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INSECT POPULATION DYNAMICS STUDIES ON THE PANTEX SITE, 1972

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ABSTRACT

This report on the study of the insects' role in the structure and function of the shortgrass prairie ecosystem (Pantex Site), 1972, is a continuation of work begun in 1970. The standard IBP "D-vac" sampling method was used to collect the data on the numbers and biomass of insects from two herbivory treatments, moderately grazed and ungrazed.

Insect numbers were higher in 1972 on both treatments than in either of the two previous years. Along with higher insect numbers, there was a significant increase in insect biomass. Rainfall was discussed as it related to herbage growth and development, and the insect trophic level was discussed as it related to the structure of the system.

INTRODUCTION

The study of the role of insects in the structure and function of the shortgrass prairie ecosystem was continued in 1972 at the Pantex Site, USIBP Grasslands Biome Project. As in 1970 and 1971, the primary objective was to obtain a series of data sets throughout the year to provide arthropod data for validation of the grassland ecosystem model. Data were collected on numbers and biomass of insects from two herbivory treatments, moderately grazed and ungrazed. Data were collected so as to provide additional information on the effect of herbivory on species diversity and to evaluate the effect of plains prickly pear on the spacial distribution of insect numbers and species. These data on species diversity and spacial distribution will be the subject of subsequent papers.

MATERIALS AND METHODS

The Study Site:

The study site is a shortgrass prairie located 15 miles east of Amarillo, Texas. Blue grama, Bouteloua gracilis, is the dominant grass species while plains prickly pear, Opuntia polyacantha, is very evident. The almost level site, 3,590 feet in elevation, has an average annual rainfall of 21 inches with a range of 5 inches in 1970 to 40 inches in 1923. The majority, 70 to 80%, of the annual rainfall occurs between May and October as short, intensive thunderstorms. Snowfall, which varies from less than one inch to over 30 inches, often drifts because of the high winds and accumulates around the prickly pear plants. Pullman silty clay loam is the soil type which predominates on the study site. Additional description of the study site is given in Huddleston (1970).

SAMPLING METHOD

Two treatments were used - treatment 1, ungrazed and treatment 3, moderately grazed. Treatment 1, the ungrazed site was subjected to moderate grazing in 1969 and previous years, but has not been grazed since 1970.

Two sampling grids, 450 ft long by 18 ft wide, were used to give 200, 9 × 9 ft quadrats in each treatment. At each sampling date, six quadrats were randomly selected for sampling. Within each quadrat, one sample location was selected by an unbiased toss of the 0.5 m^2 quick trap onto an area which contained no prickly pear. Another trap was immediately thrown onto the nearest prickly pear clump. The proportion of area in prickly pear and grass are somewhat variable from year to year. Vegetation studies at the Pantex Site indicated 11.5% of treatment 3 was prickly pear and 3% of treatment 1 was prickly pear (Fagan and Pettit 1972).

After the traps were tossed onto the designated plot, the trap on the grass strata was immediately suctioned with the "D-Vac" to capture any flying or jumping insects. This net bag was then removed from the "D-Vac" and temporarily closed to be used later in the sampling sequence. The standing plant material was then clipped with a pair of heavy duty, electric clippers and suctioned into another net bag with the "D-Vac". The bag that was used initially was then replaced on the "D-Vac" and used to collect the litter strata. To make sure no insects were missed, the crowns were then clipped approximately 1/2 inch below the surface with the electric clippers. This material was then suctioned into a shop-type vacuum cleaner, bagged, and tagged.

This type of sampling was then repeated for the prickly pear sample with the exception that the above-ground parts of the prickly pear plant was removed from the sampling enclosure by hand and placed in a separate sack. Since the prickly pear plant material has first been vacuumed and

then was shaken prior to removal from the trap, this material was not placed in a Berlese funnel. The six samples from each quadrat were placed in separate Berlese funnels for separation. The Berlese funnels were described in detail in the 1971 annual report of this project.

The extracted insects, in alcohol, were then sorted to family and species type (morpho species) and counted. Dry-weight biomass was estimated from previous studies.

INTERPRETATION OF DATA

Rainfall:

The rainfall data presented in Table 1 were taken from the U.S. Weather Bureau station at Amarillo Airport. Although rain gages were maintained by personnel at the Texas Tech University Center at Amarillo, it is felt that there can be no question about the data from the official station which is less than ten miles from the study site.

TABLE 1. Monthly precipitation data. Amarillo Municipal Airport. 1970-72.

Month	Monthly precipitation in inches			Monthly Normal
	1970	1971	1972	
January	.02	.10	.21	.65
February	.02	1.65	.11	.62
March	2.10	.10	.11	.82
April	1.33	.77	.03	1.32
May	.23	.91	2.81	3.37
June	1.54	4.17	3.87	2.89
July	1.39	1.75	2.59	2.34
August	1.27	3.33	1.73	2.58
September	.34	4.70	.71	1.89

TABLE 1. Monthly precipitation data. Continued.

Month	Monthly precipitation in inches 1970	1971	1972	Monthly Normal
October	1.06	2.59	1.66	1.76
November	.26	2.08	1.19	.66
December	T	.89	.32	.77
TOTAL	9.56	23.04	15.34	
Departure from Normal	-10.11	+ 3.37	- 4.33	
	19.67	19.67	19.67	

Rainfall, over the three year period of this study, varied from less than half of normal in 1970, to approximately 20 percent above normal in 1971 (Table 1). In 1972, although rainfall was below normal, the seasonal distribution pattern was such that herbage growth and development was promoted.

INSECT NUMBERS

Insect numbers in both the grazed and ungrazed treatments were much higher in 1972 than in either of the previous two years (Figs. 1 and 2). Overall, total insect appeared to follow the previously demonstrated trend toward a bimodal seasonal pattern. Although the hypothesis has not been tested experimentally, indications are that there is a strong correlation between the intraseasonal dynamics of herbage production and insects. The early season peak in insect numbers is probably correlated with the growth and

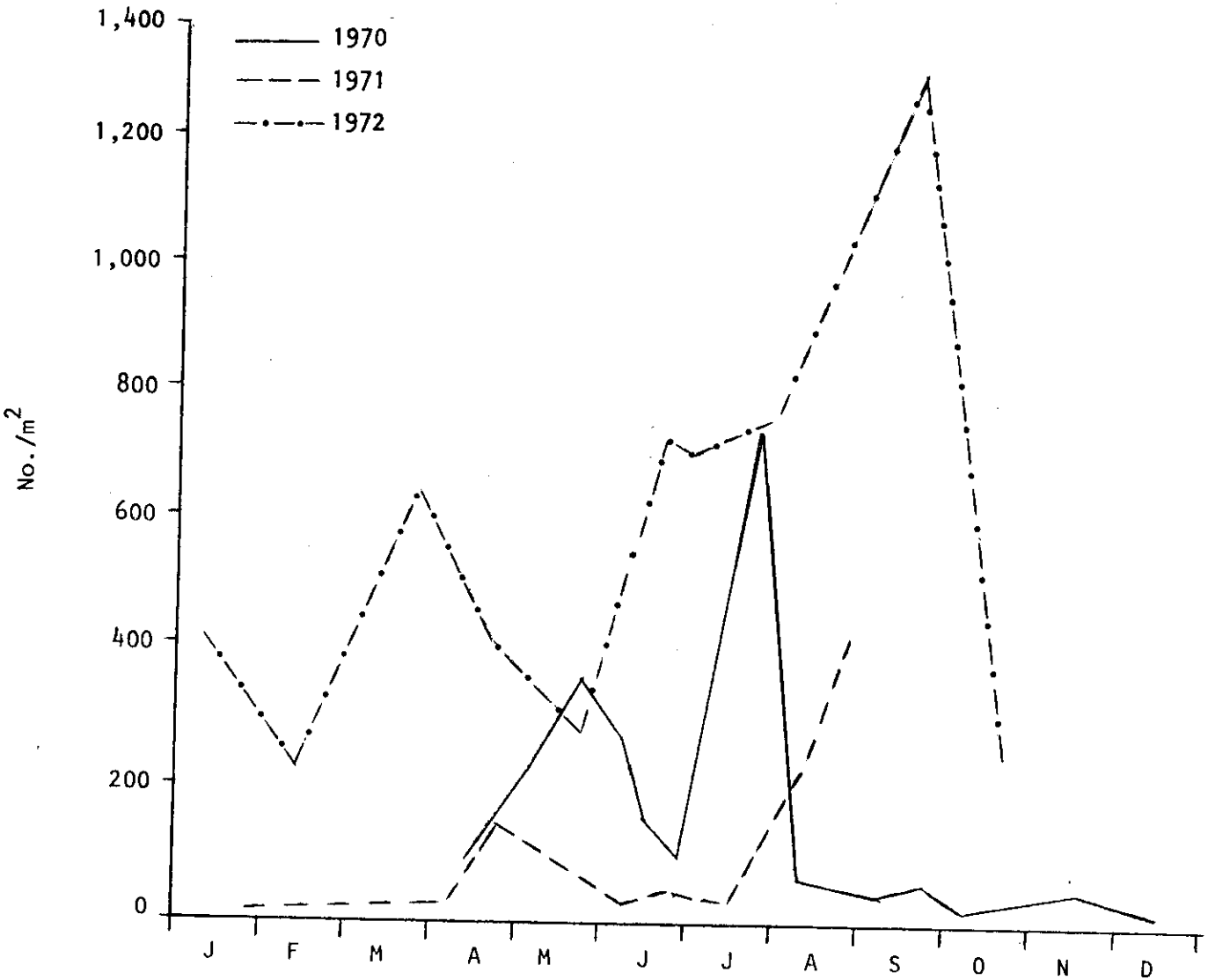

Figure 1. Insect numbers per m^2: 1970, 1971, and 1972. Treatment 1, ungrazed. Pantex Site. 1972.

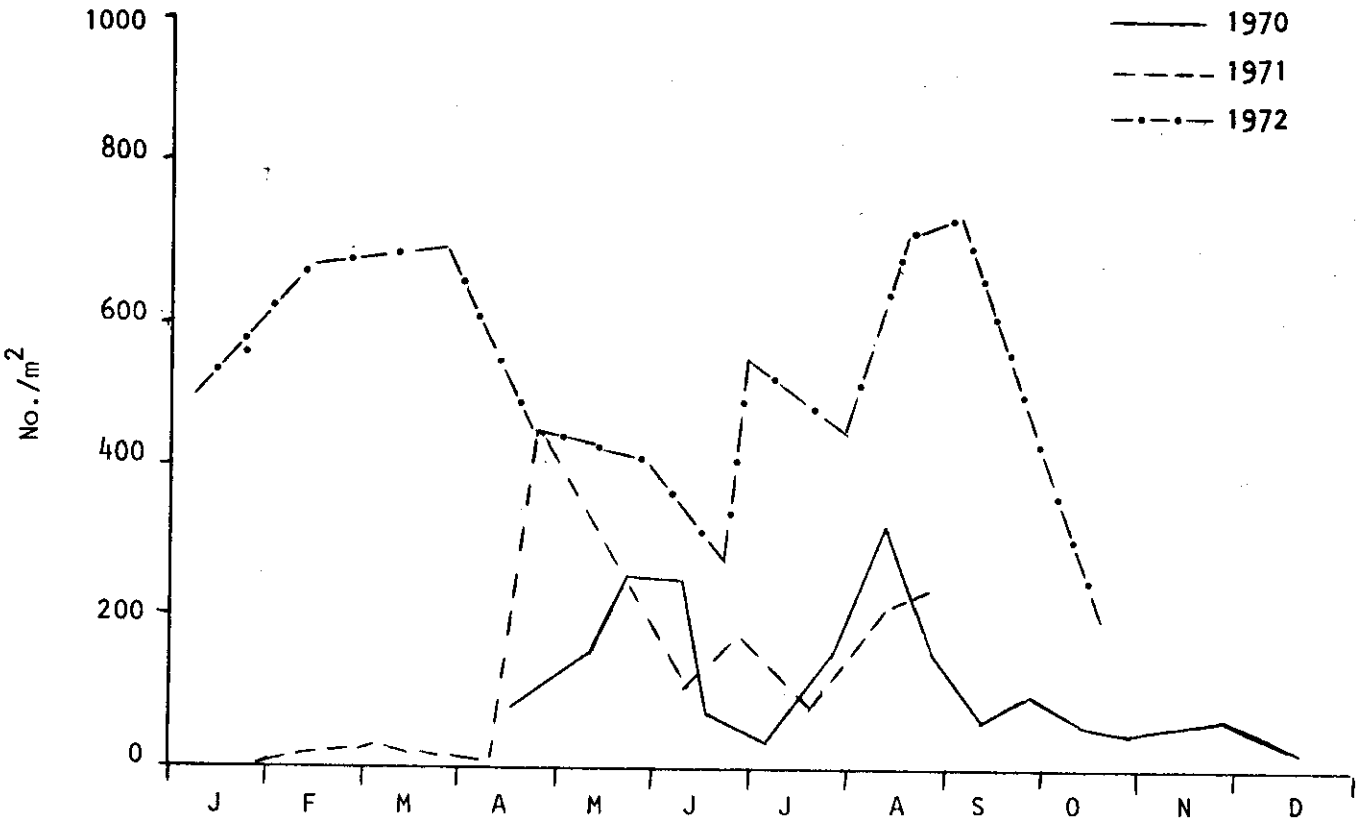

Figure 2. Insect numbers per m^2: 1970, 1971, and 1972. Treatment 3, moderately grazed. Pantex Site. 1972.

development of the cool season annual grasses, little barley and six weeks fescue. Thrips, which constitute a large portion of the early season insect numbers, are plant feeders with relatively short life cycles and therefore probably increase on the cool season plants. Collembola, which are essentially scavengers, are probably more influenced by temperature and humidity than by the growth of the cool season plants.

The second, and larger, peak in insect numbers occurs one to two months after the peak herbage production of the dominant warm season grass, blue grama. Biologically, this lag effect could be partially explained by the fact that peak egg production in thrips and leafhoppers may occur at about the time of peak blue grama biomass. Subsequent hatching and development to readily sampled life cycle stages would delay the observed peak in insect numbers.

