Community structure and habitat associations of lowland grassland birds in Nepal.

Baral, H.S.

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CHAPTER 3
GENERAL REVIEW OF BIRDS IN GRASSLAND
ECOSYSTEMS OF LOWLAND NEPAL

Summary
1. Grasslands in lowland Nepal are extremely rich in avian diversity. However, bird community composition, status, trophic structure and ecological role of birds in grasslands habitat have not been described previously.
2. Three protected areas were surveyed for birds and their presence, absence and abundance were recorded. More than 1000 km was walked during this survey. A total of 222 bird species were observed. A further 64 species recorded from grasslands in lowland Nepal were not observed during the transect surveys.
3. Bird species richness and their populations in grasslands are affected by the arrival of seasonal species during winter and summer. Most bird species in grasslands are breeding residents followed by winter visitors. The majority of resident species are insect-feeders.
4. The number of generalist birds is high compared to the number of specialists. Most of the specialists are resident or breeding birds. Most threatened species are specialist grassland birds.

Keywords: grassland birds, trophic structure, seasonality, guilds, specialists

3.1. Introduction
Avifaunal studies all over the world have contributed significantly to our understanding of the functioning of ecosystems in different vegetation types (Wiens 1973, Wiens and Rotenberry 1981, Skinner et al. 1984, Goriup 1986, Askins 1993, Kujawa 1995, Knuston and Klaas 1997). However, the grassland avifauna in the Indian subcontinent is comparatively little known. Work on the foundation for future bird research and conservation on forest and wetland ecosystems in Nepal has been accomplished by Inskipp (1989), Bhandari et al. (1994), and Bhandari (1998). Therefore, the need was mostly strongly felt to document the grassland avifauna in lowland Nepal.

Lowland Nepal can be defined as all the low-lying ground south of the Mahabharat hills. Based on avifaunal composition, I propose a tentative definition of lowland grasslands as follows "Grasslands lying below 915 m altitude, mainly south of the Mahabharat hills, but also occurring within these hills, mainly along riverine valleys, are known as lowland grasslands."

In this paper I intend to outline the basic elements of grassland bird ecology, for example, trophic structure, seasonal status, threatened status. This information is necessary to understand the ecology of any bird communities in greater detail. Based on this we may be able to visualise the general organisation of bird communities in the lowland grasslands of Nepal.

3.2. Study areas
Lowland Nepal stretches roughly from 80°07' to 88°12'E, covering all the fertile southern plains and river valleys. Once pristine and a prime habitat for wildlife, today only a small fraction of
original vegetation cover exists in these areas (Inskipp 1989). Much has been cleared following the eradication of malaria (Gurung 1983) over the past 5 decades as nearly 50% Nepal’s human population is found in this belt (CBS 1998). Needless to say all the remaining habitats, especially the grasslands, face continued pressure from Nepal’s rapidly growing population. The remaining grasslands inside protected areas are of high biodiversity value and those grasslands outside protected areas are heavily degraded and of little conservation importance.

Lowland Nepal experiences a monsoonal climate with heavy rains from June to September, when >80% of the annual precipitation is received in 4 months. The effect of the monsoon is greater in the east and central areas, and weaker in the west. This is because the monsoon clouds travel from east to west Nepal, hence the eastern parts receive comparatively more rain. The higher peaks in east and central Nepal are concentrated and placed closer to the eastern lowlands than lowlands in the far west. This factor influences the amount of rainfall in east and west Nepal. Generally, there is one winter rain which lasts less than a week between December and January.

