

Technical Report No. 199
BREEDING BIOLOGY OF THE MOUNTAIN PLOVER
(*Charadrius montanus*), 1969-1972

Walter D. Gaul
Department of Ecology and Behavioral Biology
University of Minnesota
Minneapolis, Minnesota

GRASSLAND BIOME
U.S. International Biological Program

December 1972

TABLE OF CONTENTS

	Page
Title Page	i
Table of Contents	ii
Abstract	iii
Introduction	1
Study Area and Methods	1
Results and Discussion	2
Acknowledgments	14
Literature Cited	15

ABSTRACT

A summary of the research conducted on breeding biology of Mountain Plover (*Charadrius montanus*) is presented in this report. Observations were made of birds from daylight until dark with some night observations and include dates of arrival in area, number of nests, dates of egg laying, clutch size, nest habitat, and incubation period.

INTRODUCTION

The following is a summary of the research conducted during the following periods at the Pawnee Site in eastern Colorado: 18 March to 15 August 1969, 25 May to 29 May 1970, 1 June to 31 July 1971, and 31 March to 19 May 1972.

Although major emphasis was on the behavioral aspects of the Mountain Plover (*Charadrius montanus*), the present report is limited to those aspects of breeding biology most useful to the overall ecosystem model being developed by the IBP program. Other results will be published at a later date.

STUDY AREA AND METHODS

The study area is 2 by 5 miles, just south of Keota in Weld County. Populations were also studied on the Pawnee Site, about 40 miles west of my basic area, and in scattered locations between the two areas.

Birds were observed from daylight until dark; night observations were also made. I worked from an automobile most of the time with a window-mounted 15-60X variable spotting scope. In 1969 I concentrated on locating nests and banding the birds associated with the nests. At each nest I recorded the following information: nest materials, main nest material, slope, general area description, detailed description of area close to the nest, height of the tallest vegetation within 10 feet of the nest, distance from the nest to the nearest cow manure pile, distance to the nearest Mountain Plover nest, and distance to the nearest road. Most of these same nesting parameters were randomly sampled on the main study area and on a 60-mile transect across Weld County. The fate of each nest was also recorded. Nearly all chicks that hatched from the 1969 and 1971 nests were banded at the nest. Several collections were made to verify sex. A series of chicks was also obtained.

RESULTS AND DISCUSSION

I located 133 nests and an additional 60 broods during the study. I was able to mark 37 adults and 229 chicks individually with various colored band combinations. Some adults were marked with colored dyes.

Either sex may incubate, but only one individual will tend a given nest and subsequent brood. Some females lay more than one clutch and some males copulate with more than one female. In good years, this results in having as many nests on a given area as adults. Females will renest.

The birds arrived on the study area 22 March 1969, and in 1972 they were also present the last week of March. Following their arrival, pairs are formed; a given pair will occupy a territory, which is not exclusive, up to 40 acres in size. Territory size is highly variable.

Both 1969 and 1972 egg-laying commenced on 17 April, but in 1971 it was delayed until 21 April due to stormy weather. In both 1969 and 1971 the last nest was started between 12 June and 15 June. Egg-laying reached a peak about 2 weeks after the first nest was initiated in 1969 and 1971 (Fig. 1 and 2). Rainy periods (Fig. 3 and 4) suppressed laying.

Clutch size was usually three. One four-egg clutch was found and several females were known to have only two eggs. In a given clutch, eggs were normally laid every 24 to 28 hr, but longer delays between the second and third egg were not uncommon. Two such delays were at least 96 hr.

The nest itself consists of a shallow scrape, lined with the various materials near the nest. The following characteristics are common with a large percentage of the nests: avoidance of any tall vegetation, usually against or near cow manure piles (52% within 12 inches of a pile), nearly zero slope, and usually in buffalo grass, blue grama grass, or blue

