Technical Report No. 230

INSECT STUDIES ON THE ALE RESERVE, 1972[1]

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GRASSLAND BIOME

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TABLE OF CONTENTS

ABSTRACT

Insect ecology studies were initiated this year (1972) as part of the joint IBP-ALE investigation of the shrub-steppe ecosystem in southeastern Washington. Sample regimes were established for aboveground invertebrate, belowground macroarthropod and belowground microarthropod populations.

Peak aboveground densities occurred during June in the ungrazed pasture and in October on the grazed area. Maximum biomass values were reached during October on both treatment areas coincident with emergences of Tenebrionid beetles, *Philolithus densicollis*, and *Stenomorpha puncticollis*.

INTRODUCTION

This year (1972) saw initiation of invertebrate studies on the ALE reserve. These studies are essentially in a natural history stage, concerning the structure, function and interactions of invertebrate consumers within the grassland ecosystem. Specific goals are to (1) ascertain taxonomic composition, (2) trophic structure, (3) seasonal patterns of distribution, (4) population dynamics, and (5) the role of invertebrates within the ecosystem (i.e., role in energy flow and nutrient cycling within the system). Fulfillment of these goals should meet the objectives of the joint IBP-ALE effort. They are, of course, much too ambitious to realize within a one or two year period but are designed to provide a framework for future studies.

STUDY AREA

The ALE site is located in an arid region of southeastern Washington and comprises about 120 square miles of predominantly pristine vegetation. The IBP study plots encompass 36 hectares and are located on the lower slopes of Rattlesnake Mountain at about 1200 feet in elevation.

The climax community of this area has been classified as an *Agropyron/Artemisia* association (Daubenmire 1970). The dominants consist of big sagebrush (*Artemisia tridentata*) and bluebunch wheatgrass (*Agropyron spicatum*). The occurrence of late fall and early winter rains may be considered as a climatic characteristic of the area with precipitation averaging about 7 inches per year. The summers are generally hot and dry with maximum air temperatures reaching 110°F in July. Winter minimum temperatures may reach -20°F during January (Rickard and O'Farrell 1970). A complete description of this area may be found in earlier reports (Rickard and O'Farrell 1970, O'Farrell et al. 1971, and Rickard 1972).

METHODS

Aboveground Sampling

Aboveground samples of the invertebrate fauna were made coincident with collection of aboveground herbage samples during the growing season. Thereafter, invertebrate samples were collected at monthly intervals.

The experimental design employed for aboveground herbage and arthropod sampling is shown in Fig. 1. Two treatments (grazed and ungrazed) were established in 1971 with each treatment divided into two replicates, permitting a measure of variation within treatments. In addition each replicate was partitioned into three strata with two sampling blocks located in each strata. This means a total of six aboveground arthropod samples were collected from each replicate or 12 from each treatment. The actual location of sampling points within each block was determined by selecting coordinates from a random number table.

Samples were collected utilizing quick traps suspended from tripods, thereby permitting collection of fast flying species. Plant material beneath the .5 m^2 trap area was clipped and removed with a D-Vac[R] suction apparatus. All plant material was labeled and bagged separately with subsequent placement in Berlese funnels for invertebrate extraction. Drop traps were not used early in the season—nor is it anticipated that they will be used during winter months—when few flying species are encountered.

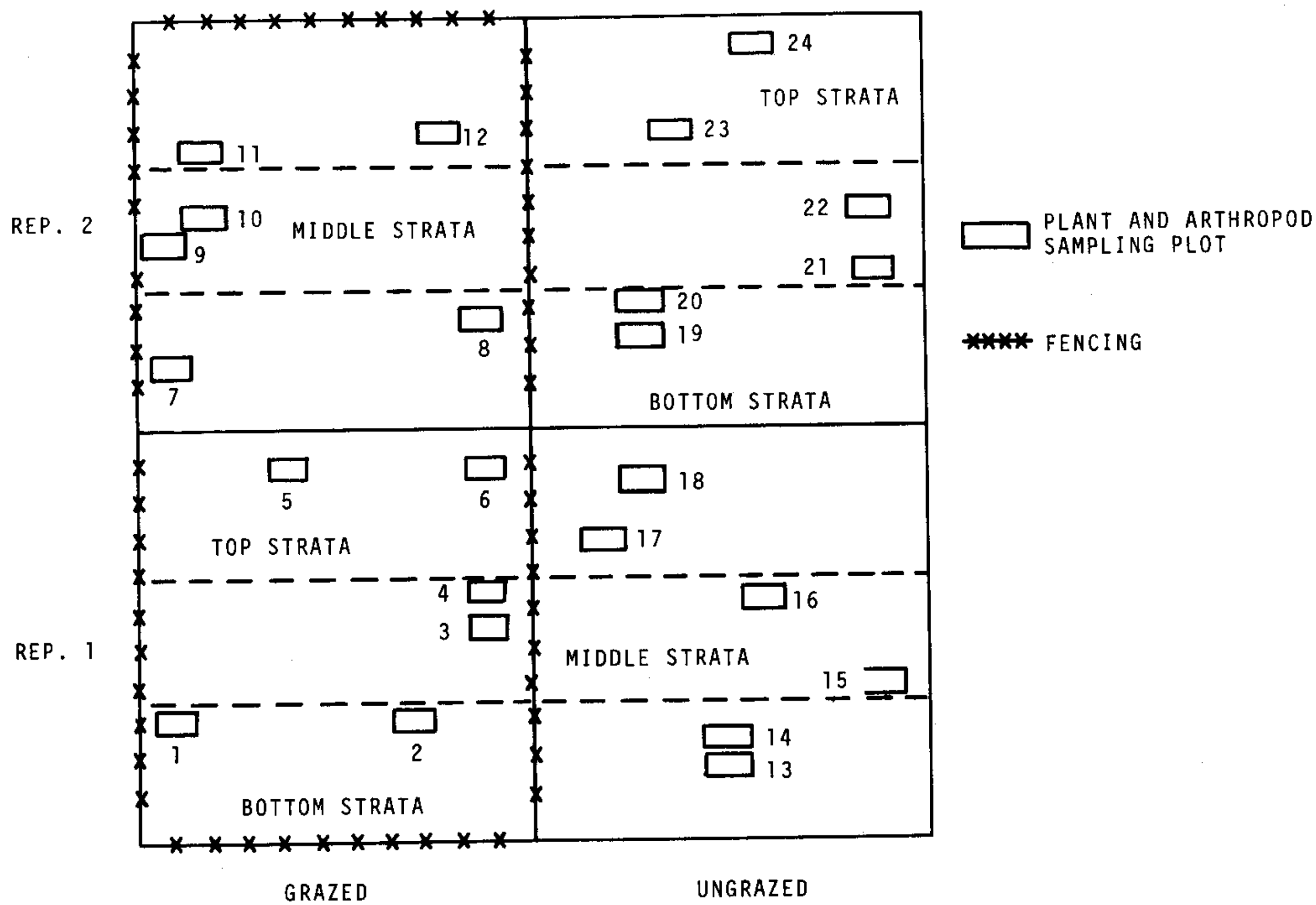

FIGURE 1. LOCATION OF PLANT AND INVERTEBRATE SAMPLING BLOCKS WITHIN GRAZED AND UNGRAZED TREATMENTS

Arthropods collected from the Berlese funnels were sorted in alcohol, using American Optical[R], variable power dissecting microscopes. Specimens were grouped by taxa and posted to invertebrate field data sheets. Representatives of each taxa were retained for subsequent drying and weighing. Identifications were generally made to the family level with duplicates sent to specialists for verification and specific determinations.

Belowground Macroarthropod Sampling

Belowground macroarthropods were sampled in May, June and October. Three 11 cm diameter cores were taken from each replicate—in 10 cm sections—to a depth of 30 cm. Extraction was accomplished by soaking each soil core in a pail of water. After the soil was softened, it was wet sieved through a series of sieves consisting of 4 mm mesh on the top, 2 mm in the middle and 1 mm on the bottom. This arrangement prevents damaging soil organisms with the extreme water pressures necessary to break up the soil cores.

Debris left in the sieves was rinsed into a pail containing a saturated $MgSO_4$ solution; stirred vigorously, allowed to settle and poured through organdy cloth to collect those specimens suspended in the solution.

Belowground Microarthropod Sampling

Progress with the microarathropod sampling scheme has been disappointing. The modified Tullgren extractor was constructed and tested with representative core samples. Results did not appear to meet expectations and inspection of the samples revealed that mites were not being completely extracted. Repetitions were made with simultaneous measurement of differential core temperatures to ascertain reason for poor extraction. Usage of 70% alcohol in the collection vial appeared to result in poor extraction. Plain water, or alcohol (not greater than 30%) resulted in more efficient extraction.

Belowground microarthropods were sampled in October. Six 5 cm diameter cores were taken from each replicate—in 5 cm sections—to a depth of 10 cm. Microarthropods were extracted from the soil cores using the Tullgren extraction as described above. Extracted mites were cleared in lactophenol and mounted on microscope slides in Hoyer's mounting medium for subsequent identification.

RESULTS

Aboveground Invertebrate Samples

Current status. Table 1 shows the current status of the aboveground invertebrate investigation on the ALE site. All samples have been processed through the October sample period. The planned December sample was taken in January due to inclement weather conditions. Analysis of this sample will be included in a later report.

A comparison of aboveground invertebrate density and biomass data in grazed and ungrazed areas is shown in Table 2. The high standard errors associated with the sample means are indicative of the variation that occurs within treatments and poses a serious problem for ecological studies of invertebrate populations.

Tables 3 through 10 contain density and biomass data arranged in taxa and grazing intensity order for each sample period. These data will provide the basis for further analysis and discussion of aboveground invertebrate density and biomass.

Density of aboveground invertebrates. Density measurements provide one parameter for evaluating the "importance" of populations that occur within an ecosystem. The density of aboveground invertebrates is shown in Fig. 2 and is expressed as the number of individual specimens occurring per square meter. An increase in numbers is apparent in both treatments

TABLE 1. Sampling Dates and Processing Status for Aboveground Invertebrate Collections.

