POPULATION DYNAMICS AND HABITAT UTILIZATION BY DIPODOMYS COMPACTUS IN A BEACH COMMUNITY ON NORTH PADRE ISLAND NATIONAL SEASHORE

Thesis

Presented to the Graduate Council
of Southwest Texas State University
in Partial Fulfillment of
the Requirements

For the Degree of
MASTER OF SCIENCE

by

Gary M. McCoig
Canyon Lake, Texas

Febuary 1983

TABLE OF CONTENTS

LIST OF FIGURES

ACKNOWLEDGEMENTS

I wish to express my gratitude to the people who assisted me with this research project. David Trimm, Ricky Scott and Jack Horton's help in the collection of data was invaluable. Further appreciation goes to Jack Horton for his tremendous help with the analysis of the data. Tom Cole's help on the final preparation of the text using the 'Diablo' program was greatly appreciated. Sincere appreciation is extended to Dr. David G. Huffman for his patient help with the computer analysis. I wish to express my deepest thanks to Dr. John T. Baccus for his confidence and support in myself and this project. Last and by no means least I thank my wife, Dianne, for her tremendous help through all phases of this paper. Without her help, support and sacrifices during the field work, data analysis and the writing of this paper I could not have finished it.

INTRODUCTION

The heteromyid rodents inhabit desert or semiarid environments of the western United States and Mexico (Brown, 1973). They prefer areas with deep sandy soils and patchy vegetation. Most dig shallow burrows and forage for seeds at night. To varying degrees most species are able to conserve metabolic water and seldom drink. The heteromyids are generally solitary except during mating. There are approximately 75 species in five genera: Dipodomys (kangaroo rats), Perognathus (pocket mice), Liomys (spiney pocket mice), Heteromys (Demarst spiney pocket mice), and Microdipodops (kangaroo mice) (Hall, 1981).

Population cycles of kangaroo rats vary throughout their geographic range (McCollock and Inglis, 1961). Northern populations breed in spring and early summer and usually have only one litter per year (MacMillen, 1964). Garner (1974) in a study of Dipodomys ordii (Ord's kangaroo rat) in western Texas found breeding occurred year-round with the exception of late spring and summer. He noted two breeding peaks were evident in early autumn and late winter. In the panhandle of Texas and New Mexico, McCollock and Inglis (1961) and Johnston (1956) recorded breeding activities in early autumn through winter into early spring. Utah populations of D. ordii were found to breed twice, late winter and early autumn (Duke, 1944). Population density varies on a seasonal basis. Garner (1974) reported an annual mean population density for Ord's kangaroo rat of 2.5 rats/ha. In this population the sex ratio was 1.4 males/female (Garner, 1974). Several individuals of the population were residents of the trapping grid for over a year. Desha (1967) in another study of *D. ordii* in western Texas reported a sex ratio of 1.6 males/female.

Habitat selection by kangaroo rats is largely influenced by the amount of cover (Brown, 1973; MacMillen, 1964; Lemen and Rosenweig, 1978). Kangaroo rats are generally found in areas of patchy vegetation interspersed with open areas. They tend to avoid grassland areas (Lemen and Rosenweig, 1978). Rosenweig and Winaker (1969) found *D. spectabilis* preferred areas with less than 67% cover. Brown (1973) considered habitat selection by kangaroo rats was directly related to the cover of perennial shrubs.

The home range of an animal is that area which is traversed in normal activities of food gathering, mating and caring of the young (MacMillen, 1964). MacMillen found home ranges of kangaroo rats had a large degree of intersexual and intrasexual overlap. This contrasted with the finding of considerable territorial behavior in kangaroo rats by Stock (1974). Cahalane (1961) observed aggressive behavior in the larger species of kangaroo rats (*D. spectabilis*) and no aggression in the smaller kangaroo rat *D. merriami*. Other studies involving *D. ordii* showed the home range size of male and female rats were generally equal in size (Garner, 1974; MacMillen, 1964).

The Padre Island kangaroo rat (*Dipodomys compactus*) a five-toed kangaroo rat, occurs on Mustang and Padre Islands, adjacent mainland areas and barrier islands of Mexico (Fig. 1). *Dipodomys compactus* is closely related to *D. ordii*. True (1889) first described *D. compactus* as a species, but it was later relegated to a subspecies status as *D. ordii compactus* by Davis (1942). Schmidly and Hendricks (1976), Stock(1974), and Baumgardner and Schmidly (1981), on the basis of marked differences in cranial features, chromosomes, serum protein data, and univariate and multivariate analysis of morphological characteristics of sympatric populations of *D. o. compactus* and *D. o. ordii*, elevated *D. o. compactus* to species rank. However, Hall (1981) listed *D. compactus* as a subspecies, *D.o. compactus*. He stated that the single morphological characteristic used to distinguish *D. compactus* and *D. ordii* by Schmidly and Hendricks (1976) is no more than a subspecies varation.

Dipodomys compactus primarily inhabits beach and beach-like habitats of the barrier islands and adjacent mainland of South Texas and Tamaulipas, Mexico. The beach environment is characterized by open areas of shifting sands interspersed with patches of vegetation. This affinity for a more open environment is similar to the habitat preferences of other species of

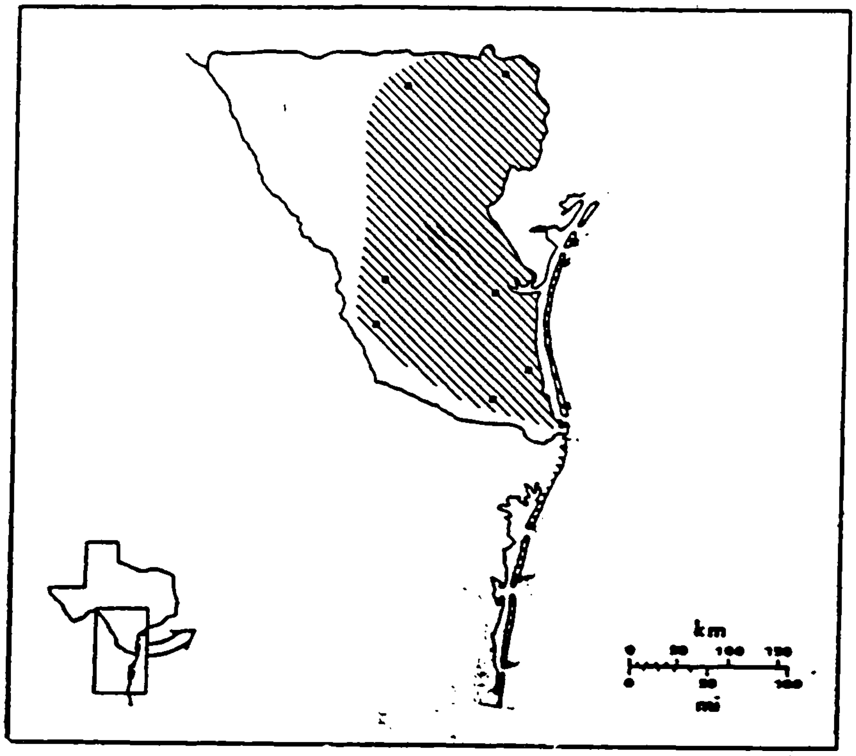

Fig. 1. Geographic distribution of Dipodomys compactus in Texas (From Baumgardner and Schmidly, 1981).

kangaroo rats. Brown (1973) reported kangaro rats inhabiting sand dunes in the western United States in habitats similar to the beach on Padre Island.

The objectives of this study were to (1) investigate the population dynamics of *Dipodomys compactus* on an undisturbed gulf beach, (2) document habitat utilization of the beach environment and (3) determine intersexual and intrasexual home range size.

STUDY AREA

This study was conducted on Padre Island National Seashore (PINS). Padre Island is a barrier island that extends 177 km from Corpus Christi Bay south to Brazos Santigo Pass. It is separated from the Texas mainland by the Laguna Madre and the man-made intercoastal waterway. The National Seashore was established in 1962 as a designated recreational area. PINS includes approximately 137.6 km of central Padre Island. Padre Island National Seashore has four different beach access areas; an unrestricted beach where vehicles are permitted, a shell beach limited to four-wheel drive vehicles, the Maliquite Beach area limited to pedestrians and a restricted beach with no public vehicle access.

