

State of California
The Resources Agency
Department of Fish and Game

POPULATION ESTIMATE AND DISTRIBUTION
OF THE MORRO BAY KANGAROO RAT
1971

by

Justin D. Congdon
California Polytechnical College, San Luis Obispo

ABSTRACT

The Morro Bay kangaroo rat (Dipodomys heermanni morrensis) was reported in 1960 to occupy approximately 4.8 square miles in San Luis Obispo County at the south end of Morro Bay. Stewart and Roest (1960) studied and delineated the extent of the range of the Morro Bay kangaroo rat. In their study, three trapping quadrats were maintained for three nights, the results of which provided a comparative base for the present study. In all three areas in 1971 substantially lower densities were found and within their total range the population of this endangered mammal was found to be substantially reduced from that in 1957. The present study estimates the total population to be 3,000 kangaroo rats on 1.75 square miles as compared to 8,000 over 4.8 square miles in 1957.

RECOMMENDATIONS

Based on the results of this study the following recommendations are made to assure continued survival of the Morro Bay kangaroo rat:

1. Department of Parks and Recreation acquisition of lands extending the boundary of Montana De Oro State Park from Hazard Canyon to Shark Inlet be given high priority.
2. Land and Water Conservation Funds be requested for acquisition of approximately 50 acres west of Pecho Valley Road and north of Hazard Canyon for preservation of the Morro Bay kangaroo rat.
3. These lands and other lands within Montana De Oro State Park supporting populations of Morro Bay kangaroo rats be designated as a Natural Preserve within the State Park system.
4. A management plan be developed and implemented to provide protection and enhancement for the Morro Bay kangaroo rat. Such plan to include a yearly or biyearly monitoring program, vegetative manipulation to maintain habitat at optimum seral stage, and feral cat control.

INTRODUCTION

The Morro Bay subspecies of Heermann's kangaroo rat (Dipodomys heermanni morroensis) was reported in 1960 to occupy approximately 4.8 square miles in San Luis Obispo County, California (Stewart and Roest, 1960). This restricted range makes the kangaroo rat highly susceptible to the impact of man. With the rapid growth of Los Osos and Baywood Park communities in the past years, and more growth predicted in the future, it was essential that information be obtained about the numbers of kangaroo rats and their distribution within their total range. During the months of April, May, and June of 1971, burrow counting and live trapping were carried on within the total range to provide population information. The data obtained are presented below.

METHODS AND MATERIALS

The total range of the Morro Bay kangaroo rat was marked off into eight areas, based on continuous habitat types and for convenience in sampling and comparing the different areas. A boundary description of the eight areas, and a map, are found in Appendices I and III. Figure 1 delineates the range and areas occupied by the Morro Bay kangaroo rat in 1971.

Burrow Counts

Within each of the eight areas, five square one-acre plots were selected at random using a numbered grid and a random number table.

Within the five plots, burrows were counted. The plots were marked off using a tape measure and a Fee and Stemwedel, Incorporated, Army Compass. A total of 40 acres was sampled. The burrow counting results are found in Table 1.

TABLE 1

Results of Burrow Counts

Areas	Acre Plot Number					Total Burrows/ Five Acres
	1	2	3	4	5	
1	0	0	0	0	0	0
2	0	0	0	1	0	1
3	1	0	0	0	23	24
4	1	0	0	0	0	1
5	0	2	7	7	1	17
6	1	0	5	0	1	7
7	3	1	0	0	0	4
8	0	0	0	1	0	1

Live Trapping

Fifteen trap lines, consisting of 11 trapping stations of two Sherman live traps each (baited with wild bird seed soaked in peanut butter diluted in