DATE	D-Vac Sample Collection	Berlese Extraction	Sorting & Posting To Field Data Sheets	Computer Analysis
March 23	X	X	X	X
April 17	X	X	X	X
May 8	X	X	X	X
May 30	X	X	X	X
June 26	X	X	X	X
July 26	X	X	X	X
Aug 24	X	X	X	X
Oct 24	X	X	X	X
Dec 31	X	X		

TABLE 2 . Density and Biomass of Aboveground Invertebrates in Grazed and Ungrazed Pastures for the 1972 Season.[1]

DATE	Density	Biomass	Density	Biomass
	--------Ungrazed--------		--------Grazed--------	
March 23	26.0 ± 16.5	7.40 ± 2.57	9.5 ± 3.9	14.92 ± 11.58
April 17	11.8 ± 3.0	8.06 ± 4.55	7.8 ± 3.5	6.89 ± 5.39
May 8	51.0 ± 10.2	19.32 ± 5.17	27.8 ± 8.2	14.82 ± 5.61
May 30	34.8 ± 7.2	19.87 ± 8.16	6.3 ± 1.6	4.38 ± 1.88
June 26	88.5 ± 29.2	47.09 ± 13.43	65.0 ± 15.8	54.48 ± 22.94
July 26	54.1 ± 11.8	45.41 ± 19.71	73.5 ± 23.0	54.01 ± 23.54
August 24	29.7 ± 10.7	28.70 ± 14.75	86.8 ± 21.5	18.16 ± 9.53
October 11	41.5 ± 11.1	106.7 ± 26.1	118.7 ± 74.6	70.3 ± 20.7

[1]Density expressed as number/m^2 ± S.E.; Biomass expressed as mg/m^2 dry weight ± S.E.

TABLE 3. Density and Biomass of Aboveground Invertebrates in Grazed and Ungrazed Pastures for March 23, 1972.[1]

ORDER	Density	Biomass	Density	Biomass
	-------Ungrazed---------		--------Grazed---------	
Acarina	1.5 ± 0.9	0.04 ± 0.03	0.2 ± 0.2	0.00 ± 0.00
Araneida	---	---	0.2 ± 0.2	0.67 ± 0.67
Coleoptera	1.3 ± 0.5	2.11 ± 0.89	6.8 ± 3.4	12.59 ± 11.07
Diptera	1.0 ± 0.3	0.71 ± 0.36	---	---
Hemiptera	0.2 ± 0.2	0.10 ± 0.10	0.2 ± 0.2	0.09 ± 0.08
Homoptera	2.2 ± 0.8	0.25 ± 0.19	1.2 ± 1.1	0.13 ± 0.13
Hymenoptera	0.3 ± 0.2	1.02 ± 1.00	0.8 ± 1.4	0.04 ± 0.03
Lepidoptera	4.0 ± 1.4	0.83 ± 1.30	0.1 ± 0.1	1.40 ± 1.40
Thysanoptera	15.5 ± 15.5	2.32 ± 2.32	---	---
TOTAL	26.0 ± 16.5	7.40 ± 2.57	9.5 ± 3.9	14.92 ± 11.58

[1]Density expressed as numbers/m^2 ± S.E.; Biomass expressed as mg/m^2 dry weight ± S.E.

TABLE 4 . Density and Biomass of Aboveground Invertebrates in Grazed and Ungrazed Pastures for April 17, 1972.[1]

ORDER	Density	Biomass	Density	Biomass
	--------Ungrazed--------		--------Grazed---------	
Acarina	0.5 ± 0.5	0.01 ± 0.01	0.1 ± 0.1	0.00 ± 0.00
Araneida	0.2 ± 0.2	0.67 ± 0.67	---	---
Coleoptera	7.3 ± 2.1	6.32 ± 4.37	5.8 ± 3.2	6.70 ± 5.38
Diptera	0.2 ± 0.2	0.30 ± 0.30	---	---
Hemiptera	0.5 ± 0.5	0.25 ± 0.25	---	---
Homoptera	0.3 ± 0.2	0.07 ± 0.07	0.2 ± 0.0	0.05 ± 0.05
Hymenoptera	2.1 ± 1.0	0.33 ± 0.23	1.5 ± 0.5	0.14 ± 0.07
Lepidoptera	0.7 ± 0.5	0.11 ± 0.07	---	---
Thysanura	---	---	0.2 ± 0.2	0.00 ± 0.00
TOTAL	11.8 ± 3.0	8.06 ± 4.55	7.8 ± 3.5	6.89 ± 5.39

[1]Density expressed as number/m^2 ± S.E.; Biomass expressed as mg/m^2 dry weight ± S.E.

TABLE 5. Density and Biomass of Aboveground Invertebrates in Grazed and Ungrazed Pastures for May 8, 1972.[1]

ORDER	Density	Biomass	Density	Biomass
	--------Ungrazed--------		--------Grazed---------	
Acarina	0.5 ± 0.2	0.01 ± 0.01	0.3 ± 0.2	0.01 ± 0.01
Araneida	0.7 ± 0.4	2.17 ± 1.17	---	---
Coleoptera	3.7 ± 1.1	3.88 ± 2.16	1.6 ± 0.5	5.57 ± 4.40
Collembola	26.0 ± 8.0	0.81 ± 0.25	16.5 ± 6.1	0.33 ± 0.15
Diptera	0.5 ± 0.3	0.05 ± 0.04	0.3 ± 0.2	0.73 ± 0.55
Hemiptera	0.2 ± 0.2	0.10 ± 0.10	0.2 ± 0.2	0.07 ± 0.05
Homoptera	5.5 ± 3.2	0.72 ± 0.24	1.2 ± 0.4	0.34 ± 0.12
Hymenoptera	9.3 ± 3.2	2.11 ± 1.61	6.5 ± 2.0	1.14 ± 0.46
Lepidoptera	1.0 ± 0.6	3.90 ± 2.77	0.3 ± 0.2	1.52 ± 1.40
Neuroptera	0.3 ± 0.2	0.60 ± 0.51	---	---
Orthoptera	1.2 ± 0.5	3.91 ± 1.75	0.7 ± 0.4	5.09 ± 4.40
Thysanoptera	0.3 ± 0.2	0.79 ± 0.57	0.2 ± 0.2	0.02 ± 0.02
Thysanura	1.8 ± 1.8	0.27 ± 0.27	---	---
TOTAL	51.0 ± 10.2	19.32 ± 5.17	27.8 ± 8.2	14.82 ± 5.61

[1]Density expressed as numbers/m^2 ± S.E.; Biomass expressed as mg/m^2 dry weight ± S.E.

TABLE 6 . Density and Biomass of Aboveground Invertebrates in Grazed and Ungrazed Pastures for May 30, 1972.[1]

ORDER	Density	Biomass	Density	Biomass
	--------Ungrazed--------		--------Grazed---------	
Acarina	1.0 ± 0.5	0.02 ± 0.01	1.5 ± 0.7	0.04 ± 0.02
Araneida	0.2 ± 0.2	1.33 ± 0.84	0.7 ± 0.3	2.03 ± 1.07
Coleoptera	0.3 ± 0.2	0.40 ± 0.28	0.3 ± 0.2	0.08 ± 0.08
Collembola	0.2 ± 0.2	0.01 ± 0.01	---	---
Diptera	0.2 ± 0.2	0.33 ± 0.33	---	---
Hemiptera	1.5 ± 1.0	0.80 ± 0.53	---	---
Homoptera	25.3 ± 6.0	0.30 ± 0.14	2.8 ± 1.1	0.02 ± 0.01
Hymenoptera	0.2 ± 0.2	0.00 ± 0.00	0.5 ± 0.4	0.80 ± 0.80
Lepidoptera	---	---	0.3 ± 0.2	1.40 ± 1.40
Orthoptera	1.0 ± 0.4	16.45 ± 7.53	---	---
Thysanura	0.2 ± 0.2	0.00 ± 0.00	---	---
Thysanoptera	4.7 ± 3.4	0.23 ± 0.21	0.2 ± 0.2	0.01 ± 0.01
TOTAL	34.8 ± 7.2	19.87 ± 8.16	6.3 ± 1.6	4.38 ± 1.88

[1]Density expressed as numbers/m^2 ± S.E.; Biomass expressed as mg/m^2 dry weight ± S.E.

TABLE 7. Density and Biomass of Aboveground Invertebrates in Grazed and Ungrazed Pastures for June 26, 1972.[1]

ORDER	Density	Biomass	Density	Biomass
	--------Ungrazed--------		--------Grazed---------	
Acarina	14.0 ± 9.4	0.24 ± 0.14	11.5 ± 6.7	0.31 ± 0.20
Araneida	0.9 ± 0.4	0.77 ± 0.65	1.8 ± 0.6	1.72 ± 0.85
Coleoptera	8.0 ± 3.8	29.94 ± 11.29	3.5 ± 1.7	32.35 ± 18.56
Collembola	0.3 ± 0.2	0.01 ± 0.01	0.5 ± 0.4	0.01 ± 0.01
Diptera	3.5 ± 1.6	6.67 ± 4.69	3.6 ± 1.3	1.07 ± 0.48
Hemiptera	1.7 ± 0.8	1.34 ± 0.65	2.7 ± 0.8	1.67 ± 0.59
Homoptera	41.3 ± 16.5	1.09 ± 0.25	20.2 ± 6.1	0.60 ± 0.19
Hymenoptera	14.8 ± 9.0	1.89 ± 1.43	16.8 ± 7.4	2.66 ± 1.49
Lepidoptera	0.7 ± 0.3	1.57 ± 1.38	1.2 ± 0.5	1.15 ± 0.94
Neuroptera	---	---	0.3 ± 0.2	0.45 ± 0.36
Orthoptera	0.5 ± 0.2	3.55 ± 2.24	1.2 ± 0.9	12.41 ± 9.15
Psocoptera	0.5 ± 0.5	0.00 ± 0.00	0.3 ± 0.2	0.07 ± 0.04
Thysanura	---	---	0.2 ± 0.2	0.00 ± 0.00
Thysanoptera	2.3 ± 1.1	0.02 ± 0.01	1.0 ± 0.4	0.01 ± 0.00
Trichoptera	---	---	0.2 ± 0.2	0.00 ± 0.00
TOTAL	88.5 ± 29.2	47.09 ± 13.43	65.0 ± 15.8	54.48 ± 22.94

[1]Density expressed as numbers/m^2 ± S.E.; Biomass expressed as mg/m^2 dry weight ± S.E.

