

NESTS OF HORNED LARKS AND LONGSPURS ON A MONTANA PRAIRIE

WITH FOUR ILLUSTRATIONS

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The observations here recorded relate to the nests of three species of terrestrial birds, the Desert Horned Lark, McCown Longspur, and Chestnut-collared Longspur, which are closely associated during the breeding season on the prairie bench lands of Montana. The data cover a period of four years beginning in the fall of 1914, and are limited to a locality known as the Teton Slope, in the prairie portion of Teton County, Montana, lying east of the Rocky Mountains. In all, 141 nests belonging to these three species were inspected. Some of these were marked as observation nests and were revisited as opportunity permitted. Others were not revisited but yielded comparative data on such items as situation, concealment, structure, egg complement, and date of nesting.

The writer was absent from the locality during the last part of the nesting season for the first year (after June 24). Storms caused extensive destruction of nests and interruptions in the nesting cycles. The dates of the most destructive storms were as follows:

First year (1915), cold rain (36 hours), ceased June 4.

Second year (1916), began as rain May 24, deep snow May 25, snowstorm ceased May 26.

Second year (1916), three-day rainstorm ceased June 23. (Killed all known nestlings, of all three species.)

Organization of Data.—The data here presented are arranged under the following heads, in the order shown:

(1) *Table of Nests*: The main table, for each species, serves as a complete index of all nests found, and shows the nesting date and the complement so far as known.

(2) *Progress Supplement*: This is a condensed record of the progress of nest building, laying, and other items, in which are recorded such additional visits to observation nests as could not be included in the table. Some nests visited only once are included, to show data not reported elsewhere.

(3) *Additional Data*: Items not otherwise provided for.

(4) *Topical Notes and Summaries*: Each summary contains descriptive notes upon one topic for various nests. The numerals, referring to particular nests, make it possible to correlate different topics for a given pair of birds.

Notation.—Dates in the tables are shown by numbered month and day (thus: 5-8 means May 8).

Dash (—), in column 4, indicates nest was not revisited; in other columns, information not available.

Asterisk (*), in column 4 refers to Progress Supplement for further dates and contents.

Stage of incubation (column 6) is given approximately in per cent. (Thus: 0 = fresh; 50 = about half; 90 = nearly ready to hatch.)

Date of laying final egg of clutch is marked *Kn*, if known by actual observation; *Est.*, if estimated from observed state of young or stage of incubation.

Letter symbols (used in tables and supplements): *e*, eggs; *g*, gathering nest material; *i*, parent bird in nest; *n*, nest; *o*, empty (a new nest); *p*, nest in process of construction; *x*, not known; *y*, young; *z*, abandoned.

Reference numbers, used in the summaries, refer to the nest numbers assigned in column 1 of the table. Letters (a, b, c, etc.), similarly employed, refer to the notes following the summary. In the notes, all reference numbers are the nest numbers of column 1 of the table.

DESERT HORNED LARK

The following table of fifty-eight nests of the Desert Horned Lark (*Otocoris alpestris leucolaema*) shows the nesting date and complement for each nest (so far as known). The headings of the columns are self-explanatory.

Nest No.	First observation			Final observation			Complement	Date of laying final egg (known or estimated)	Nest No.	First observation			Final observation			Complement	Date of laying final egg (known or estimated)
	Date found	Contents	Date	Contents	Incuba-tion	Date found				Contents	Date	Contents	Incuba-tion				
1	1915																
2	4-16	3e	4-18	3e	10	3	4-16	Est.	31	6-5	3e	6-7	3e	30	3	6-4	Est.
3	4-16	p	5-8	z					32	6-5	4e	6-6	4e	10	4	6-5	Est.
4	4-17	p	*	*			5-5	Kn.	33	6-6	3e			20	3	6-4	Est.
5	4-26	3e	*	*			4-19	Est.	34	6-7	p	*	*		3	6-12	Kn.
6	4-28	o							35	6-13	3y	*	*		3	6-2	Est.
7	4-28	3e	4-29	3e	10	3	4-28	Est.	36	6-18	o						
8	5-5	3y	*	*			4-29	Est.	37	7-6	3e			50	3	7-1	Est.
9	5-6	3e	*	*			5-6	Est.	38	7-7	2e	*	*		3	7-8	Kn.
10	5-8	2e	5-9	o					39	7-19	2y					6-29	Est.
11	5-14	3y					4-29	Est.		1917							
12	5-15	3y					4-30	Est.	40	4-21	3e			20	3	4-19	Est.
13	5-19	3y	*	*			4-29	Est.	41	4-26	4e			0	4	4-26	Est.
14	5-20	3y					5-6	Est.	42	4-26	4e			10	4	4-25	Est.
15	5-20	2e	5-21	3e	0	3	5-21	Kn.	43	5-7	4e			0	4	5-7	Est.
16	5-22	3e			30	3	5-19	Est.	44	5-8	4e			0	4	5-8	Est.
17	5-23	3e			0	3	5-23	Est.	45	5-17	4e			30	4	5-14	Est.
18	5-27	3e			30	3	5-24	Est.	46	5-15?	4e				4		
19	5-30	4e	5-31	4e	10	4	5-30	Est.	47	5-23	2e						
20	5-31	p	*	*			6-13	Kn.	48	6-3	4e	*	*		4	6-3	Est.
21	5-31	p	*	*			6-3	Kn.	49	6-29	2e	*	*		3	6-30	Kn.
22	6-16	2y					6-2	Est.		1918							
23	6-21	3e			90	3	6-12	Est.	50	3-25	p	*	*				
24	6-23	3e	*	*			6-23	Kn.	51	4-10	3e	4-12	3e	10	3	4-10	Est.
25	4-14	p	*	*					52	4-10	o						
26	4-19	3e	4-22	3e	30	3	4-18	Est.	53	4-18	3e	4-20	4e	0	4	4-19	Kn.
27	4-26	p	*	*					54	5-2	2e	*	*		4	5-4	Kn.
28	5-16	3e			80	3	5-8	Est.	55	5-22	3e			60	3	5-14	Est.
29	5-29	3e	5-29*	*	30	3	5-26	Est.	56	6-4	3e	*	*		3		
30	6-2	3e	6-5	3e	30	3	6-2	Est.	57	6-29	3e	*	*		3	6-20	Est.
	6-3	3e	6-5	3e	20	3	6-3	Est.	58	7-2	4e	7-4	4e	20	4	7-2	Est.

PROGRESS SUPPLEMENT

Nest 3.—About Apr. 17, *op*; 28, some soft material added in loose condition; 29, loose material pressed down into place; May 3 (9:30 a. m.), *1e*; (7 p. m.), *1e* surrounded with loose soft weed material (yarrow) not matted down; May 4 (7 a. m.), *2e* and no loose material; (7 p. m.), *2e*, have a few loose yarrow pods around them; 5 (8:30 a. m. and 7:30 p. m.), *3e*; 8, 9, 10, 13, 14 and 15, *3e* (birds never seen until May 8); 16 (7:30 p. m.), *3y*; 18, 19, 20, 23, *3y*; 25 (9 a. m.), nest empty but 2 young six and ten feet away (parents not seen); 25 (evening), nest partially torn out. Incubation period 11 to 11½ days. Nestling period 9 days.

