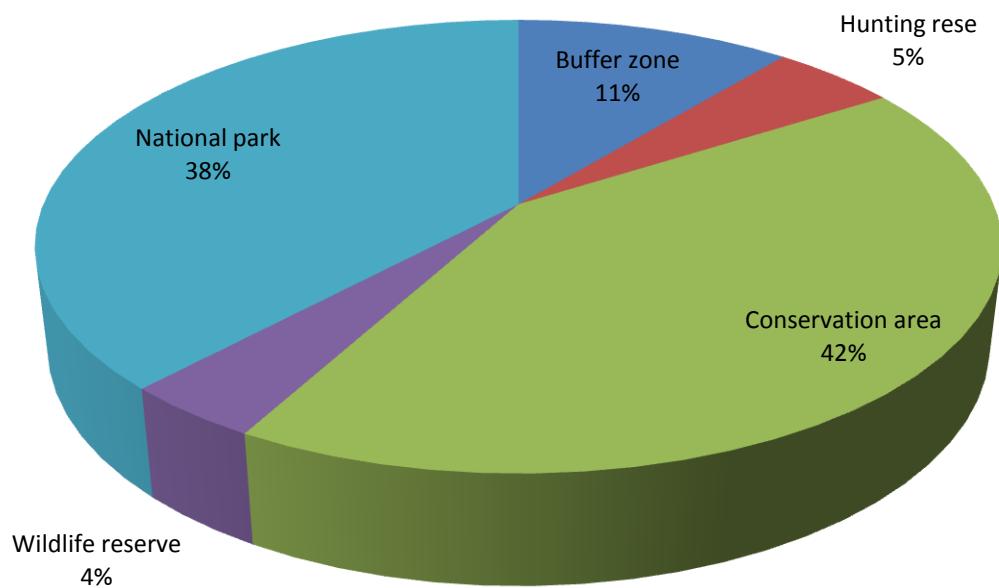


Figure 3. Protected area of Nepal.

Methodology

For the study of animal association in the forest of Chitwan National Park and the Community forest area adjoining the National Park, the adopted method were elephant safari in the Chitwan National Park (Figure 4-5), the open roofed vehicles to the forest visit, the direct visit to the forest area with the help of guide, asking the local people of the National park area and direct observation of the animals associated in their natural habitat (Stickel, 1954; Williams *et al.*, 2002).

The field study trip to Sauraha Chitwan was done along with the B.Sc. students of third year and a team of teachers (Figure 6) of the Science Department of Padmakanaya Multiple Campus from January 3 to January 7, 2015. The exciting and interesting field visit was accomplished with a package of activities including the practical works, getting information regarding the socio-economical status of the people of the buffer zone, bird watching, and visit to the elephant breeding center. The main focus of the tour was the elephant jungle safari and observation of the animal association and adaptation along with the bio-diversity of Chitwan National Park. So, during the few days of jungle safari the observation of the different wild animals had been done in their natural habitat. Jungle safari was done by the different methods as mentioned above i.e. by open roofed vehicles, by the help of elephant safari, sometimes by direct visit to the park with the help of

guide and also by the method of canoeing in the river which helped a lot to observe the animals living in between the river bank and the wetlands inside the National Park area. Information regarding the appearance of wild animals and their tracks were collected from the guide and the local people around the national park. Elephant rider called Mahute who took us through the jungle also helped a lot to give information regarding the list of wild animals, their hiding places, the time and the particular weather favourable for their appearance, the possible encounter with the animals, the management of the risk if in case the encounter with the wild animals like Rhino and wild buffalo would happen during the park visit. The excreta, urine and the footprints left by the wild animals was also taken as the good indicator so as to get the chance of direct observation of as much animals as possible along with their association with the plants, with other animals and the particular methods which they adopted so as to survive and escape from their specific enemies inside the park. It was genuinely a field visit which was performed by direct observation in the natural habitat. The photograph was taken silently so as to avoid any disturbance to the wild animals. National Park visit was done very carefully in a calm and quiet manner so as to avoid any disturbance to the wild animals and to minimize threat to them so that observations could be done as much clearly as possible in the different posture and from the different sides of their body.



Figure 4. Elephant safari in Chitwan National Park of Nepal.



Figure 5. Elephant safari and observation of animals in Chitwan National Park.



Figure 6. Study group in Chitwan National park.

RESULTS

The different wild animals (Table 1) and observed association among them during jungle safari in Chitwan National Park were given below.

