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**FINAL REPORT**  
**TRAPPING EFFORTS FOR THE FEDERALLY ENDANGERED**  
**MORRO BAY KANGAROO RAT (*Dipodomys heermanni morroensis*),**  
**AT THE FORMER BAYWOOD PARK TRAINING AREA,**  
**MONTANA de ORO STATE PARK**  
**SAN LUIS OBISPO COUNTY, CALIFORNIA**  
**(September-November, 1995)**

Prepared for  
**Chambers Group, Inc.**  
for presentation to:  
**U.S. Army Corps of Engineers**  
**Los Angeles District**

**Contact Person: Dr. John Moeur**

Prepared by:  
**The Morro Group, Inc.**  
1443 Marsh Street  
San Luis Obispo, CA 93401



**February, 1996**

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## **I. INTRODUCTION**

### **A. GENERAL STATUS OF MORRO BAY KANGAROO RATS**

The declining Morro Bay kangaroo rat (MBKR) subspecies (*Dipodomys heermanni morroensis*) occurs within a restricted range on stabilized sand dunes south of Morro Bay, San Luis Obispo County, California. Factors contributing to its decline include direct loss of habitat, changes in the remaining habitat, predation by domestic and feral cats and dogs, destruction of burrows by vehicle, livestock, and pedestrian traffic, competition with other burrowing rodents, fragmentation of larger populations into small sub-populations, and perhaps inbreeding (Roest 1982, Gambs 1986b, Gambs 1990, Gambs and Holland 1988, Gambs and Nelson 1989 and 1990). The problem with the continued survival of this geographic-race was first recognized by Stewart (1958) and has been re-emphasized by subsequent investigators (Stewart and Roest 1960; Congdon 1971; Congdon and Roest 1975; Roest 1973, 1977, 1982, 1984; Toyoshima 1983; Gambs 1985, 1986a, 1986b, 1986c, 1986d, 1986e, 1986f, 1986g, Gambs and Holland 1988, Gambs and Nelson 1990 and 1991, and Villablanca 1986, 1987). It was placed on the Federal list of endangered species in 1970 (Federal Register 35(199):16047), and was recognized as an endangered species by the state of California in 1971.

### **B. GENERAL DIET, HOME RANGE, BURROWING BEHAVIOR, AND BREEDING**

Seeds are a primary and nutritionally important part of the diet of *D. heermanni*; however fruits, buds, leaves, stems, insects, and land snails appear to be seasonally important (Stewart 1958, United States Fish and Wildlife Service 1982, Kelt 1988, Nowak 1991). The most recent home range data suggest that the average home range size of MBKR varies from about 0.19 to 0.28 ha (Villablanca 1987) with a mean of about .23 ha (Gambs and Holland 1988). Captive MBKR that were introduced into a 0.2 ha enclosure at Pecho South maintained an average of 6 burrow systems/individual during the summer and 10 burrow systems/individual during the fall. Although about 3/4 of all matings in the wild were predicted to occur between March and May (Gambs and Holland 1988 and Gambs, Villablanca, and Roest 1988); mating can occur as early as January and as late as August. Captive females exhibit estrus throughout the year and may even produce litters in late fall and early winter (Roest 1987).

### **C. GENERAL HABITAT RELATIONSHIPS**

Brown and Harney (1993) suggest that population and community ecology of heteromyid and other rodent species in deserts is influenced by combinations of interacting biotic and abiotic factors, including climate, substrate, vegetation, productivity, food, competitors and predators. These factors likely influence MBKR and other rodents in coastal areas.

Most of the Pecho area is covered by a mosaic of plant communities. The historic and potential range of MBKR occurs almost entirely within this soil type and vegetation mosaic (Gambs and Holland, 1988). The west-facing Pecho area is covered by a complex mosaic of shrubby and herbaceous plants living on Baywood fine sand. The pioneer coastal dune community occurs along the strand and on unstabilized dunes. Coastal dune scrub is located immediately east of the unstabilized dunes and Chaparral is generally restricted to older dunes east of Pecho road. The major plant community on the site and the principal habitat for MBKR is the coastal dune scrub

community. The coastal dune scrub community is composed of a mixture of herbaceous, subshrubby and shrubby species that have shallow root systems that tap surface water available in the upper soil horizons. Dominant species are mostly soft-stemmed shrubs or subshrubs that have thin, often deciduous or semi-deciduous leaves. Associated herbaceous species range from diminutive, spring-flowering annuals to coarse succulents, bunch grasses and mat-forming perennial herbs. In addition, much of the soil bears a crust-like cover of lichens that reduces soil erosion. The overall aspect of the vegetation is an open to dense shrub land with a predominantly gray-green color. The shrubs vary in height from about 0.2 to 2.0 m, but most are less than 1 m tall. Species that occur in this community at Pecho are listed in Gambs and Holland (1988).