3.3. Protected areas

Royal Sukila Phanta Wildlife Reserve (hereafter Sukila Phanta, 28°49' - 28°57' N / 80°07' - 80°15' E) lies in the extreme southwest of the terai covering 15 500 ha, ranging in altitude from 90 m to 270 m (IUCN 1993). Some 54.7% of the reserve is covered by mixed deciduous forest, grassland and marsh in the southwest where soils are of recent alluvium. The remainder is covered in moist deciduous forest and savannah, supported by the better-drained soils on higher terrain in the northeast (IUCN 1993). The reserve possesses the largest grassland phantas (open plains of short grasslands) in Nepal. There is a plan to extend the reserve at the eastern side. When this plan is realised and protection is afforded, more phantas will develop. After this extension, the total area of Sukila Phanta will be 30 500 ha (Tirha Man Maskey pers. comm. 1996). Sukila Phanta has a monsoonal climate but remains drier for a longer period than most areas in lowland Nepal. In April and May, a characteristic warm and dry westerly wind blows across the phantas during the late afternoon generally settling before sunset. Such a dry wind has a significant influence on the avifauna of grasslands here.

Royal Chitwan National Park (hereafter Chitwan, 27°15' - 27°35'N / 83°45' - 84°58'E) is an inner doon valley in the central terai of Nepal between the Siwalik hills in the south and the Mahabharat hills to the north, ranging in altitude from 150 m to 815 m (IUCN 1993). All other protected areas in lowland Nepal lie beyond the final range of hills. The total area of Chitwan is 93 200 ha and is located in the drainage basin of three major rivers, Narayani, Rapti and Reu. Approximately 70% of the park is covered by Sal Shorea robusta forest (Laurie 1978), the remainder being grassland and riverine forests. It possesses numerous small patches of grasslands alongside the rivers. These riverside grasslands vary in width from a few metres to 1500 m.
Koshi Tappu Wildlife Reserve (hereafter Koshi Tappu, 26° 35' – 26° 40' N / 86° 56' – 87° 04' E) occupies 17,500 ha of the Sapta Koshi River floodplain at the most northeasterly extension of the Gangetic Plain. It ranges in altitude from 75 - 81 m (IUCN 1993). The reserve is located between two flood control embankments and is subject to annual flooding. Approximately 70% of the reserve's land area is grassland (Heinen 1993b), although during high flood years a large amount of grassland is altered and replaced by new alluvial deposits.

Additionally, Royal Bardia National Park (hereafter Bardia, 28°38'N81°20'E 96,800 ha), Parsa Wildlife Reserve (hereafter Parsa, 49,900 ha) and Lumbini (1000 ha) were visited within our study period.

3.4. Methods

Transects were laid out in three protected areas, Chitwan, Sukila Phanta and Koshi Tappu. In Table 3.1, a summary is given of the distribution of grassland types defined by Peet et al. (1999) over different sections of our transects. See Chapter 2 for details on how environmental and bird data were recorded from the transect surveys.

A collective list was made of all bird species recorded during the transect surveys, of all species seen at other times during field work, and of species recorded as occurring in grasslands in the literature (Fleming et al. 1984, Rahmani 1988, Majumdar and Bramhachari 1988, Ali and Ripley 1987, Inskipp and Inskipp 1991).

Information on various aspects of these species were based on the following literature sources: diet (Ali and Ripley 1987), habitat (Fleming et al. 1984, Ali and Ripley 1987, Inskipp and Inskipp 1991), breeding and seasonal status (Inskipp and Inskipp 1991). For family taxonomy Inskipp et al. (1996) was followed. Status of threat for the various species was based on Collar et al. (1994) and Baral et al. (1996). Species that are considered globally or nationally threatened are collectively referred to in the following as ‘species of conservation interest’. A few changes were made by including new information on the species’ ecology derived from our fieldwork. Codes indicating the use of grassland by bird species are based on Collar (1996) in which case all species were assigned a code between 1 (obligate grassland species) and 12 (species recorded as stragglers from other habitats). This type of coding was especially useful to find out each bird species’ degree of dependency on grasslands. By assigning codes to different bird species it was also possible to see if certain species were facing greater threats than others. Therefore, I tried to assign such a grassland code to all the birds that were recorded during transect counts and to all other lowland grassland birds. These codes may not be necessarily 100% true and should be treated only as guidelines. Data on optimal grass height for respective bird species were based on observations during this survey. Information was derived from the cited literature for those not recorded during this survey.
Table 3.1. An overview of the distribution of sections in different types of grassland in the three study areas