Nest 4.—Apr. 26, *3e*; 28, *3e*; 29, *3y*; May 2, nest empty, no clue.

Nest 7.—May 5, *3y*; 6, *3y*; 8, 3 *y* about ready to leave; 9 (morning), *n* empty, (evening) same.

Nest 8.—May 6, *3e*; 7, 8, 9, 10, 13, 14, 15, ditto; 16 (7:30 p. m.), *2e*, *1y* not yet dry; 17 (8 a. m.), *1e*, *2y*, (5 p. m.), *3y*; 18, 19, 21, ditto; 22, one nestling died; 25 and 27 (8 a. m.), *2y*; (11 a. m.), nest empty. Nestling period about 10 days.

Nest 12.—May 19, *3y* feathered and able to run (not revisited).

Nest 19.—May 31 (8 a. m.), excavation apparently completed; June 5, portion of nest material in place, wet with rain, about half finished; June 10 (8 p. m.), *1e* and 2 or 3 loose pieces of gray heads of yarrow in nest (*n* finished); 12 (10:30 a. m.), *3e*; 13 (9 a. m.), *4e*; 15, *4e*.

Nest 20.—May 31, *p* (about finished); June 1, *1e*; 2, *2e*; 3, *3e*; 5, ditto (kept dry through storms); 6, 10, 12 and 14 (10 a. m.), *3e*, (5 p. m.) *3y*; 19, 21, 22 (evening), *3y*; 23, young left early this morning. Incubation period 11 days. Nestling period scant 9 days.

Nest 23.—June 23 (about 8 a. m.), 3e, (about 9 a. m.), 4e; 24, 4e, the last egg smaller than other three.

Nest 24.—Apr. 14, *n* about half built; 16, not much more; 22, empty and apparently abandoned.

Nest 26.—Apr. 26, *n* almost finished; 28, empty; May 1 and 8, evidently deserted.

Nest 28.—May 29, 3e, cold, nest wet, evidently abandoned because of snowstorm.

Nest 34.—June 7, excavation found (birds near); 8, some nest material loosely in place in hollow, and a few large mud pellets on grass in front of nest; 10, one egg in nest and more pellets added; 11, 2e with 2 or 3 loose straws thrown over them; 13, 3e (clutch doubtless completed on 12th); 19, 3e; 23, 3e but nest wet in bottom; 25, empty and bottom somewhat torn up.

Nest 35.—June 13, 3y just recently hatched; 19, *y* rather well feathered; 23, 3y all dead, wet (storm).

Nest 36.—June 13, *o* (seems finished); 19, ditto; 25, *n* in water.

Nest 38.—July 7 (evening), 2ei; 8 (early a. m.), 3e; 9, 11, 12 and 16, 3e; 17, 2e and 1y hatched this evening; 18 (morning), 2e, 1y; (evening), ditto; 19 (early morning), 1e, 2y; (evening) ditto; 20, ditto (one egg infertile); 21, 22, 23, 2y; 25, one nestling taken by weasel; 27 (night), 1y; 28 (morning), nest empty; 29 (morning), saw young following mother. Note: Incubation may have started when first egg was laid, as bird was observed sitting on two eggs July 7. Incubation period 11 days. Nestling period about 10 days.

Nest 48.—June 3, 4e (fresh looking); 5, 4e; 19, empty (*y* had left?).

Nest 49.—June 29, 2e; 30 (afternoon), 3e; July 1, 6, 8 and 9 (8 p. m.), 3e; 10 (7 p. m.), 3y dry; 13, 2y (parent observed driving some small animal away from nest); 14 and 15, 2y; 18 (7 p. m.), *n* empty, young not seen. Incubation period 10 days.

Nest 50.—Mar. 25, cavity in earth finished but empty; 27, a few lichen-covered pellets of baked mud at east side, some of which had fallen into cavity; 29, ditto; Apr. 6 and 15, ditto (had been abandoned, no nest material in cavity).

Nest 54.—May 2, 2e; 3 (morning), 3e, (evening), 3e; 4 (7 a. m.), 3e; (8:30 p. m.), 4e; 13, 4e; 14 (morning), 2e, 2y; (evening), 1e, 3y; 15 (morning), 4y; 20, 4y; 23, 24 and 26 (morning), 1y, (evening), nest empty (young left nest). Incubation period 10 days. Nestling period 12 days.

Nest 56.—June 4, 3e; 7, nest torn out, 2 eggs near, no clue.

Nest 57.—June 29, 3e; 30 (5 p. m.), 3 *y*; July 2 and 3, 3y; 5, nest empty, no clue.

TOPICAL NOTES AND SUMMARIES

Nesting Dates.—The date of laying the last egg (start of incubation) is used for comparisons of nesting dates. This was either known or could be closely estimated for forty-seven nests.

The earliest observed dates for full sets were: April 16, 18, 19 and 10, in the four successive years. The next year, a farmer boy reported three eggs on April 17. In the second year a neighbor reported a nest with four eggs on April 13; and another neighbor said he found a young bird out of the nest, but unable to fly, on April 26, indicating that incubation had started about April 6.

The distribution of the dates is shown in the following table, in which the figures indicate the number of known sets completed in the first, middle and last third of each month.

Four-year Summary of Nesting Dates

Month	Period	Number of nests				Total
		First year	Second year	Third year	Fourth year	
April	First third				1	1
	Middle third	2	1	1	1	5
	Last third	5		2		7
May	First third	3	1	2	1	7
	Middle third	1		1	1	3
	Last third	4	1			5
June	First third	2	6	1		9
	Middle third	2	1		1	4
	Last third	1	1	1		3
July	First third		2		1	3

Two peaks of nesting activity occur, one about the end of April, the other early in June, indicating two broods in a year. These two natural periods of activity would appear more pronounced were it not for destructive storms and the depredations of natural enemies. The latest date recorded for fresh eggs was July 8, when a clutch of three was completed (n. 38). The one surviving nestling of this family remained in the nest until the 28th.

Progress of Nest Building and Laying.—In some instances the nests are carried rapidly to completion, while in others there is much delay. Nest 34 was built in about two days, after the excavating had been done; and the first egg was laid as soon as the nest was ready. At nest 19 there was a delay of at least ten days between the completion of the digging and the laying of the first egg. The nest appeared about half finished on the fifth day after the excavation was found. In another case (n. 3) egg laying was delayed for sixteen days after the nest was apparently ready to receive eggs. The birds added some soft material to the empty nest five days before the first egg was laid.



Fig. 13. Nest of Desert Horned Lark, showing baked mud pellets in position and a small yarrow plant overhanging on the northwest; nest 14, May 21, 1915.

Some of the customary pellets of baked mud at the nest entrance occasionally are put in place before the grass nest structure is built. This was the case at nest 34, the excavation for which was found, with both birds near, before any nesting material had been put into it. By the next day some nest material had been loosely left in

the hollow, and a few large pellets of sun-baked mud had been placed on the grass in front of the nest. After two more days there was an egg in the nest, and a few more mud pellets had been added. After the second egg had been deposited the two eggs were found to have two or three grass straws placed loosely over them.

