CHAPTER 3

POPULATION DISTRIBUTION
3.1. Introduction

Population distribution and demographic characteristics of any species has got greatest importance in wildlife management and conservation. Successive monitoring is essential to bring out the data for the population analysis, which is a technique for qualitative description of a population. These may be explained in terms of the number of animals of different age and sex. The fluctuation of population size and structure is brought about by birth, death, migration and aging. Estimates of such numerical attributes of a population are better referred as vital statistics. Thus these numerical attributes in turn describe the dynamics of a population or its demography.

3.2. Methods

Study on population distribution of rhesus monkey was started during March 1993 and continued until February 1995, covering two breeding seasons. Before starting the study, a preliminary survey of Aligarh district and its adjoining area was carried out to find out the presence of monkey groups in different localities. Connecting roads leading to different townships and villages from Aligarh were considered as transects for this purpose. These roads were traversed by a motorbike at slow speed with frequent inquiries at various stoppages across the route. Groups of located rhesus monkey were marked on the map (Fig.3.1).
Fig. 3.1: Different Roads of Aligarh district surveyed for population distribution of rhesus monkey, *Macaca mulatta* (1993-95)

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Name of groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Achaltal</td>
</tr>
<tr>
<td>2</td>
<td>Chaturi-do-raha</td>
</tr>
<tr>
<td>3</td>
<td>Chaunpur</td>
</tr>
<tr>
<td>4</td>
<td>Govt. press</td>
</tr>
<tr>
<td>5</td>
<td>Hot Mix Plant</td>
</tr>
<tr>
<td>6</td>
<td>Jawan</td>
</tr>
<tr>
<td>7</td>
<td>Khair</td>
</tr>
<tr>
<td>8</td>
<td>Municipal bld.</td>
</tr>
<tr>
<td>9</td>
<td>Nanau</td>
</tr>
<tr>
<td>10</td>
<td>Prag oil mill</td>
</tr>
<tr>
<td>11</td>
<td>Rly. Stn</td>
</tr>
<tr>
<td>12</td>
<td>Sasni</td>
</tr>
<tr>
<td>13</td>
<td>Sumera</td>
</tr>
<tr>
<td>14</td>
<td>Gabbana</td>
</tr>
</tbody>
</table>
Subsequently, these sites were repeatedly visited before birth and after birth season.

Visual count of each group was made from a close distance during dawn and dusk. Counts were conducted when animals crossed open space, road or while crossing over any wall. A binocular (10x30) was also used whenever required. To facilitate the population estimation, at times monkeys were also counted when devotees offered them food. Sometimes animals were also fed for this purpose. Individual characters such as permanent injury mark, cut ear lobe or missing digits were recorded to avoid the possibilities of recounting. Individuals were classified into following broad categories (Malik 1986, Seth and Seth 1986):

Adult male: More than 6 years old with red scrotum.
Adult female: More than 3 years old with red color rump.
Juvenile: 1-3 years old, maintaining proximity with mother but independent.
Infant: Below 1 year including new born, dependent on mother.

Periodic demographic data were collected from the continuously monitored groups to formulate the different population parameters on population dynamics. Number of birth, number of death or missing and successive recruitment in each year were monitored to investigate the demographic fluctuation in the population.
**Natality**

Birth rate was estimated as the proportion of females giving birth in a year out of the total number of adult females under observation (Altman and Altman 1970, Dunbar and Dunbar 1975, Jolly 1985).

\[
\text{Birth rate (b)} = \frac{It}{Ft} \times 100
\]

Where,
- \(It\) = total number of infants born in one year
- \(Ft\) = total number of females observed during breeding season.