Total insect numbers in 1972 were almost 1400/m^2 in the ungrazed numbers as compared with less than 800/m^2 in 1970 and slightly over 400/m^2 in 1971. In 1972, insect numbers were less in the moderately grazed treatment than in the ungrazed treatment, never reaching 800/m^2. While this same trend was found in 1970, it was not observed in 1971.

Although the experimental design for the Comprehensive Network Sites was not planned to find cause and effect answers, the data would appear to indicate that an interaction is present between insect numbers and seasonal rainfall patterns of a given year and the preceding year. The highly variable rainfall patterns in the grasslands intensifies the problem of developing models to predict insect numbers. Many years of intensive study would appear to be required.

The concentration effect of prickly pear on the distribution of insects within the sampling area was less apparent in 1972 than in 1971, especially in the grazed treatment. Concentration of snow during the winter of 1970-71 lead to a concentration of grass and herb biomass in and around the prickly pear clumps. Concentration of insect numbers then occurred. This effect was more pronounced in the grazed area than on the ungrazed area. During the winter of 1971-72, there was more standing dead vegetation in the grass strata and subsequently less snow accumulation around the prickly pear clumps. Consequently, the concentration effects, although present, was not as pronounced. As in 1971, probably because of more standing dead vegetation in the ungrazed plots, there was less concentration of insect numbers around the prickly pear clumps in the ungrazed area than in the grazed area (Figs. 3 and 4).

Insect Biomass:

Associated with the larger numbers of insects in both the grazed and ungrazed treatments in 1972, there was a significant increase in insect biomass. At every sampling date, insect biomass was greater in 1972 than in either 1971 or 1970 (Figs. 5 and 6). Peak biomass in both treatments was found to be in the grams/m^2 range instead of the mg/m^2 range observed in 1970 and 1971. Data presented for 1972 are calculated values based on ovendry values obtained for the same morpho-species or groups during 1970 and 1971. Insect biomass on a m^2 basis averaged over both the prickly pear and grass strata exceeded 4g/m^2 in September, 1972 in the moderately grazed treatment. In the ungrazed treatment, the seasonal biomass peak of approximately 2.3g/m^2 occurred in early July.

The concentration of insects around prickly pear clumps was less apparent in the grazed plot when biomass instead of numbers was used as the

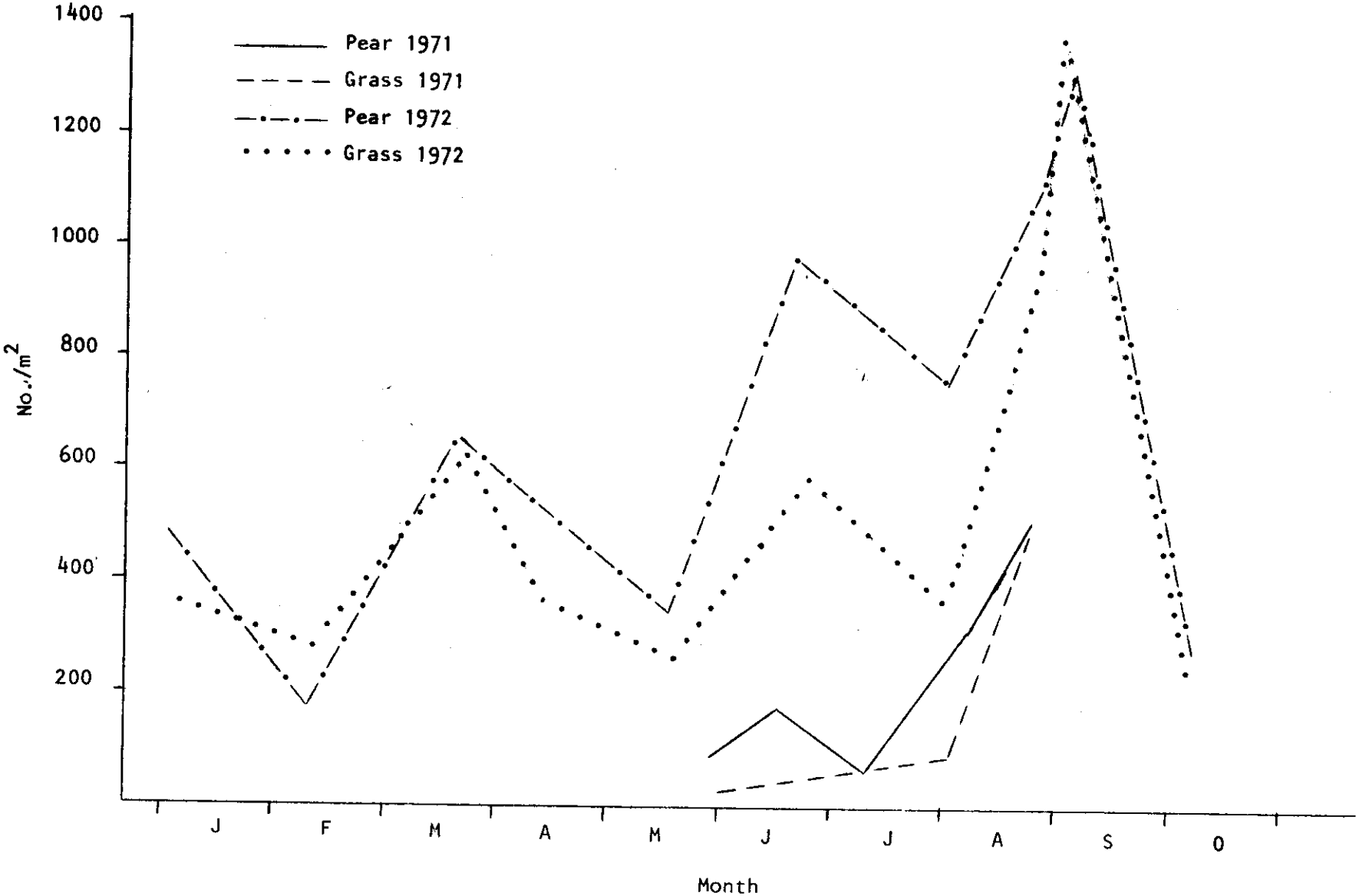

Figure 3. Numbers of insects per m^2 in prickly pear and grass strata: 1971 and 1972. Treatment 1, ungrazed. Pantex Site. 1972.

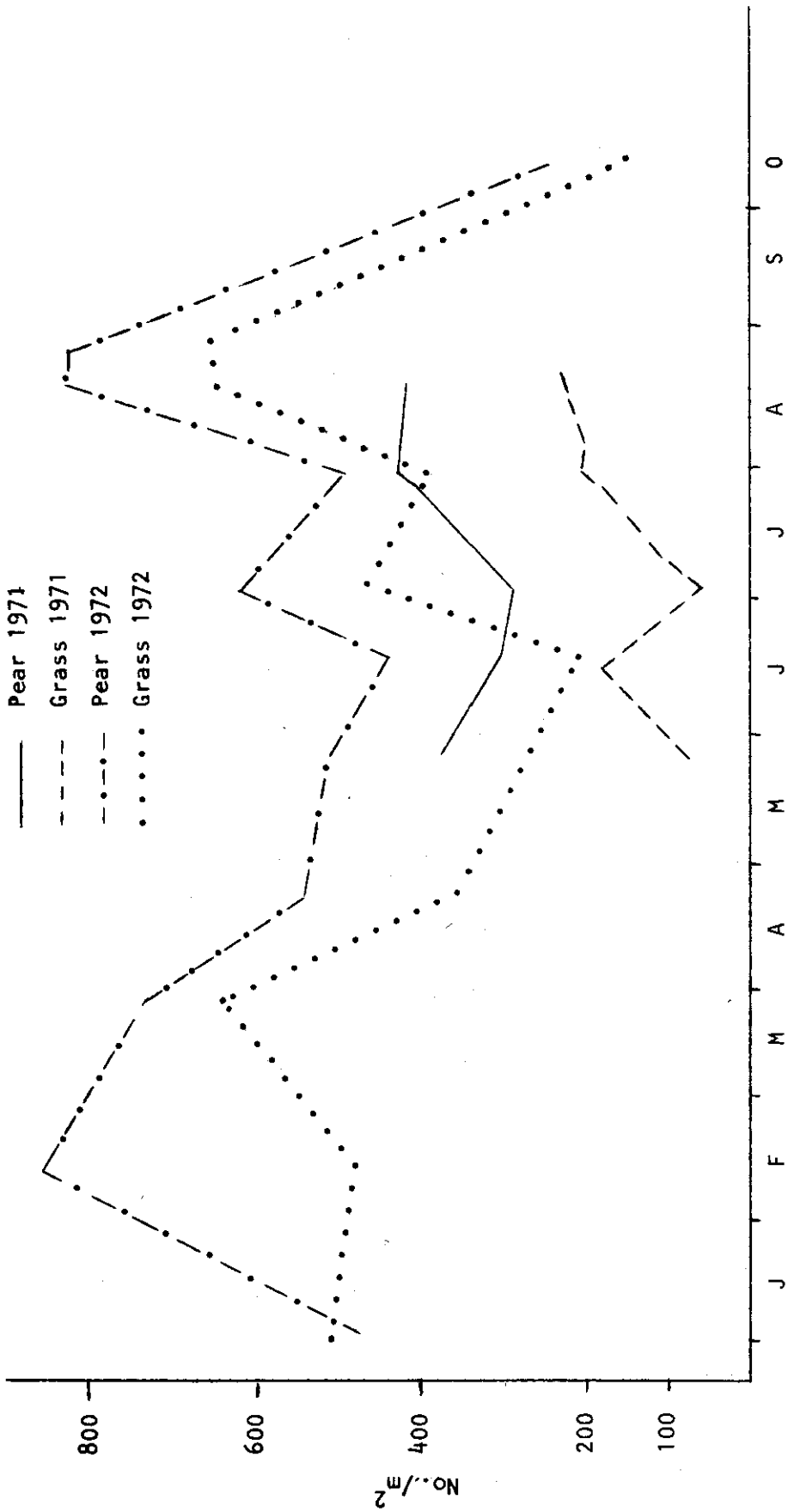

Figure 4. Numbers of insects per m^2 in prickly pear and grass strata: 1971 and 1972. Treatment 3, moderately grazed. Pantex Site. 1972.

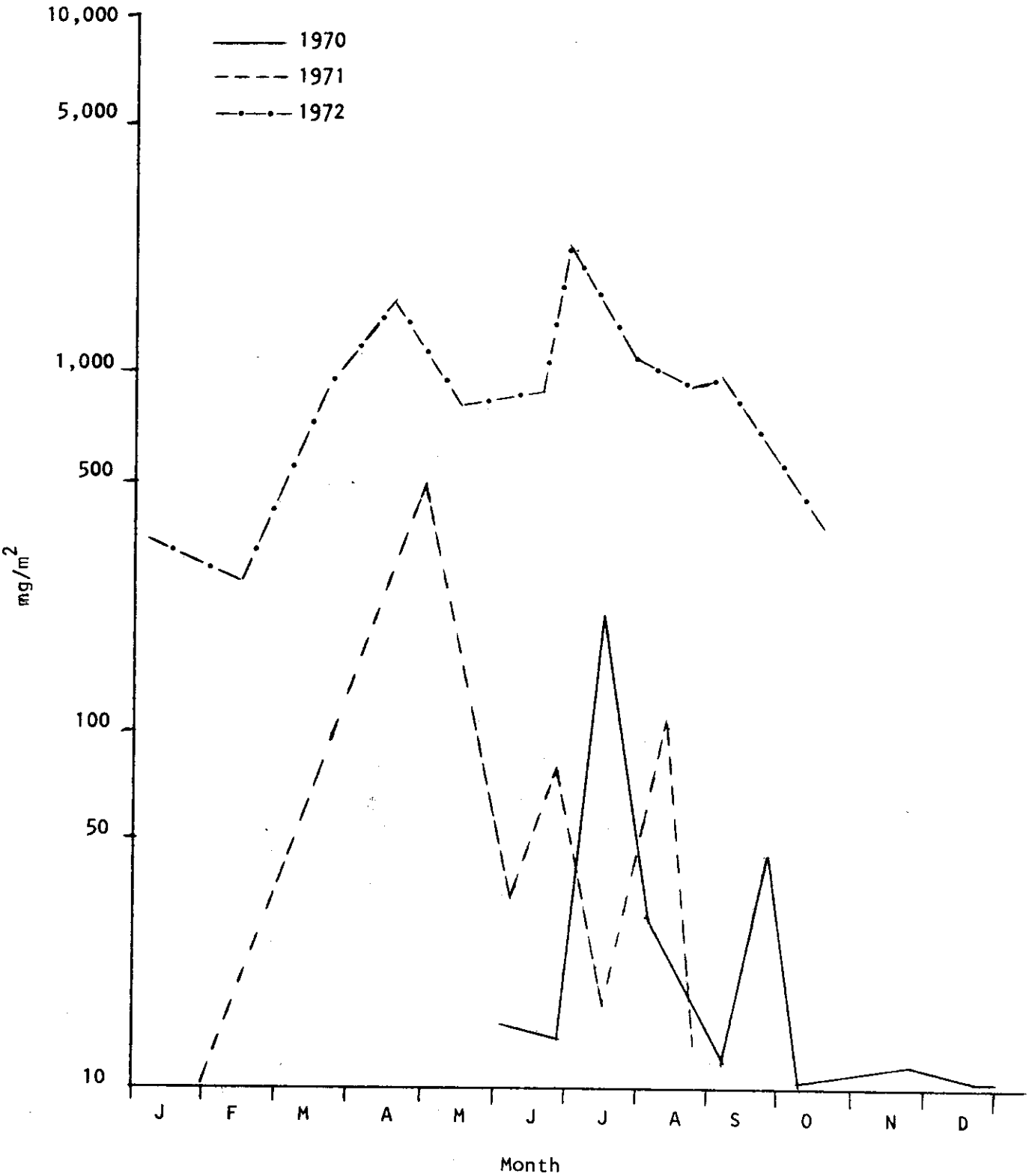

Figure 5. Insect biomass per m^2: 1970, 1971, and 1972. Treatment 1, ungrazed. Pantex Site. 1972.