<table>
<thead>
<tr>
<th>Habitat Code</th>
<th>Sections</th>
<th>Chitwan</th>
<th>Sukila Phanta</th>
<th>Koshi Tappu</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS</td>
<td>30</td>
<td>23</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>IMPC</td>
<td>48</td>
<td>11</td>
<td>37</td>
<td>0</td>
</tr>
<tr>
<td>TA</td>
<td>23</td>
<td>23</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>SSSB</td>
<td>9</td>
<td>9</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ICNP</td>
<td>39</td>
<td>6</td>
<td>33</td>
<td>0</td>
</tr>
<tr>
<td>NARP</td>
<td>26</td>
<td>21</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>PK</td>
<td>17</td>
<td>0</td>
<td>6</td>
<td>11</td>
</tr>
<tr>
<td>FRST</td>
<td>10</td>
<td>3</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>CYMB</td>
<td>4</td>
<td>0</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Wheat</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>208</td>
<td>98</td>
<td>90</td>
<td>20</td>
</tr>
</tbody>
</table>

Key to the codes:

Table 3.2. Summary of bird records in lowland grasslands

<table>
<thead>
<tr>
<th>Description</th>
<th>Column code in Table 3.3</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total species recorded on transects</td>
<td>Transect birds</td>
<td>222</td>
</tr>
<tr>
<td>Species observed during study, but not during transect surveys</td>
<td>Grassland spp. not on transects</td>
<td>42</td>
</tr>
<tr>
<td>Species added from literature but not recorded during our survey</td>
<td>Grassland spp. not on transects</td>
<td>22</td>
</tr>
<tr>
<td>Birds that utilise grasslands all or part of the year</td>
<td>Grassland birds</td>
<td>186</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>All birds</td>
<td><strong>286</strong></td>
</tr>
</tbody>
</table>
Data were stored in Excel and imported into the PARADOX database programme to determine the species-richness, presence-absence, feeding guilds and other basic status of birds recorded on transects. These results are presented on tables throughout this paper. For comparison, data on lists of all birds (transect birds + outside transect this study + literature search) and grassland birds (the 186 species that use grasslands) are also given in tables where possible. The figures discussed in the results are for transect-recorded birds except for those in Table 3.10 where information is derived for all birds. In discussion, however, I also compare data from lists of all bird species and grassland bird list.

3.5. Results
3.5.1. Species richness
Species recorded from transects
More than 1000 km were walked in three protected areas of lowland Nepal during the field seasons of 1996, 1997 and 1998. Of the 31,779 individual birds, 14,782 were seen in Sukila Phanta, 16,625 in Chitwan and 372 in Koshi Tappu. A total of 222 bird species representing 44 families was recorded from the various grasslands in the three protected areas (Appendix 3). A total of 172 species was recorded from Sukila Phanta, 160 from Chitwan and 48 from Koshi Tappu. Of the 222 species recorded in transects, 122 are identified as dependent on grasslands. The best represented families were Muscicapidae with 45 species, Turdidae 15 species, Accipitridae 13 species and Motacillidae and Picidae each with 12 species (Table 3.3). Several bird species dependent on forests or wetlands were also recorded because of the survey methods used to record birds on the transects.

The frequency with which different bird species were observed varied from a single observation to almost a thousand records (Table 3.4). With 964 observations, Common Stonechat *Saxicola torquata* was the most frequently recorded bird on transects of lowland grasslands.

Grassland bird communities
64 species either recorded outside transects or mentioned in the literature as dependent on lowland grasslands were added to the birds recorded on transects. This made a total of 286 species. Of these 286 bird species, the best represented families were Muscicapidae with 59 species, followed by Accipitridae (26), Turdidae (16), Motacillidae (15) and Picidae (12) species. As many as 100 bird species recorded during the transect surveys were forest or wetland dependent birds (Tables 3.2 and 3.3) that were removed selectively to produce a list of grassland birds (Appendix 4). A total of 186 bird species was listed as grassland birds omitting those species classified under code 11 and 12 (Table 3.5). The best represented families among grassland birds were Muscicapidae with 41 species, Accipitridae (25), Motacillidae (15) and Turdidae with 13 species. Of the 33 families represented, as many as 18 families were represented by less than 5 species (Table 3.3).
Table 3.3. A comparison of birds observed on transects, grassland birds not observed and both combined by family.