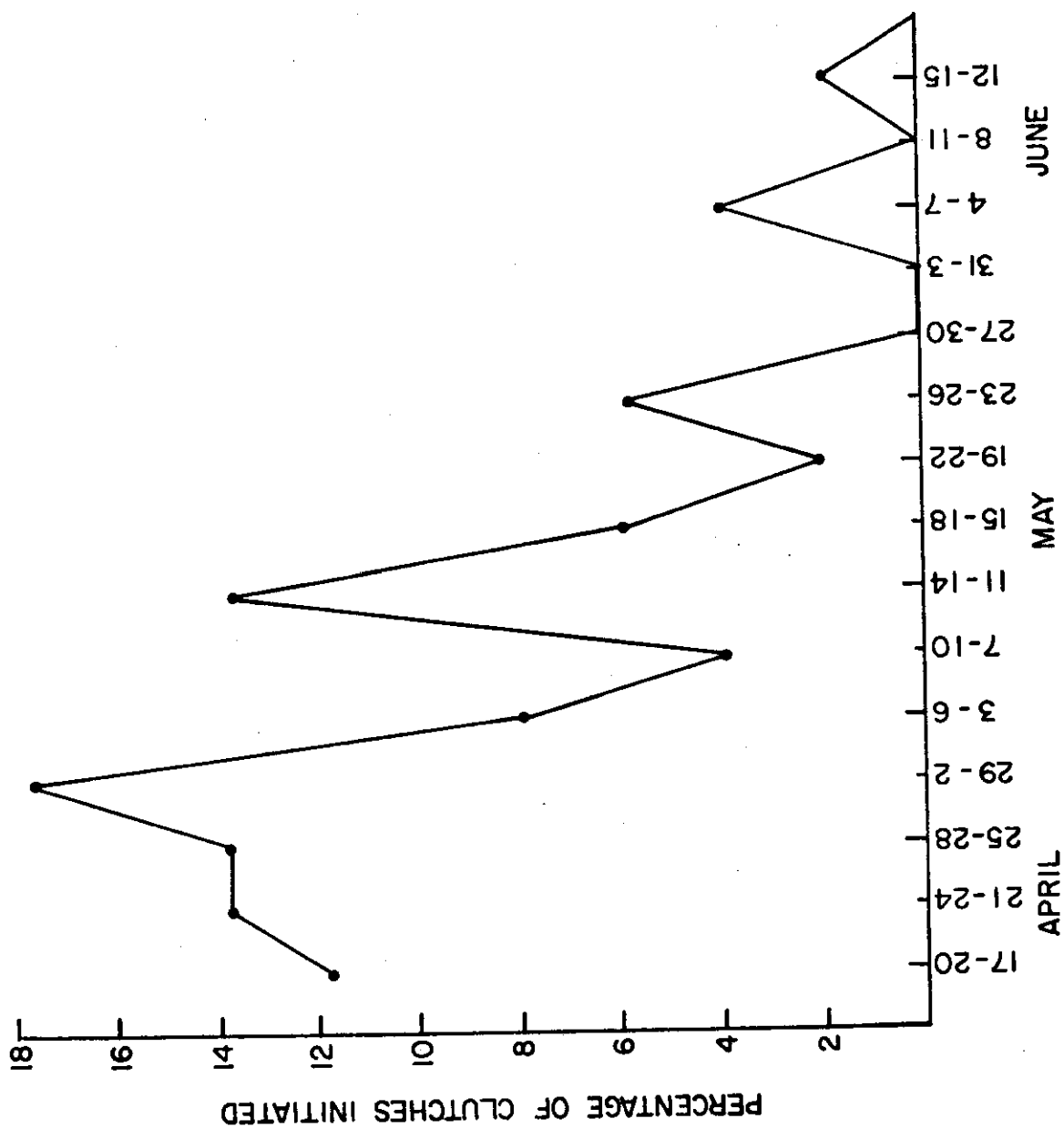


Fig. 1. Initiation of egg-laying in the 1969 season based on 55 nests.

