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SMALL MAMMAL STUDIES ON THE ALE RESERVE, 1971[1/]

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GRASSLAND BIOME

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ABSTRACT

Studies of small mammals were conducted on grazed and ungrazed grassland sites in south-central Washington to quantify changes in species composition, relative abundance, biomass, and reproductive performance. During seven trapping sessions in 1971 eight species of small mammals were recorded: *Perognathus parvus*, *Peromyscus maniculatus*, *Spermophilus townsendii*, *Onychomys leucogaster*, *Reithrodontomys megalotis*, *Lagurus curtatus*, *Rattus norvegicus*, and *Thomomys talpoides*. The first four species accounted for 98% of all captures. Pocket mice were the most numerous species (≈20/ha), and ground squirrels attained the highest biomass. The total peak biomass in June was 1.3 and 0.7 kg/ha for the ungrazed and grazed sites, respectively. Fifteen yearling steers gained 34 kg/ha in 58 days of grazing. No jackrabbits or other larger native herbivores were observed. Small mammals disturbed less than 1% of the total surface area by burrowing. There were no apparent differences in small mammal populations attributable to the impact of grazing.

INTRODUCTION

The original plan for the U.S. IBP Grassland Biome called for detailed total-system research designed to answer broad questions about the ecosystem. Major efforts focused on the intraseasonal dynamics of grasslands, particularly the biomass and the flow of energy, minerals, and water through the various trophic levels. It was recognized that measurements of the important driving variables would have to be made simultaneously with measurements of important state variables on several representative sites over a period of years. Descriptive information of this nature is necessary for the development and testing of simulation models and also for the basis for hypotheses concerning the structure and function of the ecosystem. Field studies imposing treatments or stresses were designed to yield data for testing these hypotheses. Herbivory, principally by large domestic herbivores, was selected as the principal stress. The design included measurements of the abiotic, producer, consumer, and decomposer variables and changes in these induced by grazing.

Small mammal studies on Project ALE were conducted during 1971 to fulfill the research objectives of the Grassland Biome. The major objective of the field research was to determine the species composition, relative abundance, and biomass of small mammals on grazed and ungrazed grasslands of Project ALE and to relate changes in these variables to seasonal variation in abiotic and primary production variables.

Emphasis was placed on small mammals since there are few large or medium-sized herbivores indigenous to the bunchgrass steppes of south-central Washington. Mule deer are scarce and restricted to areas that have free water nearby. Neither antelope nor bison have ever occupied this region, and lagomorphs are normally scarce unless the native vegetation is heavily disturbed by grazing or agricultural practices. Also, small mammal studies are a part of the overall design of the Comprehensive Network research scheme, and data are needed to compare the responses of these northern grassland species with small mammals residing on more southern sites.

STUDY AREA

The Comprehensive Network Site is located within Project ALE, a 120-sq mile ecological research area operated by Battelle-Northwest for the U.S. Atomic Energy Commission in south-central Washington. The plots are located at the 1200-ft level of the northeast-facing slope of Rattlesnake Mountain.

At this elevation an annual minimum temperature of 23.1°F was recorded in December 1970, and an annual maximum temperature of 96.6°F was recorded in August 1971. Precipitation averages 9.22 inches/year with 80% of the moisture falling during the winter from October to April. Snow is infrequent and seldom covers the ground for more than a few days.

Soils underlying the site are deep, zoneless Ritzville silt-loams which have a bulk density of 1.3 g/cm^3. This soil has developed from silty, wind-laid deposits mixed with small amounts of volcanic ash (Hajek, 1966).

The vegetation is dominated by a uniform stand of the *Artemisia-Agropyron* association (Daubenmire, 1970). Big sagebrush, *Artemisia tridentata*, is the dominant shrub, although it has a canopy coverage of only 3-4% and seldom reaches 1 m in height on the plots. Bluebunch wheatgrass, *Agropyron spicatum*, is the most important and most abundant species of grass. Other perennial grasses include *Poa cusickii*, *Poa secunda*, and *Stipa thurburiana*. There are a few forbs including *Crepis atrabarba*, *Antennaria dimorpha*, and *Lupinus* spp.

METHODS

Livetrapping

Four 9-ha plots were surveyed, and two were fenced to permit cattle grazing (Fig. 1). Two grids of 144 trapping sites were established: one in a grazed and one in an ungrazed plot. The grids consisted of a 12 × 12 matrix with 15 m spacing between trap sites.

Two Sherman live traps were placed at each grid intersection. The traps contained a sufficient quantity of seeds to prevent torpor in trapped animals, as well as Dacron batting for use as a nest during confinement. The traps were shielded by a large can which provided some protection from environmental stress. On the ungrazed plot galvanized "tents" were placed over traps and cans to provide shade and cooler temperatures for confined mice (Fig. 2). These "tents" were not used on the grazed pasture until after the cattle were removed because we felt that the total area covered by the "tents" might remove a significant portion of the pasture from grazing pressure.

Starting in March 1971 traps were opened during seven monthly trapping sessions: March and April, prior to grazing; May, with cattle present; and June, July, September, and November, after the cattle had been removed for the year. Traps were opened at about 1500 hours each day and baited with

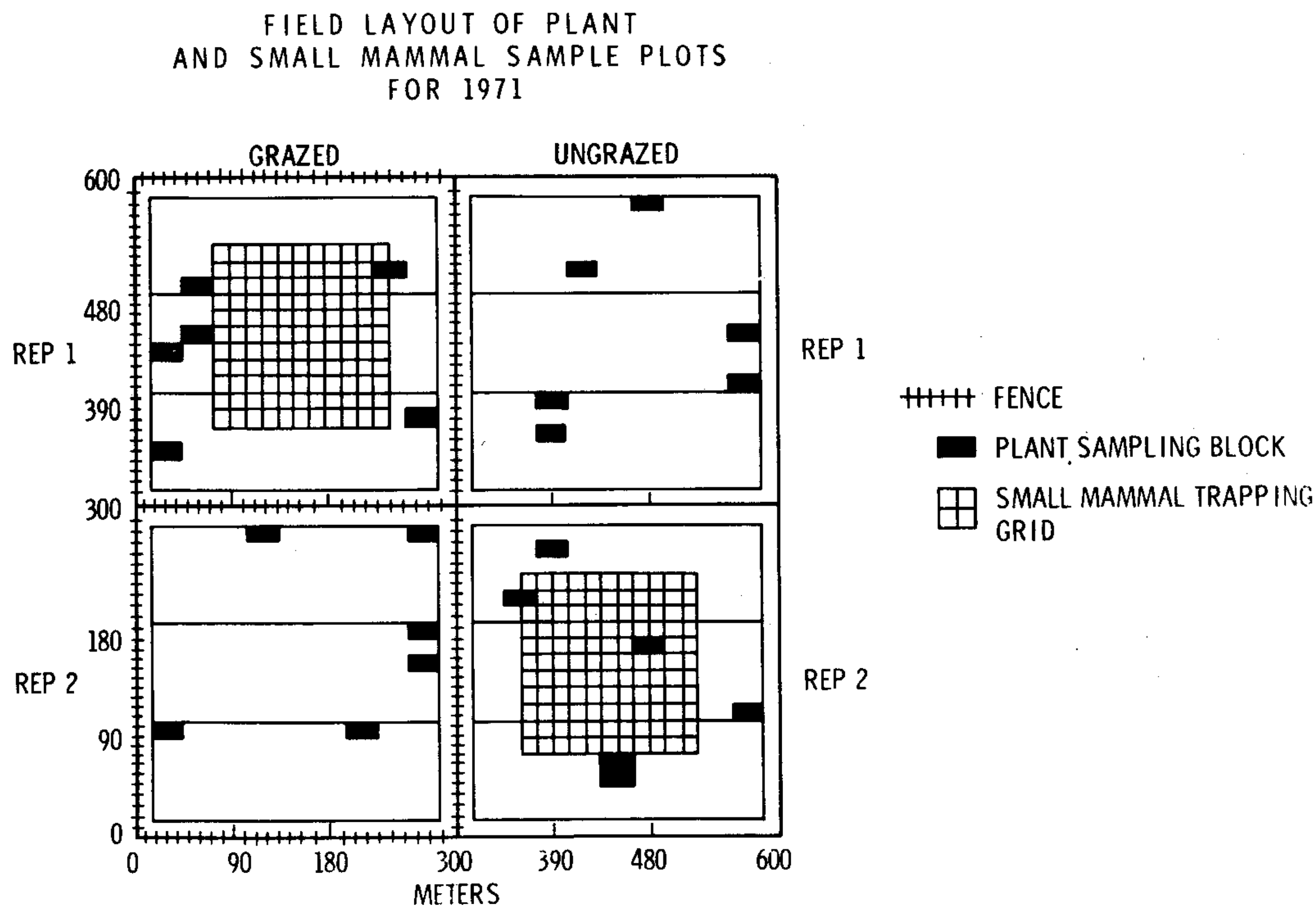

Fig. 1. Layout of the four grids containing sample plots for abiotic, producer, and consumer studies on Project ALE, 1971.