Average annual precipitation ranges from 76.2 to 88.5 cm per year. Rainfall increases during winter months, triggered by warm moist air from the gulf contacting air from cold fronts. The lower portion of the Gulf Coast recieves less precipitation than the upper Gulf Coast (Brown et al., 1977). This results in less vegetation for foredune stablization, more wind erosion, fewer wetlands and a larger area of wind tidal flats. Temperatures range from an average winter low of 8^0C to an average summer high of 33^0C.

A 3.2 km stretch of restricted beach with no vehicular traffic served as the study site (Fig. 2). The study area has been restricted since the establishment of PINS except for an occassional park vehicle and an oil field maintenance truck. Pedestrian traffic is limited due to the distance from access areas. To the north , creosote posts separate the study area from a beach with normal vehicle traffic. The access road from the park headquarters is the southern boundary of the study area. The study site is the only remaining natural gulf beach at PINS. This area has a higher plant and animal species diversity than other beach areas (Baccus et al., 1977). This site is characterized by a narrow berm with an average width of 33 m and a wide area of embryo dunes with an average width of 58 m. The dominant plant species are sea-oats (*Uniola paniculata*), gulf croton (*Croton punctatus*) and the beach evening primrose (*Oenothera drummondii*). These plants are all primary dune builders. The dominant small mammals captured were the Padre Island kangaroo rat (*D. compactus*) and the spotted ground squirrel (*Spermophilus spilosoma*). Other mammals caught were the pygmy mouse (*Baiomys taylori*), the short-tailed grasshopper mouse (*Onychomys leucogaster*) and a single south Texas pocket gopher (*Geomys personatus*). Tracks of the coyote (*Canis latrans*) were common along the trap lines. There were a few active burrows of the badger (*Taxidea taxus*) near the trapping grid.

Fig. 2. Map of study site showing transect lines.

METHODS AND MATERIALS

Sixteen transect lines were established along a 3.2 km stretch of beach (Fig. 2). The transect lines extended from a primary central line with eight lines to the north and eight lines to the south. Spacing between lines started at 5 m and doubled with each line for the first five lines in both directions. The last three lines in both directions were spaced 0.6 km apart. Twelve trap stations occurred on each transect line at 6 m intervals. A Sherman live trap (9 cm x 7.5 cm x 23 cm) was placed at each trap station. Trap station 12 always occurred at the foredune base with the other stations positioned seaward. Rolled oats were used as bait. Traps were set three consecutive nights per month beginning in March 1979 through April 1980. Traps were checked at midnight and dawn, thus giving a total of six trap nights per month per trap station for a total of 9,000 trap nights during the study. Sampling did not occurr in June 1979.

Captured animals were marked by toe clips and released at the capture site (Giles, 1971). Captured animals were sexed and classified as adults or juveniles using size as the basic criteria. Animals less than 200 mm total length were classified as juveniles (Garner, 1974, McCollock, 1961). Male reproductive condition was recorded as scrotal or nonscrotal testes. Female reproductive condition was noted as perforate or nonperforate vagina. Females with the nonperforate vagina were considered pregnant.

At each site of capture the amount of vegetative cover was estimated and rated as heavy, medium, light or no cover. The basis for the ratings was: heavy cover 76-100% coverage; medium cover 26-75% coverage; light cover 1-24% coverage; and no cover -0% coverage.

The inclusive boundary strip method (Stikel, 1954; 1965) was used to determine home ranges of animals caught five or more times.

Data analysis were based on programs from the Statistical Package for the Social Sciences (Nie et al., 1975) and the Biodat Series, written in BASIC by David G. Huffman. The habitat data was obtained using a version of the Search.Bio Program modified by Jack Horton. Population estimates were calculated using Schnabel's method (Giles, 1971).

RESULTS and DISCUSSION

Population Dynamics

This study revealed a bimodal seasonal regime for *D. compactus* -a breeding peak and a dispersal peak. A contrast in activity periods was evident due to the high numbers of females during the fall (breeding) peak and their low numbers in the winter (dispersal) peak (Fig. 3). Garner (1974) in a study of *D. ordii* showed active breeding from August to May with peaks in early autumn and late winter. He documented active breeding females during this period by microscopic ovarian examinations of female kangaroo rats. He found the greatest occurrences of vescular follicles and corpora lutea in early autumn, late winter and early spring. There was no evidence of breeding during the late spring and summer. McCollock and Inglis (1961), Johnston (1956) and Duke (1944) reported similar patterns for females. In contrast, actively breeding females on Padre Island occurred only in the late summer and early fall (Fig. 4). The continuously changing vaginal condition at this time indicated active breeding. Females were represented in low numbers at other times of the year with no captures during March and April. Possible causes for the lower number of captures were the increased competition for food and space during the dispersal of young animals which probably occupied traps that normally would have

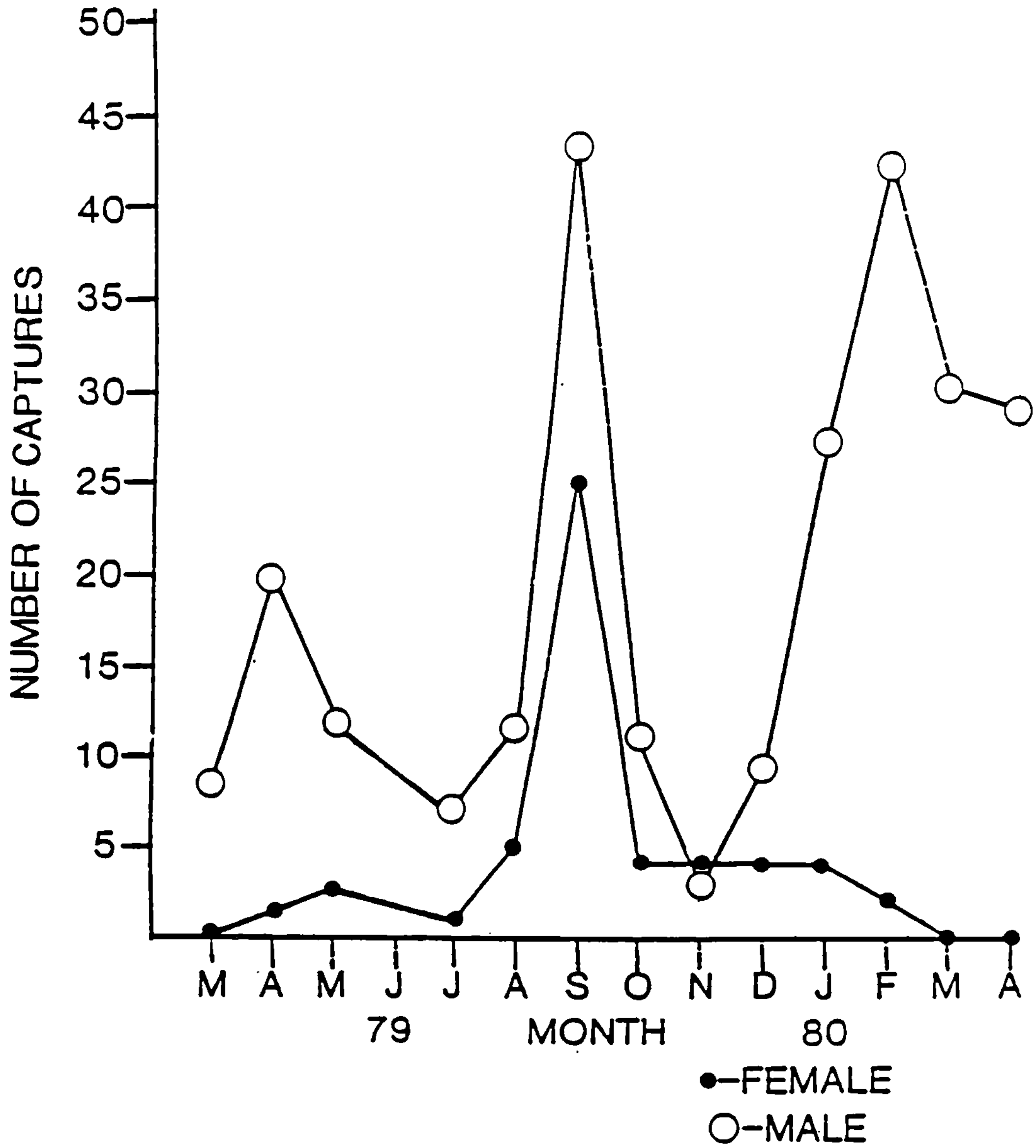

Fig. 3. Monthly captures of male and female kangaroo rats at Padre Island National Seashore.

