Technical Report No. 107

DATA COLLECTED ON THE PAWNEE SITE RELATING TO WESTERN HARVESTER ANT AND INSECT PREDATORS AND PARASITES, 1970

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GRASSLAND BIOME

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ABSTRACT

This technical report presents data concerning the role of the western harvester ants (*Pogonomyrmex occidentalis* Cresson) and the robber flies (Asilidae) in the grassland ecosystem. Other general data are presented concerning the parasitism rate of grasshoppers and the population fluctuations of other insect predators.

INTRODUCTION

This study was designed to ascertain the effects of insect predation, parasitism, and the western harvester ants on the shortgrass plains ecosystem.

The investigation was conducted on the Pawnee Site near Nunn, Colorado. The intensive study pastures utilized in the study are identified as follows: light use (23W), moderate use (15E), heavy use (23E), and the winter use pasture (22E).

Preliminary results are included in this report. A supplemental report will be issued when the data have been fully analyzed.

Western Harvester Ants

A major portion of the effort this past summer was directed toward investigating the effects of the western harvester ants. The previous year's research (Lavigne and Rogers 1970) and the research of others (Wiegert and Evans 1967) had indicated that the harvester ants may play an important role in the grassland ecosystem.

Data were gathered on forage selection, foraging distance, forage rate, activity in response to environmental factors, density/m^2, biomass/m^2, and dispersion patterns in the light and heavy grazed pastures. These data plus an estimate of the amount of energy flowing through the western harvester ant population should permit an accurate assessment of the role of these ants in the grassland ecosystem.

Insect Predation and Parasitism

A continued effort was made to monitor the proportional density of the insect predators in the intensive study pastures. Work during the previous summer had indicated that the robber flies (Asilidae) and the wolf spiders (Lycosidae) were the most numerous predators encountered on the transects (Lavigne and Rogers 1970). The robber flies were selected for more intensive study since they were abundant and prey upon grasshoppers.

In each pasture type the prey species selected, prey size, percent of robber flies engaged in predatory activities, and amount of biomass transferred from the prey population to the robber fly population per unit of time was studied.

The parasitism study is, at present, only concerned with determining the percentage of grasshoppers infected with internal parasites.

METHODS

Data Processing

Every effort was made to collect data in such a manner that it could be processed and stored in punched card form. Field data sheets were developed with the aid and advice of the staff of the Natural Resource Ecology Laboratory. These field data sheets were periodically forwarded for data processing under cover of a separate transmittal. See sample appended to this report (Fig. 1).

Western Harvester Ant Study

The collection of data concerning the ants' forage selection, foraging distance, forage rate, and activity in response to environmental factors

were made at weekly intervals during the period from June 15 to Sept. 26. The colony to be studied was determined by selecting two coordinates from a random number table. Observations were then made on that colony closest to the intersection of the coordinates.

Forage selection. The type of forage selected by the ants was determined by collecting returning foragers for five minute periods every hour during the day. The forage was grouped as plant vegetative parts, plant reproductive parts, seeds, animal prey, animal dead, animal feces, unknown animal substance, mineral, and unknown material. In addition, each of the types were classed as being part or whole pieces.

The foragers were collected by placing a small vial over each worker ant that returned to the disc with forage. The ant generally responded by attempting to climb up the side of the glass vial. The vial was then quickly inverted entrapping the ant in the vial with the forage it had collected. All of the forage for the five minute period was combined in one vial and labeled with the collection date, time, pasture, and the number of foragers that had returned during that period. The forage material was then oven dried at 65°C for 24 hours, weighed, and posted to the field data sheet (Fig. 2). Seed identification was made by the state seed laboratory at the University of Wyoming.

A test was made on a sampling device that automatically collected foraging ants for five minute periods of each hour. The sampler consisted of a barricade with separate exit and entrance tubes, a 12-volt releasing solenoid, and a sliding tray containing collection vials.

The barricade was erected on the edge of the disc so that the ants were forced to enter and leave the disc by way of the tubes. The entrance

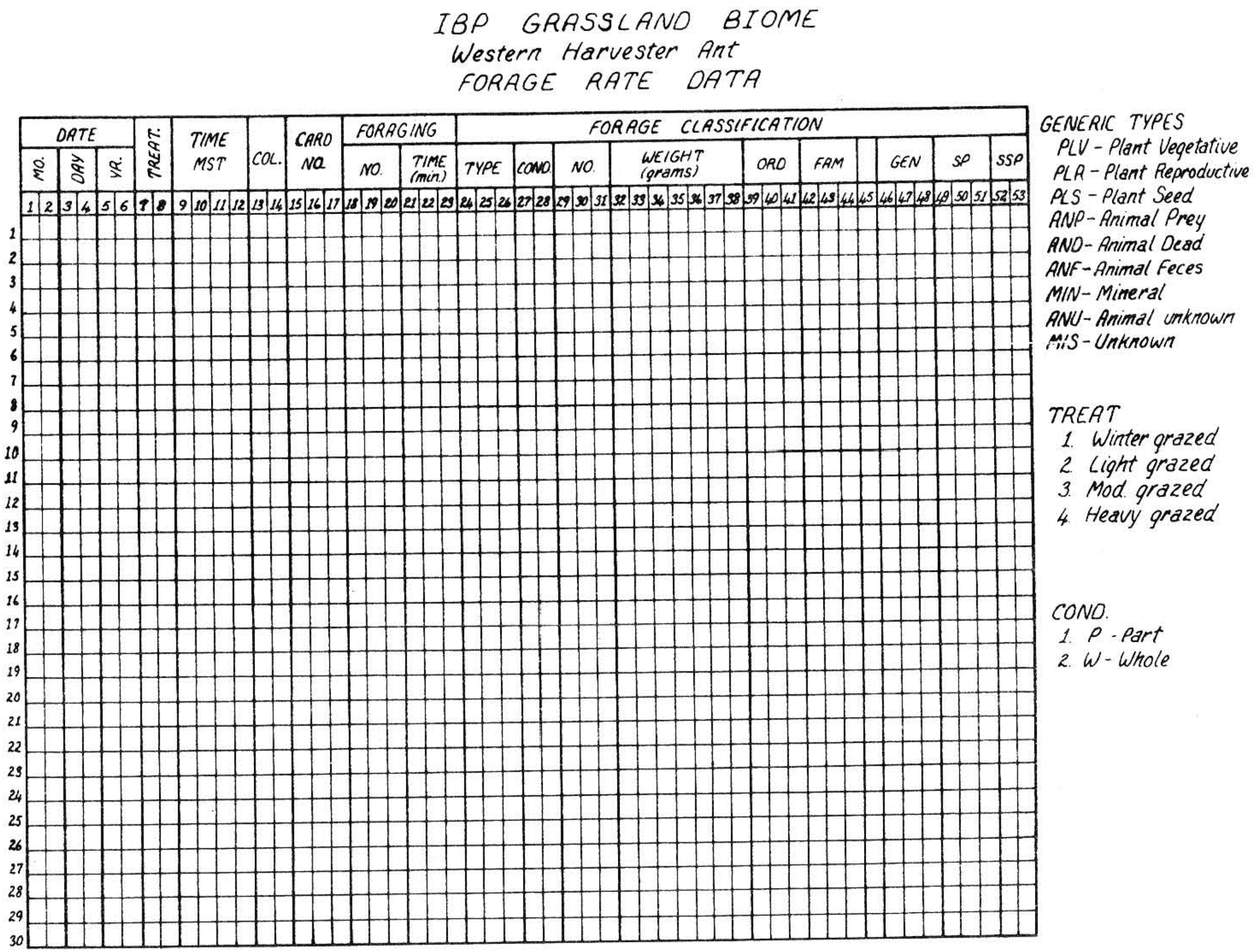

Fig. 2. Western harvester ant forage rate field data sheet.

tube terminated with a short drop to a board that allowed the ants to continue on to the nest. The timer emitted an impulse at hourly intervals that engaged a solenoid, moving the sliding tray forward so that a vial came to rest under the entrance tube. The returning ants then came down the tube and dropped into the vial. Five minutes later the sliding tray would again move forward so that the ants once again dropped on the board and returned to the nest.

The device was installed and operated on a colony in the heavy use pasture. The ants learned to enter and leave the barricade in about two days. The device did not appear to be impeding their foraging activities after that time but before data could be gathered to test this observation the ants abandoned the colony and started a new one about 4 m away and that ended that!

Activity in response to environmental factors. Specific types of activity under investigation were time of mound opening, initiation of foraging, non-foraging period during midday, cessation of foraging at night, initiation of mound closure, mound closure, and rate of departure of foragers throughout the day. Data for these activities were gathered by arriving at the randomly selected colony prior to the time of mound opening and making periodic observations concerning the behavior of the ants throughout the day. These observations were made weekly from mid-June through mid-September.

Surface temperatures were measured by placing a six-inch mercury thermometer on the ground near the mound opening. The bulb of the thermometer was covered with a thin layer of soil so that it was not exposed to the direct rays of the sun.

The time, activity code, surface temperature, and the number of foragers leaving per minute were recorded on the field data sheet shown in Fig. 3.

Forage rate. Forage rate data were gathered simultaneously with the forage selection data. The number of ants returning with forage per unit of time was recorded, along with the forage selection data, on the field data sheet illustrated in Fig. 2.

Forage distance. The distance that a foraging ant travelled from the colony was determined by following individual ants and marking their path with numbered markers. The data were recorded on the data sheet shown in Fig. 4.

Colony density. The first question to be asked was what method of harvester ant density determination would provide the most accurate population estimate. Morris (1960) discussed the advantages of using population indices rather than attempting to measure actual populations of some organisms. Using a mark-recapture method, Chew (1960) attempted to estimate population densities of individual colonies but his results were inconclusive. Golly and Gentry (1964) indicated that short-term marking recapture estimates based on aboveground individuals of *Pogonomyrmex badius* greatly underestimate the size of the colony.

Odum (1959) indicated that it was frequently better to ascertain the number of ant colonies per unit area and subsequently to determine numbers of individuals per average colony. Because of the propensity of small colonies of these ants to move into abandoned larger quarters, estimates of colony size based on the size of either mound or disc have proved to be inadequate in

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Western Harvester Ant Activity

Data Type	Site	Initials	Date DAY	Date MO	Date YR	Treatment	Time	Colony Number	Activity Code	Surface Temperature (°F)	Number of foragers Leaving / minute	Notes
1-2	3-4	5-7	8-9	10-11	12-13	14	20-23	24-26	27-28	29-31	32-34	

DATA TYPE

11-Invertebrate

SITE

11 Pawnee

TREATMENT

1 Ungrazed

2 Lightly grazed

3 Moderately grazed

4 Heavily grazed

ACTIVITY CODES

0 Not foraging - morning

1 Mound opened

2 Foraging

3 Not foraging - midday

4 Not foraging - evening

5 Start of mound closure

6 Mound closed

Fig. 3. Western harvester ant activity field data sheet.

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Field Data Sheet
Western Harvester Ant Range Determination

Date	TRTM	Col. No.	Dist. from west boundary	Dist. from south boundary	Temp.	Time	Marker	Dist. from colony	Activity

Fig. 4. Western harvester ant range determination field data sheets.

previous studies (Lavigne 1969). Consequently, it was decided to count the actual number of colonies per unit area and then to estimate colony populations based on numbers of ants recovered from randomly selected colonies.

The method used to determine colony density consisted of counting all colonies in a 32 ha area and then reducing this figure to colonies/m^2.

The colonies were counted by walking back and forth across the sample area. Each colony counted was marked by spraying a spot of paint near the mound. This method permitted verification that all colonies had been counted.

Colony dispersion patterns. Investigation during the previous summer (Lavigne and Rogers 1970) had revealed that there was a significant difference in the density of western harvester ant colonies in the light and heavy use pastures.

The question then considered was whether there was also a difference in the dispersion patterns between these two pastures.

A system of quadrats had been set up for one of the ornithological studies. Permission was secured from Dr. Ryder to utilize this system for an investigation into the dispersion patterns of the western harvester ant. The general layout of the system of quadrats is shown in Fig. 5. Each quadrat consists of .16 ha. The entire system of 50 quadrats comprises 8 ha.

A count was made of the number of ant colonies present in each quadrat. This data will be used to determine if there is a difference in the colony dispersion patterns in the light and heavy use pastures.

Biomass and density per colony. Biomass and population density per colony data were obtained by excavating colonies. Colony excavations were

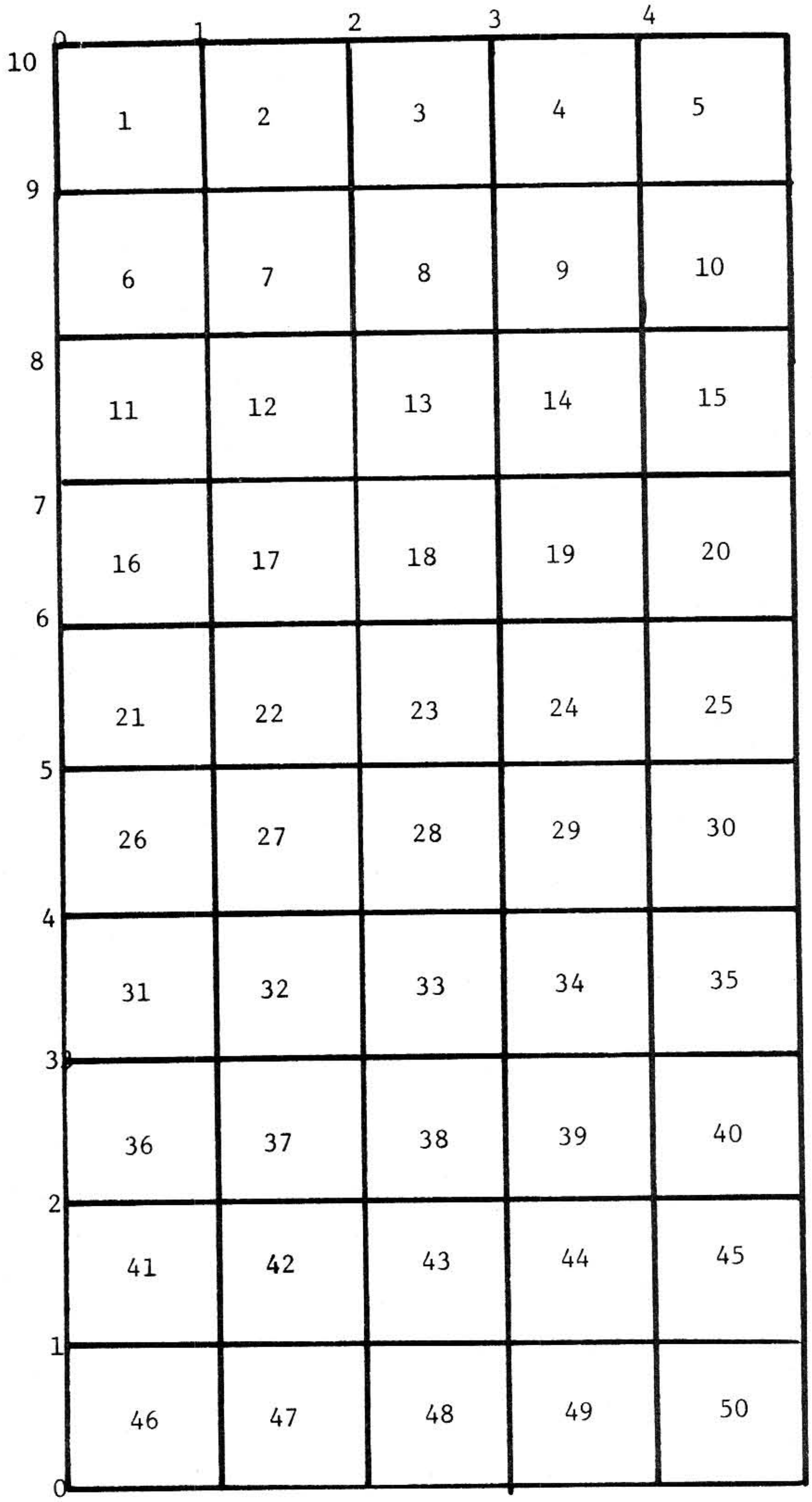

Fig. 5. Quadrat system used to determine dispersion patterns of the western harvester ant.

limited to designated areas due to the destructive nature of the sampling technique.

A backhoe was used to dig down next to the edge of the disc area. The entire mound of the colony was then removed and placed in a container. This usually removed most of the ants that were near the entrance of the mound. Ants that came to the surface in response to this disturbance were picked up with an aspirator and placed in a container. The remaining ants in the colony were uncovered by digging into the colony from the side after Lavigne (1969). As the ants and seeds were uncovered, they were placed in a container and marked according to their depth in the colony. As a general practice, the colony was dug out a foot deeper than the location of the last ant found in the colony.

After excavating, the ants were taken to the laboratory, counted and dried at 65°C for 24 hours. They were then weighed and the weights recorded.

Bioenergetics

One of the primary aims of a model of the grassland ecosystem is to predict the flow of energy through the system. Since the harvester ants were particularly abundant, it was thought essential to ascertain energy values for this species. Wiegert and Evans (1967), in referring to the role of ants in an old field ecosystem, made the following comment: "Ants are probably the dominant group of insects on the field and consume significant amounts of the net primary production. Studies of this group are in progress (Evans and Wiegert, unpublished) and we estimate total ingestion of all other consumers and will, if confirmed, substantially increase the estimate of consumer respiration, ingestion, and perhaps production."

Following Golley and Gentry's (1964) lead, the requisite information to produce a value for total energy flow is (1) density, (2) biomass, (3) growth, and (4) heat production. The methods used to determine biomass, colony density, and changes in hill density have been previously explained. Production of ants was estimated from counts of larvae and pupae in brood chambers, both on site and those of Lavigne (1969), for the same species. The average live weight of individual worker ants of *Pogonomyrmex occidentalis* was determined to be 6.6 mg. This figure is identical with that reported by Golley and Gentry (1964) for *Pogonomyrmex badius*. Therefore, it was decided that the oxygen consumption values for *Pogonomyrmex badius* would probably be valid for *Pogonomyrmex occidentalis*. The bioenergetics figures for *Pogonomyrmex occidentalis* are based on this value.

To determine the annual energy flow values, it is necessary to know the periods of activity of the ants in the field, the surface temperatures during these periods and the ground temperatures where the underground chambers were located. Part of this information ~~are~~ is collected by the investigators. The remainder will be taken from data collected electronically at the weather station on site. In the absence of these latter figures, estimates were made using Lavigne's (1969) data. Heat production of the foraging ant population was calculated by multiplying oxygen consumption (ml O_2/ant/hour) at temperatures ants were active by number of hours at these temperatures. These values were calculated on a weekly basis over the total period of time foraging occurred. Similar calculations were made for the underground component of the colony. Both figures were based on data (Lavigne, unpublished) which indicated that one-tenth of the total colony were active foragers. The sum of these estimates was the total oxygen consumption for one hill per year. The estimate was converted to kcal by multiplying liters of oxygen consumed by the caloric equivalent for a liter of oxygen at an RQ of 0.8 which is approximately 4.8 kcal/l O_2.

Thus the energy flow of the ant population on the various pastures was computed by adding the energy expense of heat production and the energy stored in the production of new ants.

Predator Population Determination

The goal in determining the predator population density was to see if there was a significant difference in their densities between pasture types and in different years.

The transect method was selected because it does not require any sampling equipment and seemed to adequately sample the fast-flying predators. This method is not entirely satisfactory, however, since insects flushed along side may fly ahead and land on the transect. Robber flies seem to be attracted to moving objects and, for this reason, may tend to be overestimated by this method. However, other sampling methods currently in use are probably not adequately sampling the fast-flying predatory insects since some of these insects are very "flighty" when approached.

The transect consisted of an area two feet wide and a mile long. The location of the transect was varied at random on a weekly basis so that different portions of each pasture would be covered. Transects were walked weekly from early June to the end of September. Data pertaining to predator identification and numbers were recorded on field data sheets (Fig. 6).