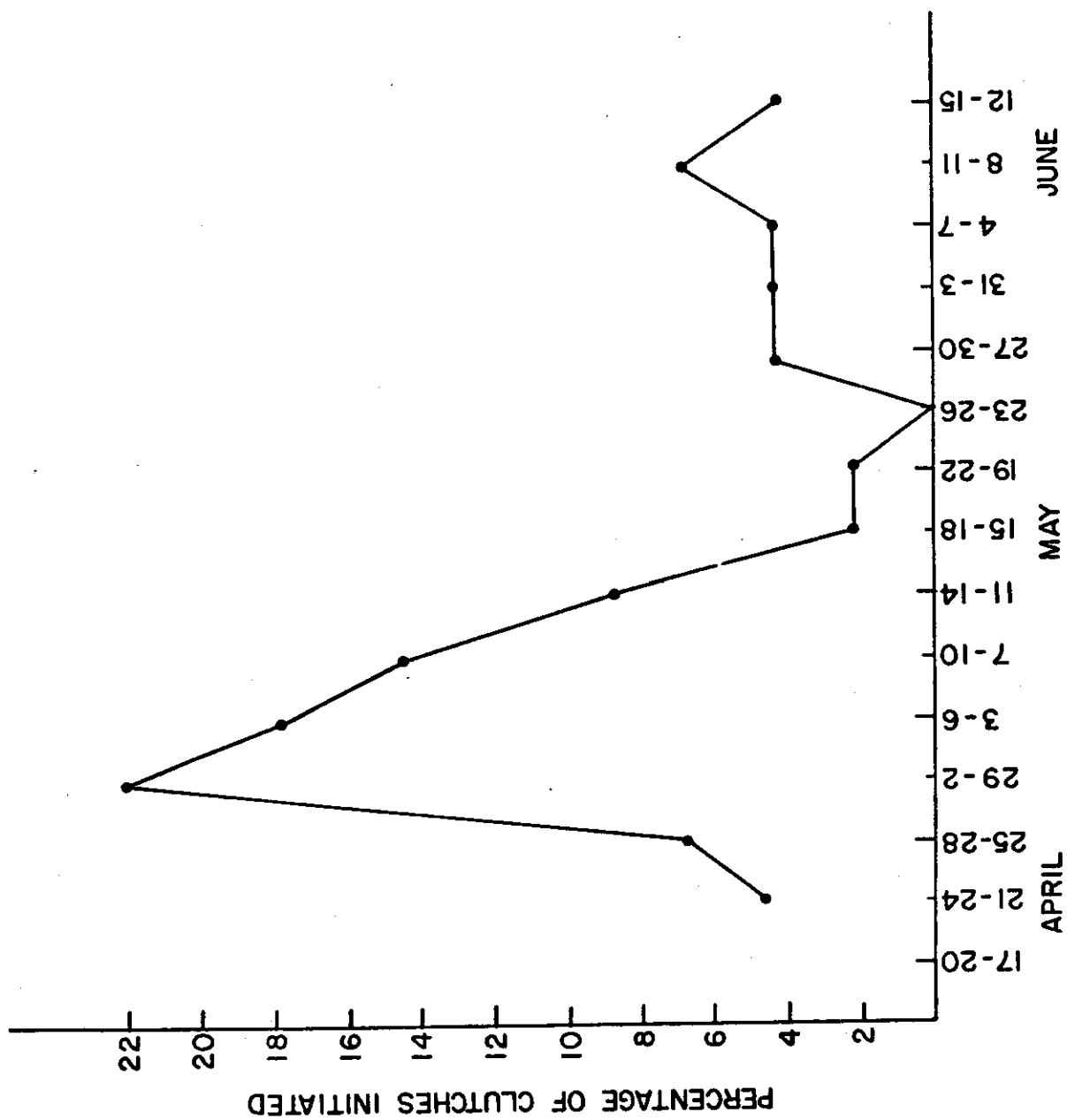


Fig. 2. Initiation of egg-laying in the 1971 season based on 13 nests and 32 broods.

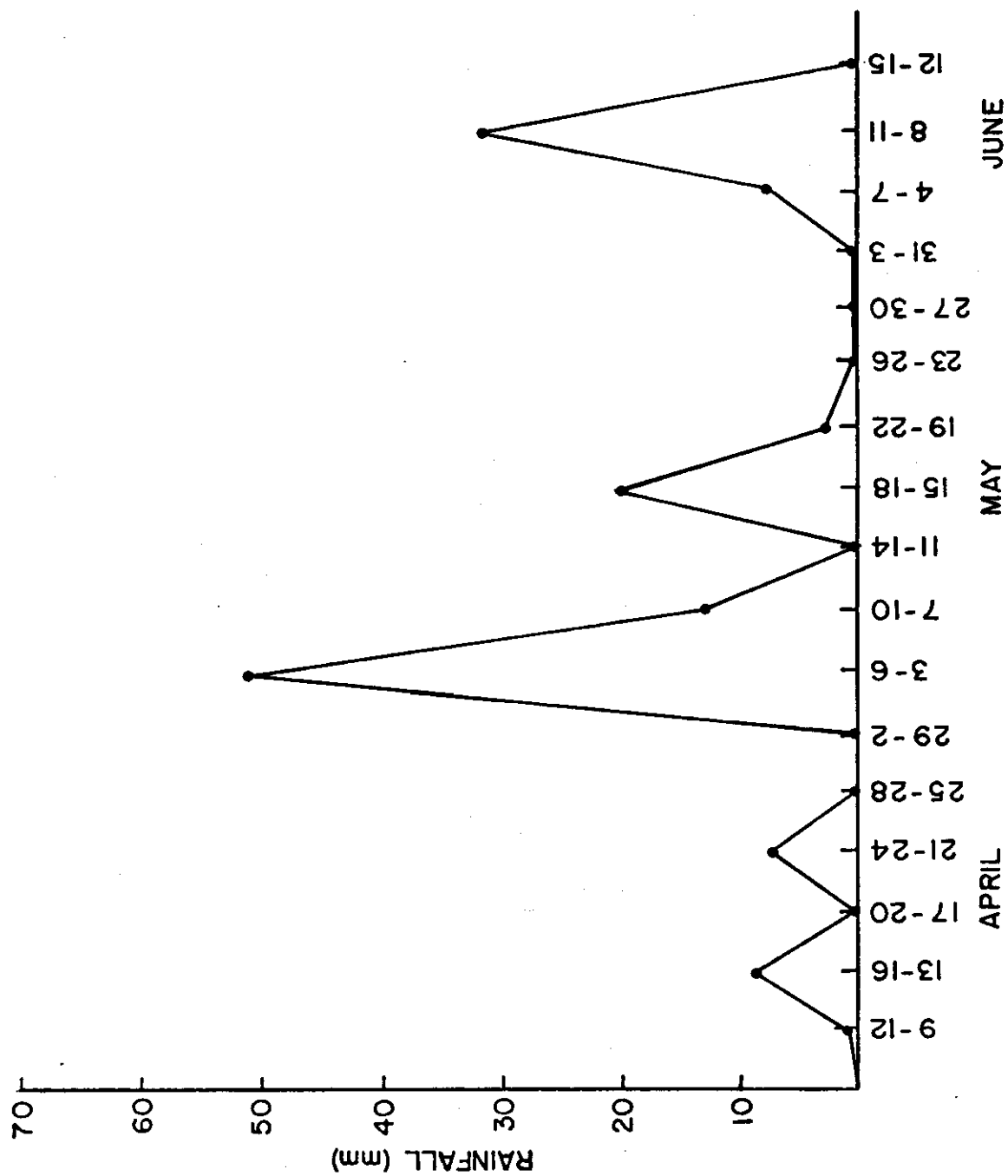


Fig. 3. Rainfall during the 1969 nesting season.