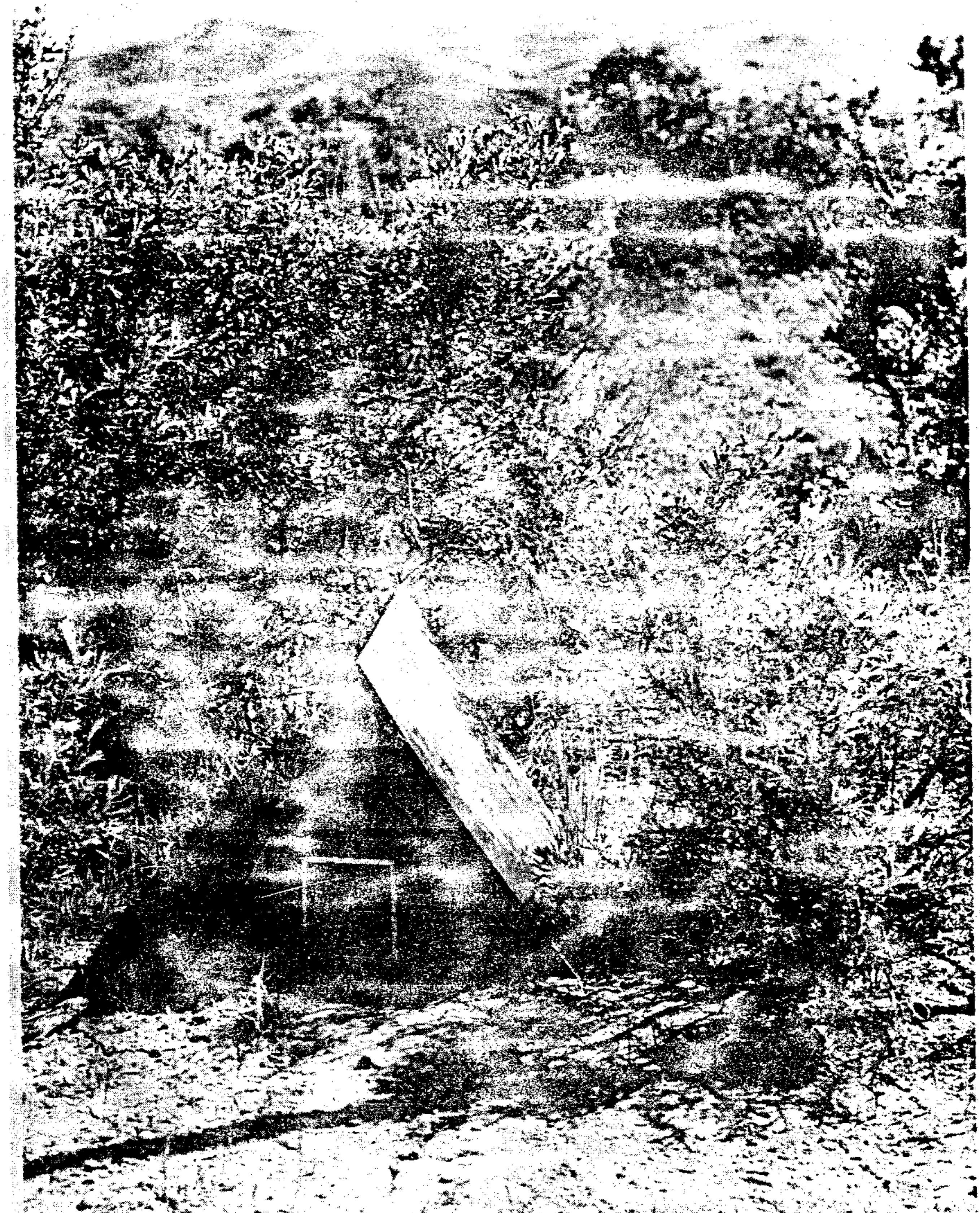

Fig. 2. A small mammal live-trapping station showing a trap surrounded by a metal can and placed under the galvanized "tent."

a small quantity of an oatmeal-peanut butter mixture. All traps were opened for 5 consecutive days during March through June. During July and September traps in the ungrazed plot were opened for 5 consecutive days, and those on the grazed grid were operated for 3 days. In November trapping was discontinued after 2 days on both plots because few animals were taken.

Early each morning animals were removed from traps and examined. All animals were individually marked by toe clipping; their species, sex, age class, reproductive condition, pelage, general condition, location of capture, and weight were recorded. A computer diary was consulted at each capture to insure proper identification. Animals were immediately released at the site of capture.

Field data were transcribed onto computer sheets, punched, sorted, and listed. After proofreading, the data were added to computer tapes for analysis and preparation of field diaries. These data were transcribed into the format prescribed by Form NREL-10, and the information is stored as Grassland Biome data set A2U10B1.

Kill Trapping

During the first three trapping sessions small mammals were collected to obtain data on food preference, reproduction, ecto- and endoparasites, and spontaneous tissue lesions. A line of 50 snap traps, spaced approximately 15 m apart, was placed 1 to 1½ miles north of the live trap grids in the same vegetation type. The traps were baited in the late afternoon; dead animals were removed the following morning and placed in plastic bags, one species to a bag to insure that ectoparasites would be associated with their correct host. Few animals were taken in the kill traps, even on nights when 60-100 *Perognathus* were taken on the live trap grids. For this reason kill trapping was discontinued after May.

Jackrabbit Transect

Jackrabbit populations were estimated on all comprehensive sites in 1971. A road count, using a vehicle equipped with spotlights throwing beams a measured distance perpendicular to the path of travel, was suggested as the common index technique. On Project ALE a road, which traverses the grassland association for about 8 miles, was used for preliminary road counts in late March; but no jackrabbits were seen, and the transects were discontinued.

Cattle

On 14 April 1971, 15 yearling Hereford steers were introduced onto one of the two grazed pastures. Cattle were rotated between the grazed plots every 7 days until 10 June 1971 when they were removed. This pasture rotation scheme was adopted because it is a plan commonly used by cattlemen in this region, but in this case it concentrated the herbivory in a smaller area. It also allowed the investigators to make measurements and sample biota on the grazed plots when the cattle were in the other pasture. The livestock were weighed at the beginning and end of the grazing season.

RESULTS

Livetrapping

Seven species of small mammals were trapped on the IBP plots in 1971: Great Basin pocket mouse, *Perognathus parvus*; deer mouse, *Peromyscus maniculatus*; Townsend's ground squirrel, *Spermophilus townsendii*; northern grasshopper mouse, *Onychomys leucogaster*; western harvest mouse, *Reithrodontomys megalotis*; sagebrush vole, *Lagurus curtatus*; and the Norway rat, *Rattus norvegicus*. Fresh pocket gopher (*Thomomys talpoides*) mounds were observed in a limited area on the ungrazed plot, but none were trapped. The species composition and relative abundance of small mammals is summarized in Table 1. The number of each species represents the total number of *individuals* of that species taken during the trapping session.

Four species (*Perognathus parvus*, *Peromyscus maniculatus*, *Spermophilus townsendii*, and *Onychomys leucogaster*) accounted for 98% of the individuals livetrapped each month (Fig. 3).

Perognathus was the most numerous mammal on both plots during all months except November. On the ungrazed plot *Perognathus* comprised 58-69% of captures from March through May and 85-97% from June to September. On the grazed plot 63-98% of the trapped animals were *Perognathus*.