In all observed instances the eggs were deposited at the rate of one egg each day. Incubation normally began when the last egg of the clutch was laid.

Complement.—The complement of eggs is either three or four, depending, possibly, upon weather conditions as well as upon individual proclivities. The count of full sets observed was as follows: first year, 3 sets of four and 16 sets of three; second year, 1 set of four and 11 sets of three; third year, 7 sets of four and 2 sets of three; fourth year, 2 sets of four and 5 sets of three. In the third year, when the proportion of large sets showed remarkable increase, the spring was unusually wet and cold.

Period of Incubation and Nestling Period.—The normal period of incubation is 10 or 11 days, as indicated by the data from five nests (nos. 3, 20, 38, 49, 54). The nestlings remain in the nest from 9 to 12 days after hatching, as shown by the dates for five nests (nos. 3, 8, 20, 38, 54).

Situation.—The Desert Horned Larks avoid the more luxuriant growths which are to be found in moist situations. They prefer the dry bench lands. There is no special preference as to surface contour so long as the situation is a dry one. Nests occur on knolls or slopes, or in the dry depressions of the benches. The following exemplify rather unusual situations: One nest in the higher part of a low meadow in which Chestnut-collared Longspurs were nesting (32); one at the edge of a large meadow; another in a small meadow which, however, had become quite dry (51); and one on the slope of a coulee bank (11).

The number of nests which one finds near old dried droppings of horses, and sometimes of cattle, seems much greater than the laws of chance would account for. Five nests were especially mentioned as having none near them (b), but numerous others had droppings within a few feet. The first nest was about twelve inches from a hillock of dried horse dung (1); and two nests were situated at the very edge of such material (a). These slight elevations serve as convenient lookout stations; the birds frequently stand upon them.

The fencing off of new roads, and the vehicular travel on them, do not prevent the use of desired nesting spots. A nest may be close to a fence (28), or in undisturbed sod in a roadway (54). One pair of larks built a nest only a few rods south of my cabin (38).

Only one nest was found in a cultivated field (55). This, the home of a bird pioneer, merits more than passing mention. It was in a field of young spring wheat which stood in drills, about two inches tall, the ground being otherwise bare. The nest was sunk, in the usual manner, in the soft cultivated soil. There was a sprig of young wheat a few inches high at the edge of it on the west. Some loose bits of old wheat stubble were strewn at the east side, and several bare pellets of earth (without lichens) were arranged on the northeast side. The nest was composed of old, dead grass and rootlets, with the lining-grass somewhat shredded, and with a few bits of soft plant-down at the bottom.

Notes.—(a) 23, 24. (b) 6, 29, 30, 32, 58. In fenced pasture (21, 39, 56, 57, 58). Few feet from edge of wheat field, in prairie sod (29).

Concealment.—The prevailing short grasses of the bench lands do not afford much cover. The concealment of nests in general, so far as the surrounding grass

is concerned, is very incomplete, sometimes quite meager. Nevertheless, the nests are not easy to see. In most cases there is some protection from grass on the west side; sometimes it slants over the nest, owing to the prevailing winds.

A slight bunch of buffalo grass may project somewhat over the west side, or a little yarrow plant may overhang (14). Occasional nests are not at all protected on any side. Six nests among those recorded were remarkable for the openness of their situations. Two in virgin prairie had scarcely any grass around them; two were in a fenced pasture which was very closely cropped by horses and cattle. Five nests were but slightly protected on the west by a scant clump of vegetation; one was rather well hidden by a thick tuft of dead grass which curved over it from the west (53); another was sheltered on the west by a thick, compact tuft of short grass (19); one was scantily surrounded by tufts of blue-joint (31); and one was situated in the midst of a small thick tuft which protected it somewhat on the south, west, and north (29).

Notes.—Protected on west: (41, 42); small bunch buffalo grass (6, 24, 25, 30); very slight tuft and weed (28); well protected on west and southwest (18). Scantily surrounded: (37); chiefly on west (32); except northeast, thickest tuft southwest (33); overhanging (44). In very short grass, hay cut last fall (51). Scarcely any grass: no clump on west (22); no protection, but mud pellets on east as usual, grass at west possibly eaten by stock after nest was built (17).

Excavation.—The nest is invariably built in a rounded hollow in the ground,



Fig. 14. Same nest as shown in figure 13, with pellets lifted and loose fine dirt removed from the cavity at the entrance side of nest; May 21, 1915.

which is evidently scratched out by the birds, the excavated dirt in the form of fine scratchings being thrown out to one side of the nest. This dirt is almost always on the east side, which is also the side least protected by vegetation.

Usually the top of the nest structure is flush with the ground surface. Of fifteen nests where this feature was noted, seven were so recorded (a) and four more were almost flush (b). The grass rim of one nest projected above ground a half inch or more (42). The other three were only about half sunken and each of these possessed some further peculiarity. One of them was in a thick tuft of grass which doubtless made the digging difficult (29), another, which projected about an inch, had a little mound around it, built up by the birds (37), and the third, sunk a little more than half its depth, had a few scratchings of earth to the southeast, and only a few bits of dried mud in irregular lumps instead of the usual flat chips (53).

Notes.—(a) 1, 6, 15, 18, 23, 28, 32. (b) 30, 33, 51, 58.

Materials of Nest Structure.—The materials used for the body of the nest are dead grasses, including both stems and blades, usually without any other materials. In one nest the dried grasses were all rather fresh (43); but in eight others they were old (b) and more or less weathered (c). Fifteen of the nests were noted simply as "dried" or "dead" grass, the material being neither remarkably new nor old (a). One nest was made of grasses and weed stems some of which were partly decayed (28). The nest structure built by the pioneer on cultivated land contained rootlets together with old dead grass (55).

Notes.—(a) 1, 14, 15, 16, 17, 18, 22, 23, 25, 29, 30, 37, 40, 41, 53. (b) 19, 32, 33, 42, 44, 45. (c) 27, 51.

Lining.—The linings display more individuality. Dried grass forms the principal lining of all nests, but it is usually supplemented with other materials. Thirty nests in which the lining was particularly examined might be grouped thus: (A) no other substance than grass in the lining (2 nests); (B) only one substance in addition to grass (24 nests); (C) two substances in addition to grass (3 nests); (D) three substances in addition to grass (1 nest).

In the two nests of group A, dead grasses, mostly old and weathered, formed the only lining (a).

In group B, one nest had merely the addition of a single bit of rag from my cabin yard (28); another had some tiny bits of rabbit fur (25); two contained some soft, silky, white plant down (b); and a fifth had other soft plant fibers (37). The remaining nineteen of this group contained seed pods, heads, tips or leaves of yarrow (c). The typical lining is dried grass with the addition of some bits of yarrow, which, when dried, are gray or white, and of soft, velvety texture.

The three nests of group C contained bits of yarrow as the second substance. The third substance was in one nest, a tiny bit of wool (6), in another, some white hairs of the jack rabbit (1), and in the third, a few bits of white fluffy down from some cottony weed seeds (19).

The nest in group D was lined with dried grass, yarrow, soft plant fibers, and skeletonized bits of plants (15).