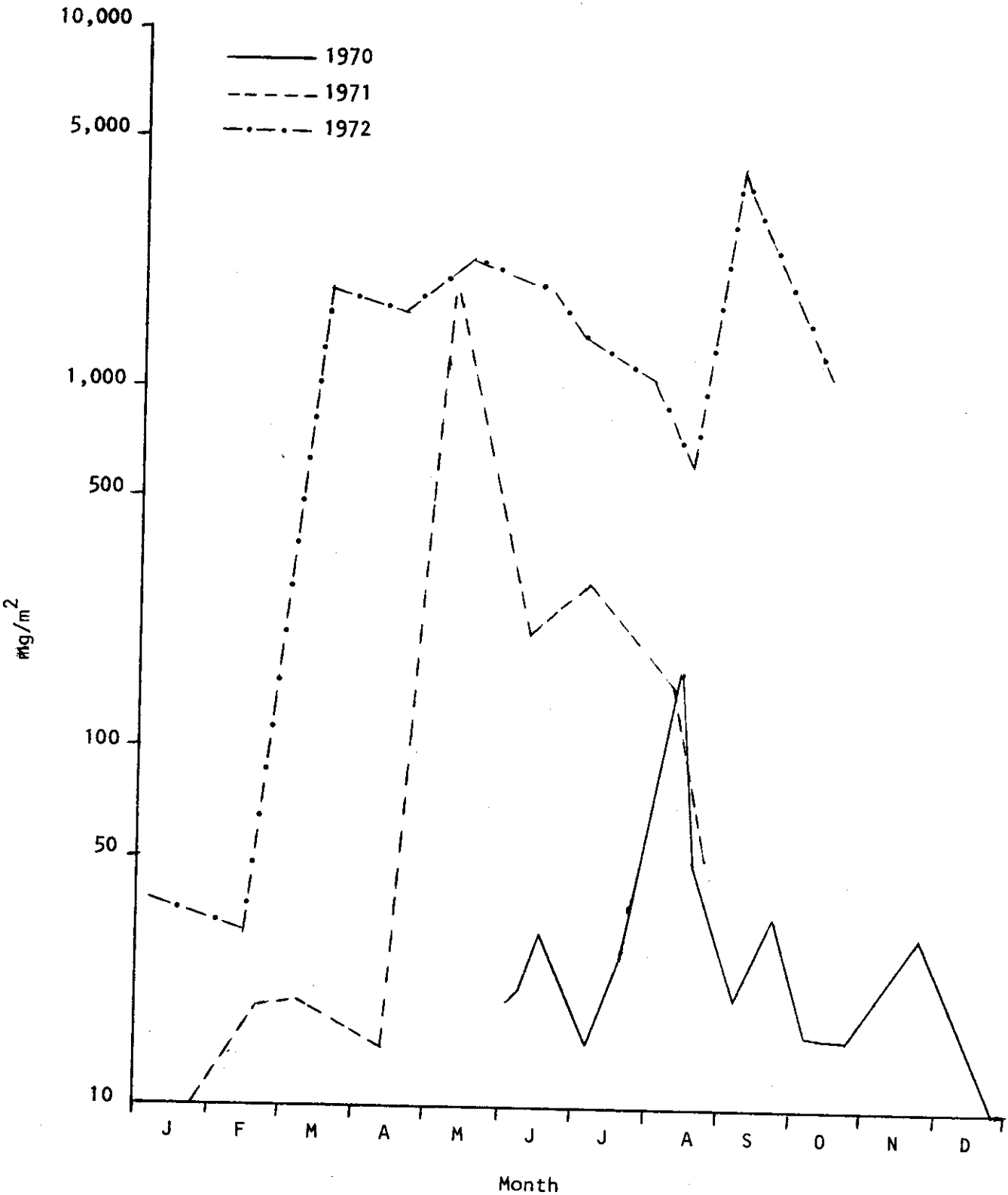

Figure 6. Insect biomass per m^2: 1970, 1971, and 1972. Treatment 3. Moderately grazed. Pantex Site. 1972.

criterion (Fig. 7). Also, the differences observed at the different sampling dates were much more variable in biomass than in numbers. In the ungrazed treatment, differences in numbers between the two strata appear to correlate quite well with differences in biomass (Fig. 8).

Throughout the 1972 season, tenebrionids or darkling beetles made the most significant overall contribution to total insect biomass, except in January and February when noctuid larvae were important (Tables 2, 3, 4 and 5). The apparently host-specific coreid, because of its size, made a more significant contribution to the biomass values than to the numbers values. However, the significance of coreids was overshadowed by the combination of numbers and weight of the tenebrionid that were well distributed in both the pear and grass strata (Tables 6, 7, 8, and 9)

The role of the Tenebrionidae in the structure and function of the grassland ecosystem at the Pantex Site should be investigated. The adults, the stage found in the samples, probably act primarily as scavengers. The larvae which are soil dwellers and which undoubtedly feed on plant roots, have not been studied and have not been encountered in soil samples in numbers which in any way correlate with adult numbers.

TROPHIC LEVEL STRUCTURE IN THE INSECT COMPARTMENT

In the grass strata, when insect numbers are considered, plant sap feeders are the dominant trophic level (Figs. 9 and 10). The most important plant sap feeders at the Pantex Site are thrips and leafhoppers. Herbivores, both tissue and sap feeders, constituted approximately half of the total numbers in the insect compartment. As would be expected, herbivores were more important during the growing season than either in January or October. A mid-season depression in the numbers of herbivores

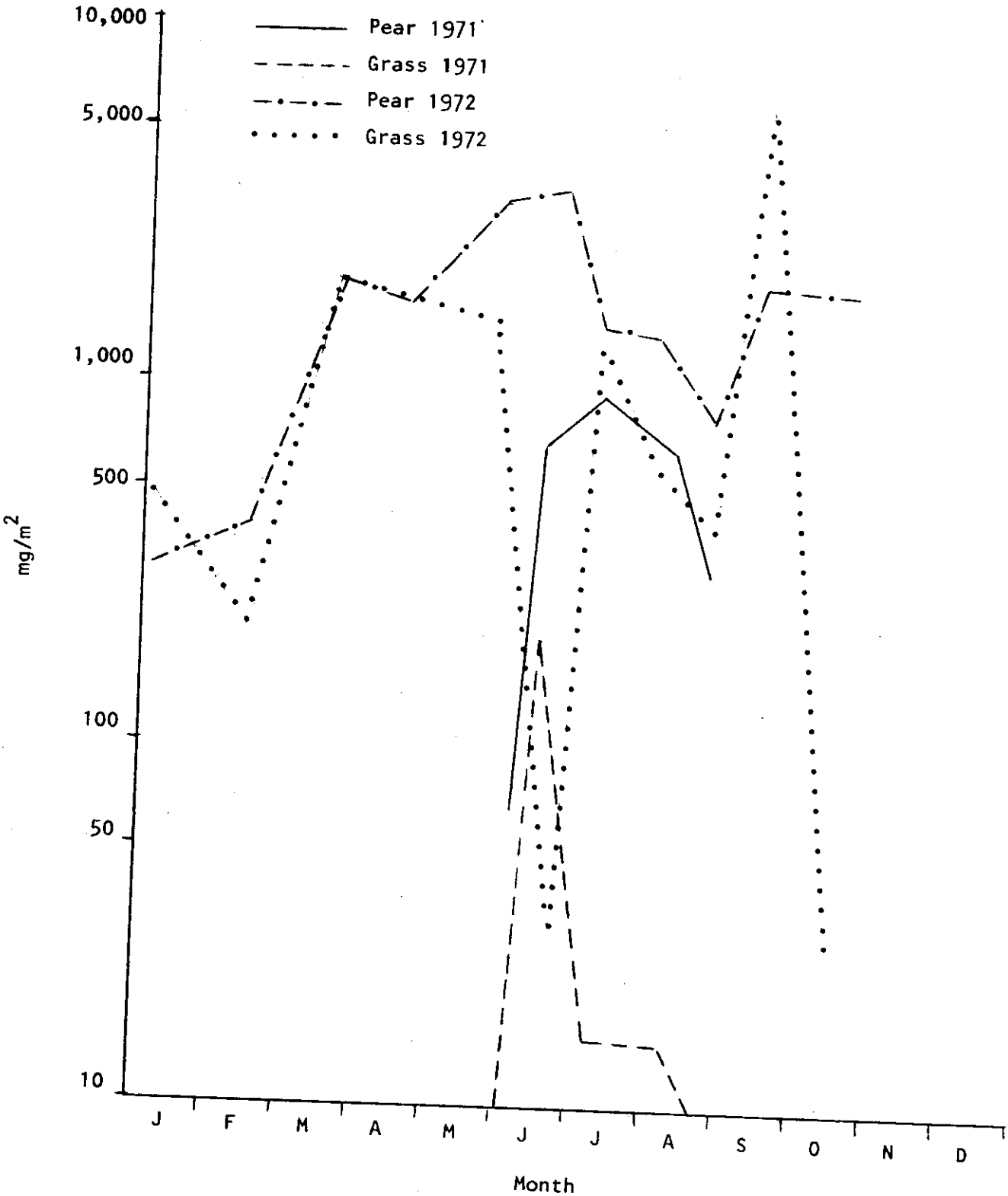

Figure 7. Biomass of insects per m^2 in prickly pear and grass strata: 1971 and 1972. Treatment 3, moderately grazed. Pantex Site. 1972.

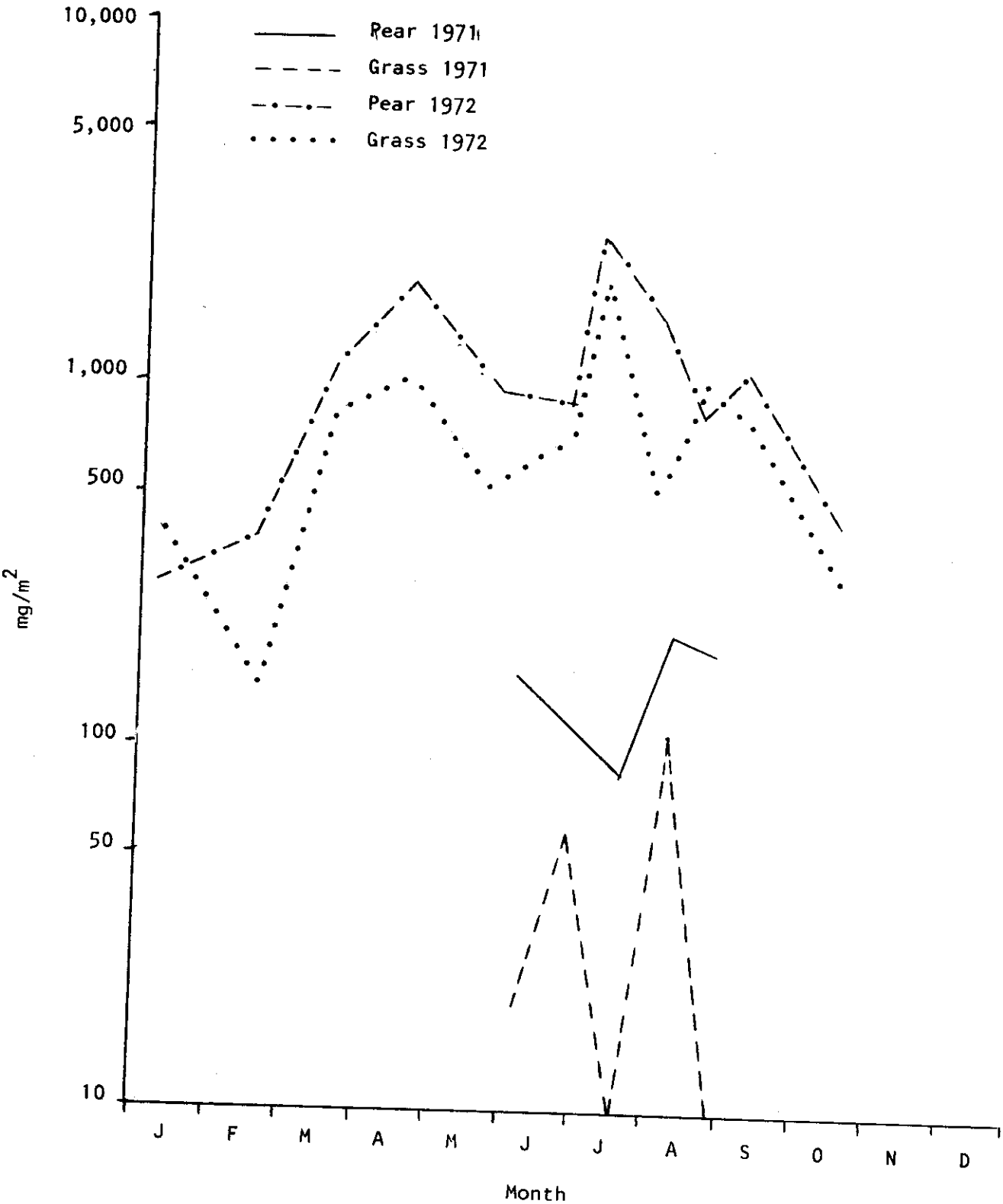

Figure 8. Biomass of insects per m^2 in prickly pear and grass strata: 1971 and 1972. Treatment 1, ungrazed. Pantex Site. 1972.

Table 2. Summary of the Three Most Important Orders, Families, and Species of Insects in Terms of Numbers in the Grass Strata of the Ungrazed Treatment. Pantex Site. 1972.

