Avian Diversity in Different Habitats in Wetland of Yellow River National Nature Reserve, Henan Province

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Abstract: A census on bird has been carried out in the wetland of Yellow River National Nature Reserve in Henan Province from September 2006 to August 2007. 247 species belonging to 53 families and 16 orders have been recorded. The avian species number, avian abundant grade, diversity, as well as similarity in four different habitats (hill, bottomland, water area, manual forest) are analyzed. The avian species number, G-index and F-index are the highest in the bottomland. The avian composition of the hill and the manual forest is similar.

Keywords: Wetland of Yellow River National Nature Reserve; avian diversity; G-F index

1 Method

1.1 Field survey

Our survey was designed to obtain a basic understanding of biodiversity and habitat use in the study area. We conducted surveys using three different methods: (1) Visual surveys, (2)点数法, and (3) 目视观察法. 

Visual surveys were conducted in the study area during the breeding season, from April to June. We used a combination of visual observations and direct counts to estimate the abundance and distribution of species in each habitat type. We systematically laid out transect lines across different habitats and sampled all visible birds along these lines. This method allowed us to collect data on bird species richness, abundance, and distribution within the study area.

Point count surveys were conducted from July to September, focusing on avian species known to be present in the study area. These surveys involved setting up observation points and counting birds seen within a 10-minute period. This method provided data on the relative abundance and distribution of species within each habitat type.

1.2 Species richness and diversity

Species richness was calculated using the formula: S = N + 1, where N is the number of species observed. Diversity was assessed using the Shannon-Wiener index (H' = -Σpi log2 pi), where pi is the proportion of individuals belonging to species i. We used the G-F index to compare the diversity patterns among different habitats. 

2 Results and discussion

2.1 Avian species composition

A total of 129 species were recorded in the study area, representing 16 orders and 53 families. The most abundant groups were Passeriformes (53 species) and Charadriiformes (19 species). 

2.2 Avian diversity

Compared to the hill habitat, the bottomland habitat supported a greater diversity of avian species, as indicated by the higher G-F index. However, there was no significant difference in diversity between the hill and manual forest habitats.

2.3 Avian habitat use

The results showed that different habitats supported different avian communities. The bottomland habitat was characterized by a high diversity of species, while the hill habitat supported a more species-rich community. This pattern was consistent with previous studies in similar environments.

Acknowledgments

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References


Appendix

A list of the recorded avian species is provided in the supplementary material.
表 1 河南黄河湿地国家级自然保护区鸟类目、科、种组成分析

<table>
<thead>
<tr>
<th>科</th>
<th>种</th>
<th>种所占百分比%</th>
</tr>
</thead>
<tbody>
<tr>
<td>鳥類目</td>
<td>1</td>
<td>1.62</td>
</tr>
<tr>
<td>鶴形目</td>
<td>2</td>
<td>1.21</td>
</tr>
<tr>
<td>鶴形目</td>
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<td>5.67</td>
</tr>
<tr>
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<td>12.55</td>
</tr>
<tr>
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<td>3</td>
<td>9.31</td>
</tr>
<tr>
<td>鶴形目</td>
<td>4</td>
<td>1.62</td>
</tr>
<tr>
<td>鶴形目</td>
<td>3</td>
<td>4.05</td>
</tr>
<tr>
<td>鶴形目</td>
<td>8</td>
<td>15.79</td>
</tr>
<tr>
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</tr>
<tr>
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</tr>
<tr>
<td>鶴形目</td>
<td>1</td>
<td>2.43</td>
</tr>
<tr>
<td>鶴形目</td>
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<tr>
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</tr>
<tr>
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<td>1</td>
<td>0.40</td>
</tr>
<tr>
<td>鶴形目</td>
<td>1</td>
<td>2.43</td>
</tr>
</tbody>
</table>

种，旅鸟 23 种。分析该生境鸟类区系成分，其中古北种 77 种，东洋种 17 种，广布种 40 种。

滩地的国家级重点保护鸟类有 21 种，多为雁形目、鸭形目和鶥形目的鸟类。如大雁和黑鹳每年在滩地越冬，其中记录到大雁最大种群数量 52 只，黑鹳种群数量 25 只。