**Annual Population growth (%)**

Siddiqi and Southwick (1977) method was used to calculate the annual population increase with the following formula:

Annual Population growth =

\[
\frac{\text{Population counted in the present year} - \text{Population counted in the last year}}{\text{Population counted in the last year}} \times 100
\]

**Mortality**

As adopted in some previous studies (Siddiqi and Southwick 1977, Seth and Seth 1986), disappearances of any individual in the consecutive census were considered as deaths. Since, only a few individuals were identified, mortality was estimated from relative differences between the age–sex classes in successive census of each monitored group. For the present study, mortality was calculated by comparing the total population of rhesus monkey recorded during June 1993
(after recruitment of individuals) with March 1994 (before next breeding season).

For the next year the population of June 1994 was compared with the population of February 1995.

<table>
<thead>
<tr>
<th>No. of individuals recorded after recruitment</th>
<th>No. of individuals recorded during June</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality</td>
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</tr>
<tr>
<td>No. of individuals recorded after recruitment</td>
<td>X100</td>
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3.3. Results

3.3.1. Population status and group composition

The results of population distribution and estimation of rhesus monkey has been shown in Tables 3.1-3.5. The rhesus monkey in Aligarh district and its adjoining areas has wide distribution in almost all types of habitats and has shown encouraging results of survival and growth rate. Presence of monkey in the study area could be seen in highly disturbed and busy market of Aligarh and Khair, on roadside tree plantation of Chatari-do-raha and Jalalpur (Hot Mix Plant), on Canal bank side and in rural agriculture and mango orchard of Chaunpur (Table 3.6). Besides these, some of the scattered population of monkey groups were also observed in University area, Municipality building and at Aligarh Railway station. During the present study, 20 groups of rhesus monkey of different size were monitored each year. In the beginning (March 1993), the total population of rhesus monkeys was 963, which increased to 1337 in 1995. The annual census conducted during 1993-95, gave an idea of annual growth in the total population.
Table 3.1: Population of rhesus monkey in Aligarh district in March 1993 (before birth season)

<table>
<thead>
<tr>
<th>Name of groups</th>
<th>Number of group</th>
<th>Adult male</th>
<th>Adult female</th>
<th>Subadult - Juvenile</th>
<th>Infant</th>
<th>Total</th>
</tr>
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<tr>
<td>Chaunpur</td>
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<td>Govt. press</td>
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<td>Hot mix plant</td>
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<td>11</td>
<td>26</td>
<td>18</td>
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<td>077</td>
</tr>
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<td>Jawan</td>
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<td>05</td>
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<td><strong>Total</strong></td>
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<td><strong>323</strong></td>
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Table 3.2: Population of rhesus monkey in Aligarh district in June 1993 (after birth season).

<table>
<thead>
<tr>
<th>Name of groups</th>
<th>Number of group</th>
<th>Adult male</th>
<th>Adult female</th>
<th>Subadult - Juvenile</th>
<th>Newborn</th>
<th>Total</th>
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<td>23</td>
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<td><strong>Total</strong></td>
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<td><strong>405</strong></td>
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</table>
Table 3.3: Population of rhesus monkey in Aligarh district in March 1994 (before birth season)

<table>
<thead>
<tr>
<th>Name of groups</th>
<th>Number of group</th>
<th>Adult male</th>
<th>Adult female</th>
<th>Subadult -Juvenile</th>
<th>Infant</th>
<th>Total</th>
</tr>
</thead>
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<tr>
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<td>27</td>
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<td>45</td>
<td>54</td>
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<tr>
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</tr>
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<td>11</td>
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<td><strong>36.2</strong></td>
<td><strong>22.8</strong></td>
<td><strong>25.9</strong></td>
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</table>
Table 3.4: Population of rhesus monkey in Aligarh district in June 1994 (after birth season)

<table>
<thead>
<tr>
<th>Name of groups</th>
<th>Number of group</th>
<th>Adult male</th>
<th>Adult female</th>
<th>Subadult - Juvenile</th>
<th>Newborn</th>
<th>Total</th>
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<td><strong>28.8</strong></td>
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Table 3.5: Population of rhesus monkey in Aligarh district in February 1995 (before birth season)