DATE	RANK	ORDER	% OF TOTAL	FAMILY	% OF TOTAL	SPECIES	% OF TOTAL
10 Jan.	1	Coll	56	Smin	44	Smin 02	44
	2	Thy2	20	Thri	16	Bre 01	14
	3	Homo	15	Cicl	11	Cic2 01	11
19 Feb.	1	Thy2	61	Thri	49	Bre 01	47
	2	Cole	15	Phlo	10	Oed 01	8
	3	Homo	8	Elat	5	Neg Pec 01	5
25 Mar.	1	Thy2	36	Thri	28	Bre 01	27
	2	Hyme	26	Form	25	Sol 03	18
	3	Cole	18	Phlo	9	Oed 01	7
22 Apr.	1	Homo	27	Pseu	25	Pseu 01	25
	2	Cole	26	Thri	22	Bre 01	18
	3	Thy2	26	Tene	13	Tene 01	12
22 May	1	Thy2	43	Thri	39	Bre 01	22
	2	Cole	15	Pseu	9	Thri 03	17
	3	Homo	14	Form	6	Pseu 01	9
20 June	1	Hyme	33	Form	32	Cre Pun 01	14
	2	Cole	31	Mala	9	Sol 03	14
	3	Hemi	10	Pseu	7	Mala 01	9
9 July	1	Cole	41	Form	24	Sol 03	12
	2	Hyme	14	Phlo	11	Cre Pun 01	11
	3	Thy2	10	Mala	7	Oed 1	11
31 July	1	Thy2	27	Pseu	22	Pseu 01	22
	2	Homo	26	Thri	14	Bre 01	10
	3	Cole	24	Phlo	13	Cre Pun 01	8
21 Aug.	1	Thy2	31	Thri	19	Cre Pun 01	13
	2	Cole	27	Form	18	Bre 01	12
	3	Hyme	20	Phlo	12	Tene 02	7
9 Sept.	1	Thy2	30	Form	25	Cre Pun 01	16
	2	Hyme	27	Phlo	16	Phlo 05	13
	3	Cole	19	Thri	14	Pseu 01	10
14 Oct.	1	Cole	53	Cara	19	Cara 03	15
	2	Thy2	16	Tene	13	Tene 02	13
	3	Hyme	13	Form	13	Cre Pun 01	11

Table 3. Summary of the Three Most Important Orders, Families, and Species of Insects in Terms of Numbers in the Prickly Pear Strata of the Ungrazed Treatment. Pantex Site. 1972.

DATE	RANK	ORDER	% OF TOTAL	FAMILY	% OF TOTAL	SPECIES	% OF TOTAL
10 Jan.	1	Coll	35	Smin	42	Smin 02	42
	2	Thy2	28	Thri	14	Bre 01	13
	3	Homo	17	Cicl	10	Cicl 01	97
19 Feb.	1	Thy2	40	Thri	28	Bre 01	28
	2	Cole	28	Phlo	11	OED 01	10
	3	Coll	9	Antl	9	Neg Pec 01	5
25 Mar.	1	Thy2	37	Thri	26	Bre 01	24
	2	Hyme	25	Form	24	Cre Pun 01	14
	3	Cole	17	Phlo	10	Sol 03	10
22 Apr.	1	Thy2	31	Thri	26	Bre 01	22
	2	Cole	22	Form	16	Tene 01	15
	3	Hyme	18	Tene	16	Cre Pun 01	13
22 May	1	Thy2	42	Thri	40	Thri 03	22
	2	Cole	24	Tene	12	Bre 01	16
	3	Hemi	11	Form	8	Tene 01	5
20 June	1	Hyme	53	Form	52	Cre Pun 01	26
	2	Cole	20	Ento	10	Phe Sit 01	22
	3	Coll	13	Mala	6	Ento 01	10
9 July	1	Cole	34	Form	27	Cre Pun 01	18
	2	Hyme	29	Mala	10	Mala 01	10
	3	Thy2	11	Tene	10	Tene 02	8
31 July	1	Cole	36	Form	20	Cre Pun 01	18
	2	Hyme	20	Tene	16	Tene 02	15
	3	Thy2	20	Pseu	11	Pseu 01	11
21 Aug.	1	Thy2	28	Form	27	Cre Pun 01	19
	2	Hyme	28	Thri	21	Bre 01	15
	3	Cole	23	Phlo	8	Pseu 01	9
9 Sept.	1	Thy2	34	Form	26	Cre Pun 01	18
	2	Hyme	29	Thri	20	Phlo 05	11
	3	Cole	17	Phlo	18	Thri 02	9
14 Oct.	1	Cole	49	Form	26	Cre Pun 01	22
	2	Hyme	26	Tene	16	Tene 02	16
	3	Thy2	12	Cara	14	Cara 03	11

Table 4. Summary of the Three Most Important Orders, Families, and Species of Insects in Terms of Numbers in the Grass Strata of the Grazed Treatment. Pantex Site. 1972.

DATE	RANK	ORDER	% OF TOTAL	FAMILY	% OF TOTAL	SPECIES	% OF TOTAL
10 Jan.	1	Thy2	36	Smin	27	Smin 02	27
	2	Coll	31	Thri	25	Bre 01	25
	3	Homo	11	Cicl	9	Oed 01	11
19 Feb.	1	Thy2	66	Thri	59	Bre 01	57
	2	Homo	19	Cicl	10	Cicl 01	9
	3	Cole	11	Phlo	5	Neg Pec 01	5
25 Mar.	1	Thy2	50	Thri	46	Bre 01	43
	2	Cole	21	Form	14	Sol 03	12
	3	Hyme	15	Tene	13	Tene 01	12
22 Apr.	1	Thy2	48	Thri	47	Bre 01	32
	2	Cole	28	Tene	22	Tene 01	21
	3	Homo	14	Pseu	9	Pseu 01	9
22 May	1	Thy2	33	Thri	25	Bre 01	22
	2	Cole	31	Tene	22	Tene 01	21
	3	Hemi	14	Form	10	Thy2 04	9
20 June	1	Hyme	50	Form	49	Sol 03	45
	2	Cole	25	Elat	10	Neg Pec 01	6
	3	Coll	11	Smin	10	Smin 02	5
9 July	1	Cole	49	Tene	19	Tene 02	10
	2	Hyme	17	Form	16	Cre pun 01	8
	3	Thy2	16	Cara	12	Tene 07	8
31 July	1	Thy2	45	Thri	26	Tene 02	16
	2	Cole	28	Phlo	19	Phlo 05	17
	3	Homo	11	Tene	16	Bre 01	11
21 Aug.	1	Thy2	73	Thri	65	Bre 01	60
	2	Cole	14	Phlo	8	Thri 02	9
	3	Homo	6	Cicl	5	Tene 02	5
9 Sept.	1	Thy2	54	Thri	35	Thri 02	31
	2	Cole	25	Phlo	20	Phlo 05	17
	3	Homo	9	Pseu	8	Pseu 01	8
14 Oct.	1	Cole	52	Tene	20	Tene 02	20
	2	Thy2	16	Cara	17	Cre pun 01	8
	3	Hyme	14	Form	12	Cara 03	7

Table 5. Summary of the Three Most Important Orders, Families, and Species of Insects in Terms of Numbers in the Prickly Pear Strata of the Grazed Treatment. Pantex Site. 1972.

DATE	RANK	ORDER	% OF TOTAL	FAMILY	% OF TOTAL	SPECIES	% OF TOTAL
10 Jan.	1	Thy2	46	Thri	26	Bre 01	26
	2	Coll	17	Smin	24	Smin 02	21
	3	Homo	12	Cicl	11	Cicl 01	11
19 Feb.	1	Thy2	43	Thri	38	Bre 01	36
	2	Coll	22	Ento	20	Ento 01	20
	3	Cole	19	Elat	11	Neg Pec 01	10
25 Mar.	1	Thy2	36	Thri	33	Bre 01	31
	2	Hyme	27	Form	25	Sol 03	15
	3	Cole	17	Tene	10	Tene 01	10
22 Apr.	1	Thy2	48	Thri	46	Bre 01	41
	2	Cole	18	Tene	13	Pseu 01	14
	3	Homo	17	Form	12	Tene 01	12
22 May	1	Cole	33	Thri	25	Tene 01	23
	2	Thy2	26	Tene	24	Smin 02	19
	3	Coll	19	Smin	19	Thri 03	15
20 June	1	Hyme	39	Form	37	Sol 03	22
	2	Cole	23	Ento	17	Ento 01	14
	3	Coll	20	Cara	8	Cre Pun 01	13
9 July	1	Cole	41	Form	23	Cre Pun 01	11
	2	Hyme	24	Tene	16	Sol 03	10
	3	Homo	8	Cara	9	Tene 02	10
31 July	1	Thy2	40	Thri	34	Thri 01	14
	2	Cole	33	Tene	15	Bre 01	14
	3	Homo	8	Cara	8	Tene 02	14
21 Aug.	1	Thy2	60	Thri	46	Bre 01	37
	2	Cole	19	Phlo	14	Cre Pun 01	11
	3	Hyme	13	Form	13	Tene 02	9
9 Sept.	1	Thy2	49	Thri	26	Phlo 05	18
	2	Cole	26	Phlo	22	Thri 02	16
	3	Homo	10	Tene	9	Tene 02	9
14 Oct.	1	Cole	50	Tene	24	Tene 02	24
	2	Hyme	19	Form	18	Cre Pun 01	13
	3	Thy2	13	Cara	16	Cara 03	12

Table 6. Ranking of Insect Orders, Families, and Species in Terms of Biomass in the Grass Strata of the Ungrazed Treatment. Pantex Site. 1972.

DATE	RANK	ORDER	% OF TOTAL	FAMILY	% OF TOTAL	SPECIES	% OF TOTAL
10 Jan.	1	Lepi	40	Noct	41	Cara 01	29
	2	Cole	40	Cara	33	Noct 01	16
	3	Aran	6	Aran	6	Noct 02	15
19 Feb.	1	Lepi	55	Noct	55	Noct 01	49
	2	Cole	21	Mala	7	Mala 01	7
	3	Hemi	7	Tene	5	Noct 03	5
25 Mar.	1	Cole	84	Tene	77	Tene 01	76
	2	Lepi	7	Noct	6	Noct 01	6
	3	Aran	3	Aran	3	Aran	3
22 Apr.	1	Cole	89	Tene	86	Tene 01	85
	2	Lepi	4	Noct	3	Noct 02	3
	3	Dipt	3	Ther	3	Ther 01	3
22 May	1	Cole	85	Curc	43	Ceu con 01	43
	2	Lepi	9	Tene	37	Tene 01	6
	3	Hemi	2	Pyra	5	Pyra 02	5
20 June	1	Cole	68	Tene	30	Tene 01	21
	2	Dipt	14	Cara	11	Mala 01	10
	3	Lepi	5	Curc	8	Tene 07	9
9 July	1	Orth	70	Gry2	68	Gry2 02	68
	2	Cole	21	Tene	9	Tene 02	6
	3	Lepi	4	Cara	6	Mala 01	4
31 July	1	Cole	65	Cara	28	Tene 02	22
	2	Lepi	8	Tene	22	Cara 46	18
	3	Hyme	7	Arct	8	Mala 01	7
21 Aug.	1	Cole	70	Tene	43	Tene 02	29
	2	Lepi	13	Cara	11	Tene 01	14
	3	Orth	4	Arct	11	Arct 03	11
9 Sept.	1	Cole	69	Tene	43	Tene 02	25
	2	Lepi	7	Mala	12	Tene 01	19
	3	Hyme	7	Form	7	Mala 01	12
14 Oct.	1	Cole	75	Tene	45	Tene 02	43
	2	Aran	8	Cara	16	Cara 03	9
	3	Lepi	6	Aran	8	Aran 01	8

Table 7. Ranking of Insect Orders, Families, and Species in Terms of Biomass in the Prickly Pear Strata of the Ungrazed Treatment. Pantex Site. 1972.

DATE	RANK	ORDER	% OF TOTAL	FAMILY	% OF TOTAL	SPECIES	% OF TOTAL
10 Jan.	1	Lepi	36	Noct	36	Noct 01	21
	2	Cole	20	Core	13	Core 01	13
	3	Hemi	17	Aran	13	Aran	13
19 Feb.	1	Lepi	68	Noct	68	Noct 01	68
	2	Cole	23	Tene	14	Tene 01	8
	3	Hemi	6	Core	5	Tene 02	6
25 Mar.	1	Cole	68	Tene	63	Tene 01	62
	2	Hemi	13	Core	12	Core 05	7
	3	Lepi	11	Pyra	6	Pyra 01	6
22 Apr.	1	Cole	90	Tene	88	Tene 01	88
	2	Lepi	5	Pyra	5	Pyra 01	3
	3	Dipt	2	Ther	2	Ther 01	2
22 May	1	Cole	93	Tene	82	Tene 01	80
	2	Hemi	4	Curc	5	Cen con 01	3
	3	Lepi	1	Mala	3	Ger bas 01	2
20 June	1	Cole	69	Cara	27	Tene 01	12
	2	Hyme	15	Tene	21	Cara 32	11
	3	Lepi	4	Form	15	Mala 01	11
9 July	1	Orth	52	Gry2	52	Gry2 02	52
	2	Cole	35	Tene	21	Tene 02	14
	3	Lepi	6	Mala	6	Mala 01	7
31 July	1	Cole	82	Tene	42	Tene 02	35
	2	Lepi	8	Cara	31	Cara 46	22
	3	Hemi	3	Mala	5	Tene 01	7
21 Aug.	1	Cole	73	Tene	47	Tene 02	30
	2	Hyme	7	Mala	9	Tene 01	16
	3	Hemi	6	Form	7	Cre pun 01	6
9 Sept.	1	Cole	64	Tene	46	Tene 02	26
	2	Dipt	18	Dipt	18	Tene 01	20
	3	Hyme	6	Mala	6	Dipt 07	17
14 Oct.	1	Cole	80	Tene	49	Tene 02	47
	2	Dipt	6	Cara	16	Ger lec 01	9
	3	Aran	4	Curc	13	Cara 03	6

Table 8. Ranking of Insect Orders, Families, and Species in Terms of Biomass in the Grass Strata of the Grazed Treatment. Pantex Site. 1972.