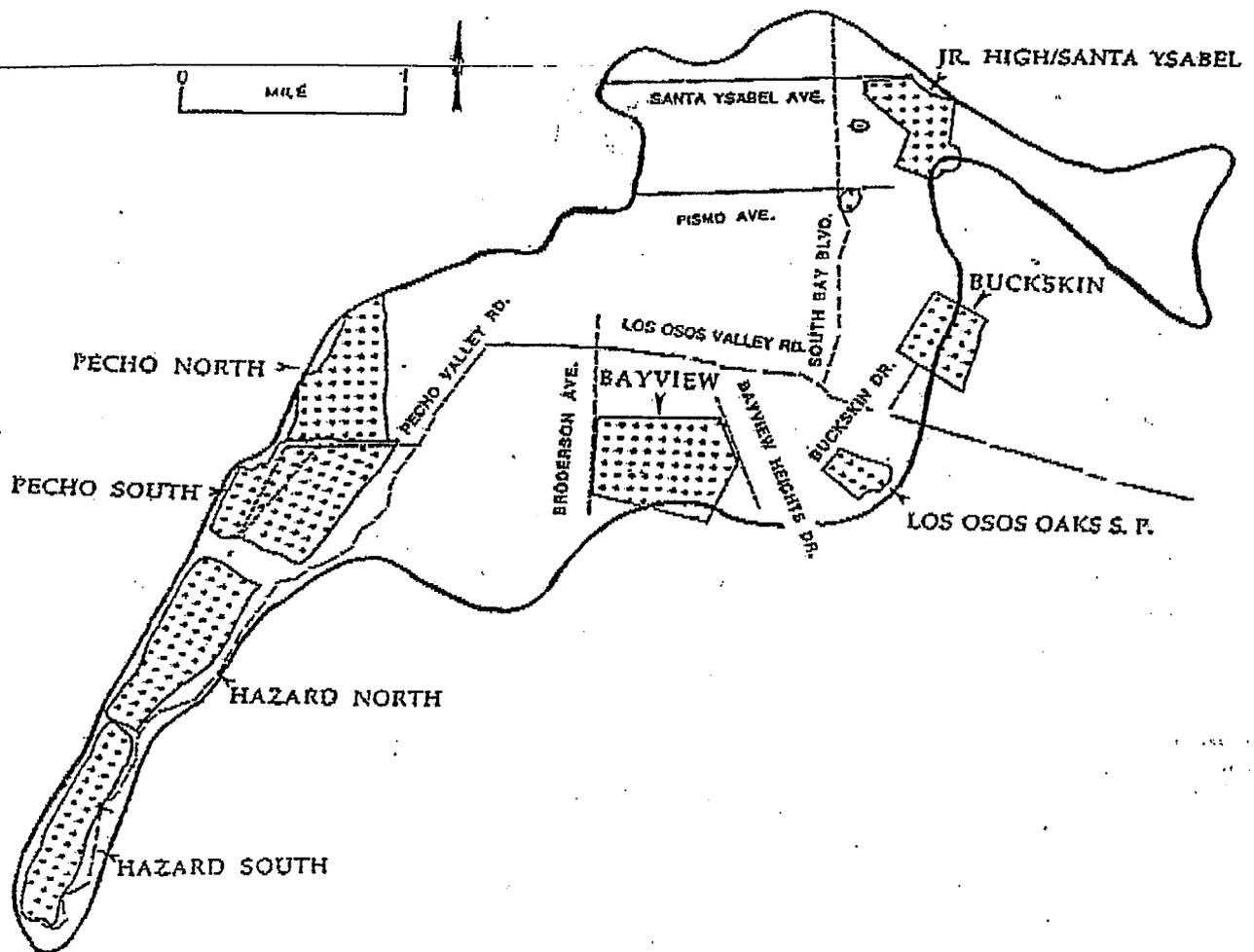
Comparisons of overall plant cover of habitat recently occupied by Morro Bay kangaroo rats to habitat not recently occupied by MBKR show substantial differences (Gambs and Holland 1988). Morro Bay kangaroo rats showed a definite preference for coastal dune scrub assemblages having a comparatively low plant species diversity in which the coverage of buckbrush (*Ceanothus cuneatus*), deerweed (*Lotus scoparius*), and silverweed (*Horkelia cuneata*) were high and the coverage of yarrow (*Achillea borealis*), ice plant (*Carpobrotus spp.*), California aster (*Corethrogyne filaginifolia*), and Dudleya (*Dudleya caespitosa*) were low.

#### D. HISTORICAL CHANGES IN HABITAT AND PATTERNS OF MORRO BAY KANGAROO RAT OCCUPANCY AT THE PECHO SITE

In 1956, heavy equipment was used to plow the Pecho area during the removal of unexploded ordnance left behind when the area was used as a firing range during World War II (USFWS 1982). During this operation, many plants on the Pecho site were uprooted, piled, and burned (Roest pers. comm.). By 1958, the MBKR population at Pecho was quite high (Stewart 1958 and USFWS 1982). As plant communities have continued to mature following the removal of ordnance at Pecho, their numbers have progressively declined (Gambs and Holland, 1988).

In 1982, the California Department of Fish and Game (CDFG) developed a management plan for the Morro Dunes Ecological Reserve which called for a rotating program of brush removal to enhance habitat quality for MBKR on the Reserve and elsewhere in the Pecho area (Lidberg 1982). In 1983, USFWS, in cooperation with the CDFG, Parks and Recreation, Forestry, Corrections, and the California Conservation Corps initiated a habitat enhancement program at Pecho which involved manually removing about 30 cubic yards of ice plant throughout the area and manually thinning brush on two, 1 ha experimental plots located on the Morro Dunes Ecological Reserve. Three prescribed burns were conducted on experimental plots ranging from 2-3 ha up to 10-15 ha between 1984 and 1986 (Gambs and Holland 1988). Neither clearing nor burning produced plant community types that were significantly more similar to sites recently occupied by MBKR (Gambs and Holland, 1988).

The total area of the Pecho site (see Figure 1) includes about 16 ha (40 acres) north of old Army road (Pecho North) and about 52 ha (129 acres) south of old Army road (Pecho South). Previous studies at Pecho North indicate that much of the area was occupied by MBKR until about the early to middle 1970's. In 1977, Roest (1977) caught one Morro Bay kangaroo rat during a trapping effort of 480 trap nights. Burrow surveys and trapping conducted at Pecho North in 1989 and 1991 failed to provide any evidence that MBKR were present in the area. Like Pecho North, Pecho South was occupied by MBKR until about the early to middle 1970's. The most recent population estimate of resident, wild-reared MBKR at Pecho South (Dunes) was conducted in 1978 and 1979 by Toyoshima (1983). She estimated that no more than about 20 ha of Pecho South habitat were populated by Morro Bay kangaroo rat at an average density of 1.0 MBKR / ha. Four MBKR from a captive breeding colony were released into an enclosure at Pecho South in 1988. In the fall of 1988, one of the three remaining animals escaped and established a burrow system outside the enclosure. Despite intense ground surveys and trapping in the immediate



Source: Gambs, Wilson, Norstadt and Smith, 1992.

**Figure 1**  
**Historical Range of Morro Bay Kangaroo Rat**

vicinity as well as Pecho South area in 1989 and 1991, no evidence of these MBKR was found (Gambis and Nelson, 1989, 1990).

### **E. PURPOSE OF STUDY**

This is part of a multi-faceted project by the U. S. Army Corps of Engineers designed to assess the risk to the public of the removal of unexploded ordnance remaining at Montana de Oro State Park land. The purpose of this specific project is to evaluate 53, randomly selected, 100 ft X 200 ft plots at the Pecho Site for the presence of Morro Bay kangaroo rats. Those plots found to support these animals will be identified so they can be protected during ordnance removal operations.

### **F. PROPOSED WORK ELEMENTS**

The work elements of the field survey included the following:

1. Conduct ground reconnaissance of all plots and record suitable habitat and signs for Morro Bay kangaroo rats.
2. Conduct one live trapping session for each plot. Trapping, handling, marking and transportation, of MBKR will be performed as authorized by the U. S. Fish and Wildlife Service, California Department of Fish and Game and California Department of Parks and Recreation permits, Biological Opinions, Memorandum of Understanding, and other verbal or written instructions and restrictions.
3. Prepare a report which identifies and details habitat conditions of all plots where Morro Bay kangaroo rats or their signs are found during the study.

## II. METHODS AND MATERIALS

### A. STUDY AREA

The Pecho North and Pecho South sites are located west of the village of Los Osos, CA; on Sections 14 and 23, T30S, R10E, Morro Bay South Quadrangle; Longitude 120° 52', Latitude 35° 18'. These two sites are both located west of Pecho Road and south of Morro Bay, within the area designated as MBKR Critical Habitat. The north and south portions of the Pecho site are divided by Old Army Road. The last time that a wild-reared Morro Bay kangaroo rat was trapped at the Pecho site was in 1978-79.