All four nests of the last two groups contained the yarrow, making a total of 23 nests containing this plant out of a total of 30 nests reported. In one nest the yarrow leaves were partly fresh and green (19). It is noteworthy that no horse hairs or cow hairs were found in any nest; the small bits of wool and rabbit fur were the only animal substances observed. As for the condition of the grass used in the linings, in the majority of nests it was neither remarkably old nor new. In six nests it was old and weathered (d); five contained shreds of old grass (f); one was

lined with grass which was newer than that of the main nest structure (27). In one instance the lining grass was in short bits (14).

Notes.—(a) 51, 58. (b) 30, 55. (c) 3, 14, 16, 17, 18, 22, 23, 27, 29, 31, 32, 33, 40, 41, 42, 43, 44, 45, 53. (d) 19, 32, 33, 42, 45, 51. (f) 18, 43, 53, 55, 58.

Orientation.—There is remarkable uniformity in the direction in which the entrances to the nests faced. Out of 36 nests recorded in this respect, 28 faced approximately east; and, omitting one which had no well defined entrance (48), all nests recorded in four seasons faced toward that quarter of the compass between northeast and south-of-southeast. The strong prevailing winds from the west offer an adequate explanation. No doubt the bird chooses a spot to the leeward of a tuft of grass and stands facing against the wind while scratching the excavation.

Notes.—East (6, 8, 9, 14, 15, 17, 19, 22, 23, 25, 27, 28, 30, 31, 32, 33, 34, 37, 42, 44, 45, 46, 50, 51, 58); slightly north of east (21, 29); slightly south of east (53); northeast (18, 52, 57); southeast (16, 41, 43); south of southeast (40).

Mud Pellets.—The first nest examined had pellets of sun-baked mud arranged at the edge of it, some of them closely fitted to the rim, over the bulged body of the nest structure. All nests examined, with only one exception (42), were provided with pellets of dried mud at the entrance or elsewhere around the nest. These are little cakes or broken pieces of the cracked crust which forms on the surface of mud when baked by the sun.

Usually the pellets have either a growth of lichens or a diminutive kind of moss on the side which had been uppermost before they were gathered; but some of them are bare. At two nests all the pellets were bare (a), while at two others all were lichen-covered (b); at three nests bare and lichen-covered pellets were mixed (c); and at two nests some pellets were covered with moss and others with lichens (d). The pellets are used chiefly to cover the loose dirt thrown out in excavating the hole for the nest. Hence they are most numerous at the entrance, on the east side of the nest. At some nests, however, they are used around the rim, and are sometimes very neatly placed and arranged (1). In other instances they are arranged about the edge of the nest on the open side only (6). At an unusual nest which was half above ground, the mud pellets, without lichens, were placed on top of prostrate, green grass blades (29). One other nest had loose pellets on top of the grass at the entrance (58). Nest 32 had lichen-covered mud pellets at both the east and west sides, although the excavated dirt was nearly all on the east side as usual. At nest 53 the birds used a few small irregular lumps of dried mud, instead of the customary flat pellets.

The pellets are sometimes placed lichen-side up, and sometimes bare side up. There seems to be a difference in individuals in this respect, although some nests show no uniformity. All the pellets at nest 30 were placed moss side down, paving the entrance-way on the east side. At nest 51, where more pellets than usual were employed, some were placed lichen or moss side up, while others were rough side up.

On rare occasions small pieces of other material are used in conjunction with the pellets to complete the camouflage. For example, one nest had the dried root-stock of a plant and a flat piece of rock about the size of a dime at the entrance among the mud pellets, which latter were mostly without lichens (43). The nest on cultivated land had pieces of old wheat stubble, together with bare pellets—a combination well suited to the new situation (55). Without doubt, the pellets render less conspicuous the fresh earth removed from the hollow.

Notes.—(a) 29, 55. (b) 28, 32. (c) 25, 41, 43. (d) 30, 51. Mostly moss instead of lichens (30). Few pellets at entrance, mostly bare (41). North of entrance only; few in number (44).

Form and Dimensions.—The ground hollow for nest 32 measured 4 inches in diameter by 2 inches deep; the inside measurements of the finished nest were 2½ by 1¾ inches; hence the maximum thickness of nest wall, near the top, was about three-fourths of an inch, while the bottom of the nest was only about one-fourth inch thick. Nine nests showed mean inside diameters ranging from 2⅜ to 2⅝ inches (average 2.49); and inside depths from 1⅝ to 2¼ inches (average 1.92). The ratio of depth to diameter, referred to as the depth-factor, varied from 0.65 to 0.90 (average 0.77). Two of these nests were ¼ inch longer than wide; one measured ½ inch longer than wide; the other six were very nearly circular. After the eggs have hatched the nests become enlarged by the growing, squirming nestlings.

MCCOWN LONGSPUR

The accompanying table of nests of the McCown Longspur (*Rynchophanes mccownii*), and the progress supplement immediately following, employ the notation previously explained.