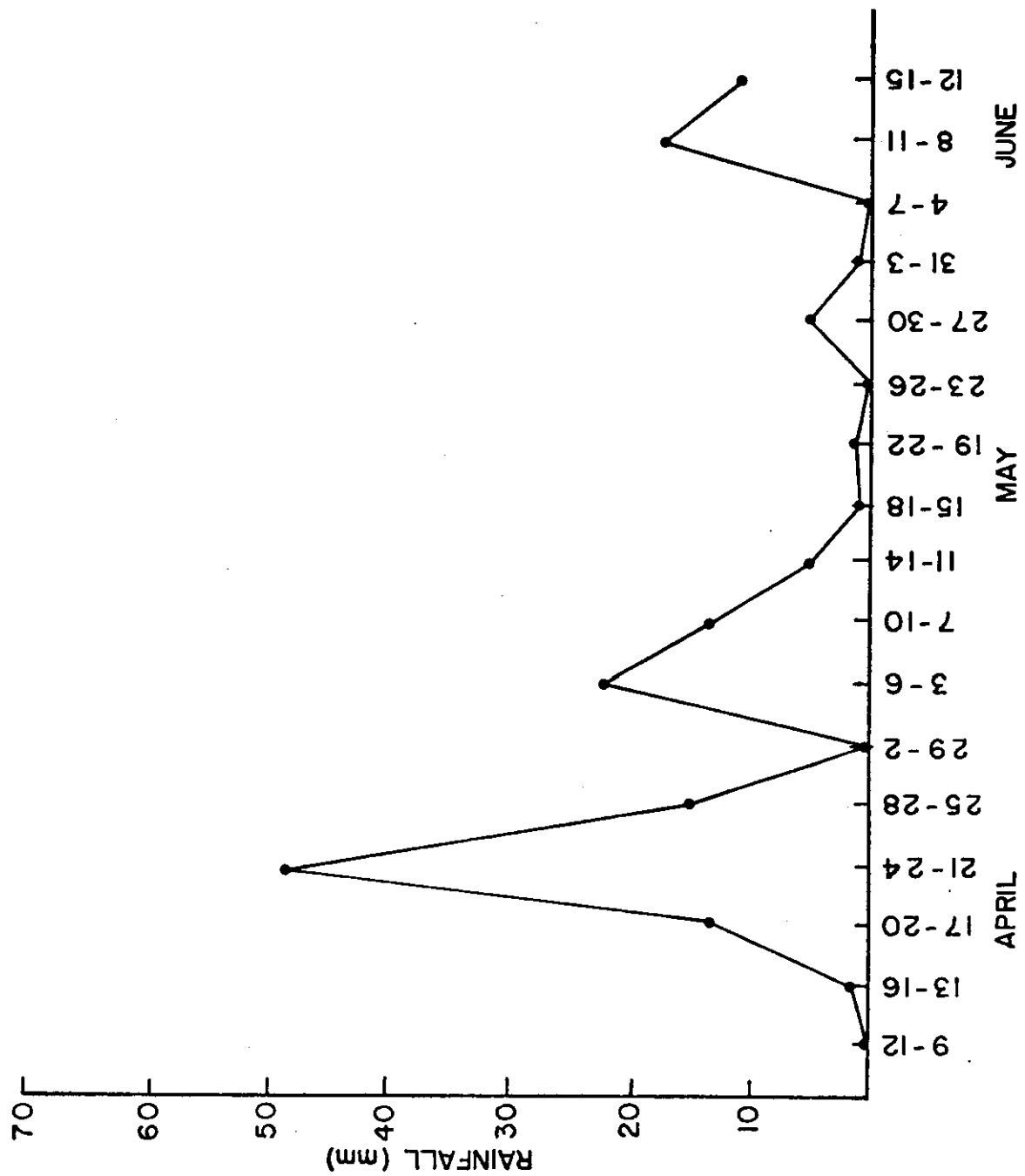


Fig. 4. Rainfall during the 1971 nesting season.

grama-wheatgrass combination area. Almost all nests were on areas which received heavy summer grazing pressure.

Based on the above characteristics, my 60-mile random sample of potential habitat shows that about 60% of the northern Weld County area is not Mountain Plover habitat, 20% is marginal, and only 20% is good habitat. By visiting other known Mountain Plover nesting areas and through extensive correspondence, I have concluded that Weld County represents the main breeding ground for this species.

Nests tended to be clumped, even within good habitat, especially when the population was low (1971). Populations in a given area tended to fluctuate greatly from year to year. For instance, in 1969 I found 27 nests on a 160-acre plot with 21 of them active at the same time. The population on this plot appeared to remain stable through the 1970 season, but in 1971 only two nests and one additional brood were located on the area. In 1972 the population on this plot was apparently again on the increase. Three nests were located during half of the nesting season.