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Insect Predator Transect Data

	DATE			TREAT.	PREDATOR					QTY*
	MO	DAY	YR		ORD	FAM	GEN	SP	SSP	
1										
2										
3										
4										
5										
6										
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36										
37										
38										
39										
40										

TREAT

1.- Winter grazed
2.- Light grazed
3.- Mod grazed
4.- Heavy grazed

* Qty refers to the number of insects observed on the transect.

Fig. 6. Insect predator transect field data sheet.

Robber Fly Predation Study

A separate count of the number of robber flies engaged in feeding activities was made coincident with the gathering of the transect data. This count was made to permit the calculation of the percent of robber flies feeding at a given time.

The investigation of prey selection consisted of two methods. If the attack and initiation of feeding had been observed, the predator and its prey would be kept under observation until the prey was discarded. At that time, the remains would be collected and compared to the average weight of live specimens of comparable size to determine the amount consumed. If the start of feeding had not been observed the prey was immediately collected and recorded as a feeding record only.

Data pertaining to predator, prey, prey size, prey weight, and predator feeding time were recorded on the field data sheets as illustrated in Fig. 7.

Parasitism Study

A weekly collection of grasshoppers was made to determine the percentage of grasshoppers parasitized. The grasshoppers were collected from adjacent areas rather than from the intensive study pastures so that there would be no disruption of grasshopper density counts by other workers. Because of the small numbers of grasshoppers present in the area, no attempt was made to collect equal numbers of the different species. Grasshoppers were collected by net and immediately immersed in alcohol for dissection at a later time.

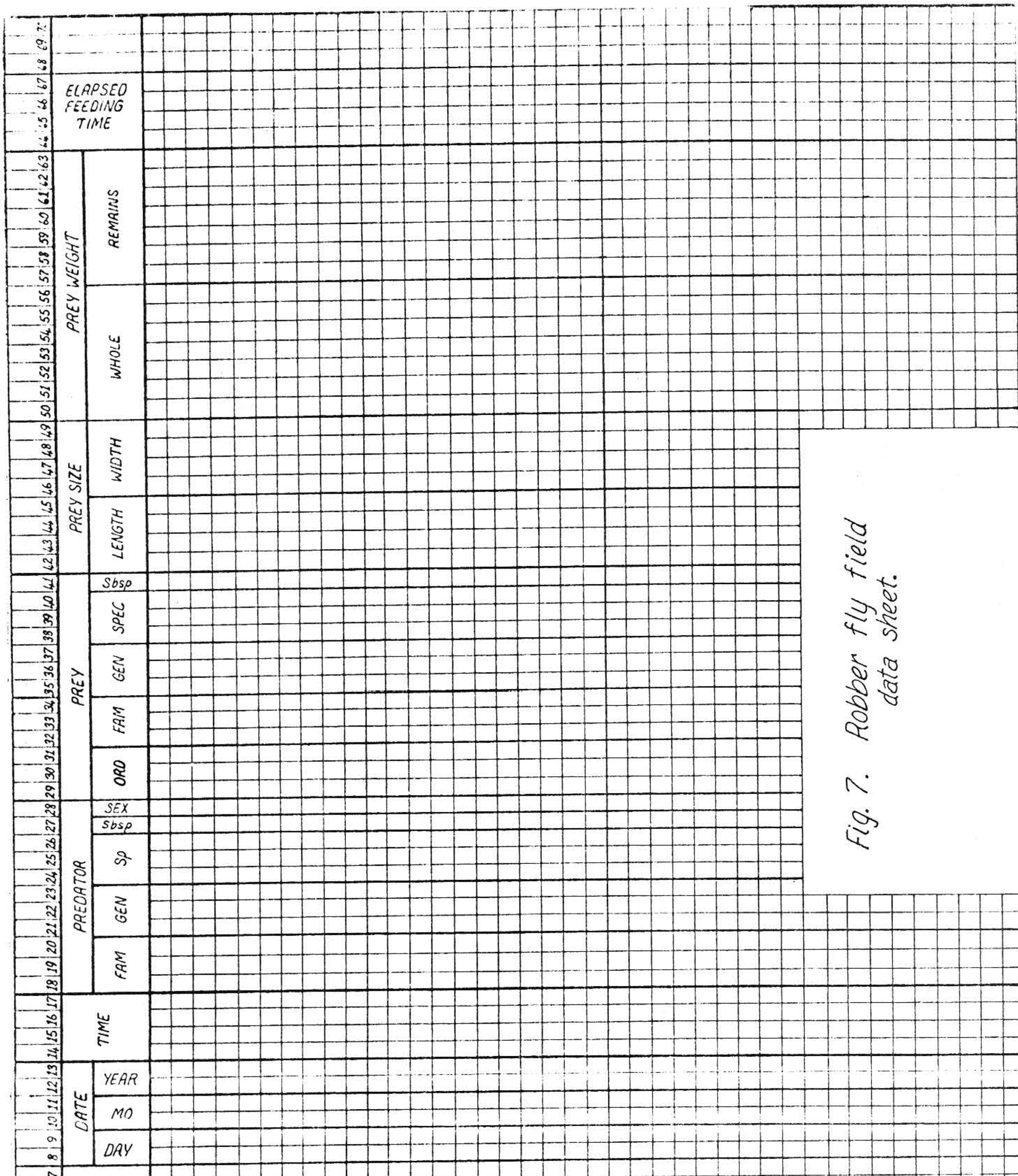

Fig. 7. Robber fly field data sheet.

RESULTS

Western Harvester Ants

Forage selection. There were 38 species of seeds representing 30 genera foraged by the western harvester ants as shown in Table 1. The numbers of each seed foraged and the factors affecting seed selection are still being analyzed and will have to be included in a later report. Additional work is being planned for the investigation of seed availability throughout the season.

The insects serving as forage material are shown in Table 2. Some Lepidoptera (Pyralidae), Coleoptera (Scarabaeidae) and Isoptera were taken into the colony alive indicating that these ants do prey on other insects. The other insects serving as forage were assumed to be scavenger material although in some instances the prey may have been killed by the ants prior to being transported to the colony.

The data obtained the previous summer indicated that approximately 50% of the forage consisted of seeds, 40% other plant parts, and 10% animal matter (Lavigne and Rogers 1970).

Activity in response to environmental factors. The activity of the western harvester ant foragers varies throughout the day. The number of foragers leaving the colony per minute increases rapidly in the early morning, drops off around midday, and increases in the early afternoon again. Activity ceases sometime around 6:00 PM (MST). The average number of foragers leaving per minute at hourly intervals is shown in Table 3. As the season progresses, the mound is opened and closed later in the day (Fig. 8). All evidence thus far accumulated suggests that this is a response to soil temperature rather than time of day.

Table 1. Seeds foraged by the western harvester ants at the Pawnee Site.

No.	Scientific Name	Common Name
1.	*Allium* sp.	Onion
2.	*Amaranthus retroflexus*	Redroot amaranth
3.	*Aristida longiseta*	Red three-awn
4.	*Aristida oligantha*	Prairie three-awn
5.	*Aster tanacetifolius*	Tansy aster
6.	*Bahia oppositifolia*	Plains bahia
7.	*Bouteloua curtipendula*	Side oats grama
8.	*Bouteloua gracilis*	Blue grama
9.	*Bouteloua hirsuta*	Hairy grama
10.	*Buchloe dactyloides*	Buffalo grass
11.	*Carex* sp.	Sedge
12.	*Chenopodium* sp.	Goosefoot
13.	*Corispermum* sp.	Tickseed
14.	*Cryptantha minima*	Cryptantha
15.	*Cymopterus acaulus*	Stemless cymopterus
16.	*Dactylis glomerata*	Orchard grass
17.	*Elymus canadensis*	Canada wild rye
18.	*Elymus glaucus*	Blue wild rye
19.	*Elymus junceus*	Russian wild rye
20.	*Eriogonum effusum*	Spreading wild buckwheat
21.	*Eypatorium maculatum*	Spotted joe-pye weed
22.	*Festuca octoflora*	Six-weeks fescue
23.	*Gaura coccinea*	Scarlet gaura
24.	*Hackelia* sp.	Stickseed
25.	*Heterotheca villosa*	Hairy gold aster
26.	*Lappula occidentalis*	Stickseed
27.	*Lappula* sp.	Stickseed
28.	*Lepidium densiflorum*	Prairie pepperweed
29.	*Mirabilis nyctagenea*	Prairie four-o'clock
30.	*Mirabilis linearis*	Four o'clock
31.	*Musineon divaricatum*	Leafy musineon
32.	*Oenothera albicoulis*	Pale evening primrose
33.	*Opuntia* sp.	Prickly pear
34.	*Oxytropis sericea*	Silky crazyweed
35.	*Polygonum aviculare*	Prostrate knotweed
36.	*Schedonnardus paniculatus*	Tumble grass
37.	*Stipa viridula*	Green needlegrass
38.	*Stipa comata*	Needle and thread

Table 2. Insects serving as forage for the western harvester ants.

Order	Family	Common Name
Acarina		Mite
Coleoptera	Curculionidae	Weevil
	Carabidae	Ground beetle
	Histeridae	Hister beetle
	Scarabaeidae[a/]	June beetle
	Tenebrionidae	Darkling beetle
Diptera	Asilidae	Robber fly
	Chloropidae	Frit fly
Hemiptera	Lygaeidae	Chinch bug
	Nabidae	Damsel bug
	Scutelleridae	Shield backed bugs
Homoptera	Aphididae	Aphids
	Cicadellidae	Leafhoppers
Hymenoptera	Chalcididae	Chalcid wasps
	Formicidae	Ants
Isoptera[a/]		Termite
Orthoptera	Acrididae	Grasshopper
Lepidoptera	Pyralidae[a/]	Pyralid Moths

[a/] Some of these insects were taken into the colony alive.

Table 3. Average number of *Pogonomyrmex occidentalis* foragers leaving per minute at hourly intervals.[a/]

	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800
	1	1	4	10	6	1	1	11	1	2	11	4
	10	15	5	3	11	1	2	23	1	8	4	1
	3	27	12	7	5	2	52	3	2	15	6	1
	2	21	11	3	6	2	7	8	3	7	9	6
	14	1	6	2	4	7	3	2	6	3	2	3
	1	15	4	1	5	1	5	4	5	6	5	
	3	3	4	3	8	8	4	6	3	9		
		10	4	1	1	2	2	13	5	5		
	6	3	1	2		15	3	2	10			
	3	5	6	1		6	6	2	1			
	1	7	2	1		2	4	5	13			
	2	1	2	14		2	15	1	1			
	1	4	5	3			2	2	2			
			5	2			9	4	7			
				5				5	8			
								8				
Total	34	106	70	51	74	24	101	109	55	97	37	15
Mean +/- SD	4.9 ± 5.1	8.2 ± 8.7	5.4 ± 2.7	3.6 ± 2.6	4.9 ± 3.6	3.0 ± 2.8	8.4 ± 14.2	7.8 ± 6.0	3.4 ± 1.6	6.5 ± 4.3	6.2 ± 3.3	3.0 ± 2.1

[a/] Time in MST.

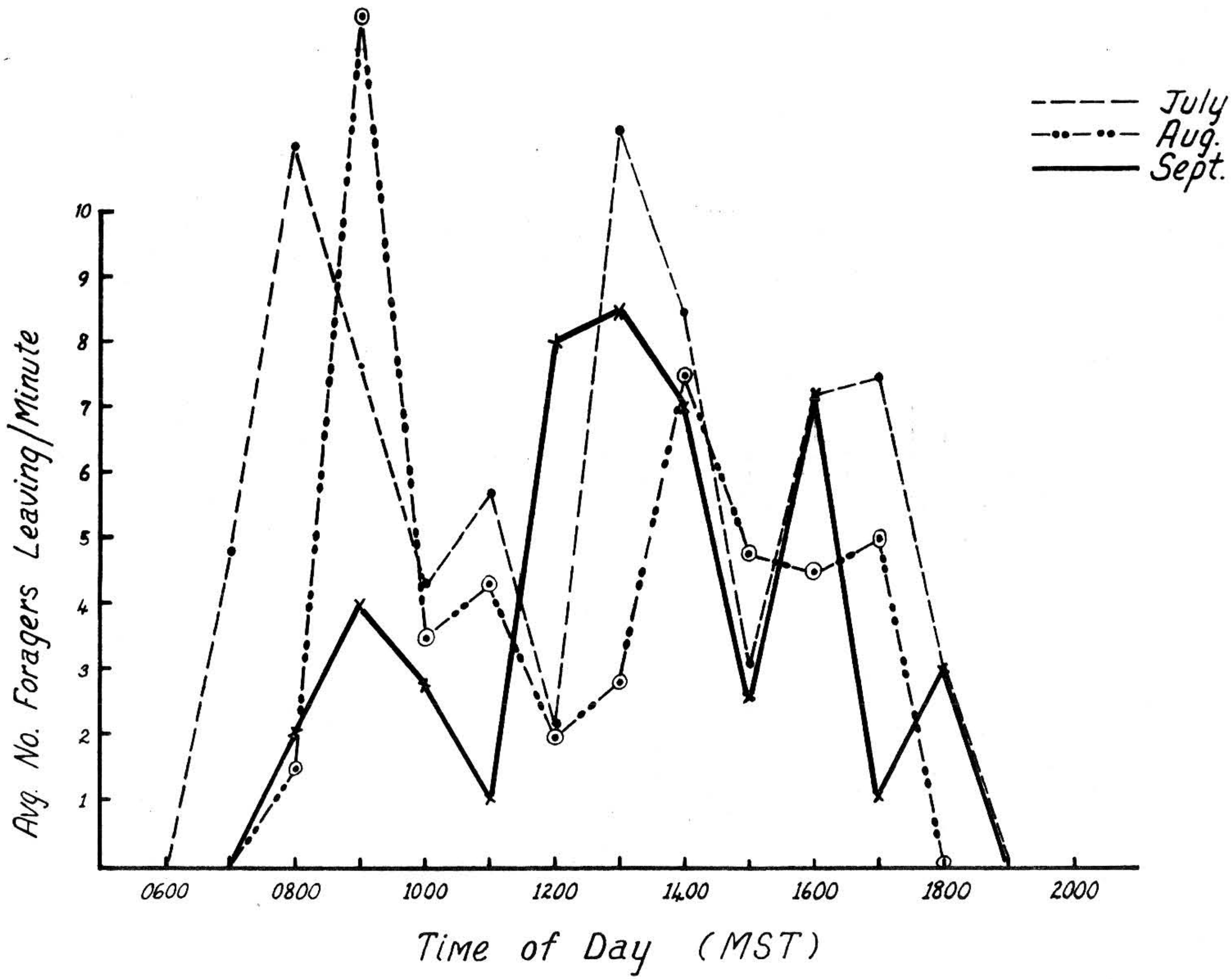

Fig. 8. Changes in daily activity patterns of *Pogonomyrmex occidentalis* through the summer of 1970.

The relationship between foragers leaving per minute and surface temperatures in morning and afternoon is shown in Fig. 9.

Once the surface temperatures rise above about 20°C the ants will start foraging. Once foraging starts, there is a surge of activity as the ants leave the colony for the first foraging trip of the day. Following this surge of activity, foraging continues at a lower but steady rate until surface temperatures of about 38°C are reached. The rate of foraging then continues to decline at higher temperatures and finally ceases altogether at about 52°C. Shortly thereafter, all ants retreat into the colony. Later in the day the ants will emerge and commence foraging once again. They frequently start foraging at even higher temperatures than occurred at the time of foraging cessation. In this instance, the ants may be responding to incoming radiation rather than to soil temperature. The average number of foragers leaving per minute at different temperatures is shown in Table 4.

Forage rate. The rate at which forage is brought into the colony depends on the number of ants foraging, the searching rate of the ants, the density of the forage material, and the length of the daily forage period.

The factors affecting the number of ants foraging and the length of the daily forage period were previously discussed. Additional work needs to be done concerning the density of forage material. The data concerning the searching rate of the ants and the rate at which forage is brought into the colony are still being analyzed and will be reported at a later time.

It is anticipated that the forage rate data can be expressed in mg/colony/hour, for the different forage types, as a function of the environmental factors controlling the ants foraging activity. This, of course, is dependent on the availability of adequate meteorological data.

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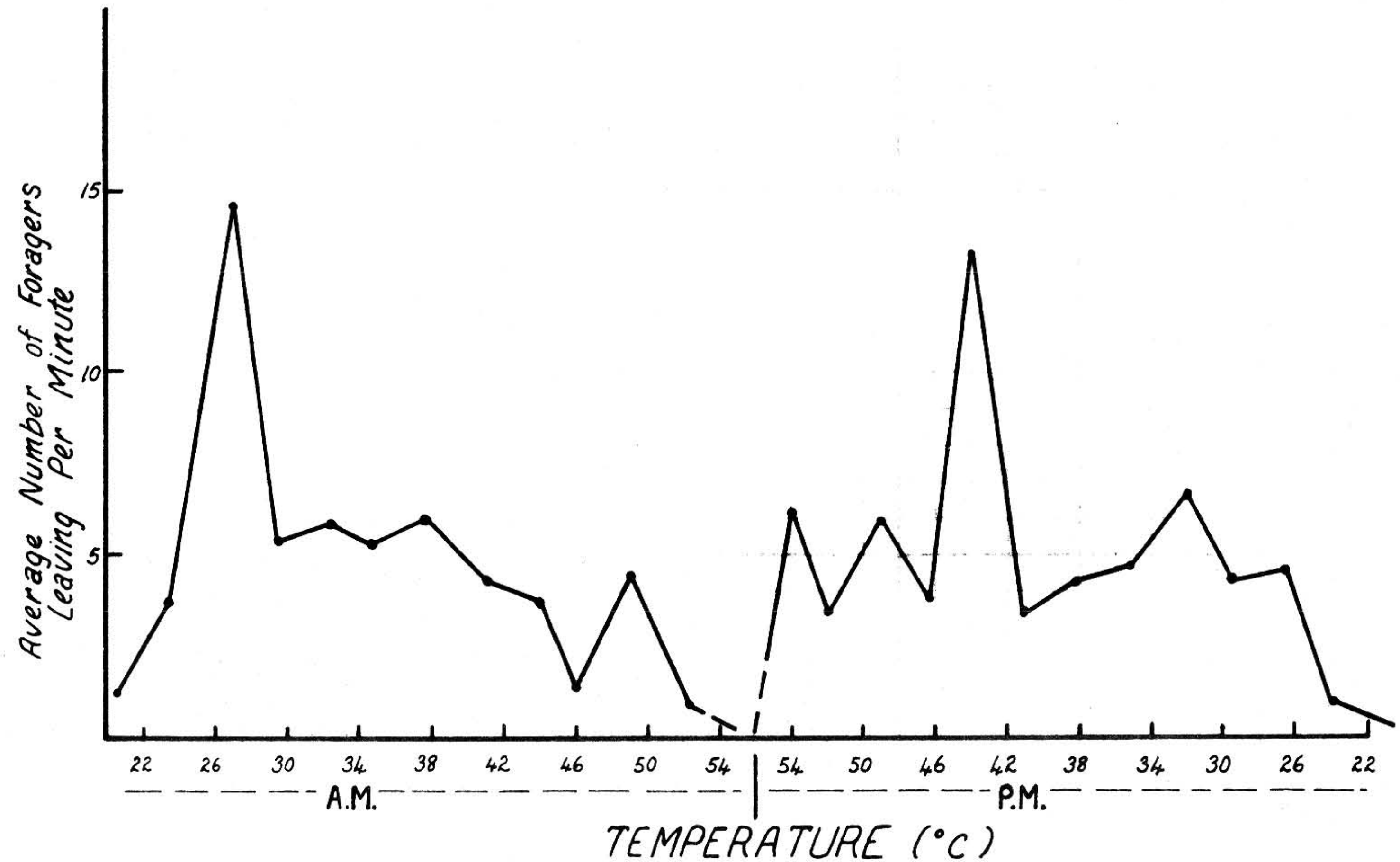

Fig. 9. Average number of western harvester ant foragers leaving per minute vs. temperatures in the morning and afternoon.