### B. STUDY PLOTS

A total of 53, randomly selected, 100 ft X 200 ft plots were located and marked by Army Corps of Engineers staff biologists. We then conducted a ground reconnaissance of each of these plots to search for signs of and evaluate habitat suitability for MBKR. Those plots having signs of MBKR as well as those that supported habitat which appeared to be suitable for MBKR were selected for live trapping.

### C. GROUND SURVEY TECHNIQUES

The soil surface of plots at Pecho was searched for signs of Morro Bay kangaroo rats on 5 - 8 September and on 21 October, 1995. Potential signs of Morro Bay kangaroo rat presence were as follows:

1. Burrow entrances which showed signs of recent digging or scat;
2. Small, shallow digs in the soil surface;
3. Shallow tail drags in the soil surface.

Habitat suitability of plots and signs of MBKR were assessed at the same time. Habitat was judged to be suitable (poor to good) using the following general guidelines:

1. Presence of horkelia, Deerweed, Buckwheat, California crotom, California Aster, and other sub-shrub species which produce seeds eaten by kangaroo rats.
2. Presence of scattered shrubs including: California Sage, Black Sage, Mock Heather, Buck Brush, Lupine, etc.
3. Presence of scattered patches of bare ground, trails, roads, and banks along roads and trails.
4. Presence of gentle sloping terrain with fairly stable soil.
5. Absence of shrub cover in which the crowns of the plants touch or overlap.
6. Absence of high cover by ice plants and invasive grasses.

#### D. PERMITS

All field work was conducted under provisions of USFWS, permit no. PRT-799495; Jan. 4, 1995, USFWS Biological Opinion to Army Corps of Engineers; Cal. Dept. of Parks and Recreation Collecting Permits (expires Mar. 20, 1996); California Department of Fish and Game (CDFG) scientific collecting permits: # 2706 (to Roger Gambs Phd, expires September 1, 1997) and # 2303 (to Christopher Logan, expires April 14, 1997); and CDFG MOU between R. D. Gambs and the CDFG (expires April 30, 1997).

#### E. TRAPPING METHODS

A 100 ft X 100 ft trapping grid was located on each of the selected 100 ft X 200 ft plots. The grid was positioned on what appeared to be the best habitat for MBKR within these plots. Trapping stations were spaced 25 feet apart resulting in a total of 25 trapping stations per grid. One folding, aluminum Sherman XLK live trap and one wire mesh Stoddard live trap were placed at each trapping station (50 traps per plot). When possible, trapping was conducted for 3 consecutive nights at each plot.

When appropriate, all traps were positioned under the dripline of plants to provide protection from the elements. Stoddard traps were covered with a protective metal hood. Each trap was baited with a small handful of bait (Quaker old-fashioned rolled oats), which was divided between the inside of the trap and the ground outside the door. During the first three weeks of field work, traps were set in the late afternoon, and then checked at dawn the following morning. As nighttime temperatures became cooler, a small piece of cotton batting was added to each trap; however the cotton did not seem to provide sufficient insulation for animals in the Stoddard traps. For the remainder of the field work, traps were checked once at night and again at dawn the following morning. All captured animals were identified to species level, marked by clipping a small patch of hair, and released at the site of capture.

#### F. TRAPPING INTENSITY AND RELATIVE ABUNDANCE

Trapping intensity is expressed as trap nights (TN). It is defined as the number of nights trapping multiplied by the total number of traps set, minus the number of traps that were vandalized, missing, tripped, or containing other animals. As an example, three nights of trapping on one plot with 50 traps would produce a trapping intensity of  $3 \times 50 = 150$  TN.

Relative abundance is expressed as the number of animals captured per 100 TN (#/100 TN), given the number of animals captured and the number of trap nights during a trapping session. For purposes of this study, the number of animals captured equals the number of new captures plus the number of recaptures. As an example, if the trapping session consisted of 225 TN and 9 Deer Mice were captured or recaptured, the relative abundance of Deer Mice would be  $(100/225 \text{ TN}) \times 9$  animals, or 4 Deer Mice /100 TN.

### III. RESULTS AND DISCUSSION

#### A. GROUND SURVEYS OF RANDOMLY SELECTED PLOTS

Ground search and habitat evaluation of the original 53 randomly selected plots were conducted on 5 - 8 September 1995. Four plots were relocated after discovering they were on private property. These were searched and evaluated on 21 October 1995. Plot numbers, decisions concerning whether or not to trap, and additional comments are presented in Table 1. The locations of plots that were trapped are shown on Figure 2.

#### B. TRAPPING RESULTS

Abbreviations for small mammal species captured in at least one plot during the study are as follows: MBKR = Morro Bay Kangaroo Rat (*Dipodomys heermanni morroensis*); CHCA = California Pocket Mouse (*Chaetodipus californicus*) (formerly PGCA = California Pocket Mouse (*Perognathus californicus*); PEMA = Deer Mouse (*Peromyscus maniculatus*); PECA = California Mouse (*Peromyscus californicus*); REME = Western Harvest Mouse (*Reithrodontomys megalotis*); NEFU = Dusky-footed Woodrat (*Neotoma fuscipes*); MICA = California Vole (*Microtus californicus*).

#### C. TRAPPING SUMMARIES

Summary trapping results for each plot are presented in Appendix 1, Tables A-1 through A-22. Between September 13, 1995 and November 4, 1995, six different species and 633 small mammals were captured at the former Baywood Park Training (BPTA). Three-hundred eighty two of these were new captures and 251 were recaptures. Five-hundred sixty captures were made with Sherman XLK traps. Seventy-three captures were made with Stoddard traps.

**No Morro Bay kangaroo rats were captured.**

Table 1 provides a summary of the plot number keyed to Figure 2, the trapping decision and comments regarding the decision to trap. A total of 22 plots were trapped. Table 2 gives a summary of the trapping results for the 22 plots trapped.