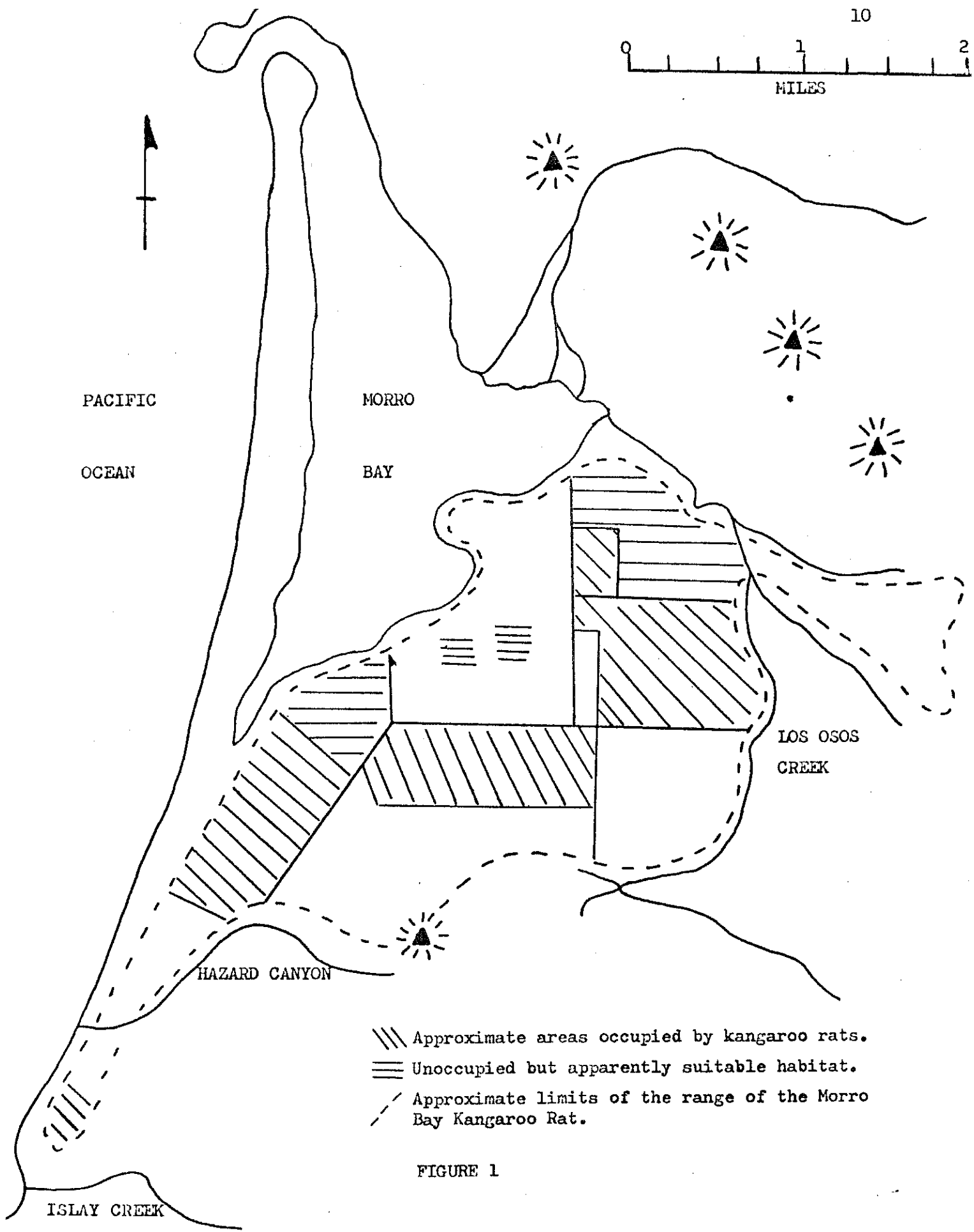


FIGURE 1

peanut oil), were set in a straight line crossing a maximum of the sampled habitat. To gather comparative data, six additional trap lines were placed in the same quadrat areas that were trapped by Stewart and Roest in 1957. The distance between trap stations was 30 to 35 paces (75' to 85'). The variation in distance allowed all traps to be placed in an open area where they might be visited by a kangaroo rat. Each pair of traps had a maximum distance between them of two feet. Including one half the distance between trap stations on each side of the trap line, each line was assumed to sample 1.24 acres. With 21 trap lines of 11 trap stations and one trap line (line 22) of 4 stations, a total of 26.49 acres was sampled. The trap lines were set for three, four, or eight nights. Trap lines were placed in all marked off areas except Area I, where burrow counts and further search uncovered no evidence of kangaroo rats. In addition to Dipodomys heermanni morroensis, Peromyscus maniculatus and Perognathus californicus were also captured. A description and map of the location of each trap line are found in the Appendices II and III. The trap line results are found in Table 2.

TABLE 2

Live Trapping Results

<u>Area</u>	<u>Line</u>	<u>Nights Set</u>	<u>Dipodomys h.m.</u>	<u>Peromyscus</u>	<u>Perognathus</u>
	1	3	0	4	1
	2	3	0	1	0
II	3*	4	1	1	0
	4*	4	3	1	0
	5	3	0	0	0
III	6	8	8	0	0
	7	3	9	0	0
IV	8	3	0	0	0
	9*	8	5	0	0
V	10*	8	9	0	0
	11	3	0	13	0
	12*	3	0	0	0
	13*	4	0	0	0
	14	4	0	0	0
VI	15	4	1	0	0
	16	3	3	1	0
	17	8	4	1	0
	18	4	0	2	0
	19	4	0	2	0
VII	20	4	0	3	0
	21	3	0	0	0
VIII	22	3	0	0	0
TOTALS			43	28	1

*Trap lines sampling the quadrat areas of Stewart and Roest, 1957.

DISCUSSION

Area I (Appendix III) has only isolated pockets of sandy soil and at present shows no evidence of kangaroo rats. In addition to burrow counts, additional searches were made before the decision was made not to trap this area. Area II poses an interesting question. The area contains large open sections of apparently suitable habitat (see Stewart and Roest, 1960, for a discussion of plant types) yet kangaroo rats exist only in the sections closest to 11th Street on the west side of this area. There are no observable differences in open space or vegetation types between the