What Characterizes an Urban Bird?

H. Elliott McClure*

Abstract This is a review of the urban birds of eastern Asia and of the United States comparing their modifications for city life which have made them successful in that environment. It compares the habitat use by 848 species in Malaysia, Thailand, Japan and United States as seen among 30 locations where more than a million birds were tallied from 1941 through 1988. Using a criterion that an urban bird species was one in which at least one-third of the population was found in city environs, 70 species fell into this category. Compared by 113 characteristics of bird bionomics these species had similarities which suggested that having or developing those characteristics enhanced their success as urban birds. These are listed.

Foreward

I am honored to be asked to participate in this memorial issue for Dr. Yamashina. We were friends and associates occasionally meeting at the Institute or over lunch for a quarter of a century. I greatly valued his support and interest and he was an inspiration to young ornithologists or biologists that both of us helped along the way. I wish to dedicate this study to him. It covers a lifetime of bird-watching nearly half of which was in eastern Asia.

Introduction

Although lists of late Pleistocene avifaunas are available (H. Howard, 1962, Alan Feduccia, 1980) they tell us little about the distribution and organization of global bird populations. Early man was a hunter and gatherer (Dunn, 1975, Hodden, 1959, McNeely and Wachtek, 1988, William-hunt, 1952) and because of the small size and high mobility of birds, he probably had less of an impact upon them than he did upon the mammals near his camps or villages. Folklore and tribal rituals tell us of the importance of birds in his mythology. As his technology advanced, especially in Mediterranean environments, his agricultural and city impacts upon local biota became more destructive and disruptive. Bird faunas were displaced or altered as man’s populations and land use increased and this would have resulted in genetic variation to permit survival under these more rigorous conditions. This genetic change must have taken place in Asia Minor, India and northward through Europe over several thousand years before the time of Linnaeus. During the 17th and 18th centuries thinking biologists were attempting to see organization or orderly progression among the living things about them. Linnaeus and others were attempting to describe and classify all of the

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known plants and animals. From such descriptions it is evident that most wild bird species of central and southern Europe (and possibly Asia) capable of doing so had already established themselves as urban birds.

The North and South American continents were virgin. Their biota had been arranged climatically and geographically over millions of years without the interfering hand of man. American Indians, of Asian origin, over much of North or South American had never reached an abundance to effectively alter the environments around them. With the advent of Europeans it took less than three hundred years to reduce the vast ecological systems (eastern deciduous forests, grassland prairies, montane evergreen forests) to mere fragments and all of the fauna in these ecosystems had to adjust or face extinction (Keller, 1983). Most birds reach breeding maturity and can pass on their genes the year following hatching (i.e. at one generation a year). At most, North American birds have had fewer than 300 generations in which to adjust genetic patterns to be acceptable to or compatible with the modern environmental fragmentation and pollution.

In the present century, tropical environments supporting rain and deciduous forests are being assailed by massive destruction and disruption. Whereas societies, both human and animal, in the rest of the world have had centuries to adjust to these disturbances, in tropical environments, the biota have had only a few generations in which to adjust. The burst of technocracy and the human population have greatly accelerated environmental deterioration in north temperate habitats and they are overwhelming the vast remnant tropical forests which in the past have withstood or dominated man. Human societies are faced with massive biotic extinctions world-wide and especially in tropical habitats because humankind has not developed the individual and social disciplines necessary to permit an understanding of natural ecosystems and an economic adjustment to provide for their adequate survival.

My purpose in this present discussion is to seek an answer to the question: “With our present knowledge of avian fauna and its world distribution, can we look at the species being displaced in the present deforestation of tropical lands and select those which we can expect to survive under urban conditions?” From this question arises another: “Are the characteristics exhibited by urban birds universal enough that we can identify them as tools useful in measuring capability to urbanize?” To which might be added: “Can the urban birds of the temperate regions evolve rapidly enough to adjust to, and withstand the widespread pollutions to which they are being exposed?”

