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NESTING OF THE LARK BUNTING IN NORTH-CENTRAL COLORADO

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ABSTRACT

Despite its local abundance on the shortgrass prairies of the plains states, there is relatively little information recorded of the nesting ecology of the lark bunting, *Calamospiza melanocorys*. Bailey and Niedrach (1965) did present a general description of this species in Colorado, and secondary information on the lark bunting is best summarized by Baumgarten (1968); but even this contribution draws on preliminary, fragmentary, and often conflicting data, i.e., Cameron (1908), Langdon (1933) and Roberts (1936). Current field study information is presented here to clarify and to enlarge upon various aspects of nesting lark buntings, such as parental roles of sexes, nestling foods, and growth rates of young.

STUDY AREA

The lark bunting breeds on the prairies from southern Alberta and Saskatchewan, southward to northern Texas and New Mexico, and east of the Rocky Mountains to Nebraska and western Minnesota. In Colorado, although occurring in mountain parks throughout the state, it nests primarily on the eastern plains.

This species was observed during the summer of 1969 at the Central Plains Experimental Range on the Pawnee National Grasslands, located in Weld County, Colorado. This site is within the area of the International Biological Program's Grassland Biome Study, known as the Pawnee Site. The main study plots contained extensive stands of red threeawn (*Aristida longiseta*), saltbush (*Atriplex canescens*), buffalograss (*Buchloe dactyloides*), and rabbitbrush (*Chyrsothamnus nauseosus*); with lesser amounts of eriogonum (*Eriogonum effusum*), sage (*Salvia reflexa*), blue grama (*Bouteloua gracilis*), and prickly pear (*Opuntia polyacantha*). Other nesting songbirds within these areas were McCown's longspurs (*Rhynchophanes mccownii*), chestnut-collared longspurs (*Calcarius ornatus*), western meadowlarks (*Sturnella neglecta*), Brewer's sparrows (*Spizella breweri*), and horned larks (*Eremophila alpestris*).

METHODS

Efforts were made to locate all lark bunting nests in the area studied. After a nest was located, the adults were mist netted, color-marked and banded. To capture the birds at the nest, an eight-foot segment of mist net was attached to two aluminum poles each 15 feet long. Because the flushing distance of the adults was usually less than 15 feet, it was possible to entangle the adults at the nest by placing the net over that area when they were incubating.

Food samples from nestlings were obtained by using a #3 white thread, knotted around the throat, thus preventing the nestling from swallowing the food. These thread collars could easily be tied and removed without wrenching or pinching the nestlings' necks as sometimes occurred with the use of pipe cleaners when used in the same manner. Twenty minutes after tying the thread, the nestlings were revisited and the food sample removed with forceps. All measurements of eggs, nests and nestlings' primary feathers were made with a millimeter ruler and rounded to the nearest 10th mm.

ARRIVAL

Small flocks of male lark buntings were first seen on the Pawnee Site on 1 May, and females were first observed on 5 May. The local population increased rapidly with flocks of 100 birds, 85% to 95% males, seen within a week of the initial arrivals. Dispersal from these formations began almost immediately, and by 9 May most of the males were distributed throughout the study area. Small flocks of females and first-year males, recognizable as described by Roberts (1936), continued arriving until 30 May.

Langdon (1933) stated that courtship and pair bonding occurred within the migrant flock formations; however this appears unlikely because of the disproportionate presence of males within the initial flocks and the arrival of females after the males dispersed. On the area studied, females moved through the locations where males were displaying, there being joined by the resident male. Apparently, actual pair formation occurred without conspicuous ground displays, although females may have been attracted to those areas by male display flights and songs, as described by Whittle (1922).

NESTING

Females selected nest sites by sampling various plants, which possibly could provide nest protection, until suitable vegetation was found. The male followed its mate on these trips and investigated each site after the female had moved on to another plant. A few sites were visited repeatedly by the female, until one of these remaining locations was chosen as the nest site. Nests were built on the ground in shallow depressions, closely associated with this protective plant species. Nethersole-Thompson and Nethersole-Thompson (1943) stated that many birds selected sites which afforded protection from the weather. The majority of lark bunting nests (81.4%) were shielded on the north and/or west, thus protective plants supply cover from both the sun and the prevailing northwest winds. Nest cover vegetation and corresponding nest success (those nests which successfully fledged young) are summarized in Table 1. Red threeawn, because of its compactness and flexibility, domes over and shades the nest, offering comparatively more cover than the other plants. Indicative of the selective value of red threeawn is the percentage of nests protected and nesting success of those nests.