TABLE 8 . Density and Biomass of Aboveground Invertebrates in Grazed and Ungrazed Pastures for July 26, 1972.[1]

ORDER	Density	Biomass	Density	Biomass
	--------Ungrazed--------		--------Grazed---------	
Acarina	12.2 ± 3.2	0.33 ± 0.09	19.1 ± 9.3	0.57 ± 0.28
Araneida	1.5 ± 0.7	5.56 ± 3.83	1.3 ± 0.5	4.36 ± 1.79
Coleoptera	1.0 ± 0.5	12.27 ± 8.51	3.0 ± 1.6	14.91 ± 9.55
Collembola	---	---	0.2 ± 0.2	0.00 ± 0.00
Diptera	0.5 ± 0.3	0.40 ± 0.35	0.7 ± 0.3	0.46 ± 0.35
Hemiptera	---	----	0.2 ± 0.2	0.10 ± 0.10
Homoptera	33.8 ± 10.1	0.56 ± 0.23	42.2 ± 19.4	0.40 ± 0.18
Hymenoptera	1.0 ± 0.7	7.18 ± 5.61	0.5 ± 0.5	0.02 ± 0.02
Lepidoptera	2.3 ± 0.9	0.27 ± 0.18	0.3 ± 0.2	0.07 ± 0.05
Neuroptera	---	---	0.2 ± 0.2	0.11 ± 0.11
Orthoptera	0.8 ± 0.5	18.83 ± 11.99	1.2 ± 0.5	32.99 ± 13.80
Psocoptera	---	---	1.8 ± 1.8	0.00 ± 0.00
Thysanoptera	1.0 ± 0.7	0.01 ± 0.01	2.8 ± 1.8	0.02 ± 0.01
TOTAL	54.1 ± 11.8	45.41 ± 19.71	73.5 ± 23.0	54.01 ± 23.54

[1]Density expressed as numbers/m^2 ± S.E.; Biomass expressed as mg/m^2 dry weight ± S.E.

TABLE 9 . Density and Biomass of Aboveground Invertebrates in Grazed and Ungrazed Pastures for August 24, 1972.[1]

ORDER	Density	Biomass	Density	Biomass
	--------Ungrazed-------		--------Grazed---------	
Acarina	9.3 ± 4.4	0.13 ± 0.07	26.8 ± 8.4	0.62 ± 0.20
Araneida	0.2 ± 0.2	0.03 ± 0.03	0.5 ± 0.5	4.55 ± 4.55
Coleoptera	0.8 ± 0.6	1.58 ± 1.15	3.0 ± 1.5	6.77 ± 3.69
Diptera	1.0 ± 0.4	12.55 ± 6.69	---	---
Hemiptera	0.8 ± 0.5	0.34 ± 0.18	4.1 ± 3.3	2.49 ± 1.97
Homoptera	16.5 ± 6.9	0.35 ± 0.16	50.5 ± 15.1	0.40 ± 0.11
Hymenoptera	---	---	0.5 ± 0.4	1.44 + 1.43
Lepidoptera	0.5 ± 0.3	0.24 ± 0.24	---	---
Neuroptera	---	---	0.2 ± 0.2	0.11 ± 0.11
Orthoptera	0.2 ± 0.2	12.91 ± 12.91	0.2 ± 0.2	1.77 ± 1.77
Thysanura	0.2 ± 0.2	0.57 ± 0.57	---	---
Thysanoptera	---	---	0.8 ± 0.6	0.01 ± 0.00
Trichoptera	0.2 ± 0.2	0.00 ± 0.00	0.2 ± 0.2	0.00 ± 0.00
TOTAL	29.7 ± 10.7	28.70 ± 14.75	86.8 ± 21.5	18.16 ± 9.53

[1]Density expressed as numbers/m^2 ± S.E.; Biomass expressed as mg/m^2 dry weight ± S.E.

TABLE 10. Density and Biomass of Aboveground Invertebrates in Grazed and Ungrazed Pastures for October 11, 1972.[1]

ORDER	Density	Biomass	Density	Biomass
	--------Ungrazed--------		--------Grazed--------	
Acarina	9.6 ± 2.2	0.15 ± 0.05	13.9 ± 4.2	0.27 ± 0.09
Araneida	2.0 ± 0.7	1.85 ± 1.58	0.8 ± 0.5	0.13 ± 0.08
Coleoptera	6.8 ± 1.0	96.61 ± 25.90	6.5 ± 1.5	49.99 ± 17.95
Collembola	0.2 ± 0.2	0.01 ± 0.01	0.7 ± 0.4	0.01 ± 0.01
Diptera	1.5 ± 0.6	3.94 ± 1.60	33.4 ± 31.8	5.83 ± 3.50
Hemiptera	0.7 ± 0.3	0.39 ± 0.24	2.8 ± 1.1	3.42 ± 1.56
Homoptera	19.7 ± 10.4	3.66 ± 3.05	38.5 ± 21.8	2.24 ± 1.33
Hymenoptera	0.3 ± 0.3	0.07 ± 0.07	9.8 ± 7.5	0.71 ± 0.62
Lepidoptera	0.2 ± 0.2	0.00 ± 0.00	3.3 ± 2.4	7.03 ± 6.98
Thysanura	0.3 ± 0.2	0.00 ± 0.00	0.2 ± 0.2	0.00 ± 0.00
Thysanoptera	0.2 ± 0.2	0.01 ± 0.01	8.8 ± 7.6	0.64 ± 0.51
TOTAL	41.5 ± 11.1	106.69 ± 26.10	118.7 ± 74.6	70.27 ± 20.66

[1]Density expressed as number/m^2 ± S.E.; Biomass expressed as mg/m^2 dry weight ± S.E.

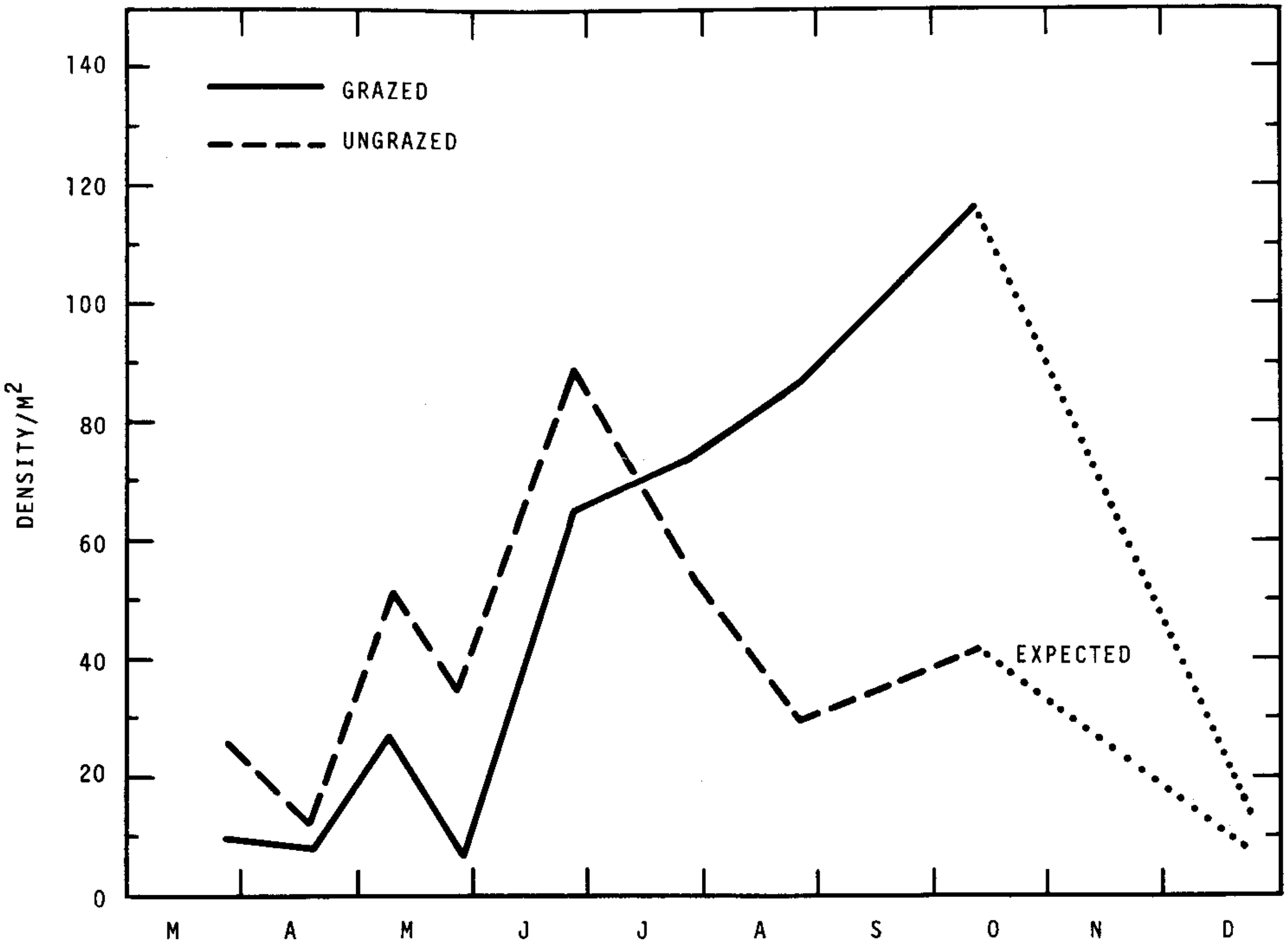

FIGURE 2. DENSITY OF ABOVEGROUND INVERTEBRATES IN GRAZED AND UNGRAZED TREATMENTS

through June. Subsequent sample periods, however, reveal a decline in density on the ungrazed pasture while density values on the grazed pasture continued to increase. This may reveal a numerical response to differential grazing pressures but additional data gathering efforts during subsequent seasons will be required before an interpretation can be made.