<table>
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<tr>
<th>Name of groups</th>
<th>Number of group</th>
<th>Adult male</th>
<th>Adult female</th>
<th>Subadult -Juvenile</th>
<th>Infant</th>
<th>Total</th>
</tr>
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<tr>
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<td>50</td>
<td>55</td>
<td>191</td>
</tr>
<tr>
<td>Prag oil mill</td>
<td>1</td>
<td>06</td>
<td>09</td>
<td>04</td>
<td>03</td>
<td>022</td>
</tr>
<tr>
<td>Railwat station</td>
<td>1</td>
<td>04</td>
<td>06</td>
<td>00</td>
<td>00</td>
<td>010</td>
</tr>
<tr>
<td>Sasni</td>
<td>1</td>
<td>17</td>
<td>37</td>
<td>20</td>
<td>26</td>
<td>100</td>
</tr>
<tr>
<td>Sumera</td>
<td>1</td>
<td>07</td>
<td>11</td>
<td>05</td>
<td>05</td>
<td>028</td>
</tr>
<tr>
<td>Gabhana</td>
<td>1</td>
<td>13</td>
<td>31</td>
<td>14</td>
<td>22</td>
<td>080</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>216</td>
<td>455</td>
<td>317</td>
<td>349</td>
<td>1337</td>
</tr>
<tr>
<td>Mean % of total pop</td>
<td></td>
<td>16.2</td>
<td>34.0</td>
<td>23.7</td>
<td>26.1</td>
<td></td>
</tr>
</tbody>
</table>
Table 3.6: Habitat-wise distribution of rhesus monkey in Aligarh district and its adjoining area.

<table>
<thead>
<tr>
<th>Roadside</th>
<th>Near human pop</th>
<th>Temple pop</th>
<th>Canal side</th>
<th>Near cropland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chatardi-do-raha</td>
<td>Achalta</td>
<td>Achalta</td>
<td>Nanau</td>
<td>Chaunpur</td>
</tr>
<tr>
<td>Hot mix plant</td>
<td>Khair</td>
<td>Hot mix plant</td>
<td>Sumera</td>
<td>Chatardi-do-raha</td>
</tr>
<tr>
<td>Gabhana</td>
<td>Jawan</td>
<td></td>
<td>Nanau</td>
<td>Hot mix plant</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Govt press</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Municipal bld.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prag oil mill</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Railway station</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sasni</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gabhana</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3.7: Mean age-sex composition (before-birth seasons)

<table>
<thead>
<tr>
<th>Month &amp; year</th>
<th>Adult male</th>
<th>Adult female</th>
<th>Sex ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>March 1993</td>
<td>153</td>
<td>323</td>
<td>2.1</td>
</tr>
<tr>
<td>March 1994</td>
<td>176</td>
<td>419</td>
<td>2.4</td>
</tr>
<tr>
<td>February 1995</td>
<td>216</td>
<td>455</td>
<td>2.1</td>
</tr>
<tr>
<td>Mean</td>
<td>180.2</td>
<td>399</td>
<td>2.2</td>
</tr>
</tbody>
</table>
During 1993-94, 20.4% annual growth was recorded, which declined to 15.4% in the next year. Further, a population growth of 18.5% in 1993-94 and 14.5% in 1994-95 was observed in the monkey group of Achaltal, while in Chatari-do-raha monkey group, it was 15.6% and 15.2% respectively. Classification of monkey individuals in different age-sex categories gave an idea of population composition of different groups. During March 1993, monkey population constituted 15.9% adult male, 35.5%, adult females, 22.8% subadults-juveniles and 27.7% infants respectively. A marginal difference in population composition was recorded during March 1994 (15.2% adult males, 36.2% adult females, 22.8% subadults-juveniles and 26% infants) and in February 1995 (16.2% adult males, 34% adult females, 23.7% subadults-juveniles and 26% infants) (Tables 3.1-3.5 and 3.11).

