Lepidoptera composed 14 per cent of the insect diet of the Starling in Texas. This is much higher than was shown in the New England studies. The Noctuidae, however, was the largest group found in both Texas and New England.

The other orders of insects found in the Texas samples were also present in the samples from New England, the only deviation being in the Formicidae (ants) which the northeastern Starlings ate in much greater quantities than did the Texas birds.

Miscellaneous animal foods (gastropods, spiders, and pillbugs) were all recorded as important foods of the Starling in New England. They occurred throughout the year in the Texas sample, but only rose to importance in late winter (February–March) when it may be presumed that insects are not readily available.

The proportion of plant material in Texas samples is lower than that found in New England. The New England studies showed that the Starling consumed great quantities of cherries during the spring of the year. The uncommon wild black cherry (*Prunus serotina*) was the only member of this group to be found in the Texas sample, and then it was present in only one bird. Hackberry and tallow tree were the only plant materials eaten in large quantities and these were eaten only in the early winter. They are not recorded in the diets of New England Starlings, but McIlhenny (1936) has mentioned that these were consumed by the Starling in Louisiana. These are the two known fruits in the area that are the most nutritive in fats and proteins (Hastings 1966). They seem to play an important role in the diet of the Starling in eastern Texas and are probably the second most preferred food (after insects).

SUMMARY AND CONCLUSIONS

Animal food is eaten in greater quantities by Starlings in eastern Texas than in New England. Orthoptera are the most commonly taken insects in Starling diets in eastern Texas, and since these insects are generally considered harmful to grasslands, this makes the Starling a useful bird in the area. Coleoptera are eaten in large amounts during the late winter but are not taken in as large quantities as they are in the northeast. Gastropods and arachnids are important foods during the late winter but they may not be preferred foods since they are generally not found at other times of the year. Plant material is utilized in the fall when fruits that are highest in protein and fat, hackberry and Chinese tallow tree, are consumed in large quantities.

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WANDERING INTERSPECIFIC FLOCKS IN RELATION TO ANT-FOLLOWING BIRDS AT BELÉM, BRAZIL

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Many naturalists have noted that one can wander for hours in tropical forests without seeing any bird and then suddenly encounter a noisy flock of birds. Some species of birds flock together to exploit fruit trees, while other species follow army-ant raids day after day to feed on flushed arthropods. The species of wandering flocks, however, wander together through the forest without being attracted by concentrated sources of food.

At Belém, Brazil, while studying ant-following birds at swarms of *Eciton burchelli* (Oniki, MS), I saw wandering interspecific flocks join the ant-followers on six occasions for a few minutes to 2 hr. Usually the wandering flock moved away in a few minutes, since these birds move faster than do ant-following birds, which stay with the slow-moving ant raids. On 21 other occasions I observed wandering flocks far from ant-following groups. From these 27 flocks I obtained a list of 45 species (table 1). More birds may have been present, for I must have overlooked small and shy birds behind tangled lianas and thick foliage.

The largest interspecific flock contained 13 individuals. Most of the birds perch on thin branches from the ground up to 20 m. Most move rapidly and chatter noisily. Unlike the ant-following birds, which preen for long periods between foraging activities, they rarely preen for long periods.

Moynihan (1962:1), who studied the organization of some kinds of mixed flocks of neotropical birds in Panamá, points out that most birds of these complex flocks are passerines. At Belém, they are also passerines with the exception of one woodpecker that is regularly with the wandering interspecific flocks.

TABLE 1. Birds observed in 27 wandering flocks at Belém.