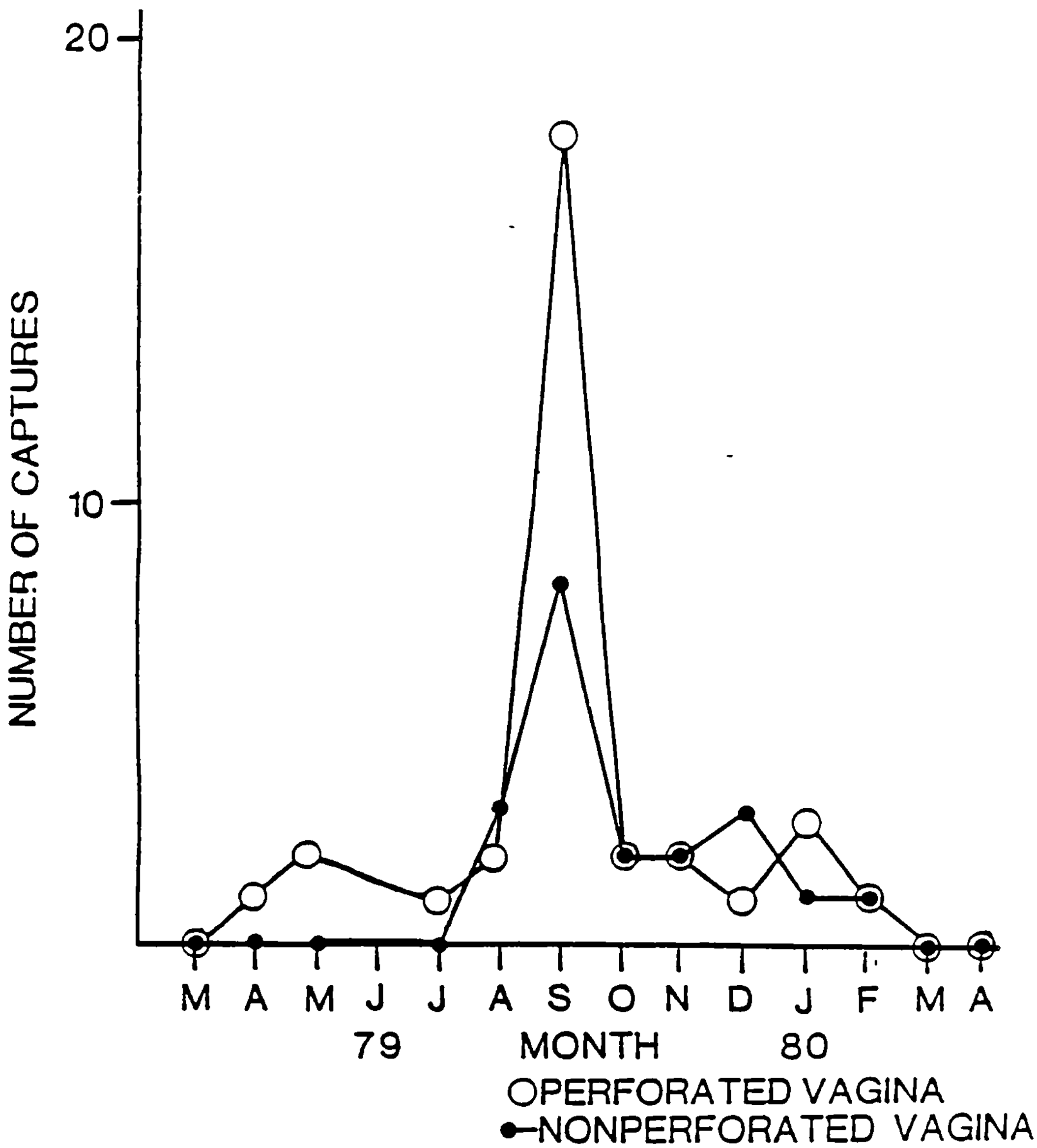

Fig. 4. Monthly reproductive activity in female kangaroo rats at Padre Island National Seashore.

been occupied by the less aggresive females, or the grid pattern in the trapping area was not extensive enough to capture the less mobile females.

Males with scrotal testes were taken throughout the sample period with the greatest number occurring in late summer and early fall (Fig. 5). On the average there were 0.9 scrotal males per nonscrotal male. The scrotal to nonscrotal ratio ranged from a high in July and August when only males with scrotal testes were taken to a low of 0.11/1 in April 1980. The emergence of young animals in April was the reason for the low ratio. The 100% occurrence of scrotal males in July and August may be an indication of active breeding. This high percentage cannot be used safely to determine active breeding. Garner (1974) found the scrotal position of the testes was not a completely valid indicator of breeding ability. In his study males captured in May, June and July had 91%, 90% and 93% scrotal testes. However, only 30% in May and June had epididymal spermatozoa. One of 13 rats captured in July lacked epididymal spermatozoa.

The dispersal period climaxed in January (Fig. 6). There were two basic criteria used to define the period from November to April as a dispersal period. First, the majority of the captures were juveniles, and secondly, there was an increase in males with nonscrotal testes (Figs. 5 and 6). The months that followed dispersal was a period when young adults established

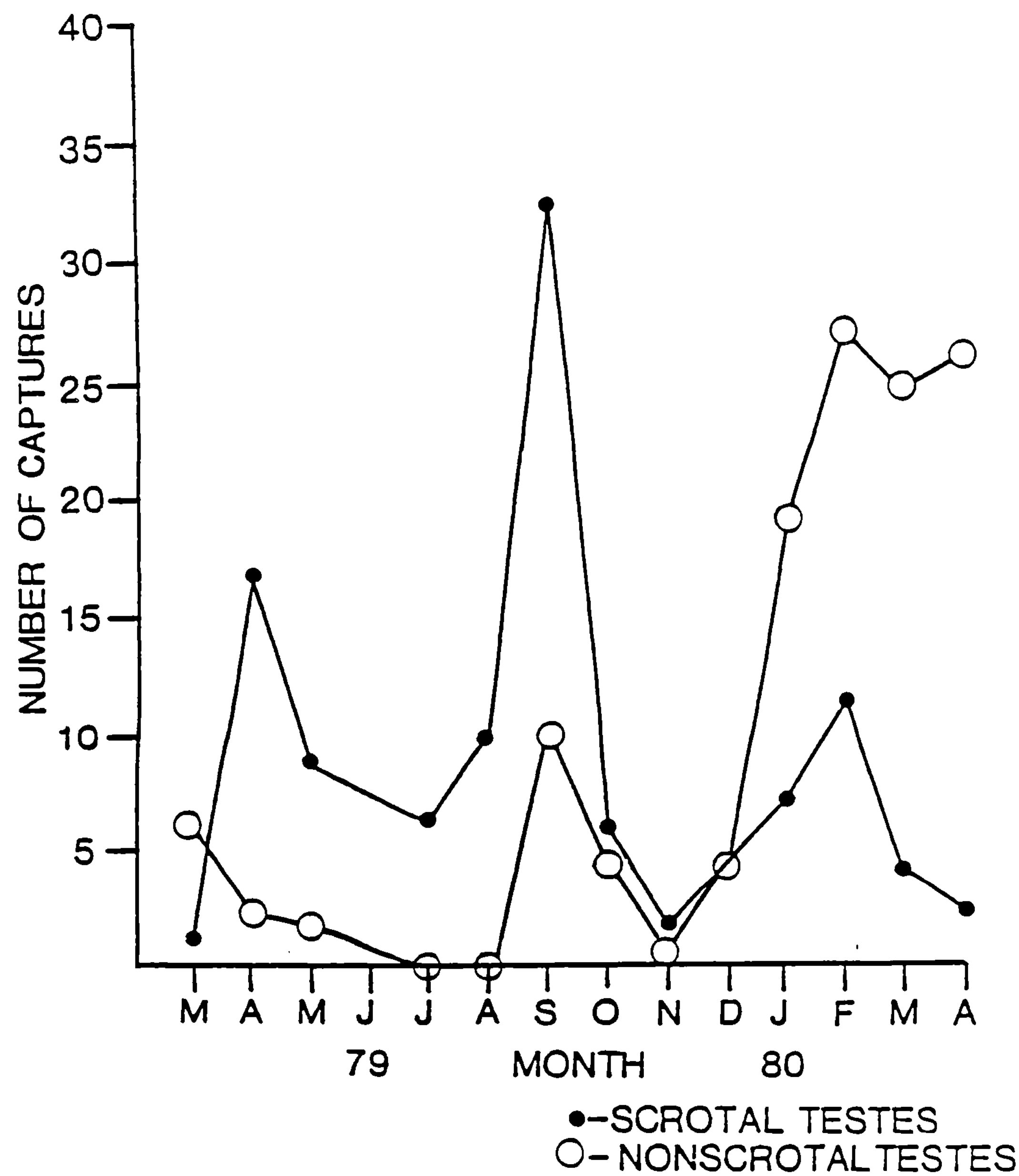

Fig. 5. Monthly reproductive activity in male kangaroo rats at Padre Island National Seashore.