During the past century numerous ornithologists and bird watchers, stimulated by the changing habitats about them (new farmlands, new cities), have published summaries of birds tallied in urban and non-urban habitats (Burleigh 1921, Dover 1925, Gilman 1915, Heis 1910, Lacy 1911, Larson 1935, McClure 1961, 1982, Nauman 1926 and Swarth 1900). “American Birds” published by National Audubon Society has summarized such counts for the past 88 years and Terry Root (1988) has assembled ten years of “Christmas Count” information concerning numbers and distribution of birds in North America in winter. Derek Goodwin (1978) discussed some city birds in both Europe and America.
In the late 1960's, the Institute for Urban Studies was established in Columbia, Maryland and numerous papers have originated from its sponsored studies (Tylka, 1987 bibliography). In most of these studies, the observers have analyzed the edaphic conditions provided by the habitats for birds (Aldrich 1980; Beissinger 1982, Burr 1968, Cavareski 1976 and Geis 1974). The Feeder Watch program of Cornell Laboratory of Ornithology (Dunn 1988), is designed to explore the distribution and numbers of species that make use of man's direct feeding, mostly urban locations.

Karr (1968, 1971) explored the distribution, seasonality, and success of avian communities, comparing those of an Illinois forest with a forest in Panama. Niche characteristics indicated that generalized species requirements allowed for more diversified habitat use. Howell (1971) and Ricklefs (1969) explored this further in central American rain forests. From earlier studies, Erz (1966) developed what he felt were ecological principles in the urbanization of birds. Lovejoy (1974) summarized these tropical studies in part: "If a species has similar absolute abundance per unit area in two (or more) habitat types, both habitats offer the same basic niche requirements of that species. The various resources may differ in availability, but the limiting factor, even if not the same in the various habitats, must be at the same level, other differences in forest type are irrelevant to such species. Differing abundance may be due to one or more of a number of factors."

None of the above have looked at the capabilities of the birds involved.

Methods

Tallies in various habitats were made by walking along a prescribed route within an hour after sunup, listing and counting all species seen or heard. Roadside counts were also made along regularly traveled routes in early morning from vehicles traveling at 15 miles per hour (25 kmph). Some of the roadside counts in central Thailand were at 30 to 40 mph (48 to 64 kmph). In study areas where there was netting or trapping, captured species were considered in the totals (no attempt was made to relate captured birds to abundance as did Lovejoy 1974). Seasonality was not distinguished nor the number of hours of observation. The unit of observation was one day. Lists of species for each locality and major habitat were prepared to determine the amount of overlap between species and localities. In analysis of these data, the common denominators included the place where the species was seen, the species present, the date of the study, and the number of individuals counted.

The areas under study included: Malaya, July 1958-July 1963; circa 3°N. Lat. × 101°E. Long. 1) Coastal mangroves, Nipah palm, rubber and coconut cultivation (Rantau Panjang, Selangor); 2) Lowland secondary rain forest (Subang); 3) Coastal mountain rain forest up to 500 meters (Gombak); 4) Cloud forests at 1500-2000 meters (Mt. Brinchang); 5) Cultivated fields near Kuala Lumpur; 6) Kuala Lumpur city habitats. Included 1210 days of observations.

Thailand, July 1966-July 1975, circa 13° N. Lat. × 113° E. Long. 7) Rain forest at Khao Yai National Park; 8) Disturbed riparian environments at Wat Phai Lom Sanctuary; 9) Cultivation between Bangkok and Khao Yai; 10) Bangkok city. Included 780
field days.

Japan, July 1950-July 1958, May 1963-July 1966, circa 36° N. Lat. \(\times\) 140° E. Long. 11) Conifer forest at 500 meters (Mt. Takao); 12) Secondary deciduous forest and gardens at sea level (Setagaya); 13) Rice fields and conifer plantings at 100 meters (Sagiya); 14) Coastal rice, bamboo, tideflats and duck ponds (Shinhama); 15) Coastal bamboo, conifers and city parks (Tokyo and Hama Park). Included 662 field days.

Kern County, San Joaquin Valley, California, June 1946–July 1950, circa 35.5° N. Lat. \(\times\) 119° W. Long. 16) Oak-pine forest at 500 meters (Lumreau); 17) Deciduous and evergreen planted park along Kern River (Kern Park); 18) Farms and farmyards near Shafter; 19) 100 Hectare olive grove near Bakersfield; 20) Sagebrush desert west of Shafter; 21) Riparian environments along the Kern River; 22) Bakersfield City. 896 days in field.

Ventura County, Pleasant Valley, California, February, 1976-December, 1988, circa 34.2° N. Lat. \(\times\) 119° W. Long. 23) Chaparral pasture and residual Valley Oak groves (Camarillo County Park); 24) Camarillo city. 1089 field days.