Table 4. Average number of *Pogonomyrmex occidentalis* workers foraging at different temperatures.[a]

	<21.1	23.9	26.7	29.4	32.2	35.0	37.8	41.0	44.0	46.0	49.0	52.0	>52.
	1	10	14	1	3	10	7	3	6	1	2	1	5
	1	3	1	15	10	3	2	6	4	7	2	1	2
	2	2	3	4	6	5	7	2	5	6	7	4	9
	1	2	15	6	5	11	4	3	8	5	3	2	9
		1	27	1	12	1	4	5	1	1	5	4	2
			21	8	11	4	2	3	2	2	3	3	
			11	4	11	2	5	5	52	2	8		
			1	3	1		2		23	2	6		
			2	4	1		3		3		1		
			6	4	15		5		6		6		
			2		1		1		1		8		
					3		14		6		2		
					3		4		1		15		
					57		7		6		3		
					1		5		13		6		
					2				5		1		
					4				10		13		
									2		2		
									5		9		
									15		8		
									8				
Total	5	19	103	50	146	36	72	27	182	26	110	15	27
Mean +/- SD	1.3±.5	3.2±3.4	9.4±9.0	5.0±4.1	8.6±13.3	5.1±3.9	4.8±3.2	3.9±1.5	8.9±11.3	3.3±.9	5.5±3.9	2.5±1.4	5.4±3.5

[a] Surface temperature in °C.

Biomass and density data. The number and dry weights of western harvester ants per colony are shown in Table 5. The number of adults per colony averaged 2,059 ± 743 ants at the Pawnee Site. This compares with an average of 1759 adult ants per colony from 20 excavated colonies on open grassland near Casper, Wyoming (Lavigne 1969).

The average dry weight biomass of adult ants per colony was 6.55 ± 1.08 g. The average live weight was determined to be 6.6 mg per ant.

The biomass and density data was developed for use in discussing the bioenergetics of the western harvester ant.

Colony density. A comparison was made of colony density in the four differentially grazed pastures as shown in Table 6. These data were necessary for the analysis of bioenergetics, to determine the fluctuation of colony density from year to year and to determine if grazing intensity affects the colony density of the western harvester ants.

The highest colony density occurs in the winter use pasture sample area (798 colonies) and the lowest colony density is in the heavy use pasture sample area (245 colonies). Each sample area consisted of 32 ha.

A comparison of colony density in the light and heavy use pastures in the summer of 1969 and the summer of 1970 is shown in Table 7. There were no significant differences in colony density between these years.

Forage distance. The distances foraged by western harvester ants in the light and heavy use pastures are shown in Table 8.

The maximum distance foraged was 14.3 m in the light use pasture and 11.0 m in the heavy use pasture. The average distance foraged by these ants was 6.1 ± 3.7 and 3.9 ± 3.1 m, respectively.

Table 5. Number and dry weight of western harvester ants per colony.[a/]

Colony No.	No.	Weight	No.	Weight	No.	Weight
	Adults		Larvae		Pupae	
1 June 25, 1970	1,577	6.90	295	1.39	0	0
2 Aug. 11, 1970	1,626	3.57	349	.74	298	.75
3 Aug. 11, 1970	1,810	5.42	438	1.41	883	1.89
4 Aug. 11, 1970	1,650	4.62	418	1.26	362	.91
5 Sept. 3, 1970	2,182	5.67	679	.54	383	.85
6 Oct. 23, 1970	3,506	13.12	0	0	0	0
Total	12,351	39.30	2,179	5.34	1,926	4.40
Mean +/- SD	2,059 ± 743	6.55 ± 1.08	436 ± 147	1.07 ± .40	482 ± 270	1.10 ± .53

a/ Weights expressed in grams.

Table 6. A comparison of western harvester ant colony density in four different sample areas.[a]

Sample Area	Density
Winter use	798
Light use	597
Moderate use	600
Heavy use	245
	Chi sq 95,3 = 7.81 Calculated Chi sq = 283.63 Significant Difference

[a] Each sample area consists of 32 ha.

Table 7. A comparison of western harvester ant colony density in two different years.[a]

Sample Area[a]	1969	1970	Calculated Chi sq[b]	Conclusion
		DENSITY		
Light Use	597	619	.36	not significant
Heavy Use	245	258	.29	not significant

Chi sq 95,1 = 3.84

[a] Each sample area consists of 32 ha.
[b] Since there is only one degree of freedom, a correction for continuity was applied by reducing each (observed/expected) value by .5 before computing the Chi sq value.

Table 8. A comparison of the maximum distances foraged by western harvester ants.

Observation Number	Forage Distance[a/]	
	Light use[b/]	Heavy use[c/]
1	4.0	9.5
2	9.4	4.6
3	6.7	3.1
4	1.2	1.2
5	14.3	8.5
6	2.7	5.5
7	6.7	1.2
8	4.9	.9
9	11.9	6.7
10	3.7	3.7
11	7.3	1.8
12	5.2	2.4
13	4.0	11.0
14	1.5	1.5
15	1.2	9.4
16	9.4	1.8
17	7.9	2.4
18	7.6	1.2
19		1.8
20		1.8
21		2.4
22		4.6
23		
Total	109.6	88.5
Mean +/- SD	6.1 $\pm$ 3.7	3.9 $\pm$ 3.1

a/ Forage distance refers to the maximum distance from the colony and not distance traveled. Distance measured in meters.

b/ Section 23W.

c/ Section 23E.

The time per foraging trip, in minutes, is shown in Table 9. The average foraging time in the light use area was 25.6 ± 16.9 minutes, while the average for the heavy use area was 22.5 ± 18.7 minutes.

It is interesting to note that while the ants ranged further in the light use area, the average time per trip was nearly identical in the two areas. Comment will be reserved on these observations until it is determined if these differences are statistically significant.

Colony dispersion patterns. A count of ant colony density per quadrat was made for a system of 50 quadrats as discussed in the Methods section. The number of colonies per quadrat are shown in Tables 10 through 13.

The highest colony density per quadrat occurred in the winter use pasture (5.72 ± 2.82 colonies) and the lowest density occurred in the heavy use pasture (1.20 ± .88 colonies). This data will be analyzed to determine if the colonies are distributed at random within the system of quadrats. The discussion concerning colony density in the differentially grazed pastures pointed out that there were significant differences in the colony densities between the four pastures. The question now considered is whether the colonies in the less dense pastures are dispersed in the same manner as the colonies in the more dense pastures.

If the analysis of these data indicated a nonrandom dispersion pattern of the colonies, an investigation could be conducted to determine the factors responsible for the nonrandom condition (Gregg-Smith 1957).

Bioenergetics. The annual energy flow through the western harvester ant population was estimated by determining the amount of energy required for the production of new tissue and the amount of energy expended in respiration.

Table 9. A comparison of time per foraging excursion by western harvester ants.

Observation Number	TIME[a/] Light use[b/]	Heavy use[c/]
1	28	67
2	34	37
3	57	4
4	12	4
5	65	47
6	5	59
7	26	8
8	19	22
9	14	15
10	25	20
11	24	18
12	34	25
13	19	33
14	40	15
15	4	50
16	36	11
17	12	4
18	6	5
19		15
20		9
21		12
22		35
23		3
Total	460	518
Mean +/- SD	25.6 ± 16.9	22.5 ± 18.7

a/ Time per foraging excursion measured in minutes.
b/ Section 23W.
c/ Section 23E.

Table 11. Western harvester ant colony density per quadrat in the moderate grazed pasture (15E).[a]

Quadrat No.	Density	Quadrat No.	Density
1	5	26	6
2	7	27	1
3	3	28	5
4	5	29	1
5	6	30	2
6	9	31	2
7	2	32	5
8	0	33	4
9	0	34	3
10	1	35	5
11	7	36	5
12	1	37	5
13	4	38	2
14	7	39	3
15	9	40	6
16	5	41	5
17	11	42	9
18	8	43	6
19	8	44	8
20	4	45	8
21	4	46	4
22	4	47	3
23	2	48	3
24	0	49	4
25	2	50	7
		Total	226
		Mean +/- SD	4.52 ± 2.67

[a] Each quadrat consists of .16 ha.

Table 12. Western harvester ant colony density per quadrat in the winter grazed pasture (22E).[a/]

Quadrat No.	Density	Quadrat No.	Density
1	8	26	9
2	5	27	9
3	4	28	9
4	1	29	5
5	3	30	4
6	8	31	7
7	7	32	8
8	6	33	2
9	7	34	2
10	4	35	6
11	3	36	9
12	10	37	3
13	6	38	4
14	6	39	11
15	2	40	10
16	5	41	11
17	6	42	6
18	7	43	5
19	6	44	8
20	4	45	3
21	8	46	4
22	7	47	4
23	10	48	0
24	8	49	1
25	4	50	1
		Total	286
		Mean +/- SD	5.72 + 2.82

[a/] Each quadrat consists of .16 ha.

Table 13. Western harvester ant colony density per quadrat in the heavy grazed pasture (23E).[a/]

Quadrat No.	Density	Quadrat No.	Density
1	0	26	1
2	0	27	1
3	1	28	1
4	1	29	1
5	2	30	1
6	0	31	1
7	0	32	1
8	1	33	1
9	1	34	2
10	2	35	1
11	0	36	0
12	0	37	0
13	3	38	1
14	1	39	2
15	1	40	1
16	0	41	2
17	0	42	3
18	3	43	2
19	1	44	3
20	2	45	2
21	0	46	2
22	2	47	2
23	1	48	2
24	1	49	1
25	1	50	2
Total	30	Total	30
		Mean +/- SD	1.20 ± .88

a/ Each quadrat consists of .16 ha.

The amount of energy required in the winter use pasture for the production of new tissue was determined by multiplying the number of ants produced per colony each year (3,090) times the average worker biomass (6.6 mg) times the number of colonies per hectare (4.3). This biomass figure was then multiplied by 2.5 kcal/g live weight and divided by 10,117.18 m (one hectare) to give a value of .12 kcal/m^2/year.

The amount of energy expended in respiration was calculated separately for the time the foragers were outside in summer, the time the foragers were inside in summer, the workers that remain inside all summer, and the total colony population during the winter. This type of computation was used because the foragers outside are exposed to higher temperatures and because of the seasonal fluctuations of the soil temperatures.

The amount of energy required in the winter use area for respiration by the foragers outside in summer was calculated by multiplying the amount of time the foragers were outside per day (8.4 hours) times the number of foragers active during the day (206) times the oxygen consumption rate at 38°C (.15 ml O_2/ant/hour) times the number of days foraging occurred during the year (135). This value was then multiplied by the number of colonies per hectare (4.3) and converted to an energy value per m^2 by multiplying by 4.8 kcal/10^2 and dividing by 10,117.18 m (one hectare). This gives a value of .40 kcal/m^2/year.

The amount of time the foragers were outside during the day was determined by averaging the daily foraging periods for the summer. The number of foragers active during the day and the number of ants per colony were discussed previously. The temperature that the foragers were exposed to was determined by averaging temperatures at the 1 inch depth over a four month period. The rate of oxygen consumption at this temperature was read from the graph presented by Golley and Gentry (1964). The number of days that foraging occurred during the year was determined by observing that the ants started foraging in late May and ceased foraging in early October. The colony density and biomass per hectare was previously discussed and is shown in Table 14.

The estimated respiration rate for the time the foragers were inside the colony during the summer was determined in a similar manner. The only differences were the use of a temperature of 25°C and an exposure period of 15.6 hours per day.

The estimated values for the ants remaining in the colony all summer were derived by using an estimated 1,854 ants at a temperature of 25°C for a period of 135 days.

The estimate of the total colony respiration rate during the winter was determined by using an estimated colony population of 2,060 ants at a temperature of 14°C for 230 days.

Similar computations were made for the ants in the other study pastures. A summation of the energy values required for tissue production and the energy required for heat production is shown in Table 15 as the amount of energy flowing through the western harvester ant population. These values range from 6.48 $kcal/m^2/year$ in the winter use pasture to 1.99 $kcal/m^2/year$ in the heavy use pasture.

Predator population determination. The predatory families observed on each of the transects during the summer of 1970 are shown in Table 16. These

Table 14. Western harvester ant biomass and density per hectare.

	Winter use pasture	Moderate use pasture	Light use pasture	Heavy use pasture
Density[a/]	24.3	18.3	18.3	7.5
Biomass[b/]	200	149	150	61

a/ Colony/ha
b/ g/ha

Table 15. Estimated energy flow through the western harvester ant population.

	Winter use pasture	Light use pasture	Moderate use pasture	Heavy use pasture
Production[a/]	.12	.09	.09	.04
Respiration[a/]	6.36	4.76	4.78	1.95
Total	6.48	4.85	4.87	1.99

a/ Energy values espressed in kcal/m^2/year.

Table 16. Insect predator transect data.[a]

Date	Predator	Pasture[b]	Number
6/4/70	Jumping spider (Salticidae)	1	1
	Jumping spider (Salticidae)	3	1
	Wolf spider (Lycosidae)	3	3
	Wolf spider (Lycosidae)	4	2
6/17/70	Wolf spider (Lycosidae)	4	1
	Wolf spider (Lycosidae)	1	7
	Robber fly (Asilidae)	1	2
	Wolf spider (Lycosidae)	3	1
	Jumping spider (Salticidae)	3	1
	Robber fly (Asilidae)	3	1
6/24/70	Wolf spider (Lycosidae)	1	1
	Robber fly (Asilidae)		
	Proctacanthella sp.	1	1
	Jumping spider (Salticidae)	2	1
	Wolf spider (Lycosidae)	2	1
	Wolf spider (Lycosidae)	3	3
	Robber fly (Asilidae)	3	1
7/3/70	Robber fly (Asilidae)		
	Efferia sp.	1	1
	Proctacanthella sp.	1	5
	Proctacanthella sp.	2	3
	Efferia sp.	2	4
	Jumping spider (Salticidae)	2	1
	Mantid (Mantidae)	3	1
	Robber fly (Asilidae)		

Table 16. (Continued)

Date	Predator	Pasture	Number
	Proctacanthella sp.	3	14
	Efferia sp.	3	1
	Proctacanthella sp.	4	8
	Asilus mesae	4	1
	Mantid (Mantidae)	4	1
	Wolf spider (Lycosidae)	4	1
7/10/70	Mantid (Mantidae)	1	1
	Robber fly (Asilidae)		
	Proctacanthella sp.	1	2
	Efferia sp.	1	1
	Efferia sp.	2	3
	Proctacanthella sp.	2	2
	Tiger beetle (Cicindelidae)	2	1
	Wolf spider (Lycosidae)	3	1
	Robber fly (Asilidae)		
	Proctacanthella sp.	3	7
	Proctacanthella sp.	4	2
	Efferia sp.	4	3
	Wolf spider (Lycosidae)	1	3
7/17/70	Robber fly (Asilidae)		
	Proctacanthella sp.	1	1
	Proctacanthella sp.	2	1
	Efferia sp.	2	4
	Tiger beetle (Cicindelidae)	2	3
	Mantid (Mantidae)	2	1
	Tiger beetle (Cicindelidae)	3	1

Table 16. (Continued)

Date	Predator	Pasture	Number
	Mantid (Mantidae)	3	1
	Robber fly (Asilidae)		
	Proctacanthella sp.	3	6
	Efferia sp.	3	1
	Proctacanthus sp.	4	1
	Wolf spider (Lycosidae)	4	2
	Tiger beetle (Cicindelidae)	4	1
7/23/70	Wolf spider (Lycosidae)	1	3
	Wolf spider (Lycosidae)	2	1
	Robber fly (Asilidae)		
	Efferia sp.	2	5
	Wolf spider (Lycosidae)	3	4
	Robber fly (Asilidae)		
	Proctacanthella sp.	4	1
	Proctacanthus sp.	4	1
	Jumping spider (Salticidae)	1	1
7/31/70	Robber fly (Asilidae)		
	Proctacanthus sp.	1	1
	Proctacanthella sp.	1	1
	Proctacanthus sp.	2	2
	Proctacanthella sp.	3	2
	Efferia sp.	3	1
	Mallophorina sp.	3	1
	Mantid (Mantidae)	3	1
	Jumping spider (Salticidae)	3	1

Table 16. (Continued)

Date	Predator	Pasture	Number
	Wolf spider (Lycosidae)	3	1
	Wolf spider (Lycosidae)	4	1
	Robber fly (Asilidae)		
	Proctacanthus sp.	4	1
	Efferia sp.	4	1
8/12/70	Jumping spider (Salticidae)	1	2
	Wolf spider (Lycosidae)	1	5
	Robber fly (Asilidae)		
	Stenopogon picticornis	1	2
	Proctacanthella sp.	1	1
	Ospriocerus abdominalis	2	1
	Proctacanthella sp.	2	1
	Stenopogon picticornis	2	1
	Stenopogon picticornis	3	2
	Proctacanthella sp.	3	1
	Efferia sp.	3	3
	Jumping spider (Salticidae)	3	1
	Grasshopper wasp (Sphecidae)		
	Tachysphex tarsatus	3	1
	Wolf spider (Lycosidae)	3	1
	Robber fly (Asilidae)		
	Mallophorina sp.	4	2
	Efferia sp.	4	1
	Tiger beetle (Cicindelidae)	4	2
	Wolf spider (Lycosidae)	4	1

Table 16. (Continued)

Date	Predator	Pasture	Number
8/21/70	Wolf spider (Lycosidae)	2	1
	Robber fly (Asilidae)		
	Efferia sp.	2	1
	Stenopogon picticornis	2	4
	Stenopogon picticornis	4	2
	Efferia sp.	4	7
8/25/70	Wolf spider (Lycosidae)	1	5
	Robber fly (Asilidae)		
	Efferia sp.	1	5
	Stenopogon picticornis	1	1
	Stenopogon picticornis	2	6
	Efferia sp.	2	5
	Jumping spider (Salticidae)	2	1
	Mantid (Mantidae)	3	1
	Jumping spider (Salticidae)	3	1
	Wolf spider (Lycosidae)	3	6
	Robber fly (Asilidae)		
	Efferia sp.	3	8
	Efferia sp.	4	5
	Stenopogon picticornis	4	8
	Wolf spider (Lycosidae)	4	1
9/4/70	Wolf spider (Lycosidae)	1	13
	Robber fly (Asilidae)		
	Efferia sp.	1	3
	Efferia sp.	2	1
	Stenopogon picticornis	2	1

Table 16. (Continued)

Date	Predator	Pasture	Number
	Wolf spider (Lycosidae)	2	1
	Mantid (Mantidae)	3	1
	Jumping spider (Salticidae)	3	3
	Wolf spider (Lycosidae)	3	7
	Robber fly (Asilidae)		
	Efferia sp.	3	4
	Efferia sp.	4	1
	Jumping spider (Salticidae)	4	1
9/17/70	Wolf spider (Lycosidae)	1	5
	Jumping spider (Salticidae)	2	2
	Wolf spider (Lycosidae)	2	1
	Robber fly (Asilidae)		
	Efferia sp.	2	4
	Efferia sp.	3	1
	Stenopogon picticornis	3	1
	Wolf spider (Lycosidae)	3	14
	Jumping spider (Salticidae)	3	1
	Jumping spider (Salticidae)	4	1
	Wolf spider (Lycosidae)	4	1
	Robber fly (Asilidae)		
	Efferia sp.	4	2
9/26/70	Wolf spider (Lycosidae)	2	1
	Wolf spider (Lycosidae)	4	7
	Robber fly (Asilidae)		
	Efferia sp.	4	1

a/ Each transect was 2 ft wide by one mile long.
b/ 1-winter use, 2-light use, 3-moderate use, 4-heavy use.

data are summarized and compared with the transect data for 1969 in Table 17. There were no significant differences between numbers of individuals observed from one year to the next except for a decrease in the wolf spiders (Lycosidae) and the sphecid wasps (Sphecidae).

An analysis of the numbers of members representing each predatory family observed on transects in the four pastures is shown in Table 18. There was a significant difference in the wolf spider and sphecid wasp numbers in the four pastures. Both of these families had their highest density in the winter use pasture.

Robber fly predation study. The prey records collected for the robber flies occurring on the Pawnee Site are shown in Tables 19 through 24. Average prey lengths and widths are shown with their standard deviations.