The actual incubation period (from the time the last egg was laid until it hatched) averaged 29 days, with a range of 28 to 31 days.

Incubation is relatively long compared to other plovers. This may be related to the behavior of the incubating adult. During egg-laying the attending adult visits the nest only during the heat of the day to shade the eggs (Fig. 5). As full incubation progresses the attending adult spends more and more time on the nest (Fig. 6), but throughout incubation the attending adult also spends considerable time away from the nest. During egg-laying the adult does not sit on the eggs at night, and I have recorded two cases where the eggs were not incubated at night for the first 5 days of the incubation period. With rains during the daylight hours, however, the attending adult quickly returns to incubate the previously unattended eggs.

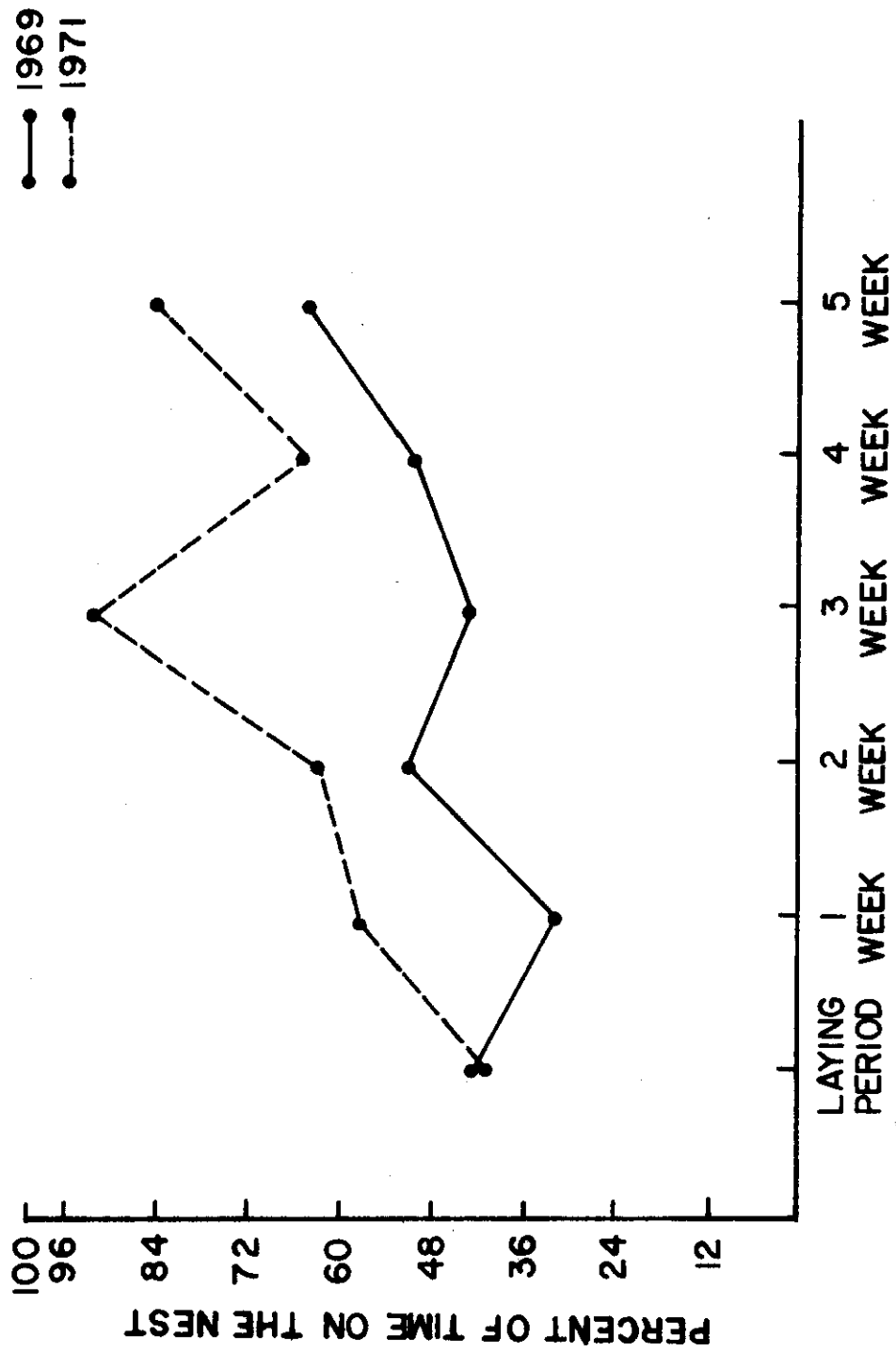


Fig. 5. Percent of daylight hours spent on the nest by incubating adults, excluding hatching period.