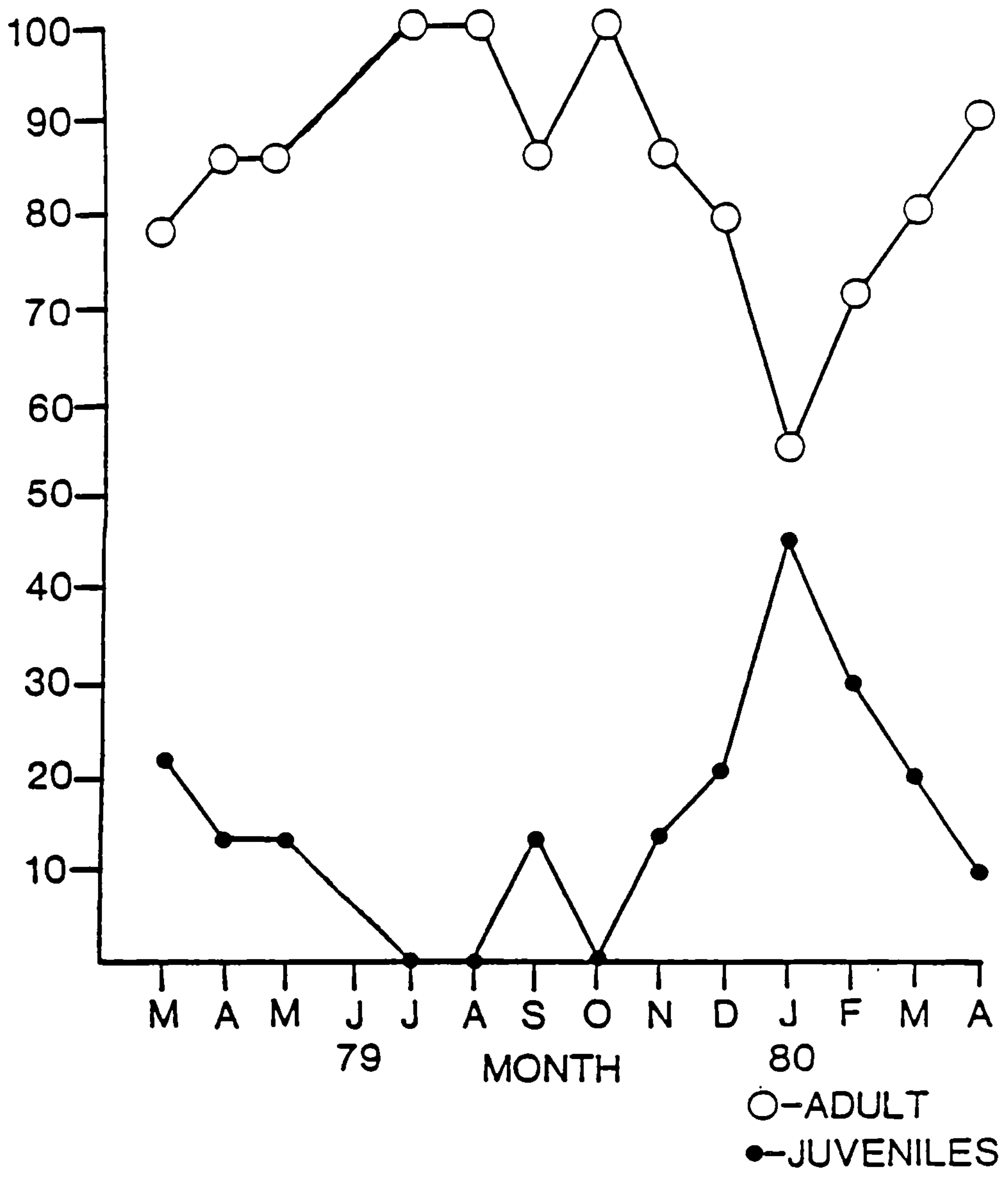

Fig. 6. Monthly population comoposistion based on capture percent for kangaroo rats on Padre Island National Seashore.

territories and replaced older individuals. Schroder and Rosenweig (1975) found that vacated habitat was quickly occupied by animals of the same species. The males caught at this time seemed more aggressive and healthier than at other times during the study. Dispersal in temperate climates is affected by seasonal changes. Garner (1974) captured a larger number of subadults in the spring. An increased number of juvenile D. agilis were taken during spring (MacMillen, 1964). Padre Island has a semitropical environment without well defined seasons. Dispersal of the Island population of kangaroo rats probably is not influenced by seasonal changes.

The estimated population of D. compactus increased throughout the study. The lowest population estimate of 54 individuals occurred in mid-summer and the highest estimate of 111 individuals was in early autumn. The increase in the population came during September-October when it increased by 77 kangaroo rats and stabilized at approximatly 80 individuals. This increase coincided with the peak of breeding activity and recruitment of new individuals into the populaton. A second increase occurred from January through April. Population densities ranged fom 3.02 kangaroo rats per ha to 6.18 kangaroo rats per ha with the average being 4.6 kangaroo rats per ha. Garner (1974) calculated densities with a range from 4.0 kangaroo rats per ha to 1.6 kangaroo rats per ha with an average of 2.5 kangaroo rats per ha. The limitations of the narrow beach habitat contributed to the increased densities. Sex ratios of 1.4 males per female (Garner, 1974) and 1.6 males per female (Desha, 1967) have been reported. On Padre Island the sex ratio was 4.8 males per female. The average number of adults per juvenile captures was 4.4/1.

Habitat

The amount of cover at trap stations apparently influenced trap success. Habitat preference by kangaroo rats in regards to cover density has been documented (Lemen and Rosenweig, 1978, Brown and Leidermann, 1973 and Rosenweig and Winaker, 1969). Lemen and Rosenweig (1978) found _D. ordii_ preferred an open habitat to grassland habitat by 77.4% to 25.5%. Ghiselin (1970) in a study of kangaroo mice found soil types influenced habitat selection. _Dipodomys spectabilis_ preferred open foliage areas with less than 67% cover (Rosenweig and Winaker, 1969). Generally areas with medium cover were preferred by _D. compactus_ (Fig. 7). Areas with light cover or no cover were secondarily preferred habitats. Trap sites with heavy cover were generally avoided. Trapping success for male kangaroo rats indicated utilazation of any cover density. Females on the other hand exhibited a preference for medium cover (Fig. 7). The greater mobility and more aggresive behavior of the males possibly accounted for their wider utilization of different cover types. Adult animals were captured more often in medium cover whereas, juveniles were more

PERCENT OF CAPTURES

	TOTAL	MALE	FEMALE	ADULT	JUVENILE	SCROTAL	NON SCROTAL	NON PERFORATE	PERFORATE
NO COVER	29.9	24.3	5.6	23.8	5.7	14.9	14.5	11.3	18.9
LIGHT COVER	30.5	26.2	4.3	23.7	6.6	13.3	18.5	9.4	15.1
MEDIUM COVER	34.4	26.7	7.7	29.5	4.9	17.6	14.8	17.0	26.4
HEAVY COVER	5.6	5.3	0.3	4.3	1.3	2.0	4.4	0.0	1.9
	100	82.5	17.5	81.5	18.5	47.8	52.2	37.7	62.3

Fig. 7. Captures of kangaroo rats in relation to on amount of cover on Padre Island National Seashore.

abundant in light cover.

Throughout the sample period cover preferences changed (Fig. 8). Utilization of open sand (no cover) areas was highest in the spring and summer, however the utilization of these areas sharply decreased during the fall and winter months. Light cover captures were low in the spring and summer before increasing to preferred cover status in the winter and early spring. Capture success at the medium cover trap stations was moderate for most of the sampling period. There was an increase in capture success during August and September in areas with medium cover. Habitat preference, in regard to amount of cover varied with the population cycles. In August through October there was an increase in medium cover captures. This correlates with the peak breeding period. Females were caught most often in medium cover. During the breeding period, scrotal adult males also inhabited medium cover. This greater utilization of medium cover habitat allowed more instances of breeding contact and concealment from predators with out hampering escape routes. Light cover was utilized during dispersal periods.The absence of preferred habitat in respect to an increased population at this time forced animals into suboptimum habitat which accounted for the increased captures in light cover and no cover areas.

