IMPACT OF MODERN AGRICULTURAL PRACTICES ON POPULATION DENSITY OF INDIAN PEAFOWL (PAVO CRISTATUS) IN HARYANA, INDIA

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ABSTRACT
Impact of changing cropping pattern, increased pesticide usage and mechanized farming on the population density of Indian peafowl was studied in Ambala, Kurukshetra, Karnal and Yamuna Nagar districts of Haryana. The study area selected is dominated by agricultural lands under the cultivation of rice, wheat and sugarcane. Density of Indian peafowl was quite low in wheat and paddy fields but was high in orchards. Peafowl in orchards was found in microhabitat Cyonodon whereas in sugarcane it preferred Cenchrus. Pesticides used in orchards had less effect on the population density while those used in wheat and paddy decreased the population density immensely. In mango orchards where harvesting was done manually both eggs and fledglings were found while in wheat fields where combine harvesters were used occurrence of eggs and fledglings was nil. Maximum covey size of Indian peafowl was observed in orchards whereas, no coveys were found in paddy or wheat. Habitat loss due to rapid urbanization, decreasing number of orchards as well as use of pesticides and mechanized farming pose serious threat to peafowl in the study area.

Key words: Cropping pattern, Haryana, Indian peafowl, Pesticides, Population density.

INTRODUCTION
Indian Peafowl (Pavo cristatus), the national bird of India, is a species of bird in the genus Pavo of the Phasianidae family of the order Galliformes. It was formerly quite widespread across the Indian subcontinent occupying a variety of habitats (Ali and Ripley, 1989; Madge and McGowan, 2002) but in the last few decades, however, the species has undergone a massive decline due to various reasons like habitat destruction, habitat fragmentation, hunting, poaching, human interference (Shahabuddin and Kumar, 2007) and changes in the cropping pattern (Imam, 2005). Increased pesticide usage in farmlands and mechanized farming also has harmful impact on farm land birds like Peafowl (Budgey, 1994; Chamberlain, 2000).

The cropping pattern in Haryana was quite diversified in 1960’s but has undergone a vast transformation since last three and a half decades. With the advent of ‘Green Revolution’ the cropping pattern changed and wheat-rice became the major crop pattern in the state. The cultivation of pulses became marginalized and declined sharply (J aglan, 2005). The number of orchards also decreased as farmers preferred cash crops (Mangala et al., 2009). Changes in cropping pattern in favour of rice, wheat and sugarcane has not only removed the foraging and breeding habitats of Indian Peafowl but also has increased the input of pesticides that has severely affected the population of Indian Peafowl in Haryana.

At present there is no information on the current status and distribution of peafowl in Haryana. Questionnaire survey by Choudharyand and Sathyakumar, 2007 hints at the declining population of peafowl in the state but this needs to be substantiated by experiential data (Ramesh and McGowan, 2009). To understand the species status and more detailed habitat preference, survey was conducted in different areas of Haryana. Haryana being predominantly an agricultural state and as the species survives in agricultural lands, there is probability of pesticide contamination in Indian peafowl which can have adverse impact on its population density. Thus, there is need to analyze the relationship between current agricultural practices and survival of the species. The present
paper focuses on impact of changing cropping pattern, modern farm machinery used today and pesticides used on the population density of peafowl.

Survey was conducted in Ambala, Karnal, Kurukshetra and Yamuna Nagar districts of Haryana where sugarcane, wheat and rice are the predominant crops. Study area was divided into number of survey sites. Population density was obtained using line transect method (Bibby, et.al. 2000). At least 3-4 transects of 1-2 km were laid in each survey site to analyze the density of Indian peafowl. Information regarding agricultural practices was obtained by interviewing local farmers and by visual interpretation of fields. Dynamics regarding agricultural system in Haryana was collected from Krishi Vigyan Kendra, Ambala. Density and population size estimation was based upon distance sampling theory (Buckland et. al., 2001) and SPSS 7.5. Kruskal-wallis was conducted to estimate variation in density indices between encounter rates in different study sites. Spearman-rank correlation was performed between mean density and pesticide impact.

Table 1 shows the density index of Indian peafowl with respect to weedicides and insecticides used. It also shows different herbal microhabitats occupied by peafowls in different fields. Mango orchards have high density of peafowls (8.6 birds/km$^2$) while paddy and wheat fields have very less density (3.9 & 3.4 birds/km$^2$ respectively). Table 1 clearly indicates that the weedicides and insecticides used in wheat and paddy fields adversely affect the density of peafowls as compared to those used in orchards. This is perhaps due to the feeding habits of Indian Peafowl which forages on ground and is virtually omnivorous eating everything from grain and green crops to insects, small reptiles, mammals, and even small snakes (Ali and Ripley, 1989). Wild herbs like Dichanthium annulatum, Pluchea lanceolata, Achyranthes aspera and Panicum antidotale have also been reported to be consumed by Peafowls (Yasmin, 2011). Both insecticide and weedicide indirect effect act predominantly via reduction in food supplies of birds by reducing the numbers of target and non target insects and weeds (Bright et al., 2008). Moreover, consumption of grains and weeds sprayed with pesticides is toxic to the farmland birds like peafowl (Fuller et al., 1995; Mitra et al., 2011). There have been reports of the large scale mortalities of Peafowl due to high pesticide use in agricultural lands and the population being drastically decreased in certain areas of Haryana especially in the Bhivani, Jhajjar and Kurukshetra districts (Choudhury and Sathyakumar, 2007). Peafowl being top carnivore in the grassland ecosystem might also show bioaccumulation of pesticide residues (Kaphalia et. al, 1981).