A prey-predator matrix for the robber flies is shown in Table 25. This shows the selection of different orders of prey by the robber flies. The *Efferia* species of robber flies can be seen to prey heavily on the Diptera, Hymenoptera, and Orthoptera. *Lasiopogon quadrivittatus* selects almost all Diptera as prey while the *Proctacanthella* species select both Diptera and Homoptera. *Proctacanthus* species is the largest robber fly at the Pawnee Site and preys primarily on the Diptera and Orthoptera. *Stenopogon picticornis* preys almost exclusively on grasshoppers.

The percentage of robber flies engaged in feeding at any given time is shown in Table 26. This table shows that about 10% of the robber flies are usually feeding during favorable conditions. When sufficient records of complete feeding times on different size prey are available, we will be able to estimate the effect of robber flies on the prey population. Data

Table 17. A comparison of predatory families observed on transect in 1969 and 1970.[a/]

Predator	1969	1970	Chi sq value[b/]	Conclusion
Jumping spiders (Salticidae)	16	15	0.00	Not sig.
Wolf spiders (Lycosidae)	211	77	61.42	Significant
Mantids (Mantidae)	8	8	.06	Not sig.
Tiger beetles (Cicindelidae)	8	8	.06	Not sig.
Sphecid wasps (Sphecidae)	24	1	19.32	Significant
Robber flies (Asilidae)	189	170	.90	Not sig.

Chi sq 95,1 = 3.84

a/ Each transect was 2 ft wide by one mile long. The totals were composited from 44 transects each year.

b/ Since there is only one degree of freedom, a correction for continuity was applied by reducing each (observed/expected) value by .5 before computing the Chi sq value.

Table 18. Analysis of predator distribution.[a/]

Range	Lycosidae	Asilidae	Mantidae	Sphecidae	Salticidae	Cicindelidae
Winter (22E)	120	98	6	17	8	3
Light (23W)	38	99	2	4	6	3
Moderate (15E)	73	95	5	3	13	4
Heavy (23E)	57	67	3	1	4	6
Total	288	359	16	25	31	16
Chi sq Value:	51.18	7.78	2.50	25.44	5.76	1.50
Conclusion:	Significant	Not significant	Not significant	Significant	Not significant	Not significant

Chi Sq $95,3 = 7.81$

a/ Each transect was 2 ft wide by one mile long. There were 11 transects walked in each pasture each year. The totals include data from the summers of 1969 and 1970.

Table 19. Prey records for a group of relatively rare robber flies at the Pawnee Site.

Order	Family	Genus	Species
	- - - - - *OSPRIOCERUS* sp. - - - - -		
Coleoptera	Meloidae	*Epicauta*	*ferruginea*
Coleoptera	Meloidae	*Zonitis*	*atripennis*
Hemiptera	Lygaeidae	*Xyonysius*	*californicus*
	- - - - - *ASILUS FORMOSUS* - - - - -		
Homoptera	Cicadellidae	*Flexamia*	*flexulosa*
	- - - - - *ASILUS MESAE* - - - - -		
Hymenoptera			
Diptera	Anthomyiidae	*Hylemya*	sp.
Orthoptera	Acrididae		
	- - - - - *ABLAUTUS MIMUS* - - - - -		
Diptera	Dolichopodidae	*Medetera*	*veles*
Diptera	Sepsidae	*Saltella*	*sphondylii*
Hemiptera	Lygaeidae	*Crophius*	*bohemani*
	- - - - - *MALLOPHORINA GUILDIANA* - - - - -		
Hemiptera	Miridae		
Hymenoptera	Mutillidae	*Dasymutilla*	*vesta*
	- - - - - *STICHOPOGON TRIFASCIATUS* - - - - -		
Homoptera	Cicadellidae	*Cuerna*	sp.

Table 20. Prey records for the robber fly *Proctacanthella* sp. at the Pawnee Site.

Order	Family	Genus	Species
1. Diptera	Chloropidae		
2. Diptera	Tephritidae	*Euarestoides*	*acutangula*
3. Diptera	Dolichopodidae	*Medetera*	*veles*
4. Diptera	Bombyliidae	*Phthiria*	*sulphurea*
5. Diptera	Tachinidae	*Mypophasia*	sp.
6. Diptera	Cecidomyiidae	*Neolasioptera*	sp.
7. Diptera	Anthomyiidae		
8. Homoptera	Cicadellidae	*Athysanella*	sp.
9. Homoptera	Cicadellidae	*Commellus*	*sexvittatus*
10. Homoptera	Cicadellidae	*Mocuellus*	*caprillus*
11. Homoptera	Cicadellidae	*Gillettiella*	*atropunctata*
12. Homoptera	Cicadellidae	*Gillettiella*	*labiata*
13. Homoptera	Cicadellidae	*Aceratagallia*	*uhleri*
14. Homoptera	Cicadellidae	*Balclutha*	*neglecta*
15. Homoptera	Cicadellidae	*Xerophloea*	sp.
16. Homoptera	Membracidae		
17. Hemiptera	Miridae	*Chlamydatus*	sp.
18. Hemiptera	Rhopalidae	*Harmostes*	*reflexulus*
19. Hymenoptera	Formicidae	*Formica*	sp.
20. Hymenoptera	Formicidae	*Tapinoma*	*sessile*
21. Hymenoptera	Braconidae	*Chelonus*	sp.
22. Hymenoptera	Pompilidae		
23. Orthoptera	Acrididae	*Opeia*	*obscura*
24. Orthoptera	Acrididae	*Eritettix*	*simplex*
25. Orthoptera	Acrididae	*Ageneotettix*	*deorum*

Average prey length[a/] = .37 ± .23

Average prey width[a/] = .09 ± .04

Average dorsal area (L × W)[a/] = .03

N = 30

[a/] Measurements expressed in centimeters.

Table 21. Prey records for the robber fly *Efferia* sp. at the Pawnee Site.

Order	Family	Genus	Species
1. Diptera	Asilidae	*Mallophorina*	*guildiana*
2. Diptera	Asilidae	*Asilus*	*mesae*
3. Diptera	Asilidae	*Proctacanthella*	*leucopogon*
4. Diptera	Asilidae	*Efferia*	*staminea*
5. Diptera	Tachinidae	*Siphosturmia*	*maltana*
6. Diptera	Bombyliidae	*Villa*	*perplexa*
7. Diptera	Bombyliidae	*Villa*	*alternata*
8. Diptera	Bombyliidae	*Exoprosopa*	*dodrina*
9. Diptera	Bombyliidae	*Poecilanthrax*	*alpha*
10. Diptera	Bombyliidae	*Anastoechus*	*barbatus*
11. Diptera	Bombyliidae	*Phthiria*	sp.
12. Diptera	Muscidae	*Haematobia*	*irritans*
13. Diptera	Otitidae	*Chrysomyza*	sp.
14. Diptera	Sarcophagidae	*Ravinia*	*planifrons*
15. Orthoptera	Acrididae	*Paropomala*	*wyomingensis*
16. Orthoptera	Acrididae	*Opeia*	*obscura*
17. Orthoptera	Acrididae	*Melanoplus*	*infantilis*
18. Orthoptera	Acrididae	*Melanoplus*	*foedus*
19. Orthoptera	Acrididae	*Encoptolophus*	*sordidus*
20. Orthoptera	Acrididae	*Cordillacris*	*occipitalis*
21. Orthoptera	Acrididae	*Trachyrhachys*	*aspera*
22. Orthoptera	Acrididae	*Trachyrhachys*	*kiowa*
23. Orthoptera	Acrididae	*Eritettix*	*simplex*
24. Orthoptera	Acrididae	*Ageneotettix*	*deorum*
25. Orthoptera	Acrididae	*Phlibostroma*	*quadrimaculatum*
26. Neuroptera	Myrmeleontidae	*Hesperoleon*	*nigrilabris*
27. Hemiptera	Alydidae	*Alydus*	*curinus*
28. Hemiptera	Miridae	*Stictopleurus*	sp.
29. Hemiptera	Miridae	*Melanothichus*	sp.
30. Homoptera	Cicadellidae	*Athysanella*	sp.
31. Homoptera	Cicadellidae	*Cuerna*	*striata*
32. Homoptera	Cicadellidae	*Aceratagallia*	*uhleri*
33. Homoptera	Cicadellidae	*Cabrulus*	*laberculus*
34. Lepidoptera	*Arctiidae*		
35. Lepidoptera	Noctuidae		
36. Lepidoptera	Hesperiidae		
37. Coleoptera	Hydrophilidae	*Sphaeridium*	*scarabaeoides*
38. Coleoptera	Scarabaeidae	*Aphodius*	*haemorrhoidalis*
39. Hymenoptera	Formicidae	*Formica*	sp.
40. Hymenoptera	Formicidae	*Myrmica*	sp.
41. Hymenoptera	Sphecidae	*Tachysphex*	sp.
42. Hymenoptera	Apidae	*Epeolus*	sp.
43. Hymenoptera	Braconidae	*Urosigalphus*	sp.
44. Hymenoptera	Ichneumonidae		
45. Odonata	Coenagrionidae	*Enallagma*	*praevarum*

Average prey length[a/] = 1.11 ± .73
Average prey width = .22 ± .12
Average dorsal area (L × W) = .25
N = 68

[a/] Measurements expressed in centimeters.

Table 22. Prey records for the robber fly *Proctacanthus milbertii* at the Pawnee Site.

Order	Family	Genus	Species
1. Orthoptera	Acrididae	*Opeia*	*obscura*
2. Orthoptera	Acrididae	*Arphia*	sp.
3. Orthoptera	Acrididae	*Arphia*	*pseudonietana*
4. Orthoptera	Acrididae	*Trachyrhachys*	*kiowa*
5. Orthoptera	Acrididae	*Melanoplus*	sp.
6. Orthoptera	Acrididae	*Melanoplus*	*infantilis*
7. Diptera	Asilidae		
8. Diptera	Asilidae	*Mallophorina*	*guildiana*
9. Diptera	Asilidae	*Stenopogon*	*picticornis*
10. Diptera	Asilidae	*Proctacanthus*	*milbertii*
11. Diptera	Bombyliidae		
12. Diptera	Bombyliidae	*Villa*	sp.
13. Diptera	Bombyliidae	*Poecilanthrax*	*signatipennis*
14. Diptera	Tachinidae	*Ptilodexia*	sp.
15. Hymenoptera	Formicidae		
16. Hymenoptera	Formicidae	*Formica*	sp.
17. Hymenoptera	Apidae	*Bombus*	sp.
18. Hymenoptera	Halictidae	*Agapostemon*	*angelicus*
19. Coleoptera	Hydrophilidae	*Sphaeridium*	*scarabaeoides*
20. Coleoptera	Cicindelidae	*Cicindela*	*punctulata*
21. Coleoptera	Carabidae	*Harpalus*	sp.
22. Coleoptera	Scarabaeidae		
23. Coleoptera	Histeridae	*Hister*	*abbreviatus*
24. Lepidoptera	Hesperiidae		
25. Neuroptera	Myrmeleontidae	*Hesperoleon*	*abdominalis*
26. Neuroptera	Myrmeleontidae	*Hesperoleon*	*nigrilabris*
27. Odonata			
28. Homoptera			

Average prey length[a/] = .91 ± .95
Average prey width = .18 ± .18
Average dorsal area = .16
N = 41

[a/] Measurements expressed in centimeters.

Table 23. Prey records for the robber fly *Stenopogon picticornis* at the Pawnee Site.

Order	Family	Genus	Species
1. Orthoptera	Acrididae	*Opeia*	*obscura*
2. Orthoptera	Acrididae	*Trachyrhachys*	*kiowa*
3. Orthoptera	Acrididae	*Melanoplus*	*gladstoni*
4. Orthoptera	Acrididae	*Melanoplus*	sp.
5. Orthoptera	Acrididae	*Melanoplus*	*infantilis*
6. Orthoptera	Acrididae	*Melanoplus*	*sanguinipes*
7. Orthoptera	Acrididae	*Melanoplus*	*femur-rubrum*
8. Orthoptera	Acrididae	*Encoptolophus*	*sordidus*
9. Orthoptera	Acrididae	*Phlibostroma*	*quadrimaculatum*
10. Orthoptera	Acrididae	*Ageneotettix*	*deorum*
11. Homoptera	Cicadellidae	*Cuerna*	sp.
12. Diptera	Asilidae	*Efferia*	*helenae*

Average prey length[a/] = 1.69 ± .77

Average prey width[a/] = .26 ± .11

Average dorsal area (L × W)[a/] = .44

N = 17

[a/] Measurements expressed in centimeters.

Table 24. Prey records for the robber fly *Lasiopogon quadrivittatus* at the Pawnee Site.

Order	Family	Genus	Species
Diptera	Anthomyiidae	*Hylemya*	*cinerella*
		Hylemya	*platura*
	Asilidae	*Lasiopogon*	sp.
	Chironomidae	*Orthocladiinae*[a/]	
	Chloropidae	*Thaumatomyia*	*appropinqua*
	Sarcophagidae	*Ravinia*	*planifrons*
Homoptera	Cicadellidae	*Parabolocratus*	*viridis*
	Psyllidae	*Aphalara*	sp.

Average prey length[b/] = .56 ± .13

Average prey width[b/] = .14 ± .04

N = 14

a/ Subfamily.
b/ Measurements expressed in centimeters.

Table 25. Robber fly prey-predator matrix.

Prey	*Efferia* sp.	*Asilus* sp.	*Ablautus mimus*	*Lasiopogon quadrivittatus*	*Proctacanthella* sp.	*Proctacanthus* sp.	*Stenopogon picticornis*	Total
Coleoptera	6	0	0	0	0	5	0	11
Diptera	30	5	4	14	15	19	1	88
Hemiptera	3	0	2	0	2	0	0	7
Homoptera	8	1	1	2	18	1	1	32
Hymenoptera	12	3	0	0	8	7	0	30
Lepidoptera	9	0	0	0	0	3	0	12
Odonata	1	0	0	0	0	1	0	2
Orthoptera	31	2	0	0	4	12	15	64
Neuroptera	2	0	0	0	0	2	0	4
TOTAL	102	11	7	16	47	50	17	250

Table 26. Percentage of robber fly species engaged in feeding activities during any given time period.

Robber Fly	Number Feeding	Number Not Feeding	Percent Feeding
Proctacanthus milbertii	3	25	10.7
Stenopogon picticornis	5	50	9.1
Efferia sp.	17	152	10.1
Proctacanthella sp.	5	69	6.8
TOTAL	30	296	10.1

(unpublished) are available from a previous study which shows activity patterns for most of these species.

Parasite study. Although there have been reports of high parasitism rates for grasshoppers from other grassland areas, this does not seem to be the case for the grasshoppers at the IBP site. A total of 204 grasshoppers have been dissected so far without finding any evidence of internal parasites.

A report on parasites of Wyoming grasshoppers in an area of similar elevation and vegetation noted that less than 2% of the grasshoppers were infested (Lavigne and Pfadt 1966).

The grasshoppers collected during the summer of 1970 are still being dissected. It is becoming apparent, however, that the grasshopper parasites probably play a minor role in the population dynamics of the grasshoppers at the Pawnee Site.

Other Data

Other ants. None of the methods currently in use are satisfactory for determining density and biomass estimates for any other species of ant present on site, nor is such data being collected by the comprehensive site people. A list of ants recorded by R. E. Gregg from Weld County, Colorado is presented in Table 27. Ants collected from the soil cores have been tentatively identified by Lavigne, and this list will be included in the supplementary report after these identifications have been verified by Dr. Gregg. If ants prove to be as important in the grassland as they are in old field ecosystems, then present priorities of invertebrate specialists need to be reevaluated.

Food web. One of the objectives of this study is to determine the paths of energy flow through the grassland ecosystem. The food web presented as

Table 27. Ants recorded in Weld County, Colorado by R. E. Gregg.

Camponotus (Tanaemyrmex) vicinus Mayr

Dorymyrmex (Conomyrma) pyramicus (Roger)

Eciton (Neivamyrmex) nigrescens (Cresson)

Formica (Raptiformica) bradleyi Wheeler

Formica cinerea lepida Wheeler

Formica dakotensis montigena Wheeler

Formica fusca argentea Wheeler

Formica (Proformica) limata Wheeler

Formica neoclara Emery

Formica (Proformica) neogagates Emery

Formica obscuripes Forel

Formica (Raptiformica) obtusopilosa

Formica oreas Wheeler

Formica ravida Wheeler

Lasius alienus americanus Emery

Lasius (Acanthomiyops) latipes (Walsh)

Lasius niger neoniger Emery

Leptothorax tricarinatus Emery

Monomorium minimum (Buckley)

Myrmica brevinodis sulcinodoides Emery

Myrmica sabuleti americana Weber

Pheidole pilifera coloradensis Emery

Pogonomyrmex occidentalis (Cresson)

Solenopsis (Diplorhoptrum) molesta validiuscula Emery

Solenopsis (Diplorhoptrum) salina Wheeler

Tapinoma sessile (Say)

Fig. 10 is constantly built on from year to year as more information becomes available. The ideal, of course, will be food webs built around individual plant species. While such information currently has no place in the mathematical model, it is hoped that by building up these submodels we will be more accurate in determining values for the main model.

SUMMARY

A major portion of the research this past year has been concerned with the western harvester ants, robber flies, and monitoring the population changes of other insect predators.

The western harvester ants are important components of the insect fauna since they denude large areas, consume large quantities of seed, prey on other insects, till the soil, function as scavengers, and maintain high and rather constant populations throughout the year.

The colony density of western harvester ants was shown to vary with grazing intensity. The highest density occurred in the winter use pasture and the lowest density occurred in the heavy use pasture.

An estimate was made of the amount of energy flowing through the western harvester ant population. The estimated values ranged from 6.48 kcal/m^2/year in the winter use pasture to 1.99 kcal/m^2/year in the heavy use pasture.

The importance of robber flies and other insect predators in the grassland ecosystem have never been fully ascertained. The robber flies are secondary and higher order consumers and, as such, will probably never account for a large portion of the total insect biomass. They may, however, prove to be important in the population dynamics of other insects.

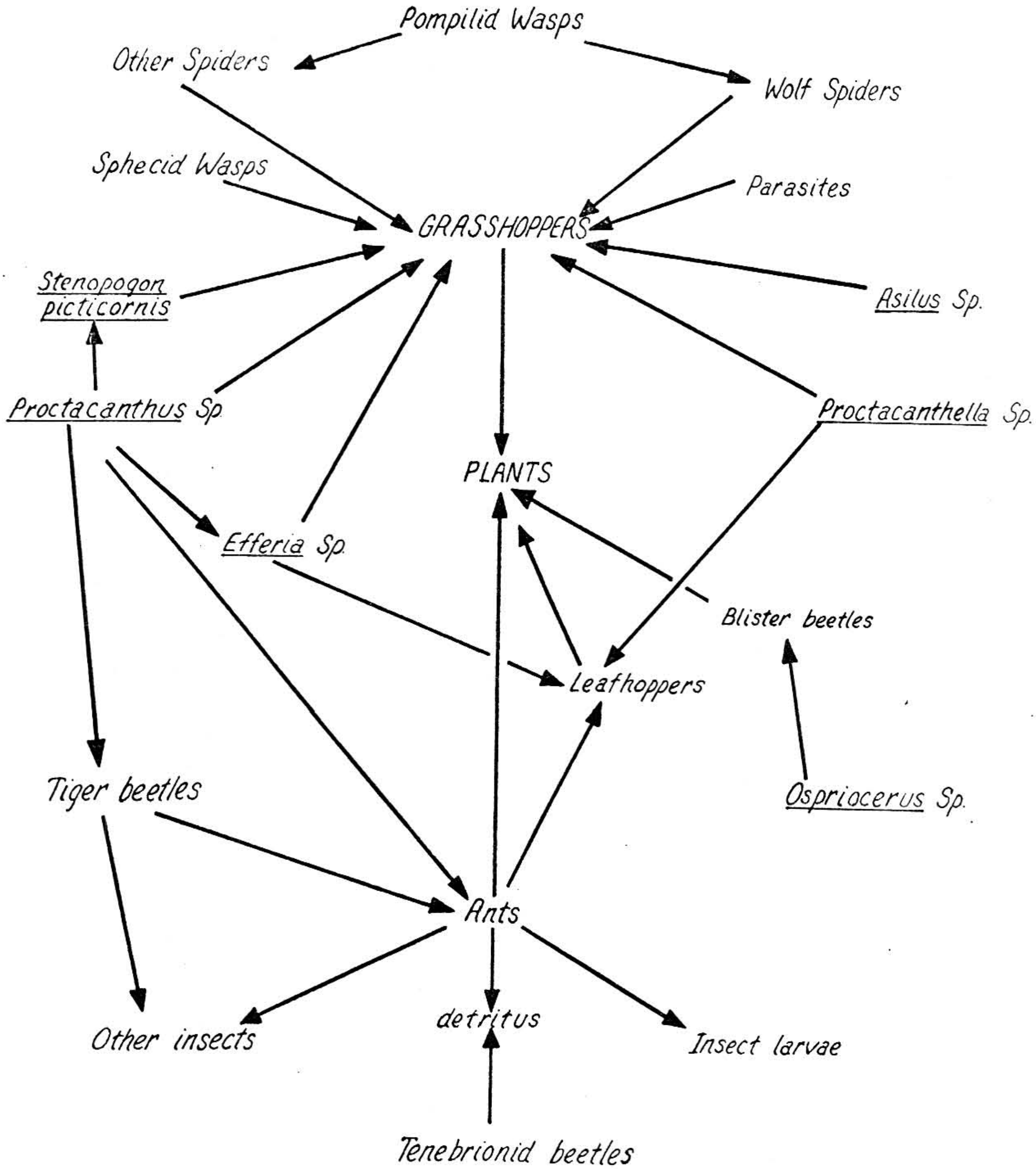

Fig. 10. Insect food web for the Pawnee Site.