从图可以看出，3～6 月冬候鸟迁走，夏候鸟开始迁来，鶥形类及鶥形科的一些旅鸟路过滩地停留，鸟类种类和数量都是最少的。10～11 月，冬候鸟回囬，夏候鸟迁走的时期，鸟类种类和数量较多，因为一些候鸟的北迁和南迁的路线不同，导致春秋季鸟类种类和数量不同。

滩地农田人为活动频繁，鸟类种类却是最多的，分析有以下几点原因。首先滩地本在邙山岭和黄河河道之间，生境多样，成为一些山林鸟和河道水鸟的过渡区，冬季农作物多为小麦，雁鸭类多在此取食。大量滩地形成人工湿地，如扣马村周围有 660 hm² 的荷塘和鱼塘，一些废弃的滩地重新长满芦苇，滩地有大量林田间作的树木。第二是平坦的滩地适合禽鸟活动。其三是农民的耕作方式较为粗放，干扰相对较少。尤其是荷塘，每年 4 月下旬种上莲菜开始放水，然后很少再管理，莲菜收获时间长，从 10 月持续到来年 4 月，能给鸟类提供相对安静的空间。

2.2.3 水域鸟类多样性组成 水域记录到鸟类 119 种。主要由鸥鸟目、雁形目、鶥形目、鶥形目、鹳形目及鶥形科的鸟类组成。优势种如豆雁、青头鸭、赤麻鸭、红头潜鸭、灰沙雁等。常见种如小鷄鷄、鷄鷄、鸭、风头麦鸡、普通翠鸟、灰鹤等。其中夏候鸟 43 种，旅鸟 38 种，夏候鸟 21 种，留鸟 15  种，迷鸟 2 种。分析该生境鸟类区系成分，有古北种 85 种，占总数的 71.67%；广布种 28 种，占总数的 23.33%，东洋种 6 种，占总数的 5%。

水域有国家级重点保护鸟类 19 种，多为雁形目和鶥形目鸟类。如大天鹅每年在水域越冬，记录到最大种群数量 800 只。灰鹤最大种群数量 247 只。

从图可以看出，随季节变化，水域鸟类的种类及数量变化极大。冬季的 10 月到翌年 2 月，数以千计的鴴类在此越冬，4 月下旬冬候鸟北迁后，水面及滩涂上只有少数留鸟如小鷄鷄、绿头鸭、灰鹤等过冬，夏候鸟如灰沙雁、普通燕鸥等。6 月中旬小浪底水库进行为期 20 天的调洪调沙实验，洪水卷起混浊的泥沙向黄河入海，黄河的夹心滩和岸边嫩滩涂被水流侵没。7～8 月是黄河的汛期，所以 6 月底至 8 月，除了在河面上空盘旋的灰沙雁、普通燕鸥外，水面上很少有水鸟的踪迹。如 2007 年小浪底在 6 月 8 月进行了两次调洪调沙，河面上更是鸟踪难寻。9 月下旬至 11 月，雁类等和鶥形目、鶥形目的冬候鸟又会成群结队的来迁。

2.2.4 人工林鸟类多样性组成 人工林生态记录到 98 种鸟类，其中留鸟 38 种，夏候鸟 21 种，冬候鸟 19 种，旅鸟 20 种。古北种 48 种，东洋种 21 种，广布种 29 种。优势种为山斑鸠、灰斑鸠、喜鹊等。常见种为白鹭、大杜鹃、红尾伯劳等。该生境鸟类种类和数量随着季节略有变化。5 月和 10 月种类达到最多。因为苍鹭、白鹭、池鹭、夜鹭等在人工林内培育雏，所以在 6～9 月鸟类数量最多。人工林有国家级重点保护鸟类 21 种。为雁形目和鶥形目鸟类。
采用 SPSS12.0 统计软件进行统计学处理，实验所得数据均以平均数加减标准差表示，并检验。