The population size of *Perognathus parvus* was estimated as a function of time for both plots using Jolly's (1965) stochastic model. Each of the trapping sessions was treated as one sampling point in time, and each individual was counted only once each session although it may have actually been captured between one and five times. The results are shown in Fig. 4 which includes the estimated populations of *Perognathus* (±0.95 confidence interval) for the grazed and ungrazed plots. Data for March and September represent the actual number of individuals trapped since the nature of Jolly's model precludes making estimates on the first and last sampling dates.

The estimated population size and the actual number of individuals trapped each month were almost identical from April to June. The trapping

Table 1. Species composition and relative abundance of small mammals livetrapped on grazed and ungrazed grasslands, Project ALE, 1971.

Species	Ungrazed Plot								Grazed Plot							
	Mar.[a]	Apr.	May	June	July	Sept.	Nov.[b]	Σ	Mar.	Apr.	May	June	July[c]	Sept.[c]	Nov.[c]	Σ
Perognathus parvus	33	63	72	49	32	22	-	146	26	63	59	45	33	10	0	120
Peromyscus maniculatus	18	12	10	1	1	3	3	33	21	24	4	-	2	5	2	46
Spermophilus townsendii	2	14	21	2	-	-	-	30	1	-	10	-	-	-	-	11
Onychomys leucogaster	3	2	3	3	-	1	1	7	2	-	1	1	1	1	-	6
Reithrodontomys megalotis	-	-	1	-	-	-	-	1	2	1	-	-	-	-	-	3
Lagurus curtatus	1	-	-	-	-	-	-	1	2	2	-	-	-	-	-	4
Rattus norvegicus	-	-	1	-	-	-	-	1	-	-	-	-	-	-	-	0
Thomomys talpoides	Mounds present--not trapped								No mounds observed							

[a]/288 livetraps at risk/night/plot: traps operated for 5 consecutive days each month.
[b]/Traps operated for 2 consecutive days.
[c]/Traps operated for 3 consecutive days.

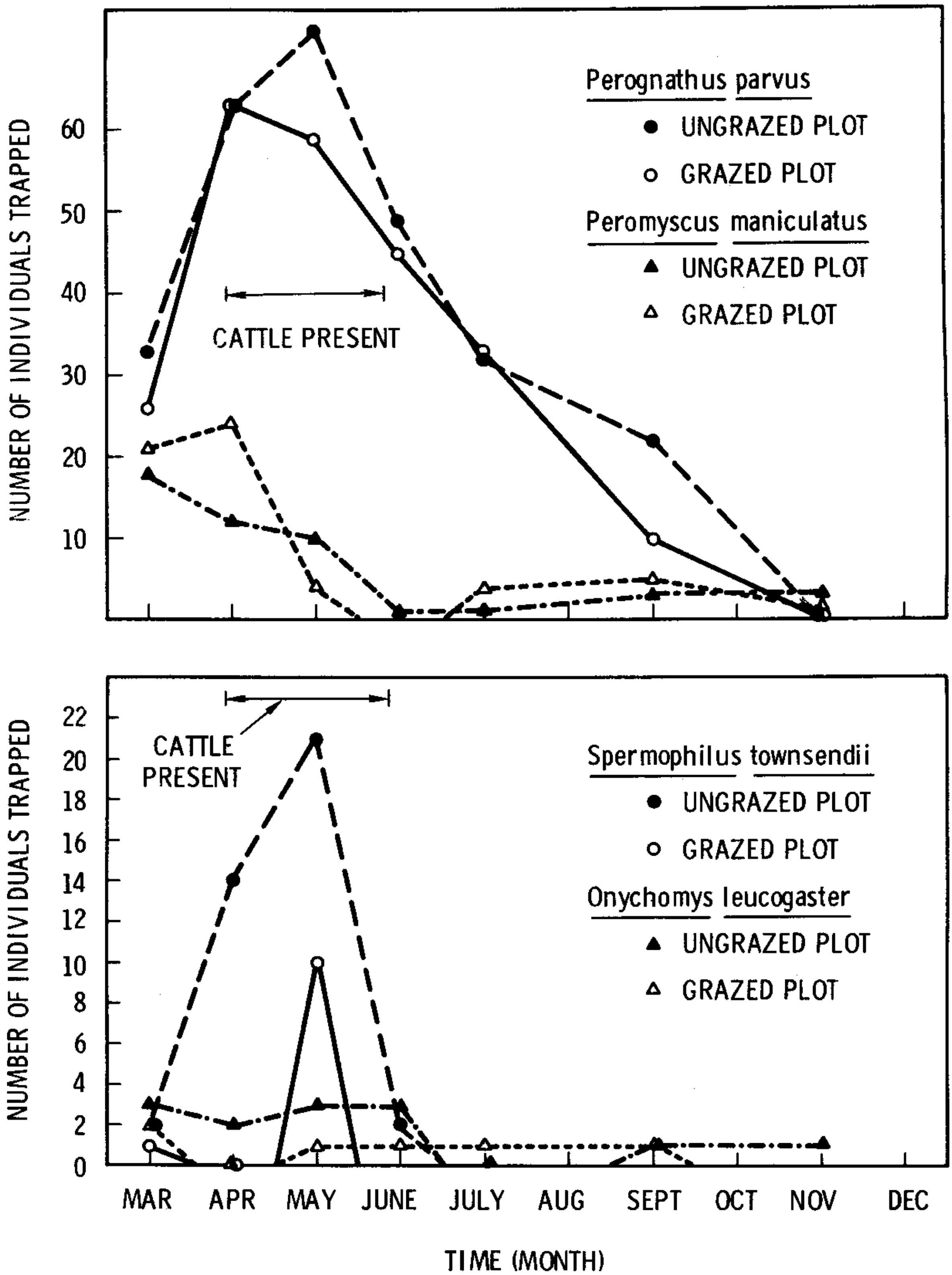

Fig. 3. Graph of species abundance as a function of time for the four most numerous small mammals trapped in 1971 on grazed and ungrazed sites.