Species	No. occasions observed	No. of individuals
Long-billed Gnatwren (*Ramphocaenus melanurus*)	8	9
Plain-throated Antwren (*Myrmotherula hauxwelli*)	8	8
Cinereous Antshrike (*Thamnomanes caesius*)	5	8
Wedge-billed Woodcreeper (*Glyphorhynchus spirurus*)	5	8
Buff-throated Woodcreeper (*Xiphorhynchus guttatus*)	7	7
Red-stained Woodpecker (*Veniliornis affinis*)	6	6
Plain-brown Woodcreeper (*Dendrocincla fuliginosa*)	5	6
Amazonian Antshrike (*Thamnophilus amazonicus*)	4	6
Spix's Woodcreeper (*Xiphorhynchus spixii*)	5	5
White-fronted Nunbird (*Monasa morphoeus*)	3	5
Silver-beaker Tanager (*Ramphocelus carbo*)	3	5
Scale-backed Antbird (*Hylophylax poecilonota*)	4	4
Spot-winged Antshrike (*Pygiptila stellaris*)	4	4
Gray Antbird (*Cercomacra cinerascens*)	4	4
Gray-headed Tanager (*Eucometis penicillata*)	4	4
Cocoa Thrush (*Turdus fumigatus*)	2	4
White-shouldered Antshrike (*Thamnophilus aethiops*)	3	3
Streaked Antwren (*Myrmotherula surinamensis*)	3	3
Yellow-rumped Cacique (*Cacicus cela*)	3	3
Barred Woodcreeper (*Dendrocolaptes certhia*)	2	2
Plain Xenops (*Xenops minutus*)	2	2
White-flanked Antwren (*Myrmotherula axillaris*)	2	2
Helmeted Pygmy-Tyrant (*Colopteryx galeatus*)	2	2
Fulvous-crested Tanager (*Tachyphonus surinamus*)	2	2
Pectoral Sparrow (*Arremon taciturnus*)	2	2
Others (20 spp.)	20	20

Interspecific flocks of birds were observed in second-growth (capoeira), tidally flooded (várzea), and mature upland (terra firme) forests. In different types of forest, different species of birds are common. For instance, Gray-headed Tanagers and Pectoral Sparrows are commonly in flocks in the várzea forest, less often in flocks in terra firme or capoeira. Long-billed Gnatwrens and Amazonian Antshrikes are most often in capoeira and at the forest edges.

While table 1 suggests that some species are often in wandering flocks, none is very regular, and there is a high species diversity. Perhaps this is partly due to the fact that flocks were watched in different types of forest. Johnson (1954:48–52) found that in Panamá two species of antbirds, Dot-winged (*Microrhopias quixensis*) and White-flanked (*Myrmotherula axillaris*) Antwrens, regularly form the centers of flocks. E. O. Willis (1971) reports that Spotted Antbirds (*Hylophylax naevioides*) are the only common birds in Panamá that fly low and forage on the ground and in low foliage. At Belém, the central species is often the noisy Cinereous Antshrike, and among the common and persistent attendant birds are Long-billed Gnatwrens, Plain-throated Antwrens, Buff-throated Woodcreepers, and Red-stained Woodpeckers (scientific names in table 1). Plain-throated Antwrens and Scale-backed Antbirds take the low niche of Spotted Antbirds.

All the birds in table 1 except the Streaked Antwren, Yellow-rumped Cacique, Fulvous-crested Tanager, and the Helmeted Pygmy-Tyrant occasionally follow army ant raids (Oniki, MS). The Plain-brown Woodcreeper, Scale-backed Antbird, Gray-headed Tanager, and Barred Woodcreeper are among the "professional" ant-followers at Belém: that is, they obtain more than 50 per cent of their food over swarms of ants.

Although at Belém certain forest birds, such as the Screaming Piha (*Lipaugus vociferans*), never follow nearby ant-following flocks or wandering interspecific flocks, other species are easily attracted by the noise and movements and either participate in the flocks or return to their normal activities after a brief investigation period. For instance, on 9 September 1966 one Red-stained Woodpecker stayed around birds over swarming ants for 3 hr but was not obtaining food flushed by the ants. On this same occasion Yellow-rumped Caciques and Red-rumped Caciques (*Cacicus haemorrhous*) followed ants by perching lower than they normally do, but did not obtain much food either. That such birds obtain food in their normal ways without taking advantage of the insects flushed by ants, yet stay near ant-following birds, suggests that they are very strongly attracted by other species. Johnson (1954) similarly reported birds joining both the wandering and ant-following flocks, but considered that members of the former actively captured insects flushed by army ants.

Belt (1874:123) suggested that associating in wandering flocks helps in food-getting, while Johnson (op. cit.) suggests that different species in these wandering flocks are attracted by social advantages other than food-getting. Moynihan (1962), however, points out that social attraction is not an advantage of flocks, but a mechanism that achieves such advantages. I never observed birds in a flock capturing food flushed by others. Neither hawks nor other predators attacked the birds while I was studying them, so there was no test of the theory of Bates (1863:347) that birds can avoid predation better when flocking.