<table>
<thead>
<tr>
<th>Family</th>
<th>All spp.</th>
<th>Recorded on transects</th>
<th>Grassland spp not on transects</th>
<th>Non-grass-land spp on transects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accipitridae</td>
<td>26</td>
<td>9</td>
<td>23</td>
<td>1</td>
</tr>
<tr>
<td>Alaudidae</td>
<td>7</td>
<td>2</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Alcedinidae</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Apodidae</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Ardeidae</td>
<td>6</td>
<td>4</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Artamidae</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Bucerotida</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Burhinidae</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Caprimulgidae</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Caprimulidae</td>
<td>9</td>
<td>4</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Ciconiidae</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Columbidae</td>
<td>8</td>
<td>8</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Cuculidae</td>
<td>6</td>
<td>5</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Dicaeidae</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Dicruridae</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Emberizidae</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Falcolidae</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Fringillidae</td>
<td>5</td>
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<td>2</td>
</tr>
<tr>
<td>Gruidae</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Hemipodidae</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>3</td>
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<tr>
<td>Hirundinidae</td>
<td>5</td>
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<tr>
<td>Irenidae</td>
<td>2</td>
<td>2</td>
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<td>0</td>
</tr>
<tr>
<td>Leiothrichidae</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Motacillidae</td>
<td>6</td>
<td>5</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Muscicapidae</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>2</td>
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<td>Nectarinidae</td>
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<tr>
<td>Pardidae</td>
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<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Phalacrocoracida</td>
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<tr>
<td>Phasianidae</td>
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<td>12</td>
<td>12</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Ploceidae</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Psittacidae</td>
<td>5</td>
<td>5</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Pycnonotidae</td>
<td>5</td>
<td>5</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Rallidae</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Sittidae</td>
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<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Strigidae</td>
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<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Sturnidae</td>
<td>7</td>
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<td>5</td>
<td>3</td>
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<tr>
<td>Turdidae</td>
<td>16</td>
<td>15</td>
<td>13</td>
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<td>Upupidae</td>
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</tr>
<tr>
<td>Zosteropidae</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>286</td>
<td>222</td>
<td>186</td>
<td>64</td>
</tr>
</tbody>
</table>
### Table 3.4. Frequency of occurrence of the most frequently met species in the three study areas.