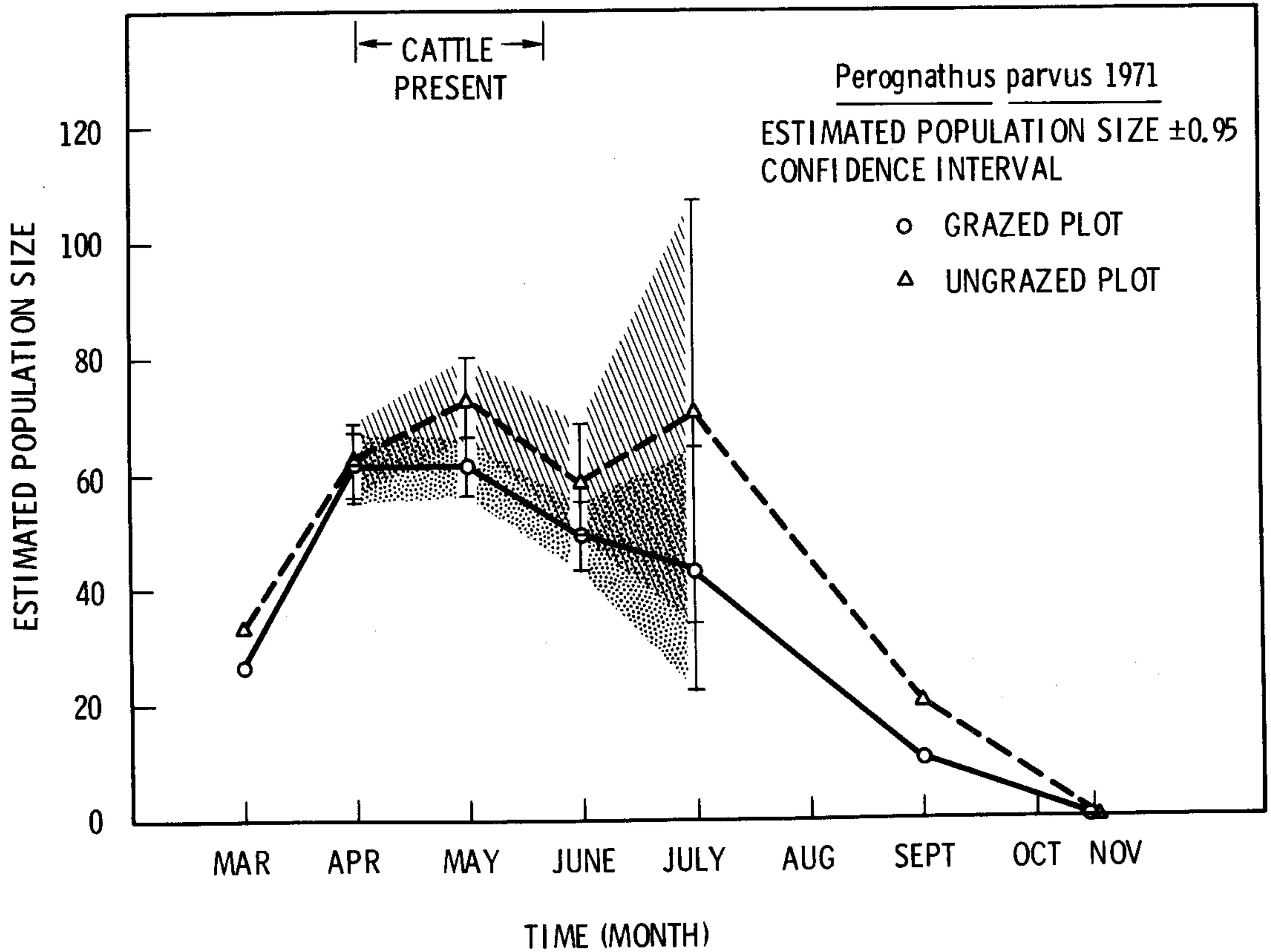

Fig. 4. Population size (±0.95 confidence interval) of pocket mice, *Perognathus parvus*, on grazed and ungrazed plots estimated with Jolly's (1965) stochastic model.

intensity and high probability of recapture of *Perognathus* no doubt contributed to the similarity between the actual number trapped and the population estimates. Results on the ungrazed plot differed in July in that substantially fewer individuals were trapped than were estimated to be in the population (32 vs. 70). Judging by the width of the confidence interval we might consider the estimate an artifact of the estimation model due to the data collected late in the season. On the ungrazed plot many marked mice missed in July were trapped in September. Further trapping in 1972 should help reduce the variance of the estimate in July and reduce the difference between the estimate and the number of individuals actually trapped.

Trapping data for *Perognathus parvus* (Fig. 3) and the graph of estimated population size (Fig. 4) indicate that the species reached peak numbers on the two grids during April and May--the period between arousal from torpor and commencement of breeding. After May the population declined rapidly and ceased aboveground activities between September and November.

These data were adequate to permit an examination of the sex and age structure of the population (Fig. 5). From March through May the entire trappable population was composed of adults, but from June on 35-90% of the captures were subadults. The recruitment of juveniles was apparently inadequate to compensate for the declining numbers of adults.

Males were active aboveground 1 month before the females, attained their peak populations approximately 1 month earlier than females, and were more abundant throughout the trapping period. The numbers of both sexes declined from April and May until September.

Subadults were first taken in June, reached peak densities in July, and declined in numbers from then on. There appeared to be more subadult

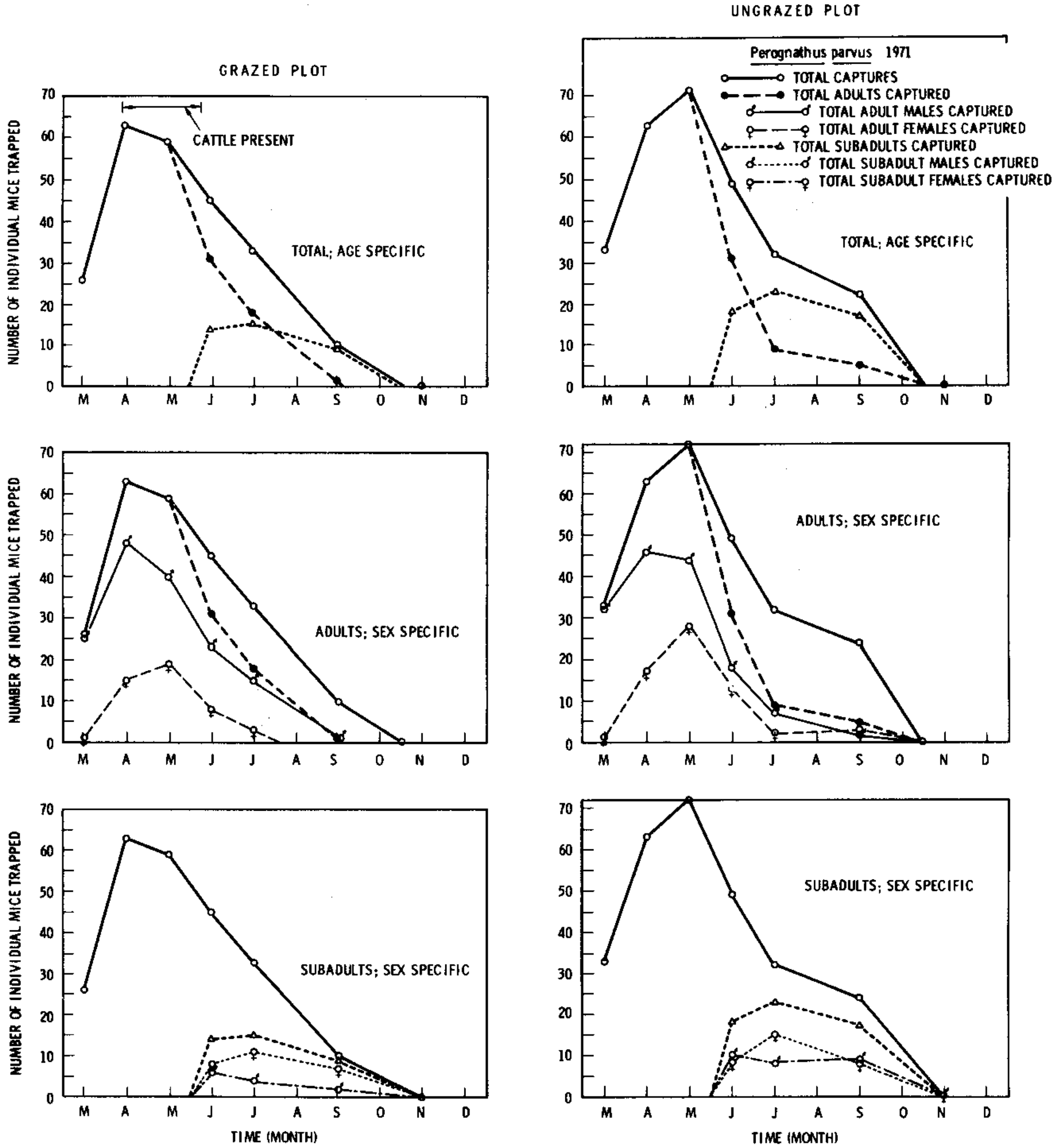

Fig. 5. Number of individual pocket mice captured as a function of time and expressed as both age- and sex-related contributions to the total population.

females than males on both plots during July, but the sample size was too small to establish significant deviations from a 1:1 sex ratio.

Deer mice, *Peromyscus maniculatus*, were the second most abundant mammal and reached peak densities in March and April. Their numbers were reduced sharply during the hotter months from June through September (Fig. 3). *Peromyscus* and *Onychomys* were the only species trapped in November.

Ground squirrels, *Spermophilus townsendii*, were active on both grids between March and June and reached peak numbers in May (Fig. 3). Twice as many individuals were captured on the ungrazed plot during May as on the grazed pasture. No squirrels were trapped after June when the population apparently began to estivate.

Only a few individual grasshopper mice, *Onychomys leucogaster*, were taken in 1971, but they were taken consistently through the trapping season. They were one of only two species trapped in November, although most *Onychomys* were trapped between March and June.

Reithrodontomys megalotis and *Lagurus curtatus* were taken sporadically on both grids between March and May, and neither species appeared to be abundant on these sites.