It was also observed that the population composition changed due to births, deaths and age variation of the rhesus monkey during 1993-1995 census. During June 1993, population of rhesus monkey constituted 15% adult males, 34% adult females, 22.8% subadults-juveniles and 28.1% newborns. Almost similar results were recorded during June 1994, when percentage of adult males, adult females, subadults-juveniles and newborns were 16.3%, 36.3%, 18.8% and 28.8% respectively. Moreover, the population census revealed that the sex ratio for Aligarh monkey population during March 1993 was 2.1 females per male, which increased to 2.4 in March 1994 and 2.1 females per male in February 1995. Mean sex ratio for entire study period was calculated 2.2 females per male (Table 3.7).
3.3.2. Natality and Mortality

One of the most important characteristics of established monkey groups of Aligarh and its adjoining areas was their high natality and low mortality. Tables 3.8 and 3.9 show the birth characteristics of different groups located in the area. A total of 700 offsprings were born, giving a gross birthrate of 0.81 infant/female/year. Variation in the birth rate was noticed in different years within the same group. The birth rate (%) computed for the Achaltal varied from 91.7% in 1993-94 to 91.3% in 1994-95 and for Chatari-do-raha it varied from 89.7% to 93.8%. By comparing the difference between population of June 1993 with March 1994, a total loss of 2.7% was found, while next year it declined to 1.5%. During 1993-94 season, maximum mortality of 10.3% was found in Gabhana monkey group and in the next year maximum mortality of 4% was seen in Achaltal monkey group. On considering the Achaltal monkey group, 1.6% mortality was recorded during 1993 which increased to 4% in the next year. In Chatari-do-raha it was 4% in 1993 and 8% in the next year Table 3.10).

3.4. Discussion

Aligarh district may be considered as one of the ancient sites of rhesus monkey population in Northern India. Over the past 40 years, population of rhesus monkey in Aligarh district has shown remarkable fluctuation in population and distribution. In 1959 there were 337 rhesus monkeys spread over in 17 groups,
Table 3.8: Birth rate recorded in different rhesus monkey groups during 1993-95

<table>
<thead>
<tr>
<th>SN</th>
<th>Name of Groups</th>
<th>Birth rate</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Achaltal</td>
<td>91.7</td>
<td>91.5</td>
</tr>
<tr>
<td>2</td>
<td>Chatari-do-raha</td>
<td>89.7</td>
<td>91.8</td>
</tr>
<tr>
<td>3</td>
<td>Chaunpur</td>
<td>90.0</td>
<td>76.4</td>
</tr>
<tr>
<td>4</td>
<td>Govt press</td>
<td>75.0</td>
<td>68.8</td>
</tr>
<tr>
<td>5</td>
<td>Hot Mix Plant</td>
<td>88.5</td>
<td>88.7</td>
</tr>
<tr>
<td>6</td>
<td>Jawan</td>
<td>53.8</td>
<td>48.4</td>
</tr>
<tr>
<td>7</td>
<td>Khair</td>
<td>93.9</td>
<td>93.2</td>
</tr>
<tr>
<td>8</td>
<td>Municipality bld.</td>
<td>58.3</td>
<td>57.7</td>
</tr>
<tr>
<td>9</td>
<td>Nanau</td>
<td>89.3</td>
<td>91.4</td>
</tr>
<tr>
<td>10</td>
<td>Prag oil mill</td>
<td>37.5</td>
<td>35.4</td>
</tr>
<tr>
<td>11</td>
<td>Railway Station</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>12</td>
<td>Sasni</td>
<td>78.8</td>
<td>78.3</td>
</tr>
<tr>
<td>13</td>
<td>Sumera</td>
<td>50.0</td>
<td>47.7</td>
</tr>
<tr>
<td>14</td>
<td>Gabhana</td>
<td>78.6</td>
<td>78.9</td>
</tr>
<tr>
<td></td>
<td><strong>Average</strong></td>
<td><strong>82.7</strong></td>
<td><strong>81.6</strong></td>
</tr>
</tbody>
</table>