DATE	RANK	ORDER	% OF TOTAL	FAMILY	% OF TOTAL	SPECIES	% OF TOTAL
10 Jan.	1	Lepi	64	Noct	63	Noct 01	35
	2	Hemi	16	Core	16	Noct 02	18
	3	Cole	9	Aran	6	Core 01	16
19 Feb.	1	Lepi	64	Noct	64	Noct 01	64
	2	Cole	16	Chry	4	Chry 01	4
	3	Hemi	5	Aran	4	Aran	4
25 Mar.	1	Cole	86	Tene	83	Tene 01	83
	2	Lepi	10	Pyra	7	Pyra 01	7
	3	Hemi	2	Noct	4	Noct 01	3
22 Apr.	1	Cole	97	Tene	95	Tene 01	94
	2	Lepi	2	Noct	2	Noct 07	2
	3	Thy2	1	Mala	1	Mala 01	1
22 May	1	Cole	95	Tene	86	Tene 01	85
	2	Hyme	2	Curc	5	Ceu con 01	5
	3	Hemi	1	Cara	3	Cara 01	3
20 June	1	Cole	73	Tene	40	Tene 01	26
	2	Orth	17	Acri	17	Tene 07	12
	3	Hyme	3	Hydr	9	Acri 18	10
9 July	1	Cole	80	Tene	38	Tene 02	18
	2	Lepi	13	Cara	31	Tene 07	15
	3	Aran	2	Noct	12	Cara 38	14
31 July	1	Cole	89	Tene	46	Tene 02	45
	2	Lepi	4	Cara	37	Cara 46	22
	3	Aran	2	Arct	11	Arct 03	9
21 Aug.	1	Cole	51	Tene	35	Tene 02	35
	2	Orth	18	Acri	18	Acri 20	18
	3	Lepi	14	Arct	11	Arct 03	9
9 Sept.	1	Orth	91	Gry2	91	Gry2 01	91
	2	Cole	7	Tene	4	Tene 02	3
	3	Lepi	1	Cara	1	Mala 01	1
14 Oct.	1	Cole	75	Tene	48	Tene 02	48
	2	Orth	10	Cara	21	Acri 20	10
	3	Aran	6	Acri	10	Aran 01	6

Table 9. Ranking of Insect Orders, Families, and Species in Terms of Biomass in the Prickly Pear Strata of the Grazed Treatment. Pantex Site. 1972.

DATE	RANK	ORDER	% OF TOTAL	FAMILY	% OF TOTAL	SPECIES	% OF TOTAL
10 Jan.	1	Lepi	63	Noct	63	Noct 01	42
	2	Cole	13	Aran	5	Noct 06	5
	3	Hemi	9	Core	4	Aran	5
19 Feb.	1	Lepi	50	Noct	50	Noct 01	48
	2	Cole	35	Tene	17	Tene 02	12
	3	Hemi	10	Chry	9	Chry 02	8
25 Mar.	1	Cole	88	Tene	85	Tene 01	84
	2	Lepi	6	Pyra	4	Pyra 01	4
	3	Hemi	3	Noct	3	Noct 01	2
22 Apr.	1	Cole	93	Tene	88	Tene 01	87
	2	Lepi	3	Cara	3	Noct 01	2
	3	Hemi	2	Noct	3	Chry 02	1
22 May	1	Cole	95	Tene	84	Tene 01	82
	2	Lepi	3	Curc	7	Ceu con 01	7
	3	Hemi	1	Cara	3	Cara 01	2
20 June	1	Orth	79	Gry2	78	Gry2 01	78
	2	Cole	17	Cara	9	Cara 12	4
	3	Lepi	1	Tene	5	Tene 01	3
9 July	1	Cole	75	Tene	37	Tene 02	20
	2	Lepi	8	Cara	25	Cara 38	14
	3	Hemi	7	Noct	6	Mala 01	4
31 July	1	Cole	90	Cara	54	Cara 46	32
	2	Lepi	4	Tene	31	Tene 02	24
	3	Aran	2	Arct	3	Pas 01	9
21 Aug.	1	Cole	68	Tene	47	Tene 02	46
	2	Lepi	8	Curc	9	Acri 20	8
	3	Hemi	7	Acri	8	Ger bas 01	6
9 Sept.	1	Orth	64	Gry2	64	Gry2 01	64
	2	Cole	28	Tene	19	Tene 02	17
	3	Lepi	3	Cara	4	Mala 01	3
14 Oct.	1	Orth	73	Gry2	73	Gry2 01	73
	2	Cole	22	Tene	17	Tene 02	16
	3	Hemi	2	Cara	5	Aran 01	2

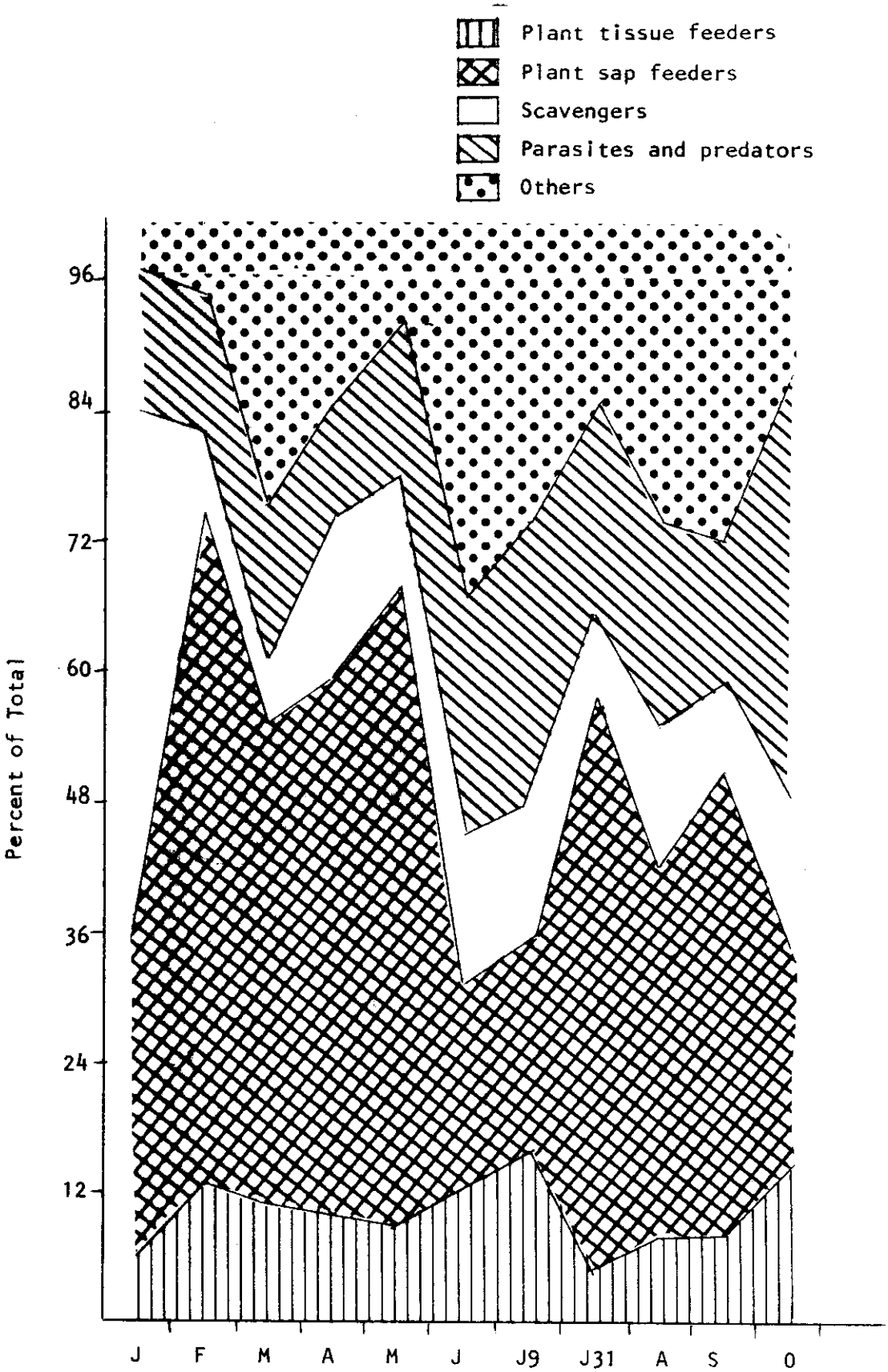

Figure 9. Numerical structure of the insect compartment in the grass strata of the ungrazed treatment. Pantex Site. 1972.

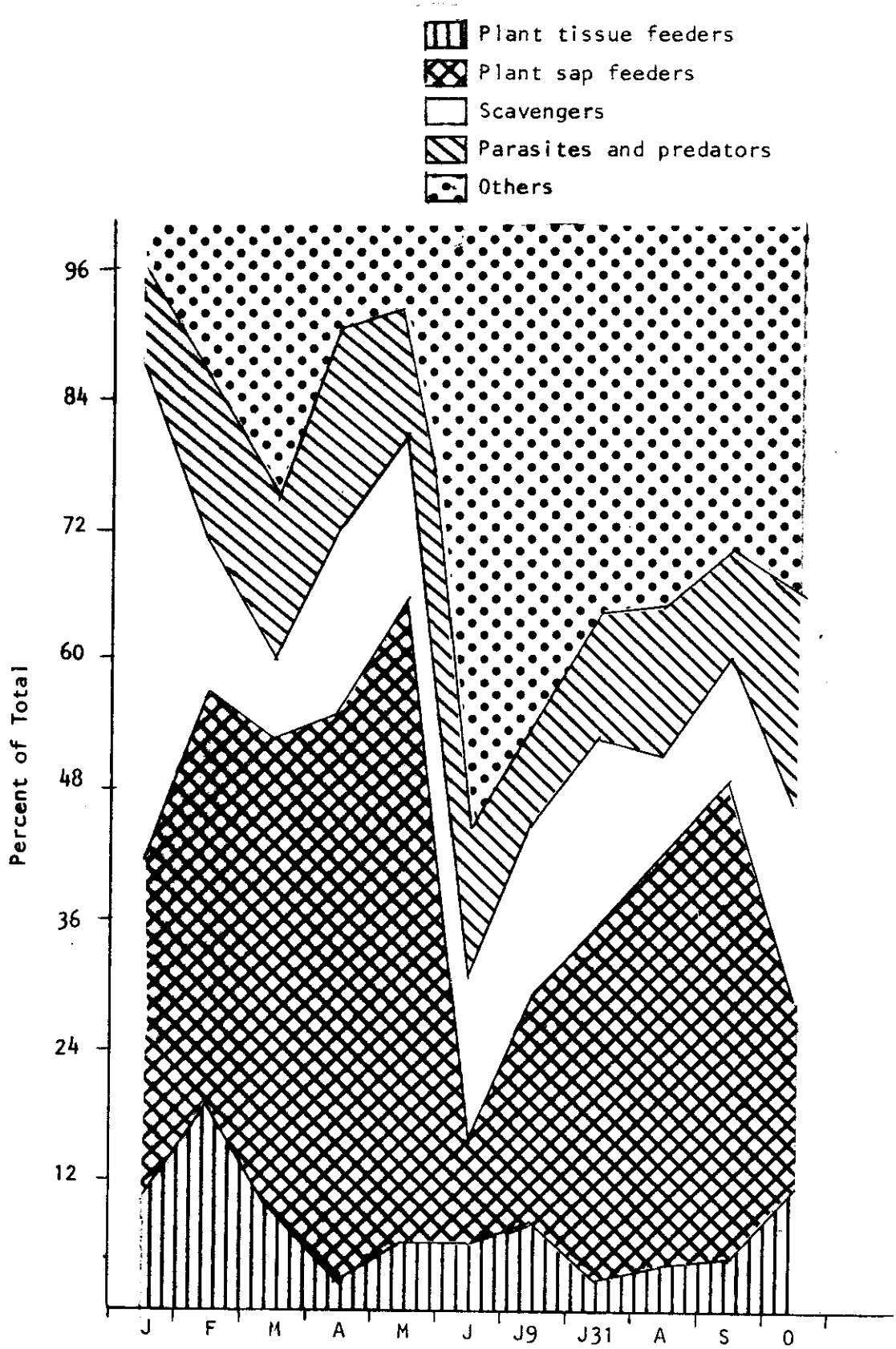

Figure 10. Numerical structure of the insect compartment in the prickly pear strata of the ungrazed treatment. Pantex Site. 1972.

in relation to the total numbers of insects was very apparent and was associated with more than one sampling date. Part of this depression is an artifact of the large number of ants, considered as omnivores and thus not counted in the herbivore groups, encountered in June and July. Scavengers and the parasite-predator groups were approximately equal and each constituted 10 to 20 percent of the overall totals.

Structure, on the basis of numbers, in the prickly pear strata followed the same general trends as in the grass strata except that the overall percentages of herbivores were reduced and the scavenger and parasite-predator groups constituted somewhat higher percentages of the total. Formicidae were also numerous in the prickly pear strata and by being classified in the "others" category had a significant effect on the percentages of the other categories (Figs. 11 and 12).

The small size of the plant sap feeders, and the large size of many of the scavengers lead to a completely different graph of the trophic level structure when biomass is considered. Plant sap feeders constituted only a very small fraction of the total biomass in the insect compartment. Herbivores were found to account for as much as 80% of the total biomass in January and February in the grazed plots and approximately 70% of the total biomass in the ungrazed plots (Tables 10 - 13). A difference, in biomass structure, in the grass strata between the grazed and ungrazed treatment was found. Significantly more plant tissue feeder biomass was found in the ungrazed treatment, especially in April and May (Figs. 13, 14, 15 and 16).

The biomass of scavengers was extremely large in both treatments and both strata. The intraseasonal change in structure in July was caused by the consistent appearance of a few large carabids in the samples.