Nest No.	First observation			Final observation			Complement	Date of laying final egg (known or estimated)	Nest No.	First observation			Final observation			Complement	Date of laying final egg (known or estimated)			
	Date found	Contents	Date	Contents	Incubation	Date found				Contents	Date	Contents	Incubation							
1	1915								32	6-7	4e	6-8	4e	30	4	6-5	Est.			
2	5-9	4e	5-10	4e	0	4	5-9	Est.	33	6-8	4e	.....	.....	30	4	6-4	Est.	
3	5-12	4e	.....	.....	0	4	5-10	Est.	34	6-10	3e	.....	.....	30	3	6-6	Est.
4	5-13	3e	.....	.....	0	4	5-13	Est.	35	6-13	4ei	6-15	4e	30	4	6-11	Est.	
5	5-13	4e	5-14	4e	0	4	5-13	Est.	36	6-16	3e2y	.....	.....	5	5	6-4	Est.	
6	5-15	3e	.....	.....	0	3	5-13	Est.	37	6-27	2y	.....	.....	.....	.....	6-9	Est.
7	5-22	3e	5-29*	3y	0	3	5-22	Est.	38	7-1	3ei	.....	.....	.....	.....	7-1	Est.
8	5-27	3e	6-5*	3y	0	3	5-22	Est.	39	7-1	3ei	.....	.....	.....	.....	6-28	Est.
9	5-30	4e	5-31*	o	10	4	5-22	Est.	40	7-2	2ei	7-7*	5e	20	5	7-5±	Kn.			
10	5-31	4y	.....	.....	10	4	5-29	Est.	41	7-20	3ei	7-23*	3e	.....	5	7-11	Est.
11	5-31	4y	.....	.....	10	4	5-10	Est.	42	7-23	4e	.....	.....	30	4	7-24	Est.
12	6-15	p	0	4	6-19±	Kn.	1917							
13	6-16	1e	6-29	4e	0	4	6-14	Est.	43	5-18	4e	.....	.....	20*	4	5-16	Est.	
14	6-22	3e	6-23	3e	70?	3	6-14	Est.	44	5-19	3e	.....	.....	30	3	5-16	Est.	
15	6-23	4e	.....	.....	30	4	6-19	Est.	45	5-26	y	.....	.....	.....	.....	.....	.....
16	6-27	3ei	.....	.....	.....	3	6-20?	Est.	46	5-28	y	.....	.....	.....	.....	.....	.....
17	6-27	4ei	.....	.....	.....	4	6-20?	Est.	47	6-21	3y	.....	.....	.....	.....	.....	.....
18	6-27	4ei	.....	.....	.....	4	6-20?	Est.	48	6-21	y	.....	.....	.....	.....	.....	.....
19	6-27	4ei	.....	.....	.....	4	6-20?	Est.	49	7-7	4e	.....	.....	90	4	6-27	Est.
20	5-12	4e	10*	4	5-10	Est.	1918							
21	5-13	p	.....	.....	10*	4	5-19	Kn.	50	5-22	2e	.....	.....	60?	.....	5-14	Est.
22	5-13	3ei	5-15	3e	40	3	5-10	Est.	51	5-22	3y	.....	.....	.....	.....	5-10	Est.
23	5-18	3e	.....	.....	30	3	5-14	Est.	52	5-22	3y	.....	.....	.....	.....	5-6	Est.
24	5-16	3e	5-19*	3e	30	3	5-16	Est.	53	5-22	4e	.....	.....	40	4	5-16	Est.	
25	5-18	3ei	5-19	3e	*	3	5-13	Est.	54	5-22	3e	5-26	4e	30	4	5-23±	Kn.			
26	5-27	3y	.....	.....	20	4	5-11	Est.	55	5-24	3e	5-26	3e	30	3	5-23	Est.	
27	5-15	o	5-27*	3e	10	3	5-23	Est.	56	6-4	3e	.....	.....	90	3	5-25	Est.	
28	6-2	3e	5-5*	4e	20	4	6-3	Kn.	57	6-4	4e	.....	.....	30	4	5-30	Est.	
29	6-5	3e	.....	.....	20	3	6-3	Est.	58	6-4	4e	.....	.....	90	4	5-26	Est.
30	6-5	3e	.....	.....	20	4	6-4	Est.	59	6-29	4e	.....	.....	4	4	6-26	Est.
31	6-7	3e	.....	.....	30	4	6-4	Est.	60	6-29	o	7-5*	3e	3	4	6-23	Est.	
					30	3	6-4	Est.	61	7-2	1e	.....	.....	3	3	7-2	Kn.	

PROGRESS SUPPLEMENT

Nest 5.—May 15 (evening), 3e; 16 (7:30 a. m.), 3e; (8 p. m.), 3ei; 17, 18, ditto; 19 (10:30 a. m.), 1e, 1y wet, 1y dry; (about 7:30 p. m.), 1e, 2y; 20 (8 a. m.), 3yi; 23, 3y; 25, 27, ditto; 28 (evening), y well feathered; 29 (evening), n empty. On May 16 bird absent at 7:30 a. m. and at times of several other visits during day, but was incubating at 8 p. m. Nestling period 10 days.

Nest 6.—May 22, 3e; 23, 3e; 27, 3y (2 or 3 days old); 29, 3y.

Nest 7.—May 27, 29, 30, 3e; June 5, 3y (recently hatched).

Nest 8.—May 30, 4e; May 31, two eggs destroyed and one partly broken showing holes made by teeth or mandibles. Incubation advanced. Nest near ground squirrel diggings.

Nest 9.—May 30, 4e (drilled one, nearly fresh); 31, n empty; shell 3 ft. away showed two tooth-marks, probably ground squirrels.

Nest 10.—May 31, 4y about ready to leave n.

Nest 11.—June 15, p (excavation apparently finished; fine dirt scratched out

among grass at northeast side); 16 (9 a. m.), principal portion of nest material in place but seemingly not ready for lining; 18, nest rummaged on inside (ground squirrels?) and deserted.

Nest 17.—May 12, 4e (incubation more apparent in the heavily marked egg).

Nest 18.—May 13, pg (seems nearly finished); 14 (morning), lining partly in place; (evening), red and white hair in lining, evidently finished; 16 (morning), 1e; 17 (7:30 a. m.), 2e; (7 p. m.), 2e; 18 (6 a. m.), 3e; (6 p. m.), ditto, bird absent; 19 (7 a. m.), 4ei; 25 and 26, nest under snow; 26 (afternoon), I uncovered nest and female returned to it; 27, 28, 29, i; 30, 4e warm, bird absent; 31 (morning), bird absent; June 4, 4ei; 5, ditto; 6 (morning and evening), 4e warm; 7 (morning), absent; (noon), i; 8 (noon), i; (morning and evening), absent; 9 (early morning), eggs destroyed and nest torn up (skunk?).

Nest 21.—May 16, 3e; 18, 3ei; 19, 3e.

Nest 22.—May 18, 3ei; 19, 3e one advanced, two infertile.

Nest 23.—May 27, 3y dead (killed by storm) probably hatched about May 23.

Nest 24.—May 15, o; 27, 3e under water (nearly fresh).

Nest 25.—June 2, 3e; 3, 4e; 5, 4e.

Nest 27.—June 5, 3e had been abandoned because of snowstorm, incubation well begun.

Nest 36.—June 16, 3e, 2yi; 19, 1e, 4y, egg infertile (removed); 23, 4y dead as result of storm.

Nest 37.—June 27, 2y with wing quills well sprouted.

Nest 38.—July 1, 3ei; 2, 3e; 5, 3ei; 10, n empty, no clue.

Nest 39.—July 1, 3e; 2, 3e and a partly emptied damaged shell on ground a foot from nest; 5, 3e (bird not seen); 10, 1e, 2y (hatching); 13, 3y; 19, 3y rather well feathered; 21 (morning), n empty. Nestling period doubtless 10 days.

Nest 40.—July 2, 2ei; 6, 5ei; 7, 5e.

Nest 41.—July 20, 3ei; 21, 23, ditto.

Nest 42.—July 28, 4e, the longest one infertile.

Nest 43.—May 18, 4e, the bluish egg nearly fresh.

Nest 51.—May 22, 3y just hatched.

Nest 58.—June 28, 4e apparently fresh; July 2, 4e; 8, 1e, 3y; 9, 4y (fourth hatched in night); 13, n empty and lining torn out (skunk?).

Nest 59.—June 29, 4e; July 5 (morning), 1e, 3y; (later in day) 4y; 13, y fully feathered; 15 (morning) 4y, but they all left the nest before 3 p. m.; 17 young can fly for short distances. Nestling period 10 days.

Nest 60.—June 29, o; 30, 1e; July 2, 3e; 5, 3e.

Nest 61.—July 2, 1e; 3, 2e; 5, 1e; 6, 1e; 7, empty, no clue.

TOPICAL NOTES AND SUMMARIES

Nesting Dates.—Nesting begins in the early part of May and continues into July. There are evidently two broods in a season; young birds, able to fly, were observed on the ground close to sitting females at two nests. The distribution of nesting dates during four seasons is indicated in the accompanying summary. In one nest the eggs were hatched on May 19, indicating completion of the clutch about May 7. But a young McCown which was found out of the nest, unable to fly, on May 23 (1915) seemed to evidence an egg as early as the first day of May.

