

## A STUDY OF SUMMER BIRD POPULATIONS NEAR TOKYO, JAPAN

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AS PART of a study of birds and their relationship to Japanese B encephalitis, an attempt was made to determine the population density of nesting birds, and seasonal changes in their abundance and age composition in a rural area bordering Tokyo. This great, sprawling city, encompassing rural as well as metropolitan areas, is the center of ornithological thought in Japan, and much has been written concerning the birds of the city and its environs. Austin and Kuroda (1953) described briefly the status of species which are found about Tokyo. Kabaya (1948, 1951) attempted accurate listing of species and their seasonal occurrence at Mt. Takao, a forested mountain about 600 meters high, located 25 miles west of Tokyo. But quantitative studies of birds in rural habitats in the Tokyo district do not appear to have been reported.

For the study of a breeding bird population reported here, a site that was roughly rectangular and included about 100 acres of upland farms was selected in Setagaya Ward on the southwest outskirts of Tokyo (Fig. 1). This acreage was part of a larger area which had been under observation since 1950. The site included most of the usual habitat segments characteristic of the district. Dominant trees of the 10 acres of wooded plots included several species of oaks (*Quercus stenophylla*, *Q. paucidentata*, *Q. myrsinaefolia*), chestnut (*Castanea puninervis*), beech (*Fagus japonica*), pine (*Pinus thunbergii*), *Zelkova japonica* (Ulmaceae), and *Cryptomeria japonica* (Taxodiaceae). Figure 2 shows a segment of the area dominated by *Zelkova* and chestnut. Bamboo thickets covering about four acres were mainly of the species *Phyllostachys reticulata* which forms such dense stands that no undergrowth can exist (Fig. 3). There were about two acres of farmyards, such as those shown in Fig. 4. A small stream crossing the study area was bordered with approximately two acres of dense shrubbery entangled with mats of vines and *Rosa multiflora*. There were about six acres of flower gardens and of nursery for young trees. As the area was also used for recreation there were about five acres of open lawn and pasture. The remainder included cultivated fields of barley, wheat, tomatoes, onions, radishes, and other truck crops which were rotated each year. The interspersions of these habitats and their approximate sizes are shown in Fig. 1.

During the period from March 11 through August 26, 1953, 24 weekly observations were made, and between April 17 and August 25, 1954, 20 weekly observations. The tallies were made along a route crossing the acreage 10 times in a north and south grid. Weather conditions during the mornings of observation were as follows; in 1953, four mornings were clear, seven partly

cloudy and 13 cloudy; in 1954, three were clear, five partly cloudy and 12 cloudy. It rained on eight of the mornings in 1953, and on three in 1954. Wind was not a factor either year, for in early morning there was rarely more than a light breeze. The temperature range was not great, between 50° and 70° Fahrenheit.