western or eastern portions of the area. Area III has the densest population of kangaroo rats over the entire range. The population is centered from east Nipomo Road to Buckskin Drive. Area IV is covered mostly with tall dense brush and scrub oak and the population there is minimal or completely absent. Area V has a high density population which extends east to west across the open expanse just south of Highland Drive and Bayview Drive. This population extends up the hill to the south until the vegetation becomes tall and dense. Area VI near Shark Inlet is another section where apparently suitable habitat is not occupied. Only one small group of burrows was found in the area just north of the north access road to Suicide Hill. The section from the southern access road south almost to Hazard Canyon has a low to medium density occupation. Area VII has some kangaroo rats at its southern extreme, but the area immediately on either side of Hazard Canyon has zero population. Area VIII has some kangaroo rats on its eastern edge, but is being rapidly developed and is no longer of any importance to the total population of kangaroo rats. The populated areas are represented on the map, Figure 1.

Stewart and Roest trapped three quadrats consisting of 36 traps set at 30-foot intervals (sample area about 3/4 acre), which were maintained for three nights each in August and November of 1957. Based on this study, the population was estimated to be 8,000 kangaroo rats (Stewart, pers. comm.). Results from these quadrats provide the only comparison of densities available for the present study. The comparison follows in Table 3.

TABLE 3
A Comparison of Densities From 1957 and 1971

<u>Quadrat</u>	<u>Total Captures of D.h.m.</u>			<u>Trap Line Nos.</u>
	<u>1957</u>		<u>1971</u>	
	<u>August</u>	<u>November</u>	<u>June</u>	
B	8	6	3	3, 4
C	33	33	14	9, 10
D	6	14	0	12, 13

In each of the three areas there is a substantial reduction in the numbers of kangaroo rat captures in 1971. This reduction becomes more meaningful when the more than doubled sample size and extended trapping time used in 1971 are considered. Upon examining the 1971 capture locations over the total range indicated in 1960, it becomes evident that not only are number of captures down, but areas of kangaroo rat occupation are also reduced.