East of the Rocky Mountains: 25) Nebraska, sandhills and Calamus River riparian habitats (Dunne’s Ranch) May 1941-May 1944, circa 42.2° N. Lat. \(\times\) 99.3° W. Long.; 116 field days. 26) Illinois, Vermillion County, farmland and oak hickory woodlands, circa 40.1° N. Lat. \(\times\) 87.5° W. Long., 21 days between 1976 and 1984. 27) Eastern Virginia, wooded residential environments, circa 37.5° and 38.5° N. Lat. \(\times\) 77 W. Long.; 40 days between 1977 and 1988. 28) Miscellaneous city sites to fill in urban observations across the continent between 1975 and 1989: California 62 days; Arizona 14 days; Utah 3 days; Wyoming 2 days; Colorado 1 day; Texas 2 days; Iowa 3 days; and Illinois 2 days. Total 89 days. This is an overall total of 4903 days in the field during the 48 years.

About ten percent of the species recorded appeared to relate more to urban habitats than to rural ones. From these birds were selected 70 species, the populations of which included one-third or more in urban sites than in all of the other habitats that it used. These 70 species (See appendix) were then compared by the 113 criteria selected to distinguish them (listed in appendix).

Results

The study encompassed 848 species representing 79 families in more than thirty habitat groups and totaled more than a million birds. Very few of these species were found in abundance on both sides of the Pacific Ocean and these were non-passerines or introduced passerines. On both continents, the more distinctive or ecologically restricting a habitat was, the fewer of its birds were shared with other habitats.

In Malaya 321 species were noted in five habitats from sea level to 2000 meters. Eighty-five species were found in Kuala Lumpur, all but two of which were shared by other habitats, whereas in the cloud forests above 1500 meters, 60 of 99 species were not seen elsewhere. The situation was repeated in lowland rain forests where 102 of 211 species were limited to this ecological complex. Very few species were limited to the heavily altered environments of cutover forest, farms or city. Table 1 lists the
Table 1. Distribution of 321 avian species in five Malayan habitats during 1210 days of observations between July 1958 and July 1963; and the number of species sharing habitats.

<table>
<thead>
<tr>
<th>Ecosystems Involved</th>
<th>Montane Forest</th>
<th>Lowland Forest</th>
<th>Cutover Forest</th>
<th>Farms Fields</th>
<th>City</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Observations</td>
<td>72</td>
<td>288</td>
<td>260</td>
<td>320</td>
<td>288</td>
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<td>Number Species Recorded</td>
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<td>211</td>
<td>107</td>
<td>73</td>
<td>85</td>
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<td>Number Species Seen Only</td>
<td>60</td>
<td>102</td>
<td>15</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>Number Species Sharing Other Habitats</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
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<td>Montane Forest</td>
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<td>38</td>
<td>16</td>
<td>10</td>
<td>19</td>
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<tr>
<td>Lowland Forest</td>
<td>38</td>
<td>—</td>
<td>73</td>
<td>41</td>
<td>63</td>
</tr>
<tr>
<td>Cutover Forest</td>
<td>16</td>
<td>73</td>
<td>—</td>
<td>54</td>
<td>70</td>
</tr>
<tr>
<td>Farms, Fields</td>
<td>10</td>
<td>41</td>
<td>54</td>
<td>—</td>
<td>55</td>
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<tr>
<td>City</td>
<td>19</td>
<td>63*</td>
<td>70</td>
<td>55</td>
<td>—</td>
</tr>
</tbody>
</table>

* Note: Do not attempt to total these columns because a species may be present in more than one environment either horizontally or vertically.

Montane Forest: Mt. Brinchang, cloud forest, 1500–2000 meters.
Lowland Forest: Gombak watershed, dipterocarp rain forest, sea level to 600 m.
Cutover Forest: Subang and near Klang, logged coastal rain forests, sea level to 100 m.
Farms and Fields: Near Kuala Lumpur, Selangor State.
City: Kuala Lumpur, circa 100 m.

Table 2. Distribution of 266 species of birds in four Thailand habitats during 780 days of observations, July 1964-July 1975, showing the numbers sharing other habitats.