The earliest date for a full clutch of eggs actually found was May 9; the latest date for eggs was July 28 (with incubation about one-third advanced).

Four-year Summary of Nesting Dates

	First year		June 11 to 20	1 nest
May	1 to 10	4 nests	June 21 to 23	0
May	11 to 20	3 nests	June 21 to 25,	destructive storm
May	21 to 31	3 nests	June 24 to 30	1 nest
June	1 to 4	0	July 1 to 10	2 nests
June 2 to 4,	destructive storm		July 11 to 20	1 nest
June 5 to 10	0		July 21 to 31	1 nest
June 11 to 20	5 nests			
June 24,	observer left station		Third and fourth years combined	
	Second year		May 1 to 10	2 nests
May	1 to 10	2 nests	May 11 to 20	4 nests
May	11 to 20	5 nests	May 21 to 31	4 nests
May	21 to 25	2 nests	June 1 to 10	2 nests
May 24 to 26,	destructive storm		June 11 to 20	0
May 26 to 31	0		June 21 to 30	3 nests
June 1 to 10	11 nests		July 1 to 10	1 nest

Note: Figures in the summary show the number of known nests completed in the first, middle and last third of each month. Interruptions caused by destructive storms are indicated for the first and second years. Nesting operations were not arrested by storms during the third and fourth years; hence these years, taken together, show a more significant average.

Complement.—The number of eggs in a clutch is usually three or four, rarely five. Three nests were found containing only two incubated eggs or young, but their previous history was unknown. The total count of full sets was as follows: 24 sets of three, 26 sets of four, and 2 sets of five eggs.

Nestling Period.—The nestling period was ten days in each of the three nests noted (nos. 5, 39, 59). The young from nest 59 were able to fly for short distances two days after leaving the nest; that is, when they were twelve days old.

Situation.—The McCown Longspurs use the same nesting sites as the Desert Horned Larks. They prefer the dry situations. The occasional nests on low ground were probably built in very dry weather.

No nests were found on cultivated ground. A nest was observed in a narrow strip of sod between two wheat fields, at the extreme edge of the grass, against the bare dirt turned over by the plow (55); another was found in a strip between a wheat field and new breaking (42), while another, though in the prairie grass, was near the edge of a wheat field (26). Even more notable was a nest on a narrow dead furrow of prairie sod, missed by the breaking plows, in the middle of a field of winter wheat (57).

Three nests were observed between the roadway fences of infrequently traveled prairie roads (53), one only five feet from the wheel tracks (24).

Although the nests are usually placed without reference to any objects other than the tufts of grass, one of the roadway nests was against a partly buried rock (54). Occasionally nests are placed near old dried heaps of horse droppings; one was a foot away (28), one was quite close (1), one was at the edge of such a point of vantage (19), while another was in the midst of a scattered pile which had become very dry and weathered (34).

Notes.—On high ground, top of knoll or ridge (5, 11, 28, 30, 31, 32, 33, 35, 40, 42, 59); slope of knoll (8, 18, 24, 58); low ground, or rather low, but dry (39, 43).

Concealment.—The prairie is covered chiefly with short buffalo grass interspersed with a sprinkling of the taller "blue-joint," none of the grass being really tall. Typical nests are not effectually hidden by grasses; but some nests are hard to see (6). A nest may be effectively camouflaged by scant blue-joint grass-clusters slanting over the top of it (22), or by dry blades of grass hanging loosely over it (1). A nest between two small tufts of grass was not easily seen, even at close range (4).

At the other extreme are a few nests quite devoid of concealing vegetation. One, in a grazed pasture, had no standing grass about it—just three or four scant shoots (20). At another the growing tufts near-by had been cropped off by stock (34).

Nests are sometimes built in the middle of a little tuft of grass (28), or have a more or less effective clump of taller or thicker grass at one side. One was at the base of a tuft which grew on the north (31), one had a tuft on the west (24), and another an ineffective small clump of dry grass on the southwest (43). One nest was surrounded by grass, a few spindling little weed stalks and a small low creeping plant (26).

Only one nest showed any indication of a special entrance: it was surrounded by a scrawny growth of moderately tall blue-joint grass with somewhat of an entrance-way at the southeast side (40).

Notes.—Sparse tall grass around nest (21, 29, 40, 57). Amid ordinary growth,



Fig. 15. Nest and four eggs of McCown Longspur; nest 59, July 3, 1918.

slightly protected (25, 30, 35, 42, 54); not much protection (17), short tufts (32), scant clump (44); no clump (19).

Excavation.—The nests are built in hemispherical hollows in the ground prepared by the birds and the rim of the nest is usually flush with the ground surface. Of seventeen nests especially noted, twelve were even with the ground (a), three were nearly even (b), one had its rim slightly below the surface (20). The rim of one nest was built above ground and was woven into the standing grass, except at one side where the dirt from the excavation had been left among the grass and was partly covered with nest material (12). Two other nests showed fine dirt that had been scratched out among the grass at the northeast side (c). These three were the only nests recorded as showing any indication of dirt that had been removed from the nesting hollows.

Notes.—(a) 1, 4, 17, 19, 21, 22, 24, 25, 28, 42, 43, 44. (b) 40, 54, 55. (c) 11, 28.

Materials of Nest Structure.—The composition of thirty-four nests was noted. Thirty-one were composed entirely of dried grasses, including both blades and stems. Some nests were made and lined entirely with old dead grass, somewhat shredded. In one instance the grass was very old and weathered at the rim but not so old beneath (34). The three nest structures not wholly of grass were as follows: The body composed of old weed stems and grass (56); weed stalks used with grass for the foundation or preliminary lining of the ground hollow, but the inner portion

entirely of rather old dead grass (42); nest body of grass and shreds of weed stems, some of them decayed, together with a few roots (24).

Notes.—Entirely of dried grass blades and stems: not remarkably old nor new (1, 2, 3, 4, 17, 19, 25 to 33 inclusive, 35, 44, 53); old (21, 22, 40, 49, 54, 55); old and somewhat shredded (14, 60); some of grasses shredded (12); old and shredded (57); base of old weathered grass (20); very old at rim (34); rather fresh dead grass (43).

Lining.—The lining of the nests is mainly of grass, though occasionally with some slight additions. Ten nests were lined entirely with grass of the same character as the nest body, sometimes old and shredded, sometimes newer and not shredded. In two nests the lining was of finer grass and shreds (24). In one, it was of newer grass than the body structure, somewhat shredded (20). One nest showed a lining of quite new dried grass blades, with a few shreds and a few hairs added (22).

When only one other substance is used in combination with the grass lining it is most frequently a small amount of hair. Twelve nests contained a few horse or cow hairs. In one of these a little bunch of soft brown horse hair had been placed at one spot among the grasses of the lining (35). One nest had a considerable patch of short red hair (4); two contained both red and white hairs in combination. Instead of hair, the second substance may be light shredded plant fibers (a), sometimes soft, silky and matted (b), or soft, white, matted plant-down (29). One nest contained two feathers in the grass lining, which latter was unusual in that it consisted of new dry grass stems and blades (some of the stems split) and a few shreds (21). Another nest was lined in the bottom with the outer husks from wheat stubble (54).