Burrow counts and trapping results pointed out this reduction, especially in Areas II and VI and, possibly for different reasons, in Area VIII. The reasons for this reduction are not clear, but growth of plant cover over the past 14 years and the buildup of dead brush certainly play a role, as it reduces the open areas between plants. The kangaroo rat requires areas with open space available for its rapid, erratic, bipedal escape. These first rapid jumps are of great importance to the kangaroo rat in escaping from a predator. Batholomew and Caswell (1951) discuss this mechanism and its importance and adaptive significance in depth. The reduction in escape ability along with the high population of cats near the developed areas (Area VIII) might be a major factor in reducing population size and distribution in these areas.

One other factor which must be considered is the tendency of rodent populations to be cyclic. Without previous sampling it is not possible to eliminate cycling as an explanation for the low numbers of kangaroo rats in the present study. It is possible that 1957 was a peak year while 1971 is a low in such a cycle.

CONCLUSION

A total of 43 kangaroo rats were captured using 96 trap stations (two traps each) over 11 nights of trapping. These results show only 1.75 square miles of the 4.8 square miles of total range to be occupied. This might be explained by the animal's tendency to occupy the best parts of its range first, especially during the breeding season. All of the males captured had descended testes, indicating active breeding during May and June, 1971. This corresponds with what the author found in the Mojave Desert for the desert kangaroo rat (Dipodomys deserti) which is found to occur in localized colonies as the population in large areas is reduced.

By taking the number of kangaroo rats captured and dividing by the number of trap lines which captured rats and then dividing by the number of acres sampled per trap line, an average number of 3.5 kangaroo rats per acre in occupied range is reached. At least 20 percent of the total occupied range is uninhabited due to roads, buildings, brush, trees, etc., and this was subtracted from the total occupied acres. The resulting estimate is 3,000 Morro Bay kangaroo rats over their entire range in 1971. This represents a substantial reduction from the estimate of 8,000 in 1957.

There is definite need for further study of the Morro Bay kangaroo rat. A monitoring program of the population should be maintained on a yearly or bi-yearly basis and a study should be made to determine the kangaroo rat's home range size. A study made of the vegetation types and densities and dead brush buildup in occupied areas, as compared with that in apparently suitable but unoccupied areas would provide meaningful knowledge. An active feral cat control program should be adopted in the kangaroo rat range. The State of California should extend the boundary of the area of Montana De Oro State Park near Hazard Canyon north to Shark Inlet and east to Pecho Valley Road and set this area aside as a Natural Preserve within the State Park system. The reason for selecting this area even though it is not highest in kangaroo rat density is because of its continuity with the existing Montana De Oro

State Park and future prospect of complete urbanization of the remaining natural habitat of the Morro Bay kangaroo rat. If information gained in the previously mentioned plant cover studies indicate that a certain seral stage is optimum habitat for the kangaroo rat, this area should be maintained at the optimum seral stage. This could be accomplished by mechanical means or, if necessary, by burning.

ACKNOWLEDGMENTS

I would like to thank Dr. Aryan Roest for his advice and assistance on all phases of this paper. In addition, I would like to thank Richard Van Loben Sels and Nancy Rosner for their help with the field work.

REFERENCES CITED

- Bartholomew, T. J. and Caswell. 1951. Locomotion in kangaroo rats and its adaptive significance. *Jour. Mamm.* 32:155-169.
- Stewart, G. R. and A. I. Roest. 1960. Distribution and habits of kangaroo rats at Morro Bay. *Jour. Mamm.* 41:126-129.

APPENDIX I

A description of the boundaries of eight areas making up the total range of the Morro Bay kangaroo rat (see also map, Appendix III).