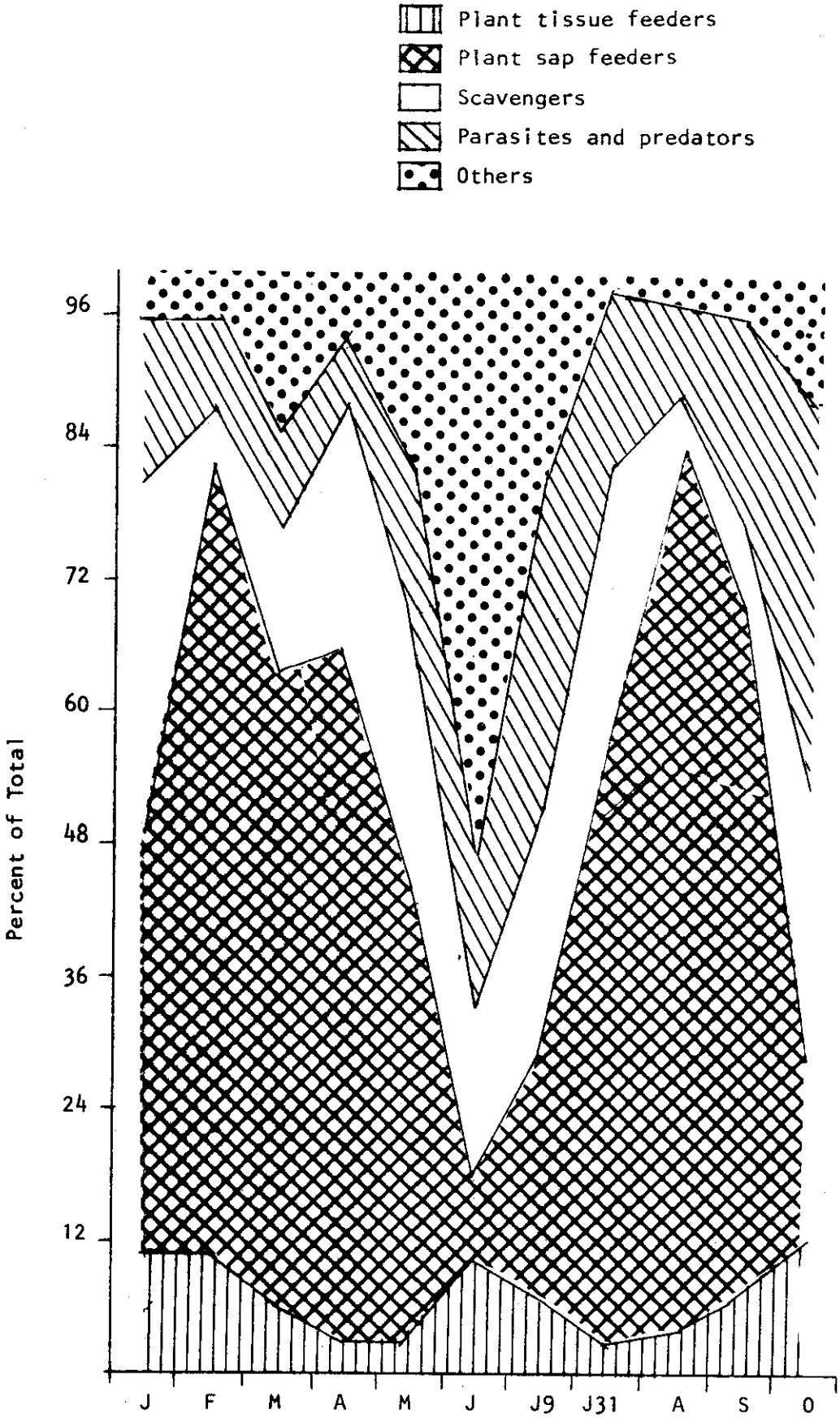

Figure 11. Numerical structure of the insect compartment in the grass strata of the grazed treatment. Pantex Site. 1972.

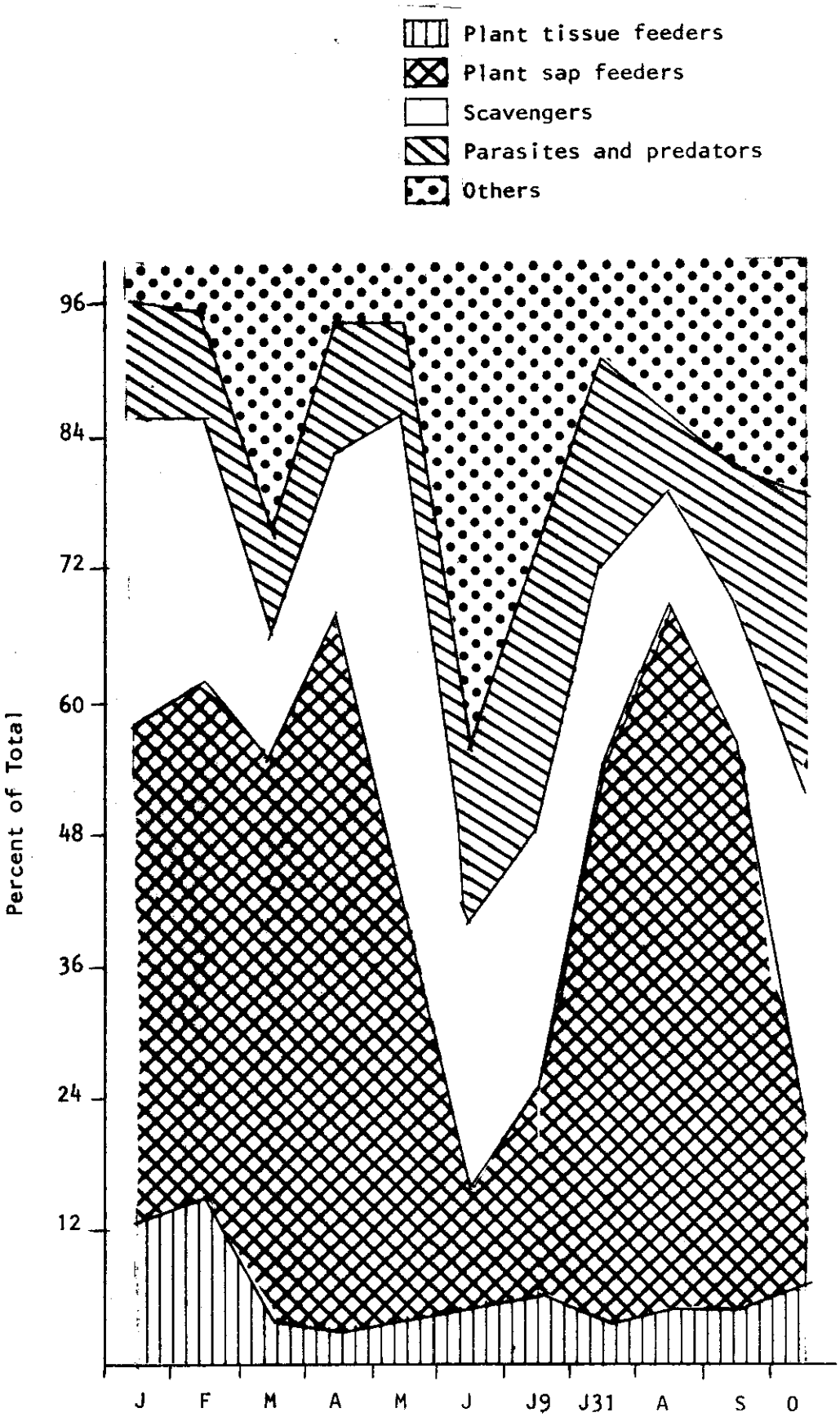

Figure 12. Numerical structure of the insect compartment in the prickly pear strata of the grazed treatment. Pantex Site. 1972.

Table 10. Comparison of Trophic Level Structure, Based on Numbers of Insects in Each of Five Major Trophic Designations, Within the Grass Strata of the Grazed and Ungrazed Treatments. Pantex Site. 1972.

	Trophic Level Structure Expressed as a Percentage of the Total									
	Plant Tissue		Plant Sap		Scavenger		Pred.-Parasite		Other	
	Grazed	Ungrazed	Grazed	Ungrazed	Grazed	Ungrazed	Grazed	Ungrazed	Grazed	Ungrazed
Jan.	11	6	39	30	31	58	15	13	3	4
Feb.	11	13	72	62	5	7	8	13	4	6
March	6	11	58	44	13	6	8	13	15	26
April	3	10	63	50	22	14	6	10	6	15
May	3	9	42	59	24	10	13	14	19	8
June	10	12	8	19	15	14	14	20	53	36
July 9	7	16	22	20	23	12	28	26	19	26
July 31	3	5	54	53	25	7	16	19	3	16
Aug.	4	8	79	34	6	13	7	19	3	25
Sept	7	8	63	43	8	8	16	13	7	28
Oct.	12	15	17	20	24	14	33	49	14	21

Table 11. Comparison of Trophic Level Structure, Based on Numbers of Insects in Each of Five Major Trophic Designations, Within the Prickly Pear Strata of the Grazed and Ungrazed Treatments. Pantex Site. 1972.

	Trophic Level Structure Expressed as a Percentage of the Total									
	Plant Tissue		Plant Sap		Scavengers		Pred.-Parasite		Other	
	Grazed	Ungrazed	Grazed	Ungrazed	Grazed	Ungrazed	Grazed	Ungrazed	Grazed	Ungrazed
Jan.	13	10	45	31	28	46	10	9	4	4
Feb.	15	19	47	38	24	14	9	16	6	13
March	4	9	51	44	11	7	9	15	26	25
April	3	3	65	52	14	17	7	6	12	19
May	4	6	38	59	44	15	8	12	5	9
June	5	6	11	10	24	15	16	13	44	56
July 9	6	8	19	21	23	16	26	19	26	45
July 31	4	3	50	33	18	17	19	23	9	24
Aug.	5	4	64	38	10	9	6	14	15	34
Sept.	5	5	51	44	12	11	13	10	18	30
Oct.	7	11	15	17	30	18	27	20	21	34

Table 12. Comparison of Trophic Level Structure, Based on Biomass of Insects in Each of Five Major Trophic Designations, Within the Grass Strata of the Grazed and Ungrazed Treatments. Pantex Site. 1972.

	Trophic Level Structure Expressed as a Percentage of the Total									
	Plant Tissue		Plant Sap		Scavengers		Pred.-Parasite		Other	
	Grazed	Ungrazed	Grazed	Ungrazed	Grazed	Ungrazed	Grazed	Ungrazed	Grazed	Ungrazed
Jan.	66	46	19	5	4	6	9	40	2	1
Feb.	71	64	9	10	5	6	10	15	5	5
March	11	9	2	4	83	77	3	8	1	9
April	2	49	1	1	95	87	2	5	1	2
May	7	54	1	2	86	37	5	5	2	11
June	20	17	3	3	41	31	27	41	8	7
July 9	15	7	2	2	42	78	38	12	2	1
July 31	5	16	2	7	47	22	44	48	3	8
Aug.	35	21	9	3	36	44	19	23	2	8
Sept.	2	18	1	4	95	45	3	25	1	12
Oct.	18	18	3	3	48	45	30	30	2	4

Table 13. Comparison of Trophic Level Structure, Based on Biomass of Insects in Each of Five Major Trophic Designations, Within the Prickly Pear Strata of the Grazed and Ungrazed Treatments. Pantex Site. 1972.

	Trophic Level Structure Expressed as a Percentage of the Total									
	Plant Tissue		Plant Sap		Scavengers		Pred.-Parasite		Other	
	Grazed	Ungrazed	Grazed	Ungrazed	Grazed	Ungrazed	Grazed	Ungrazed	Grazed	Ungrazed
Jan.	70	45	13	20	5	14	8	13	4	4
Feb.	68	74	11	6	13	14	6	3	2	3
March	7	13	3	14	85	63	3	1	1	3
April	5	6	3	1	88	89	4	3	1	1
May	10	8	1	4	84	82	4	5	1	1
June	3	11	1	3	84	24	11	45	2	18
July 9	11	8	7	3	42	74	33	13	7	2
July 31	5	10	2	3	31	44	59	40	3	4
Aug.	25	7	11	8	48	48	11	22	6	15
Sept.	3	9	2	3	83	47	9	14	2	28
Oct.	1	16	2	3	90	49	7	27	1	4

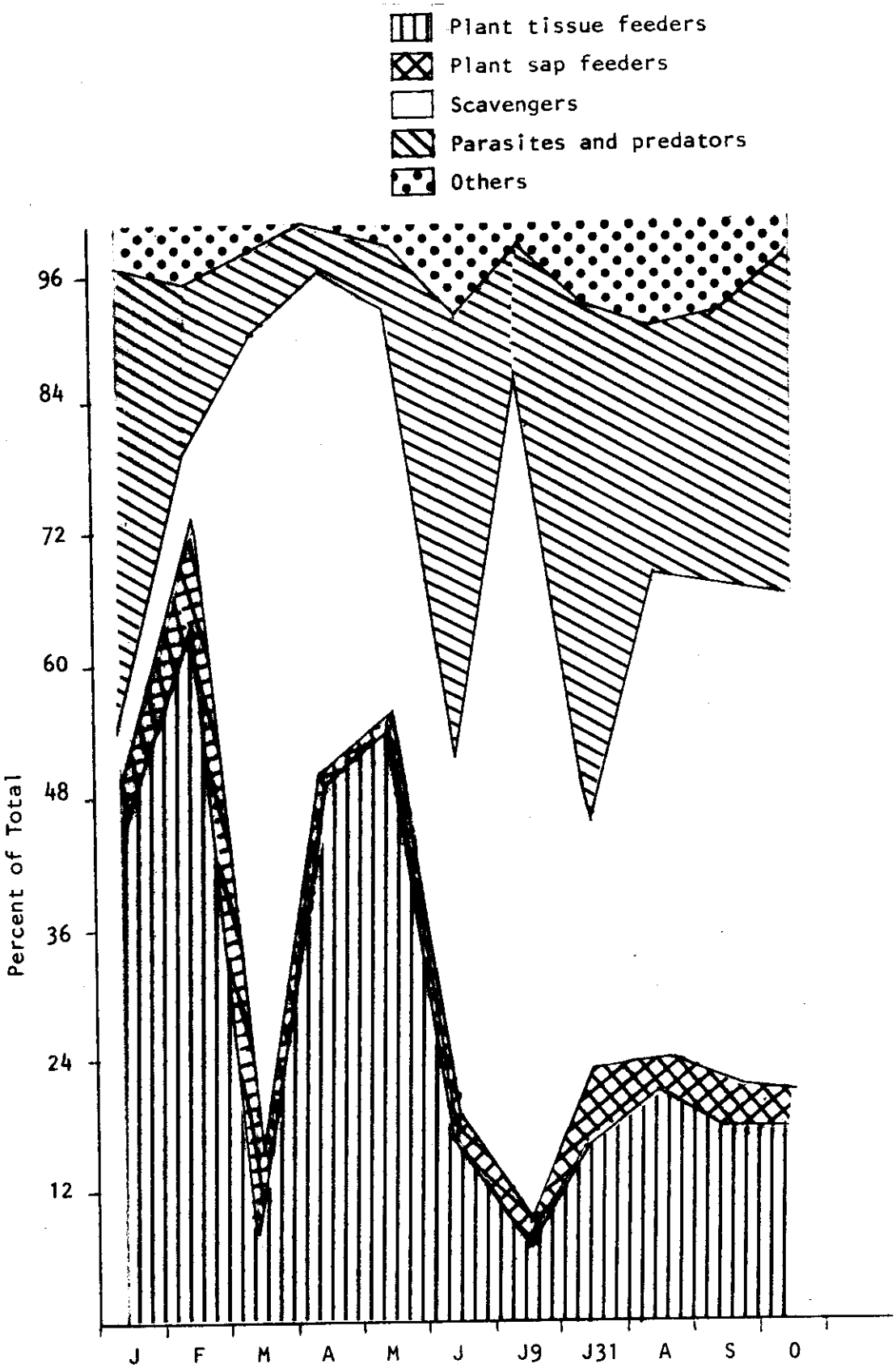

Figure 13. Biomass structure of the insect compartment in the grass strata of the ungrazed treatment. Pantex Site. 1972.