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NO EVIDENCE FOR INCUBATION PATCH CHANGES IN MOURNING DOVES THROUGHOUT REPRODUCTION

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Male and female Mourning Doves (*Zenaidura macroura*) possess a bare ventral apterium throughout the year. Both the female and male birds participate in incubating the eggs and caring for the young, but whether they develop an incubation patch has not been established. At times it has been assumed that pigeons and doves possess an incubation patch similar to some passerine species (Bailey 1952; Eisner 1960), but no direct evidence of tissue changes in the ventrum of doves has been shown.

As a part of a preliminary investigation of wild Mourning Doves to determine the interrelationship between organ and tissue changes and hormonal secretions during the nesting cycle, 17 female and 14 male adults were collected May–August 1968 in rural areas about 10 miles W of the city limits of Omaha, Nebraska. The interval of the reproductive cycle studied was divided into four periods for analysis: mated and egg-laying birds and 1–6 days incubation; 7–15 days incubation; 1–6 day nestlings; 7–15 day nestlings. Anterior and posterior sections of ventral apterium were taken 1 cm from each end of the sternum and histologically examined. The following measurements were made to the nearest 2.5 μ at randomly selected positions on the cross sections of ventral apterium stained with hematoxylin and eosin: (1) thickness of the stratum germinativum and cornified layers; (2) number of cell layers in the stratum germinativum; (3) thickness of the dermis layer; (4) number of blood vessels over 10 μ in diameter per mm; and (5) diameter of the blood vessels greater than 10 μ in diameter.

The mean length and width of the ventral apterium of the males was 22 $\times$ 65 mm, and of the females, 26 $\times$ 58 mm. This area in both males and females was always bare and never appeared to have possessed feathers. The apterium extended from the thoracic inlet to the abdomen in all the birds, so that the length was primarily dependent on the size of the bird.

No consistent trends were seen in the number of layers of the stratum germinativum or in the number or size of blood vessels. The number of layers of the stratum germinativum ranged, usually, between 2 and 4. Measurements of the number of blood vessels and the thickness of the dermis layer were subject to error. Most of the large blood vessels were in the lower part of the dermal layer and some of these vessels were damaged in sectioning. Consequently no definitive statement on the number of blood vessels can be made. Examination of both the anterior and posterior sections of the ventral apterium did not reveal any significant or consistent trends in the thickness of the stratum germinativum or dermis layers during any particular part of the nesting cycle that was studied (table 1).

Bailey's (1952) study of the incubation patch formation in passerine birds given various hormone injections established that in some passerines the incubation patch develops in response to a combination of estrogen and prolactin. Estrogen alone produced vascularization while prolactin when administered alone had no effect. From histological studies, Bailey characterized formation of the brood patch as involving defeatherization, vascularization, and edema. Hinde and Steel (1964) studied the tactile sensitivity of the Canary (*Serinus canarius*) incubation patch and found that the ventral surface becomes more sensitive to tactile stimulation as the breeding season advances. Injections of estrogen with prolactin or progesterone reportedly caused a decrease in the tactile sensitivity threshold. Consequently increased tactile sensitivity may also be characteristic of the incubation patch in some birds. R. E. Jones (pers. comm.) has recently found nerve receptors in the incubation patch of the California Quail (*Lophortyx californicus*).

It has been suggested that in species in which males possess an incubation patch, androgen may stimulate its development. Johns and Pfeiffer (1963) gave injections of estradiol, testosterone, and prolactin in various combinations to male and female Wilson's Phalaropes (*Steganopus tricolor*). In this species only the male builds the nest, incubates the eggs, and broods the young. They found that only testosterone and prolactin in combination produced incubation patches in all birds, both male and female.

Prolactin is apparently essential to the complete formation of the incubation patch in many species (R. E. Jones, in press). Mourning Doves examined in this study exhibited an increase in prolactin activity during the incubation period as evidenced by crop sac development. Despite the evidence of prolactin secretion following gonadal activity (during which estrogen or testosterone would be abundant) there was no evidence of tissue proliferation or edema in the ventral apterium of the doves.