A single capture of a female Norway rat, *Rattus norvegicus*, was probably an oddity. Most references indicate that this species is found associated with human developments. The closest habitation, a small house and barn, is over 5 miles away across an unbroken stretch of native vegetation.

Pocket gopher (*Thomomys talpoides*) mounds were observed on the ungrazed grid only, between March and September. There appeared to be only one individual since the mounding activity was confined to an area of less than 250 m^2. In November there was an increase in mounding on both plots, but the actual number of pocket gophers was not determined.

Biomass

All animals were weighed each trapping session, and the data were used in conjunction with estimates of species population densities to estimate biomass of small mammals. Data on biomass, expressed in grams (wet weight) as a function of time, are presented in Tables 2 and 3.

If dominance, or "importance", is defined as percent contribution to the total biomass of an area, *Perognathus* remains the most important species with two exceptions: on the grazed site ground squirrels accounted for more total biomass in May, and on the ungrazed site they accounted for a higher biomass in April and May. These results are illustrated in Fig. 6, which includes a graph of total biomass in the upper illustration and a graph of biomass excluding *Spermophilus*. The peak total biomass was reached in May 1971 with a twofold difference (4282 vs. 2229 g) between the two plots. There was a sharp decline in estimated total biomass commencing in May; the decline closely paralleled the decline in numbers of *Spermophilus* active on the surface (Fig. 3). In estimating biomass density we assumed that the area actually being trapped was 3.24 ha including a buffer zone of half the distance to the next trap (7.5 m) around the 2.8-ha grid. The peak total biomass on the two plots was estimated to be 0.13 g/m^2 and 0.07 g/m^2 on the ungrazed and grazed plots, respectively.

The lower graph in Fig. 6 illustrates estimated biomass as a function of time excluding ground squirrels. This graph allows comparisons of the

Table 2. Estimated biomass (grams, wet weight) of small mammals on a grazed grassland, Project ALE, 1971.

Species	Month						
	Mar.	Apr.	May	June	July	Sept.	Nov.
Perognathus parvus	424	1048	973	656	523	146	-
Peromyscus maniculatus	351	424	63	-	29	88	40
Spermophilus townsendii	112	-	1242	-	-	-	-
Onychomys leucogaster	50	-	21	21	26	-	-
Reithrodontomys megalotis	27	10	-	-	-	-	-
Lagurus curtatus	50	-	-	-	-	-	-
TOTAL (grams, wet weight)	1014	1482	2229	677	578	256	40

Table 3. Estimated biomass (grams, wet weight) of small mammals on an ungrazed grassland, Project ALE, 1971.

Species	Month						
	Mar.	Apr.	May	June	July	Sept.	Nov.
Perognathus parvus	556	1024	1184	694	480	317	-
Peromyscus maniculatus	306	207	181	19	17	54	58
Spermophilus townsendii	325	1393	2711	492	-	-	-
Onychomys leucogaster	73	59	71	67	-	24	22
Reithrodontomys megalotis	-	-	15	-	-	-	-
Lagurus curtatus	26	-	-	-	-	-	-
Rattus norvegicus	-	-	120	-	-	-	-
TOTAL (grams, wet weight)	1286	2683	4282	1272	497	395	80

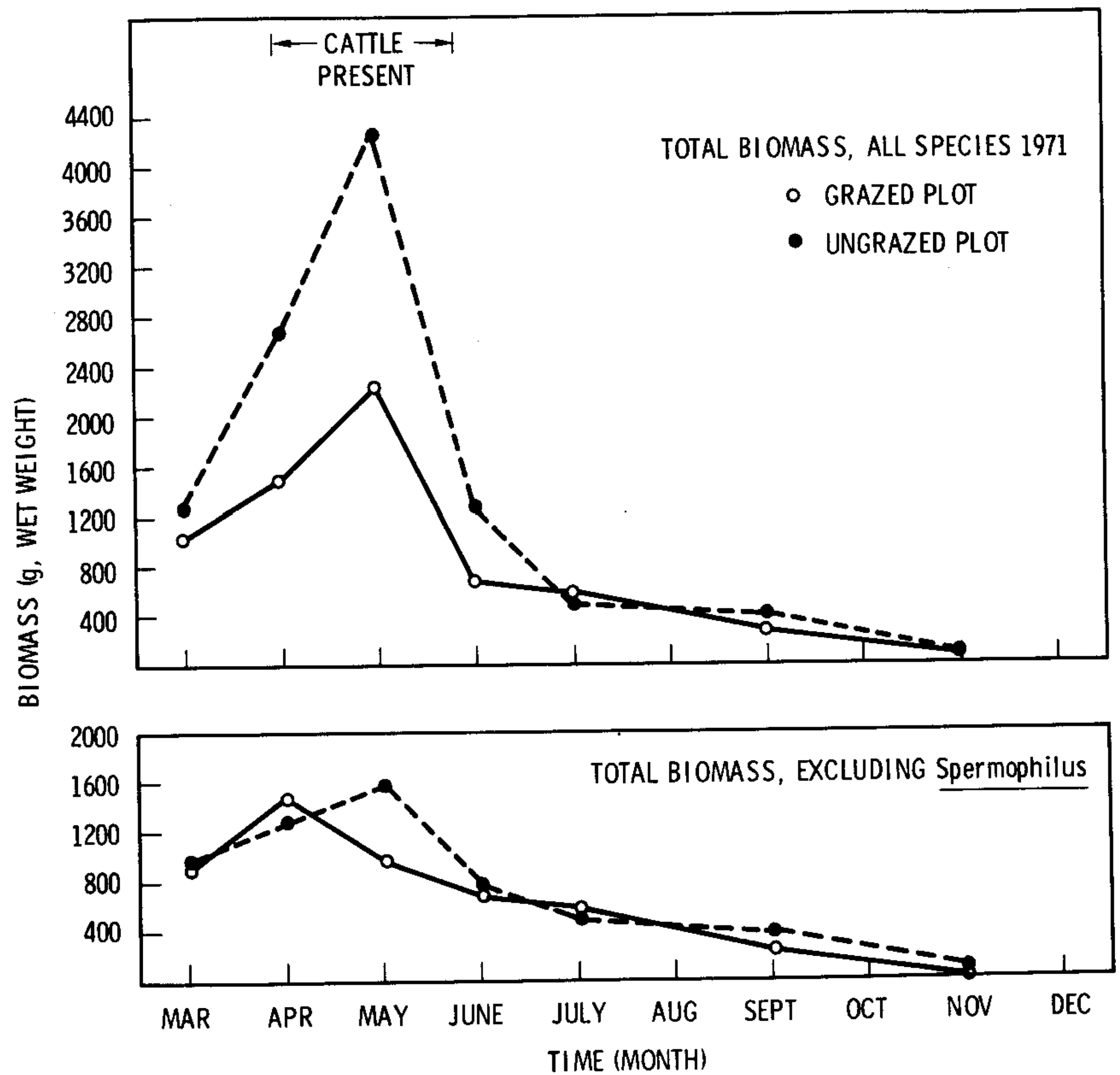

Fig. 6. Biomass of small mammals on the ALE grasslands plots during 1971 shown as a function of time. The lower graph illustrates the biomass exclusive of the contribution from ground squirrels.

changes in biomass resulting from changes in the population sizes of the most numerous mammals. It demonstrates that the peak biomass of the other small mammals was similar (1482 vs. 1571 g) on the grazed and ungrazed sites, but that the peak on the latter area occurred 1 month later.

Cattle

On 14 April 1971 the 15 yearling steers introduced onto the site weighed a total of 6615 lb. (3003.2 kg). When they were removed on 10 June they had gained 1355 lb. (615.2 kg) for an average weight gain of 1.6 lb. (707 g)/animal/day, an excellent rate of gain on open range. On an areal basis the cattle gained 3.4 g/m^2 in 58 days or an average of 0.6 g/m^2/day in the 1971 grazing season.

Jackrabbits

The road censuses in late March were unsuccessful since no animals were seen. This was expected since no jackrabbits were seen in the grasslands over the past 4 years. None were seen by the large field crews on the area in spring and summer, and no jackrabbit pellets were observed in the many plant biomass sample plots.