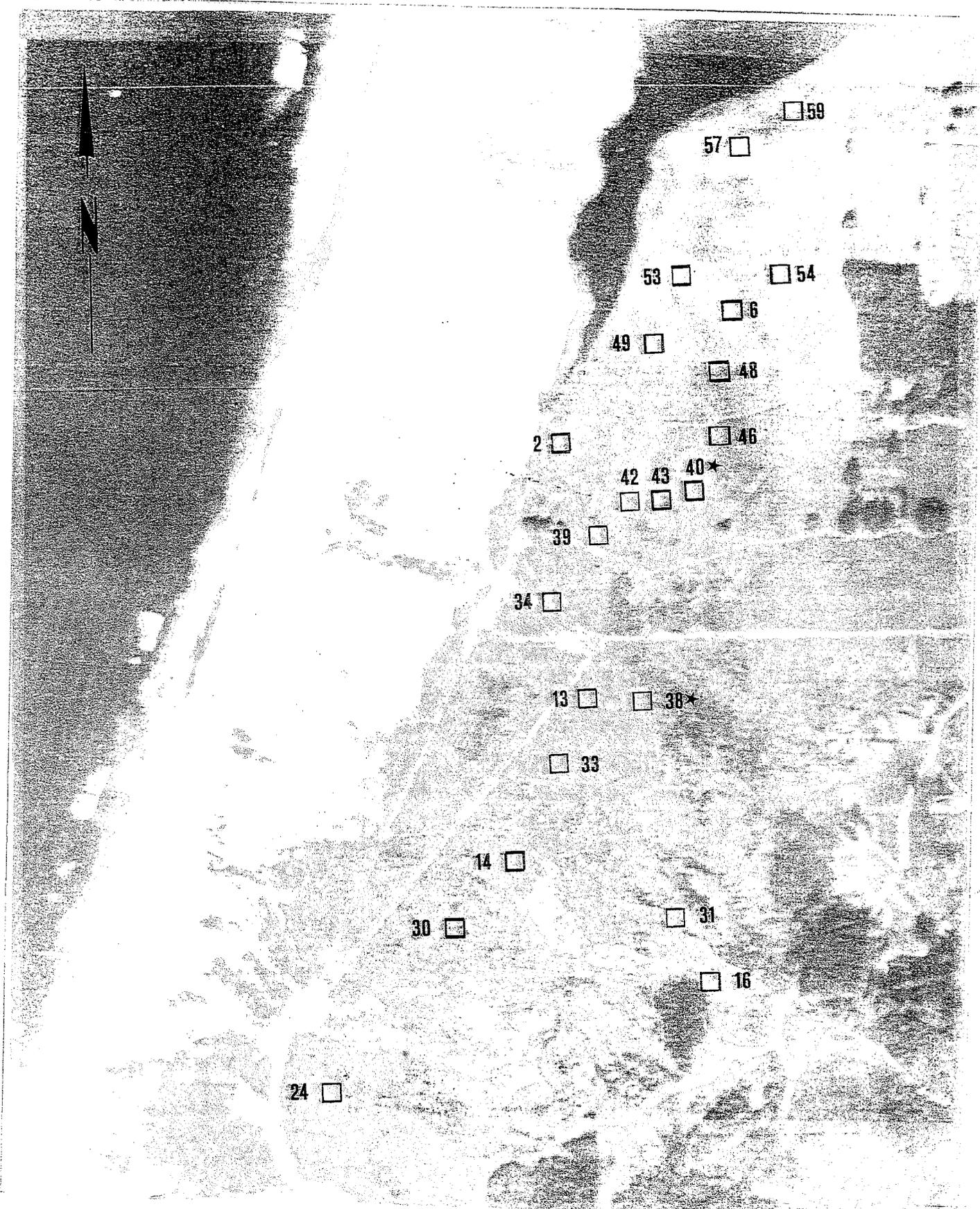


Figure 2

Location of Plots, MBKR Trapping Program  
BPTA Training Area-NOT TO SCALE

Table 1  
Plots Surveyed and Decision for Trapping

| PLOT NO.         | TRAPPING DECISION | COMMENTS                             |
|------------------|-------------------|--------------------------------------|
| 2                | TRAP              | Better habitat than 45 and 47        |
| 4                | No Trap           | Area trapped in spring 1995          |
| 4                | No Trap           | Area trapped in spring 1995          |
| 5                | No Trap           | Area trapped in spring 1995          |
| 6                | TRAP              | +                                    |
| 7                | No Trap           | On private property                  |
| ~ 7 (relocated)  | No Trap           | Low priority to trap                 |
| 8                | No Trap           | ∅                                    |
| 10               | No Trap           | ∅                                    |
| 12               | No Trap           | Area trapped in spring 1995          |
| 13               | TRAP              | +                                    |
| 14               | TRAP              | +                                    |
| 16               | TRAP              | Possible tail drags                  |
| 24               | TRAP              | +                                    |
| 30               | TRAP              | +                                    |
| 31               | TRAP              | +                                    |
| 32               | No Trap           | ∅                                    |
| 33               | TRAP              | +                                    |
| 34               | TRAP              | Close to area trapped in spring 1995 |
| 36               | No Trap           | Area trapped in spring 1995          |
| 37               | No Trap           | Area trapped in spring 1995          |
| 38               | No Trap           | On private property                  |
| 38 (relocated)   | TRAP              | +                                    |
| 39               | TRAP              | +                                    |
| 40               | No Trap           | On private property                  |
| 40 (relocated)   | TRAP              | +                                    |
| 41               | No Trap           | On private property                  |
| ~ 41 (relocated) | No Trap           | Low priority to trap                 |
| 42               | TRAP              | +                                    |
| 43               | TRAP              | +                                    |
| ~ 45             | No Trap           | Low priority to trap                 |
| 46               | TRAP              | +                                    |
| ~ 47             | No Trap           | Low priority to trap                 |
| 48               | TRAP              | +                                    |
| 49               | TRAP              | +                                    |
| ~ 50             | No Trap           | Low priority to trap                 |
| 53               | TRAP              | +                                    |
| 54               | TRAP              | +                                    |
| ~ 56             | No Trap           | Low priority to trap                 |
| 57               | TRAP              | Possible burrows in SW corner        |
| 58               | No Trap           | Plot extends into the bay/shoreline  |
| 59               | TRAP              | +                                    |

+ Plots where potential signs were found and/or where habitat was judged to be at least somewhat favorable for MBKR.

∅ Plots where no potential signs were found and where habitat was judged to be unfavorable for MBKR.

~ Plots where habitat appeared to be less favorable for MBKR than that on plots selected for trapping.

## D. DISCUSSION

Although possible tail drags and burrows were observed during the study, no MBKR were captured during the eight week trapping period (September 13 to November 4, 1995, refer to Table 2). Results from a number of previous studies indicate that MBKR are much easier to detect and capture during the spring (March to June) than during the fall months. Since the data of this study were collected during the fall, they should not be projected to apply to the small mammal community that might be found at the Pecho site at other times of the year.

The number of species captured per plot ranged from 2 (plots 43, 54, and 57) to 5 (plot 24). The average relative abundance of all small mammals captured per plot ranged from 8.2 (plot 57) to 42.4 (plot 49) individuals / 100 TN. These differences probably reflect differences in habitat composition on the plots rather than seasonal differences in trapping success. Although the nights became somewhat colder as the study progressed, rain did not confound the field work until the last (eighth week of the study). The effects of local climatic change during the study did not appear to be particularly great because neither the number of species nor the average relative abundance of small mammals caught per plot showed any significant change from the first to the eighth week of the study ( $R^2 = .022$  and  $.002$ , respectively).

Compared to previous studies (e.g. Gambs and Holland, 1988), Western Harvest Mice and Dusky-footed Woodrats were less common and California Voles were more common at Pecho during the present study (Table 2).