Peak density values on the ungrazed pasture occurred in June with 88.5 ± 29.2 individuals per square meter. Peak density on the grazed pasture occurred in October with 118.7 ± 74.6 specimens per square meter.

The seasonal distribution of important invertebrate orders are shown for ungrazed (Fig. 3) and grazed treatment conditions (Fig. 4). Homoptera occurred in relatively low numbers—in both treatments—early in the season and became more numerous as the season progressed. The most abundant members of this group belong to the superfamily Coccoidea. A few leafhoppers (Cicadellidae), Aphids (Aphididae) and plant hoppers (Fulgoridae) also occurred intermittently in the collections. The coccoidea were primarily comprised of mealybugs (Pseudococcidae) most of which were taken in association with bluebunch wheatgrass (Agropyron spicatum) indicating that this grass may be a favored food source.

The Acarina (mites) make a significant contribution to invertebrate numbers during the months June through August. The prostigmata mites belonging to families Erythraeidae and Tenuipalpidae appear to occur most frequently. The Erythraeids are mostly parasites and predators of small arthropods while the false spider mites (Tenuipalpidae) are phytophagous, occurring in the leaf sheaths of grasses and frequently becoming pests (Krantz, 1971).

Hymenoptera were most numerous in June on both grazed and ungrazed treatments. Species were collected representing seven different families.

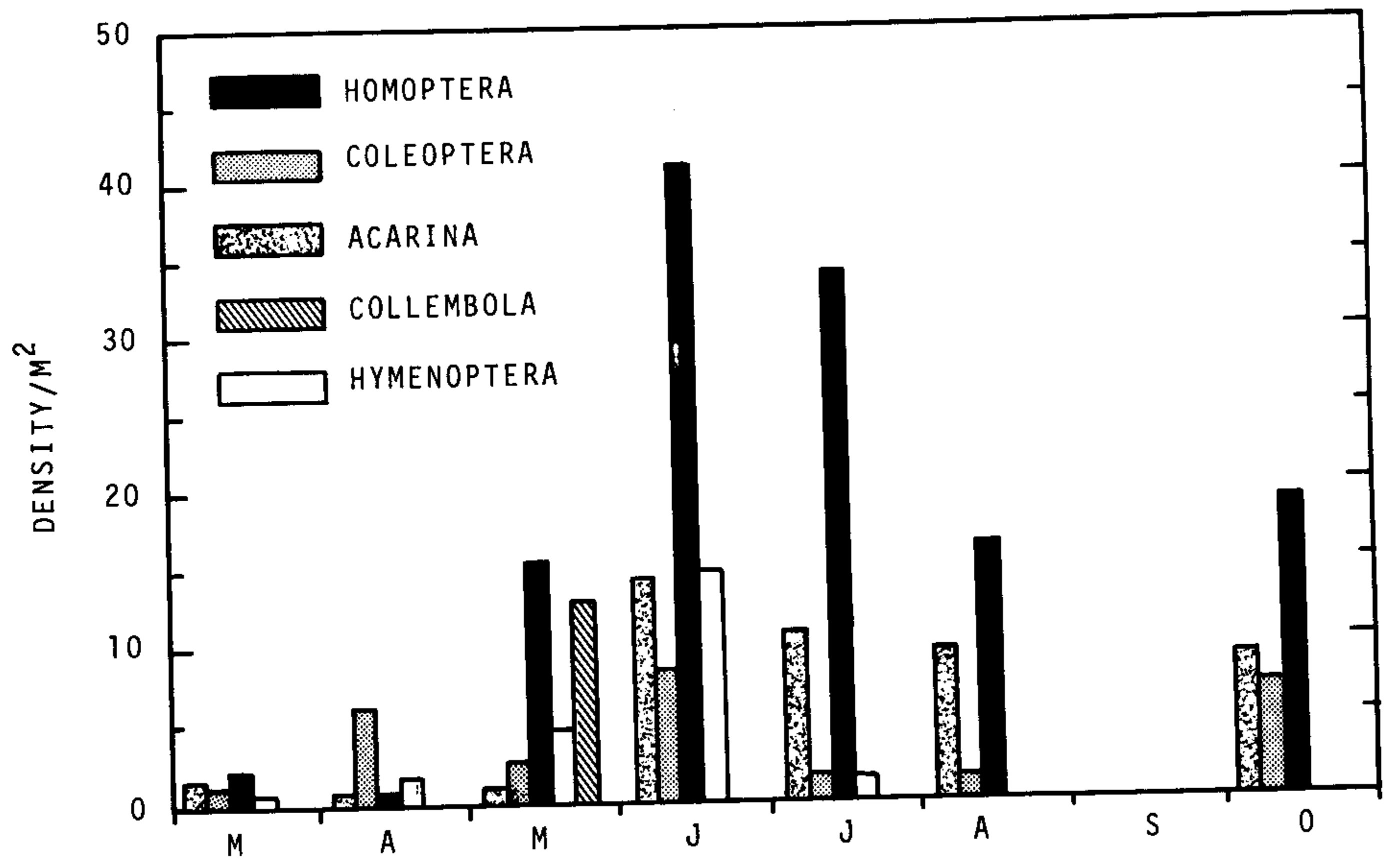

FIGURE 3. DENSITY OF IMPORTANT INVERTEBRATE TAXA IN THE UNGRAZED TREATMENT

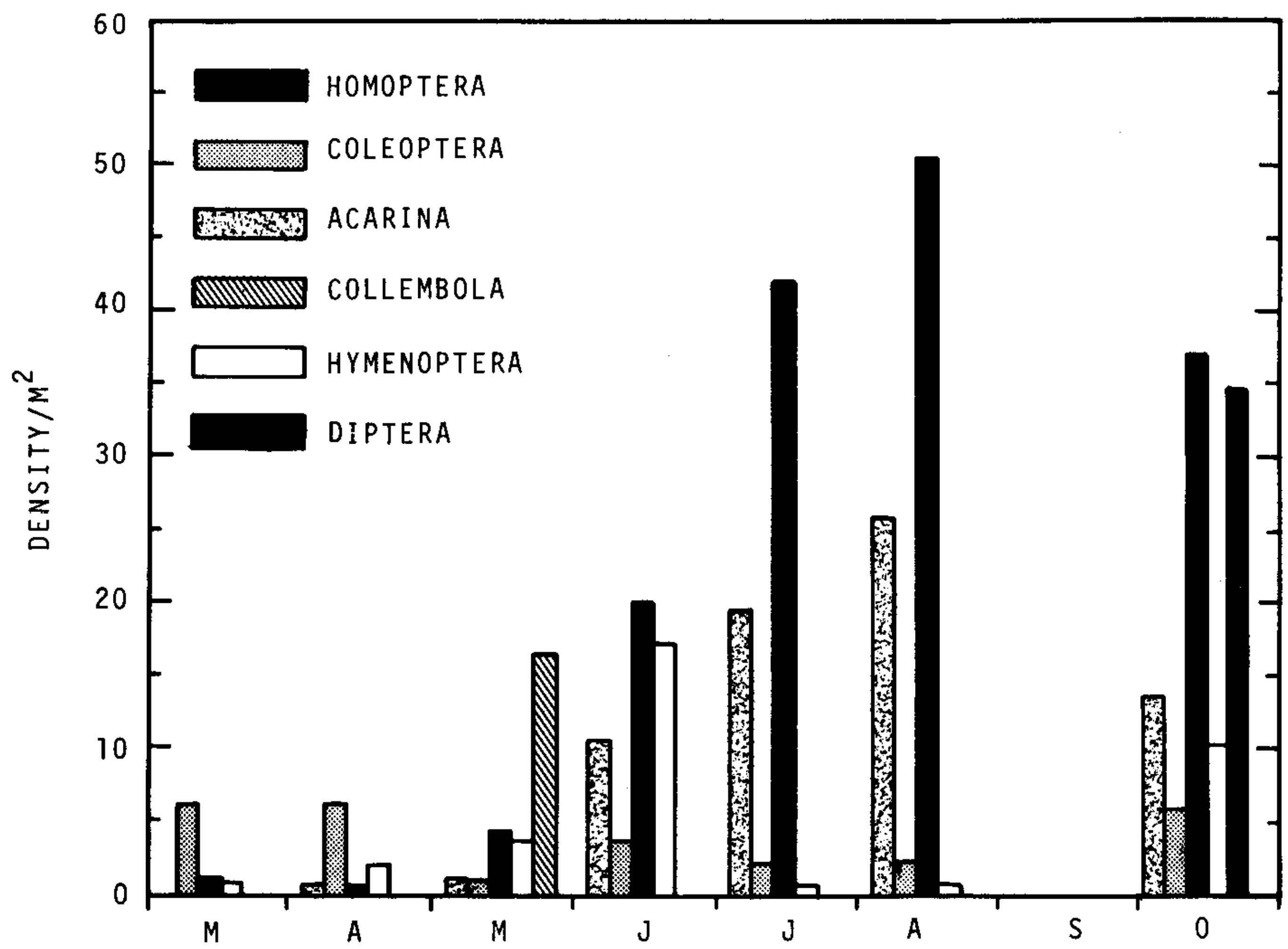

FIGURE 4. DENSITY OF IMPORTANT INVERTEBRATE TAXA IN THE GRAZED TREATMENT

The ants (Formicidae) completely dominate hymenoptera density values in both grazing treatments. The tiny ant Solenopsis molesta was the most numerous species encountered, occurring in nearly all samples collected.

Collembola populations peaked in early May on both treatments and were collected infrequently during other sample periods. They appear to be associated with the crowns of grasses and in the litter layer that accumulates beneath sagebrush (Artemisia tridentata) plants. The most abundant collembola species belong to the family Sminthuridae, sometimes called the globular springtails.