Nest descriptions and measurements were available from 43 different nests. Mean inside cup diameter was 75 mm, cup depth averaged 37 mm, and all nests were flush, or nearly so, with the ground. Nest cups were constructed of fine grasses, rootlets, and animal hair, with courser grasses and plant fibers on the exterior.

Copulation began during nest construction and was often repeated until completion of the clutch. Egg laying began two or three days after the apparent completion of the nest, with one egg being laid in the early morning (before 0530 MST) each day. The average size of the 154 eggs

Table 1. Association of lark bunting nesting success and plant species.

Protective Plant	% Nests Protected	Nesting Success		
		n	S	%S
Red threeawn	62.7	27	18	67
Rabbitbrush	23.2	10	3	30
Saltbush	4.7	2	1	50
Eriogonum	4.7	2	2	100
Sage	4.7	2	0	0

*

n = Number of nests

S = Number of successful nests

%S = % Nesting success

examined was 21.9 x 17.2 mm, 50 eggs (21.9 x 16.8 mm). Mean clutch size was 3.6 eggs per nest (ranging from two to five eggs).

Although Langdon (1933) and Roberts (1936) both report that the male lark bunting does not share incubation duties, in the area studied, both sexes incubated. However, out of the 113 visits to nests which were being incubated at the time, females were present 79 times compared with 34 times for males--a significant difference with the chi square test at the 95% confidence level. Mean flushing distance (the distance between my nearest approach and the nest when the adult exited) was not significantly different between sexes; 6.0 feet (±4.8) for the female, 6.4 feet (±5.1) for the male. Distraction displays, consisting of a broken wing act or a mouse-like run, were often given when the adults left the nest.

The incubation period, initiated by incubation of the first egg, was 12 days (10-14), and hatching was spread over about a 28 hour period. Egg shells were promptly removed by both sexes, although infertile eggs were left in the nest. After hatching of the young, attentiveness of males to nest areas increased. In a timed period of 130 minutes at one nest when four, two-day old nestlings were present, the male brooded for 66 minutes (50.8%), and the female for 49 minutes (37.7%). The nest was unattended for 15 minutes (11.5%).

FOODS FED TO NESTLINGS

As indicated in Table 2, number of feeding trips increased, and amount of brooding time decreased with aging of the nestlings. Adults participated equally in feeding of the young, with most food being captured within a 100 foot radius of the nest.

The procedure for obtaining foods fed to young yielded 43 samples comprising 100 individual insects representing 15 families. The taxanomic

Table 2. Number of feeding trips of adult lark buntings to a nest with young of different ages.

Date	Approx. Age of Nestlings (Days)	Observation Period (MST)	Trips/2-hr. Period			% of Time Brooded		
5 July	2	0800-1000	4	9	13	37.7	50.8	88.5
6 July	3	0700-0900	6	10	16	33.8	42.1	75.9
8 July	5	1200-1400	10	12	22	28.5	25.3	53.8
10 July	7	1300-1500	11	12	23	21.5	5.2	26.7

composition varied with the sampling period (Table 4), although the size distribution of the foods did not. Size distribution of all prey items is shown in Fig. 1 and represents the size of food fed to young still in the nest. As seen in Tables 3 and 4, grasshoppers occurred in the majority of samples, increasing proportionally with their increasing biomass (Van Horn, 1969) as the summer progressed. The percent occurrence of insect families, the size distribution of prey and their relative biomass, offer an important index to the exploitation of available foods by the adult lark bunting.

GROWTH OF YOUNG

The daily increase in length of the first primary feather (P_1) was adopted for use in aging the nestlings. A curve representing growth data from 75 nestling lark buntings is compared with the daily weight-gain curve (n = 20) in Fig. 2. With the use of this as a reference curve, it was possible to date nesting schedules when a nest was located in an advanced state. Weights of young lark buntings could also be approximated, eliminating the necessity of carrying a balance constantly in the field.

Young remained in the nest eight or nine days, with larger nestlings leaving before the smaller. Fledglings moved quickly from the nest site, and were difficult to follow once they left the nest area. One banded young, still unable to fly any substantial distance, was found 50 m away one day after it had left the nest. Usually young remained in the nest until P_1 reached a length of about 25 mm, and were capable of only short flights when P_1 reached at least 40 mm. Both adults continued to feed the young after they had left the nest.

Table 3. Percent representation and dry weights[a/] of taxa in diet of nestling lark buntings (100 prey items).