1. Wild boar (*Sus scrofa*): Wild boar is found in Chitwan National Park (Figure 7) and adjoining community forest area of Nepal. It is the strong bodied mammal with a long mobile snout and terminal nostrils. They feed on the dead bodies of animals like snakes and insects. They also use to dig the roots of plants with their powerful canine teeth developed from both jaws in such a way that they grow continuously forming long triangular and curved tusks for defense. Wild boar has small-sized brain with well developed sense of smell. They feed on dead bodies of

animals like snakes and insects. They also use to feed on roots, tubers of certain plants and cultivated crops causing much damage. They are gregarious and found in Asia and Europe.

Mutualistic relationship between wild boar and plants and the trees: Wild boars use to eat the fruits and the seeds within the fruit. The boar population increase dramatically due to the availability of sufficient amount of food which they get from the tree. On the other hand, wild boars defecate under the tree. Some seeds remain intact and are then planted through the forest by being packaged within the boar manure as the boar manure acts as the effective fertilizer. So planting of new trees by the help of wild boars is the excellent example of mutualism which is going on in the forest of Chitwan National Park of Nepal.

Table 2. Wild animals of Chitwan National Park.

Nepalese name	English name	Scientific name
Mammals		
Salak	Pangolin	<i>Manis pantadantyla</i>
Pudke kharayo	Hispid hare	<i>Coprolagus hispidus</i>
Gaurigai	Bison	<i>Bos gaurus</i>
Jangali hatti	Wild elephant	<i>Elephas maximus</i>
Gainda	Rhinoceros	<i>Rhinoceros unicornis</i>
Sauns	Dolphin	<i>Platanista gangetica</i>
Patebagh	Royal Bengal tiger	<i>Panthera tigris</i>
Bwanso	Grey wolf	<i>Canis lupus</i>
Birds		
Kalo saras	Black stork	<i>Ciconia nigra</i>
Seto saras	White stork	<i>Ciconia ciconia</i>
Saras	Sarus crane	<i>Grus antelope</i>
Reptiles		
Ajingar	Asiatic rock python	<i>Python molurus</i>
Ghadiyal gohi	Gharial crocodile	<i>Gavialis gangeticus</i>
Sungohoro	Golden Monitor Lizard	<i>Varanus flavescens</i>



Figure 7. Wild boar *Sus scrofa* found in Chitwan National Park of Nepal.

2. The bears *Ursus arctos*: Bears are solitary and territorial type of mammals. They are omnivorous in food habit eating all types of food including vegetables and meats. They are included under the family Ursidae. There are 3 species of bear in Nepal. They are Black bear - *Selenarctos tibetanus*, Brown bear - *Ursus arctos* and Sloth bear - *Melursus ursinus*. Bears are very agile creatures

which use to kill prey by their powerful blows of the forelimbs which are armed with claws. Among the three species of bear found in Nepal, Sloth bear inhabits the Terai forest which is rich in termites. Sloth bear uses its well developed claws to break the termite moulds (Figure 8) which are made up of mud. They form tubes by their lips for sucking ants. They also eat leaf of plants.

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3. Deer's survival method for the limited food management: Deer are the mammals which are strictly herbivorous in food habit. Deer are abundantly distributed in Chitwan National Park (Figure 9) area of Nepal and also in the adjoining community forest area. Deer are such animals which use to eat less but they use to travel more. According to the principle of wildlife biology, it has been assumed that large reserve of fat present in the body of deer is helpful as it indicates the good condition of the area for its survival and for the food management. In the Chitwan National Park area there are many herbivorous animals all of them have to share the vegetable food resources. Deer use to adapt with the vegetable food source which it gets from forest and at the same time it utilizes its reserve food which is the fat component which is stored in the body to be used as the supplementary food. The fat reserve of the animals is also the useful indication which indicates the

good forage condition. It also serves as the indirect indicator of the sufficient amount of body fat as the supplementary reserve food.

Mutualism between deer and monkey: Hanuman langur monkeys (Figure 10) (*Presbytis entellus*) and chital deer (*Axis axis*) are found to be closely associated with one another in the dense forest of Chitwan National Park of Nepal. Langur troop drop leaves from the top of tree of Sal forest which the chital eat as the food. Chital alert langur frequently whenever the predators approach. Both of them use to alarm one another making alert to the approaching predators. A form of antagonistic interactions between the two species is going on in nature which is also called as the asymmetrical mutualism. Chital gains more benefit than langur as it gains opportunity taking advantage of vegetation dropped by langur alarm behavior



Figure 8. Termite mould in the dense forest of Chitwan National Park.



Figure 9. Deer in the dense forest of Chitwan National Park.



