CHAPTER III

POPULATION

Population dynamics of gamebirds have been mainly studied from management point of view. Among pheasants, the ring-necked pheasant, *Phasianus colchicus* has been the centre of attraction. Research on *P. colchicus* population dynamics were done quite early (Bach, 1944; Einarson, 1945; Arnold, 1951; Dale, 1951; Blouch, 1955; Wagner et al., 1965; Doude, 1975; Luce, 1976; Jarvis & Simpson, 1978; Warner & Etter, 1986 and Wasilewski, 1987).

Apart from the ring-necked pheasant, the few studies on the population dynamics of the pheasants include the work done on Koklass Pheasant, *Pucrasia macrolopha* in Pakistan (Khan & Shah, 1982) and that on Indian Peafowl, *Pavo cristatus* in Mettupalayam (Thirumurthy et al., 1993). For the management of a wildlife species, knowledge of all aspects of the populations are required, i.e., size, dynamics and their causes. The present study provides data on the population dynamics of a peafowl population living near human habitation.

3.1 METHODS

Census procedures for Himalayan pheasants have been described by Gaston (1980). However, for peafowls, total count has been
attempted by Johnsingh & Murali (1978) and Thirumurthy et al. (1993) for estimating small populations. Line transect method of Emlen (1971) has been tried by Trivedi (1993) for estimating the peafowl density in Gir National Park.

In the present study, peafowls were counted on roosts just before sunrise. Four (weekly) counts per month were made and the highest count was taken into consideration. The location of the bird was marked on map and direction of flight was recorded in case the bird flushed. Thus, double counting was avoided. Number, sex and age class were recorded. Males could be divided into adults, subadults and juveniles on the basis of plumage differences and train elaboration. Females could not be divided into age classes.

Statistical analysis:

The population growth was measured by exponential rate of increase following the formula

$$N_t = N_0 e^{rt}$$

The constant 'e' is the base of natural logarithm

$N_0 =$ Initial population

$N_t =$ Final population

$t =$ Time
3.2 RESULTS

3.2.1 Population size

The results of population counts are given in Fig 2. The population size of peafowl varied from 40-67 during 1993 and from 34-60 during 1994. The minimum counts were in January 1993 and December 1994. The maximum counts were in May 1993 and 1994. The total count of peafowl gradually increased from January to May and then decreased thereafter.

3.2.2 Population structure and sex ratio

The sex ratio was biased towards male (Table 3.1). Only four chicks were produced during 1993 and none during 1994. The age structure showed that there were greater proportion of adult individuals in the population than the younger ones.

3.2.3 Density

If there is not much fluctuation in the population, the density can be calculated from the average number of all counts. But, in this case, the maximum count was taken into consideration. The density was 1.399 individuals per hectare in 1993 and 1.254 individuals in 1994.
FIG. 2. FLUCTUATION IN POPULATION SIZE OF PEA FOWL AT ALIGARH FORT.

(a), ADULT MALE; (b), SUBADULT MALE; (c), IMMATURE MALE;
(d), FEMALE
Table 3.1. Sex ratio and percentage of peafowls at Aligarh Fort.

<table>
<thead>
<tr>
<th>Month</th>
<th>1993 Male:female % Male:Female</th>
<th>1994 Male:female % Male:Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan</td>
<td>1.22:1 55 45</td>
<td>1.87:1 65 35</td>
</tr>
<tr>
<td>Feb</td>
<td>1.22:1 55 45</td>
<td>1.40:1 58 42</td>
</tr>
<tr>
<td>Mar</td>
<td>1.05:1 51 49</td>
<td>1.52:1 60 40</td>
</tr>
<tr>
<td>Apr</td>
<td>1.20:1 56 44</td>
<td>2.00:1 67 33</td>
</tr>
<tr>
<td>May</td>
<td>1.31:1 57 43</td>
<td>2.62:1 70 30</td>
</tr>
<tr>
<td>Jun</td>
<td>1.31:1 57 43</td>
<td>1.62:1 62 38</td>
</tr>
<tr>
<td>Jul</td>
<td>1.77:1 64 36</td>
<td>2.80:1 74 26</td>
</tr>
<tr>
<td>Aug</td>
<td>2.17:1 63 29</td>
<td>2.50:1 73 27</td>
</tr>
<tr>
<td>Sep</td>
<td>2.90:1 69 24</td>
<td>2.50:1 68 32</td>
</tr>
<tr>
<td>Oct</td>
<td>2.27:1 63 27</td>
<td>2.00:1 67 33</td>
</tr>
<tr>
<td>Nov</td>
<td>1.56:1 56 36</td>
<td>1.77:1 64 36</td>
</tr>
<tr>
<td>Dec</td>
<td>2.14:1 63 29</td>
<td>2.09:1 68 32</td>
</tr>
</tbody>
</table>

3.2.4 Exponential rate of increase

The exponential rate of increase was calculated for the data collected during the study period and was also compared with the previous data (collected by Jamal & Rashid, pers comm). The r value was -0.139 during 1989-1992, -0.095 during 1992-1993 and -0.11 during 1993-1994. The data shows a declining trend of the population size. Thus, the first hypothesis that the peafowl population in an agro-ecosystem is stable, is rejected.