Table 3.9: Birth rate for each year-all groups combined

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of adult Female</th>
<th>Number of birth</th>
<th>Birth rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1993-94</td>
<td>405</td>
<td>335</td>
<td>82.7</td>
</tr>
<tr>
<td>1994-95</td>
<td>454</td>
<td>365</td>
<td>80.4</td>
</tr>
<tr>
<td>Average</td>
<td>859</td>
<td>700</td>
<td>81.5</td>
</tr>
</tbody>
</table>
Table 3.10: Mortality (%) in different groups during 1993-94 and 1994-95

<table>
<thead>
<tr>
<th>S. N.</th>
<th>Name of Groups</th>
<th>Mortality (%)</th>
<th>1993-94</th>
<th>1994-95</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Achaltal</td>
<td>Mortality</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>2</td>
<td>Chatari-do-raha</td>
<td></td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>Chaunpur</td>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Govt. press, Aligarh</td>
<td></td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>Hot mix plant</td>
<td></td>
<td>3</td>
<td>-5</td>
</tr>
<tr>
<td>6</td>
<td>Jawan</td>
<td></td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td>Khair</td>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>Municipality bld.</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>9</td>
<td>Nanau</td>
<td></td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>10</td>
<td>Prag oil mill</td>
<td></td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>11</td>
<td>Railway station</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>12</td>
<td>Sasni</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>13</td>
<td>Sumera</td>
<td></td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>14</td>
<td>Gabhana</td>
<td></td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Total mortality</td>
<td></td>
<td>32</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>Percentage</td>
<td></td>
<td>2.7%</td>
<td>1.5%</td>
</tr>
</tbody>
</table>
Table 3.11: Population growth rate in different rhesus monkey groups

<table>
<thead>
<tr>
<th>S. N.</th>
<th>Name of groups</th>
<th>Monkey population</th>
<th>Growth rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Achaltal</td>
<td>157</td>
<td>186</td>
</tr>
<tr>
<td>2</td>
<td>Chatari-do-raha</td>
<td>154</td>
<td>178</td>
</tr>
<tr>
<td>3</td>
<td>Chaunpur</td>
<td>68</td>
<td>92</td>
</tr>
<tr>
<td>4</td>
<td>Govt. press</td>
<td>37</td>
<td>42</td>
</tr>
<tr>
<td>5</td>
<td>Hot mix plant</td>
<td>77</td>
<td>78</td>
</tr>
<tr>
<td>6</td>
<td>Jawan</td>
<td>25</td>
<td>30</td>
</tr>
<tr>
<td>7</td>
<td>Khair</td>
<td>117</td>
<td>144</td>
</tr>
<tr>
<td>8</td>
<td>Municipality bld.</td>
<td>22</td>
<td>30</td>
</tr>
<tr>
<td>9</td>
<td>Nanau</td>
<td>150</td>
<td>172</td>
</tr>
<tr>
<td>10</td>
<td>Prag oil mill</td>
<td>12</td>
<td>19</td>
</tr>
<tr>
<td>11</td>
<td>Railway station</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>12</td>
<td>Sasni</td>
<td>61</td>
<td>87</td>
</tr>
<tr>
<td>13</td>
<td>Sumera</td>
<td>20</td>
<td>23</td>
</tr>
<tr>
<td>14</td>
<td>Gabhana</td>
<td>57</td>
<td>69</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>963</td>
<td>1159</td>
</tr>
<tr>
<td></td>
<td>Mean growth rate</td>
<td>20.4%</td>
<td>15.4%</td>
</tr>
</tbody>
</table>
which increased to 403 in 21 groups by 1962 (Southwick et al. 1965). Their population declined irregularly and even reached to an alarming low point of 163 in 1970 (Southwick and Siddiqi 1983). After that, this population again started to increase and reached to 445 in 1990-91 (Southwick and Siddiqi 1994a). The trend of population growth marked in this district was quite interesting and possibly projects the trend of population growth of rhesus monkey found elsewhere. Though of a short term, the present study on population distribution was an attempt to provide some more information on this aspect.