Only three of the nests examined contained two substances in the lining in addition to grass, the second substance being hair in each instance. One of these contained two small bird feathers with only two or three horse hairs (34); another had some newer grass, and in the bottom a few bits of soft plant fiber, and about half a dozen black hairs (40); and the last, a small amount of white rabbit fur and soft brown hair (28).

Notes.—(a) 17, 19. (b) 30, 31. Lining entirely of grass; same as body (1, 26, 44); finer, with shreds (24); newer than body, somewhat shredded (20); rather old (42); old, somewhat shredded (14, 32, 49, 55, 60); blades and shreds (43); shreds (27). Lining of grass with hairs added: few hairs (2); hairs, both red and white (3, 18); some horse hairs (33). Some of the grass old and shredded, with very few fine red hairs (12); somewhat shredded, with very few horse or cow hairs (25).

Form and Dimensions.—Measurements of four nests were taken soon after the eggs had been laid. The internal diameters varied from $2\frac{1}{4}$ to $2\frac{1}{2}$ inches (average 2.34); the depths from $1\frac{3}{4}$ to $2\frac{1}{4}$ inches (average 1.94); the ratio of depth to diameter, from 0.74 to unity (average 0.83), the depth of one nest being equal to its diameter.

CHESTNUT-COLLARED LONGSPUR

In the succeeding table, of nests of the Chestnut-collared Longspur (*Calcarius ornatus*), and also in the supplements, the notation is the same as previously explained.

PROGRESS SUPPLEMENT

Nest 5.—May 22 (p. m.), ground hollow found (no loose dirt near); 23 (a. m.), construction of nest begun at rim; 25 (9:30 a. m.), p; 27 (8 a. m.), nest apparently finished; 29 (7 p. m.), 2e; 30 (9:30 a. m. and 8 p. m.), 3e; 31 (8 a. m.), 4e; June 5, nest empty but no clue to marauder.

Nest 9.—June 10, 4e; 13, ditto; 23, 4y, killed by storm.

Nest 10.—June 12, 5e (3 nearly fresh, 2 far advanced).

Nest 11.—June 29 (p. m.), 3ei; 30 (a. m.), 4ei; July 1, 6, 8 and 11, 4e; 12 (early morning), 2e, 2y not yet dry; (mid-afternoon), 1e, 3y; 13 (a. m.), 4yi; 19, 4y (feathered); 20, 3y; 21, ditto; 22, ditto but 1y dead; 23, n empty (2 young few inches away, one of them dead). Period of incubation about $12\frac{1}{2}$ days. Nestling period about $10\frac{1}{2}$ days.

Nest No.	Date found	First observation	Final observation		Incubation	Complement	Date of laying final egg (known or estimated)	
		Contents	Date	Contents				
1	2	3	4	5	6	7	8	
	1915							
1	5-8	4e	5-9	4e	20	4	5-6	Est.
2	5-14	4e	5-15	4e	0	4	5-14	Est.
3	5-22	4e	.....		60	4	5-14	Est.
4	5-22	4e	5-23	4e	20	4	5-21	Est.
5	5-22	p	*			4?	5-31	Kn.
6	6-23	4e	.....		70	4	6-12	Est.
	1916							
7	6-5	4e	6-6	4e	0	4	6-5	Est.
8	6-6	5e	6-7	5e	10	5	6-5	Est.
9	6-10	4e	*			4	6-9	Est.
10	6-12	5e	.....			5	6-3	Est.*
11	6-29	3e	*			4	6-30	Kn.
12	7-1	5e	7-2	5e	10	5	6-30	Est.
13	7-3	5e	.....		10	5	7-1	Est.
14	7-7	4e	*			4	6-29	Est.
15	7-10	4e	*			4	7-9	Est.
	1917							
16	5-17	3(?)	5-19*	4e	0	4	5-18	Est.
17	6-7	5e	.....		0	5	6-7	Est.
18	6-7	2y	*			.....	5-17	Est.
19	6-23	5e	.....			5	6-20	Est.*
20	7-11	4e	.....		10	4	7-10	Est.
	1918							
21	6-2	2e	6-6	4e	0	4	6-4	Est.
22	5-22	3e	.....		60?	3?	5-16	Est.

Nest 14.—July 7, 4e; 8, ditto; 10 (noon), 3e, 1y; (evening), 1e, 3y; 11 (morning), ditto; 12 (morning), 4yi; 18, 4y; 19, 3y (one died and had been removed by parent), one left nest during afternoon, leaving 2y; 20 (a. m.), 2y; (p. m.), nest empty. Nestling period about 9½ days.

Nest 15.—July 10, 4e; 13 and 16, ditto; 19, 4ei; 21 (a. m.), 2e, 2y; (p. m.), 1e, 3y.

Nest 16.—May 17, 3e?; 18, 4e; 19, 4e.

Nest 18.—June 7, 2y about ready to leave nest when found.

Nest 19.—June 23, 5e (one lightly marked and practically fresh, others well begun).

ADDITIONAL DATA

Anomalies.—Nest 1.—Eggs small and nearly spherical.

Nest 9.—Female in approximate male plumage. No fabricated nest structure.

Nest 10.—Unequal incubation in two groups of eggs.

Nest 11.—Death of nestlings without violence.

Nest 14.—Short distance from earlier nest no. 9. Female in approximate male plumage. Death of nestling without violence.

Nest 15.—Female in intermediate phase of plumage.

Nest 19.—Unequal incubation (fresh egg lightly marked). Female in intermediate phase of plumage.

TOPICAL NOTES AND SUMMARIES

Nesting Dates.—The nesting season begins early in May and extends into July. The estimated final laying dates for the earliest and latest sets found were May 6 and July 10, respectively. The distribution of dates in the following summary leaves it uncertain whether more than one brood is raised each year. The protracted nesting season may be due to unsuccessful trials.

Four-year Summary of Nesting Dates

Month	Period	First year	Second year	Number of nests		Fourth year	Total
				Third year			
May	First third	1					1
	Middle third	2		2		1	5
	Last third	2					2
June	First third		4	1		1	6
	Middle third	1		1			2
	Last third		3				3
July	First third		2	1			3

Progress of Nest Building.—The birds evidently dig the hole in which to build their nest; but the method employed and the time required were not determined. On the afternoon of May 22 I discovered a nicely rounded hollow in the ground, amidst the grass (n. 5). There was no loose dirt near it. When I returned the next morning the nest proper had been started at the rim. There were only two weed stems at the bottom of the hole. Two and a half days later, at 9:30 a. m., the entire excavation had been lined with dead grass blades and stems, but the material was as yet rather loose in the bottom, while the rim was apparently finished. The grass material of the rim had been interwoven with the basal stems of the standing grass which grew around the nest. It seems especially noteworthy that the weaving of the rim was the first work done upon the nest structure. By 8 a. m. on May 27 (about four days after construction had started) the nest was apparently finished, with some white hairs added to the lining. The first egg was probably laid early the next day, as there were two eggs on the evening of the 29th, three on the morning of the 30th, and four on the morning of the 31st.