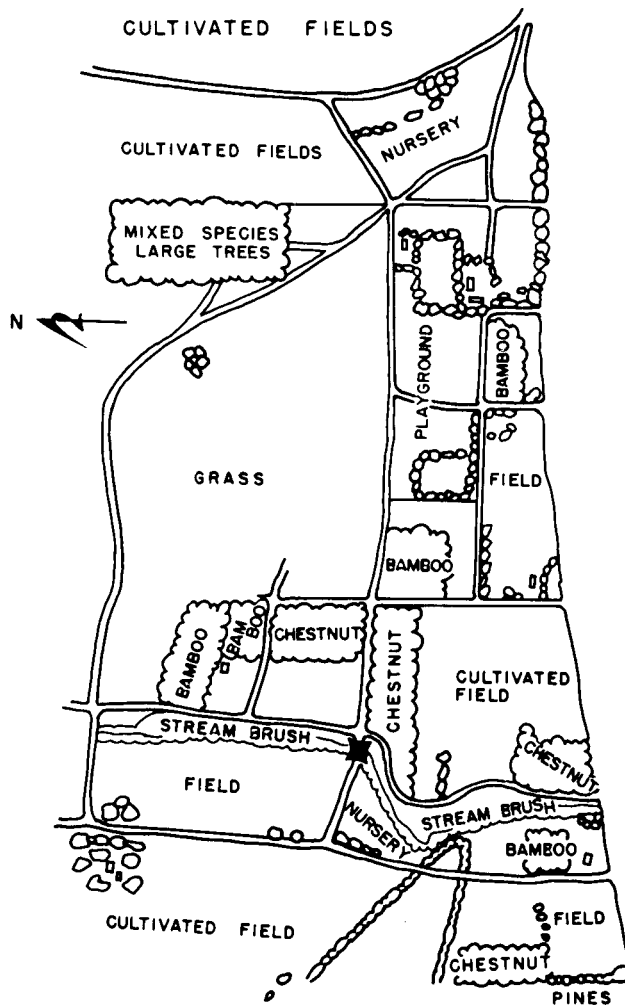


FIG. 1. Map of the Setagaya Breeding-bird Study Area.

A total of 6472 individuals, an average of 269 per trip, was tallied in 1953, and 5194 individuals, 259 per trip, were counted in 1954. There were 37 species recorded in 1953 and 30 in 1954, the difference being made up of

winter residents present in 1953 which had left by the time the 1954 study was started. Only 11 permanent residents and one summer resident were



FIG. 2. A segment of the study area dominated by *Zelkova* and chestnut.

TABLE 1

THE AVERAGE NUMBER OF RESIDENT BIRDS NOTED WEEKLY PER 100 ACRES AT SETAGAYA, TOKYO-TO, JAPAN, DURING 1953 AND 1954

	April		May		June		July		August	
	1953	1954	1953	1954	1953	1954	1953	1954	1953	1954
Bamboo Pheasant	1.6	1.3	2.0	1.7	2.2	1.2	3.6	1.2	4.7	1.2
Turtle Dove	5.2	5.2	1.7	1.2	1.2	1.7	1.2	.2	0	.2
Skylark	8.0	6.2	9.3	6.7	5.5	5.5	5.0	6.0	4.0	3.2
House Swallow	.2	.5	1.0	4.0	4.0	4.0	8.0	6.5	8.0	2.5
Jungle Crow	1.8	.7	0	1.7	0	1.7	.6	.2	.2	.2
Carrion Crow	.6	1.8	2.0	1.2	2.7	1.7	3.6	3.2	1.7	5.0
Blue Magpie	3.6	3.0	1.0	.7	.5	1.0	.4	7.0	3.0	6.0
Bull-headed Shrike	1.0	2.5	1.3	2.2	1.5	2.7	2.0	1.2	1.7	1.0
Ashy Starling	7.8	9.5	13.0	6.7	32.0	13.7	42.2	49.5	109.7	125.2
Tree Sparrow	85.6	101.7	98.3	138.0	192.0	221.0	280.0	216.0	374.0	167.0
Greenfinch	2.6	2.8	1.0	.5	1.0	0	1.2	.7	2.5	0
Meadow Bunting	5.0	2.5	5.2	2.5	7.5	4.7	6.4	1.7	6.5	1.7
Misc. Species	62.0	31.5	8.2	14.4	.6	5.1	3.8	1.0	1.6	1.8
Totals	185.0	169.2	144.0	181.0	249.7	264.0	358.0	294.4	417.0	315.0

regularly seen each summer. These are listed in Table 1, and the average numbers tallied are compared by month and year.

The most striking facts shown by this table are the paucity of species and individuals in such a group of habitats, and the domination by Tree Sparrows. No similar habitat in America has been studied and reported in *Audubon Field Notes* in the past five years. However, an area in Missouri under observation by P. B. Dowling and his group was located in a deciduous forest region at about the same latitude. In Table 2 are presented Dowling's tally of breeding males per 100 acres of mixed farmland in 1954 as compared with the breeding males found on the Setagaya location. Dowling did not explain why the English Sparrow (*Passer domesticus*) was not evident on the

TABLE 2  
A COMPARISON OF THE SUMMER BIRD POPULATIONS OF A FARMING AREA IN MISSOURI AND THAT AT A SIMILAR LATITUDE NEAR TOKYO, JAPAN