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APPENDIX I

FIELD DATA

Western Harvester Ant Forage Rate Data

Western harvester ant forage rate data is Grassland Biome data set A2U306B. Data were collected on the data form shown as Fig. 2. A listing of the data follows.

+++ FIELD DATA +++

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

060570 20900    1  8  5AND W  1  .0018HYMFOR
060570 20900    2      PLV P  5  .0035
060570 20900    3      ANF P  1  .0004
060570 20900    4      PLS P  1  .0014   GRA  AR LO
060570 21000    1  6  5PLS W  1  .0023   GRA  AR LO
060570 21000    2      PLV P  5  .0108
060570 21300    1  3  5PLV P  3  .0034
060570 21400    1 12  5PLV P 10  .0072
060570 21400    2      ANF P  1  .0011
060570 21400    3      MIN P  1  .0022
060570 21500    1  7  5PLV P  6  .0105
060570 21500    2      AND P  1  .0042HYM
060570 21600    1  5  5PLV P  4  .0011
060570 21600    2      AND P  1  .0010
061570 2080024  1  1  5PLV P  1  .0005
061570 20900    1  6  5MIN P  4  .0136       LICHEN
061570 20900    2      PLV P  1  .0052
061570 20900    3      ANF P  1  .0004
061570 21000    1  9  5PLV P  3  .0115
061570 21000    2      ANF P  1  .0290   AVE
061570 21000    3      MIN P  3  .0590
061570 21000    4      PLS W  1  .0023   GRA  AR LO
061570 21100    1  5  5PLS P  1  .0016   GRA  AR LO
061570 21100    2      PLV P  2  .0007
061570 21100    3      PLV P  1  .0095       LICHEN
061570 21100    4      MIN P  1  .0125
061570 21200    1  3  5PLV P  3  .0164
061570 21300    1  3  5PLV P  1  .0022
061570 21300    2      MIN P  2  .0172
061570 21400    1  9  5MIN P  2  .0760
061570 21400    2      AND W  1  .0015HYMFOR
061570 21400    3      AND P  2  .0007HYMFOR
061570 21400    4      PLV P  4  .0030
061570 21500    1  4  5PLV P  3  .0002
061570 21500    2      PLS P  1  .0009   GRA  AR LO
061570 21600    1  8  5PLV P  7  .0278
061570 21600    2      MIN P  1  .0008
061570 40900    1  3  5ANF P  1  .0075
061570 40900    2      MIN P  2  .0096
061570 41000    1  5  5AND P  1  .0004HYMFOR
061570 41000    2      PLS P  1  .0021   CHE  CO SP
061570 41000    3      MIN P  1  .0073
061570 41000    4      PLV P  2  .0012   GRA  AR LO
```

061570	41100	1	5	5PLV	P	4	.0057			
061570	41100	2		PLS	W	1	.0021	BOR	LA	OC
061570	41200	1	2	5MIN	P	1	.0205			
061570	41200	2		PLS	P	1	.0013	GRA	AR	OL
061570	41300	1	7	5PLV	P	4	.0035			
061570	41300	2		PLS	P	1	.0018	BOR	LA	OC
061570	41300	3		MIS	P	1	.0012			
061570	41300	4		PLS	W	1	.0004	COM	ER	SP
061570	41400	1	6	5PLS	W	4	.0019			
061570	41400	2		PLV	P	2	.0006			
061570	41500	1	3	5PLS	W	2	.0010	COM	ERE	SP
061570	41500	2		PLV	P	1	.0032	GRA	AR	LO
061570	41600	1	5	5MIN	P	1	.0142			
061570	41600	2		PLS	W	1	.0005	COM	ERE	SP
061570	41600	3		PLV	P	3	.0038			
063070	20842	1	5	10PLS	W	1	.0032	UMB	MU	DI
063070	20842	2		AND	P	1	.0058COL			
063070	20842	3		AND	W	1	.0002HYMFOR			
063070	21623	1	6	2MIS	P	1	.0053			
063070	21623	2		PLS	W	1	.0006	COM	ER	SP
063070	21623	3		PLS	W	1	.0016	GRA	AR	LO
063070	21623	4		PLS	W	1	.0014	GRA	AR	LO
063070	21623	5		PLV	P	1	.0006			
063070	21623	6		AND	W	1	.0004HOMCIC			
063070	21015	1	11	10PLS	W	1	.0084	NYC	MI	LI
063070	21015	2		PLS	W	1	.0100	NYC	MI	LI
063070	21015	3		PLR	P	1	.0040			
063070	21015	4		PLV	P	1	.0011			
063070	21015	5		PLS	W	1	.0015	GRA	AR	LO
063070	21015	6		PLS	W	1	.0011	NYC	MI	LI
063070	20912	1	1	1AND	W	1	.0001HOMAPH			
063070	21504	1	8	2AND	W	1	.0012ORTACR			
063070	21504	2		AND	W	1	.0002HOMAPH			
063070	21504	3		AND	W	1	.0011HOMCIC			
063070	21426	1	7	10AND	W	1	.0014HOMCIC			
063070	21426	2		AND	P	1	.0005HYMFOR			
063070	21426	3		AND	P	1	.0011HYMFOR			
063070	21456	1	7	2AND	W	1	.0012HYMFOR			
063070	21456	2		AND	P	1	.0009HOMCIC			
063070	21456	3		MIN	W	1	.0019			
063070	21456	4		AND	W	1	.0002HOMCIC			
063070	21548	1	5	2AND	P	1	.0002HOMAPH			
063070	21548	2		PLV	P	1	.0003			
063070	21550	1	6	2PLS	W	1	.0094	NYC	MI	LI
063070	21550	2		PLS	W	1	.0032	GRA	BU	DA
063070	21550	3		AND	P	1	.0000HYMFOR			
063070	21550	4		AND	W	1	.0000ACA			
070170	41405	1	10	5PLS	W	1	.0060	NYC	MI	LI
070170	41405	2		PLS	W	1	.0043	NYC	MI	LI
070170	41405	3		AND	P	1	.0003HYMFOR			
070170	41405	4		AND	P	1	.0000HOMCIC			

070170	41405	5		AND	P	1	.0004HYMFOR			
070170	41405	6		PLS	W	1	.0004	CRU	LE	DE
070170	41405	7		PLS	W	1	.0002	CRU	LE	DE
070170	41405	8		PLS	W	1	.0002	CRU	LE	DE
070170	40853	1	18	3PLV	P	1	.0016	GRA	GA	CO
070170	40853	2		ANF	W	1	.0079	AVE		
070170	40853	3		PLS	W	1	.0015	CRU	LE	DE
070170	40853	4		PLS	W	1	.0008	CRU	LE	DE
070170	40853	5		PLS	W	1	.0005	CRU	LE	DE
070170	40853	6		PLV	P	1	.0001			
070170	40853	7		PLV	P	1	.0005			
070170	40853	8		PLV	P	1	.0008			
070170	40853	9		AND	P	1	.0000			
070170	40853	10		MIS	P	1	.0002			
070170	41034	1	8	4PLV	P	1	.0003			
070170	41034	2		PLS	W	1	.0006	CRU	LE	DE
070170	41034	3		PLV	P	1	.0005			
070170	41034	4		PLS	W	1	.0005	CRU	LE	DE
070170	41535	1	17	10AND	P	1	.0056COLCAR			
070170	41535	2		AND	W	1	.0002DIP			
070170	41535	3		AND	P	1	.0019COL			
070170	41535	4		ANF	P	1	.0059			
070170	41535	5		PLS	W	1	.0009	CRU	LE	DE
070170	41535	6		PLS	W	1	.0008	CRU	LE	DE
070170	41535	7		PLS	W	1	.0003	CRU	LE	DE
070170	41535	8		PLS	W	1	.0007	CRU	LE	DE
070170	41535	9		PLS	W	1	.0002	CRU	LE	DE
070170	41535	10		PLS	W	1	.0003	CRU	LE	DE
070170	41535	11		PLS	W	1	.0003	CRU	LE	DE
070170	41535	12		PLS	W	1	.0002	CRU	LE	DE
070170	41535	13		PLS	W	1	.0010	GRA	AR	LO
070170	41535	14		AND	P	1	.			
070170	41535	15		PLV	P	1	.0002			
070170	41510	1	10	5PLS	W	1	.0043	NYC	MI	LI
070170	41510	2		PLS	W	1	.0022	NYC	MI	LI
070170	41510	3		PLS	W	1	.0004	CRU	LE	DE
070170	41510	4		PLS	W	1	.0015	CRU	LE	DE
070170	41510	5		PLS	W	1	.0005	CRU	LE	DE
070170	41510	6		PLS	W	1	.0004	CRU	LE	DE
070170	41510	7		PLS	W	1	.0003	CRU	LE	DE
070170	41510	8		AND	P	1	.0006HYMFOR			
070170	41510	9		AND	P	1	.0002HYMFOR			
070170	41510	10		PLV	P	1	.0001			
070170	40934	1	16	4PLS	W	1	.0063	NYS	MI	LI
070170	40934	2		PLS	W	1	.0003	CRU	LE	DE
070170	40934	3		PLS	W	1	.0006	CRU	LE	DE
070170	40934	4		PLS	W	1	.0009	CRU	LE	DE
070170	40934	5		PLS	W	1	.0010	CRU	LE	DE
070170	40934	6		PLS	W	1	.0003	CRU	LE	DE
070170	40934	7		PLS	W	1	.0009	CRU	LE	DE
070170	40934	8		PLS	W	1	.0008	CRU	LE	DE

070170	40934	9		PLS	W	1	.0008	CRU	LE	DE
070170	40934	10		PLS	W	1	.0006	CRU	LE	DE
070170	40934	11		PLS	W	1	.0007	CRU	LE	DE
070170	40934	12		PLS	W	1	.0034	LEG	TR	PR
070170	40934	13		PLS	W	1	.0004	CRU	LE	DE
070170	40934	14		PLS	W	1	.0005	CRU	LE	DE
070170	40934	15		MIS	P	1	.0012			
070670	41355	1	4	5PLR	W	8	.0020	GRA	BU	DA
070670	41355	2		PLS	W	1	.0067	GRA	BU	DA
070670	41355	3		PLS	W	1	.0002	GRA	DA	GL
070670	41355	4		PLS	W	1	.0010	BOR	HA	SP
070670	41535	1	8	5PLR	W	20	.0075	GRA	BU	DA
070670	41535	2		PLV	P	1	.0007			
070670	41535	3		PLS	W	2	.0158	GRA	BU	DA
070670	41535	4		ANF	W	1	.0259			
070670	41620	1	12	5PLR	W	31	.0102	GRA	BU	DA
070670	41620	2		PLS	W	4	.0236	GRA	BU	DA
070670	41620	3		PLS	W	1	.0001	GRA	DA	GL
070670	41620	4		PLV	P	1	.0015			
070670	41719	1	4	2PLR	W	1	.0016	GRA	BU	DA
070670	41719	2		PLS	W	1	.0056	GRA	BU	DA
070670	41719	3		PLV	P	1	.0082			
070670	41323	1	7	3PLR	W	28	.0063	GRA	BU	DA
070670	41323	2		AND	P	1	.0039COL			
070670	41323	3		PLV	P	1	.0020			
070670	41323	4		PLR	W	1	.0037	ONA	GA	CO
070770	40705	1	4	4PLS	W	1	.0034	GRA	BU	DA
070770	40705	2		PLV	P	1	.0006	GRA	BU	DA
070770	40800	1	5	7PLS	W	1	.0078	GRA	BU	DA
070770	40800	2		PLV	P	1	.0001			
070770	40800	3		PLV	P	1	.0010			
070770	40800	4		PLS	W	1	.0002	GRA	FE	OC
070770	40825	1	10	3PLS	W	2	.0070	GRA	BU	DA
070770	40825	2		PLS	W	1	.0025	GRA	BU	DA
070770	40825	3		PLS	W	1	.0025	CYP	CA	SP
070770	40825	4		PLS	W	1	.0008	COM	AS	TA
070770	40825	5		PLV	P	2	.0001			
070770	40825	6		AND	W	1	.0002COLHIS			
070770	41000	1	11	4AND	W	1	.0003HYMFOR			
070770	41000	2		AND	W	1	.0005HEMPYR			
070770	41000	3		PLR	W	10	.0021	GRA	BU	DA
070770	41000	4		PLS	W	1	.0042	GRA	BU	DA
070770	41000	5		PLS	W	1	.0061	NYC	MI	LI
070770	41000	6		PLS	W	1	.0023	GRA	BU	DA
070770	41000	7		PLS	W	1	.0006	GRA	DA	GL
070770	41000	8		PLS	W	1	.0001	CRU	LE	DE
070770	41000	9		PLV	P	1	.0072			
070770	41030	1	7	3PLS	W	1	.0002	CRU	LE	DE

070770 41030	2		PLS	W	3	.0001	CRU	LE	DE	
070770 41030	3		PLV	P	2	.0005				
070770 41030	4		MIN	P	1	.0147				
070870020725	1	5	4ANF	W	1	.0135				
070870020725	2		ANF	W	1	.0017				
070870020725	3		PLV	P	2	.0032				
070870020725	4		AND	P	1	.0006INS				
070870020833	1	11	3ANF	P	1	.0468				
070870020833	2		PLV	P	7	.0093				
070870020833	3		PLV	P	1	.0005				
070870021036	1	11	6ANF	W	1	.0300				
070870021036	2		PLS	W	3	.0038	GRA	ST	CO	1
070870021036	3		PLV	P	3	.0045				
070870021036	4		AND	P	1	.0012HYMFOR				
070870020914	1	11	4PLS	W	1	.0022	GRA	AR	LO	1
070870020914	2		ANF	W	1	.0352				
070870020914	3		PLS	W	1	.0107	NYC	MT	LI	
070870020914	4		MIS	P	1	.0050				
070870020914	5		PLV	P	1	.0014				
070870020914	6		PLV	P	5	.0053				
070870021055	1	3	5PLV	P	1	.0076				
070870021055	2		PLV	P	2	.0027				
070870021430	1	7	4AND	W	1	.0006HOMCIC				
070870021430	2		PLV	P	5	.0148				
070870021440	1	1	3PLV	P	1	.0007				
070870021610	1	8	6AND	W	3	.0035HYMFOR				
070870021610	2		PLV	P	4	.0042				
070870021610	3		AND	P	1	.0002HOMCIC				
070870021712	1	13	6AND	W	1	.0017HYMFOR				
070870021712	2		PLV	P	4	.0050				
070870021712	3		PLV	P	6	.0073				
070870021712	4		PLS	W	1	.0017	GRA	AR	LO	
070870021740	1	5	5PLV	P	3	.0025				
071370 21146	1	16	3PLS	W	4	.0108	GRA	AR	LO	
071370021146	2		AND	W	1	.0009COLSCA				
071370021146	3		PLS	W	4	.0035	CRU	LE	DE	
071370021146	4		PLS	W	2	.0059	LIL	AL	SP	
071370021146	5		PLV	P	3	.0059				
071370021146	6		AND	P	1	.0001				
071370 21240	1	6	4PLV	P	3	.0095				
071370 21240	2		PLS	W	1	.0009	CRU	LE	DE	
071370 21342	1	17	5MIN	P	3	.0171				
071370 21342	2		PLS	W	4	.0056	GRA	AR	LO	
071370 21342	3		PLV	P	1	.0021				
071370 21342	4		AND	W	1	.0022HYMFOR				
071370 21342	5		PLS	W	2	.0018	CRU	LE	DE	
071370 21342	6		PLS	W	1	.0028	CAR			
071370 21342	7		PLS	W	1	.0031	UMB	MU	DI	
071370 21342	8		PLV	P	1	.0008				
071370 21342	9		AND	P	1	.0001HYMFOR				
071370 21342	10		AND	W	1	.0002DIPCHL				
071370 21342	11		AND	P	1	.0002HOMCIC				
071370 21730	1	4	3PLS	W	1	.0038LIL	AL	SP		

071370	21730	2		PLS	W	1	.0011	CRU	LE	DE
071370	21730	3		MIN	P	2	.0090			
071370	21445	1	21	5PLV	P	4	.0105			
071370	21445	2		PLS	W	6	.0133	GRA	AR	LO
071370	21445	3		MIN	P	4	.0480			
071370	21445	4		AND	W	3	.0042HYMFOR			
071370	21445	5		AND	W	1	.0008HOMCIC			
071370	21445	6		PLS	W	1	.0038	NYC	MI	LI
071370	21445	7		PLS	W	1	.0004	CRU	LE	DE
071370	21445	8		AND	P	1	.0002HOMCIC			
071370	21600	1	12	3MIN	P	4	.0168			
071370	21600	2		PLS	W	1	.0039	GRA	AR	LO
071370	21600	3		PLV	P	5	.0090			
071370	21600	4		PLS	W	1	.0027	GRA	ST	CO
071370	21600	5		PLS	W	1	.0006	CRU	LE	DE
071370	20744	1	7	4PLS	W	1	.0018	LIL	AL	SP
071370	20744	2		MIN	P	6	.0180			
071370	20847	1	22	5MIN	P	10	.0533			
071370	20847	2		PLS	W	1	.0002	CRU	LE	DE
071370	20847	3		PLS	P	1	.0001	CRU	LE	DE
071370	20847	4		PLV	P	2	.0047			
071370	20847	5		PLS	W	1	.0016	GRA	AR	LO
071370	20847	6		PLS	W	1	.0020	LIL	AL	SP
071370	20847	7		MIS	P	1	.0004			
071370	20936	1	20	4MIN	P	11	.1045			
071370	20936	2		PLS	W	1	.0024	GRA	AR	LO
071370	20936	3		PLS	P	1	.0008	GRA	AR	LO
071370	20936	4		PLS	W	1	.0009	CRU	LE	DE
071370	20936	5		PLS	P	1	.0001	CRU	LE	DE
071370	20936	6		PLV	P	1	.0008			
071370	20936	7		AND	W	1	.0005HOMCIC			
071370	20936	8		AND	W	1	.0003HYMFOR			
071370	20936	9		AND	W	2	.0028COLSCA			
071370	21039	1	22	4MIN	P	4	.0600			
071370	21039	2		PLS	W	3	.0078	GRA	AR	LO
071370	21039	3		PLS	P	1	.0055	GRA	AR	LO
071370	21039	4		AND	P	2	.0021			
071370	21039	5		PLS	W	2	.0007	CRU	LE	DE
071370	21039	6		AND	W	2	.0028COLSCA			
071370	21039	7		PLV	P	2	.0006			
071470	40845	1	5	5ANP	W	2	.0022COLSCA			
071470	40845	2		ANP	W	2	.0004ISO			
071470	40845	3		ANF	W	1	.0013			
071470	40845	4		MIN	P	1	.0061			
071470	41011	1	18	5ANP	W	5	.0049COLSCA			
071470	41011	2		AND	P	1	.0003HOMCIC			
071470	41011	3		MIN	P	10	.1467			
071470	41011	4		AND	P	1	.0007HYMFOR			
071470	41011	5		PLV	P	1	.0040			
071470	41200	1	11	5ANP	W	7	.0074COLSCA			
071470	41200	2		AND	P	1	.0013COLSCA			

071470	41200	3		MIN	P	1	.0219			
071470	41200	4		PLS	W	1	.0078	NYC	MI	LI
071470	41200	5		AND	P	1	.0005HYMFOR			
071470	41035	1	7	5ANP	W	4	.0019COLSCA			
071470	41035	2		PLS	W	1	.0061	NYC	MI	LI
071470	41035	3		MIN	P	2	.0115			
071470	41035	4		AND	P	1	.0002COL			