Figure 14. Biomass structure of the insect compartment in the prickly pear strata of the ungrazed treatment. Pantex Site. 1972.

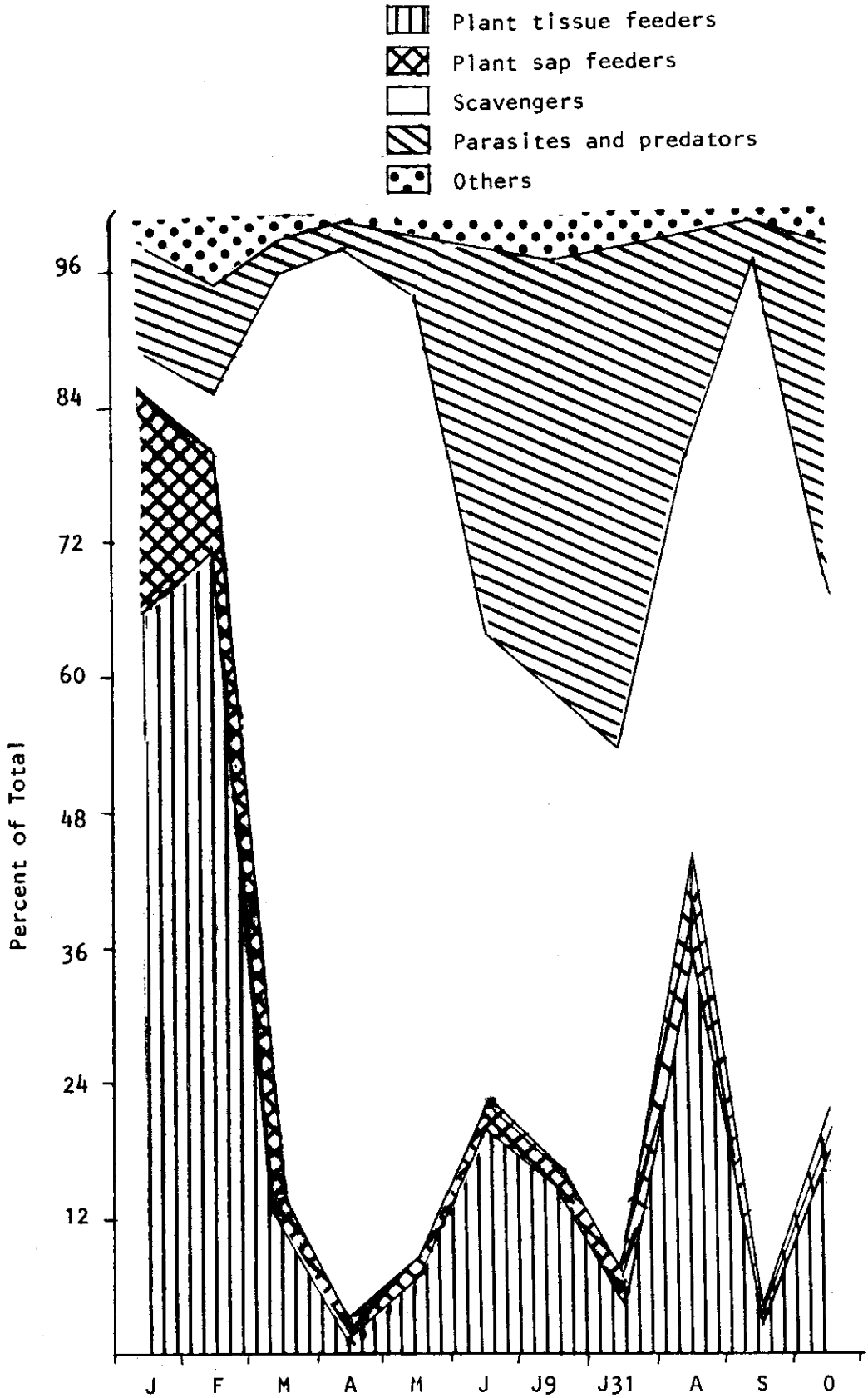

Figure 15. Biomass Structure of the insect compartment in the grass strata of the grazed treatment. Pantex Site. 1972.

Figure 16. Biomass structure of the insect compartment in the prickly pear strata of the grazed treatment. Pantex Site. 1972.

Obviously, biomass and numbers each give a different picture of the structure of a system. Another problem with a study such as this one, is that certain types of insects and certain life cycle stages of a given insect are sampled much more effectively than others. While this may not be especially important in the case of certain insects, it is extremely critical at the Pantex Site. Tenebrionidae presents the greatest problem in that the larval stage probably extends over at least two seasons as a plant root feeder and is not sampled at all. The adult stage is very readily sampled, makes a significant contribution to biomass, and may play only a minor role in actual energy flow.

LITERATURE CITED

Fagan, R. E., and R. D. Pettit. 1972. Herbage Dynamics Studies at the Pantex Site, 1971. US/IBP Grassland Biome Tech. Rep. No. 193. Colorado State Univ., Fort Collins. 30 p.

Huddleston, E. W. 1970. Comprehensive Network Site description, Pantex. US/IBP Grassland Biome Tech. Rep. No. 45. Colorado State Univ., Fort Collins. 12 p.

APPENDIX I

FIELD DATA

Aboveground invertebrate data collected at the Pantex Site were recorded on form NREL-30. Two additional columns were recorded on the form to indicate stratum. In column 68, G was recorded for the grass stratum and P was recorded for prickly pear. In column 69, A represents aboveground captures, L represents litter, and C represents crowns. The data are stored as Grassland Biome data set A2U30EA with a format slightly expanded from the original recorded data form. Dry weight is in columns 56 to 63; number weighed is in columns 64 to 68; the stratum codes are in columns 70 and 71; a sample date identifier is in columns 76 to 80. A sample data form and an example of the data are attached.

IBP

GRASSLAND BIOME

U.S. INTERNATIONAL BIOLOGICAL PROGRAM

FIELD DATA SHEET - INVERTEBRATE

D A TYPE	SITE	INITIALS	DATE			TREATMENT	REPLICATE	PLOT SIZE	QUADRAT	TROPHIC	HOST	ORDER	FAMILY	GENUS	SPECIES	SUBSPECIES	LIFE STAGE	TOTAL NO.	DRY WT.	NO. WEIGH
			Day	Mo	Yr															

DATA TYPE

01 Aboveground Biomass
02 Litter
03 Belowground Biomass
10 Vertebrate - Live Trapping
11 Vertebrate - Snap Trapping
12 Vertebrate - Collection
20 Avian Flush Census
21 Avian Road Count
22 Avian Road Count Summary
23 Avian Collection - Internal
24 Avian Collection - External
25 Avian Collection - Plumage
30 Invertebrate
40 Microbiology - Decomposition
41 Microbiology - Nitrogen
42 Microbiology - Biomass
43 Microbiology - Root Decomposition
Microbiology - Respiration

SITE

01 Ale
02 Bison
03 Bridger
04 Cottonwood
05 Dickinson
06 Hays
07 Hopland
08 Jornada
09 Osage
10 Pantex
11 Pawnee

TREATMENT

1 Ungrazed
2 Lightly grazed
3 Moderately grazed
4 Heavily grazed
5 Grazed 1969, ungrazed 1970
6
7
8
9

TROPHIC

0 Unknown
1 Plant feeding (tissue)
2 Plant feeding (sap)
3 Plant feeding (pollen and nectar)
4 Plant feeding (seed)
5 Predator
6 Parasitoid
7 Parasite
8 Scavenger
9 Non-feeding stage

LIFE STAGE

00 Undetermined
10 Adult
20 Pupae
30 Egg
40 Nymph or Larva
41 Nymph or Larva, early
42 Nymph or Larva, middle
43 Nymph or Larva, late
50 Instar
51 Instar, 1st
52 Instar, 2nd
53 Instar, 3rd