The average relative abundance of small mammals captured per plot during the present study was 19.6 individuals / TN. The most common small mammal species captured were California Pocket Mice (mean relative abundance / plot = 75 / TN), Deer Mice (mean relative abundance / plot = 43 / 100 TN). These results are moderately comparable to results obtained from previous studies at the Pecho site. The relative abundance of both California Pocket Mice and Deer Mice showed a weak, but not significant ( $R^2 = .048$  and  $.152$ , respectively) tendency to increase from the first to the eighth week of the study. In contrast, the relative abundance of California Mice showed a weak, but not significant ( $R^2 = .138$ ), tendency to decrease from the first to the first to the eighth week of the study.

If one were to use the composition of the small mammal community on each plot as a criterion for selecting plots to evaluate more thoroughly during the spring months, then those plots that support California Pocket Mice along with a few Deer Mice and a few or no other species would be likely candidates for MBKR.

Table 2  
Summary of Trapping Results  
(Plot Numbers Keyed to Figure 1)

Summary of trapping results from 22, 100'x100' plots located within Critical Habitat for the endangered Morro Bay kangaroo rat. Abbreviations for small mammal species are as follows: MBKR = Morro Bay kangaroo rat (*Dipodomys heermanni morroensis*); CHCA = California Pocket Mouse (*Chaetodipus californicus*), formerly PGCA = California pocket mouse (*Perognathus californicus*); PEMA = deer mouse (*Peromyscus maniculatus*); PECA = California mouse (*Peromyscus californicus*); REME = Western harvest mouse (*Reithrodontomys megalotis*); NEFU = Dusky-footed woodrat (*Neotoma fuscipes*); MICA = California vole (*Microtus californicus*).

RELATIVE ABUNDANCE OF SMALL MAMMAL SPECIES (# / 100TN)

| WK | PLOT NO. | NO. OF SPECIES CAUGHT | MBKR | CHCA | PEMA | PECA | REME | NEFU | MICA | SUM. ALL SPP. |
|----|----------|-----------------------|------|------|------|------|------|------|------|---------------|
| 1  | 16       | 3                     |      | 3.4  | 2.0  | 5.4  |      |      |      | 10.8          |
| 1  | 24       | 5                     |      | 6.7  | 6.7  | 9.3  | 0.7  | 3.0  |      | 26.4          |
| 1  | 31       | 3                     |      | 8.2  | 2.1  | 19.1 |      |      |      | 29.4          |
| 2  | 14       | 3                     |      | 6.7  | 7.4  | 6.7  |      |      |      | 20.8          |
| 2  | 30       | 4                     |      | 6.8  | 6.2  | 3.4  |      | 0.7  |      | 17.1          |
| 2  | 33       | 3                     |      | 2.7  | 5.3  | 1.3  |      |      |      | 9.3           |
| 3  | 13       | 4                     |      | 6.7  | 10.1 | 6.0  |      | 2.0  |      | 24.8          |
| 3  | 34       | 4                     |      | 10.3 | 9.0  | 3.4  |      |      | 2.8  | 25.5          |
| 3  | 38       | 4                     |      | 6.8  | 6.1  | 3.4  |      | 0.7  |      | 17.0          |
| 3  | 43       | 2                     |      | 1.3  | 8.7  |      |      |      |      | 10.0          |
| 4  | 39       | 3                     |      | 9.5  | 4.8  | 1.4  |      |      |      | 15.7          |
| 4  | 42       | 3                     |      | 6.9  | 3.4  | 5.5  |      |      |      | 15.8          |
| 5  | 46       | 3                     |      | 2.7  | 6.8  | 4.1  |      |      |      | 13.6          |
| 5  | 48       | 3                     |      | 7.4  | 3.4  |      |      |      | 3.4  | 14.2          |
| 6  | 6        | 3                     |      | 12.0 | 3.3  | 2.7  |      |      |      | 18.0          |
| 6  | 49       | 4                     |      | 17.4 | 13.9 | 7.6  |      |      | 3.5  | 42.4          |
| 6  | 53       | 3                     |      | 10.1 | 12.1 | 2.0  |      |      |      | 24.2          |
| 6  | 54       | 2                     |      | 11.3 | 8.0  |      |      |      |      | 19.3          |
| 7  | 2        | 4                     |      | 17.0 | 6.8  | 10.9 |      | 2.0  |      | 36.7          |
| 7  | 40       | 4                     |      | 6.7  | 9.5  | 0.7  |      |      | 3.5  | 20.4          |
| 8  | 57       | 2                     |      | 1.4  | 6.8  |      |      |      |      | 8.2           |
| 8  | 59       | 4                     |      | 2.0  | 8.8  | 0.7  | 0.7  |      |      | 12.2          |

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### **Pers. Communication**

~~Roest, A. I. refer to page 2, paragraph 3.~~

## APPENDIX A

Table A-1  
Plot 24

Results of a 3 consecutive night trapping session conducted on plot number 24 between September 13 and September 15, 1995 (Week 1). Traps were not supplied with cotton batting. Traps were set before dusk and checked within two hours of sunset.

| SPECIES | TRAPPING INTENSITY (NO. TN) | NO. OF NEW CAPTURES | NO. OF RECAPTURES | RELATIVE ABUNDANCE (NO./100 TN) |
|---------|-----------------------------|---------------------|-------------------|---------------------------------|
| MBKR    | 150                         | 0                   | 0                 | 0                               |
| CHCA    | 150                         | 8                   | 2                 | 6.7                             |
| PEMA    | 150                         | 9                   | 1                 | 6.7                             |
| PECA    | 150                         | 10                  | 4                 | 9.3                             |
| REME    | 150                         | 1                   | 0                 | 0.7                             |
| NEFU    | 150                         | 1                   | 2                 | 2.0                             |
| MICA    | 150                         | 0                   | 0                 | 0                               |
| TOTAL   |                             | 29                  | 9                 |                                 |

Table A-2  
Plot 16

Results of a 3 consecutive night trapping session conducted on plot number 16 between September 13 and September 15, 1995 (Week 1). Traps were not supplied with cotton batting. Traps were set before dusk and checked within two hours of sunset.

| SPECIES | TRAPPING INTENSITY (NO. TN) | NO. OF NEW CAPTURES | NO. OF RECAPTURES | RELATIVE ABUNDANCE (NO./100 TN) |
|---------|-----------------------------|---------------------|-------------------|---------------------------------|
| MBKR    | 148                         | 0                   | 0                 | 0                               |
| CHCA    | 148                         | 3                   | 2                 | 3.4                             |
| PEMA    | 148                         | 3                   | 0                 | 2.0                             |
| PECA    | 148                         | 7                   | 1                 | 5.4                             |
| REME    | 148                         | 0                   | 0                 | 0                               |
| NEFU    | 148                         | 0                   | 0                 | 0                               |
| MICA    | 148                         | 0                   | 0                 | 0                               |
| TOTAL   |                             | 13                  | 3                 |                                 |