Biomass of aboveground invertebrates. Biomass is perhaps of more fundamental ecological interest than density since it provides a better comparison of standing crop relationships between invertebrate consumer and other consumer populations.

The biomass of aboveground invertebrates is represented graphically in Fig. 5. This shows biomass values to be relatively low in early spring and to increase to a peak during June and July. Biomass values then decrease through August, followed by another peak during the month of October. The peak biomass values for October were 106.7 $\pm$ 26.1 mg/m^2 for the ungrazed area and 70.3 $\pm$ 20.7 mg/m^2 for the grazed area (Table 2).

The biomass of some important invertebrate orders are shown for both ungrazed (Fig. 6) and grazed treatments (Fig. 7). The Coleoptera and Orthoptera appear to be significant biomass contributors throughout the season. A peak in Coleoptera biomass during June was primarily due to the occurrence of antlike flower beetles (Anthicidae) and darkling beetles (Tenebrionidae). The high beetle biomass during October occurs coincident with emergences of the Tenebrionid beetles Philolithus densicollis and Stenomorpha puncticollis. These beetles frequently occur in great numbers on the ALE reserve (Rickard, 1965). Very few grasshopper specimens were

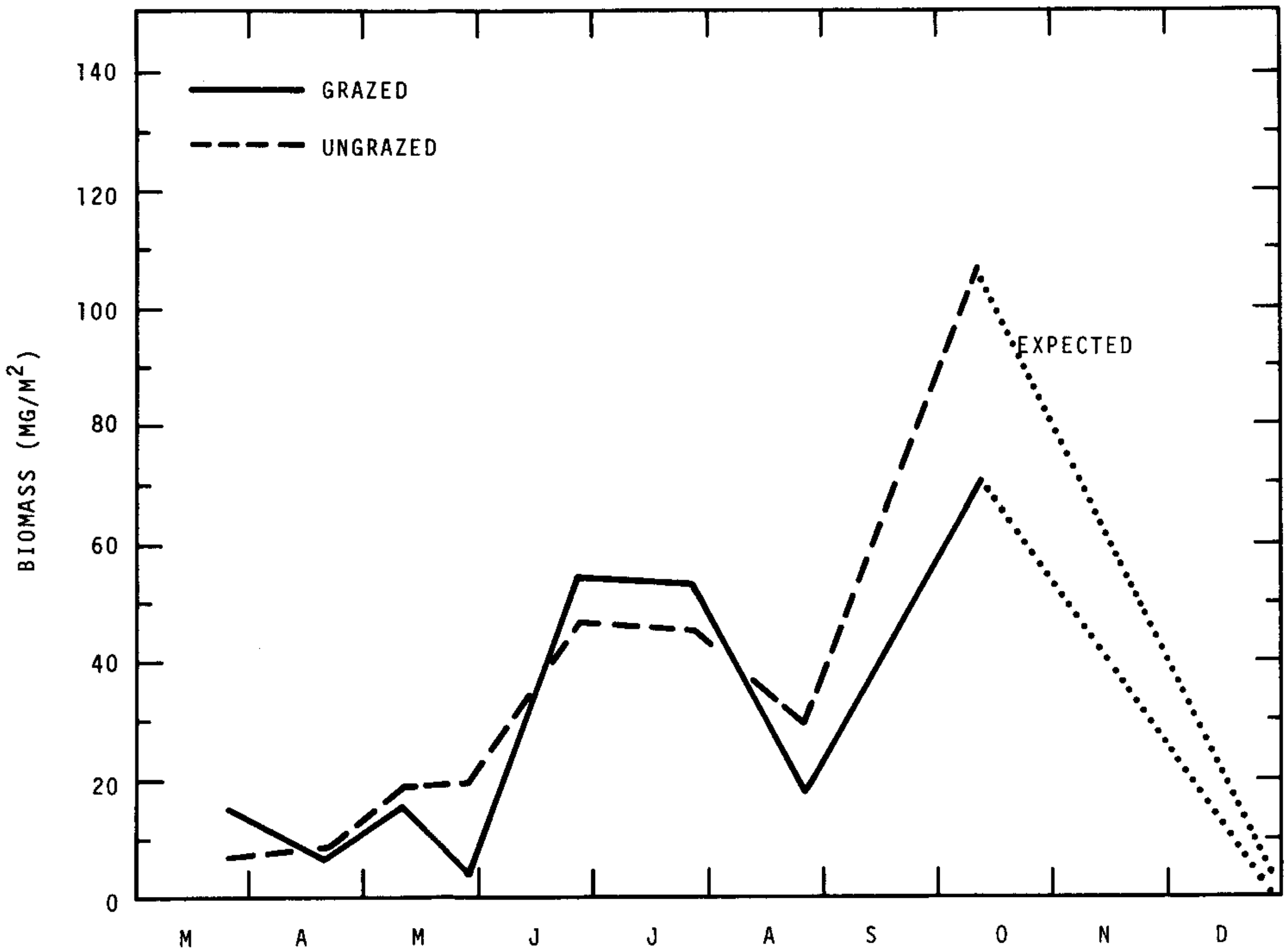

FIGURE 5. BIOMASS OF ABOVEGROUND INVERTEBRATES IN GRAZED AND UNGRAZED TREATMENTS

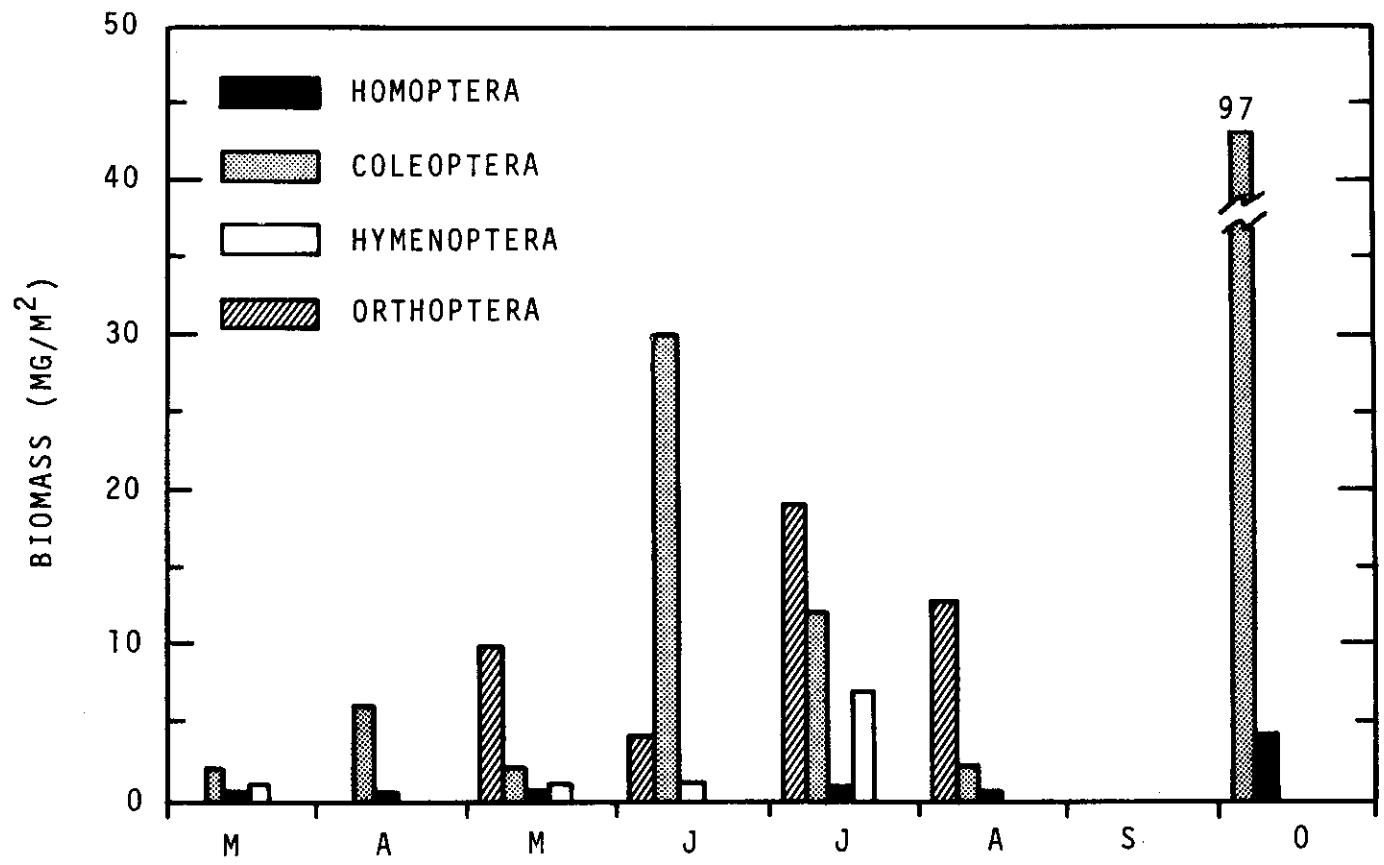

FIGURE 6. BIOMASS OF IMPORTANT INVERTEBRATE TAXA IN THE UNGRAZED TREATMENT

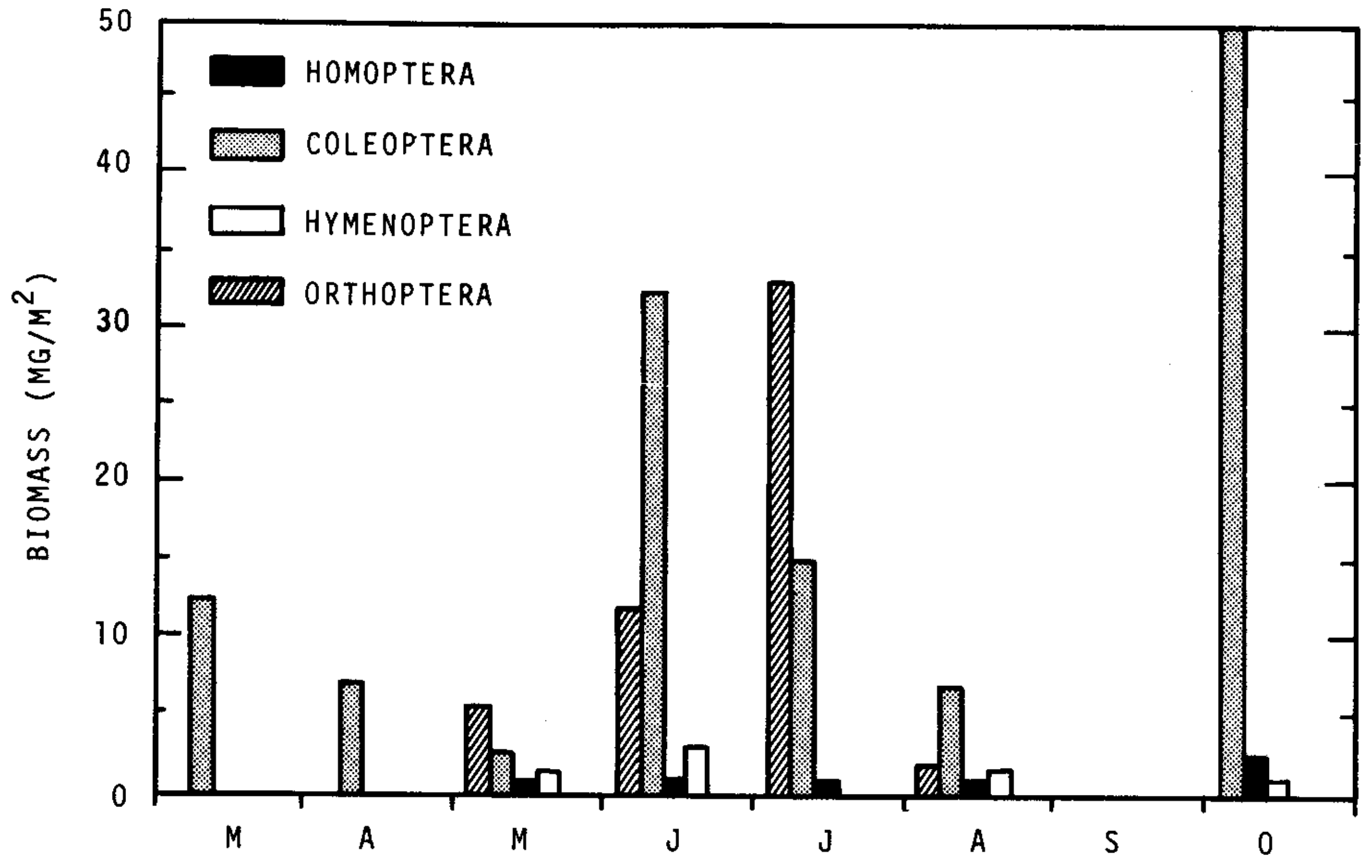

FIGURE 7. BIOMASS OF IMPORTANT INVERTEBRATE TAXA IN THE GRAZED TREATMENT

collected on the study site but their large size and consequent weight necessitates their being classified as important biomass contributors during June and July on the grazed treatments (Fig. 7) and during July and August on the ungrazed treatments (Fig. 6). Homoptera and hymenoptera never contributed significantly to total biomass values during the season.

Belowground Macroarthropod Samples

Belowground macroarthropods were sampled during three different periods in 1972. Specimens were extracted, identified and posted to key punch advice forms. These data have not been computer processed, thereby precluding a complete analysis at this time. The information has been summarized and is presented in tabular form for comparative purposes (see Appendix II). More specimens were collected in July than in other sample periods. It was also observed that specimens occurred at greater depths during July, possibly indicating a response away from the hot, dry soil surface.

Four taxa accounted for 76 percent of the total number of specimens collected. These were the Anthicidae (20%), Curculionidae (22%), Tenebrionidae (17%) and Formicidae (17%). A more refined analysis will be made upon completion of computer processing.

Belowground Microarthropod Samples

Samples were taken during October. The microarthropods were extracted, cleared and mounted on microscope slides, and are now being identified and sent to specialist for verification.

DISCUSSION

The grasslands of the world comprise some of the most productive agricultural areas known to man. A large portion of these areas has been stripped of their native vegetation and converted to intensive agricultural practices. Other areas unsuitable for crops have been retained in a more-or-less natural condition and utilized as grazing lands.

One aspect of this study addresses the question of what happens to native arthropod populations when domesticated herbivores are introduced into an arid grassland ecosystem. The hypothesis is that there will be no change in numbers or biomass of arthropod populations as a result of herbivore introduction (with expectation of rejection at a preselected level of statistical significance). This hypothesis may be tested by sampling available arthropod niches in grazed and ungrazed areas. Previous studies have shown that several years of data measurement are necessary in an arid environment, before normal variations in climatic conditions are encountered and resulting impact on natural populations evaluated. An attempt to analyze impact of grazing on invertebrate populations would, therefore, be premature at this time. It is anticipated that a three year data base will be adequate.

