MATERIALS AND METHODS:

To study the conservation and management of wildlife at Chandoli National Park (old Chandoli Wildlife Sanctuary), the study area was frequently visited and observed conservation and management practices carried out by wildlife division of Government of Maharashtra. The objectives of the work were carried out at site and in laboratory during the study period from July, 2002 to December, 2008. The samplings of different types of samples were carried out during the study period and were analysed and studied in laboratory.

3.1 Study of Ecological Parameters:-

The ecological parameters of Chandoli National Park were studied by collecting data and by giving field visits. The meteorological parameters, such as air temperature, relative humidity, wind velocity, rate of water evaporation and rainfall in Chandoli National park area was studied from January 2003 to December 2006.

3.2 Study of Water Resources:

The water is an important parameter in the terrestrial ecosystem and plays a key role in distribution of flora and fauna. Hence, in present investigation the study of water resources from Chandoli National Park was carried out quantitatively and qualitatively.

The quantitative study of water resources was carried out by surveying the study area for the availability of water in the form of pond, lake, man made reservoir, springs, streams, rivulets and rivers.

3.2.1 Survey of Water Resources:

During the study period the survey of water resources was carried out from Chandoli National Park area for the identification of pond, lake, man made reservoir, springs, streams, rivulets and rivers. The perennial water resources, which provides water to wildlife in summer season were identified and tabulated from study area during the initial stage of research work.
The selected four perennial water resources of Chandoli National Park were identified for the water quality study from observed water resources.

3.2.2 Selection of Important Resources for Seasonal Monitoring of Water Quality:

The water quality of representative water resources were studied in terms of its physico-chemical parameters. The representative water resources with of great potential to provide water to wild animals and to man were selected for its quality study. During the selection of water resources, probable water pollution sources and pheasibility of collection of water samples in different seasons for monitoring its quality were also considered and following four water resources were selected as representative water resources for quality monitoring.

i) The back water of Vasantsagar reservoir near Manadur;

ii) Pond near hide at Zolambi;

iii) Spring near Zolambi temple;

iv) Stream near Ukhalu village.

3.3 Study of Physico-chemical Parameters:

The Chandoli National Park area was visited frequently to collect water samples for the analysis of physico-chemical parameters seasonally. Some physico-chemical parameters such as external appearance, pH, temperature, dissolved oxygen and free carbon-dioxide were determined at field and samples were collected, preserved and transported to laboratory for analysis of other physico-chemical parameters such as total solids, total dissolved solids, total suspended solids, total acidity, total alkalinity, chlorides, hardness, calcium, magnesium, residual chlorine, hydrogen sulphide, sodium, potassium, nitrates and phosphate. The physico-chemical parameters were studied during September, 2002 to May, 2006.
3.3.1 Study of Physical parameters:

The physical parameters such as external appearance, pH, temperature, total solids, total dissolved solids and total suspended solids were studied by following widely accepted methodology given by APHA (1981), Trivedy & Goel (1986) and Kaul & Gautam (2002).

3.3.1.1 External Appearance:

The external appearance of water resources were observed during field visits and observations were noted.

3.3.1.2 Temperature:

The temperature of water body was monitored during field visit by using thermometer.

3.3.1.3 pH: pH of water sources were monitored during field visit by using HANNA’s Pen pH meter.

3.3.1.4 Total solids (TS): The water samples from selected sites of Chandoli National Park were collected and analyzed for Total Solids (TS) by using method described by Trivedy and Goel (1986).

3.3.1.5 Total Dissolved Solids (TDS): The water samples from selected sampling sites from Chandoli National Park were collected and analyzed for Total Dissolved Solids (TDS) content by using the method described by Trivedy and Goel (1986).

3.3.1.6 Total suspended solids (TSS): Total suspended solids of collected water samples were determined by following the method given by Trivedy and Goel (1986).

3.3.2 Study of Chemical Parameters:

The chemical parameters such as dissolved oxygen, free carbon-dioxide, total acidity, total alkalinity, chloride, total hardness, calcium, magnesium, residual chlorine, hydrogen sulphide, sodium, potassium, nitrates and phosphates were determined by following widely accepted methods during the study period from the selected water resources.
3.3.2.1 Dissolved Oxygen (DO): The dissolved oxygen of water samples were determined in the field by using method described by Trivedy and Goel (1986).

3.3.2.2 Free Carbon-dioxide (Free CO$_2$): Free carbon-dioxide of water samples of water sources were determined in the field by using method given by Trivedy and Goel (1986).

3.3.2.3 Total Acidity: The total acidity of the water samples were determined in laboratory by using method given by Trivedy and Goel (1986); Kaul & Gautam (2002).