**Table A-3**  
**Plot 31**

Results of a 3 consecutive night trapping session conducted on plot number 31 between September 13 and September 15, 1995 (Week 1). Traps were not supplied with cotton batting. Traps were set before dusk and checked within two hours of sunset.

| SPECIES | TRAPPING INTENSITY (NO. TN) | NO. OF NEW CAPTURES | NO. OF RECAPTURES | RELATIVE ABUNDANCE (NO./100 TN) |
|---------|-----------------------------|---------------------|-------------------|---------------------------------|
| MBKR    | 146                         | 0                   | 0                 | 0                               |
| CHCA    | 146                         | 9                   | 3                 | 8.2                             |
| PEMA    | 146                         | 3                   | 0                 | 2.1                             |
| PECA    | 146                         | 19                  | 9                 | 9.1                             |
| REME    | 146                         | 0                   | 0                 | 0                               |
| NEFU    | 146                         | 0                   | 0                 | 0                               |
| MICA    | 146                         | 0                   | 0                 | 0                               |
| TOTAL   |                             | 31                  | 12                |                                 |

Table A-4  
Plot 14

Results of a 3 consecutive night trapping session conducted on plot number 14 between September 20 and September 22, 1995 (Week 2). Traps were not supplied with cotton batting. Traps were set before dusk and checked within two hours of sunset.

| SPECIES | TRAPPING INTENSITY (NO. TN) | NO. OF NEW CAPTURES | NO. OF RECAPTURES | RELATIVE ABUNDANCE (NO./100 TN) |
|---------|-----------------------------|---------------------|-------------------|---------------------------------|
| MBKR    | 149                         | 0                   | 0                 | 0                               |
| CHCA    | 149                         | 8                   | 2                 | 6.7                             |
| PEMA    | 149                         | 8                   | 3                 | 7.4                             |
| PECA    | 149                         | 7                   | 3                 | 6.7                             |
| REME    | 149                         | 0                   | 0                 | 0                               |
| NEFU    | 149                         | 0                   | 0                 | 0                               |
| MICA    | 149                         | 0                   | 0                 | 0                               |
| TOTAL   |                             | 23                  | 8                 |                                 |

**Table A-5**  
**Plot 30**

Results of a 3 consecutive night trapping session conducted on plot number 30 between September 20 and September 22, 1995 (Week 2). Traps were not supplied with cotton batting. Traps were set before dusk and checked within two hours of sunset.

| SPECIES | TRAPPING INTENSITY (NO. TN) | NO. OF NEW CAPTURES | NO. OF RECAPTURES | RELATIVE ABUNDANCE (NO./100 TN) |
|---------|-----------------------------|---------------------|-------------------|---------------------------------|
| MBKR    | 146                         | 0                   | 0                 | 0                               |
| CHCA    | 146                         | 9                   | 1                 | 6.8                             |
| PEMA    | 146                         | 8                   | 1                 | 6.2                             |
| PECA    | 146                         | 5                   | 0                 | 3.4                             |
| REME    | 146                         | 0                   | 0                 | 0                               |
| NEFU    | 146                         | 1                   | 0                 | 0.7                             |
| MICA    | 146                         | 0                   | 0                 | 0                               |
| TOTAL   |                             | 23                  | 2                 |                                 |

Table A-6  
Plot 33

Results of a 3 consecutive night trapping session conducted on plot number 33 between September 20 and September 22, 1995 (Week 2). Traps were not supplied with cotton batting. Traps were set before dusk and checked within two hours of sunset.

| SPECIES | TRAPPING INTENSITY (NO. TN) | NO. OF NEW CAPTURES | NO. OF RECAPTURES | RELATIVE ABUNDANCE (NO./100 TN) |
|---------|-----------------------------|---------------------|-------------------|---------------------------------|
| MBKR    | 150                         | 0                   | 0                 | 0                               |
| CHCA    | 150                         | 3                   | 1                 | 2.7                             |
| PEMA    | 150                         | 6                   | 2                 | 5.3                             |
| PECA    | 150                         | 1                   | 1                 | 1.3                             |
| REME    | 150                         | 0                   | 0                 | 0                               |
| NEFU    | 150                         | 0                   | 0                 | 0                               |
| MICA    | 150                         | 0                   | 0                 | 0                               |
| TOTAL   |                             | 10                  | 4                 |                                 |

Table A-6  
Plot 33

Results of a 3 consecutive night trapping session conducted on plot number 33 between September 20 and September 22, 1995 (Week 2). Traps were not supplied with cotton batting. Traps were set before dusk and checked within two hours of sunset.

| SPECIES | TRAPPING INTENSITY (NO. TN) | NO. OF NEW CAPTURES | NO. OF RECAPTURES | RELATIVE ABUNDANCE (NO./100 TN) |
|---------|-----------------------------|---------------------|-------------------|---------------------------------|
| MBKR    | 150                         | 0                   | 0                 | 0                               |
| CHCA    | 150                         | 3                   | 1                 | 2.7                             |
| PEMA    | 150                         | 6                   | 2                 | 5.3                             |
| PECA    | 150                         | 1                   | 1                 | 1.3                             |
| REME    | 150                         | 0                   | 0                 | 0                               |
| NEFU    | 150                         | 0                   | 0                 | 0                               |
| MICA    | 150                         | 0                   | 0                 | 0                               |
| TOTAL   |                             | 10                  | 4                 |                                 |

Table A-7  
Plot 13

Results of a 3 consecutive night trapping session conducted on plot number 13 between September 27 and September 29, 1995 (Week 3). Traps were supplied with cotton batting. Traps were set before dusk and checked within two hours of sunset.

| SPECIES | TRAPPING INTENSITY (NO. TN) | NO. OF NEW CAPTURES | NO. OF RECAPTURES | RELATIVE ABUNDANCE (NO./100 TN) |
|---------|-----------------------------|---------------------|-------------------|---------------------------------|
| MBKR    | 149                         | 0                   | 0                 | 0                               |
| CHCA    | 149                         | 5                   | 5                 | 6.7                             |
| PEMA    | 149                         | 9                   | 6                 | 10.1                            |
| PECA    | 149                         | 5                   | 4                 | 6.0                             |
| REME    | 149                         | 0                   | 0                 | 0                               |
| NEFU    | 149                         | 3                   | 0                 | 2.0                             |
| MICA    | 149                         | 0                   | 0                 | 0                               |
| TOTAL   |                             | 22                  | 15                |                                 |

**Table A-8**  
**Plot 34**

Results of a 3 consecutive night trapping session conducted on plot number 34 between September 27 and September 29, 1995 (Week 3). Traps were supplied with cotton batting. Traps were set before dusk and checked within two hours of sunset.