Trap stations 3 through 9 were more successful in the capture of kangaroo rats (Fig. 9). The trap stations at either

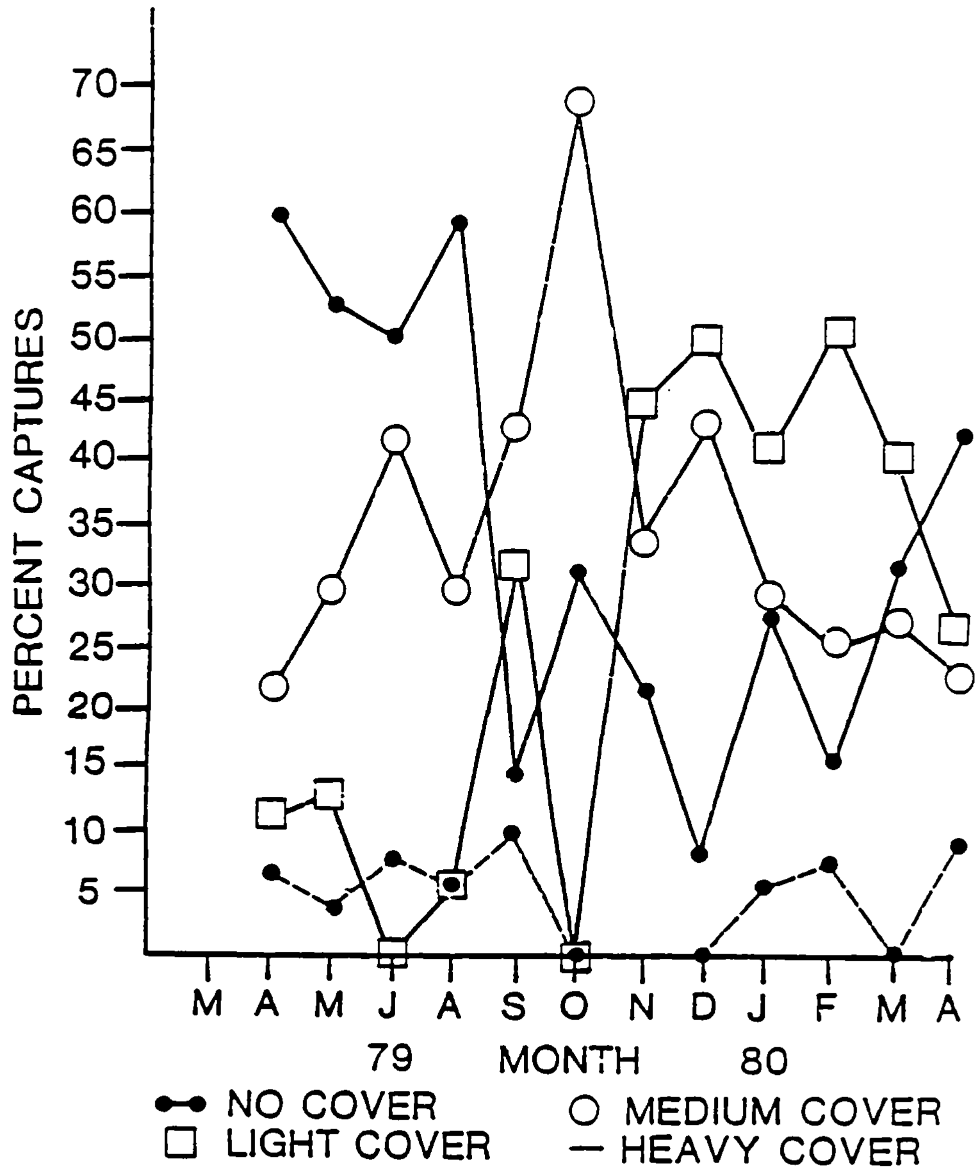

Fig. 8. Captures of kangaroo rats in relation to amount of cover on Padre Island National Seashore.

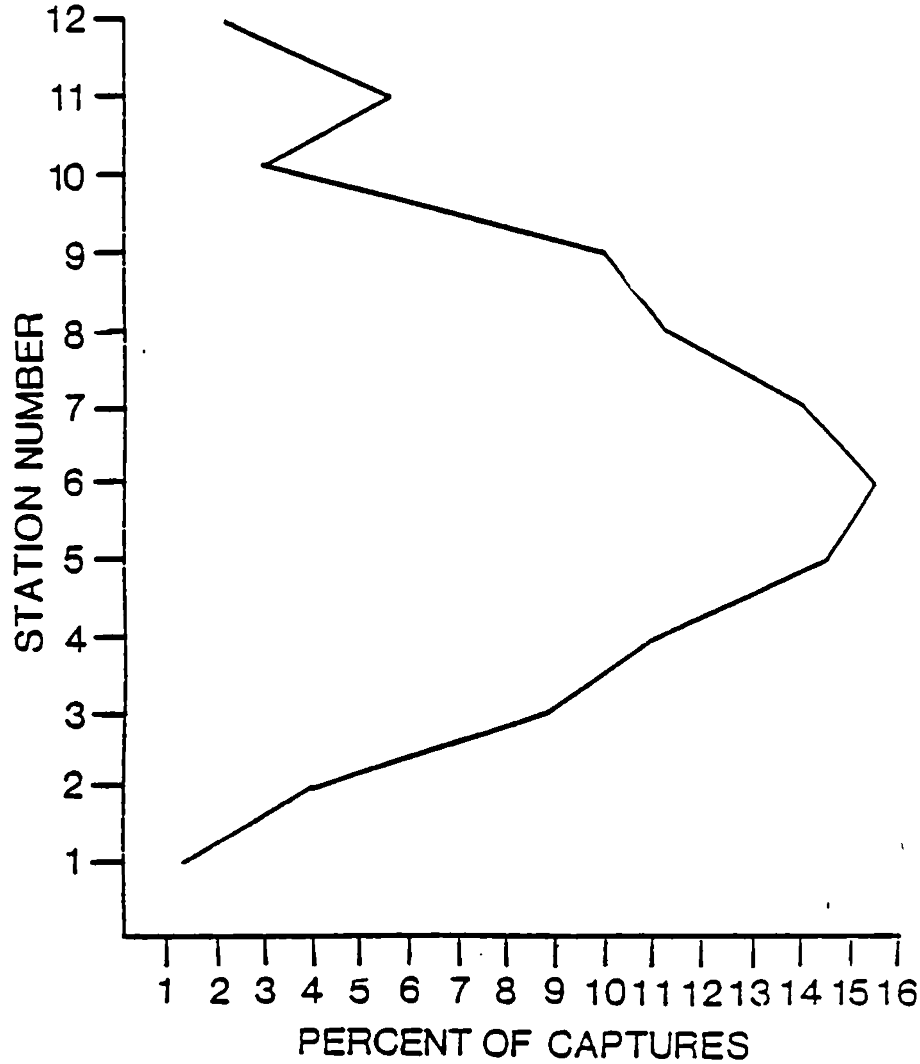

Fig. 9. Percent of capture of kangaroo rats by trap station number at Padre Island National Seashore.

end of a trap line were located in suboptimum habitat. Trap stations 1 through 3 generally were located on the open berm where food or escape cover was not available. Trap stations 2 and 3 in some areas were located in dense growths of sea-oats associated with embryo dunes. The first small dunes on the beach are characteristically steep. The ocean side is generally bare and the leaward side has dense vegetative growth. Trap stations 10 through 12 were located primarily at the base of the large foredunes. This area is composed of loose sands bordered by dense grasses. Captures in this area were primarily of the spotted ground squirrel with an occasional capture of a kangaroo rat. Trap stations 4 through 9 were situated in the preferred habitat in which clumps of plants provided light to medium cover juxtaposition with open areas of sand. This area provided the mobile D. compactus an ample forage resource while not inhibiting rapid escape movement. Figures 10-14 show that most captures at trap stations 4 through 9 were in association with light and medium cover. The success of the first and last trap stations varied with population cycles. During September animals were captured at all trap stations on a trap line (Fig. 15). This coincided with the increased activity of D. compactus during breeding. In January animals were taken in all trap locations along the berm due to dispersing animals occupying suboptimum habitat. In periods of low activity, captures were restricted to trap stations 4 through 9. The spotted ground squirrel was active

TRANSECT

TRAP NUMBER	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.1	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8
12	2								1	1						4
11		5		1	1		2	1	4				1		7	1
10		1	3		1				1	1	1	1			5	1
9	2	3	3	2	6	1				3	2	1	2	1	5	2
8	4	2	4	6	2	3			1	3	5	5		1	3	
7	4	2	3	5	7	1		3	4	2	3	11	3	1	1	2
6	3	7	7	1	5	4		3	2	3	3	7		3		3
5	4	3	3	5	3	1		2	8	4	2	3		6	3	6
4	3	2	3	5		1	1	1	3		2	3	2	7		7
3	1	3	4	4		3			1	1	4	2	1	4		
2	1	1	1	3		2					1	2	1	2		
1		1		1								2		1		

Fig. 10. Total number (n=359) of kangaroo rat captures by transect number and trap station number.