<table>
<thead>
<tr>
<th>Ecosystems Involved</th>
<th>Mountain Forest</th>
<th>Farms</th>
<th>Riparian, Chao Phya River</th>
<th>City</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Observations</td>
<td>140</td>
<td>30</td>
<td>100</td>
<td>500</td>
</tr>
<tr>
<td>Number Species Recorded</td>
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<td>66</td>
<td>98</td>
<td>43</td>
</tr>
<tr>
<td>Species seen in only one Locality</td>
<td>127</td>
<td>10</td>
<td>18</td>
<td>4</td>
</tr>
<tr>
<td>Species Sharing Other Habitats</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mountain Forest</td>
<td>—</td>
<td>42</td>
<td>65</td>
<td>22</td>
</tr>
<tr>
<td>Farms</td>
<td>42</td>
<td>—</td>
<td>34</td>
<td>25</td>
</tr>
<tr>
<td>Riparian, Chao Phya River</td>
<td>65</td>
<td>34</td>
<td>—</td>
<td>29</td>
</tr>
<tr>
<td>City</td>
<td>22</td>
<td>25</td>
<td>29</td>
<td>—</td>
</tr>
</tbody>
</table>

Mountain Forest: Khao Yai National Park, 600 m.
Farms: Near Bangkok, sea level to 100 m.
Riparian: At Wat Phai Lom Sanctuary, Chao Phya River, sea level.
City: Bangkok, sea level.

exchange in species between habitats in Malaya.

Five ecosystems, involving 266 species were under observation in central Thailand, from sea level to 600 meters. Table 2 shows the interchange among these species. The forests of Khao Yai National Park supported 217 species, 127 of which were not tallied in other study areas. Khao Yai supported primary forest and the remaining
study tracts were deforested or heavily altered. The species exchange was high among the disturbed environments. Seasonally, the urban and farm habitats were dominated by migrant House Swallows (Hirundo rustica) and annually by four species of starlings.

Because of their tropical origins, the birds listed in Malaya and Thailand were combined and from them emerged only nine species with one-third of their observed populations in urban habitats: House Swallow, Yellow-vented Bulbul (Pycnonotus goiavier), House Crow, (Corvus splendens), Magpie Robin (Copsychus saularis), Common Myna (Acridotheres tristis), Asiatic Tree Sparrow (Passer montanus), Rock Dove (Columbia livia), House Swift (Apus affinis), and Black-throated Tailorbird (Orthotomus atrogularis).

Urban requirements in temperate environments for successful colonization by birds would appear to be more rigorous than those in the tropics, furthermore, the disturbances of temperate habitats has historically been much more intense and widespread than that of tropical locations.

During 662 days of observation at five areas of the Kanto Plain in and around Tokyo 155 species were tallied. The habitat in nine locations ranged from secondary spruce-oak-chestnut forested mountains (Mt. Takao) at about 600 meters to the seacoast of Tokyo Bay. The mountain species were less restricted in this environment than those in the tropics, for 38 of the 70 noted here were also in Tokyo. Because of its location by the sea, and its numerous rivers and water impoundments, Tokyo supported a large population of sea and shorebirds. Of the 65 species seen about downtown Tokyo, 38 were also seen in the mountain habitats. The most persistent urban birds appeared to be the Black-headed Gull (Larus ridibundus), Great Tit (Parus major), Asiatic Tree Sparrow, Grey Starling (Sturnus cineraceus), and Jungle Crow (Corvus macrorhynchos).

Table 3. The distribution of 155 species of birds in five habitats of the Kanto Plain, Japan, during 662 days of observations from July 1950 to July 1957 and July 1963 to June 1966; illustrating the number of species sharing habitats.

<table>
<thead>
<tr>
<th>Ecosystem Involved</th>
<th>Deciduous-Evergreen Foothills</th>
<th>Secondary Evergreen Woods</th>
<th>Woodyed Farmlands</th>
<th>Coastal Bamboo Tidelands</th>
<th>City</th>
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</thead>
<tbody>
<tr>
<td>Number of Observations</td>
<td>65</td>
<td>105</td>
<td>101</td>
<td>200</td>
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<tr>
<td>Number Species Recorded</td>
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<td>77</td>
<td>89</td>
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<td>Species observed only in one habitat</td>
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<td>6</td>
<td>2</td>
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<td>Species Sharing Other Habitats</td>
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<td>—</td>
<td>46</td>
<td>39</td>
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<td></td>
<td>Secondary Evergreen</td>
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<td>42</td>
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<td></td>
<td>Coastal Tidelands</td>
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<tr>
<td></td>
<td>City</td>
<td>36</td>
<td>48</td>
<td>47</td>
<td>43</td>
</tr>
</tbody>
</table>