2 结果

表 1 不同强度有氧运动对大鼠血液 FFA、肌肉 FFA 的影响

<table>
<thead>
<tr>
<th>指标</th>
<th>A 组(n=10)</th>
<th>B 组(n=10)</th>
<th>C 组(n=10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>血液 FFA (μmol/L)</td>
<td>625.03 ± 53.82 *</td>
<td>627.12 ± 49.64 **</td>
<td>251.36 ± 48.31</td>
</tr>
<tr>
<td>肌肉 FFA (μmol/gprot)</td>
<td>46.73 ± 9.24 **</td>
<td>47.02 ± 9.51 **</td>
<td>22.59 ± 8.72</td>
</tr>
</tbody>
</table>

与 C 组比较 * P < 0.05, ** P < 0.01 水平

表 2 不同强度有氧运动对大鼠血脂和脂肪蛋白以及相关指标的影响

<table>
<thead>
<tr>
<th>指标</th>
<th>A 组(n=10)</th>
<th>B 组(n=10)</th>
<th>C 组(n=10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TG (mg/dL)</td>
<td>54.35 ± 6.11</td>
<td>53.31 ± 8.39</td>
<td>56.27 ± 9.84</td>
</tr>
<tr>
<td>TC (mg/dL)</td>
<td>74.75 ± 7.34</td>
<td>73.25 ± 6.63</td>
<td>75.84 ± 4.73</td>
</tr>
<tr>
<td>LDL (mg/dL)</td>
<td>24.01 ± 11.46 *</td>
<td>31.84 ± 14.22</td>
<td>30.04 ± 12.17</td>
</tr>
<tr>
<td>HDL (mg/dL)</td>
<td>38.86 ± 9.92 **</td>
<td>28.24 ± 9.78</td>
<td>33.30 ± 14.6</td>
</tr>
<tr>
<td>BW (g)</td>
<td>199.2 ± 12.4</td>
<td>172.3 ± 15.5 *</td>
<td>199.0 ± 13.9</td>
</tr>
<tr>
<td>BGLU (mmol/L)</td>
<td>8.78 ± 0.72 **</td>
<td>9.61 ± 0.45 **</td>
<td>6.83 ± 0.97</td>
</tr>
<tr>
<td>Upro (mg/g)</td>
<td>51.64 ± 31.54</td>
<td>97.6 ± 40.1 **</td>
<td>35.2 ± 24.6</td>
</tr>
</tbody>
</table>

与 C 组比较 * P < 0.05, ** P < 0.01 水平

3 讨论

3.1 不同强度有氧运动对大鼠血液 FFA、肌肉 FFA 的影响

不同强度有氧运动后，A、B 两组大鼠血清 FFA、肌细胞 FFA 较 C 组均有极显著性升高，故中等强度的有氧运动即可促进大鼠利用脂肪酸供能的能力。

3.2 不同强度有氧运动对大鼠血脂和脂肪蛋白以及相关指标的影响

实验表明8周不同强度有氧运动训练对血清总胆固醇 (TC) 及甘油三酯 (TG) 影响不大。而国内外对有氧运动能否降低血清总胆固醇 (TC) 及甘油三酯 (TG) 含量的

报道尚不一致 (赵瑞祥等, 1998; 徐晓春, 2004)，这可能与采用的实验对象、运动方式、运动强度、持续时间等因素有关。

研究表明，经常参加有氧运动锻炼可使体重维持恒定 (田振军等, 1999)，体瘦者与体胖者相比高密度脂蛋白 (HDL) 水平高，故认为只控制体重，不参加体育运动就不可保持较高的血脂水平。而本实验表明，中等强度有氧运动，体重基本恒定，高密度脂蛋白 (HDL) 明显升高，低密度脂蛋白 (LDL) 略有降低；而高强度有氧运动，体重、血脂、尿蛋白变化明显，高密度脂蛋白 (HDL) 明显升高，血脂代谢出现异常波动。所以只控制体重不参加有氧运动或认为大强度运动可大幅度降低体重的两种极端都不可取；而规律的、长期的、适当的有氧运动可改善代谢，有益健康。

4 参考文献