+++ EXAMPLE OF DATA +++

```
        1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890

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3010EH 25 37231.50001 1  COLEELATNEGPEC0110    1.  .00020   1. GA  G  1
3010EH 25 37231.50001 2  HOMOCIC1      0140    2.  .429403896. GA  G  1
3010EH 25 37231.50001 2  HOMOPSEU      0100    1.  .00414 170. GA  G  1
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3010EH 25 37231.50002 1	COLEANTI	0910	2.	.00052	1.	GC	G	1
3010EH 25 37231.50002 9	DIPT	2910	1.	.00200	1.	GC	G	1
3010EH 25 37231.50002 2	THY2THRIBRE	0110	14.	.00070	15.	GC	G	1
3010EH 25 37231.50002 2	THY2THRI	0210	1.	.00047	10.	GC	G	1
3010EH 25 37231.50002 2	THY2THRI	0310	1.	.00023	10.	GC	G	1
3010EH 25 37231.50002 2	THY2PHLO	0140	1.	.00020	5.	GC	G	1
3010EH 25 37231.50002 7	HYMEFORMSOL	0310	56.	.00610	230.	GC	G	1
3010EH 25 37231.50002 9	DIPT	0120	1.	.00210	1.	GC	G	1
3010EH 25 37231.50002 0	DIPT	0140	3.	.00310	2.	GC	G	1
3010EH 25 37231.50002 1	COLEELATNEGPEC	0110	16.	.00020	1.	GL	G	1
3010EH 25 37231.50002 1	LEPINOCT	0140	1.	2.32010	98.	GL	G	1
3010EH 25 37231.50002 8	COLEIENE	0140	13.	.02100	1.	GL	G	1
3010EH 25 37231.50002 1	LEPINOCI	0740	1.	.00450	1.	GL	G	1
3010EH 25 37231.50002 8	COLEIENE	0210	3.	10.04350	2045.	GL	G	1
3010EH 25 37231.50002 5	COLECARA	0110	2.	1.06490	137.	GL	G	1
3010EH 25 37231.50002 5	ARAN	00	4.	1.33800	571.	GL	G	1
3010EH 25 37231.50002 5	THY2PHLOOED	0110	4.	.00540	95.	GL	G	1
3010EH 25 37231.50002 5	THY2PHLOOED	0140	4.	.00057	5.	GL	G	1
3010EH 25 37231.50002 2	THY2THRIBRE	0110	46.	.00070	15.	GL	G	1
3010EH 25 37231.50002 2	THY2THRI	0210	2.	.00047	10.	GL	G	1
3010EH 25 37231.50002 2	THY2PHLO	0340	1.	.00017	5.	GL	G	1
3010EH 25 37231.50002 5	COLECARA	2510	1.	.00090	1.	GL	G	1
3010EH 25 37231.50002 2	HOMOAPHI	0110	1.	.00470	20.	GL	G	1
3010EH 25 37231.50002 2	HOMOPSEU	0100	1.	.00414	170.	GL	G	1
[illegible]0EH 25 37231.50002 2	HOMOCIC1	0140	1.	.42940	3896.	GL	G	1
3010EH 25 37231.50002 2	HOMOCIC1	0310	1.	.00820	16.	GL	G	1
3010EH 25 37231.50002 5	HEMILYGAGEU	0110	1.	.02290	24.	GL	G	1
3010EH 25 37231.50002 5	HEMILYGAGEU	0140	2.	.00364	16.	GL	G	1
3010EH 25 37231.50002 2	HEMICORE	0310	1.	.00040	1.	GL	G	1
3010EH 25 37231.50002 2	HEMIPIES	0140	1.	.00500	3.	GL	G	1
3010EH 25 37231.50002 2	HEMICOR4	0140	1.	-0.00000	-0.	GL	G	1
3010EH 25 37231.50002 2	HEMITING	0310	1.	.00021	1.	GL	G	1
3010EH 25 37231.50002 1	COLEPHAL	0210	1.	.00110	1.	GL	G	1
3010EH 25 37231.50002 1	COLECHRY	0140	1.	.00430	1.	GL	G	1
3010EH 25 37231.50002 7	HYMEFORMCREPUN	0110	1.	.36940	1631.	GL	G	1
3010EH 25 37231.50002 7	HYMEFORMPHESIT	0110	1.	.01900	96.	GL	G	1
3010EH 25 37231.50002 7	HYMEFORMSOL	0310	49.	.00610	230.	GL	G	1
3010EH 25 37231.50003 2	HOMOPSEU	0100	1.	.00414	170.	GA	G	1
3010EH 25 37231.50003 2	HOMOCIC1	0140	3.	.42940	3896.	GA	G	1
3010EH 25 37231.50003 2	HOMOCIC1	0140	2.	.42940	3896.	GA	G	1
3010EH 25 37231.50003 2	HOMOCIC1	0310	1.	.00820	16.	GA	G	1
3010EH 25 37231.50003 5	THY2PHLOOED	0140	5.	.00057	5.	GA	G	1
3010EH 25 37231.50003 2	THY2THRIFRA	0140	1.	.00007	5.	GA	G	1
3010EH 25 37231.50003 2	THY2THRIBRE	0110	59.	.00070	15.	GA	G	1
3010EH 25 37231.50003 2	THY2PHLO	0210	4.	.00010	2.	GA	G	1
3010EH 25 37231.50003 1	LEPINOCI	0140	1.	2.32010	98.	GC	G	1
3010EH 25 37231.50003 5	NEURHEME	0140	1.	.00060	1.	GC	G	1
3010EH 25 37231.50003 1	COLEELATNEGPEC	0110	1.	.00020	1.	GC	G	1
3010EH 25 37231.50003 1	COLEANTI	0910	1.	.00052	1.	GC	G	1
[illegible] 0EH 25 37231.50003 5	COLECARA	2510	1.	.00090	1.	GC	G	1
3010EH 25 37231.50003 5	COLECARA	0110	2.	1.06490	137.	GC	G	1
3010EH 25 37231.50003 5	THY2PHLOOED	0140	1.	.00057	5.	GC	G	1
3010EH 25 37231.50003 2	THY2PHLO	0310	1.	.00015	3.	GC	G	1
3010EH 25 37231.50003 2	THY2THRI	0210	6.	.00047	10.	GC	G	1
3010EH 25 37231.50003 2	THY2THRIBRE	0110	31.	.00070	15.	GC	G	1
3010EH 25 37231.50003 6	HYMECHA3	0110	1.	.00210	37.	GC	G	1

3010EH 25 37231.50003 7	HYMEFORMSOL	0310	10.	.00610	230.	GC	G	1
3010EH 25 37231.50003 8	COLLENTO	0100	1.	.00070	4.	GL	G	1
3 0EH 25 37231.50003 1	COLEELAINEGPEC	0110	11.	.00020	1.	GL	G	1
3010EH 25 37231.50003 8	COLETENE	0140	5.	.02100	1.	GL	G	1
3010EH 25 37231.50003 5	COLEMALA	0140	3.	.04260	24.	GL	G	1
3010EH 25 37231.50003 1	LEPINOC1	0640	1.	.02400	1.	GL	G	1
3010EH 25 37231.50003 2	HOMOCIC1	0140	8.	.429403896.		GL	G	1
3010EH 25 37231.50003 2	HOMOCIC1	0140	7.	.429403896.		GL	G	1
3010EH 25 37231.50003 2	HOMOCIC1	0310	1.	.00820	16.	GL	G	1
3010EH 25 37231.50003 2	HOMOCIC1	0210	1.	.00070	2.	GL	G	1
3010EH 25 37231.50003 2	HOMOPSEU	0100	5.	.00414	170.	GL	G	1
3010EH 25 37231.50003 5	COLECARA	2510	2.	.00090	1.	GL	G	1
3010EH 25 37231.50003 8	COLETENE	0710	1.	.00500	1.	GL	G	1
3010EH 25 37231.50003 1	COLECHRY	0110	3.	.01070	11.	GL	G	1
3010EH 25 37231.50003 1	COLEPHAL	0210	1.	.00110	1.	GL	G	1
3010EH 25 37231.50003 5	ARAN	00	1.	1.33600	571.	GL	G	1
3010EH 25 37231.50003 6	HYMECHA3	0110	11.	.00210	37.	GL	G	1
3010EH 25 37231.50003 5	COLECOCC	1010	6.	.00010	10.	GL	G	1
3010EH 25 37231.50003 9	DIPT	2510	1.	.00030	1.	GL	G	1
3010EH 25 37231.50003 2	HEMICORE	0310	3.	.00040	1.	GL	G	1
3010EH 25 37231.50003 2	HEMICOR4	0140	8.	-0.00000	-0.	GL	G	1
3010EH 25 37231.50003 5	HEMILYGAGEO	0140	10.	.00364	16.	GL	G	1
3010EH 25 37231.50003 2	HEMICORE	0340	6.	.00007	10.	GL	G	1
3010EH 25 37231.50003 1	COLECORCGERBAS	0110	1.	.53820	31.	GL	G	1
3010EH 25 37231.50003 2	HEMILYGA	1310	1.	.00400	2.	GL	G	1
3010EH 25 37231.50003 7	HYMEFORMCREPUN	0110	4.	.369401631.		GL	G	1
3010EH 25 37231.50003 7	HYMEFORMPHESIT	0110	1.	.01900	96.	GL	G	1
3 0EH 25 37231.50003 7	HYMEFORMSOL	0310	11.	.00610	230.	GL	G	1
3 .0EH 25 37231.50003 2	THY2THRIFRA	0140	5.	.00007	5.	GL	G	1
3010EH 25 37231.50003 5	THY2PHLOOED	0140	6.	.00057	5.	GL	G	1
3010EH 25 37231.50003 5	THY2PHLOOED	0110	2.	.00540	95.	GL	G	1
3010EH 25 37231.50003 2	THY2PHLO	0210	1.	.00010	2.	GL	G	1
3010EH 25 37231.50003 2	THY2THRIBRE	0110	101.	.00070	15.	GL	G	1
3010EH 25 37231.50003 2	THY2THRI	0210	1.	.00047	10.	GL	G	1
3010EH 25 37231.50003 2	THY2PHLO	0240	1.	.00019	5.	GL	G	1
3010EH 25 37231.50004 2	HOMOCIC1	0140	5.	.429403896.		GA	G	1
3010EH 25 37231.50004 2	HEMICORE	0310	2.	.00040	1.	GA	G	1
3010EH 25 37231.50004 2	HEMICOR4	0140	1.	-0.00000	-0.	GA	G	1
3010EH 25 37231.50004 8	COLETENE	0140	1.	.02100	1.	GA	G	1
3010EH 25 37231.50004 5	THY2PHLOOED	0140	1.	.00057	5.	GA	G	1
3010EH 25 37231.50004 2	THY2PHLO	0310	1.	.00015	3.	GA	G	1
3010EH 25 37231.50004 2	THY2THRIBRE	0110	44.	.00070	15.	GA	G	1
3010EH 25 37231.50004 6	HYMECHA3	0110	1.	.00210	37.	GA	G	1
3010EH 25 37231.50004 7	HYMEFORMPHESIT	0110	2.	.01900	96.	GA	G	1
3010EH 25 37231.50004 2	THY2THRIBRE	0110	16.	.00070	15.	GC	G	1
3010EH 25 37231.50004 5	THY2PHLOOED	0140	1.	.00057	5.	GC	G	1
3010EH 25 37231.50004 1	LEPINOC1	0140	2.	2.32010	98.	GC	G	1
3010EH 25 37231.50004 5	HEMILYGAGEO	0140	1.	.00364	16.	GC	G	1
3010EH 25 37231.50004 1	COLEELAINEGPEC	0110	1.	.00020	1.	GC	G	1
3010EH 25 37231.50004 5	COLECARA	0140	1.	.00120	1.	GC	G	1
3010EH 25 37231.50004 5	COLECARA	0110	1.	1.06490	137.	GC	G	1
3010EH 25 37231.50004 7	HYMEFORMCREPUN	0110	1.	.369401631.		GL	G	1
3 10EH 25 37231.50004 7	HYMEFORMSOL	0310	4.	.00610	230.	GC	G	1
3 0EH 25 37231.50004 5	COLEMALA	0140	3.	.04260	24.	GL	G	1
3010EH 25 37231.50004 1	LEPIPYRA	0140	1.	.20010	1.	GL	G	1
3010EH 25 37231.50004 8	COLETENE	0140	96.	.02100	1.	GL	G	1
3010EH 25 37231.50004 0	DIPT	0140	1.	.00310	2.	GL	G	1
3010EH 25 37231.50004 1	COLEELAINEGPEC	0110	7.	.00020	1.	GL	G	1
3010EH 25 37231.50004 2	HOMOCIC1	0140	14.	.429403896.		GL	G	1
3010EH 25 37231.50004 2	HOMOCIC1	0140	3.	.429403896.		GL	G	1

3010EH	25	37231.50004	2	HOMOCICI	0310	1.	.00820	16.	GL	G	1
3010EH	25	37231.50004	2	HOMOCICI	0210	1.	.00070	2.	GL	G	1
3010EH	25	37231.50004	2	HEMICORE	0310	6.	.00040	1.	GL	G	1
3010EH	25	37231.50004	2	HEMICOR4	0140	7.	-0.00000	-0.	GL	G	1
3010EH	25	37231.50004	5	HEMILYGAGED	0140	9.	.00364	16.	GL	G	1
3010EH	25	37231.50004	5	'AKAN	00	3.	1.33800	571.	GL	G	1
3010EH	25	37231.50004	2	HOMOPSED	0100	5.	.00414	170.	GL	G	1
3010EH	25	37231.50004	1	COLECHRY	0110	1.	.01070	11.	GL	G	1
3010EH	25	37231.50004	1	COLECHRY	0310	4.	.04770	265.	GL	G	1
3010EH	25	37231.50004	5	COLECARA	0310	1.	.00820	9.	GL	G	1
3010EH	25	37231.50004	5	COLECARA	0210	1.	.01060	11.	GL	G	1
3010EH	25	37231.50004	5	COLECOCC	0610	1.	.00050	1.	GL	G	1
3010EH	25	37231.50004	2	HEMILYGA	1310	1.	.00400	2.	GL	G	1
3010EH	25	37231.50004	2	HEMILYGA	0410	1.	.00095	2.	GL	G	1
3010EH	25	37231.50004	5	COLECARA	0110	2.	1.06490	137.	GL	G	1
3010EH	25	37231.50004	5	THY2PHLOGED	0110	2.	.00540	95.	GL	G	1
3010EH	25	37231.50004	5	THY2PHLOGED	0140	9.	.00057	5.	GL	G	1
3010EH	25	37231.50004	2	THY2PHLO	0210	2.	.00010	2.	GL	G	1
3010EH	25	37231.50004	2	THY2PHLO	0310	2.	.00015	3.	GL	G	1
3010EH	25	37231.50004	2	THY2THR1FRA	0140	3.	.00007	5.	GL	G	1
3010EH	25	37231.50004	2	THY2THR1BRE	0110	118.	.00070	15.	GL	G	1
3010EH	25	37231.50004	2	THY2THR1	0210	11.	.00047	10.	GL	G	1
3010EH	25	37231.50004	6	HYMECHA3	0110	8.	.00210	37.	GL	G	1
3010EH	25	37231.50004	7	HYMEFORMPHESIT	0110	4.	.01900	96.	GL	G	1
3010EH	25	37231.50004	7	HYMEFORMCREPUN	0110	7.	.369401631.		GL	G	1
3010EH	25	37231.50004	7	HYMEFORMSOL	0310	19.	.00610	230.	GL	G	1
3010EH	25	37231.50004	9	DIPT	0120	1.	.00210	1.	GL	G	1
3010EH	25	37231.50004	9	DIPTBIBI	0110	1.	.00019	1.	GL	G	1
3010EH	25	37231.50005	1	COLEELAINEGPEC	0110	1.	.00020	1.	GA	G	1
3010EH	25	37231.50005	2	HOMOCICI	0140	5.	.429403896.		GA	G	1
3010EH	25	37231.50005	2	THY2PHLO	0210	1.	.00010	2.	GA	G	1
3010EH	25	37231.50005	2	THY2THR1	0210	5.	.00047	10.	GA	G	1
3010EH	25	37231.50005	2	THY2THR1BRE	0110	38.	.00070	15.	GA	G	1
3010EH	25	37231.50005	7	HYMEFORMCREPUN	0110	1.	.369401631.		GA	G	1
3010EH	25	37231.50005	7	HYMEFORMPHESIT	0110	1.	.01900	96.	GA	G	1
3010EH	25	37231.50005	1	COLEELAINEGPEC	0110	4.	.00020	1.	GC	G	1
3010EH	25	37231.50005	8	COLETENE	0710	1.	.00500	1.	GC	G	1
3010EH	25	37231.50005	6	HYMECHA3	0110	3.	.00210	37.	GC	G	1
3010EH	25	37231.50005	5	COLECARA	0110	3.	1.06490	137.	GC	G	1
3010EH	25	37231.50005	5	HEMILYGAGED	0140	2.	.00364	16.	GC	G	1
3010EH	25	37231.50005	2	HOMOCICI	0140	1.	.429403896.		GC	G	1
3010EH	25	37231.50005	2	HOMOCICI	0140	1.	.429403896.		GC	G	1
3010EH	25	37231.50005	8	COLETENE	0140	10.	.02100	1.	GC	G	1
3010EH	25	37231.50005	5	COLECARA	0140	1.	.00120	1.	GC	G	1
3010EH	25	37231.50005	0	COLE	0640	3.	.00020	10.	GC	G	1
3010EH	25	37231.50005	1	LEPIPYRA	0140	1.	.20010	1.	GC	G	1
3010EH	25	37231.50005	2	THY2THR1BRE	0110	57.	.00070	15.	GC	G	1
3010EH	25	37231.50005	2	THY2THR1	0210	3.	.00047	10.	GC	G	1
3010EH	25	37231.50005	7	HYMEFORMSOL	0310	46.	.00610	230.	GC	G	1
3010EH	25	37231.50005	1	LEPINOCI	0140	2.	2.32010	98.	GL	G	1
3010EH	25	37231.50005	1	COLEELAINEGPEC	0110	18.	.00020	1.	GL	G	1
3010EH	25	37231.50005	2	HOMOCICI	0140	2.	.429403896.		GL	G	1
3010EH	25	37231.50005	2	HOMOCICI	0140	27.	.429403896.		GL	G	1
3010EH	25	37231.50005	2	HOMOCICI	1510	1.	.00070	2.	GL	G	1
3010EH	25	37231.50005	5	THY2PHLOGED	0140	2.	.00057	5.	GL	G	1
3010EH	25	37231.50005	2	THY2PHLO	0310	1.	.00015	3.	GL	G	1
3010EH	25	37231.50005	2	THY2PHLO	0440	1.	.00021	5.	GL	G	1
3010EH	25	37231.50005	2	THY2THR1	0210	8.	.00047	10.	GL	G	1
3010EH	25	37231.50005	2	THY2THR1BRE	0110	49.	.00070	15.	GL	G	1
3010EH	25	37231.50005	2	THY2THR1	0310	1.	.00023	10.	GL	G	1