Figure 10. Monkey in the tree of dense forest of Chitwan National Park.

4. Mutualism between rhinoceros and ox-pecker

Rhinoceros and ox-peckers are found in very good association in Chitwan National Park area of Nepal. It is very interesting to observe the close association between the huge bodied rhino and the comparatively very small sized ox-pecker, which is a bird. The association between these two different species of nature helps both of them giving the example of mutualism. Ox-pecker lives frequently on the back of the huge body of rhino and cleans ticks off their hides (Figure 11). So rhinoceros is benefitted by ox-pecker both for being helped to get rid of the ectoparasites like ticks. In addition to it rhinos also get help from ox-peckers which give the early warning if predators are approaching. On the other hand, ox-peckers are also benefitted from the Rhino as they get the opportunity to burrow into the sores of rhino where from they get more

tasty treats. Ox-peckers get the benefit of using both the tick's and the host's blood as food sources. Due to this habit of ox-peckers, they are also known as "Vampire birds" by the biologists. By the method of animal association rhinoceros use to tolerate these vampire birds just for exchanging mutual help among each other.

5. Mutualism between buffalo and white stork (*Ciconia ciconia*): Another example of mutualism has been observed in between buffalo and white stork. In this association also white storks are the birds which live on the back of buffalo and use to eat insects (Figure 12). Whereas the buffaloes get benefit by white storks which help to remove the ticks and insects from the back of buffaloes. So the suitable example of mutualism or symbiosis is observed in between these two animals.



Figure 11. Mutualism between rhinoceros and ox-pecker.



Figure 12. Mutualism between white stork and buffalo.

DISCUSSION

Royal Chitwan National Park is the oldest protected area of Nepal (DNPWC, 2000). It preserves the habitat of the great number of flora and fauna along with its beautiful rivers and fertile soil, lots of lakes forming wetlands inside and around the National Park. Jungle safari by different methods like elephant riding, open roofed vehicles, direct walk through the thick forest along with the guides and interested local people and by canoeing many types of wild animals are observed. Most of them were mammals like Rhinoceros, sambar, barking deer, wild boars, peacocks, monkeys, bears, wild elephants jackals etc. Among them, observing one-horned rhino was really the adventurous part of the jungle safari. Rhinos used to appear in the favourable condition of weather like fair weather. But they could not be seen during heavy rain and in cloudy and cold winter days. They were supposed to be hiding in the core area and thick forest of National Park. Association of animals and their specific adaptation and the survival methods could be seen very rarely. Photo graphing the wild animals by the camera and video recording their activities during jungle safari was really a challenging, interesting and the adventurous thing but also a little bit risky due to the disturbance it could create to the wild animals. Tigers and leopards were very dangerous both for the ungulates and the visitors. Leopards could be seen rarely but tigers used to live in the thick forest in the core area of National Park.

Some animals were so closely associated that they were coexisting with the help of one another. Some of the trends were seen that the tree on which the langur monkey was living and under the same tree deers were found. It was a sort of mutual help with one another for both for the survival and food. Similarly, Huge bodied mammals like rhino and some domestic animals like buffalo were found with the birds like storks on their back while they did not feel any disturbance. Instead, both of them were being benefitted by getting advantage by the natural process of mutualism as mentioned above. Animals mostly observed were great one - horned rhino, Gaur, sloth bear, langur monkey, sambar, leopard, Royal Bengal tiger, wild boar etc. Main birds were Bengal floricans, lesser floricans, Giant Hornbill, peacock, parrot etc. Reptiles observed in wetlands of this area are Asian rock python, Gharial crocodile. A number of migratory birds are also found in and around the park area which are found to be documented. Inspite of many positive facets of biodiversity of this area, there are some negative impacts of current community forest management system which need to be corrected as soon as possible.

CONCLUSION

Conservation of the biodiversity requires the coordination among different factors like environmental, socioeconomic,

political and knowledge of conservation. Such crucial factors affect the structure, function and composition of different factors of the forest and its ecosystem with different intensity. Sustainable forest management inside the national park and in community forest may be helpful so as to conserve the biodiversity of this area. The protected forests may be helpful to conserve the biodiversity along with the other activities. Government and the concerned stakeholders from the field of conservation play the major role for promoting the conservation programs in the protected areas including Chitwan National Park by focusing on ecosystem based adaptation with the local community based participation which may enrich the biodiversity. Legal and the policy arrangement in national and the local level could help a lot to achieve the goal of sustainable management of biodiversity as well as the genetic resource of the country.

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