Order Family	% of Prey Items		% Dry Weight	
Orthoptera	65.0		54.9	
Acrididae		65.0		54.9
Coleoptera	9.0		13.9	
Tenebriodidae		7.0		13.4
Chrysomelidae		1.0		0.2
Staphylinidae		1.0		0.3
Diptera	7.0		9.7	
Asilidae		4.0		7.8
Tachinidae		2.0		1.1
Calliphoridae		1.0		0.8
Hymenoptera	5.0		0.9	
Formicidae		4.0		0.4
Tiphiidae		1.0		0.5
Homoptera	4.0		1.9	
Cicadellidae		4.0		1.9
Lepidoptera	4.0		2.9	
Pyralidae		3.0		1.3
Noctuidae		1.0		1.6
Araneae	3.0		5.3	
Clubionidae		2.0		4.1
Gnaphasidae		1.0		1.2
Odonata	1.0		7.5	
Agrionidae		1.0		7.5
Unidentified	2.0		3.0	
n	100.0		100.0	

a/ Approximate dry weights from a series of comparable insects that had been killed and briefly kept in 70% alcohol and intended as provisional values.

Table 4. Percent occurrence of insect families in food samples of nestling lark buntings.

	Sampling Period		
Family	1-15 July	16-31 July	1-15 August
Acrididae	61.5	80.0	100.0
Tenebrionidae	15.4	15.0	15.4
Asilidae	23.1	-	-
Cicadellidae	23.1	5.0	-
Formicidae	-	10.0	-
Pyralidae	-	-	15.4
Clubionidae	-	10.0	-
Tachinidae	7.7	-	-
Agrionidae	7.7	-	-
Calliphoridae	7.7	-	-
Chrysomelidae	-	-	7.7
Gnaphasidae	7.7	-	-
Noctuidae	-	5.0	-
Staphylinidae	7.7	-	-
Tiphiidae	-	5.0	-
Other	-	10.0	-
n	13	20	13