Habitat Group	Missouri <sup>1</sup>		Tokyo-to
Total Acres	86		100
Oak Woodland	18		10
Bamboo thicket			4
Farmyards	2 (abandoned)		2
Stream Border			2
Nursery and Garden			6
Lawn and Pasture			5
Cultivated Field	37		71
Fallow (Brushy)	16		
Open Parkland	12		
Pond	1		
Ecologic Counterparts — Estimated Males per 100 Acres			
English Sparrow	0	Tree Sparrow	40
Field Sparrow	47	Meadow Bunting	4
Bob-White	10	Bamboo Pheasant	1
Meadowlark	9	Skylark	6
Common Starling	7	Ashy Starling	2
Barn Swallow	0	Barn Swallow	2
Eastern Kingbird	5	Bull-headed Shrike	2
Mourning Dove	4	Turtle Dove	1
American Goldfinch	4	Greenfinch	1
American Crow	1	Carrion Crow	1
Other Breeding Species	36		0
Total Species	44		10
Males per 100 acres	265		60
Times observed	15		20
Hours of observation	86		50

<sup>1</sup> Data from Dowling and others, 1954.

Missouri plot. Its counterpart, the Tree Sparrow (*Passer montanus*), was the most abundant form at Setagaya. Obviously the two areas compared do not have equivalent numbers of ecologic niches. The climate at Setagaya is much wetter than that in Missouri, and the foliage denser (where it is permitted to grow). The Setagaya area was mainly under cultivation, while much of the Missouri area was reverting to woodland. There were probably many more niches available in the Missouri area than there were at Setagaya. However, the paucity of species and numbers of birds would lead to the conclusion that many of the niches at Setagaya remain vacant in the breeding season. Probably the primary cause of the low level of this bird population is human pressure against the birds, since the human population density is 30 per acre or seven times that of the birds.

Seasonal changes in population levels of the Tree Sparrow and Ashy Starling (*Sturnus cineraceus*) in the Setagaya plot are illustrated in Table 3. As young were fledged, or birds from surrounding farms flew into the study plot to feed, the percentage of the population made up of Tree Sparrows increased each year from April until mid-summer. If the population as observed in

TABLE 3  
POPULATION CHANGES NOTED IN THE BIRDS OF SETAGAYA, JAPAN, IN 1953 AND 1954

	Year	April	May	June	July	Aug.
<i>Tree Sparrow, Passer montanus</i>						
Per cent of the total population	1953	46.0	70.5	76.9	78.5	72.7
	1954	60.1	76.2	83.7	73.3	53.0
Ratio of average weekly population compared with that of April	1953	1.00	1.14	2.24	3.27	4.37
	1954	1.00	1.35	2.18	2.12	1.64
Rate of population change from month to month	1953	1.00	1.15	1.95	1.45	1.34
	1954	1.00	1.35	1.60	.98	.77
<i>Ashy Starling, Sturnus cineraceus</i>						
Per cent of the total population	1953	4.2	9.0	12.8	11.8	26.3
	1954	5.6	3.6	5.1	16.8	39.6
Ratio of average weekly population compared with that of April	1953	1.00	1.66	4.10	5.41	14.10
	1954	1.00	.70	1.44	5.21	13.10
Rate of population change from month to month	1953	1.00	1.66	2.46	1.31	2.45
	1954	1.00	.70	2.04	3.61	2.53
10 additional breeding species						
Ratio of average weekly population compared with that of April	1953	1.00	.83	.85	1.08	1.09
	1954	1.00	.82	.90	1.05	.79
Rate of population change from month to month	1953	1.00	.83	1.02	1.25	1.02
	1954	1.00	.82	.90	1.05	.75
Total population per acre per month	1953	1.85	1.44	2.49	3.58	4.17
	1954	1.69	1.81	2.64	2.94	3.15

April is given a value of 1 and the population of other months compared with that of April, it will be seen that the population increased steadily during the summer of 1953 until it was four times as great in August as it had been in April. In 1954 the population increase was not as great and the peak was reached in June. A reduction in grain crops in 1954 probably accounted for this reduction in sparrows. The rate of change in population each month can be determined by dividing the observed population of a given month by that of the preceding month. By this method June appeared to be the month of most rapid increase each year.



FIG. 3. One of the bamboo thickets in the Setagaya study area.

Not more than two pairs of Ashy Starlings nested in the study plot each year, the majority using tree holes in nearby residential districts. When the young have been fledged the families remain together and join other families to form flocks that roam the surrounding countryside. Movement of these flocks into Setagaya is reflected in the figures given in Table 3, showing the August population to be 13 or 14 times as great as that for April. The rate of population increase was greatest in July of 1954, but was of equal magnitude in June and August of 1953.