Impact of Burrowing

One way that some species of small mammals affect the habitat is by churning the soil during their burrowing activities. This may be especially important if the burrowing results in large surface disturbances, such as on gopher mounds or squirrel warrens, where little or no vegetation may grow for several years. During 1971 all surface disturbances on the two grids were mapped, and their impact in terms of total area was evaluated.

There were 682.5 m^2 and 332.5 m^2 surface disturbances on the ungrazed and grazed sites, respectively, i.e., 0.4 and 0.8% of the total areas of the plots. The greater area of disturbance on the ungrazed plot was due to the greater density of ground squirrels and to the presence of pocket gophers (Table 1).

DISCUSSION

The species of small mammals trapped on the Grassland Biome study area represent a mixture of animals common to two vegetation associations: the more xeric shrub-steppe of lower elevation and the more mesic grasslands found at higher elevations (Rickard, 1960). The pocket mouse, the most numerous mammalian consumer, is ubiquitous on the ALE Reserve, but finds its optimum habitat in the hotter, drier sites where annual grasses are more numerous. Deer mice and ground squirrels have a scattered distribution at lower elevations, but increase in density with increasing elevation, annual moisture, and cooler temperatures. Grasshopper mice are at the upper limit of their known altitudinal distribution on the grazed site and are more common, although not numerous, at lower elevations. The sagebrush vole reaches the lower limit of its altitudinal distribution on the plots since it is most often found at elevations in excess of 2000 ft. The wide variety of small mammals taken no doubt reflects the fact that the site rests in an ecotone with more xeric conditions below and more mesic ones above.

Pocket mice, the most numerous species, are associated with the drier shrub-steppe. They are mainly seed eaters, obtaining water from the metabolism of carbohydrates and are therefore not dependent upon the availability of free water. Reproduction in the species does appear to be related to the quantity or quality of forage available in the spring. Soil temperatures appear to be important cues initiating torpor and arousal during extremes of both high and low temperatures.

Populations of *Perognathus* on the grassland site reflect the dynamics of the species during an "average" year when the major perennial grass, *Agropyron spicatum*, did not flower and fruit in abundance. Peak numbers were reached in spring and consisted entirely of adults, with a predominance of males. Adult females had one litter, after which they and the males ceased aboveground activities. The juveniles, although adding slightly to the total population size, reached peak densities in July, but were not numerous enough to appreciably deflect the negative slope of the population curve. The juveniles did not breed, and between September and November they too ceased surface activity.

Ground squirrels, owing to their large size and rapid rate of growth, accounted for the largest amount of small mammal biomass, although they were active for only 4 months. *Spermophilus* is mainly herbivorous, eating a variety of grasses and forbs during the green-growth period of the plants. They are most numerous in the bunchgrass zones of ALE even up to the summit of Rattlesnake Mountain. They have adapted to the rigors of the region by growing rapidly in 3-4 months, depositing fat, and estivating and hibernating for 3/4 of the year. It is likely that ground squirrels have a greater impact on primary production than any other small mammal on the ALE site. In a short span during the growing season they not only maintain themselves and reproduce, but also concentrate adequate fat reserves for the remainder of the year. Other small mammals were most abundant, or at least more trappable, during the cooler, more moist portion of the year when the green vegetation was available. The deer mouse, grasshopper mouse, harvest mouse, and sagebrush vole were seldom taken after May.

Small mammals contributed a maximum of 4282 g of biomass (wet weight) during June 1971, which is 1.3 kg/ha. Compared with domestic herbivores, which gained 34 kg/ha in 58 days, the contribution of the small mammals appears insignificant. However, the cattle could not have survived more than a few more weeks since they had already consumed over 50% of the primary productivity in 58 days. Their gain, therefore, must be considered an annual gain for this type of range. A more meaningful understanding of the transfer of energy through the small mammals must await the description of a total energy budget for the population on an annual basis.

Assessing the influence of grazing on small mammals is premature since there is only "one data point." On a purely descriptive basis one can single out the following areas for scrutiny in subsequent years:

1. There were more ground squirrels on the ungrazed plot, but this was true even before the cattle were introduced.
2. Ground squirrels were active aboveground on the ungrazed plot in June; none were trapped on the grazed pasture.
3. More individual pocket mice were trapped on the ungrazed grid, and the peak population occurred 1 month later compared with the grazed plot.
4. There was a more even sex ratio of adult pocket mice after June on the ungrazed plot, and more juveniles were trapped on that grid.

5. There was essentially no difference between the total peak biomass on the two grids if the contribution of ground squirrels was excluded, but the peak biomass occurred 1 month later on the ungrazed site.

The lack of jackrabbits on the site is perhaps just as significant as if we had found them in abundance. From all external evidence one would expect to find lagomorphs scattered throughout the tussocks of native bunchgrass. This is not the case; they have not been observed in the grasslands at this or higher elevations. They are, however, common in the shrub-steppe at elevations only 200 to 300 ft lower. If the quantity or quality of forage is a limiting factor, it must be very restrictive since hares from surrounding habitats do not use the range even for a small portion of the year during optimum growth of the forage. Cover is not likely to be a limiting factor since jackrabbits are abundant on the shortgrass prairie of north-central Colorado where considerably less cover is available. We suggest that *Agropyron spicatum*, although giving the appearance of excellent jackrabbit food, is in fact marginal or substandard forage for the species in this region.

The small mammals on Project ALE do not disturb a significant portion of the soil surface. Their tailings, resulting mainly from the activities of ground squirrels, pocket gophers, and their predators (badgers and coyotes), cover less than 1% of the total area.

Descriptive studies of the small mammals on the ALE grasslands should continue for at least 3 to 5 years so that measurements of their population responses to changes in the driving variables of the system can be examined. If we are fortunate enough to have at least 1 poor year and 1 excellent year as regards plant production, the input necessary for scaling this compartment of the ecosystem may be obtained.

We suggest that environmental manipulation studies commence as soon as possible and be conducted concurrent with the present grazing experiments. Treatments including water amendments, herbicides, and fertilizer would yield the most significant results since water and nitrogen appear to be the major factors limiting plant productivity. Studies of small mammal populations should be conducted on these test plots to determine the population responses to changes in these driving variables. The information should set the upper and lower limits of the responses of small mammals to perturbations in the system, especially those affecting primary production.

Studies asking why there has been limited use of this area by native herbivores, such as antelope or bison, would be significant. They could help define the factors which restrict herbivory in this northern grassland to the smaller mammals.

ACKNOWLEDGEMENTS

We wish to acknowledge the contributions and support of the other members of the Ecosystems Department who participated in the grassland studies during 1971, particularly H. A. Sweany who helped conduct the mammal trapping.

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APPENDIX I

FIELD DATA

Small mammal live-trapping data collected at the ALE Site in 1971 is Grassland Biome Data Set A2U10B1. Data were punched on cards in the format prescribed by form NREL-10. A copy of the form and an example of the data are attached.

IBP

GRASSLAND BIOME

U.S. INTERNATIONAL BIOLOGICAL PROGRAM

FIELD DATA SHEET - VERTEBRATE - LIVE TRAPPING

DATA TYPE	SITE	INITIALS	DATE			TREATMENT	REPLICATE	PLOT SIZE	GENUS	SPECIES	SUBSPECIES	CONDITION	MARK	NUMBER	MALE	FEMALE	WEIGHT	MOLT	LOCATION		PREVIOUS NO.
			Day	Mo	Yr														Row	Col	
1-2	3-4	5-7	8-9	10-11	12-13	14	15	16-19	21-22	23-24	25	27	29	31-34	36	38	40-44	46	48-49	51-52	54-57

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

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

FEMALE
- 0 Adult, vulva inactive
- 1 Subadult, vuvla inactive
- 2 Juvenile, vulva inactive
- 3 Adult, vulva turgid
- 4 Subadult, vulva turgid
- 5 Juvenile, vulva turgid
- 6 Adult, vulva cornified
- 7 Subadult, vulva cornified
- 8 Juvenile, vulva cornified
- 9 Pregnant