<table>
<thead>
<tr>
<th>Species</th>
<th>All areas</th>
<th>Chitwan</th>
<th>Sukila Phanta</th>
<th>Koshi Tappu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saxicola torquata</td>
<td>964</td>
<td>374</td>
<td>579</td>
<td>11</td>
</tr>
<tr>
<td>Timalea pileata</td>
<td>811</td>
<td>530</td>
<td>281</td>
<td>0</td>
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<td>Prinia hodgsonii</td>
<td>670</td>
<td>485</td>
<td>185</td>
<td>0</td>
</tr>
<tr>
<td>Anthus rufulus</td>
<td>569</td>
<td>232</td>
<td>327</td>
<td>10</td>
</tr>
<tr>
<td>Cisticola exilis</td>
<td>556</td>
<td>1</td>
<td>554</td>
<td>1</td>
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<tr>
<td>Saxicola leucura</td>
<td>525</td>
<td>84</td>
<td>429</td>
<td>12</td>
</tr>
<tr>
<td>Saxicola caprata</td>
<td>513</td>
<td>76</td>
<td>437</td>
<td>0</td>
</tr>
<tr>
<td>Prinia subflava</td>
<td>504</td>
<td>245</td>
<td>256</td>
<td>3</td>
</tr>
<tr>
<td>Graminicola bengalensis</td>
<td>440</td>
<td>130</td>
<td>310</td>
<td>0</td>
</tr>
<tr>
<td>Pycnonotus cafer</td>
<td>418</td>
<td>260</td>
<td>152</td>
<td>6</td>
</tr>
<tr>
<td>Alauda gulgula</td>
<td>389</td>
<td>4</td>
<td>377</td>
<td>8</td>
</tr>
<tr>
<td>Francolinus francolinus</td>
<td>320</td>
<td>70</td>
<td>246</td>
<td>4</td>
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<td>Cisticola juncidis</td>
<td>318</td>
<td>88</td>
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<td>9</td>
</tr>
<tr>
<td>Merops orientalis</td>
<td>268</td>
<td>6</td>
<td>261</td>
<td>1</td>
</tr>
<tr>
<td>Prinia flaviventris</td>
<td>263</td>
<td>155</td>
<td>102</td>
<td>6</td>
</tr>
<tr>
<td>Turdoides earlei</td>
<td>257</td>
<td>54</td>
<td>175</td>
<td>28</td>
</tr>
<tr>
<td>Lanius schach</td>
<td>238</td>
<td>173</td>
<td>61</td>
<td>4</td>
</tr>
<tr>
<td>Pavo cristatus</td>
<td>219</td>
<td>166</td>
<td>53</td>
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<tr>
<td>Prinia socialis</td>
<td>198</td>
<td>142</td>
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<tr>
<td>Acrocephalus dumetorum</td>
<td>196</td>
<td>58</td>
<td>136</td>
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</tr>
<tr>
<td>Luscinia svecia</td>
<td>177</td>
<td>1</td>
<td>175</td>
<td>1</td>
</tr>
<tr>
<td>Dicrurus macrocercus</td>
<td>165</td>
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<td>71</td>
<td>5</td>
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<tr>
<td>Turdoides striatus</td>
<td>164</td>
<td>126</td>
<td>38</td>
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</tr>
<tr>
<td>Cettia flavolivacea</td>
<td>162</td>
<td>86</td>
<td>76</td>
<td>0</td>
</tr>
<tr>
<td>Luscinia pectoralis</td>
<td>156</td>
<td>101</td>
<td>55</td>
<td>0</td>
</tr>
</tbody>
</table>

### Table 3.5. Collar's description and codes used in this study from Collar 1996.

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>obligate pure grassland, all year</td>
</tr>
<tr>
<td>2</td>
<td>obligate pure grassland, part year</td>
</tr>
<tr>
<td>3</td>
<td>obligate part grassland, all year</td>
</tr>
<tr>
<td>4</td>
<td>obligate part grassland, part year</td>
</tr>
<tr>
<td>5</td>
<td>obligate quasi-grassland, all year</td>
</tr>
<tr>
<td>6</td>
<td>obligate quasi-grassland, part year</td>
</tr>
<tr>
<td>7</td>
<td>optional pure grassland, all year</td>
</tr>
<tr>
<td>8</td>
<td>optional pure grassland, part year</td>
</tr>
<tr>
<td>9</td>
<td>optional part grassland, all year</td>
</tr>
<tr>
<td>10</td>
<td>optional part grassland, part year</td>
</tr>
<tr>
<td>11</td>
<td>optional quasi-grassland, all year</td>
</tr>
<tr>
<td>12</td>
<td>optional quasi-grassland, part year</td>
</tr>
</tbody>
</table>
3.5.2. Trophic Structure
A total of 37 species was primary consumers (Table 3.6). The majority of these were passerines, 18 of which were frugivores, 16 granivores and 3 nectarivores. Secondary consumers were more numerous than any other level with a total of 141 species being primarily insect-feeders. Although many of these birds might eat seeds occasionally, their staple diet was insects, therefore, their inclusion as insect-feeders. The carnivores, such as birds of prey and owls, were secondary or higher level consumers. The trophic level of mixed consumers (omnivores) was mainly represented by small passerines, which fed equally on both insects and grains.

3.5.3. Seasonal Species
The grassland avifauna in lowland Nepal was dominated by resident birds. As many as 154 species (69%) were residents. In winter, 53 species (24%) were added to the grassland bird community, mainly altitudinal migrants from the Himalayas (Ali and Ripley 1987, Inskipp and Inskipp 1991). The remainder of the bird community (7%) is comprised of summer and passage migrants (Table 3.7).