071470	41240	1	12	5ANP	W	7	.0071COLSCA			
071470	41240	2		PLS	W	1	.0001			
071470	41240	3		MIN	P	1	.0092			
071470	41240	4		PLS	P	1	.0003	CRU	LE	DE
071470	41240	5		PLS	P	1	.0015	GRA	AR	LO
071470	41335	1	5	5ANP	P	2	.0026COLSCA			
071470	41335	2		PLV	P	2	.0023			
071470	41335	3		MIN	P	1	.0075			
071470	41435	1	7	5PLS	W	2	.0004	CRU	LE	DE
071470	41435	2		PLS	W	1	.0004	GRA	ST	VI
071470	41435	3		MIN	P	4	.0582			
071470	41602	1	9	5AND	W	1	.0014HYMFOR			
071470	41602	2		MIN	P	4	.0350			
071470	41602	3		PLV	P	1	.0025			
071470	41602	4		PLS	W	1	.0002	GRA	FE	OC
072170	20820	1	1	5PLS	W	1	.0017	MAL		
072170	20905	1	2	5PLS	W	2	.0010	COM	BA	OP
072170	20905	2		PLS	W	1	.0031	GRA	EL	CA
072170	20905	3		PLS	W	1	.0009	GRA	AR	LO
072170	21125	1	16	5PLS	W	2	.0056	GRA	EL	GL
072170	21125	2		PLS	W	6	.0035	COM	BA	OP
072170	21125	4		PLS	W	1	.0016	GRA	AR	LO
072170	21125	5		AND	W	1	.0004HOMCIC			
072170	21125	6		PLR	W	2	.0004	COM	BA	OP
072170	21125	7		MIS	P	3	.0101			
072170	21440	1	15	5PLS	W	2	.0040	GRA	EL	CA
072170	21440	2		PLS	W	1	.0011	GRA	AR	LO
072170	21440	3		PLS	W	3	.0016	COM	BA	OP
072170	21440	4		AND	W	2	.0016HYMFOR			
072170	21440	5		PLR	P	2	.0056			
072170	21440	6		MIN	P	1	.0011	ONA	DE	AL
072170	21440	7		AND	W	1	.0001HEMLYG			
072170	21440	8		AND	W	1	.0005HYMCHA			
072170	21320	1	2	15PLV	P	2	.0005			
072170	21400	1	7	5AND	W	2	.0021HYMFOR			
072170	21400	2		PLS	W	2	.0008	COM	BA	OP
072170	21400	3		AND	P	1	.0003HYMFOR			
072170	21400	4		ANF	P	1	.0015			
072170	21400	5		PLV	P	1	.0001			
072170	21550	1	12	5PLS	W	1	.0009			
072170	21550	2		PLS	W	2	.0043	GRA	EL	GL
072170	21550	3		PLS	W	1	.0009	BOR	LA	OC
072170	21550	4		PLV	P	1	.0024			
072170	21550	5		PLV	P	3	.0052			

072170	21550	6		AND	P	1	.0005HYM			
072170	21550	7		MIN	P	1	.0011			
072170	21550	8		AND	P	1	.0004			
072270	41015	1	4	5PLV	P	3	.0109			
072270	41035	1	8	5PLV	P	6	.0053			
072270	41035	2		ANF	P	2	.0232			
072270	41205	1	7	5PLS	W	2	.0046	UMB	MU	DI
072270	41205	2		PLV	P	1	.0011			
072270	41205	3		MIN	P	1	.0155			
072270	41205	4		PLS	W	2	.0054	LEG	OX	SE
072270	41205	5		PLV	P	1	.0003			
072270	41245	1	4	5PLV	P	1	.0019			
072270	41245	2		PLS	W	1	.0028	BOR	LA	SP
072270	41245	3		PLS	W	1	.0012	CYP	SC	PA
072270	41245	4		PLS	W	1	.0022	LEG	OX	SE
072270	41430	1	3	5PLS	W	1	.0038	UMB	MU	DI
072270	41430	2		PLS	W	1	.0004	CHE	CH	SP
072270	41430	3		AND	P	1	.0003HOMCIC			
072270	41515	1	2	5PLV	P	1	.0025			
072270	41515	2		PLS	P	1	.0019			
072770	21150	1	3	5PLS	W	3	.0018	COM	BA	OP
072770	21049	1	12	4PLS	W	12	.0059	COM	BA	OP
072770	21049	2		PLS	W	1	.0005	GRA	BO	CU
072770	21300	1	1	6PLS	W	1	.0003	COM	BA	OP
072770	21351	1	11	6PLS	W	6	.0037	COM	LA	SP
072770	21351	2		PLS	W	3	.0064	BOR	CR	MI
072770	21351	3		ANF	P	1	.0090			
072770	21351	4		PLV	P	1	.0003			
072770	21419	1	1	4PLS	W	1	.0002	COM	BA	OP
072870	20830	1	6	5PLS	W	3	.0016	BOR	LA	OC
072870	20830	2		PLS	W	1	.0030	BOR	LA	OC
072870	20830	3		MIN	P	1	.0067			
072870	20830	4		PLV	P	1	.0010			
072870	21255	1	5	5PLS	W	1	.0034	UMB	UM	BI
072870	21255	2		PLS	W	3	.0020	BOR	LA	OC
072870	21255	3		AND	W	1	.0005HYMFOR	MYRSAB		
072870	21255	4		MIN	P	1	.0052			
072870	20730	1	3	SAND	P	1	.0002			
072870	21035	1	2	SAND	P	1	.0003HYMFOR			
072870	21035	2		PLV	P	1	.0003			
072870	21100	1	9	5PLS	W	1	.0036			
072870	21100	2		PLS	W	3	.0015			
072870	21100	3		MIN	P	1	.0067			
072870	21100	4		PLV	P	3	.0027			
072870	21400	1	7	5PLS	W	3	.0043	BOR	LA	OC

072870	21400	2		MIN	P	3	.0285		
072870	21400	3		AND	P	1	.0005		
072870	21455	1	4	5PLV	P	4	.0052		
072870	21535	1	6	5PLV	W	1	.0065		LICHEN
072870	21535	2		PLS	W	2	.0027	BOR	LA OC
072870	21535	3		PLS	W	1	.0002	GRA	BO GR
072870	21535	4		PLS	P	1	.0003		
072870	21610	1	1	5PLS	W	1	.0010	BOR	LA OC
081270	41300	1	4	3PLV	W	2	.0056		LICHEN
081270	41300	2		PLV	P	2	.0047		
081270	41425	1	4	1ANP	W	1	.0030LEP		
081270	41425	2		2PLS	W	2	.0016	COM	BA OP
081270	41425	3		AND	W	1	.0009HOMCIC		
081270	41156	1	5	3PLV	P	5	.0019		
081270	41220	1	14	3PLS	W	8	.0033	COM	BA OP
081270	41220	2		PLS	W	1	.0006	COM	AS TA
081270	41220	3		PLS	W	1	.0009	POL	PO AV
081270	41220	4		PLV	P	4	.0024		
081270	41320	1	12	3PLS	W	2	.0017	COM	AS TA
081270	41320	2		PLS	W	2	.0012	COM	BA OP
081270	41320	3		PLV	P	3	.0032		
081270	41320	4		AND	W	1	.0009HOMCIC		
081270	41320	5		PLS	W	1	.0009	AMA	AM RE
081270	41320	6		ANF	P	1	.0003		
081270	41400	1	7	3AND	P	2	.0045ORTACR		
081270	41400	2		PLS	W	2	.0010	COM	BA OP
081270	41400	3		PLV	P	2	.0022		
081270	41400	4		AND	W	1	.0022HEMSCU		
081370	20755	1	7	5PLV	P	2	.0088		
081370	20755	2		ANF	P	3	.0114		
081370	21020	1	13	5AND	W	1	.0030COLTEN		
081370	21020	2		PLS	W	3	.0022	COM	BA OP
081370	21020	3		ANF	P	3	.0085		
081370	21020	4		PLV	P	5	.0052		
081370	21020	5		PLS	W	1	.0016	GRA	SE VI
081370	21520	1	6	5PLV	P	3	.0072		
081370	21520	2		ANF	P	3	.0052		
081370	21600	1	15	4ANF	P	1	.0311AVE		
081370	21600	2		AND	W	1	.0077ARALYC		
081370	21600	3		PLV	P	2	.0030		
081370	21600	4		PLS	W	4	.0029	COM	BA OP
081370	21600	5		AND	P	2	.0005HYMFOR		
081370	21600	6		PLS	W	1	.0007	GRA	BO OL
081370	21600	7		MIN	P	2	.0074		
081370	21600	8		PLS	W	2	.0007	CHE	CH
081370	21655	1	8	5PLV	P	1	.0015		
081370	21655	2		AND	P	1	.0001		
081370	21655	3		PLS	W	2	.0010	CHE	CH LE
081370	21655	4		PLS	W	2	.0016	COM	BA OP
081970	20820	1	5	5AND	P	1	.0089COLCUR		
081970	20820	2		AND	P	1	.0017HEMLYG		
081970	20820	3		AND	P	1	.0041		
081970	20820	4		PLV	P	1	.0004		
081970	20820	5		MIN	P	1	.0016		
081970	20920	1	15	5PLV	P	6	.0089		
081970	20920	2		ANF	P	1	.0005		
081970	20920	3		PLS	W	4	.0026	COM	AS TA
081970	20920	4		PLS	W	1	.0017	GRA	EL JU

081970	20920	5		PLS	W	1	.0007	GRA	AR LO
081970	20920	6		PLS	W	1	.0008	CRU	LE DE
081970	20920	7		ANP	W	1	.0012COLSCA		
081970	21040	1	12	5AND	P	1	.0022HOMCIC		
081970	21040	2		AND	W	1	.0016HOMCIC		
081970	21040	3		PLS	W	2	.0014	COM	AS TA
081970	21040	4		PLS	P	1	.0007	GRA	
081970	21040	5		PLV	P	7	.0260		
081970	21210	1	6	5AND	W	1	.0032HEMNAB		
081970	21210	2		PLV	P	3	.0030		
081970	21210	3		MIS	P	1	.0126		
081970	21210	4		PLS	W	1	.0009	CRU	LE DE
081970	21320	1	7	5PLV	P	4	.0043		
081970	21320	2		PLS	P	1	.0048	CAC	OP SP
081970	21320	3		PLS	W	1	.0007	CRU	LE DE
081970	21320	4		AND	W	1	.0005HYMCHA		
081970	21515	1	12	5ANP	W	1	.0034LEP		
081970	21515	2		PLS	W	3	.0014	COM	AS TA
081970	21515	3		AND	P	1	.0128COL		
081970	21515	4		PLS	P	1	.0005	COM	AS TA
081970	21515	5		PLS	W	1	.0014	GRA	AR LO
081970	21515	6		PLV	P	3	.0038		
081970	21515	7		MIN	P	2	.0093		
081970	21715	1	3	5PLV	P	2	.0015		
081970	21715	2		PLV	P	1	.0014		
082570	40915	1	1	6ANF	P	1	.0072		
082570	41035	1	4	10PLS	W	1	.0004	CRU	LE DE
082570	41035	2		PLS	W	1	.0012	COM	AS TA
082570	41035	3		AND	W	1	.0003HYMFOR		
082570	41035	4		ANF	P	1	.0012		
082570	41400	1	3	5PLV	P	3	.0028		
082570	41600	1	2	15PLV	P	1	.0000		
082570	41600	2		AND	P	1	.0001HOMCIC		
090170	20740	1	1	5MIN	P	1	.0014		
090170	20805	1	6	5MIN	P	3	.0397		
090170	20805	2		PLV	P	1	.0010		
090170	20805	3		PLR	P	1	.0026		
090170	20805	4		PLS	W	1	.0135	CAC	OP SP
090170	20910	1	14	5MIN	P	4	.0212		
090170	20910	2		PLR	P	4	.0019	POL	ER EF
090170	20910	3		PLS	P	2	.0026	GRA	AR OL
090170	20910	4		AND	P	1	.0003		
090170	20910	5		ANP	P	1	.0022		
090170	20910	6		PLS	W	1	.0008	COM	AS TA
090170	20910	7		ANP	W	1	.0005LEPPYR		
090170	21010	1	11	5PLS	W	1	.0003	COM	AS TA
090170	21010	2		PLS	W	1	.0012	COM	AS TA
090170	21010	3		PLR	P	4	.0019	POL	ER EF
090170	21010	4		PLV	P	3	.0018		
090170	21010	5		ANF	P	1	.0020		
090170	21010	6		MIN	P	1	.0024		
090770	20850	1	2	5PLV	P	1	.0000	POL	ER EF
090770	20850	2		AND	P	1	.0018COL		

090770	21120	1	15	5PLS	P	12	.0060	POL	ER	EF
090770	21120	2		PLS	W	1	.0004	COM	BA	OP
090770	21120	3		PLV	P	2	.0002			
090770	21215	1	2	5PLS	P	1	.0007	POL	ER	EF
090770	21215	2		ANF	P	1	.0017			
090770	21315	1	6	5PLR	P	5	.0029	POL	ER	EF
090770	21315	2		PLS	P	1	.0026	GRA	EL	GL
090770	21145	1	5	5PLS	P	1	.0002	POL	ER	EF
090770	21145	2		PLS	W	1	.0029	GRA	EL	GL
090770	21145	3		ANF	P	1	.0019			
090770	21145	4		PLR	P	1	.0023			
090770	21145	5		PLS	P	1	.0019	GRA	EL	JU
090770	21405	1	2	5PLS	P	2	.0012	POL	ER	EF
090770	21505	1	18	5PLS	P	13	.0069	POL	ER	EF
090770	21505	2		PLV	P	1	.0013			
090770	21505	3		PLS	P	1	.0020	GRA	EL	JU
090770	21505	4		PLS	W	1	.0002	COM	HE	VI
090770	21505	5		PLS	P	1	.0037	GRA	EL	GL
090770	21505	6		PLS	W	1	.0075	ONA	MI	LI
090770	20845	4		PLS	W	1	.0001	GRA	SC	PA
090770	21610	1	25	5MIN	P	6	.0707			
090770	21610	2		PLS	P	16	.0073	POL	ER	MI
090770	21610	3		PLV	P	3	.0015	GRA	FE	OC
090770	20845	1	3	5PLS	W	1	.0023	GRA	EL	GL
090770	20845	2		PLS	W	1	.0001	COM	AS	TA
090770	20845	3		PLS	W	1	.0001	GRA	FE	OC
090770	21005	1	14	5PLS	W	1	.0029	GRA	EL	JU
090770	21005	2		PLS	W	3	.0009	GRA	FE	OC
090770	21005	3		PLS	W	1	.0023	GRA	EI	GL
090770	21005	4		AND	P	1	.0004HYMFOR			
090770	21005	5		PLV	P	4	.0031			
090770	21005	6		PLS	W	1	.0008	COM	AS	TA
090770	21005	7		PLS	W	3	.0012	COM	AS	TA
090770	20905	1	2	5PLS	W	1	.0003	GRA	FE	OC
090770	20905	2		MIN	P	1	.0025			
091970	40915	1	6	5PLS	P	1	.0016			
091970	40915	2		AND	P	1	.0008COLSCA			
091970	40915	3		PLS	W	2	.0012	POL	EP	EF
091970	40915	4		PLS	W	1	.0001	COM	HE	VI
091970	40915	5		PLV	P	1	.0001			
091970	41015	1	16	5AND	P	1	.0081DIP			
091970	41015	2		PLS	P	1	.0074	CAC	OP	SP
091970	41015	3		PLR	P	6	.0025	POL	ER	EF
091970	41015	4		PLS	W	2	.0004	GRA	BO	HI
091970	41015	5		PLV	P	6	.0022			
091970	41100	1	13	5PLS	W	1	.0080			
091970	41100	2		PLS	P	1	.0062	CAC	OP	SP
091970	41100	3		PLS	W	1	.0030	NYC	MI	LI
091970	41100	4		ANF	P	1	.0013			
091970	41100	5		PLS	W	6	.0033	POL	ER	EF

091970	41100	6		AND	P	1	.0001INS			
091970	41100	7		PLV	P	2	.0020			
091970	41345	1	7	5PLV	P	2	.0039			
091970	41345	2		AND	W	1	.0002HOMCIC			
091970	41345	3		PLS	W	1	.0003	POL	ER	EF
091970	41345	4		AND	P	1	.0002HYMFOR			
091970	41345	5		PLR	W	2	.0004	POL	ER	EF
091970	41603	1	12	5PLS	W	1	.0040			
091970	41603	2		PLS	W	1	.0004	POL	ER	EF
091970	41603	3		PLS	W	5	.0021	POL	ER	EF
091970	41603	4		PLV	P	3	.0030			
091970	41603	5		PLS	W	1	.0000			
091970	41700	1		MIN	P	1	.0035			
091970	41445	1	10	5PLS	W	3	.0020	POL	ER	EF
091970	41445	2		PLS	W	1	.0025			
091970	41445	3		ANF	P	1	.0119			
091970	41445	4		PLV	P	1	.0004			
091970	41445	5		AND	W	1	.0005HOMCIC			
091970	41445	6		AND	P	1	.0003HOMCIC			
091970	41445	7		AND	P	1	.0005COL			
091970	41445	8		AND	P	1	.0002INS			
091970	20905	1	17	5PLS	W	5	.0017	POL	ER	EF
091970	20905	2		PLS	W	4	.0010	CHE	CH	SP
091970	20905	3		PLV	P	1	.0013			
091970	20905	4		MIN	P	1	.0048			
091970	20905	5		AND	P	1	.0001HYMFOR			
091970	20905	6		PLS	W	1	.0004	POL	ER	EF
091970	20905	7		PLS	W	1	.0002	COM	HE	VI
091970	20905	8		PLV	P	3	.0006			
091970	21005	1	16	5AND	W	1	.0003HOMCIC			
091970	21005	2		PLS	W	5	.0021	POL	ER	EF
091970	21005	3		AND	P	1	.0004INS			
091970	21005	4		AND	P	1	.0009INS			
091970	21005	5		PLS	P	1	.0023	GRA	EL	GL
091970	21005	6		PLS	P	3	.0005	CHE	CH	SP
091970	21005	7		PLV	P	4	.0016			
091970	21105	1	2	5PLV	P	2	.0001			
091970	21400	1	4	5PLS	W	1	.0014	GRA	EL	GL
091970	21400	2		AND	P	1	.0003HEM			
091970	21400	3		PLS	W	1	.0004	CHE	CH	SP
091970	21400	4		PLR	W	1	.0037			
091970	21500	1	10	5PLS	W	5	.0031	POL	ER	EF
091970	21500	2		PLS	W	11	.0013	CHE	CH	SP
091970	21500	3		AND	P	1	.0008HYMFOR			
091970	21500	4		AND	W	1	.0003HEMLYG			
091970	21500	5		PLV	P	2	.0011			
091970	21550	1	9	5ANF	P	1	.0018			
091970	21550	2		PLS	W	4	.0019	POL	ER	EF
091970	21550	3		PLS	W	2	.0009	POL	ER	EF
091970	21550	4		AND	P	1	.0003HOMCIC			

091970	21550	5		PLS	W	1	.0005	CHE	CH	SP
091970	21640	1	11	5PLS	W	3	.0019	POL	ER	EF
091970	21640	2		PLS	W	1	.0007	COM	AS	TA
091970	21640	3		PLS	W	2	.0004	POL	ER	EF
091970	21640	4		PLS	P	1	.0012	GRA	AR	LO
091970	21640	5		PLS	W	2	.0004	CHE	CH	SP
091970	21640	6		PLV	P	1	.0004			
091970	21640	7		MIN	P	1	.0062			
092670	21310	1	15	5PLS	W	14	.0093	POL	ER	EF
092670	21310	2		MIN	P	1	.0060			
092670	21350	1	18	5MIN	P	2	.0226			
092670	21350	2		PLS	W	15	.0010	POL	ER	EF
092670	21350	3		PLS	P	1	.0009	GRA	AR	OL
092670	21545	1		MIN	P	2	.0059			
092670	21545	2		PLS	W	1	.0012	BOR	LA	SP
092670	21545	3		PLS	W	8	.0045	POL	ER	EF
092670	21445	1		PLS	W	7	.0042	POL	ER	EF
092670	21445	2		MIN	P	4	.0511			
092670	21445	3		PLV	P	1	.0044			
092670	21445	4		PLS	W	2	.0004	CHE	CH	SP

Western Harvester Ant Activity Data

Western harvester ant activity data is Grassland Biome data set A2U305B. Data were collected on the data form shown as Fig. 3. A listing of the data follows.

*** FIELD DATA ***