Table 1 evidently shows that peafowls inhabit various herbal microhabitats which get destroyed with the use of weedicides. This may have implications for the breeding success of ground nesting species, such as peafowl, due to reduced nest-concealment and effects of pesticides on nesting

<table>
<thead>
<tr>
<th>N</th>
<th>Dominant Crop</th>
<th>Microhabitat</th>
<th>Insecticide/weedicide used</th>
<th>Target Organisms</th>
<th>Mean Density Index(birds/km$^2$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>Mango Orchards</td>
<td>Cymodon</td>
<td>Endosulfan35%EC 2m/lt</td>
<td>Mango plant hopper, fruitley.</td>
<td>8.6</td>
</tr>
<tr>
<td>18</td>
<td>Wheat</td>
<td>Heteropogon</td>
<td>Isoproturon 50 % WP @ 800 gm/acre</td>
<td>Canary grass</td>
<td>3.4</td>
</tr>
<tr>
<td>14</td>
<td>Paddy</td>
<td>Heteropogon</td>
<td>Monocrotophos-36 SL 200 ml /acre</td>
<td>Rice stem borer, green rice leaf hopper</td>
<td>3.9</td>
</tr>
<tr>
<td>16</td>
<td>Sugarcane</td>
<td>Cenchrus</td>
<td>Chloropyriphos 20 EC @ 2.5 litre per acre</td>
<td>Early shoot borer, termites</td>
<td>6.2</td>
</tr>
<tr>
<td>13</td>
<td>Pulses</td>
<td>Dichanthium</td>
<td>Fluchloralin 0.75kg/ha</td>
<td>Chick weed, buck wheat</td>
<td>4.1</td>
</tr>
</tbody>
</table>

N = No. of observations
Table 2: Influence of farm machinery on breeding of Indian peafowl.

<table>
<thead>
<tr>
<th>Dominant crop</th>
<th>Farm machinery</th>
<th>Observed E or F</th>
<th>No. of E/F (Mean)</th>
<th>Covey size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mango Orchards</td>
<td>Manual</td>
<td>E &amp; F</td>
<td>E-6,F-5</td>
<td>7</td>
</tr>
<tr>
<td>Wheat</td>
<td>Combine Harvester</td>
<td>Nil</td>
<td>E-0,F-0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Sickle</td>
<td>E &amp; F</td>
<td>E-3,F-0</td>
<td>0</td>
</tr>
<tr>
<td>Paddy</td>
<td>Sickle</td>
<td>E &amp; F</td>
<td>E-2,F-0</td>
<td>0</td>
</tr>
<tr>
<td>Sugarcane</td>
<td>Sickle</td>
<td>Eggs and fledgling</td>
<td>E-6,F-3</td>
<td>5</td>
</tr>
</tbody>
</table>

E - Eggs, F - Fledglings,

habitability, thus, accounting for very low density, absence of fledglings and low covey size (Table 2) of peafowls in the wheat fields.

On the other hand, in the mango orchards the weeds were not much of a problem in the study area. If required weeding was done manually and insecticides were sprayed usually on the tree foliage, thereby, not affecting the ground flora and fauna. Peafowl being the ground feeding and ground nesting bird is not much affected by the use of pesticides in the orchards. This might account for high density and covey size (Table 2) in orchards. Moreover, the orchards provide proper foraging, roosting and breeding sites due to good canopy cover and dense shrub and herb density as compared to wheat and rice fields.

Table 2 predicts the impact of mechanized farming on the population indices of Indian peafowl. In orchards or fields where harvesting was done manually eggs or fledglings or both were found while where modern machines like combine harvester was used, occurrence of eggs and fledglings was nil. These findings are similar to Budgey (1994) and Chamberlain (2000) who also stated that the modern agricultural practices have adverse effect on the population indices of farmland birds including Indian peafowl. Modern machinery used in farms wipes out all the species from the fields by destroying eggs and nests. Whereas, when harvesting was done manually, whenever farmers came across nests and fledglings they often left the breeding area without harvesting for the survival of eggs and chicks.

Our study indicates that in Haryana the changing crop pattern, increased pesticide usage and mechanized farming has an adverse impact on peafowl population. Since Galliformes species like peafowl are useful indicators of environmental quality (Conroy and Carroll, 2001), the assessment of their status is essential in the present scenario. Our findings would be helpful in deciding the recommended cropping pattern, pesticide dose and agricultural practices both for sustainable agriculture and biodiversity management.

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REFERENCES