3.5.4. Insectivores and Residents
Insectivorous resident birds dominate the lowland grassland avifauna. Among the insectivores more than half (63%) are resident, 28.4% winter migrants and rest are comprised of summer, passage migrants and vagrants. A total of 15 species was found to be threatened at the national or global level of which 12 were resident, 2 summer migrants and 1 winter migrant. Of the total 34 obligate grassland birds as many as 22 were insectivorous birds. Out of these, 18 were resident and the rest were migrants (Tables 3.4 and 3.8). More than half of birds of conservation interest were insectivores, viz 15 of the 27.

3.5.5. Collar's Code for Grassland Birds
Based upon the use of grassland habitat, Collar (1996) suggested 12 theoretical codes for classifying grassland birds (Table 3.5). Nearly one seventh of the total 222 species (Appendix 3) recorded during the grassland bird survey was classified as 'obligate grassland birds'. On the other hand, a total of 186 species was considered to be dependent on pure grasslands or quasi grasslands all year round or during a certain time of year (Appendix 4). A high number of 100 species recorded in transect surveys were considered to be edge species.

3.5.6. Specialist Grassland Birds
Grassland specialists can be defined as species found exclusively in grasslands or grassland-like habitats (quasi grasslands) or dependent on them as breeding or wintering habitat during a significant part of their life cycle. A grassland specialist will be assigned any of the grassland codes 1 to 6 as described by Collar (1996, see also Table 3.5). A further distinction can be made between the specialists either of tall grasslands (meaning >50cm grass height) or of open grasslands (meaning
### Table 3.6. Summary on guilds of grassland birds.

<table>
<thead>
<tr>
<th>Guilds</th>
<th>All birds</th>
<th>Transect birds</th>
<th>Grassland birds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insectivore</td>
<td>165</td>
<td>141</td>
<td>95</td>
</tr>
<tr>
<td>Carnivore</td>
<td>34</td>
<td>14</td>
<td>33</td>
</tr>
<tr>
<td>Omnivore</td>
<td>32</td>
<td>22</td>
<td>29</td>
</tr>
<tr>
<td>Granivore</td>
<td>23</td>
<td>16</td>
<td>21</td>
</tr>
<tr>
<td>Frugivore</td>
<td>19</td>
<td>18</td>
<td>5</td>
</tr>
<tr>
<td>Piscivore</td>
<td>8</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Nectarivore</td>
<td>3</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Apivore</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Molluscivore</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

### Table 3.7. Status of bird species in lowland grasslands.

<table>
<thead>
<tr>
<th>Status</th>
<th>All birds</th>
<th>Of conservation</th>
<th>Transect birds</th>
<th>Grassland birds</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Interest</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resident</td>
<td>180</td>
<td>28</td>
<td>154</td>
<td>104</td>
</tr>
<tr>
<td>Winter</td>
<td>79</td>
<td>7</td>
<td>53</td>
<td>63</td>
</tr>
<tr>
<td>Summer</td>
<td>14</td>
<td>3</td>
<td>12</td>
<td>7</td>
</tr>
<tr>
<td>Passage migrant</td>
<td>10</td>
<td>0</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>Vagrant</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

### Table 3.8. Insectivorous birds in lowland grasslands.

<table>
<thead>
<tr>
<th>Status</th>
<th>Total</th>
<th>Of conservation</th>
<th>Transect birds</th>
<th>Grassland birds</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>interest</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resident</td>
<td>95</td>
<td>13</td>
<td>89</td>
<td>50</td>
</tr>
<tr>
<td>Winter</td>
<td>49</td>
<td>3</td>
<td>40</td>
<td>32</td>
</tr>
<tr>
<td>Summer</td>
<td>13</td>
<td>2</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td>Passage migrant</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Vagrant</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