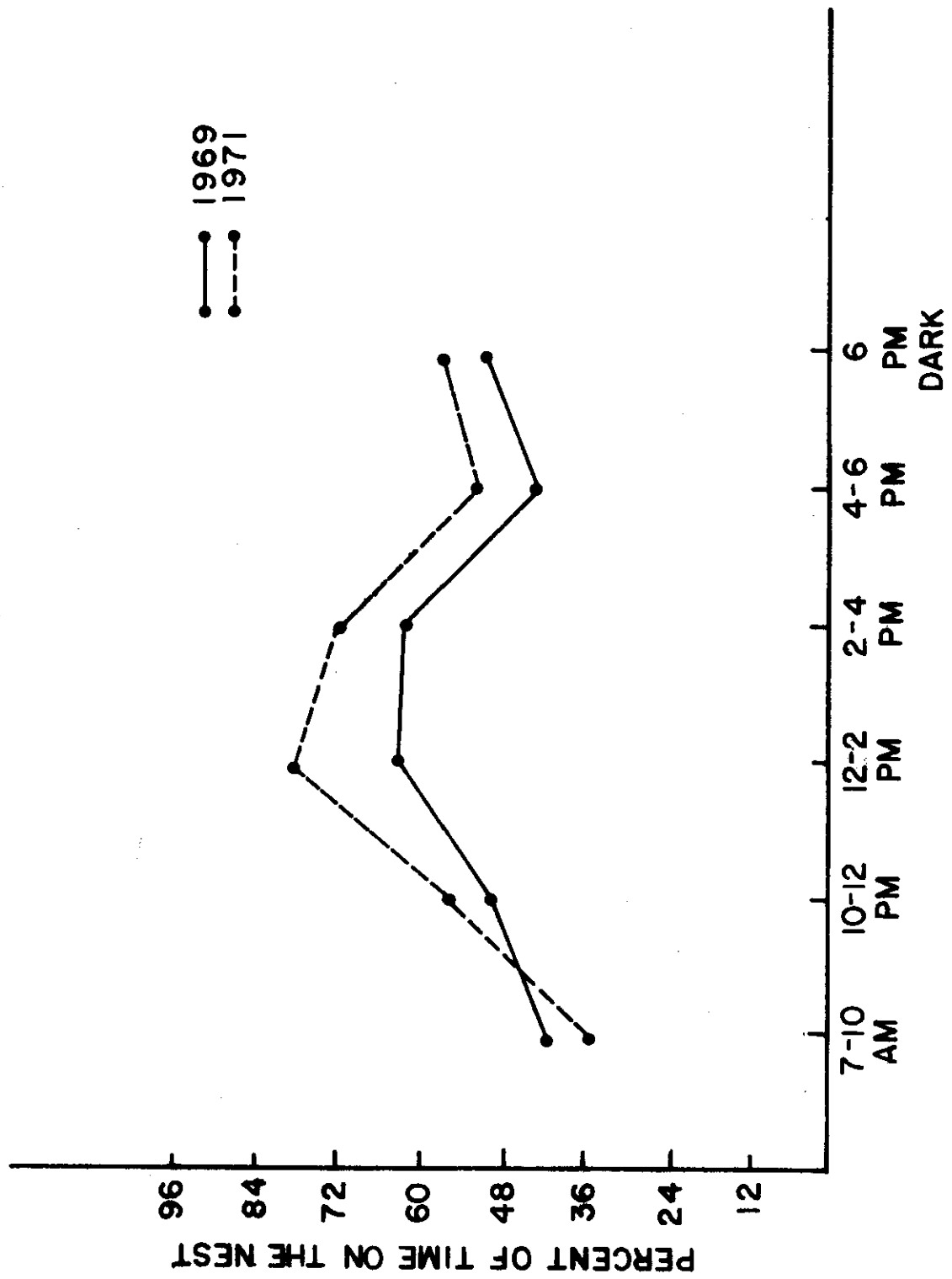


Fig. 6. Percent of time on the nest by incubating adults based on nest checks during daytime.

In 1969, 70% of the eggs hatched; and in 1971, 52.6% of the eggs hatched. The drop in hatching success in 1971 was related to a high desertion rate in June, presumably related to the hot, dry conditions. Only 1.2% of the eggs have been infertile.

Predation (mainly by the 13-lined ground squirrel, *Spermophilus tridecemlineatus*) accounted for 15.1% of the losses in 1969 and 15.8% in 1971. Weather was another factor responsible for egg loss. In 1969 hail damage and inundation accounted for 13.7% of the egg losses. One hail storm (5 May 1969) damaged eggs in 62.5% of the nests present (25). Of 72 eggs in these nests, 27.8% were damaged. One adult was also found dead at a nest as a result of this storm. It is also interesting to note that I have never found evidence of egg damage by livestock, though cattle often were very close to nests. Because of partial predation, partial hail damage, and because some females laid only two eggs, the average number of eggs hatched was 2.66.

Once the chicks hatch they suffer heavy losses. A graph of chick survival among marked chicks (Fig. 7) indicates that the first 3 days are most critical. In 1971 I recorded 16 cases of adults attending nearly fledged chicks, and the average was 1.37 chicks per attending adult. Since adults that had lost entire broods were obviously not included in this tally, not more than 56.5% of the hatched chicks reach fledging age. Marked broods showed the average number of chicks per attending adult at 6 days of age was 1.41, so apparently banding does not greatly affect survival rates. Fledging occurred at about 34 days of age, and reasons for losses prior to this are largely unknown. I made no observations of predation.