3.4.1. Population growth

In the present study, an annual growth of 20.4% (1993-94) was recorded in the total population of rhesus monkey, which declined to 15.4% in 1994-95. In Achaltal, a change of 14.5% was recorded from its previous year record of 18.5%, while in Chatari-do-raha a negligible change from 15.6% to 15.2% was observed. In some other areas, the population growth rates observed by Malik et al. 1984 (at Tughlaqabad), Ojha 1979 (at Mortha-Rajasthan), Drickamer 1974 (at Larguasa) and Itani 1975 (at Mt Takasaki), were 21.4%, 20.8%, 13 %, and 10% respectively.

3.4.2. Group Composition

The annual population census of rhesus monkey revealed that adult males constituted 15.9%, 15% and 16.2% of the total population during March 1993,
March 1994 and February 1995 respectively giving an average of 15.7%. Similarly no difference was found in the adult male percentage of Achaltal and Chatari-do-raha monkey group. On comparing with the Tughlaqabad monkey population, almost similar result was recorded (Malik et al. 1984), while it was quite different from the monkey population of south India (Kurup 1984) and Jammu and Kashmir (Tiwari and Mukherjee 1992) where it was 11% and 9.6% respectively. In the same area of Aligarh, Southwick, et al. (1965) recorded 25% adult males, while during 1991, Imam and Yahya (1995) observed 15.4% adult males.

Adult females constituted 33.5%, 36.2% and 34% of the total population during 1993, 1994 and 1995, giving an average of 34.5%. On considering the Achaltal monkey group, not much difference was found in the female percentage. In the same area, Southwick et al. (1965) and Imam and Yahya (1995) observed almost similar female percentage. On comparing with the study conducted by Kurup (1984) and Mukherjee et al. (1995) in south India and by Malik (1988) in Tughlaqabad-New Delhi, it was recorded that females constituted 33.5 %, 51.6 % and 34.3 % of their population.

Subadults-juveniles constituted 22.8%, 22.8% and 23.7% of the total monkey population during March 1993, March 1994 and February 1995 respectively. Marginal difference was found in the monkey population of Achaltal and Chatari-do-raha, where it was approximately 24% in both the areas during the each year.
In the same area, Southwick and Siddiqi (1988) and Imam and Yahya (1995) reported 27% and 29% subadults-juveniles during the respective years. In other parts of the country Shukla et al. (1984) observed 27% subadults-juveniles, while Southwick et al. (1965) Siddiqi and Southwick (1977), Mukherjee et al. (1995) reported 29%, 24.8% and 34%.

The percentage of infants in monkey population of Aligarh district was 27.7% in March 1993, which declined to 25.9% in the next year, while in February 1995 it was 26.1%. The infant's percentage recorded during the present study was similar to the 1985 infant's percentage observed in the same area by Southwick and Siddiqi (1988). A comparative study of other researchers revealed that Kurup (1984) recorded 22.5% infants, Koford (1965) 20%, Malik (1988) 26.2%, Shukla et al. (1984) 18.3%, Siddiqi and Southwick (1977) 27.5% and Southwick et al. (1965) 25.5%. It appears that percentage of infants in the present study were not much different from other groups.

The age structure of Aligarh rhesus population revealed that percentage of immature was 50.6% in 1993, while it declined to 48.7% in 1994 and 45.5% in 1995. It is obvious that only during 1993-94, age structure of rhesus population was favorable to support further growth. It seems that due to less percentage of immature, population growth during 1994-95 declined upto 15.4% in comparison to previous year of 20.4%. In the same area 55.8% immature were observed during 1992 (Imam and Yahya 1995). On comparing with some other monkey
population, the result of present study showed little variation. Southwick et al. (1961) found 54% immatures in Corbett National Park and Lindburg (1971) 56.1% in the forest of Dehradun.