35
<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>English Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acrocephalus agricola</td>
<td>Paddyfield Warbler</td>
</tr>
<tr>
<td><em>Acrocephalus bistriciceps</em></td>
<td>Black-browed Reed-Warbler</td>
</tr>
<tr>
<td><em>Acrocephalus orientalis</em></td>
<td>Oriental Reed Warbler</td>
</tr>
<tr>
<td>Amandava amandava</td>
<td>Red Avadavat</td>
</tr>
<tr>
<td>Asio flammeus</td>
<td>Short-eared Owl</td>
</tr>
<tr>
<td>Burhinus oedicnemus</td>
<td>Eurasian Thick-knee</td>
</tr>
<tr>
<td>Caprimulgus affinis</td>
<td>Savanna Nightjar</td>
</tr>
<tr>
<td>Centropus bengalensis</td>
<td>Lesser Coucal</td>
</tr>
<tr>
<td>Chrysomma alirostre</td>
<td>Jerdon's Babbler</td>
</tr>
<tr>
<td>Chrysomma sinense</td>
<td>Yellow-eyed Babbler</td>
</tr>
<tr>
<td>Chaetornis striatus</td>
<td>Bristled Grassbird</td>
</tr>
<tr>
<td>Cisticola exilis</td>
<td>Golden-headed Cisticola</td>
</tr>
<tr>
<td>Cisticola juncidis</td>
<td>Zitting Cisticola</td>
</tr>
<tr>
<td>Dumetia hyperythra</td>
<td>Tawny-bellied Babbler</td>
</tr>
<tr>
<td>Francolinus gularis</td>
<td>Swamp Francolin</td>
</tr>
<tr>
<td>Graminicola bengalensis</td>
<td>Rufous-rumped Grassbird</td>
</tr>
<tr>
<td>Houbaropsis bengalensis</td>
<td>Bengal Florican</td>
</tr>
<tr>
<td>Ixobrychus cinnamomeus</td>
<td>Cinnamon Bitter</td>
</tr>
<tr>
<td>Lonchura malacca</td>
<td>Black-headed Munia</td>
</tr>
<tr>
<td>Megalurus palustris</td>
<td>Striated Grassbird</td>
</tr>
<tr>
<td>Ploceus benghalensis</td>
<td>Black-breasted Weaver</td>
</tr>
<tr>
<td>Ploceus manyar</td>
<td>Streaked Weaver</td>
</tr>
<tr>
<td>Ploceus megarghynchus</td>
<td>Fina's Weaver</td>
</tr>
<tr>
<td>Prinia flaviventris</td>
<td>Yellow-bellied Prinia</td>
</tr>
<tr>
<td>Prinia gracilis</td>
<td>Graceful Prinia</td>
</tr>
<tr>
<td>Saxicola insignis</td>
<td>Hodgson's Bushchat</td>
</tr>
<tr>
<td>Saxicola jerdoni</td>
<td>Jerdon's Bushchat</td>
</tr>
<tr>
<td>Saxicola leucura</td>
<td>White-tailed Stonechat</td>
</tr>
<tr>
<td><em>Sypheotides indica</em></td>
<td>Lesser Florican</td>
</tr>
<tr>
<td>Timalia pileata</td>
<td>Chestnut-capped Babbler</td>
</tr>
<tr>
<td>Turdoides earleii</td>
<td>Striated Babbler</td>
</tr>
<tr>
<td>Turdoides longirostris</td>
<td>Slender-billed Babbler</td>
</tr>
<tr>
<td><em>Turnix sylvatica</em></td>
<td>Small Buttonquail</td>
</tr>
<tr>
<td><em>Tyto longimembris</em></td>
<td>Eastern Grass Owl</td>
</tr>
</tbody>
</table>

*Not recorded during our study period*
grass height <50cm) (Table 3.9). The former includes species such as Chestnut-capped Babbler *Timalia pileata*, Bright-headed Cisticola *Cisticola exilis* while the latter includes several species of pipits, wagtails, larks etc. A list of tall grassland specialists is given in table 3.10.