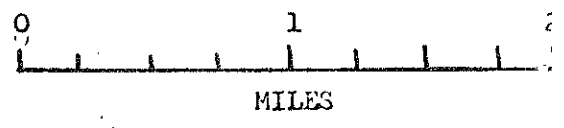
Area I	North East West South	Turri Canyon Road Sanitary Land Fill Road Los Osos Creek Clark Canyon Creek
Area II	North East West South	Los Osos Creek and Morro Bay Los Osos Creek 11th Street Pismo Avenue
Area III	North East West South	Pismo Avenue Los Osos Creek 11th Street Los Osos Valley Road
Area IV	North East West South	Los Osos Valley Road Los Osos Creek Even with Mountain View Road Hills and Los Osos Creek
Area V	North East West South	Bay View Drive and Highland Drive Even with Mountain View Drive Pecho Valley Road Hills and Cabrillo Heights
Area VI	North East West South	Shark Inlet Pecho Valley Road Morro Bay Dunes Hazard Canyon
Area VII	North East West South	Hazard Canyon Pecho Valley Road Pacific Ocean Islay Creek
Area VIII	North East West South	Morro Bay 11th Street Pecho Valley Road Los Osos Valley Road

APPENDIX II

A description of the location of the trap lines in the total range of the Morro Bay kangaroo rat.

- Line 1 East Santa Ysabel Road behind the El Morro Church of the Nazarene. Line direction E-W.
- Line 2, 3, 4 South end of 16th Street off Santa Ysabel Road to the water tank.
- 2 - Five hundred yards to the east of the tank on the ridge. Line direction NE-SW toward the grove of trees at the bottom of the hill near Walker ranch house.
- 3 - From the tank due south.
- 4 - Seventy-five yards SW of the tank. Line direction is west toward the Assembly of God Church on 11th Street.
- Line 5 North end of Mt. View Avenue 300 yards east. Line direction NE-SW.
- Line 6 East end of Nipomo Road on the NE corner of Nipomo Road and Andre Avenue. Line direction NE from corner.
- Line 7 North end of Buckskin Drive across from the Sunny Oaks Trailer Park. Line direction E-W across the road.
- Line 8 East Bay View Drive. Line direction S.
- Line 9, 10 Three hundred yards past the south end of Palasades Avenue. Line direction east to Bay View Drive and west 100 yards.
- Line 11 East end of Rodman Drive in Cabrillo Estates. Line direction east from the end of Rodman Drive.
- Line 12, 13 Between the southernmost part of Shark Inlet and Sunset Terrace Golf Course.
- Line 14 Six hundred yards east of the dunes on the south access road. Line direction S.
- Line 15 One hundred yards north of the ranch road entering upper Hazard Canyon. Line direction W.
- Line 16 One quarter of a mile south of Shark Inlet on the road along the dunes. Line direction E.
- Line 17 One-half mile south of Shark Inlet along dunes to the end of the road. Line direction S.

- Line 18 One-eighth of a mile south of the ranch road entering upper Hazard Canyon. Line direction W.
- Line 19 One-eighth of a mile south of Hazard Canyon on Pecho Valley Road until clear of the eucalyptus trees. Line direction N-S.
- Line 20 Across from the corner of Ramona Drive and 4th Street. Line direction SW.
- Line 21 West of First Street in Baywood Park. Line direction N-S.