Maximum density values occurred during the month of June on the ungrazed pasture and in July on the grazed pasture. Homoptera (Pseudococcidae), Acarina, Hymenoptera, Collembola and Coleoptera were all significant contributors to peak density values during the 1972 season.

Peak biomass occurred in October on both grazed and ungrazed treatments and was primarily due to emergence of the fall beetles *Philolithus densicollis* and *Stenomorpha puncticollis*. It is expected that biomass values will decline to fairly low values (5 to 10 mg/m^2) as this population declines with onset of consistently freezing temperatures. This expectation will be tested by extending the sampling regime into the winter months. Coleoptera, Orthoptera and to some extent Hymenoptera would have to be considered as important biomass contributors during the 1971 sampling season.

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APPENDIX I

A preliminary list of invertebrates collected on the ALE reserve during 1972.[1]

ACARINA

Cryptostigmata

Camisiidae

Platynothrus

Gymnodamaeidae

Lichnodamaeidae

Oribatulidae

Oripoda sp.

Lucoppia sp.

Prostigmata

Anystidae

Bdellidae

Caligonellidae

Molothrognathus sp.

Erythraeidae

Tenuipalpidae

Brevipalpus sp.

---

[1]Only those groups identified or verified by a specialist have been included. Many important invertebrate families are waiting specific determinations and have been excluded from this list.

COLEOPTERA

Carabidae

Agonum jejunum LeC.

Amara sp.

Calosoma luxatum Say

Harpalus sp.

Chrysomelidae

Disonycha alternata Illiger

Glyptoscelis artemisiae Blake

Monoxia grisea Blake

Pachybrachis abdominalis Say

Phyllotreta sp.

Cicindelidae

Cicindela oregona LeC.

Cicindela purpurea Ol.

Cleridae

Enoclerus eximius Mann.

Coccinellidae

Coccinella novemnotata Herbst

Hippodamia convergens Guerin

Hyperaspis elliptica Casey

Hyperaspis fastidiosa Casey

Hyperaspis quadrivittata LeC.

Hyperaspidius vittigera LeC.

Scymnus intrusoides Hatch

Scymnus (Pullus) sp.

COLEOPTERA (Cont.)

Curculionidae

Anthonomus sp.

Baris sp.

Cercopedius artemisiae Pierce

Cleonus trivittatus Say

Dyslobus alternatus Horn

Ophryastes cinerascens Pierce

Sitona californicus Fahr.

Sitona cylindricollis Fahr.

Stammoderes lanei Van Dyke

Tychius lineelus LeC.

Meloidae

Epicauta oregona Horn

Epicauta normalis Werner

Epicauta puncticollis Mann.

Lytta vulnerata cooperi LeC.

Zonitis vermiculatis schaeffer

Mordellidae

Mordellistena aspersa Melsh.

Scarabaeidae

Aphodius fossor L.

Aphodius haemorrhoidalis L.

Aphodius hirsutus Brown

Aphodius washtucna Robinson

Coenonycha sp.

Cremastocheilus pugetanus Csy.

COLEOPTERA (Cont.)

Scarabaeidae (Cont.)

Diplotaxis sp.

Glaresis clypeata Van Dyke

Onthophagus nuchicornis L.

Paracotalpa granicollis LeC.

Silphidae

Necrophorus marginatus F.

Tenebrionidae

Blapstinus discolor Horn

Blapstinus substriatus Champion

Coniontis lanei Boddy

Coniontis ovalis Ulke

Coniontis setosa Casey

Conisattus nelsoni Boddy

Eleodes granulata LeC.

Eleodes hispilabris imitabilis Blais

Eleodes humeralis LeC.

Eleodes nigrina difformis Blais

Eleodes novoverrucula Boddy

Eleodes obscura Say

Eusattus muricatus LeC.

Oxygonodera hispidula Horn

Philolithus densicollis Horn

Stenomorpha puncticollis LeC.

COLLEMBOLA

Isotomidae

Isotoma viridis Bourlet

Sminthuridae

Bourletiella hortensis Fitch

DIPTERA

Acroceridae

Eulonchus n. sp.

Asilidae

Ablautus colei Wilcox

Cyrtopogon sp.

Cyrtopogon ablautoides Melander

Dioctria sp.

Efferia sp.

Efferia albibarbis Macquart

Efferia benedicti Bromley

Lasiopogon chaetosus Cole & Wilcox

Lestomyia n. sp.

Nicocles utahensis Banks

Stenopogon inquinatus Loew

Stenopogon martini Bromley

Tolmerus sp.

Bombyliidae

Conophorus obesulus Loew

Villa sp. 1

Villa sp. 2

DIPTERA (Cont.)

Calliphoridae

Calliphora vicina R.-D.

Phormia regina Meigen

Ceratopogonidae

Culicoides crepuscularis Mall.

Chironomidae

Sp. of *Orthocladiinae* - Genus sp.?

Ephydridae

Hydrellia griseola Fallen

Muscidae

Fannia sp.

Musca domestica L.

Schoenomyza dorsalis Loew

Mycetophilidae

Docosia sp.

Nemestrinidae

Neorhyncocephalus sackenii Williston

Otitidae

Ceroxys latiusculus Loew

Physiphora demandata Fallen

Sarcophagidae

Helicobia rapax Walker

Sarcophaga sp.