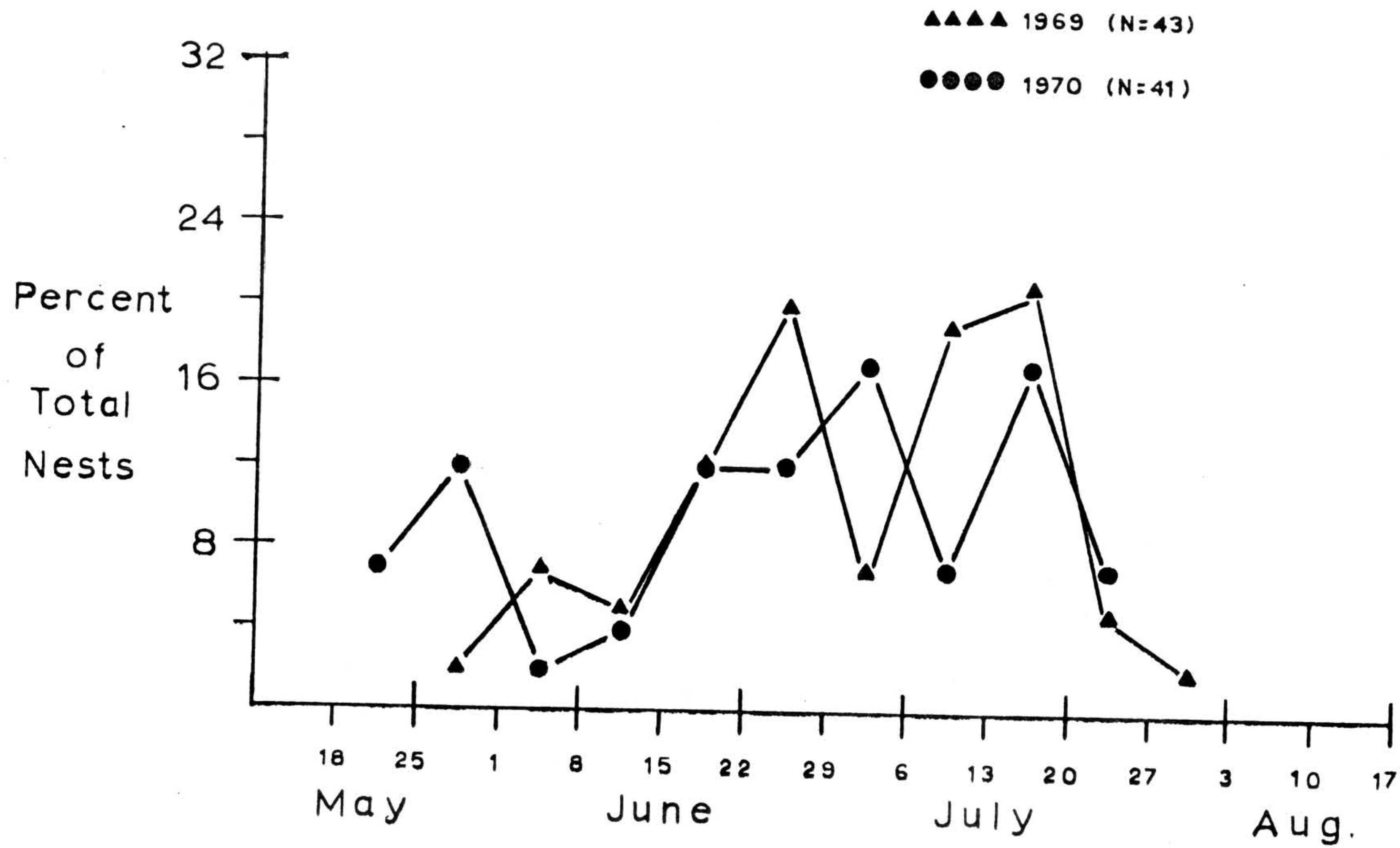

Fig. 1. Initiation of egg laying in lark buntings.