TRANSECT

TRAP NUMBER	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.1	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8
12																
11		1							1				1		4	
10																
9		2	3		1					2				1		1
8		1	1	3	1	1				1	4				1	
7	3		1		1			1	1			1				
6		1	2					1	1	1	2	2				2
5	1	1	2		1			2	3	1	1			1	2	4
4	2		1	1					2		2	1	1			2
3	1	2		2		3			1		1	2	1	1		
2	1	1	1	3		2										
1		1		1								1		1		

Fig. 11. Number (n=107) of kangaroo rat captures by transect line and trap station number in a habitat disignated as no cover.

TRAP NUMBER / TRANSECT

	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.1	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8
12	1															
11		2							1						2	
10		1													2	1
9	1				2						1				3	1
8	2		2	2		2			1	1	1	2			2	
7	1	1	1	1	3				2	2		2	2			1
6	2	5	1	1	1			2		1	1	2		2		1
5	1	2	1		1	1					1			4		1
4		1		2		1	1	1				1		5		3
3		1	1							1				1		
2												1	1	1		
1																

Fig. 12. Number (n=102) of kangaroo rat captures by transect line and trap number in a habitat disignated as light cover.

TRANSECT

TRAP NUMBER	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.1	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8
12																1
11		1			1		1	1	1						1	1
10			2						1						3	
9	1	1		2	3	1				1	1		2		2	
8	2	1	1	1	1					1		2		1		
7		1	1	3	2	1		1	1		3	8	1	1	1	1
6	1	1	2		4	4			1	1		3		1		
5	1			4	1				5	3		3		1	1	1
4	1	1	1	2					1				1	2		2
3			1	1							3			1		
2											1					
1																

Fig. 13. Number (n=120) of kangaroo rat captures by transect line and trap station number in a habitat disignated as medium cover.

TRANSECT

TRAP NUMBER	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.1	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8
12	1									1						3
11				1			1									
10			1		1					1	1	1				
9												1				
8																
7				1				1								
6			1													
5																
4			1									1				
3			1	1										1		
2												1		1		
1												1				

Fig. 14. Number (n=24) of kangaroo rat captures by transect line and trap station number in a habitat disignated as heavy cover.

TRAP NUMBER

MONTH	1	2	3	4	5	6	7	8	9	10	11	12	Spermophilus spilosoma*
MAR			1		2	1		1		1	2	1	
APR			2	5	3	2	3	5*	4		3*		5
MAY		3	1	1	4	3	3	3*	2*		1*	1*	5
JUL	1		4	1*	3	1		1*			1*		3
AUG	1	1	1	4	2	1	3		2		2		
SEPT	2	3	3	9	7	16	14	8	10*	6*	3*	1*	11*
OCT				1	5	3	3	3	1*				1
NOV		1		1	1		2	3			1*		1
DEC				1	4	1	5	2	1				
JAN	1	2	3	2	3	5	6	2	3	3	4	1	
FEB			5	7	8	5	6	4	5	1	2	2	
MAR		1	2	3	6	8	4	5	4*	3*	4*	1*	8
APR		3	6	5	5	5	3	2	1	1		1	

Fig. 15. Seasonal variations in number of captures at each trap station.

from spring through the fall and it was captured exclusively at trap stations 10, 11 and 12 (Fig. 15).

Trap success declined with each consecutive trap day (Fig. 16). Garner (1974) stated that trap prone individuals occupied traps earilier with each consecutive trap night, thus individuals were not at equal risk of being captured. My disruption of the area influenced trap success. Coyotes followed the transect lines searching for trapped animals. The presence of the predator could have led to decreased activity by the kangaroo rats. There was no difference between trap success relating to the midnight and morning captures. Dipodomys compactus was never captured during times of heavy rains.

Home Range

Home ranges were determined for 16 animals captured five or more times. Dipodomys compactus' high mobility and narrow habitat restriction resulted in long, narrow home ranges. The increased spacing of the transect lines made it possible to collect data on the wide ranging kangaroo rats. Some individuals traveled more than 3.2 km. The average female home range (3.2 ha) was smaller than the males (4.8 ha) (Fig. 17). Individual home range size varied. The average time between captures was longer for females than for males (Fig.18). This was probadly because of the higher activity of the male kangaroo rat and females remaining for longer periods in their burrows during nesting and litter

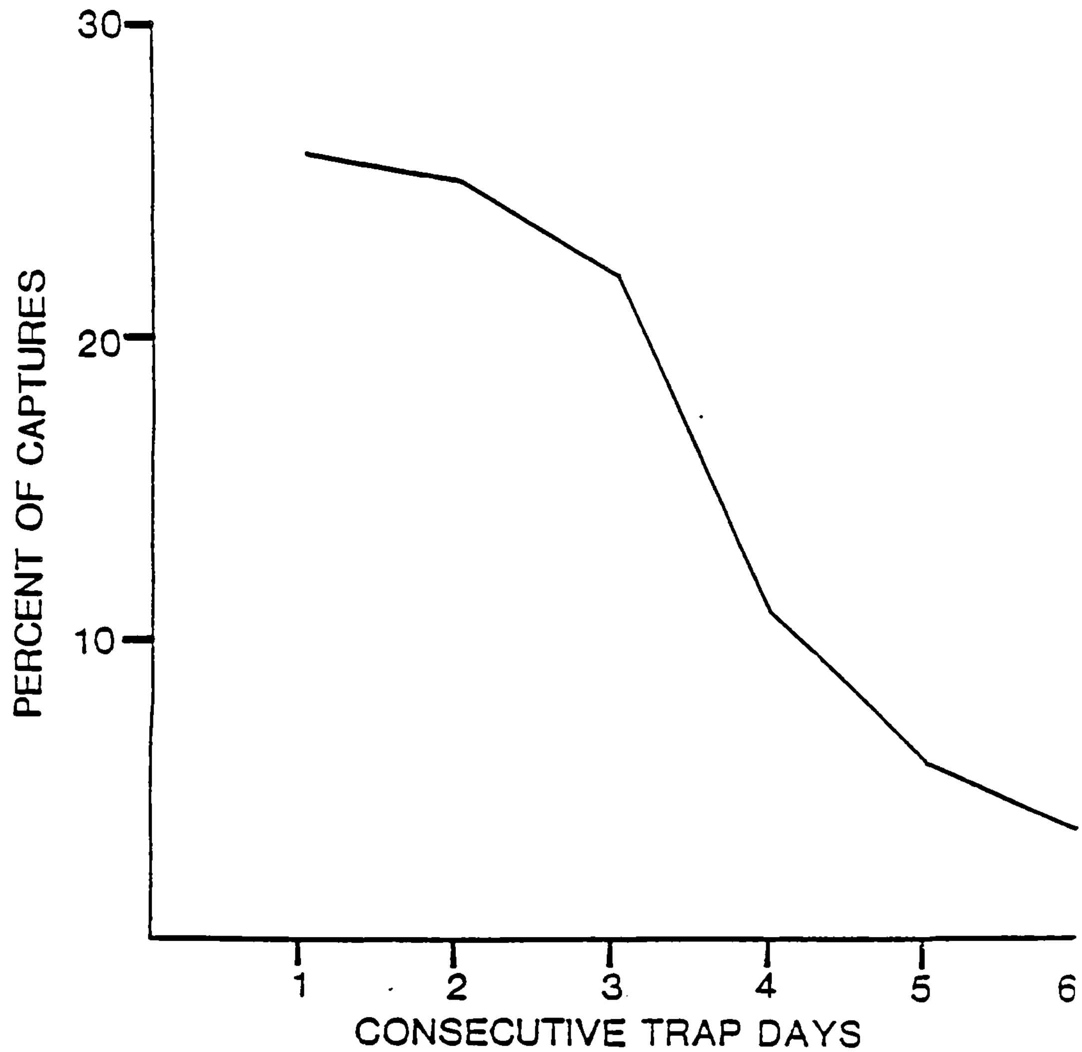

Fig. 16. Trap success as related to consecutive trap days.