CONDITION
- 0 Normal
- 1 Escaped
- 2 Torpid
- 3 Dead

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

MOLT
- 0 No evidence
- 1 Post-juvenile
- 2 Post-subadult
- 3 Adult (vernal)
- 4 Adult (autumnal)
- 5 Molt of unknown stage
- 6 Undetermined

MALE
- 0 Adult, non-breeding
- 1 Subadult, non-breeding
- 2 Juvenile, non-breeding
- 3 Adult breeding ?
- 4 Subadult breeding ?
- 5 Juvenile breeding ?
- 6 Adult breeding
- 7 Subadult breeding
- 8 Juvenile breeding
- 9 Undetermined

MARK
- 0 Normal
- 1 Unmarked
- 2 Ear tag
- 3 Toe Clip
- 4 Ear tag and toe clip
- 5 Natural amputation

+++ EXAMPLE OF DATA +++

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         1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890

1001TP019 77111 2.8 PEMA  0 2 1188 0      14.0 5  F  7
1001TP020 77111 2.8 PEMA  0 2 1189     0  15.0 5  C  4
1001TP021 77111 2.8 PEMA  0 2 1189     0       5  A  2
1001TP019 77111 2.8 PEPA  0 3 0005 0      15.5 5  M  3
1001TP020 77111 2.8 PEPA  0 3 0005 0           5  L  2
1001TP021 77111 2.8 PEPA  0 3 0005 0           5  L  3
1001TP019 77111 2.8 PEPA  0 3 0011 0      19.0 5  F  9
1001TP020 77111 2.8 PEPA  0 3 0011 0           5  C  6
1001TP021 77111 2.8 PEPA  0 3 0011 6           5  B  7
1001TP019 77111 2.8 PEPA  0 3 0012 0      19.0 5  M 12
1001TP020 77111 2.8 PEPA  0 3 0012 0           5  M 12
1001TP021 77111 2.8 PEPA  0 3 0012 0           5  M 12
1001TP019 77111 2.8 PEPA  0 3 0013 0      17.0 5  M  8
1001TP020 77111 2.8 PEPA  0 3 0013 0           5  M 10
1001TP021 77111 2.8 PEPA  0 3 0013 0           5  I 10
1001TP019 77111 2.8 PEPA  0 3 0035 0      15.0 5  M  1
1001TP020 77111 2.8 PEPA  0 3 0035 0           5  L  1
1001TP021 77111 2.8 PEPA  0 3 0035 0           5  I  1
1001TP020 77111 2.8 PEPA  0 3 0040 0      20.5 5  M  5
1001TP019 77111 2.8 PEPA  0 3 0053 0      19.0 5  K  8
1001TP020 77111 2.8 PEPA  0 3 0053 0           5  K  8
1001TP021 77111 2.8 PEPA  0 3 0053 0           5  J  9
1001TP019 77111 2.8 PEPA  0 3 0054 0      18.0 5  C 12
1001TP020 77111 2.8 PEPA  0 3 0054 0           5  D 11
1001TP021 77111 2.8 PEPA  0 3 0054 6           5  B 10
1001TP020 77111 2.8 PEPA  0 3 0100     0  14.5 5  I 11
1001TP021 77111 2.8 PEPA  0 3 0100     0       5  L 11
1001TP019 77111 2.8 PEPA  0 3 0134 0      16.0 5  B  5
1001TP020 77111 2.8 PEPA  0 3 0134 0           5  A  6
1001TP021 77111 2.8 PEPA  0 3 0134 0           5  A  4
1001TP019 77111 2.8 PEPA  0 3 0140 0      16.0 5  B  1
1001TP020 77111 2.8 PEPA  0 3 0140 0           5  G  1
1001TP021 77111 2.8 PEPA  0 3 0140 0           5  C  4
1001TP019 77111 2.8 PEPA  0 3 0151 0      18.0 5  D 10
1001TP020 77111 2.8 PEPA  0 3 0151 0           5  D 10
1001TP021 77111 2.8 PEPA  0 3 0151 0           5  D 11
1001TP020 77111 2.8 PEPA  0 3 0213 0      18.0 5  A  1
1001TP021 77111 2.8 PEPA  0 3 0213 0           5  A  1
1001TP021 77111 2.8 PEPA  0 3 0214     0  14.0 5  C 12
1001TP019 77111 2.8 PEPA  0 3 0255 0      18.0 5  A 10
1001TP020 77111 2.8 PEPA  0 3 0255 0           5  A 10
1001TP021 77111 2.8 PEPA  0 3 0255 0           5  A  9
1001TP019 77111 2.8 PEPA  0 3 0301 0      17.5 5  A 12
  01TP020 77111 2.8 PEPA  0 3 0301 0           5  B 10
1001TP021 77111 2.8 PEPA  0 3 0301 0           5  A 10
1001TP019 77111 2.8 PEPA  0 3 0334 0      21.5 5  A  2
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1001TP020	77111	2.8	PEPA	0	3	0334	0		5	A	2
)01TP021	77111	2.8	PEPA	0	3	0334	0		5	A	1
1001TP019	77111	2.8	PEPA	0	3	0342	0	14.0	5	G	2
1001TP020	77111	2.8	PEPA	0	3	0342	0		5	G	1
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1001TP019	77111	2.8	PEPA	0	3	0350	0	14.0	5	G	12
1001TP020	77111	2.8	PEPA	0	3	0350	0		5	H	11
1001TP021	77111	2.8	PEPA	0	3	0350	0		5	H	12
1001TP019	77111	2.8	PEPA	0	3	0351	0	17.0	5	I	6
1001TP020	77111	2.8	PEPA	0	3	0351	0		5	H	6
1001TP021	77111	2.8	PEPA	0	3	0351	0		5	K	5
1001TP019	77111	2.8	PEPA	0	3	0410	0	20.0	5	M	2
1001TP020	77111	2.8	PEPA	0	3	0410	0	18.0	5	M	3
1001TP021	77111	2.8	PEPA	0	3	0410	0		5	L	3
1001TP019	77111	2.8	PEPA	0	3	0425	0	15.5	5	A	2
1001TP020	77111	2.8	PEPA	0	3	0425	0		5	B	2
1001TP021	77111	2.8	PEPA	0	3	0425	0		5	A	3
1001TP020	77111	2.8	PEPA	0	3	1000	0	12.0	5	M	10
1001TP021	77111	2.8	PEPA	0	3	1000	1		5	M	10
1001TP021	77111	2.8	PEPA	0	3	1005	0	14.0	5	J	3
1001TP019	77111	2.8	PEPA	0	3	1010	1	12.5	5	K	10
1001TP020	77111	2.8	PEPA	0	3	1010	1		5	I	10
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1001TP021	77111	2.8	PEPA	0	3	1011	1		5	D	3
001TP019	77111	2.8	PEPA	0	3	1024	1	15.5	5	H	12
001TP020	77111	2.8	PEPA	0	3	1024	1		5	I	12
1001TP021	77111	2.8	PEPA	0	3	1024	1		5	H	11
1001TP019	77111	2.8	PEPA	0	3	1053	1	11.5	5	D	10
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1001TP019	77111	2.8	PEPA	0	3	1054	1	12.0	5	F	6
1001TP020	77111	2.8	PEPA	0	3	1054	1		5	E	6
1001TP021	77111	2.8	PEPA	0	3	1054	1		5	F	7
1001TP019	77111	2.8	PEPA	0	3	1055	1	15.0	5	H	4
1001TP020	77111	2.8	PEPA	0	3	1055	1		5	G	3
1001TP019	77111	2.8	PEPA	0	3	1100	1	14.5	5	I	11
1001TP020	77111	2.8	PEPA	0	3	1105	1	14.0	5	K	11
1001TP021	77111	2.8	PEPA	0	3	1105	1		5	K	10
1001TP021	77111	2.8	PEPA	0	3	1113	1	14.5	5	A	10
1001TP021	77111	2.8	ONLF	0	2	1136	6	25.5	5	I	6
1001TP019	77132	2.8	PEMA	0	2	1111	0	14.0	5	I	1
1001TP020	77132	2.8	PEMA	3	2	1111	0	17.0	5	J	1
1001TP019	77132	2.8	PEPA	0	3		9		5	F	12
1001TP020	77132	2.8	PEPA	0	3		1	12.0	5	M	8
1001TP019	77132	2.8	PEPA	0	3	0020	0	16.0	5	C	3
1001TP020	77132	2.8	PEPA	0	3	0020	0		5	D	3
1001TP021	77132	2.8	PEPA	0	3	0020	0		5	A	1
1001TP023	77132	2.8	PEPA	0	3	0020	0		5	B	2
1001TP020	77132	2.8	PEPA	3	3	0044	0	T16.0	5	G	2
1001TP019	77132	2.8	PEPA	0	3	0110	0	19.0	5	B	1
01TP020	77132	2.8	PEPA	0	3	0110	0		5	A	1
1001TP021	77132	2.8	PEPA	0	3	0110	0		5	C	3