3.3.2.4 Total Alkalinity (T.A.): The total alkalinities of the water samples were determined in laboratory by using method as described by Trivedy and Goel, (1986); Kaul & Gautam (2002).

3.3.2.5 Chloride: The Chloride content of water samples were determined in the laboratory by using method described by APHA, AWWA, WPCF (1981), Trivedy and Goel (1986).

3.3.2.6 Total Hardness: The total hardness of the collected water samples of various water sources were determined in the laboratory by using method as described by APHA, AWWA, WPCF (1981).

3.3.2.7 Calcium: The calcium content of water samples was determined in the laboratory by using method as described by Trivedy and Goel (1986).

3.3.2.8 Magnesium (Mg$^{++}$): The magnesium content from water samples were determined by using method as described by Trivedy and Goel (1986).

3.3.2.9 Residual Chlorine: The residual chlorine of water samples of selected water resources was determined in the laboratory by using method as described by Trivedy and Goel, (1984).

3.3.2.10 Hydrogen Sulphide (H$_2$S): The hydrogen sulphide content of the water samples was determined in the laboratory by using method as described by Trivedy and Goel, (1984).
3.3.2.11 Sodium (Na⁺): The sodium content of water samples were determined in the laboratory by using flame – Photometric method as described by Kaul & Gautam (2002), by using flame- photometer of Elico Model, EL22-D.

3.3.2.12 Potassium (K⁺): The potassium content of water samples were determined in the laboratory by using flame – Photometric method as described by Kaul & Gautam (2002), by using flame- photometer of Elico Model, EL22-D.

3.3.2.13 Nitrate (NO₃): The nitrate content from collected water samples were determined by using spectro- photometric method as described by Trivedy and Goel, (1984).

3.3.2.14 Phosphate (PO₄): The phosphate content of collected water samples were determined by using spectro-photometric method as described by Trivedy and Goel, (1984).

3.4 Preparation of Checklist:

The checklist of wild animals (vertebrate group) found in Chandoli National Park were prepared during the study period from 2002 to 2008. The checklist of tetrapods animals of Chandoli National Park were prepared by referring the published literature. The checklist of observed wild vertebrate fauna was prepared excluding Pisces group.

3.4.1 Checklist of Vertebrates (Tetrapoda) from Literature Survey:

The checklist of Vertebrates (Tetrapods) was prepared by referring the available published literature on Chandoli Wildlife Sanctuary in past.

3.4.2 Preparation of checklist of Vertebrates (Tetrapoda) from Chandoli National Park.

The checklist of tetrapods from vertebrate group observed/sited in Chandoli National Park area was prepared during the study period.

3.4.2.1 Preparation of checklist of Amphibia:-

A preliminary survey of amphibians in Chandoli National Park were made from June 2003 to November 2006 and extended up to
November 2008 for getting more comprehensive data about amphibian fauna. The observations and collections were made at late evening from 7 to 10 pm. In rainy season the park area became difficult to access due to heavy rainfall so, in months of June, July and up to mid of August the sites selected were easy traveling sites. The observations were carried out in the forest patches, streams, ditches, on sadas, in cracks and crevices near the water bodies etc. The identification was carried out with the help of available literature such as Daniel (2002). The species recorded were categorized as Endangered, Vulnerable, Rare and Threatened and are enlisted in tables.

3.4.2.2 Preparation of checklist of Reptilia:

A preliminary survey of reptiles in Chandoli National Park were carried out from June 2003 to November 2006 and extended up to November 2008 for getting more comprehensive data about reptilian fauna. The observations and collections were carried out at late evening from 7 to 10 pm. In rainy season the park area became difficult to access due to heavy rainfall so, in months of June, July and up to mid of August the sites selected were easy traveling sites. The observations were carried out in the forest patches, streams, ditches, on sadas, in cracks and crevices near the water bodies etc. The identification was carried out with the help of published literature such as Whitaker & Captain (2004), Daniel (2002) and Khaire (2006). The species recorded were categorized as Endangered, Vulnerable, Rare and Threatened and are enlisted.

3.4.2.3 Preparation of Checklist of Avifauna:

A preliminary survey of avifauna of the Chandoli National Park was carried out at monthly intervals during the post monsoon seasons from October, 2002 to September, 2006 and extended up to December, 2008 for getting more comprehensive data about avifauna. A survey was carried out systematically by widely accepted method (walking through the study area transact lines). The birds were observed during the active
periods of the day (6.00 am. to 10.00 am. and 16.00 pm to 18.00 pm.) and other convenient timings. Observations were carried out with the aid of 8 x 40 binocular. The observations of birds were based on Ali et al., (2002) and Grimmette et al. (2006). The birds recorded were categorized based on their abundance as critically endangered, Endangered, Vulnerable, Threatened and Rare and are enlisted. In the thick forest vocal displays of birds were also used for confirming the occurrence of species in an area.