Deciduous-evergreen Foothills: Mt Takao, 500 m.
Secondary Evergreen Woods: Setagaya, 100 m.
Woodyed Farmlands: Sagiyama, 100 m,
Coastal Bamboo Tidelands: Shinlama, Sea level.
City: Tokyo, Hama Park, sea level.
Table 4. A comparison of the species interchange among habitats in Southern California; 189 species in seven habitats in Kern County (1946–1949) and 123 species in two habitats in Ventura County (1977–1988).

<table>
<thead>
<tr>
<th>Ecosystems Involved</th>
<th>Oak-Pine Mountain</th>
<th>Deciduous Park</th>
<th>Olive Grove</th>
<th>Farms</th>
<th>Sage Desert</th>
<th>Kern River</th>
<th>Bakersfield</th>
<th>Oak Grove</th>
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<td>Deciduous Park</td>
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<td>95</td>
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<td>52</td>
<td>15</td>
<td>54</td>
<td>42</td>
<td>68</td>
<td>—</td>
</tr>
</tbody>
</table>

Kern County Locations: Oak-Pine mountains: Lumreaux, up to 600 m. Deciduous Park: Kern Park on Kern River, 100 m. Olive Grove: Hunn Grove, near Shafter, 100 hectare, 100 m.

Farms: Five farmyards and ponds near Shafter.

Kern River: Riparian habitats along the Kern River near Bakersfield.

Bakersfield: City parks and lawns.

Ventura County Locations.

Oak Grove: 25 hectare park near Camarillo, 200 m, coastal chaparral.

Camarillo: City parks and lawns.
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Table 5. The sharing of 81 species of birds among miscellaneous locations in United States.

<table>
<thead>
<tr>
<th></th>
<th>Virginia</th>
<th>Illinois</th>
<th>Nebraska</th>
<th>Miscellaneous Cities</th>
</tr>
</thead>
<tbody>
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<td>21</td>
<td>116</td>
<td>62</td>
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<tr>
<td>Number Species Recorded</td>
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<td>61</td>
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<tr>
<td>Number of species shared</td>
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<td></td>
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<tr>
<td>Misc. Cities</td>
<td>42</td>
<td>48</td>
<td>17</td>
<td>—</td>
</tr>
</tbody>
</table>

Virginia: Oak wooded residential suburbia in Hopewell and Annandale.
Illinois: Fields and Oak-hickory woods of Vermilion County.
Nebraska: Dunne's Ranch, sandhill grasses, Calamus River valley.

Table 3 presents the species overlap in these habitats.

North American temperate zone habitats have been widely stripped of their native cover and this has produced a mixing and sifting of indigenous avifauna resulting in current distribution which is more difficult to interpret than that of tropical Southeast Asia. During 896 field days, 189 species were reported from seven environmental complexes in Kern County, California. There was a much wider exchange of species than was seen in the Asian habitats. The mountain forests up to 600 meters north of Bakersfield were heavily grazed at that time, but still supported a closed canopy over many of the hillsides. In the San Joaquin Valley, not all sagebrush desert was under cultivation as it is at present. Of the 106 species seen in the Oak-pine forests above Bakersfield, only nine were not noted in lower more disturbed environments.

Within Bakersfield, of 65 species identified, 55 had been seen in the mountains, 64 had been seen in surrounding parks and farmyards, but none in the sagebrush desert. The primarily urban species included: American Robin (Turdus migratorius), Cedar Waxwing (Bombycilla cedrorum), Yellow-rumped Warbler (Dendroica coronata), Pine Siskin (Spinus pinus), American Goldfinch (Carduelis tristis), House Finch, (Carpodacus mexicanus), Spotted Dove (Streptopelia chinensis), and House Sparrow (Passer domesticus), both introduced species. (This study was made before the European Starling (Sturnus vulgaris) had invaded California.) Only three of these were permanent residents, the remainder winter birds (Table 4).

Thirty years later, Southern Californian birds were again listed; in Ventura County around Camarillo. The habitats included urban birds as well as those in a residual oak grove, among which 123 species were tallied during 1007 field days. Since the city and oak grove were adjacent, 68 species were exchanged. Sixty of the 68 species seen earlier in Bakersfield were also present in the oak grove and 42 species were in Camarillo, a 62% exchange between the two cities.