1001TP022	77132	2.8	PEPA	0	3	0110	0		5	A	1
1001TP023	77132	2.8	PEPA	0	3	0110	0		5	C	2
1001TP021	77132	2.8	PEPA	0	3	0113	0	19.0	5	A	10
1001TP022	77132	2.8	PEPA	0	3	0113	0		5	A	11
1001TP023	77132	2.8	PEPA	0	3	0113	0		5	A	12
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1001TP020	77132	2.8	PEPA	0	3	0131	0		5	K	2
1001TP021	77132	2.8	PEPA	0	3	0131	0		5	L	1
1001TP023	77132	2.8	PEPA	0	3	0131	0		5	M	1
1001TP019	77132	2.8	PEPA	0	3	0155	0	19.0	5	B	7
1001TP020	77132	2.8	PEPA	0	3	0155	0		5	B	6
1001TP021	77132	2.8	PEPA	0	3	0155	0		5	B	7
1001TP022	77132	2.8	PEPA	0	3	0155	0		5	A	6
1001TP023	77132	2.8	PEPA	0	3	0155	0		5	B	9
1001TP020	77132	2.8	PEPA	0	3	0205	0	19.0	5	H	10
1001TP021	77132	2.8	PEPA	0	3	0205	0		5	H	10
1001TP022	77132	2.8	PEPA	0	3	0205	0		5	G	10
1001TP023	77132	2.8	PEPA	0	3	0205	0		5	G	12
1001TP019	77132	2.8	PEPA	0	3	0322	0	16.0	5	F	2
1001TP020	77132	2.8	PEPA	0	3	0322	0		5	F	4
1001TP021	77132	2.8	PEPA	0	3	0322	0		5	D	2
1001TP022	77132	2.8	PEPA	0	3	0322	0		5	F	1
1001TP023	77132	2.8	PEPA	0	3	0322	0		5	F	2
1001TP021	77132	2.8	PEPA	0	3	0330	0	13.0	5	M	5
1001TP022	77132	2.8	PEPA	0	3	0330	0		5	M	5
1001TP023	77132	2.8	PEPA	0	3	0330	0		5	M	4
1001TP019	77132	2.8	PEPA	0	3	0352	0	13.0	5	D	8
1001TP020	77132	2.8	PEPA	0	3	0352	0		5	B	7
1001TP021	77132	2.8	PEPA	0	3	0352	0		5	C	9
1001TP022	77132	2.8	PEPA	0	3	0352	0		5	D	6
1001TP023	77132	2.8	PEPA	0	3	0352	0		5	B	8
1001TP019	77132	2.8	PEPA	0	3	0354	0	15.0	5	H	1
1001TP020	77132	2.8	PEPA	0	3	0354	0		5	H	2
1001TP021	77132	2.8	PEPA	0	3	0354	0		5	J	2
1001TP022	77132	2.8	PEPA	0	3	0354	0		5	H	1
1001TP023	77132	2.8	PEPA	0	3	0354	0		5	I	1
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1001TP020	77132	2.8	PEPA	0	3	0355	0		5	K	11
1001TP021	77132	2.8	PEPA	0	3	0355	0		5	J	11
1001TP022	77132	2.8	PEPA	0	3	0355	0		5	L	12
1001TP023	77132	2.8	PEPA	0	3	0355	0		5	I	12
1001TP019	77132	2.8	PEPA	0	3	0421	0	15.0	5	D	12
1001TP020	77132	2.8	PEPA	0	3	0421	0		5	C	11
1001TP021	77132	2.8	PEPA	0	3	0421	0		5	C	12
1001TP022	77132	2.8	PEPA	0	3	0421	0	NT	5	F	12
1001TP021	77132	2.8	PEPA	0	3	0422	0	14.0	5	B	1
1001TP022	77132	2.8	PEPA	0	3	0422	0		5	A	1
1001TP023	77132	2.8	PEPA	0	3	0422	0		5	B	1
1001TP019	77132	2.8	PEPA	3	3	0430	0	15.0	5	D	1
1001TP023	77132	2.8	PEPA	0	3	1002	0	18.5	5	A	1
1001TP019	77132	2.8	PEPA	0	3	1015	1	12.5	5	H	12
1001TP021	77132	2.8	PEPA	0	3	1015	0		5	G	11
1001TP023	77132	2.8	PEPA	0	3	1015	1		5	I	12
1001TP019	77132	2.8	PEPA	0	3	1031	1	12.0	5	H	7

001TP020	77132	2.8	PFPA	0	3	1031	1			5	G	7
1001TP021	77132	2.8	PFPA	0	3	1031	1			5	M	8
1001TP022	77132	2.8	PFPA	0	3	1031	1			5	J	9
1001TP023	77132	2.8	PFPA	0	3	1031	0			5	J	6
1001TP019	77132	2.8	PFPA	0	3	1034	0		20.0	5	C	3
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1001TP020	77132	2.8	PFPA	0	3	1041		1		5	H	5
1001TP021	77132	2.8	PFPA	0	3	1041		1		5	G	3
1001TP023	77132	2.8	PFPA	0	3	1041		1		5	G	8
1001TP019	77132	2.8	PFPA	0	3	1044		0	13.0	5	A	9
1001TP020	77132	2.8	PFPA	0	3	1044		0		5	C	9
1001TP022	77132	2.8	PFPA	0	3	1044		1		5	H	10
1001TP019	77132	2.8	PFPA	0	3	1050		0	15.0	5	G	9
1001TP020	77132	2.8	PFPA	0	3	1050		0		5	G	10
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1001TP020	77132	2.8	PFPA	0	3	1052		1		5	M	6
1001TP021	77132	2.8	PFPA	0	3	1052		1		5	M	5
1001TP022	77132	2.8	PFPA	0	3	1052		0		5	M	5
1001TP023	77132	2.8	PFPA	0	3	1052		1		5	K	4
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1001TP020	77132	2.8	PFPA	0	3	1101		1		5	A	4
1001TP021	77132	2.8	PFPA	0	3	1101		1		5	B	6
1001TP019	77132	2.8	PFPA	0	3	1102		1	13.0	5	B	5
1001TP020	77132	2.8	PFPA	0	3	1102		1		5	A	6
1001TP022	77132	2.8	PFPA	0	3	1102		1		5	A	8
1001TP023	77132	2.8	PFPA	0	3	1102		0		5	A	6
1001TP019	77132	2.8	PFPA	0	3	1103	1		12.5	5	F	1
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1001TP022	77132	2.8	PFPA	0	3	1103	1			5	D	2
1001TP023	77132	2.8	PFPA	0	3	1103	1			5	F	3
1001TP019	77132	2.8	PFPA	0	3	1104	1		12.5	5	M	7
1001TP020	77132	2.8	PFPA	0	3	1110	1		13.5	5	C	10
1001TP022	77132	2.8	PFPA	0	3	1110	1			5	H	10
1001TP020	77132	2.8	PFPA	0	3	1111		1	13.0	5	K	2
1001TP022	77132	2.8	PFPA	0	3	1111		1		5	J	1
1001TP020	77132	2.8	PFPA	0	3	1112	1		14.5	5	J	9
1001TP021	77132	2.8	PFPA	0	3	1112	1			5	J	10
1001TP022	77132	2.8	PFPA	0	3	1112	1			5	K	9
1001TP023	77132	2.8	PFPA	0	3	1112	1			5	L	10
1001TP021	77132	2.8	PFPA	0	3	1114		0	15.5	5	K	9
1001TP023	77132	2.8	PFPA	0	3	1114		1		5	L	8