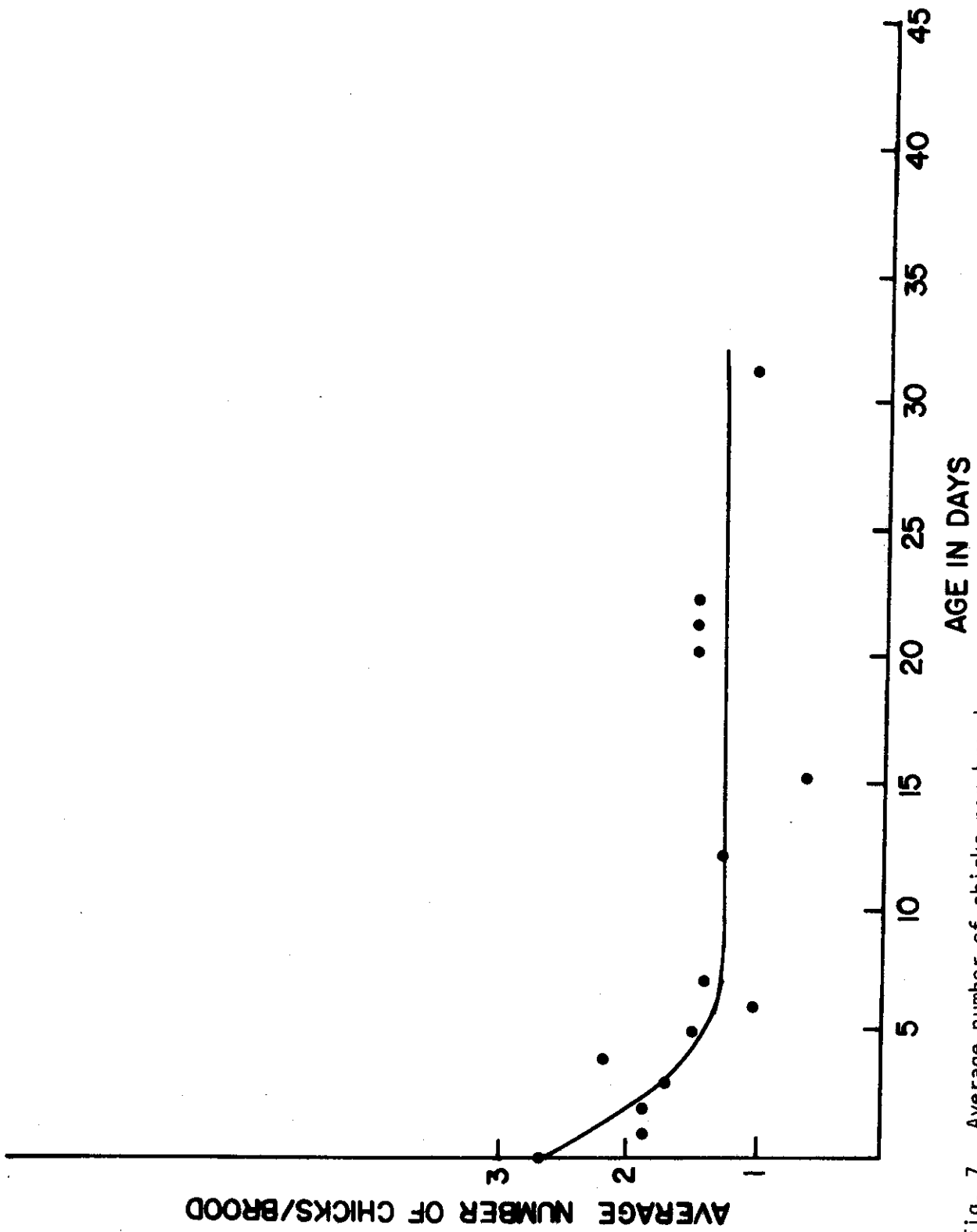


Fig. 7. Average number of chicks per brood.

The chicks appeared highly sensitive to temperature. They were usually brooded when the temperature was below 50°F, and the attending adult would shade the chicks when the temperature rose above 75°F. This restricted feeding times, so that some chicks may have had trouble getting enough food. This may account for some of the extremes in measurements of chicks in known age classes (Table 1).

In early July 1969, small flocks of adults were observed. Flocking in 1971 began in mid-June, apparently in response to the previously mentioned hot, dry weather. The flocks gradually built up until they averaged 35 individuals in late July, both in 1969 and 1971. Flocks were composed of local adults and juveniles. By mid-August the flocks reached an average size of 100 birds each; this was the size of flocks leaving the area.

The diet of the Mountain Plover has been adequately reported by Baldwin (1971). They never need to drink water; apparently they are getting a substantial amount from the diet.