The population levels of the other 10 species breeding in Setagaya were so low that little can be said about them. When totaled they showed only slight increases in late summer over the April numbers. The period of most rapid population increases appeared to be in July.

TABLE 4  
THE AVERAGE NUMBER OF BIRDS TALLIED PER CENSUS VISIT IN THE ENTIRE SETAGAYA  
360-ACRE STUDY AREA OVER A FOUR-YEAR PERIOD, 1951 THROUGH 1954

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Black-crowned Night Heron	1.5	.7	1.7	4.7	1.0	.5	1.5	0	.8	0	1.0	.5
Bamboo Pheasant	.7	.2	.5	2.5	1.5	2.7	4.0	7.2	3.0	2.5	.2	1.0
Eastern Turtle Dove	11.0	12.5	6.2	9.0	2.7	4.2	3.5	2.5	2.2	4.2	6.0	11.2
Skylark	1.7	3.0	8.7	11.5	11.0	11.7	6.7	4.2	.8	2.5	.8	2.2
House Swallow				.2	7.2	7.5	17.0	29.5	13.3			
Jungle Crow	6.0	3.2	3.7	4.2	5.0	4.2	1.0	1.5	5.0	8.2	2.2	6.8
Carriion Crow	0	1.0	1.7	0	1.5	1.2	4.2	2.0	4.0	6.0	5.2	3.5
Blue Magpie	14.2	1.7	15.0	16.0	13.5	6.7	13.0	15.0	15.0	19.0	18.0	13.8
Bull-headed Shrike	5.0	4.7	3.5	1.5	2.5	3.0	2.5	1.5	5.0	13.8	8.2	6.0
Ashy Starling	18.0	13.7	10.5	8.2	15.2	64.7	57.0	194.2	79.0	10.5	9.0	6.8
Tree Sparrow	269.0	200.0	126.0	132.0	136.0	257.0	385.0	366.0	375.0	250.0	190.0	189.0
Greenfinch	8.0	6.2	33.0	6.5	1.7	6.5	1.7	3.2	.2	3.5	22.0	32.2
Meadow Bunting	24.2	23.7	16.7	11.2	5.5	8.0	9.5	6.5	3.0	4.8	19.0	12.0
Total, all species	440.0	350.0	337.0	272.0	220.0	386.0	516.0	649.0	525.0	468.0	366.0	389.0

The number of birds seen each month slowly increased in each year from April into summer. The total population reached approximately 4 birds per acre in August.

The 100-acre breeding bird census plot was a little less than one third of a greater area in Setagaya in which birds were tallied once a month during the four years from January, 1951, to January, 1955. Table 4 lists the 12 species commonly found during all months of the year, and includes the summer resident House Swallow as well. It will be noted, by comparison with Table 1, that there are no major differences in population pattern between the breeding-bird study area and the larger plot. Therefore it is believed that the study plot was representative of the farming district in Setagaya.

Following is a discussion of each of the common species observed.

*Nycticorax nycticorax*. Black-crowned Night Heron.—This common night heron, of circumpolar distribution, did not nest in the breeding bird census area. A small colony of four or five pairs nested in the tops of tall pine trees in a nearby grove. An abundant coastal species in central and southern Japan, it nests in great colonies in association with four species of egrets. Individuals or small groups may be found roosting in dense trees during the daytime throughout the year in coastal or low mountain woodlands.

*Bambusicola thoracica*. Bamboo Pheasant.—This species preferred woody cover in association with tree bamboo or sasa (low bamboo) and was found most commonly in the areas shown in Fig. 5. Pheasants nested in the dense thickets of the stream sides and rarely led their chicks from this cover. The cocks crowed each morning during the breeding season and occasionally at other seasons, and tallies were based upon the number

heard crowing. Even though heavily hunted the population appeared to remain at a fairly uniform level.