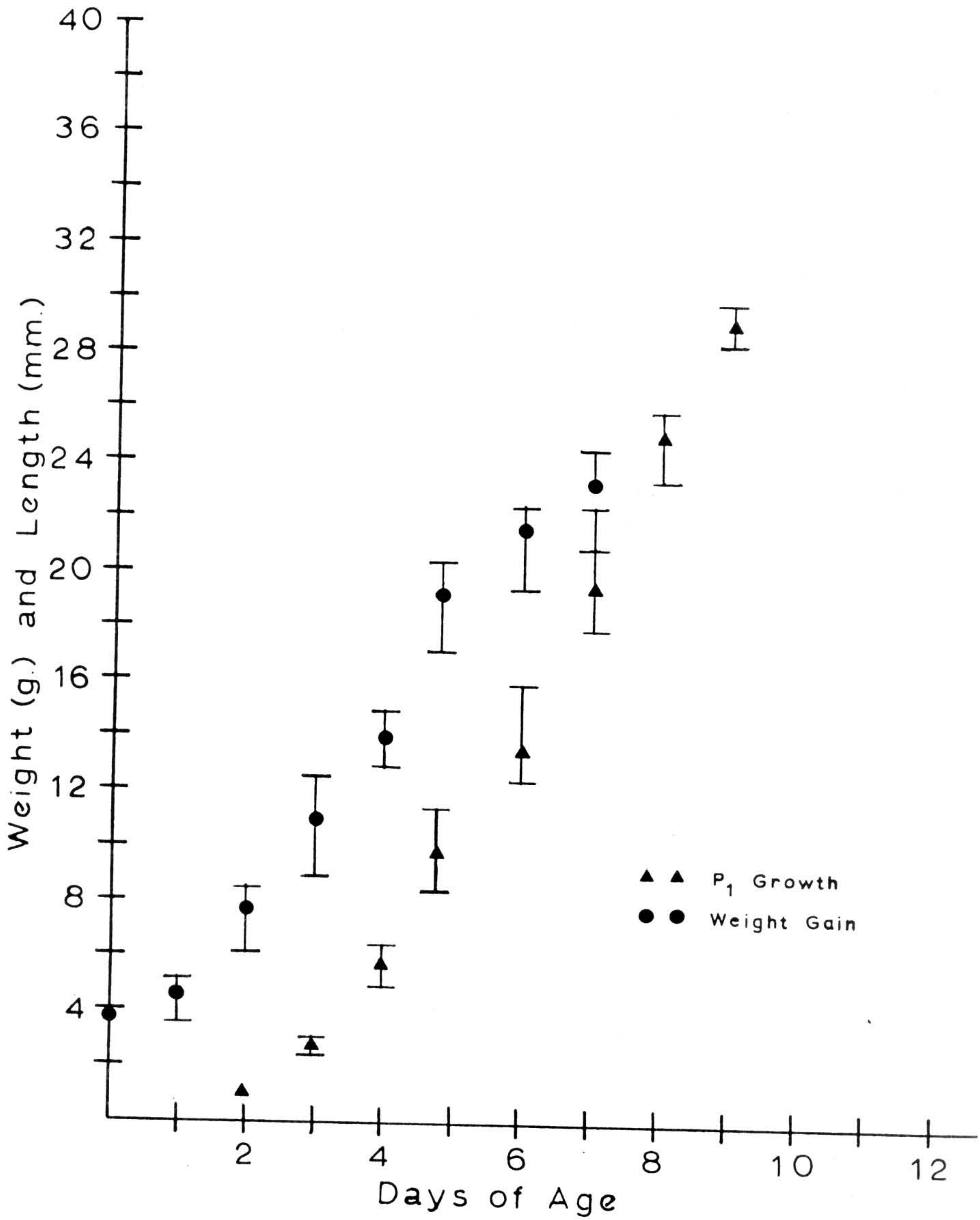

Fig. 2. Daily weight gain and first primary (P_1) growth of nestling lark buntings.

PRODUCTIVITY

The fate of 43 nests is summarized in Table 5. Hatching success (65%) of the lark bunting is surprisingly high, considering the pale blue color of the eggs and incubation by the conspicuous male. Nice (1957) cites hatching success of two other ground nesting songbirds also occurring in the area studied. She reported a hatching success of 46% for the McCown's longspur and 45% for the horned lark. Differences between these three ground nesting passerines could be the result of the close association of the lark buntings' nest with protective vegetation, as nests of the longspur and lark are often without vegetational cover.

Throughout this study, which required daily visits to nests under observation, constant care was necessary in approaching nest sites. In the early part of the research, nest predation was discouragingly high. Nests were destroyed mainly by the very abundant thirteen-lined ground squirrel (*Spermophilus tridecemlineatus*), which seemingly followed scent trails to the nests. Active defense of the nest by both male and female lark buntings against these ground squirrels was observed. The liberal use of napthalene flakes on the approach paths and around the nests considerably reduced the rate of predation. To reduce investigator influence on the nesting outcome, care was taken to visit nests, regardless of protective vegetation, in a standardized manner. However, the effect of repeated visits and use of napthalene on the actual nesting success, is not known. The only other mammalian predator observed in the area studied was the long-tailed weasel (*Mustela frenata*), and these were rarely seen.

The total area of the principal study site was 13.6 acres. Within this area, 10 lark bunting nests were found, giving a nesting density of 0.7

Table 5. Lark bunting nesting summary, 1969.

	Eggs Laid	Eggs Hatched	Eggs not Hatched	Fledglings	Eggs Preyed on*	Young Preyed on*
Number	154	100	15	59	39	20
% of Total	-	64.9	9.7	38.3	25.3	20.0
Ave./Nest	3.6	2.3	0.4	1.4	0.9	0.5
S.D.	0.8	2.5	0.3	1.7	2.2	1.2

* Influenced by visits of observer (see text).

nests/acre. Butterfield et al. (1969), relating nesting density to browse frequency, found densities of 0.06 to 0.125 nests/acre in 25 separate study plots. Within these 13.6 acres, 42 fledglings and 16 nesting adults were banded and color-marked.

DEPARTURE

Flocking of male lark buntings began by the first of August, with numbers on the study area visibly decreasing by mid-August. Males were seldom seen by the first of September, when flocks of only females and immatures were seen. A few stragglers were last sighted at the Pawnee Site on 21 September, giving a species-day use of 144 days during the summer of 1969.

SUMMARY

A field study of the lark bunting, conducted in the summer of 1969, clarified aspects of its life history on the Pawnee Site. Males arrived during the first week of May, females a few days later, after the males had dispersed. Nests were built on the ground closely associated with a protective plant which provided cover from the sun and prevailing winds. Red threeawn was associated with 62.7% of the nests.

Eggs, with a mean size of 21.9 x 17.2 mm, were laid daily. Mean clutch size was 3.6 eggs per nest. Both sexes incubated, although females were incubating during 79 nest visits compared with 34 times for the males. Incubation was about 12 days, and hatching spread over 28 hours. Hatching success (65%) was surprisingly high, considering the blue color of the eggs and incubation by conspicuous males; it may be due to the

close association of lark bunting nests with protective plants. Nesting density was 0.7 nests/acre.

A procedure using thread collars on nestlings' necks yielded 43 samples of foods fed to young. Grasshoppers comprised 65% of the prey items and 54.9% of the total prey dry weight.

Males departed the Pawnee Site by the first of September. Flocks of females and immatures remained until 21 September, giving a species-day use of 144 days.

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