Complement.—The complement of eggs is usually four, but not uncommonly five. The foregoing notes record 14 sets of four, and 6 sets of five. One nest was found with only three incubated eggs, but its previous history was unknown.

Incubation and Nestling Periods.—The period of incubation observed at nest 11 was about twelve and one-half days.

The nestling period is about ten days. Since all eggs of a clutch hatch the same day, or within two days, continuous incubation apparently does not begin until the set of eggs is either complete or nearly so. When nest 10 was found it contained five eggs in two entirely different stages, three being almost fresh while two were far advanced. In nest 19, four eggs showed incubation well begun, but the fifth egg, which was more lightly marked than the others, was practically fresh.

Situation.—The Chestnut-collared Longspurs prefer to nest in the low and slightly moist situations, where the thicker and taller grasses afford adequate concealment. If the meadow is wet or flooded the nests are placed on higher ground but are often near the moist margins. Nine of the nests were either in a low meadow (a) or at the edge of one (b), or slightly up the slope (12); but usually not in a wet place. One of these was on dry ground about twelve feet from the marshy border of Grassy Lake (10). One nest was in a small depression of the prairie which, though previously wet, was dry when the nest was found (16); two nests were in coulees (c). Thus twelve nests out of eighteen were in low places. However, one nest was high and dry on a knoll of the rolling prairie (17), one was on sloping land near a coulee (20), one in a fence border of native sod between wheat fields (21), and one was in a patch of grass on a dead-furrow left by the breaking plows, in the midst of a field of winter wheat which was almost knee high at the time the nest was found (19).

Notes.—(a) 2, 7, 8, 15. (b) 1, 9, 13. (c) 3, 6. On ordinary prairie land (4, 5).

Concealment.—The nests are effectually hidden, far more carefully secreted than the nests of McCown Longspurs and Desert Horned Larks. In the moist situations the tall grasses make this easy, but the pairs that nest on the higher ground also find grass clusters adapted for concealment. In general there is no entrance-way to the nest. One nest was open at the southeast side (16), but it was the only one that showed any definite indication of an entrance-way.

Notes.—Thoroughly hidden in meadow grass: surrounded (7); in tuft standing on all sides (1); surrounded, and a thick tuft slanting over (8). Effectually concealed by rather long grass: long tufts of dead grass at sides and leaning across



Fig. 16. Nest and eggs of Chestnut-collared Longspur in strip of prairie sod between two wheat fields; nest 21, June 6, 1918.

top (16); in rather tall thick clump (12); among clumps (13). In shorter grass: well hidden by dry and green grasses (17); completely concealed in thick short grass (3); short tufts all around (10); green grass two sides (20); in tuft of prairie grass (21).

Excavation.—Although the earth hollow for the nest is no doubt dug by the birds, I was unable to find any loose dirt in the vicinity of the nests examined. The rim of the nest is usually flush with the surface of the ground (a). One nest was deeper (16); another projected above the surface and had its rim interwoven with the bases of standing grass. Other nests were well sunk (b).

Notes.—(a) 1, 7, 8, 10, 17, 19, 21. (b) 3, 4, 9.

Materials of Nest Structure.—The body of all nests examined was composed entirely of dried grasses. These grass materials consist of both blades and stems, varying in different nests as to age and texture. One nest was made of old, soft, and shredded grasses (21); others had very old grass around the rim but fresher grasses in the bottom. Old, weathered grass in the rim is clearly an aid to concealment.

Notes.—Body entirely of dead grass: dried blades and stems (1, 2, 3, 4, 5, 6, 7, 12, 13); very old grass in rim (8); old in rim but newer in bottom (16); grass all old (17, 20); soft, old, shredded (21); slightly contracted at rim (10); no nest structure (9).

Lining of Nest.—The materials used for linings include grasses, rootlets and hair, in various combinations and proportions. One nest had only some very fine grasses in the lining, with a few old grass blades somewhat shredded (10). In two nests the fine dried grass was combined with a few fine grass rootlets (a). Three nests were lined with dried grass of the same quality as the body of the nest, with a few hairs added (b) — coarse black horse hairs in one instance (2). In one nest, rootlets and hair were combined with finely shredded grass (20), and in another the lining consisted of a few fine rootlets, and white hairs $1\frac{1}{2}$ inch long (1). Four

other root-lined nests contained no hair. One of these had a complete, thin, inner wall composed almost entirely of fine grass roots, except at the rim where old dead grass was used (19).

Three of the nests may be classed as hair lined (horse or cow hairs). One of these contained some white hair lining (5), one was lined with brown horse sheddings (4), one was so thickly lined with hair that it completely covered the other nest material (6). Yet another pair of birds had lined their nest very nicely with white rabbit's fur (prairie hare or jack rabbit) (3).

In one instance there was no fabricated nest structure, but only a mat of dead grass in the *bottom* of the excavation; the bare earth formed the only walls (9).

Notes.—(a) 12, 16. (b) 7, 21. Some long hair-like roots in lining (8). Nicely lined with fine roots (13). Lined in bottom with fine grass roots (17).

Form and Dimensions.—The nest is a deep, well formed cup, sometimes slightly contracted at the rim. As compared with nests of the McCown Longspur, these nests of the Chestnut-collared are somewhat smaller but of about the same proportions. Diameter (three nests) varies from 2 to $2\frac{3}{4}$ inches; depth from $1\frac{1}{2}$ to 2 inches; the ratio of depth to diameter from 0.75 to 0.91 (average 0.82).

Excelsior, Minnesota, January 10, 1935.

A SECOND AVIFAUNA FROM THE MCKITTRICK PLEISTOCENE

WITH THREE CHARTS

By LOYE MILLER

In 1921 Merriam and Stock announced the discovery of vertebrate remains preserved in asphalt of Pleistocene age at McKittrick, California. Birds from this deposit were made the subject of several papers by Miller (Condor, 24, 1922, pp. 122-124; 26, 1924, pp. 178-180; Univ. Calif. Publ., Bull. Dept. Geol. Sci., 15, 1925, pp. 307-326). The most extensive of these papers appeared after the excavations at the original exposure had been discontinued and the collections made available for study. The source of this material was a lens located on the north side of the Taft-McKittrick highway, its existence being made evident by the road building operations. The avifauna from this first excavation is here designated as Fauna No. 1. Later exploration in the same general locality brought to light an accumulation on the opposite side of the highway and approximately one hundred feet distant from the former exposure. The avifauna of this second excavation presents a totally different picture from that of the first, and it is here designated as Fauna No. 2. This second, and larger, collection constitutes the subject of the present paper.

Matrix and material.—The matrix is not appreciably different from that of locality No. 1, that is, crude asphalt with an admixture of fine grained silt. On the whole there may be slightly less silt though there appears to be more than in the matrix at Rancho La Brea. Much more interesting is the better preservation of the enclosed fossils. They retain much more of their original strength. Those from the earlier excavation have a tendency to crumble, as though impregnation with the asphalt had been retarded and perhaps a longer exposure to water had resulted. Preservation of bird remains in the second fauna is quite the equal of that at Rancho La Brea. An attempt was made by the excavator to apply customary methods and