### 3.6. Discussion

Subtropical riverine grasslands that grow in north India and lowland Nepal are of high conservation value for a number of grass assemblage types, threatened birds and animals (Groombridge 1994, Collar 1996, Peet1997). Birds are a significant part of faunal life in lowland grasslands.

Although several non-grassland bird species are described from transects (Appendix 3), a total of 222 species recorded from Nepal's lowland grasslands is an outstandingly high number. The most noticeable difference between the birds recorded on transects (Appendix 3) and the grassland bird lists (Appendix 4) was the low number of birds of prey recorded in transect counts. This shows that though the number of birds of prey dependent on grasslands seems large, many are rare in Nepal’s lowland grasslands.

Several species that are considered grassland birds at the same time also use other habitat types especially the wetlands. Examples are, White-throated Kingfisher *Halcyon smyrnensis*, Lesser Adjutant *Leptoptilos javanicus*, Red-naped Ibis *Pseudibis papillosa* and Sarus Crane *Grus antigone*. All these birds have been noted utilising short grasslands as much as they do wetlands, therefore, it seems justified to treat them as grassland birds. It is interesting that of the 222 birds recorded on transects, as many as 100 species are non-grassland birds viz. 45% of the total bird species recorded. These species fed on the forest/grassland margins and were recorded also from isolated trees in grasslands. These were rare and uncommon in grasslands and are considered as stragglers. The role of these stragglers in structuring bird communities in lowland grasslands is assumed to be of less importance than their help in energy transfer from one ecosystem to another. Many generalists such as *Saxicola torquata*, Long-tailed Shrike *Lanius schach*, Indian Roller *Coracias benghalensis*, bee-eaters *Merops* sps. including several edge species may have an important link in the transfer of energy from grasslands to forests/wetlands and vice-versa.

Grassland birds' trophic structure is dominated by secondary consumers. This structure is more or less the same for pure grassland birds and also for those birds recorded on transects during this study. In USA, a study on grassland birds has shown that the number of mixed and higher level consumers (tertiary) is greater than any other trophic level (Glover 1969). However, in lowland grasslands, the tertiary level of consumers was significantly lower than the secondary level. This may be an indication that grasslands in lowland Nepal (and probably also in northern India) are richer in insect fauna, hence the larger number of insectivore bird species. Similarly resident species seem to be dominant among the insect feeding species. Many of the insectivorous resident species
also show habitat specialisation. Several of these are threatened because of habitat specialisation and probably also because of specialist food needs.

Resident species dominate grassland avifauna. Three-quarters of birds recorded on transects seem to be residents. This number is, however, less for grassland birds (Appendix 4) because most grassland species that are not seen during this survey are rare migrants.

Many bird species are dependent on habitats other than grasslands while on migration. Most winter migrants to Nepalese grasslands are altitudinal that come from the mid-hills and higher Himalayas. Some of the winter birds, for example, Hodgson’s Bushchat *Saxicola insignis*, are long distance migrants from the steppes of Russia, Kazakhstan and Mongolia (Ali and Ripley 1987, Collar *et al.* 1994). Almost all the birds classified as globally threatened are residents with the exception of *Saxicola insignis*, which is perhaps the longest migrating specialist to tall grasslands of lowland Nepal and northern India in winter.

In all, 186 species are listed as grassland birds (Appendix 4). Relatively few species are found to be grassland specialists, most being generalists. This generalist adaptation within a specialised habitat marks birds out for rapid movement to exploit local abundance and insect plagues, which is likely to be a cardinal factor in the general stability and continuity of grassland systems (Collar 1996). Many of the grassland specialists are threatened and even those specialists presently considered safe are restricted to protected areas (Inskipp and Inskipp 1991, Collar *et al.* 1994, Baral *et al.* 1996).

If we are to conserve the fauna restricted to grassland habitat, a massive grassland conservation programme should be implemented. Conservation of lowland grasslands should be made high on the priority list of conservationists in Nepal. Specific studies should be made of the grassland avifauna and made available to grassland managers. Issues of conservation importance are discussed more fully in Chapter 8 where species than need immediate conservation are listed as guidelines for the conservation and research of the threatened grassland avifauna (Table 8.4).