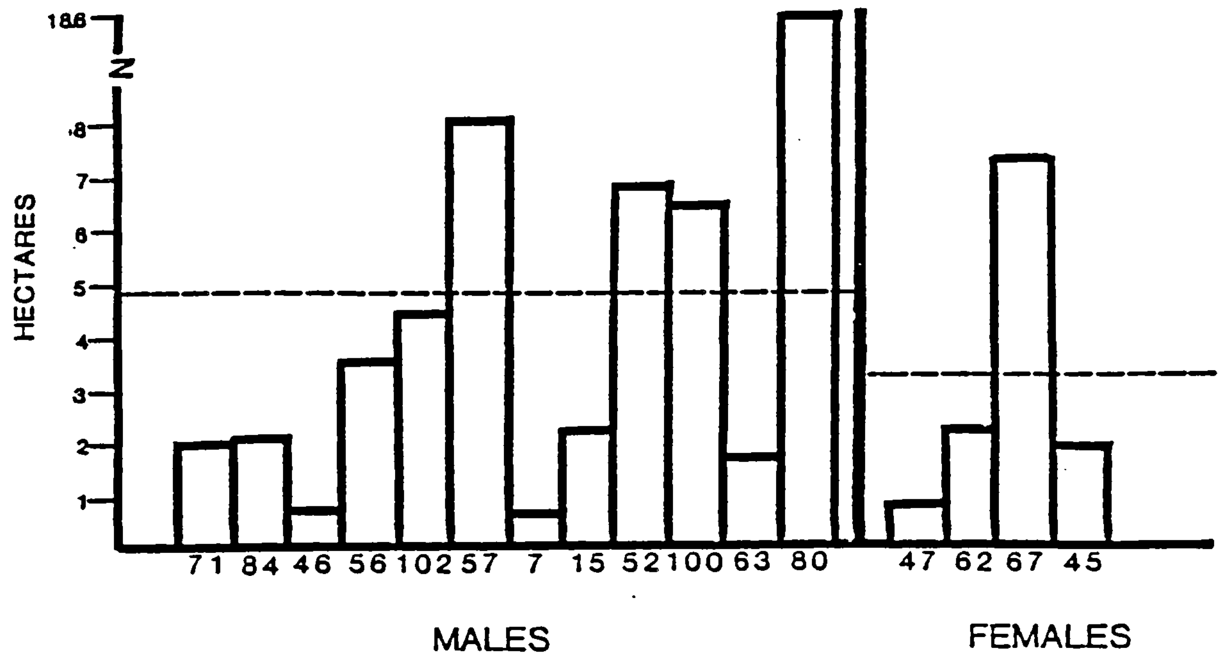

Fig. 17. Home range size for male and female kangaroo rats at Padre Island National Seashore. Dotted lines indicate mean home range size.

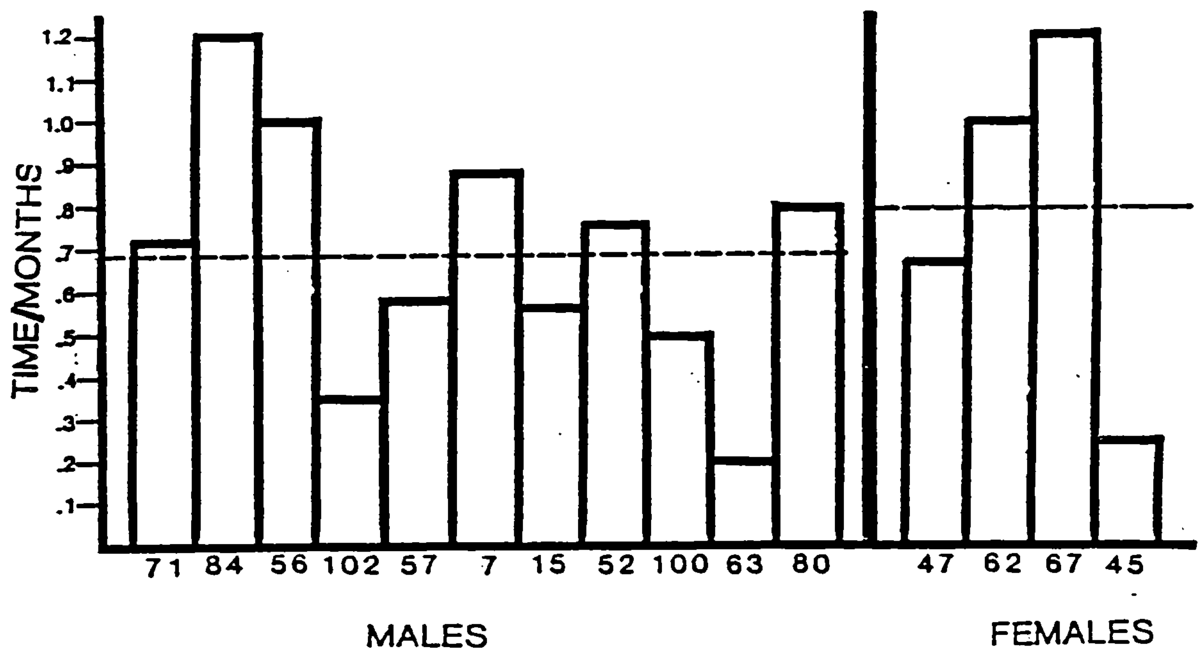

Fig. 18. Time between captures expressed in months. Dotted lines indicate mean time between captures.

production. Home range overlap between animals of the same sex was common (Fig. 19). Intersexual and intrasexual overlap of home ranges is common amoung kangaroo rats (MacMillen, 1964). Actual defended territory is probably much smaller. Released animals were observed escaping to common burrows, suggesting lower aggression amoung D. compactus. Varying degrees of aggressiveness in kangaroo rats have been observed (Stock, 1974; MacMillen, 1964; Cahalane, 1961; Garner, 1974). Cahalane (1961) found aggresive behavior in the larger species of Dipodomys with no interspecific aggression occurring in the smaller species D. merriami.

Residence time varied amoung individuals (Fig. 20). Some animals remained in the population during the entire sample period. Garner (1974) captured individual Kangaroo rats up to 18 months. Average residence time was 5 months for females and 4.7 months for males.

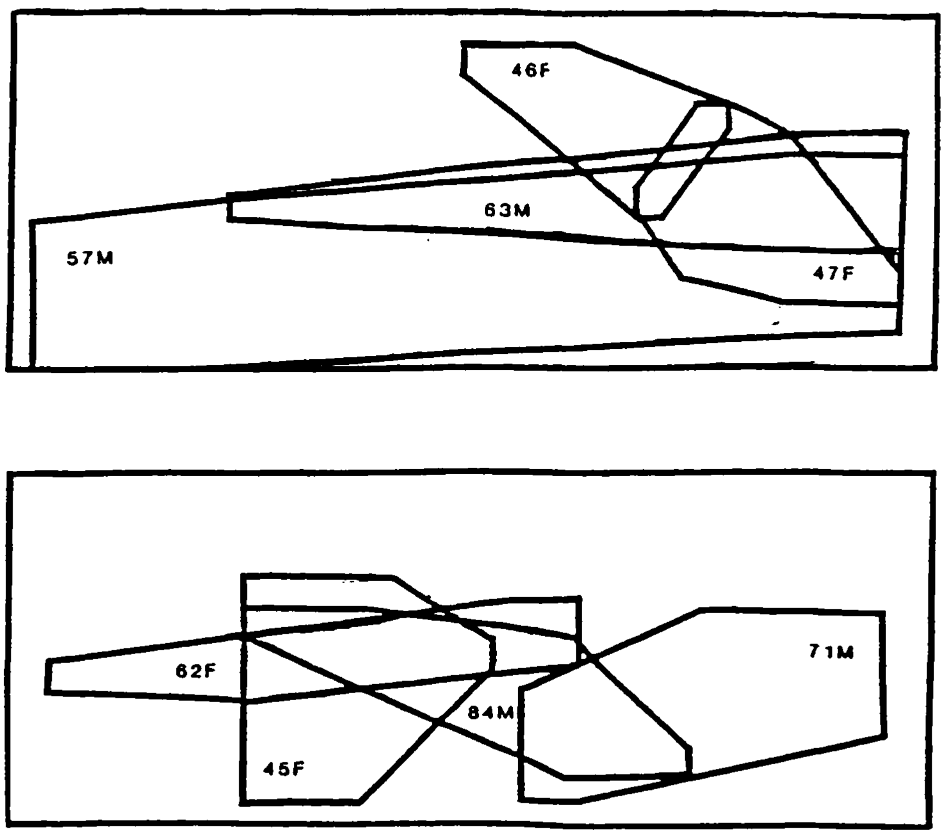

Fig. 19. Map showing overlap of home ranges of male and female kangaroo rats.