East of the Rocky Mountains studies were made in Nebraska, Cherry County sandhills, 116 observations at Dunne's Ranch along the Calamus River; Illinois farm,
21 observations; wooded urban sites in eastern Virginia, 40 days. Short term tallies were made near “Motel 6’s” about the nation. (The environments in the vicinity of the “Motel 6’s” were selected because the hotels were usually built in the midst of urban development and disturbance.) The sum of these observations involved 239 field days and the sharing of 81 species among locations are summarized in Table 5.

**Discussion**

Because of their specialized habitat requirements involving open water which must be provided by, or protected by man, the waterfowl and shorebirds have not been considered here. Those species occasionally seen in cities or present in small numbers, were also deleted. Those species which originated outside of the city environments, but which were noted with high density within the city, included 16 in Malaya, 18 in Thailand, 8 in Japan, 25 in California and 21 in eastern America. None of these except the introduced Spotted Dove, European Starling and House Sparrow occurred in both continents, but urban species in both continents were of wide geographical distribution.

Using the 113 suggested proximal characteristics that might influence the ability of a species to survive and thrive in man’s environment as related to 70 of the species which were tallied in numbers in urban communities as well as more rural ones, the following conditions were common to at least 50% of them. Not knowing their relative importance physiologically or environmentally, they are not in order of importance or selection. Each characteristic and its affect on the bird’s abundance would be subject to environmental influences brought about by local or edaphic stimuli (i.e.: temperature, weather, food supply, etc.). The factors common to 50% of the pilot birds were: 1) One or two broods per breeding season; 2) Around four eggs per clutch; 3) Non-colonial nesting; 4) Open cup-like nest; 5) Both male and female help at nest building and/or care of young; 6) Aggressive adult protection of the nest; 7) Spotted or mottled colored eggs; 8) Nesting territory covers a hectare or more; 9) The nest inhabitants are subject to invertebrate parasites; 10) The birds are gregarious during at least part of the year; 11) The adult bird is less than 12 inches (30 cm) long; 12) The species is non-migratory, moving less than 100 miles in a year; 13) A permanent resident in most cities where it occurs; 14) Longevity probably less than 10 years; 15) The species is colorful or boldly patterned; 16) Usually sleep in selected tree crowns, but not in dense flocks; 17) The males are not good singers by human standards; 18) Geologically, the species probably evolved in forest edge environments of the past; 19) Basically monogamous, at least for one breeding season; 20) Birds that are active and visible; 21) A species native to the area; 22) Appear to have developed some resistance to pesticides; 23) Courtship usually revolves around male dancing or performing about the female; 24) Male aggressive in his claim to a territory and mate; 25) Temperate zone species granivorous and insectivorous while tropical species are insectivorous and/or omnivorous; 26) Feed individually or in small groups rather than in flocks; 27) Feed on the ground or in low vegetation; 28) Incubation about 2 weeks and nestling life up to 3 weeks; and 29) Only one of the 70 species was precocious, the remainder altricial.

This list of conditions accurately describes those of the House Sparrow which has
become (along with its central and east Asian counterpart, the Asiatic Tree Sparrow), the world’s most ubiquitous urban bird.

The above characteristics may be artifacts resulting from the interpretation of field observations. Intrinsic or unknown values for which we have no measure could be equally or more important. For example, urbanization might be closely related to the bird’s ability to learn from experience and to impart at least some of this information to its young during the brief training period after fledging. Although, “resistance to pollution” is on the list we have as yet but little information concerning it. Lack of fear of man and his structures may also have bearing upon urbanization and we have no criteria by which to judge this.

Conclusion

At the beginning of this discussion three questions were posed concerning the urbanization of birds. I have shown that it is possible to identify the characteristics of a bird species which would enhance its ability to live successfully under city conditions. Also the listing of characteristics of urban species both in the tropics and in temperate areas suggests that some are universal and can be used to judge the ability to urbanize among species now being displaced by habitat alteration. The ability to withstand man’s environmental pollution and pollutants remains unexplored. The categories relative to these urban species point toward a generalized physiology and culture. The more specialized a species has become the more restricted its habitat tolerance and the more demanding its needs.