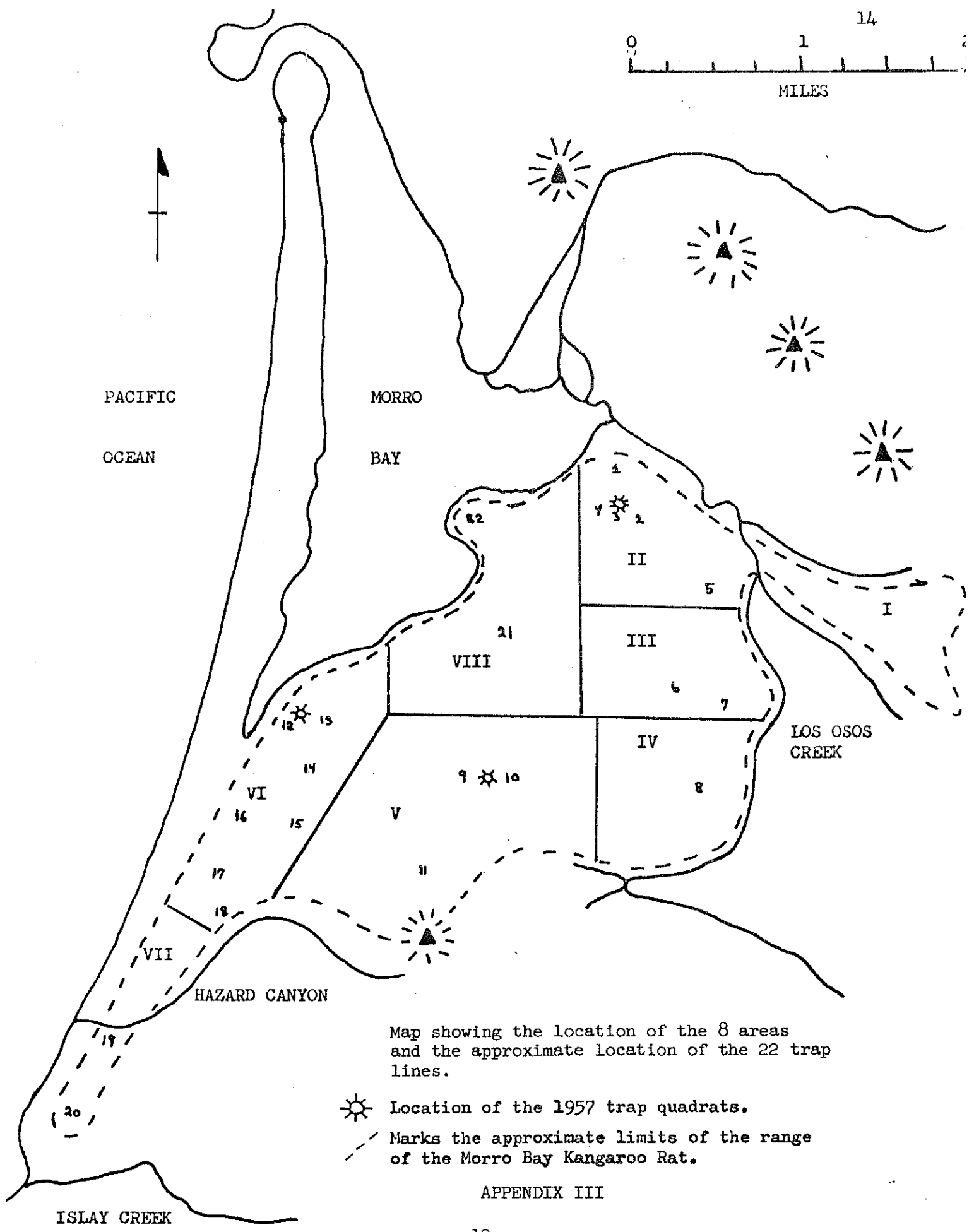
PACIFIC
OCEAN

MORRO
BAY



LOS OSOS
CREEK

HAZARD CANYON

ISLAY CREEK



Map showing the location of the 8 areas and the approximate location of the 22 trap lines.

-  Location of the 1957 trap quadrats.
-  Marks the approximate limits of the range of the Morro Bay Kangaroo Rat.

APPENDIX III



PACIFIC
OCEAN

MORRO
BAY

LOS OSOS
CREEK

HAZARD CANYON

ISLAY CREEK

Approximate Location of the Burrow
Count Areas (1 acre plots).

APPENDIX IV