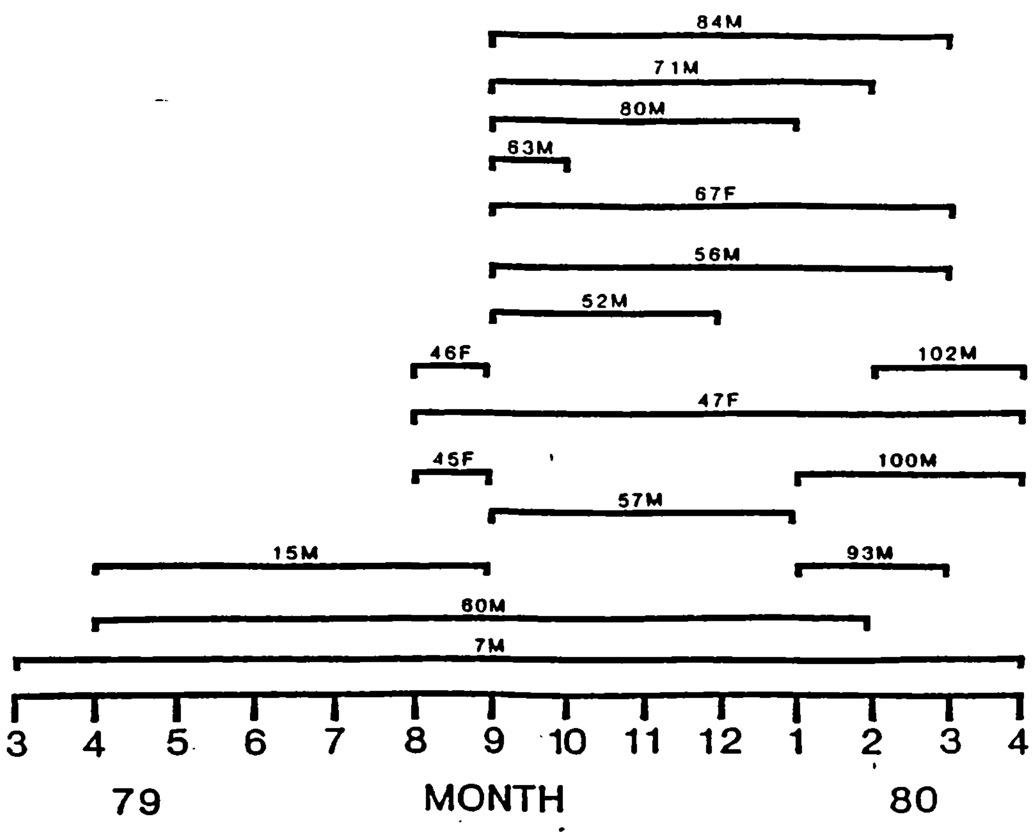

Fig. 20. Residence time of Kangaroo rats captured five or more times.

Summary

Two activity periods for *D. compactus* were recorded, a breeding period in late summer and early fall and a dispersal period in late winter. The number of active breeding males and females determined the breeding peak and the recruitment of young adults and juveniles into the population determined the dispersal peaks. *Dipodomys compactus* preferred a habitat with medium cover. Females had a narrow habitat tolerance, whereas males had a broader habitat preference. There were seasonal cover preference changes. Light cover was utilized in the spring and summer. Medium cover was preferred at other times of the year. Population size and densities increased through out the study period with lowest densities in midsummer and highest densities in late winter and early spring.

Trap success was influenced by location of the trap stations within the habitat. Trapping success correlated with the habitat type. Home ranges were long and narrow. Overlapping of home ranges occurred amoung animals of both sexes. Females had smaller home ranges than the males.

Literature Cited

Baccus,J. T., J. K. Horton, and P. D. Carangelo. 1977. A study of beach and dunes floral and faunal interrelations as influenced by recreational and user impact on Padre Island National Seashore. Final report prepared for Office of Natural Science, Southwest Region, National Park Service. pp. 121.

Baumgardner, G. D. and D. J. Schmidly. 1981. Systematics of the southern races of two species of kangaroo rats (Dipodomys compactus and D.ordii). Occs. Papers Mus. Texas Tech Univ., 73: 1-27.

Brown, L. F., J. H. McGowen, T. J. Evans, C.G. Groat and W. L. Fisher. 1977. Enviromental Geologic Atlas of the Texas Coastal Zone--Kingsville Area. Bureau of Economic Geology,Univ. of Texas at Austin.

Brown, J. H. 1973. Species diversity of seed-eating desert rodents in sand dune habitats. Ecology, 54:775-787.

Brown, J. H. and G. A. Liedermann. 1973. Resource utilization and coexsistence of seed-eating desert rodents in sand dune habitats. Ecology, 54:788-797.

Cahalane, V. H. 1961. Mammals of North America. The MacMillian Company. New York. pp. 682.

Davis, W. B. 1942. The systematic status of four kangaroo rats. J. Mammal., 23:328-332.

Desha, P. G. 1967. Variation in a population of kangaroo rats,Dipodomys ordii medius (Rodentia: Heteromyidae), from the high plains of Texas. Southwestern Nat., 12:275-290.

Duke, K. L. 1944. The breeding season in two species of Dipodomys. J. Mammal., 25:155-160.

Garner, H. W. 1974. Population dynamics, reproduction, and activities of the kangaroo rat, Dipdomoys ordii, in Western Texas. Graduate Studies No. 7 Texas Tech Univ.Texas Tech Press, Lubbock Texas. 1-28.

Ghiselin, J. 1970. Edaphic control of habitat selection by kangaroo mice (Microdipodops) in three Nevadan populations. Oecologia, 4:248-261.

Giles, R. H. 1971. Wildlife Management Techniques. Edwards Brothers, Inc. Ann Arbor, Michigan. pp. 663.

Hall, E. R. 1981. The Mammals of North America. John Wiley and Sons. New York , Vol. 1. pp. 1079.

Johnston, R. F. 1956. Breeding of the Ord kangaroo rat (Dipodomys ordii) in southern New Mexico. Southwestern Nat., 1:190-193.

Lemen, C. A. and M. L. Rosenweig. 1978. Microhabitat selection in two species of heteromyid rodents. Oecologia, 33:127-135.

MacMillen, R. E, 1964. Population ecology, water relations , and social behavior of a Southern California semidesert rodent fauna. Univ. of California Publ. Zool., Vol. 71.

McCollock, C. Y., Jr. 1961. Age classification and weight of Ord's kangaroo rat on the Southern Great Plains. Southwestern Nat., 6:149-155.

McCollock, C. Y. and J. M. Inglis. 1961 Breeding periods of the Ord kangaroo rat. J. Mammal., 42:337-344.

Nie, N. H., C. H. Hull, J. G. Jenkins, K. Steinbrenner and D. H. Bent. 1975. Statistical Package for the social sciences (2nd ed.). McGraw-Hill, New York.

Rosenweig, M. L. and J. Winaker. 1969. Population ecology of desert rodent communities: Habitats and environmental complexity. Ecology, 50:558-572.

Schmidly, D. J. and F. S. Hendricks. 1976. Systematics of the southern races of Ord's kangaroo rat, Dipodomys ordii. Bull. Southern California Acad. Sci., 75:225-237.

Schroder, G. D. and M. L. Rosenweig. 1975. Perturbation analysis of competition and overlap in habitat utilization between Dipodomys ordii and Dipodomys merriami. Oecologia, 19:9-27.

Stickel, L. F. 1954. A comparison of certain methods of measuring home ranges of small mammals. J. Mammal., 35:1-15.

Stickel, L. F. 1965. A method for approximating range size for small mammals. J. Mammal., 46:677-679.

Stock, A. D. 1974. Chromosome evolution in the genus Dipodomys and its phylogenetic implications. J. Mammal. 55:505-526.

True, F. W. 1889. Description of Geomys personatus and Dipodomys compactus, two new species of rodents from Padre Island, Texas. Proc. U. S. Nat. Mus., 11: 159-160.