3.2.5 Mortality

Two predated males were obtained in 1992 and one predated female was found in 1993. All three were probably killed by the jungle cat because the remains of the kill were obtained from near the cat's
den. One dead female with no injury marks was obtained and one female was killed by a man in 1994. The remaines of one sub-adult male was found in the scat of jungle cat in 1994.

3.2.6 Dispersal

The Fig. 2 shows monthly fluctuation in the numbers of the different age and sex groups. It is evident that there is larger fluctuation in the numbers of the females and juvenile males than the adult males. There is marked increase in females' number during and just before the mating period (April to June) and subsequent decline during the egg laying period. There is corresponding fluctuation in the sub-adult number. A second population of peafowl was located c. 5 km from the population under study. It is possible, that to and fro movement of individuals was taking place between the two populations.

3.3 DISCUSSION

Total count of a large species like peafowl in a small area was the most suitable technique for estimating the population size. Line transect is another suitable technique to sample this species in larger areas.

The monthly variation in peafowl population appeared to be governed largely by the reproductive pattern. The maximum count was during
the mating season and the minimum during the non-breeding season. However, when the availability of food and cover is taken into consideration, the food was patchily distributed during summer, which coincides with the mating season. Thus, they might also congregate according to availability of food and cover.

Sex ratio and population structure

Peafowl is a promiscuous species and can increase rapidly when the sex ratio is biased towards female. But, the population under study had sex-ratio biased towards males, and it is considered that in a promiscuous species, a population with more females than males has a higher reproductive potential than does one that is predominantly male (Spillet 1966). Similar result was obtained by Sharma (1978) in Jodhpur where the sex ratio was 170-210 males: 100 females, but Johnsingh and Murali (1978) reported an inverse relationship in a rural landscape in South India, with 47 males: 100 females.

Age structure is generally an indicator of the reproductive potential of a species. A high percentage of young as compared to adults generally indicates a fast growing population. In contrast, a relatively small percentage of young usually indicates a sluggish rate of population increase. The ratio of female to chick also indicates that the population is declining. So, both the sex ratio and the age structure of the population suggests that the present population is declining. There is a likelihood that the proportion
of older individuals would increase with the progress of time, and they would die out on reaching their physiological life span.

Density

The density estimates of this population varied slightly between the two years from 1.2 to 1.3 individuals per hectare. The other comparable figures estimated by Johnsingh and Murali (1978) ranged from 1-2 birds per hectare in rural agricultural landscape. Trivedi (1993) estimated average peafowl density in Gir National Park to be 4.48 birds per hectare. It is evident that the study population is not fairing well.

Mortality

The peafowl in this study area suffered mortality principally due to predation. The natural predator was jungle cat, although stray dogs were also seen chasing peafowl in open areas. However, the major cause of population decline was man, as the local authorities cut away the Capparis bushes, which were then used by villagers as fuel. The removal of bushes exposed the area, affecting the breeding success of peafowl and, hence, only four chicks were produced in 1993 and no chick was produced in 1994. According to Hill and Robertson (1988), the principal population regulatory mechanism of galliformes is predation, which can be true for peafowl as well, as it is a large and long lived bird.
Exponential rate of increase

During the study period, the exponential rate of increase (r) had a negative trend. The main reason were habitat destruction and poaching of eggs. In other areas reports of peacock killings have been made recently (Times of India, 28/02/95 and 08/03/95). It seems to me that peafowl populations are flourishing only in those areas where they are protected due to religious sentiments. In the only other comparable study conducted in South India, a declining trend in peafowl population was found (Thirumurthy et al. 1993).

Dispersal

Local population changes may be due to the movement of individuals between populations. Such movement is referred to as dispersal. Dispersal is accomplished due to two reasons- to regulate population density and to avoid inbreeding. There are two types of dispersal (Greenwood 1980). Natal dispersal can not be explained for the study population because the individuals were not marked. But, the monthly age structure and sex ratio of the population suggest that breeding dispersal occurs in peafowl and is definitely sex-biased towards females. The juvenile males also show wandering movement.

Adult peacocks tend to establish display sites, most probably, at the same place every year and so most dispersal may be accomplished.
by young males. Females of lek-breeding species tend to visit several leks before mating and so may show dispersal. Interlek movements by yearlings has been supported in sage grouse too (Dalke et al. 1960; Emmons and Braun 1984; Dunn and Braun 1985). Yearling males may be moving among leks more frequently because they are inexperienced at breeding and may need to investigate several leks before establishing a territory. Female-biased dispersal has been documented in sage grouse (Dunn and Braun 1985); spruce grouse (Keppie and Towers 1992) and ruffed grouse (Small and Rusch 1989). Female-biased dispersal is a general phenomenon in galliform birds, both polygynous species (e.g. Robel et al. 1972; Gates and Hale 1974; Jamieson and Zwickel 1983; Dunn and Braun 1985; Small and Rusch 1989), as well as monogamous species (Jenkins et al. 1967; Hoffman and Braun 1975; Martin and Hannon 1987).

The maintenance of group size of females and immature males for so long (Yasmin, in press) could be one strategy to avoid inbreeding. By living in groups, individuals could recognize close relatives.

3.4 SUMMARY

1. The sex-ratio of peafowl population under study was biased towards males.

2. There were larger proportion of older individuals in the population and population showed a declining trend. The principal cause was egg robbery by local people.
3. The population density was on an average one individual per hectare.

4. Breeding dispersal was biased towards females.