```
          1         2         3         4         5         6         7
123456789012345678901234567890123456789012345678901234567890123456789012345678

1111LR 0406702       1800 24 4 78
                     1808 24 6 76
1111LR 0506702       0747 24 1 74
                     0800 24 0 80
                     0900 24 2 90
                     1000 24 2102
                     1100 24 2108
                     1200 24 3116
                     1300 24 2118
                     1400 24 2116
                     1500 24 2106
                     1600 24 4 98
1111LR 1506702       0710 24 1 65
                     0730 24 0 66
                     0745 24 2 77
                     0800 24 2 77
                     0900 24 2 90
                     1000 24 2106
                     1100 24 2114
                     1200 24 2118
                     1300 24 2118
                     1400 24 2118
                     1500 24 2118
                     1600 24 2 98
                     1700 24 5 72
1111LR 2206702       0920 23 2110
                     1005 23 3120
                     1050 23 3130
                     1240 23 3130
                     1355 23 2110
                     1445 23 2118
                     1545 23 2110
                     1630 23 2100
                     1725 23 2 86
                     1755 23 4 86
                     1820 23 4 80
                     1824 23 5 80
                     1905 23 4 80
                     1925 23 6 76
1111LR 2206704       0945 27 3114
                     1020 27 3124
                     1235 27 3125
                     1350 27 3125
                     1351 27 2125
                     1422 27 2120
                     1525 27 2116
```

	1615	27	2110	
	1720	27	2 88	
	1754	27	4 88	
	1815	27	5 82	
	1900	27	6 80	
1111LR 2306702	0655	23	0 75	
	0700	23	2 75	
	0750	23	2 92	
1111LR 2306704	0705	27	2 80	
	0745	27	2 99	
1111LR 2406704	0712	27	1 86	
1111LR 2406702	0630	2301	69	
1111LR 3006702	0710	23	1 82	
	0720		0 82	
	0750		0 85	
	0830		2 96	
	0930		2104	
	1030		3120	
	1210		3128	
	1310		3125	
	1400		3125	
	1403		2125	
	1414		2125	
	1535		2116	
	1620		2110	
	1625		5110	
	1704		4 99	
	1747		4 90	
	1802		4 88	
	1814		6 86	
1111LR 0107704	0725		1 80	
	0730		2 82	
	0745		2 84	
	0830		2100	
	0930		2111	
	1030		2118	
	1045		2100	
	1158		3125	
	1255		3125	
	1335		3123	
	1338		2122	
	1340		2122	
	1438		2116	
	1520		4110	
	1615		4104	
	1735		4 87	
	1740		6 87	
1111LR 0607704	1220		2114	7
	1230		2110	52
	1252		3114	0
	1305		3110	0
	1405		3 93	0

	1415	3	90	0
	1418	3	88	0
	1527	2	78	2
	1544	2	84	8
	1625	2	92	11
	1710	2	84	4
	1712	5	84	0
	1837	4	74	0
	1905	6	70	0
1111LR 0707704	0650	2	78	3
	0740	2	90	6
	0820	2	86	11
	0940	2	94	3
	1025	2	92	5
1111LR 0807702	0630	1	80	0
	0645	2	78	1
	0655	2	80	14
	0707	2	84	15
	0715	2	88	10
	0811	2	106	6
	0905	2	118	2
	0930	2	122	1
	0950	3	126	0
	1215	3	130	0
	1245	3	130	0
	1330	3	130	0
	1431	3	130	0
	1445	2	130	2
	1455	2	130	5
	1530	2	130	9
	1615	2	128	9
	1700	2	120	6
	1715	2	110	6
	1730	2	109	1
	1730	5	109	0
	1743	4	100	0
	1800	4	102	0
	1810	4	96	0
1111LR 1307702	0645	1	71	0
	0650	2	72	2
	0705	2	77	21
	0730	2	80	27
	0830	2	88	12
	0930	2	100	7
	1030	2	106	8
	1138	2	110	2
	1230	2	116	5
	1330	2	117	8
	1430	2	114	5

	1545	2102	3
	1625	2100	4
	1710	2 92	1
	1830	4 80	0
	1833	5 80	0
1111LR 1407704	0700	1 72	0
	0715	0 76	0
	0730	0 78	0
	0745	2 81	1
	0835	0 92	0
	1000	2106	5
	1030	2110	1
	1145	2120	7
	1230	2120	3
	1330	2124	4
	1400	3 91	0
	1415	2112	6
	1430	2109	3
	1552	4100	0
	1735	4 92	0
	1815	4 83	0
	1826	5 80	0
1111LR 2107702	0710	1 70	0
	0735	0 80	0
	0757	2 87	3
	0810	2 90	5
	0900	2 92	10
	1015	2106	4
	1159	2120	2
	1230	3120	0
	1310	2122	2
	1353	2120	3
	1432	2122	3
	1545	2110	6
	1705	4100	0
	1725	5 94	0
	1730	4 92	0
	1749	4 88	0
	1800	4 86	0
	1830	4 84	0
	1900	4 82	0
	1905	6 82	0
1111LR 2207704	1000	1 84	0
	1006	2 84	6
	1030	2 90	11
	1150	2 90	1
	1240	2 84	1
	1310	3 84	0
	1410	2 98	2
	1510	4 82	0
	1525	5 78	0
	1530	4 78	0
	1610	4 74	0

	1707	4 89	0
	1800	6 75	0
1111LR 2707702	1040	2104	6
	1145	2122	1
	1250	2124	4
	1315	2110	23
	1408	2 90	1
	1425	4 83	0
	1430	4 79	0
	1435	4 74	0
	1437	4 73	0
	1450	4 70	0
	1515	4 68	0
	1540	4 66	0
	1615	4 74	0
	1745	5 66	0
	1945	6 64	0
1111LR 2807704	0700	2 70	1
	0730	2 78	15
	0825	2 85	4
	0952	2104	3
	1030	2113	1
	1050	3116	0
	1250	2104	2
	1330	2 76	1
	1445	2 78	1
	1507	2 87	15
	1555	2 97	7
	1610	4 78	0
	1905	6 70	0
1111LR 2907702	0615	1 68	0
	0637	2 68	1
	0645	2 72	3
	0652	2 74	10
1111LR 1208704	0945	1118	0
	1000	3120	0
	1030	3124	0
	1135	3130	0
	1155	3122	0
	1156	2120	8
	1203	3130	0
	1217	3130	0
	1219	3122	0
	1220	2120	15
	1315	2110	13
	1400	2109	5
	1430	2100	2
	1515	2111	1
	1517	5112	0
	1527	4116	0
	1545	4116	0

	1615	4107	0
	1650	6 90	0
1111LR 1308702	0720	1 84	0
	0735	0 89	0
	0739	2 90	1
	0820	2100	4
	0910	2116	6
	0935	2120	1
	1000	2126	2
	1030	3130	0
	1155	3130	0
	1320	3128	0
	1335	2120	6
	1345	3120	0
	1425	3130	0
	1500	3126	0
	1515	2119	13
	1548	2107	10
	1730	2 97	3
	1815	4 92	0
	1835	5 88	0
	1915	4 80	0
	1930	6 78	0
1111LR 1908702	0750	1 76	0
	0810	2 82	4
	0904	2 87	3
	1034	2104	6
	1204	2120	2
	1310	2110	6
	1505	2100	5
	1600	2 98	2
	1700	4 86	0
	1730	5 84	0
	1810	4 80	0
	1910	6 76	0
1111LR 2508704	0720	1 76	0
	0743	2 84	3
	0920	2110	1
	1000	3118	0
	1215	3125	0
	1320	2118	3
	1400	2118	1
	1440	3122	0
	1540	3114	0
	1800	6 84	0
1111LR 0109702	0930	1 66	0
	0945	2 67	2
	1015	2 66	1
	1200	2 81	6
	1340	2 88	4

	1440	2 80	2
	1540	2 72	1
	1600	5 69	0
1111LR 0709702	0752	1 74	0
	0755	2 74	1
	0850	2 84	4
	1015	2 98	14
	1135	2112	2
	1210	2116	2
	1307	2114	9
	1400	2114	8
	1500	2106	8
	1600	2 98	5
	1640	5 90	0
	1700	4 88	0
	1744	6 78	0
1111LR 0709702	0728	1 66	0
	0745	0 72	0
	0752	2 74	2
	0837	2 86	1
	0900	2 86	2
	1000	2100	1
1111LR 1909702	0803	1 80	0
	0840	2 88	57
	0900	2 93	4
	0950	2107	5
	1030	3110	0
	1105	3114	0
	1235	3115	0
	1350	2114	2
	1455	2104	5
	1545	2 97	7
	1635	4 88	0
	1705	4 84	0
	1725	4 80	0
	1735	4 80	0
1111LR 1909704	0806	1 83	0
	0845	2 90	3
	0910	2 97	5
	1005	2103	3
	1035	2108	5
	1050	2110	2
	1120	3110	0
	1230	2114	2
	1340	2110	15
	1440	2100	4
	1555	2 94	2
	1655	4 84	0
	1710	5 82	0
	1735	6 79	0

Insect Predator Transect Data

Insect predator transect data is Grassland Biome data set A2U304B. Data were collected on the data form shown as Fig. 6. A listing of the data follows.

*** FIELD DATA ***

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

050470 1ARASAL            1
       3ARASAL            1
       3ARALYC            3
050470 4ARALYC            2
051770 2HYMFORPOGOCC      5
       4HYMFORPOGOCC      1
       4ARALYC            1
051770 1ARALYC            7
       1HYMFORPOGOCC      5
       1DIPASI            2
051770 3ARALYC            1
       3ARASAL            1
       3HYMFORPOGOCC      3
       3DIPASI            1
052470 1ARALYC            1
       1HYMFORPOGOCC      6
       1DIPASIPRA SP      1
       3HYMFORPOGOCC      7
       3ARALYC            3
       3DIPASI            1
       2HYMFORPOGOCC     10
       2ARASAL            1
       2ARALYC            1
070370 1HYMFORPOGOCC      5
       1DIPASIEFFSTA      1
       1DIPASIPRA SP      5
       2HYMFORPOGOCC      7
       2DIPASIPRA SP      3
       2DIPASIEFFSTA      4
       2ARASAL            1
       4DIPASIPRA SP      8
       4ORTMAN            1
       4HYMFORPOGOCC      2
       4DIPDIPASIMES      1
       4ARALYC            1
       4DIPPRA            6
070370 3DIPPRA           14
       3HYMFORPOGOCC      6
       3ORTMAN            1
       3DIPASIEFFSTA      1
```

071070	3HYMFORPOGOCC	8
	3DIPASIPRA	7
	3ARALYC	1
	2DIPASIPRA SP	2
	2HYMFORPOGOCC	5
	2COLCICCICPUN	1
	2DIPASIEFFSTA	3
	1DIPASIEFFSTA	1
	1DIPASIPRA SP	2
	1HYMFORPOGOCC	5
	1ORTMAN	1
	4HYMFORPOGOCC	1
	4DIPASIPRA SP	2
	4DIPASIEFFSTA	3
071770	4ARALYC	2
	4DIPASIPRSMIL	1
	4HYMFORPOGOCC	2
	4COLCICCICPUN	1
	2COLCICCICPUN	3
	2DIPASIPRA SP	1
	2DIPASIEFFHEL	3
	2DIPASIEFFSTA	1
	2HYMFORPOGOCC	6
	2ORTMAN	1
	1HYMFORPOGOCC	3
	1ARALYC	3
	1DIPASIPRA SP	1
	3DIPASIPRA SP	6
	3ORTMAN	1
	3HYMFORPOGOCC	6
	3COLCICCICPUN	1
	3DIPASIEFFSTA	1
072370	4HYMFORPOGOCC	2
	4DIPASIPRA SP	1
	4DIPASIPRSMIL	1
	2HYMFORPOGOCC	2
	2DIPASIEFFHEL	5
	2ARALYC	1
	3ARALYC	4
	3HYMFORPOGOCC	3
072370	1ARALYC	3
	1HYMFORPOGOCC	6
073170	1HYMFORPOGOCC	7
	1DIPASIPRA SP	1
	1DIPASIPRSMIL	1
	1ARASAL	1
	3HYMFORPOGOCC	7
	3DIPASIPRA SP	2
	3DIPASIEFFHEL	1
	3ARALYC	1
	3ARASAL	1
	3DIPASIMAL SP	1

	3ORTMAN	1
	2DIPASIPRSMIL	2
	2HYMFORPOGOCC	2
	4ARALYC	1
	4HYMFORPOGOCC	2
	4DIPASIPRSMIL	1
	4DIPASIEFFHEL	1
081270	4HYMFORPOGOCC	3
	4DIPASIMAL SP	2
	4COLCICCICPUN	2
	4ARALYC	1
	4DIPASIEFFHEL	1
	2DIPASIOSPABD	1
	2DIPASIPRA SP	1
	2HYMFORPOGOCC	1
	2DIPASISTEPIC	1
081270	1ARALYC	5
	1DIPASISTEPIC	2
	1HYMFORPOGOCC	6
	1DIPASIPRA SP	1
	1ARASAL	2
	3HYMFORPOGOCC	4
	3DIPASIPRA SP	1
	3DIPASISTEPIC	2
	3DIPASIEFFHEL	3
	3ARALYC	1
	3ARASAL	1
	3HYMSPHTACTAR	1
082170	4DIPASIEFFHEL	7
	4DIPASISTEPIC	2
	2DIPASISTEPIC	4
	2DIPASIEFFHEL	1
	2HYMFORPOGOCC	3
	2ARALYC	1
082570	4ARALYC	1
	4DIPASISTEPIC	8
	4DIPASIEFFHEL	5
	2HYMFORPOGOCC	3
	2DIPASIEFFHEL	5
	2ARASAL	1
	2DIPASISTEPIC	6
	1DIPASIEFFHEL	5
	1ARALYC	5
	1HYMFORPOGOCC	10
	1DIPASISTEPIC	1

082570	3HYMFORPOGOCC	6
	3DIPASIEFFHEL	8
	3ARALYC	6
	3ARASAL	1
	3ORTMAN	1
090470	1DIPASIEFFHEL	3
	1ARALYC	13
	1HYMFORPOGOCC	6
	3ARALYC	7
	3DIPASIEFFHEL	4
	3ARASAL	3
	3ORTMAN	1
	3HYMFORPOGOCC	3
	2ARALYC	1
	2DIPASIEFFHEL	1
	2DIPASISTEPIC	1
	2HYMFORPOGOCC	2
	4DIPASIEFFHEL	1
	4ARASAL	1
091770	3ARALYC	14
	3HYMFORPOGOCC	3
	3DIPASISTEPIC	1
	3ARASAL	1
	3DIPASIEFFHEL	1
	1HYMFORPOGOCC	8
	1ARALYC	5
091770	2HYMFORPOGOCC	1
	2ARALYC	1
	2ARASAL	2
	2DIPASIEFFHEL	4
	4DIPASIEFFHEL	2
	4ARALYC	1
	4ARASAL	1
	4HYMFORPOGOCC	2
092670	2HYMFORPOGOCC	5
	2ARALYC	1
	4DIPASIEFFHEL	1
	4ARALYC	7
	4HYMFORPOGOCC	2

Robber Fly Field Data

Robber fly field data is Grassland Biome data set A2U303B. Data were collected on the data form shown as Fig. 7. A listing of the data follows.