Scenopinidae

Brevitrichia sp.

DIPTERA (Cont.)

Sciaridae

Bradysia sp.

Syrphidae

Eristalis tenax L.

Metasyrphus meadii Jones

Scaeva pyrastri L.

Syrphus opinator Osten Sacken

Syrphus torrus Osten Sacken

Tachinidae

Alophorella sp.

Catagoniopsis sp.

Euphorocera sp.

Exorista mella Wlk.

Gonia frontosa Say.

Ostracophyto aristalis Tns.

Peleteria sp.

Periscepsia cinerosa Coq.

Procatharosia calva Coq.

Stomatomyia parvipalpis Wulp

Tephritidae

Oxyna utahensis Quisenberry

Therevidae

Psilocephala baccata Coquillett

Thereva sp.

Tipulidae

Tipula (Lunatipula) dorsimacula Walker

DIPTERA (Cont.)

Trixoscelididae

Trixoscelis sp.

HYMENOPTERA

Argidae

Schizocerella pilicornis Holmgren

Braconidae

Agathis sp.

Apanteles sp.

Bracon gelechiae Ashm.

Cremnops californicus Morr.

Orgilus strigosus Mues.

Bethylidae

Epyris cochise Evans

Chrysididae

Ceratochrysis sp.

Chrysis sp.

Chrysura sp.

Encyrtidae

Copidosoma sp.

Eulophidae

Euderus sp.

Tetrastichus sp.

Tetrastichus coerulescens Ashmead

Eumenidae

Pterocheilus decorus Cresson

Pterocheilus provancheri Huard

Stenodynerus sp.

HYMENOPTERA (Cont.)

Eurytomidae

Harmolita sp.

Formicidae

Camponotus semitestaceus Emery

Camponotus vicinus Mayr

Formica sp.

Formica manni Wheeler

Formica neogagates Emery

Formica subpolita camponoticeps Wheeler

Lasius crypticus Wilson

Monomorium pharaonis L.

Myrmecocystus sp.

Pheidole sp.

Pheidole californica oregonica Emery

Pheidole creightoni Gregg

Pogonomyrmex owyheei Cole

Solenopsis molesta validiuscula Emery

Tapinoma sessile Say

Ichneumonidae

Anomalon sp.

Campoletis sp.

Diphyus sp.

Erigorgus sp.

Euryproctus sp.

Lissonota sp.

Meringopus dirus Prov.

Ophion sp. #1

HYMENOPTERA (Cont.)

Ichneumonidae (Cont.)

Ophion sp. #2

Ophion sp. #3

Pterocormus sp.

Mutillidae

Odontophotopsis sp.

Sphaeropthalma (Photopsis) sp.

Pompilidae

Aporinellus sp.

Pompilus (Ammosphex) sp.

Priocnemis oregona Banks

Tachypompilus torridus unicolor Banks

Sphecidae

Ammophila aberti Haldeman

Ammophila karenae Menke

Ammophila mcclayi Menke

Podalonia luctuosa Smith?

Podalonia mexicana Saussure

Podalonia valida Cresson

Prionyx atratus Lepeletier

Sphecius grandis Say

Stictiella emarginata Cresson

Stizoides unicinctus Say

Tachysphex sp.

Tachytes californicus Bohart

Tachytes distinctus Smith

HYMENOPTERA (Cont.)

Tiphiidae

Brachycistis sp.

Vespidae

Polistes fuscatus Fabricius

Vespula pensylvanica Saussure

ISOPTERA

Rhinotermitidae

Reticulitermes hesperus Banks

LEPIDOPTERA

Arctiidae

Apantesis sp.

Gelechiidae

Aroga rigidae Clarke

Noctuidae

Euxoa sp. #1

Euxoa sp. #2

Feltia ducens Walker

Feltia herilis Grote

Feltia subgothica Haworth

Lacinipolia pensilis Grote

Nephelodes emmedonia Cramer

Rhynchagrotis sp.

Spaelotis clandestina Harris

Ufeus hulsti J. B. Smith

LEPIDOPTERA (Cont.)

Phaloniidae

Genus sp.

Saturniidae

Hemileuca sp.

Scythridae

Scythris spp.

NEUROPTERA

Chrysopidae

Chrysopa coloradensis Bks.

Chrysopa excepta Bks.

Eremochrysa tibialis Bks.

Raphidiidae

Agulla bicolor Alb.

ORTHOPTERA

Acrididae

Ageneotettix deorum Thomas

Amphitornus coloradus Thomas

Arphia pseudonietana Thomas

Aulocara elliotti Thomas

Circotettix undulatus Thomas

Conozoa wallula Scudder

Cratypedes neglectus Thomas

Dissosteira carolina L.

Melanoplus sp.

ORTHOPTERA (Cont.)

Acrididae (Cont.)

Melanoplus bivittatus Say

Melanoplus cinereus cinereus Scudder

Melanoplus sanguinipes sanguinipes F.

Oedaleonatus sp.

Oedaleonotus enigma Scudd.

Paropomala pallida Bruner

Psoloessa delicatula buckelli Rehn

Trimerotropis caeruleipennis Bruner

Trimerotropis fontana Thomas

Trimerotropis gracilis sordida Walker

Trimerotropis pallidipennis pallidipennis Burmeister

Trimerotropis sparsa Thomas

Xanthippus lateritius Sauss.

Gryllacrididae

Ceuthophilus vicinus Hubbell

Gryllidae

Gryllus sp.

Oecanthus argentinus Sauss.

Mantidae

Litaneutria minor Scudd.

Tettigoniidae

Scudderia furcata Brunner

Steiroxys sp.

TRICHOPTERA

Hydroptilidae

Hydroptila xera Ross

APPENDIX II

Number of Belowground Macroarthropods[1]

Groups and Families	May	June	July	Total
Coleoptera				
Anthicidae	1	3	5	9
Curculionidae		3	7	10
Elateridae		2	1	3
Melyridae			2	2
Scarabaeidae		2		2
Tenebrionidae	2	3	3	8
Diptera			1	1
Hymenoptera				
Formicidae	5		3	8
Mecoptera				
Boreidae	—	—	3	3
TOTAL	8	13	25	46

[1]Processing has not been completed for these data. This table shows the results from 12 soil samples (11 cm in diameter by 30 cm deep) taken during three sample periods.

APPENDIX III

FIELD DATA

Aboveground Invertebrate Data

Aboveground invertebrate data collected at the ALE Site were recorded on Form NREL-30. These data are stored as Grassland Biome Data set A2U30E1. A sample data form and an example of the data are attached.

IBP

GRASSLAND BIOME

U.S. INTERNATIONAL BIOLOGICAL PROGRAM

FIELD DATA SHEET - INVERTEBRATE

DATA 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
- 4 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

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

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

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
123456789012345678901234567890123456789012345678901234567890123456789
3001LFR26067231   .5 1 1     ORTHACRI         40      1
3001LFR26067231   .5 1 2     HOMOCOCC         40     18
3001LFR26067231   .5 1 0     ACAR1802         10      2
3001LFR26067231   .5 1 0     DIPT             40      2
3001LFR26067231   .5 1 5     ARAN             40      1
3001LFR26067231   .5 1 5     HEMINABI         40      2
3001LFR26067231   .5 1 0     HYMEFORM         10      1
3001LFR26067231   .5 1 2     HEMILYGA         10      1
3001LFR26067231   .5 1 2     HEMIMIRI         40      1
3001LER26067231   .5 2 0     COLETENECO SP    10      1
3001LFR26067231   .5 2 2     HEMIMIRI         40      2
3001LFR26067231   .5 2 2     HEMINABI         40      2
3001LFR26067231   .5 2 0     HYMEFORMSO SP    10      6
3001LFR26067231   .5 2 0     HYMEFORM         10      1
3001LFR26067231   .5 2 0     ACAR1809         10     28
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3001LFR26067231   .5 2 2     HOMOCOCC         40      9
3001LFR26067231   .5 2 2     HOMOCICI         41      2
3001LFR26067231   .5 2 0     COLETENE         41      5
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3001LFR26067231   .5 2 0     ACAR             10      2
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3001LFR26067231   .5 3 0     HYMEFORMSO SP    10     27
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3001LFR26067231   .5 3 0     ACAR1801         10      1
3001LFR26067231   .5 3 0     ACAR1810         10      1
3001LFR26067231   .5 5 0     COLETENECO SP    10      1
3001LFR26067231   .5 5 1     LEPIGEOM         40      1
3001LFR26067231   .5 5 1     ORTHACRI         40      1
3001LER26067231   .5 5 5     NEURHYRH         40      1
3001LFR26067231   .5 5 0     HYMETIPH         10      1
3001LFR26067231   .5 5 1     LEPIPYRA         40      1
3001LFR26067231   .5 5 7     HYMEPTER         10      1
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3001LER26067231	.5 5 0	ACAR1812	40	2
3001LER26067231	.5 5 2	HOMOCOCC	40	2
3001LER26067231	.5 5 0	PSOC1814	10	1
3001LER26067231	.5 5 0	COLETENE	40	2
3001LER26067231	.5 5 2	HOMOFULG	40	1
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3001LER26067231	.5 5 1	THY21798	10	2
3001LER26067231	.5 5 0	COLLENTO	10	1
3001LER26067231	.5 6 8	DIPTMUSCMU DO	10	1
3001LER26067231	.5 6 2	HEMILYGA	10	1
3001LER26067231	.5 6 2	HOMOCOCC	40	7
3001LER26067231	.5 6 2	HEMICORE	40	1
3001LER26067231	.5 6 5	HEMINARI	40	1
3001LER26067231	.5 6 1	THY21817	10	1
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3001LER26067231	.5 6 1	THY21798	40	1
3001LER26067231	.5 6 0	HYMEFORMFO SP	10	1
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3001LER26067232	.5 8 1	COLLSMIN	10	2
3001LER26067232	.5 8 0	ACAR1795	10	1
3001LER26067232	.5 8 0	ACAR1810	10	3
3001LER26067232	.5 8 0	ACAR1821	10	1
3001LER26067232	.5 8 2	HOMOCOCC	40	8
3001LER26067232	.5 8 2	HEMICORE	41	1
3001LER26067232	.5 8 1	LEPI	41	1
3001LER26067232	.5 7 5	ARANTHOM	10	1
3001LER26067232	.5 7 0	TRICHYD2	10	1
3001LER26067232	.5 7 0	HYMEFORMSO SP	10	1
3001LER26067232	.5 7 5	ARAN	40	2
3001LER26067232	.5 7 0	ACAR1795	10	1
3001LER26067232	.5 7 2	HOMOCOCC	40	3
3001LER26067232	.5 7 2	HOMOCIC1	40	1
3001LER26067232	.5 7 2	HEMIPYRR	40	2
3001LER26067232	.5 7 0	DIPTMUSC	40	1
3001LER26067232	.5 7 1	LEPI	40	1
3001LER26067232	.5 7 0	ACAR	10	1
3001LER26067232	.512 0			
3001LER26067232	.5 9 0	COLETENECO SP	10	2
3001LER26067232	.5 9 8	COLETENEEL GR	10	1
3001LER26067232	.5 9 0	COLECARA	10	1
3001LER26067232	.5 9 5	NEURRAPH	40	1
3001LER26067232	.5 9 0	HYMEFORMSO SP	10	33
3001LER26067232	.5 9 0	HYMEFORMFO SP	10	1
3001LER26067232	.5 9 2	HOMOFULG	40	1
3001LER26067232	.5 9 0	THY1MACH	10	1
3001LER26067232	.5 9 0	DIPTSCIA	10	1
3001LER26067232	.5 9 2	HOMOCIC1	10	1
3001LER26067232	.5 9 2	HOMOCIC1	40	2
3001LER26067232	.5 9 2	HEMILYGA	40	1