| SPECIES | TRAPPING INTENSITY (NO. TN) | NO. OF NEW CAPTURES | NO. OF RECAPTURES | RELATIVE ABUNDANCE (NO./100 TN) |
|---------|-----------------------------|---------------------|-------------------|---------------------------------|
| MBKR    | 145                         | 0                   | 0                 | 0                               |
| CHCA    | 145                         | 11                  | 4                 | 10.3                            |
| PEMA    | 145                         | 10                  | 3                 | 9.0                             |
| PECA    | 145                         | 2                   | 3                 | 3.4                             |
| REME    | 145                         | 0                   | 0                 | 0                               |
| NEFU    | 145                         | 0                   | 0                 | 0                               |
| MICA    | 145                         | 3                   | 1                 | 2.8                             |
| TOTAL   |                             | 26                  | 11                |                                 |

Table A-9  
Plot 2

Results of a 3 consecutive night trapping session conducted on plot number 2 between September 27 and September 29, 1995 (Week 3). Traps were supplied with cotton batting. Traps were set before dusk and checked within two hours of sunset.

| SPECIES | TRAPPING INTENSITY (NO. TN) | NO. OF NEW CAPTURES | NO. OF RECAPTURES | RELATIVE ABUNDANCE (NO./100 TN) |
|---------|-----------------------------|---------------------|-------------------|---------------------------------|
| MBKR    | 148                         | 0                   | 0                 | 0                               |
| CHCA    | 148                         | 6                   | 4                 | 6.8                             |
| PEMA    | 148                         | 8                   | 1                 | 6.1                             |
| PECA    | 148                         | 3                   | 2                 | 3.4                             |
| REME    | 148                         | 0                   | 0                 | 0                               |
| NEFU    | 148                         | 1                   | 0                 | 0.7                             |
| MICA    | 148                         | 0                   | 0                 | 0                               |
| TOTAL   |                             | 18                  | 7                 |                                 |

**Table A-10**  
**Plot 39**

Results of a 3 consecutive night trapping session conducted on plot number **39** between October 4, 1995 and October 6, 1995 (Week 4). Traps were supplied with cotton batting. Traps were set before dusk and checked within two hours of sunset.

| SPECIES | TRAPPING<br>INTENSITY<br>(NO. TN) | NO. OF<br>NEW<br>CAPTURES | NO. OF<br>RECAPTURES | RELATIVE<br>ABUNDANCE<br>(NO./100 TN) |
|---------|-----------------------------------|---------------------------|----------------------|---------------------------------------|
| MBKR    | 147                               | 0                         | 0                    | 0                                     |
| CHCA    | 147                               | 9                         | 5                    | 9.5                                   |
| PEMA    | 147                               | 4                         | 3                    | 4.8                                   |
| PECA    | 147                               | 1                         | 1                    | 1.4                                   |
| REME    | 147                               | 0                         | 0                    | 0                                     |
| NEFU    | 147                               | 0                         | 0                    | 0                                     |
| MICA    | 147                               | 0                         | 0                    | 0                                     |
| TOTAL   |                                   | 14                        | 9                    |                                       |

**Table A-11**  
**Plot 42**

Results of a 3 consecutive night trapping session conducted on plot number 42 between October 4, 1995 and October 6, 1995 (Week 4). Traps were supplied with cotton batting. Traps were set before dusk and checked within two hours of sunset.

| SPECIES | TRAPPING INTENSITY (NO. TN) | NO. OF NEW CAPTURES | NO. OF RECAPTURES | RELATIVE ABUNDANCE (NO./100 TN) |
|---------|-----------------------------|---------------------|-------------------|---------------------------------|
| MBKR    | 145                         | 0                   | 0                 | 0                               |
| CHCA    | 145                         | 3                   | 7                 | 6.9                             |
| PEMA    | 145                         | 5                   | 0                 | 3.4                             |
| PECA    | 145                         | 3                   | 5                 | 5.5                             |
| REME    | 145                         | 0                   | 0                 | 0                               |
| NEFU    | 145                         | 0                   | 0                 | 0                               |
| MICA    | 145                         | 0                   | 0                 | 0                               |
| TOTAL   |                             | 11                  | 12                |                                 |

**Table A-12**  
**Plot 43**

Results of a 3 consecutive night trapping session conducted on plot number 43 between October 4, 1995 and October 6, 1995 (Week 4). Traps were supplied with cotton batting. Traps were set before dusk and checked within two hours of sunset.

| SPECIES | TRAPPING INTENSITY (NO. TN) | NO. OF NEW CAPTURES | NO. OF RECAPTURES | RELATIVE ABUNDANCE (NO./100 TN) |
|---------|-----------------------------|---------------------|-------------------|---------------------------------|
| MBKR    | 149                         | 0                   | 0                 | 0                               |
| CHCA    | 149                         | 1                   | 1                 | 1.3                             |
| PEMA    | 149                         | 8                   | 5                 | 8.7                             |
| PECA    | 149                         | 0                   | 0                 | 0                               |
| REME    | 149                         | 0                   | 0                 | 0                               |
| NEFU    | 149                         | 0                   | 0                 | 0                               |
| MICA    | 149                         | 0                   | 0                 | 0                               |
| TOTAL   |                             | 9                   | 6                 |                                 |

**Table A-13**  
**Plot 46**

Results of a 3 consecutive night trapping session conducted on plot number 46 between October 9, 1995 and October 12, 1995 (Week 5). Traps were not supplied with cotton batting. Traps were set and baited at approximately 1230 hrs on the first day and were checked at 2100 hrs that night and 0700 hrs the next morning.

| SPECIES | TRAPPING INTENSITY (NO. TN) | NO. OF NEW CAPTURES | NO. OF RECAPTURES | RELATIVE ABUNDANCE (NO./100 TN) |
|---------|-----------------------------|---------------------|-------------------|---------------------------------|
| MBKR    | 146                         | 0                   | 0                 | 0                               |
| CHCA    | 146                         | 3                   | 1                 | 2.7                             |
| PEMA    | 146                         | 7                   | 3                 | 6.8                             |
| PECA    | 146                         | 4                   | 2                 | 4.1                             |
| REME    | 146                         | 0                   | 0                 | 0                               |
| NEFU    | 146                         | 0                   | 0                 | 0                               |
| MICA    | 146                         | 0                   | 0                 | 0                               |
| TOTAL   |                             | 14                  | 6                 |                                 |

**Table A-14**  
**Plot 48**

Results of a 3 consecutive night trapping session conducted on plot number 48 between October 9, 1995 and October 12, 1995 (Week 5). Traps were not supplied with cotton batting. Traps were set and baited at approximately 1230 hrs on the first day and were checked at 2100 hrs that night and 0700 hrs the next morning.

| SPECIES | TRAPPING INTENSITY (NO. TN) | NO. OF NEW CAPTURES | NO. OF RECAPTURES | RELATIVE ABUNDANCE (NO./100 TN) |
|---------|-----------------------------|---------------------|-------------------|---------------------------------|
| MBKR    | 148                         | 0                   | 0                 | 0                               |
| CHCA    | 148                         | 4                   | 7                 | 7.4                             |
| PEMA    | 148                         | 3                   | 2                 | 3.4                             |
| PECA    | 148                         | 0                   | 0                 | 0                               |
| REME    | 148                         | 0                   | 0                 | 0                               |
| NEFU    | 148                         | 0                   | 0                 | 0                               |
| MICA    | 148                         | 2                   | 3                 | 3.4                             |
| TOTAL   |                             | 9                   | 12                |                                 |