Literature Cited

Ricklefs, R. E. 1969. The nesting cycle of songbirds in tropical and temperate regions. Living Bird 8: 165-175.
Appendix I.

Species of birds with high density distribution in urban habitats either tropical or temperate. Scientific names after Edwards (1974).

Black-eared Kite, *Milvus migrans*

Asiatic Kestrel, *Falco tinnunculus*

American Kestrel, *Falco sparverius*

Bamboo Pheasant, *Bambusicola thoracica*

Spotted Dove, *Streptopelia chinensis* (Introduced)

Rock Dove, *Columbia livia* (Introduced)

Mourning Dove, *Zenaida macroura*

Plaintive Cuckoo, *Cacomantis merulinus*

Lesser Coucal, *Centropus toulou*

Barn Owl, *Tyto alba*

Long-tailed Nightjar, *Caprimulgus macrurus*

Palm Swift, *Cypsiurus parvus*

House Swift, *Apus affinis*

Chimney Swift, *Chaetura pelagicus*

White-bellied Swiftlet, *Collocalia esculenta*

Anna’s Hummingbird, *Calypte anna*

Allen’s Hummingbird, *Selasphorus sasin*

Brown-breasted Bee-eater, *Merops superciliosus*

Blue-throated Bee-eater, *Merops viridis*

Coppersmith Barbet, *Megalaima haemacephala*

Northern Flicker, *Colaptes auratus*

Common Kingfisher, *Alcedo atthis*

Cassin’s Kingbird, *Tyrannus vociferans*

House Swallow, *Hirundo rustica*

Black-naped Oriole, *Oriolus chinensis*

Common Myna, *Acridotheres tristis*

European Starling, *Sturnus vulgaris* (Introduced)

Jungle Crow, *Corvus macrorhynchos*

House Crow, *Corvus splendens*

Jungle Crow, *Corvus levaillantii*

Common Crow, *Corvus brachyrhynchos*

Scrub Jay, *Aphelocoma coerulescens*

Blue Jay, *Cyanocitta cristata*

Black-billed Magpie, *Pica pica*

Great Tit, *Parus major*

Common Bushtit, *Psaltriparus minimus*

Northern Mockingbird, *Mimus polyglottos*

Yellow-vented Bulbul, *Pyconotus goiavier*

Blanford’s Bulbul, *Pyconotus blanfordi*

Common Iora, *Aegithina tiphia*
Pied Triller, *Lalage nigra*
Magpie Robin, *Copsychus saularis*
Brown Thrush, *Turdus chrysolaus*
Hermit Thrush, *Catharus guttatus*
Dusky Thrush, *Turdus naumanni*
American Robin, *Turdus migratorius*
Long-tailed Tailorbird, *Orthotomus sutorius*
Great Reed Warbler, *Acrocephalus arundinaceus*
Cedar Waxwing, *Bombycilla cedrorum*
Brown Shrike, *Lanius cristatus*
Scarlet-backed Flowerpecker, *Dicaeum cruentatum*
Yellow-rumped Warbler, *Dendroica coronata*
Hooded Oriole, *Icterus cucullatus*
Northern Oriole, *Icterus galbula*
Redwing, *Agelaius phoeniceus*
Meadowlark, *Sturnella magna* (or *neglecta*)
Brewer’s Blackbird, *Euphagus cyanocephalus*
Common Grackle, *Quiscalus quiscula*
Black-headed Grosbeak, *Pheucticus melanocephalus*
Cardinal, *Cardinalis cardinalis*
Fox Sparrow, *Passerella iliaca*
Pine Siskin, *Spinus pinus*
Lesser Goldfinch, *Spinus psaltria*
White-throated Sparrow, *Zonotrichia albicollis*
White-crowned Sparrow, *Zonotrichia leucophrys*
Brown Towhee, *Pipilo fuscus*
House Finch, *Carpodacus mexicanus*
Spotted Munia, *Lonchura punctulata*
Tree Sparrow (Asiatic), *Passer montanus*
House Sparrow, *Passer domesticus*

Appendix II.