3001LER26067232	.5 9 0	DIPTMUSC	40	2
3001LER26067232	.5 9 0	DIPT	40	2
3001LER26067232	.5 9 0	HYMEFORM	10	1
3001LER26067232	.5 9 0	ACAR1795	10	1
3001LER26067232	.5 9 0	ACAR1820	10	2
3001LER26067232	.5 9 0	ACAR1812	10	3
3001LER26067232	.5 9 2	HOMOCOCC	40	4
3001LER26067232	.5 9 1	LEPI	40	1
3001LER26067232	.510 8	DIPTMUSCMU DO	10	1
3001LER26067232	.510 0	COLETENECO SP	10	1
3001LER26067232	.510 0	COLETENE	10	1
3001LER26067232	.510 2	COLECOCC	10	1
3001LER26067232	.510 1	ORTHACRI	40	5
3001LER26067232	.510 0	HYMEFORMSO SP	10	3
3001LER26067232	.510 2	HOMOCOCC	40	3
3001LER26067232	.510 0	DIPTCECI	10	1
3001LER26067232	.510 1	THY21798	10	1
3001LER26067232	.510 1	LEPI	40	2
3001LER26067232	.510 0	COLETENE	40	1
3001LER26067232	.510 2	HOMOAPHI	40	1
3001LER26067232	.511 2	HOMOAPHI	40	1
3001LER26067232	.511 2	HOMOCOCC	40	1
3001LER26067211	.513 5	ARAN	10	1
3001LER26067211	.513 0	ACAR1820	10	3
3001LER26067211	.513 0	COLETENE	40	2
3001LER26067211	.513 2	HOMOFULG	40	2
3001LER26067211	.513 2	HOMOCOCC	40	1
3001LER26067211	.514 0	HYMEFORMSO SP	10	54
3001LER26067211	.514 0	COLECARA	10	2
3001LER26067211	.514 2	HOMOFULG	40	1
3001LER26067211	.514 5	ARAN	40	2
3001LER26067211	.514 0	ACAR1795	10	30
3001LER26067211	.514 2	HOMOCICI	41	3
3001LER26067211	.514 2	HEMIPYRR	10	1
3001LER26067211	.514 0	COLETENE	40	4
3001LER26067211	.514 0	COLEANTINO SP	40	17
3001LER26067211	.514 0	DIPTMUSC	40	2
3001LER26067211	.514 2	HOMOFULG	40	1
3001LER26067211	.514 0	ACAR1820	10	5
3001LER26067211	.514 2	HOMOCOCC	40	9
3001LER26067211	.514 0	PSOC1814	40	3
3001LER26067211	.514 0	ACAR1801	10	20
3001LER26067211	.514 0	ACAR1830	10	2
3001LER26067211	.514 0			
3001LER26067211	.516 5	COLECOCC	10	1
3001LER26067211	.516 0	DIPTCHIR	10	2
3001LER26067211	.516 2	HOMOCOCC	40	6
3001LER26067211	.516 2	HOMOFULG	40	1
3001LER26067211	.516 7	HYMEPTER	10	1
3001LER26067211	.516 1	THY21798	40	1
3001LER26067211	.516 0	HYMEFORMSO SP	10	2
3001LER26067211	.515 0	COLETENEEL GR	10	1
3001LER26067211	.515 0	HYMEFORMSO SP	10	6
3001LER26067211	.515 1	THY21798	40	1

3001LER26067211	.515	2	HOMOCUCC	40	2
3001LER26067211	.515	0	DIPT1823	40	1
3001LER26067211	.517	0	DIPTMUSC	10	2
3001LER26067211	.517	0	DIPTANT1	10	2
3001LER26067211	.517	2	HOMOCUCC	10	82
3001LER26067211	.517	0	DIPT1823	40	1
3001LER26067211	.517	0	DIPT	10	1
3001LER26067211	.517	0	HYMEFORMSO SP	10	1
3001LER26067211	.517	1	COLLSMIN	10	1
3001LER26067211	.517	1	THY21798	40	4
3001LER26067211	.517	1	THY21817	10	1
3001LER26067211	.517	1	LEPINOCT	40	1
3001LER26067211	.517	2	HOMOCUCC	40	2
3001LER26067211	.517	0	DIPTCHIR	10	1
3001LER26067211	.517	0	DIPTPHOR	10	1
3001LER26067211	.517	5	ARAN	40	1
3001LER26067211	.517	2	HEMIPYRR	40	1
3001LER26067211	.517	0	ACAR1810	10	1
3001LER26067211	.517	1	THY21798	40	1
3001LER26067211	.517	0	DIPTHELE	10	1
3001LER26067211	.518	3	LEPI	10	1
3001LER26067211	.518	2	HOMOCIC1	40	1
3001LER26067211	.518	0	COLEANTINO SP	40	5
3001LER26067211	.518	0	ACAR1801	10	2
3001LER26067211	.518	1	THY21798	40	1
3001LER26067211	.518	5	ACAR1834	40	1
3001LER26067211	.518	0	ACAR1810	10	1
3001LER26067212	.519	0	HYMETIPH	10	1
3001LER26067212	.519	1	ORTHACRI	40	1
3001LER26067212	.520	0	COLETENECO SP	10	1
3001LER26067212	.520	2	HEMILYGA	10	1
3001LER26067212	.520	0	DIPTHELE	10	1
3001LER26067212	.520	0	DIPTCHIR	10	1
3001LER26067212	.520	2	HOMOCUCC	40	46
3001LER26067212	.520	1	THY21798	40	4
3001LER26067212	.520	2	HOMOFULG	40	1
3001LER26067212	.520	0	HYMEFORMSO SP	10	1
3001LER26067212	.520	1	COLLSMIN	10	1
3001LER26067212	.520	7	HYMEPTER	10	1
3001LER26067212	.520	0	COLETENE	40	1
3001LER26067212	.520	0	COLEANTINO SP	40	1
3001LER26067212	.520	0	COLECURC	40	1
3001LER26067212	.520	0	ACAR1809	10	1
3001LER26067212	.520	0	ACAR1810	10	1
3001LER26067212	.520	0	ACAR1801	10	2
3001LER26067212	.520	0	ACAR1830	10	1
3001LER26067212	.520	0	DIPT1823	40	3
3001LER26067212	.520	0	COLE	20	1
3001LER26067212	.521	3	LEPINOCT	10	1
3001LER26067212	.521	2	HOMOCIC1	40	2
3001LER26067212	.521	2	HOMOCUCC	40	3
3001LER26067212	.522	1	ORTHACRI	40	1
3001LER26067212	.522	2	HOMOCIC1	10	1
3001LER26067212	.522	2	HOMOCIC1	40	3

3001LER26067212	.522	0	HYMEFORMSO SP	10	14
3001LER26067212	.522	2	HOMOCOCC	40	52
3001LER26067212	.522	5	HEMINABI	40	2
3001LER26067212	.522	0	COLEANTINO SP	40	2
3001LER26067212	.522	0	ACAR1809	10	6
3001LER26067212	.522	0	DIPTMUSC	40	1
3001LER26067212	.523	1	ORTHACRI	40	1
3001LER26067212	.523	0	COLETENECO SP	10	1
3001LER26067212	.523	0	COLECARA	10	1
3001LER26067212	.523	1	LEPI	40	1
3001LER26067212	.523	2	HOMOFULG	40	1
3001LER26067212	.523	2	HOMOCOCC	40	24
3001LER26067212	.523	0	HYMEFORMSO SP	10	3
3001LER26067212	.523	1	THY21798	40	1
3001LER26067212	.524	0	COLETENEEL GR	10	1
3001LER26067212	.524	5	DIPTASILEF SP	10	1
3001LER26067212	.524	2	HEMILYGA	10	1
3001LER26067212	.524	2	HOMOCICI	40	2
3001LER26067212	.524	0	COLEANTINO SP	40	6
3001LER26067212	.524	2	HEMIPYRR	41	1
3001LER26067212	.524	5	HEMINABI	40	3
3001LER26067212	.524	0	ACAR1795	10	5
3001LER26067212	.524	0	ACAR1820	10	2
3001LER26067212	.524	0	ACAR1801	10	1
3001LER26067212	.524	0	HYMEFORMSO SP	10	5
3001LER26067212	.524	2	HOMOCOCC	40	2
3001LER26067212	.524	5	ARAN	40	1