Some comments for maintaining this species are appropriate since the species is listed on the Federal government's "Possible Rare and Endangered Species" list. As already noted, the Mountain Plover is basically restricted to nesting in buffalo grass and blue grama grass flats that receive heavy summer grazing. Weld County appears to represent the last real stronghold of this species. Other populations appear sparse and localized. The birds return to the same area to breed each year, and densities can be quite high in good habitat. Therefore, the key to preserving this species is in maintaining the choice habitat that still remains.

The solution for maintaining the above habitat is to keep it as pasture and graze the pasture heavily during the summer. Unfortunately, these same flats are the first to succumb to the plow. Some ranchers

Table 1. Growth of chicks as indicated by weights and measurements at increments of age.

Age (days)	No. of Individuals	Culmen			Tarsus			Chord			Weight			Development
		Range	Average	Mode	Range	Average	Mode	Range	Average	Mode	Range	Average	Mode	
Hatched	75	8.5-10.0	9.2	9	24.0-28.0	26.1	26	14.0-18.0	15.2	15	8.0-13.0	11.0	10, 12	Down
2	3	10.0-10.5	10.5	10	28	28.0	28	17.0-18.0	17.3	17	13	13.0	13	Down
3	1	--	11.0	--	--	29.0	--	--	16.0	--	--	15.0	--	Down
4	4	11.0-12.0	11.3	11	28.5-30.0	29.2	29	16.0-18.0	17.0	17	12.0-14.0	13.3	14	Down
5	4	11	11.0	11	29.0-30.0	29.5	29, 30	16.0-18.0	17.0	17	12.0-18.0	15.0	--	Down
6	2	11	11.0	11	27.0-30.0	27.5	--	18.0-22.0	20.0	--	11.0-19.0	15.0	--	No feathers; one had a few on upper back and flanks
7	1	--	11.0	--	--	31.0	--	--	18.0	--	--	16.0	--	Down
9	2	13.0-14.0	13.5	--	32.0-33.0	32.5	--	22	22.0	22	22.0-24.0	23.0	--	Down on one; others had feathers on upper back and flanks
12	1	--	13.0	--	--	34.0	--	--	24.0	--	--	24.0	--	Feathers on upper back, flanks, breast; wing coverts
14	2	12.0-16.0	14.0	--	32.0-35.0	33.5	--	17.0-34.0	25.5	--	18.0-30.0	24.0	--	Down on one; other same as 12-day. Second primary is 9 mm (4.5 mm exposed)
18	2	15.0-16.0	15.5	--	37	37.0	37	37.0-43.0	40.0	--	41.0-42.0	41.5	--	Same as 12-day with feather strip middle of crown. Second primary is 22 mm (none exposed)
19	2	17.0-18.0	17.5	--	39.0-41.0	40.0	--	39.0-45.0	42.0	--	30.0-41.0	35.5	--	Same as 18-day with strip feathers under eye and slight lore line. Second primary is 25 mm (5 mm exposed)
20	1	--	16.0	--	--	39.0	--	--	45.0	--	--	41.0	--	Same as 19-day. Second primary is 22 mm (2 mm exposed)
24	1	--	18.0	--	--	41.0	00	00	65.0	--	--	53.0	--	Feathers on all but lower back and crown edges; no tail. Second primary is 36 mm (15 mm exposed)
27	2	16.0-17.0	16.5	--	35.0-38.0	37.5	--	34.0-50.0	42.0	--	34.0-46.0	40.0	--	Same as 24-day. Second primary is 30 mm (10 mm exposed); 6 mm (0 exposed)
28	1	--	20.0	--	--	42.0	--	--	75.0	--	--	56.0	--	Down on only back of crown, front edges of wings, on lower back, and under chin; no tail
33	1	--	18.5	--	--	41.5	--	--	80.0	--	--	54.0	--	Same as 28-day. Second primary is 30 mm exposed
34	2	--	21.0	--	--	41.0	--	--	102.0	--	--	54.0	--	One fledged nearly. Second primary is 45 mm exposed still down back of crown, lower back under chin; tail shafts present
44-45	2	--	---	--	--	---	--	--	---	--	--	---	--	Fledged--down on back of crown

partially till these flats to increase the moisture retention ability of the soil in hopes of growing taller grasses on the land. During the short course of my study I have seen several of these flats follow one of the above two courses, and if this trend continues the Mountain Plover population will continue to decline.

ACKNOWLEDGMENTS

This research was conducted while I was a predoctoral trainee supported by NIH Training Grant No. 5 T01 GM 1779. The Chapman Fund of the American Museum of Natural History and a Grant-in-aid of Research from the Society of the Sigma Xi also provided funds for my research; I am grateful to all of the above organizations. I would also like to thank all those associated with the IBP Pawnee Site for helping me in numerous ways. I would especially like to thank Ronald Ryder for making many facilities available to me at Colorado State University. I also express my thanks to Frank McKinney for his continuing guidance throughout my study. Finally, I thank David Parmelee who offered the initial encouragement for me to undertake this study.

LITERATURE CITED

Baldwin, P. H. 1971. Diet of the Mountain Plover at the Pawnee National Grassland, 1970-1971. U.S. IBP Grassland Biome Tech. Rep. No. 134. Colorado State Univ., Fort Collins. 34 p.