+++ FIELD DATA +++

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         1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890

3500LER240767   ASIEFFHEL  HYMSPHTACASH 1.00 .30                     251
3500LER190768   ASIEFFSTA  DIPBOMPHT     .30 .08                     247
3511LER1208681505ASIOSPABD  COLMELEPIFER  .90 .25                    570
3511LER1208681530ASIPRS    FORTACROPEOBS 1.55 .25                    571
3511LER210469   ASIABL     HEMLYGCROBOH  .24 .10                     373
3511RJL210469   ASIABLMIN FDIP                                       569
3511RJL290469   ASIABL     DIP                                       566
3511LER290469   ASIABL     DIPDOLMEDVEL  .24 .08                     565
3511LER120569   ASIABLMIM  HEMLYGCROBOH  .35 .10                     256
3511LER130569   ASILAS    FDIPANTHYLCIN  .70 .14                     257
3511LER130569   ASILAS    FDIPANTHYLCIN  .40 .10                     258
3511LER150569   ASILASQUA  HOMCICPARVIR  .40 .15                     255
3511LER150569   ASILASQUA  HOMPSYAPH     .   .                       254
3511LER170569   ASILAS    MDIPATHHYLCIN  .45 .14                     356
3511LER170569   ASILAS    FDIPANTHYLPLA  .55 .15                     357
3511LER1705691645ASILAS    FDIPCHLORT     .55 .12                    299
3511LER1805691130ASILAS    FDIPCHLTHAAPP  .40 .11                    300
3511LER1805691405ASILAS    FDIPMICRICTUR  .60 .07                    301
35   _ER1805691540ASILAS    FDIPMICMICTUR  .60 .07                   302
3511LER1805691200ASILAS    FDIPANTHYLCIN  .55 .14                   358
3511LER1805691245ASILAS    MDIPANTHYLCIN  .55 .18                   359
3511LER1805691333ASILAS    MDIPANTHYLCIN  .50 .14                   360
3511LER180569   ASILAS    MDIPANTHYLCIN  .48 .14                     362
3511LER1805691437ASILAS    FDIPSARRAVPLA  .60 .20                    361
3511LER070769   ASIPRA     HEMRHOHARREF  .80 .30                     485
3511LER080769   ASIPRALEU FDIPCHLOLC     .   .                       363
3511LER080769   ASIPRALEU FDIPTEPEUAACU  .30 .10                     364
3511LER080769   ASIPRALEU FDIPCECNEO     .36 .08                     365
3511LER080769   ASIPRALEU FDIPCECNEO     .30 .06                     366
3511LER080769   ASIPRALEU FDIPCECNEO     .30 .06                     367
3511LER080769   ASIPRALEU FDIPCECNEO     .35 .06                     370
3511LER080769   ASIPRALEU FHOMCIC        .30 .08                     368
3511LER080769   ASIPRALEU FHOMCICATH     .38 .10                     369
3511LER080769   ASIPRALEU FHOMCICBALNEG  .32 .09                     371
3500LER110768   ASIEFFSTA  HOMCICCUESTR  .80 .20                     246
3511LER150769   ASIPRALEU FDIPDOLMEDVEL  .30 .07                     374
3511LER1507691506ASIPRALEU FDIPBOMPHTSUL  .45 .13                    376
3511LER1507691604ASIPRALEU MHYMBRACHE     .34 .10                    377
3511LER1507691730ASIPRALEU FHYMPOM        .   .                      379
3511LER1507691707ASIPRALEU FHYMFORTAPSES  .30 .09                    379
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3511LER150769	ASIEFFSTA	ODOCOEENAPRA	3.00	.35			481
..11RJL1507691347	ASIPRALEU	FHYM					375
..11RJL150769	ASIEFFSTA	HYM					482
3511LER210769	ASIPRS	ORTACR	.45	.15			446
3511LER2107691300	ASIEFFSTA	ORTACRMEL	.	.			483
3511RJL220769	ASIPRS	FHOM					487
3511LER220769	ASIEFFSTA	COLSCAAPHHAE	.65	.25			484
3511LER220769	ASIOSPLAT	COLMELZONATR	.75	.25			489
3511LER220769	ASIPRA	FORTACR	.60	.10			444
3511LER220769	ASIPRA	FORTACRAGEDEO	.40	.10			445
3511RJL230769	ASIPRS	MDIPASIPRS					488
3511LER230769	ASIPRA	DIPTACMYINEO	.	.			486
3511LER2507691600	ASIOSPABD	COLMELEPINOR	.85	.25			467
3511LER2507691345	ASIOSPLAT	HEMLYGXYOCAL	.60	.16			468
3511LER2507691130	ASIEFFSTA	HYMBRAURO	.28	.09			466
3511RJL300769	ASIPRACAC	FHOMCIC					511
3511RJL3007691359	ASIPRSMIL	MDIP				.0016	512
3511RJL3007691430	ASIPRSMIL	HYM				.0009	513
3511RJL3007691449	ASIPRSMIL	DIPBOM			.0596	.0022	514
3511RJL3107691030	ASIPRS	FLEP				.0303	517
3511RJL3107691100	ASIPRS	MLEP				.0513	518
3511RJL3107691300	ASIEFFSTA	HYM				.0072	519
3511LER3107690835	ASIPRS	FCOLHYDSPHSCA	.70	.40		.0131	515
3511LER3107690910	ASIPRS	FNEUMYRHESABD	2.40	.20		.0370	516
3511RJL0108691320	ASIPRSMIL	MHYM					522
3511RJL010869	ASIPRS	MDIPASI					529
3511RJL0108691530	ASIPRS	FDIPPRS					531
.11RJL0108691535	ASIPRS	MDIPASI					532
3511LER0108691039	ASIPRSMIL	DIPTACPTI	1.40	.40		.0116	521
3511LER0108691050	ASIEFF	FDIPTACSIPHAL	1.10	.35		.0092	528
3511LER0108691525	ASIPRSMIL	MNEUMYRHESNIG	3.00	.35			524
3511LER0108691615	ASIPRS	MCOLCICCICPUN	1.45	.40			533
3511LER0108691740	ASIPRSMIL	FCOLHISHISABB	.60	.35			526
3511LER0108691520	ASIPRS	FORTACRARP	1.50	.20		.0338	530
3511LER0108691420	ASIPRSMIL	MORTACRTRAKIOK	1.80	.45		.0586	523
3511LER0108691620	ASIPRSMIL	MORTACROPEOBS	1.50	.15			525
3511LER0108691340	ASIEFF	FORTACROPEOBS	1.20	.10			527
3511RJL0408691000	ASIPRS	FDIPASI				.0489	535
3511LER0408691045	ASIPRS	MCOLCARHAR	1.75	.50		.0515	536
3511RJL0508691345	ASIEFF	DIPASIMAL				.0442	539
3511RJL0508691510	ASIEFF	DIPASIMAL				.0155	541
3511LER0508691400	ASIOSP	COLMELEPIFER	.90	.25			540
3511LER0508691120	ASISTEPIC	ORTACRTRAKIOK	.	.		.2572	538
3511RJL0608690940	ASIEFF	FLEP					542
3511RJL0608690950	ASIPRS	MHYMFOR					543
3511RJL0608691005	ASIPRS	MDIPASI					544
3511RJL0608691400	ASIPRA	FHYMFOR					545
3511RJL0608691550	ASIPRS	FLEPHES					546
3511RJL1308690950	ASIEFFHEL	MDIPBOM				.0293	548
3511RJL1308691428	ASIPRS	FDIPASISTEPIC				.0248	550
3511RJL1308691600	ASIEFFEFF	FDIPBOMM				.0035	552
3511LER1308691702	ASIOSPABD	FCOLMELEPIFER	.90	.23			563

3511LER130869	ASIEFFHEL	MNEUMYRHESNIG	2.80	.25	.0381	.0118	547
3511LER1308691005	ASIEFFHEL	MORTACROPEOBS	1.45	.20			549
11LER1308691500	ASISTEPIC	ORTACRMEL	1.70	.25			551
3511LER130869	ASIEFFHEL	MORTACRMEL	1.10	.15			561
3511RJL1308691745	ASIPRS	FDIPBOM					564
3511RJL140869	ASIPRS	FDIPASI					553
3511RJL1408691310	ASIPRS	MDIPASI					554
3511RJL1408691335	ASIEFFHEL	MDIP				.0014	555
3511RJL1408691555	ASIEFFHEL	FHOMCIC					559
3511RJL1408691308	ASIEFFHEL	MHYM					562
3511LER1408691550	ASIEFF	FORTACRPARWYO	2.70	.18			558
3511LER1408691530	ASIPRS	FORTACRMEL	1.70	.25			557
3511LER1408691510	ASIEFFHEL	MORTACRMEL	1.50	.25			556
3511RJL1908691500	ASIPRS	FDIPASI					572
3511RJL1908691515	ASIPRS	MDIPBOM				.0895	573
3511LER2608691500	ASIEFFHEL	MHEMALYALYEUR	1.20	.28			603
3511LER2608691515	ASIEFFHEL	FORTACRMELINF	1.80	.25		.0700	100604
3511LER2008691200	ASISTEPIC	ORTACROPEOBS	2.20	.30			575
3511LER2108691520	ASIEFFHEL	FCOLHYDSPHSCA	.70	.40			591
3511LER2108691110	ASIEFFHEL	FCOLHYDSPHSCA	.60	.38			577
3511LER2108691110	ASIEFFHEL	FDIPMUSHAEIRR	.60	.16			578
3511LER2108691345	ASIEFFHEL	FORTACRTRAASP	2.00	.45			585
3511LER2108691500	ASIEFFHEL	FORTACRERISIM	2.30	.30		.0840	590
3511LER210869	ASIEFFHEL	FORTACROPEOBS	1.80	.20		.0232	576
3511LER2108691325	ASIEFFHEL	MORTACROPEOBS	.	.			584
3511LER2108691400	ASIEFFHEL	FORTACROPEOBS	.	.			588
3511LER2108691415	ASIEFFHEL	FORTACROPEOBS	1.70	.20	.0691	.0388	589
11LER2108691426	ASIPRS	FORTACROPEOBS	2.10	.30	.1658	.0794	593
3511LER250869	ASIEFFHEL	MORTACRAGEDEO	2.05	.35			600
3511LER2508691030	ASIEFFHEL	MORTACRPHLQUA	1.08	.30			597
3511LER2508691130	ASIEFFHEL	FORTACROPEOBS	1.30	.25			599
3511LER250869	ASISTEPIC	ORTACRMELINF	2.50	.35		.0889	596
3511LER2908691230	ASIPRS	FORTACRARPPSE	2.50	.40			651
3511LER2908691345	ASIEFFHEL	FORTACRTRAKIOK	1.80	.35			650
3511LER2908691255	ASIEFFHEL	FORTACROPEOBS	1.75	.20			652
3511LER2908691340	ASIEFFHEL	MORTACRMEL	1.80	.25			646
3511LER2908691350	ASIEFFHEL	FORTACRMEL	1.60	.30			647
3511LER2708691338	ASIEFFHEL	MCOLHYDSPHSCA	.55	.36			615
3511LER2708691315	ASIEFFHEL	MORTACRENCSORC	2.30	.35			613
3511LER2708691355	ASIEFFHEL	MORTACRCOROCC	2.30	.30			617
3511LER2708691250	ASIEFFHEL	FORTACROPEOBS	1.60	.23			609
3511LER2708691300	ASIEFFHEL	FORTACROPEOBS	1.65	.20			610
3511LER2708691300	ASIEFFHEL	FORTACROPEOBS	2.30	.30			611
3511LER2708691338	ASIEFFHEL	MCOLHYDSPHSCA	.56	.36			615
3511LER2708691315	ASIEFFHEL	MORTACRENCSORC	2.30	.35			613
3511LER2708691355	ASIEFFHEL	MORTACRCOROCC	2.30	.30			617
3511LER2708691250	ASIEFFHEL	FORTACROPEOBS	1.60	.23			609
3511LER2708691300	ASIEFFHEL	FORTACROPEOBS	1.65	.20			610
3511LER2708691300	ASIEFFHEL	FORTACROPEOBS	2.30	.30			611
3511LER1904701430	ASIABL	FDIPSEPSALSPH	.35	.08			372
3511RJL1806701545	ASIASIMES	FHYM	0.15	0.03			656
3511RJL1906701015	ASIASIMES	FHYM	0.17	0.03			657
3511RJL1906701138	ASIASIMES	MHYM	0.26	0.07			658

3511RJL1906701210ASIASIMES	FDIPANT	0.440.15		659
3511RJL1906701222ASIASIMES	FDIPANTHYL	0.500.12		660
3511RJL2306700835ASIPRALEU	FHYMFORFOR	0.900.13		661
3511RJL2406700815ASIPRALEU	MHYMFORFOR	0.800.13		662
3511RJL2506701235ASIPRALEU	MHOMCIC	0.400.15		663
3511RJL2506701300ASIPRALEU	MDIPTAC	0.460.15		664
3511RJL2506701310ASIASIMES	FORTACR			.000520.0665
3511RJL2506701320ASIPRALEU	MHOMCIC	0.410.12		666
3511RJL2506701320ASIPRALEU	MORTACROPEOBS	0.500.10		667
3511RJL2506701345ASIPRALEU	MHOMCIC	0.11		.000220.0668
3511RJL2506701455ASIPRALEU	MHOMCICXER	0.680.20		669
3511RJL2506701522ASIPRALEU	MHOMCIC	0.400.10		.0008 6.0670
3511RJL2506701530ASIPRALEU	HOMCIC	0.440.10		.0008 5.0671
3511RJL2506701535ASIPRALEU	MHOMCIC	0.360.09		672
3511RJL2506700824ASIASIGIL	ORTACRPSODEL	0.700.12		673
3511RJL2506700914ASIASIGIL	DIPTAC	0.600.16		.000816.0674
3511RJL2506700950ASIASIGIL	FDIPANTHYL	0.750.15		.001926.0675
3511RJL3006701215ASIPRALEU	MHOMCIC	0.370.08		676
3511RJL3006701235ASIPRALEU	MDIP	0.300.08		677
3511RJL3006701244ASIPRA	MHOMCIC	0.240.07		.000710.0678
3511RJL3006701615ASIPRA	FHOMACROPEOBS	0.700.12		679
3511RJL3006701730ASIPRA	FHOMCICACE	0.270.10		680
3511RJL3006701731ASIASIFOR	DIP	0.210.07		.0008 3.0681
3511RJL3006701745ASIPRA	FHOMCICATH	0.370.08		682
3511RJL0307700834ASIEFFSTA	FHEMMIRMEL	0.350.09		.0001 3.0683
3511RJL0307700840ASIEFFSTA	FDIP	0.300.07		.0008 8.5684
3511RJL0307700850ASIEFFSTA	FHYMICH	1.000.14		685
3511RJL0307700859ASIEFFSTA	FHOMCICACEUHL	0.300.10		.0004 5.0686
3511RJL0307701042ASIPRALEU	MORTACRERISIM	0.900.15		.0148 3.0687
3511RJL0307701232ASIEFFSTA	MDIPBOMVILALT	1.300.34		.0366 4.0688
3511RJL0307701236ASIEFFSTA	DIPSARRAVPLA	0.600.13		689
3511RJL0307701342ASIEFFSTA	DIPASIASIMES	0.900.17		691
3511RJL0307701358ASIEFFSTA	MDIPSARRAVPLA	0.610.13		.0047 8.0692
3511RJL0307701445ASIEFFSTA	FDIPASIPRALEU	1.500.18		693
3511RJL0307701245ASIEFFSTA	MDIPASIEFFSTA	1.500.25	.1283	.0451101.694
3511RJL0707701245ASIEFFSTA	FDIPTAC	0.680.20		690
3511RJL0707701430ASISTITRI	HOMCICCUE	0.430.20		695
3511RJL0807700830ASIASIFOR	FHOMCICFLEFLE	0.380.10		696
3511RJL1007700945ASIPRA	FHEMMIRCHL	0.220.08		697
3511RJL1007701005ASIPRA	FHOMMEM	0.580.19		.0009 7.0698
3511RJL1007701024ASIPRA	FDIP	0.140.05		699
3511RJL1007701028ASIPRA	FHOMCICATH	0.330.10		700
3511RJL1007701040ASIPRA	FDIP	0.250.09		701
3511RJL1007701056ASIPRA	FDIPANT	0.500.12		702
3511RJL1807700830ASIPRS	FHYMFOR	0.910.12		703
3511RJL1807700945ASIEFFSTA	FLEPNOC	1.500.30		704
3511RJL2107700845ASIPRS	FHYMFORFOR	0.700.13		705
3511RJL2107701220ASIEFF	MORTACR			706
3511RJL2107701345ASIEFF	FNEUMYM	3.500.25		707
3511RJL2207701500ASIEFFPAL	FHYM	0.900.16		708
3511RJL2307701330ASIEFF	FORTACRMELFOE	0.900.19		709
3511RJL2307701345ASIPRS	MORTACRTRAKIO	2.200.45		710
3511RJL2407700800ASIPRS	FCOLSCA	0.500.21		711

3511RJL2407701500ASIPRS	FHYMAPIBOM	1.400.60		712
3511RJL2107701215ASIEFF	FORTACROPEOGS	1.170.14		713
3511RJL310770 ASIPRS	FDIPBOMVIL	1.200.32	.0097	714
3511RJL3107701500ASIPRS	ORTACRMELINT	2.020.29		715
3511RJL3107701510ASIPRS	DIPTAC	1.100.31		716
3511RJL0608701305ASIMALGUI	HYMMUTDASVES	0.900.20		717
3511RJL0608701310ASIEFF	FDIPBOMVILPER	0.850.35		718
3511RJL0608701340ASIPRS	MDIPBOMPOESIG	1.380.38		719
3511RJL0608701430ASIPRALEU	FDIP	0.230.07		720
3511RJL0608701500ASIPRS	HYMHALAGAANG	0.950.20		721
3511RJL0608701600ASIPRS	ORO	3.600.50		722
3511RJL0708701500ASIPRS	FDIPASIMALGUI	1.300.30		723
3511RJL1008700938ASIEFFHEL	MDIPSAR	0.400.14		724
3511RJL1008701000ASIEFFSTA	FDIPTAC	0.360.16		725
3511RJL1008701020ASIEFFSTA	MDIPSAR	0.650.24		726
3511RJL1008701035ASIEFFSTA	FDIPDIP	0.210.06		727
3511RJL1008701210ASIEFF	FDIPBOMEXODOD	1.000.36		728
3511RJL1008701210ASIMALGUI	HEMMIR	0.550.20		729
3511RJL1008701150ASIEFFSTA	MLEP	1.030.22		730
3511RJL1208700[illegible]ASIEFF	FHOMCICATH	0.260.08		731
3511RJL1208700[illegible]ASIEFFSTA	FDIPTAC	0.500.15		732
3511RJL1208700[illegible]25ASIEFFHEL	[illegible]	0.250.06		733
3511RJL1208700[illegible]30ASIEFFHEL	FDIP	0.300.08		734
3511RJL1208701000ASIEFFHEL	[illegible]IRSTI	0.620.17		735
3511RJL1208701010ASIEFFHEL	[illegible]CICATH	0.360.09		736
3511RJL1208701135ASIEFFHEL	[illegible]EXO	1.200.34		737
3511RJL1208701215ASIEFFSTA	FLE[illegible]SPYR	1.300.26		738
3511RJL1308701235ASIPRS	ORTACROPEOBS	2.350.30		739
3511RJL1408700915ASISTEPIC	ORTACRENCSOR	1.900.30		740
3511RJL1408700930ASISTEPIC	HOMCICCUE	0.770.21		741
3511RJL1408700130ASIEFFHEL	MHOMCICCUE	0.800.23		742
3511RJL1408701020ASIEFF	FHOMCIC	0.330.08		743
3511RJL1408701025ASIPRS	FORTACROPEOBS	1.500.21		744
3511RJL1408701030ASISTEPIC	ORTACRMELSAN	2.500.45		745
3511RJL2108701030ASISTEPIC	ORTACROPEOBS	2.600.35		746
3511RJL2308701400ASIOSP	COLMELEPI	0.950.27		747
3511RJL2408701300ASISTEPIC	ORTACRAGEDEO	1.700.28		748
3511RJL2408701325ASIEFFHEL	ORTACR			749
3511RJL2408701600ASIEFFHEL	FDIPOTICHR	0.700.17		750
3511RJL2408701630ASISTEPIC	ORTACRMELGLA	1.900.26		751
3511RJL2508701500ASIEFFHEL	FLEP	1.400.25		752
3511RJL2508701515ASIEFFHEL	FHOMCICCUE	0.750.24		753
3511RJL2508701525ASISTEPIC	DIPASIEFFHEL	2.150.36		754
3511RJL2508701600ASISTEPIC	ORTACRMELINT	1.800.25		755
3511RJL2608700815ASIEFFHEL	F	0.140.08		756
3511RJL2608700825ASIEFFHEL	FDIPBOMEXODOD	1.300.32		757
3511RJL2608700840ASIEFFHEL	FDIPBOMVIL	1.000.30		758
3511RJL2608700900ASIEFFHEL	MHYMAPIEPE	0.900.25		759
3511RJL2608701300ASIEFFHEL	MDIPBOMPOEALP	1.250.31		760

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3511RJL2708701400ASISTEPIC  ORTACROPEOBS 1.950.24                             761
3511RJL010970      ASIEFFHEL FLEP         1.250.27                             762
3511RJL0109701035ASIEFFHEL FLEP          0.900.21                             763
3511RJL0409700830ASIEFFHEL FHYMFORMYR    0.700.12                             764
3511RJL0409700935ASIEFFHEL FHYMFORFOR    0.800.15                             765
3511RJL0409701220ASISTEPIC  ORTACRMELGLA 1.800.26                             766
3511RJL0409701255ASIEFFHEL FCOLHYDSPH    0.650.40                             767
3511RJL0409701320ASISTEPIC  ORTACRMELGLA 1.800.30                             768
3511RJL070970      ASIEFFHEL FLEPARC      1.300.32                             769
3511RJL2807701030ASIPRA     FHYMFOR       0.46 .09                             770
3511RJL1609701415ASIEFFHEL FCOLSCAAPH    0.450.25                             771
3511RJL1609701415ASIEFFHEL FHYM          0.680.14                             772
3511RJL1609701430ASIEFFHEL FHYMFORFOR    0.800.14                             773
3511RJL1609701440ASISTEPIC FORTACRPHLQUA 1.500.25                             774
3511RJL1609701445ASIEFFHEL FDIPBOMANABAR 0.800.25                             775
3511RJL1909701100ASIEFFHEL FLEP          1.030.28                             776
3511RJL1909701310ASIEFFHEL FORTACRTRAKIO 1.600.33                             777
3511RJL130569      ASILAS     FDIPASILAS    0.900.20                             778
3511RJL060968      ASIEFFHEL  ORTACR                        .0230  .008690.0
3511RJL2208680826ASISTEPIC FORTACRMELFEM                          .1268
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