Lifestyle or attributes by which urban birds were judged.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Number of broods per breeding season: 1, 2, 3.</td>
</tr>
<tr>
<td>4.</td>
<td>Number of eggs per brood: 1–2, 3–4, 5–6</td>
</tr>
<tr>
<td>7.</td>
<td>Incubation period, weeks: 1, 2, 3, 4</td>
</tr>
<tr>
<td>11.</td>
<td>Length of nestling life, weeks: 1, 2, 3, 4</td>
</tr>
<tr>
<td>15.</td>
<td>Young altricial</td>
</tr>
<tr>
<td>16.</td>
<td>Young precocious</td>
</tr>
<tr>
<td>17.</td>
<td>Group or colonial nesting</td>
</tr>
<tr>
<td>18.</td>
<td>Individual pairs nesting</td>
</tr>
<tr>
<td>19.</td>
<td>Egg color: White, Blue, Spotted or mottled, other</td>
</tr>
</tbody>
</table>
23. Type of nest: Cup, open at top
24. Type of nest: Brushy, open at side
25. Type of nest: Pendulous
26. Type of nest: Mainly of mud
27. Type of nest: Intricately woven
28. Nest location: Box
29. Nest location: Tree hole or burrow
30. Nest location: Man’s structures
31. Nest location: On ground
32. Nest location: In shrubs or low trees, 1–3 meters
33. Nest location: High in trees, above 5 meters
34. Male and female share nest duties.
35. Other nest helpers.
36. Nest protection by adults: Good, poor.
38. Size of nest territory: Less than one hectare.
40. Nests parasitized by invertebrates.
41. Nests parasitized by vertebrates (cowbirds, etc.)
42. Gregarious species
43. Size of bird: Less than 15 cm, 15–30 cm, 30–45 cm.
51. Weight of adult: Above 50 grams
52. Migratory: 160 or more kilometers
53. Non-migratory: Less than 150 kilometers
54. Residency: Permanent, Spring and Fall transient, Summer, Winter
58. Estimated longevity: Less than ten years
59. Estimated longevity: More than 10 years
60. Aggression toward other species: Slight, Great
62. Background color: Colorful, Plain, Drab
65. Sleeping Place: Box
66. Sleeping Place: Tree hole or nest
67. Sleeping Place: In tree crown
68. Sleeping Place: About man’s structures
69. Sleeping Place: On open limbs
70. Roost individually
71. Roost in groups
72. Good singer (Man’s definition).
73. Indifferent singer (Man’s definition).
74. Native Species
75. Introduced species
76. Probable habitat of origin: Forest, Forest edge, Grassland or pampas.
79. Polygamous
80. Monogamous
81. Very visible: Active
82. Retiring
83. Food and feeding habits: Granivorous
84. Food and feeding habits: Insectivorous
85. Food and feeding habits: Omnivorous
86. Food and feeding habits: Predatory
87. Food and feeding habits: Parasitic
88. Food and feeding habits: Fructivorous
89. Food and feeding habits: Aerial Feeder
90. Food and feeding habits: Aquatic Feeder
91. Food and feeding habits: Use Feeders Heavily
92. Food and feeding habits: Feed Individually
93. Food and feeding habits: Feed as a group
94. Food and feeding habits: Scratch for Food
95. Food and feeding habits: Explore for food with beak
96. Food and feeding habits: Wood Boring
97. Food and feeding habits: Ground Feeder
98. Food and feeding habits: Tree and Shrub Feeder
99. Food and feeding habits: With Muscular Gizzard
100. Food and feeding habits: With Normal Crop
101. Food and feeding habits: Soft Bill
102. Food and feeding habits: Hard Bill
103. Resistance to pesticides: Good, Poor
104. Resistance to disease: Good, Poor
105. Predator-Prey relationship: Wary, Unwary
106. Complicated courting procedures: Lec.
107. Complicated courting procedures: Dance or Performance
108. Complicated courting procedures: Courtship Feeding
109. Simple mating procedure: Male aggressive
110. Simple mating procedure: Female aggressive

何が都市鳥を性格づけるか？

都市鳥が都市環境でうまく生活できるように適応してきた生態の比較レビュである。マレンシア、タイ、日本、アメリカの延べ30ヵ所で、1941-1988年に間中時代1 848種100万羽の環境選択を比較した。種ごとの記録個体数の3分の1以上が都市周辺であったものを都市鳥と定義すると、70種がその範囲に含まれた。鳥の生態に関する113要素について比較分析したところ、都市鳥はそれを維持発展させることが都市鳥としての適応を強めるような特性を共通に持つことが明らかになった。（文責後田正敏）

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