*Streptopelia orientalis*. Eastern Turtle Dove.—Although this large dove is a permanent resident, it reached greatest abundance in the Tokyo area during the winter, when local populations were augmented by migrants from Hokkaido and northern Honshu. It is not a farmyard species as is the Mourning Dove of America, but prefers to nest in brush land or in second-growth timber. The breeding population in Setagaya was low, and tallies reflected the movement of winter concentrations from the area. Instead of showing a rise in numbers from the production of young, there was a steady decrease throughout the summer as the species moved into more desirable habitats. The nest is a typical dove's nest, loosely woven and usually placed in a low crotch.

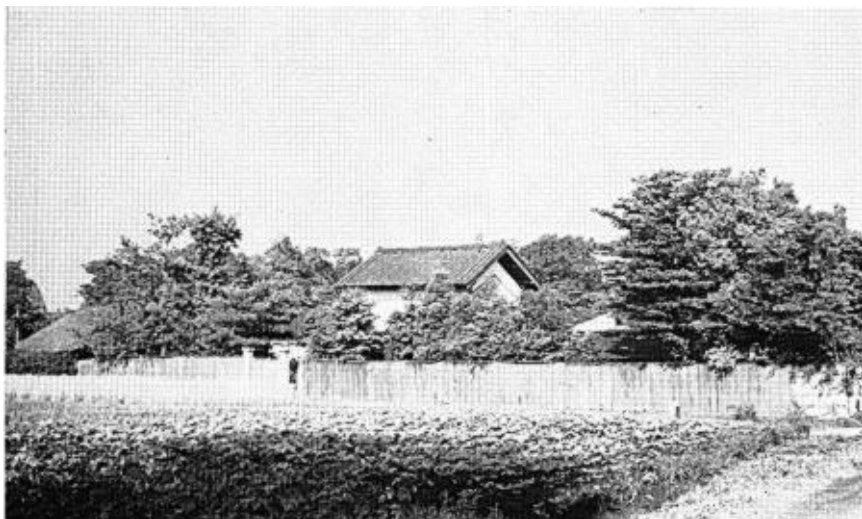


FIG. 4. A typical farmyard of the Setagaya area.

*Alauda arvensis*. Skylark.—The aerial performance of this palaeartic species was seen over all open, cultivated or noncultivated lowland habitats of Japan. It was a permanent resident of the farmlands reaching peak numbers in early summer. Since Skylarks nested early, the population was increased by juveniles during April, May and June. Population counts were based both upon calling males and flushed females or young; and the areas where Skylarks were commonly seen are shown in Fig. 6. The gradual reduction in numbers from month to month as shown in Table 1 reflected the gradual reduction in song performance rather than an actual decrease in numbers of birds. Because the nests are hidden at the bases of clumps of grass and are very difficult to find, none was discovered during the two years of early morning tallies.

*Hirundo rustica*. House Swallow.—The House or Barn Swallow was the only abundant summer resident in the area. It arrived from the south in April, reached peak numbers in August, and left in September. The species nested in or about farmhouses and foraged over open fields.

*Corvus leuillanti*, Jungle Crow, and *C. corone*, Carrion Crow.—These two species ranged over the entire study area. The Jungle Crow did not nest on the 100-acre plot,



but ranged over it from nearby nesting territories. In 1954 a Carrion Crow nest was placed in a tall *Zelkova* tree near the southeast corner of the plot, and the daily range of this pair extended beyond the limits of the 100 acres. The family flock was present in July and August.

*Cyanopica cyanus*. Blue Magpie.—Also ranging over the breeding area, but not nesting in it, were Blue Magpies. Their jay-like nests were placed in pines and *Cryptomeria* one-half mile or more from the plot. As shown in Table 4 this species was present in small