3.4.2.4 Preparation of checklist of Mammals:-

To prepare the checklist of mammals of Chandoli National Park the diurnal and nocturnal observations were carried out in study area by visiting study area at monthly intervals during the post-monsoon season from September, 2003 to September, 2006. The work was extended up to December 2008 for getting more comprehensive data about mammals. The identification of animals (mammals) was carried out by two methods. I) Direct observation of mammals in study area mostly at water bodies and were identified by the help of published literature such as Prater, (2005). II) The mammals were also observed and identified by evidences of their presence like tracks, vocalization and scates by using published literatures like Bang and Dahlstrom, (1980).

The mammals were also identified by direct observations and evidences by participating in the census programmes organized by forest department.

3.4.3 Preparation of Checklist of Flora (Especially food species of some selected wild animals):

The checklist of flora (especially food species of selected wild animals) of Chandoli National Park was prepared by visiting the study area frequently during post-monsoon season from September 2002 to September 2006. The work was extended up to December 2008 for getting more comprehensive data about food species of some selected wild animals. Two methods were employed for studying food species-
a) Direct observation: After observing feeding habit of animals through binoculars (8 x 40), on-site inspections of food plants were made to identify plant species. An unidentified browsed plant species were brought to laboratory for identification by using published key.

b) Data collection: Secondly the information was collected by preparing questioner according to the total design method (Russel, 1988). The questioner prepared was distinguished for management staff of Chandoli National Park, N.G.O. members interested enthusiastically in conservation of park, activists participating in wildlife census, people inhabiting park area and the people recently rehabilitated by the forest department from the park area. It was in local (Marathi) language for effective communication. The data was analyzed and checklist of food species of some selected wild animals.

3.4.4 Preparation of checklist of Threatened species:

By referring published literature, the checklist of threatened species from Chandoli National Park has been prepared. Simultaneously the endemic wild species were enlisted from same area.

3.5 Methods of Study of Wildlife Conservation practices.

The conservation practices has been studied at Chandoli National Park (Chandoli Wildlife Sanctuary) area from 2002 to 2006 and extended up to 2008 by giving frequent visits and related data was collected. The information about conservation practices carried out in study area was collected from staff of Chandoli National Park, Non-governmental organization members interested enthusiastically in conservation of park, tourist visiting periodically to the park, activist participating in wildlife census (yearly), people inhabiting park area, communities living in vicinity of park area and the people recently rehabilitated by forest department from park area. The questionnaire method was implemented for the same. Simultaneously, the Chandoli National Park area was visited to observe the wildlife practices viz. 1)
Species conservation, 2) Habitat conservation. The causes of habitat degradation were studied in detail by visiting the study area.

3.6 Methods of Study of Wildlife Management practices:

The management practices in Chandoli National Park were studied by frequently visiting the park area mostly in the season of winter and summer. The related data about the management practices were collected from the staff of Chandoli National Park, Non-governmental organization members interested enthusiastically in conservation of park, tourist visiting periodically to the park, activist participating in wildlife census (yearly), people inhabiting park area, communities living in vicinity of park area and the people recently rehabilitated by forest department from park area.

The Chandoli National Park management study was carried out by following the method given by Rusell (1988). Questionnaire was prepared in local language for effective communication. The species and habitat management at Chandoli National Park were studied at sites by visiting area and adopting widely accepted methods.

3.7 Materials and Methodology for Collection of Data about Study of Human-Wildlife Conflict

The wildlife from the protected area creates the problems to human society by attacking them, wild reeds on crops and by cattle lifting etc. and the human population creates some problems to wild animals by killing them or destroying their habitat by many ways. Hence, to study the human-wildlife conflict in Chandoli National Park areas following methods were used

The study was carried out among communities living in and incivility of park area. A self-administered questionnaire was prepared separately for the people living in association of park. It was in local language (Marathi). The questionnaire was prepared according to the total design method (Russell, 1988), was used randomly to obtain data from 5 to 10 adult residents in the communities of selected villages
associated to park, in between the period of 2002 to 2006. The work was extended up to 2008 for getting more comprehensive picture. Care was taken to ensure that respondent were resident within five to ten km of the boundary of the park area. To ensure the collected data from the people, the verification has been made to the forest department, Chandoli National Park.

Simultaneously, the data about human-wildlife conflict was collected from the officials of Chandoli National Park.
Map Showing Water Sampling Sites

Plate No. 4
Site A: Back Water of Vasantsagar Reservoir.

Site B: Pond near Hide at Zolambi

Site C: Spring near Zolambi Temple

Site D: Stream near Ukhalu Village.

Plate No. 5