3.4.3. Sex ratio

The sex ratio of Aligarh rhesus monkey population was more than 2 females per male, whereas similar ratio was recorded in Achaltal and Chatari-do-raha groups. In the same area, Imam (1992), Imam and Yahya (1995) and Southwick and Siddiqi (1977) recorded similar sex ratio. In other places like Tughlaqabad and the forest of Dehradun, Malik (1988) and Lindburg (1971) found similar results in their respective areas. Mukherjee et al. (1995) found 4.2 females per male in Darjeeling monkey population, whereas Tiwari and Mukherjee (1992) found 6.4 females per male in Jammu and Kashmir, 4.6 in Himachal Pradesh, 3.4 in Haryana, 3 in Punjab, 4 in Delhi, 3.2 in Uttar Pradesh, 6 in Rajasthan, 3.3 in Madhya Pradesh, 4.6 in Gujarat, 2.3 in Bihar, 3.3 in Orissa, 3.4 in Maharashtra and 2.4 in Andhra Pradesh respectively.

There could be several reasons for the present sex ratio. Firstly when young males reach the stage of subadult, they start fighting for access to females which leads to exclusion of some of male members from natal group. During 1991-92 a group of such type was seen in Aligarh Railway station (Imam and Yahya 1995). Secondly, male infants move away relatively greater distance from their parents than female infants. The male infants are also more playful. During such movements and play
sessions, male infants are at greater risk than those who spend most of their time with parents. These may lead to more chances of male infant mortality. Another possibility may be that male individuals are more susceptible to infections and disease as reported in case of human (Naik - Personal communication). Therefore, sex ratio shifts in the favor of females. It is quite possible that such reasons have played positive role in shifting the sex ratio in the favor of females, however no direct evidences were observed in the present study.

3.4.4. Natality and Mortality

The rhesus groups in Aligarh district were remarkably productive in terms of infant born. In the present study 92.7% and 80.4% adult females were observed carrying newborn during the breeding season of 1993-94 and 1994-95 respectively. In the same area, Imam and Yahya (1995) recorded 81.5% natality, Siddiqli and Southwick (1977) 90.3%, Southwick and Siddiqli (1988) 86 % and Southwick and Siddiqli (1994a) 85.5 %. On comparing with other populations, it was found that Malik et al. (1984) recorded 82.4 % natality in Tughlaqabad, and Teas et al. (1981) 62 % in Kathmandu (Nepal).

In the monkey population of Aligarh area a mortality of 2.7% and 1.5% was recorded during 1993-94 and 1994-95 respectively. The mortality rate was almost similar to the previous observation recorded by Imam and Yahya (1995) in the same area. Before the ban on commercial trapping 16-34 % mortality was recorded by Southwick and Siddiqli (1988) during 1960s to 1980s in Aligarh
district, whereas Southwick *et al.* (1982) and Malik *et al.* (1984) observed 19.3 % and 4.3 % mortality in Tughlaqabad and Kathmandu, respectively.

There could be several possible reasons for the high natality and low mortality in Aligarh rhesus population. Apart from the ban on commercial trapping, *conservation awareness are more pronounced now than earlier*. The emotional attachment with rhesus monkey on religious ground also continues. It was observed that rhesus were simply repelled even if they stole food or other items from shops or residential houses. These feelings of protection were also observed in Tughlaqabad (Malik *et al.* 1984). Other possible reasons may be the absence of any predator except dogs, who (reportedly) at times killed the young. Food resources were also abundant and sufficient to support the population. In addition to some natural foods, local people and devotees coming for prayer at temples also fed the monkeys almost daily, thereby sustaining the continued growth of populations.