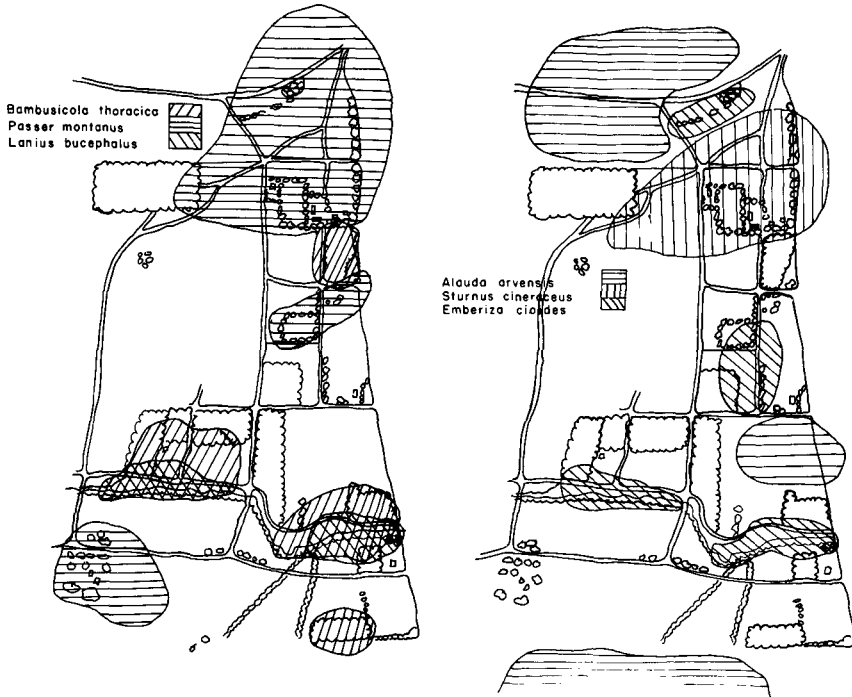


FIG. 5. (left) Distribution of *Bambusicola thoracica*, *Passer montanus* and *Lanius bucephalus* in the study area.

FIG. 6. (right) Distribution of *Alauda arvensis*, *Sturnus cineraceus* and *Emberiza cioides* in the study area.

numbers throughout the year. In the breeding bird census area (Table 1) fewer were noted in May and June as nesting activity kept the parents closer to the nest. Usually five to seven young are fledged and they remain with the parents until late in the year.

*Lanius bucephalus*. Bull-headed Shrike.—This species was conspicuous, but not abundant. It nested very early each year and young were usually fledged by the end of March or middle of April. The observation of nestings late in May suggested that there may be two broods. After the young were fledged the family group remained in thickets along the creek (Fig. 5), where the shrikes were secretive during July and August. An influx of migrants and winter residents into the Kanto Plain from the north brought the population up to a peak in October (Table 4).

*Sturnus cineraceus*. Ashy Starling.—Figure 6 shows the habitats commonly used by this second most abundant species in the breeding area. Starlings nested in tree hollows or in thatched roofs of farm buildings. The daily range during nesting activities did not appear to extend much outside of that shown in Fig. 6, but after young were fledged the starlings gathered into flocks which included several families and roamed over the countryside. Foci of such wanderings appeared to be the original nesting or roosting place of the birds that had been there at the beginning of the nesting season.

*Passer montanus*. Tree Sparrow.—The sparrows' daily wanderings centered around farmyards (Fig. 5). They raised at least three broods, from April into August, preferring the interstices of tiled roofs of farm buildings as nesting places. After the young were fledged they joined adults and fed with them in the fields of ripening grain. These flocks returned each evening to the farm buildings where they roosted.

*Chloris sinica*. Greenfinch.—This was the most sporadic resident of the Setagaya breeding area. No nests were found, although a male had a singing perch on the top of a tall *Cryptomeria*. This was a common winter resident with peak numbers in March when migrants passed through on their way north. Breeding residents were most commonly found associated with large trees.

*Emberiza cioides*. Meadow Bunting.—A common, brush-loving species, the Meadow Bunting was found most often in the areas shown in Fig. 6. Males sang from the tops of the higher trees in their nesting territories. The song cycle was a long one, lasting from January until October. Two broods commonly were raised. The neatly woven cup-shaped nests were usually placed at a height of less than five feet in the crotches of shrubs in dense thickets. The population pattern, including singing males and flushed birds, is shown in Table 1.

#### SUMMARY

Bird populations were tallied in weekly observations made at sunrise during the periods from March 11 through August 26, 1953, and April 17 through August 25, 1954, on a 100-acre plot of upland farms and farmyards at Setagaya, near Tokyo, Japan. Twelve species, including one summer resident were regularly recorded. The two most abundant species were the Tree Sparrow (*Passer montanus*) and the Ashy Starling (*Sturnus cineraceus*). The total population recorded increased from fewer than two birds per acre in April to nearly four birds per acre in August. Population changes of the 12 species are discussed.

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