Table A-15

Plot 6

Results of a 3 consecutive night trapping session conducted on plot number 6 between October 18, 1995 and October 20, 1995 (Week 6). Traps were not supplied with cotton batting. Traps were set and baited at approximately 1230 hrs on the first day and were checked at 2100 hrs that night and 0700 hrs the next morning.

| SPECIES | TRAPPING INTENSITY- (NO. TN) | NO. OF NEW CAPTURES | NO. OF RECAPTURES | RELATIVE ABUNDANCE (NO./100 TN) |
|---------|------------------------------|---------------------|-------------------|---------------------------------|
| MBKR    | 150                          | 0                   | 0                 | 0                               |
| CHCA    | 150                          | 7                   | 11                | 12.0                            |
| PEMA    | 150                          | 5                   | 0                 | 3.3                             |
| PECA    | 150                          | 1                   | 3                 | 2.7                             |
| REME    | 150                          | 0                   | 0                 | 0                               |
| NEFU    | 150                          | 0                   | 0                 | 0                               |
| MICA    | 150                          | 0                   | 0                 | 0                               |
| TOTAL   |                              | 13                  | 14                |                                 |

**Table A-16**  
**Plot 49**

Results of a 3 consecutive night trapping session conducted on plot number 49 between October 18, 1995 and October 20, 1995 (Week 6). Traps were not supplied with cotton batting. Traps were set and baited at approximately 1230 hrs on the first day and were checked at 2100 hrs that night and 0700 hrs the next morning.

| SPECIES | TRAPPING INTENSITY (NO. TN) | NO. OF NEW CAPTURES | NO. OF RECAPTURES | RELATIVE ABUNDANCE (NO./100 TN) |
|---------|-----------------------------|---------------------|-------------------|---------------------------------|
| MBKR    | 144                         | 0                   | 0                 | 0                               |
| CHCA    | 144                         | 9                   | 16                | 17.4                            |
| PEMA    | 144                         | 10                  | 10                | 13.9                            |
| PECA    | 144                         | 5                   | 6                 | 7.6                             |
| REME    | 144                         | 0                   | 0                 | 0                               |
| NEFU    | 144                         | 0                   | 0                 | 0                               |
| MICA    | 144                         | 2                   | 3                 | 3.5                             |
| TOTAL   |                             | 26                  | 35                |                                 |

Table A-17  
Plot 53

Results of a 3 consecutive night trapping session conducted on plot number 53 between October 18, 1995 and October 20, 1995 (Week 6). Traps were not supplied with cotton batting. Traps were set and baited at approximately 1230 hrs on the first day and were checked at 2100 hrs that night and 0700 hrs the next morning.

| SPECIES | TRAPPING INTENSITY (NO. TN) | NO. OF NEW CAPTURES | NO. OF RECAPTURES | RELATIVE ABUNDANCE (NO./100 TN) |
|---------|-----------------------------|---------------------|-------------------|---------------------------------|
| MBKR    | 149                         | 0                   | 0                 | 0                               |
| CHCA    | 149                         | 6                   | 9                 | 10.1                            |
| PEMA    | 149                         | 11                  | 7                 | 12.1                            |
| PECA    | 149                         | 3                   | 0                 | 2.0                             |
| REME    | 149                         | 0                   | 0                 | 0                               |
| NEFU    | 149                         | 0                   | 0                 | 0                               |
| MICA    | 149                         | 0                   | 0                 | 0                               |
| TOTAL   |                             | 20                  | 16                |                                 |

**Table A-18**  
**Plot 54**

Results of a 3 consecutive night trapping session conducted on plot number **54** between October 18, 1995 and October 20, 1995 (Week 6). Traps were not supplied with cotton batting. Traps were set and baited at approximately 1230 hrs on the first day and were checked at 2100 hrs that night and 0700 hrs the next morning.

| SPECIES | TRAPPING INTENSITY (NO. TN) | NO. OF NEW CAPTURES | NO. OF RECAPTURES | RELATIVE ABUNDANCE (NO./100 TN) |
|---------|-----------------------------|---------------------|-------------------|---------------------------------|
| MBKR    | 150                         | 0                   | 0                 | 0                               |
| CHCA    | 150                         | 4                   | 13                | 11.3                            |
| PEMA    | 150                         | 7                   | 5                 | 8.0                             |
| PECA    | 150                         | 0                   | 0                 | 0                               |
| REME    | 150                         | 0                   | 0                 | 0                               |
| NEFU    | 150                         | 0                   | 0                 | 0                               |
| MICA    | 150                         | 0                   | 0                 | 0                               |
| TOTAL   |                             | 11                  | 18                |                                 |

**Table A-19**  
**Plot 38**

Results of a 3 consecutive night trapping session conducted on plot number 38 between October 24, 1995 and October 27, 1995 (Week 7). Traps were not supplied with cotton batting. Traps were set and baited at approximately 1230 hrs on the first day and were checked at 2100 hrs that night and 0700 hrs the next morning.

| SPECIES | TRAPPING INTENSITY (NO. TN) | NO. OF NEW CAPTURES | NO. OF RECAPTURES | RELATIVE ABUNDANCE (NO./100 TN) |
|---------|-----------------------------|---------------------|-------------------|---------------------------------|
| MBKR    | 147                         | 0                   | 0                 | 0                               |
| CHCA    | 147                         | 7                   | 18                | 17.0                            |
| PEMA    | 147                         | 7                   | 3                 | 6.8                             |
| PECA    | 147                         | 3                   | 13                | 10.9                            |
| REME    | 147                         | 0                   | 0                 | 0                               |
| NEFU    | 147                         | 1                   | 2                 | 2.0                             |
| MICA    | 147                         | 0                   | 0                 | 0                               |
| TOTAL   |                             | 18                  | 36                |                                 |

Table A-20  
Plot 40

Results of a 3 consecutive night trapping session conducted on plot number 40 between October 24, 1995 and October 27, 1995 (Week 7). Traps were not supplied with cotton batting. Traps were set and baited at approximately 1230 hrs on the first day and were checked at 2100 hrs that night and 0700 hrs the next morning.

| SPECIES | TRAPPING INTENSITY (NO. TN) | NO. OF NEW CAPTURES | NO. OF RECAPTURES | RELATIVE ABUNDANCE (NO./100 TN) |
|---------|-----------------------------|---------------------|-------------------|---------------------------------|
| MBKR    | 148                         | 0                   | 0                 | 0                               |
| CHCA    | 148                         | 5                   | 5                 | 6.7                             |
| PEMA    | 148                         | 7                   | 7                 | 9.5                             |
| PECA    | 148                         | 1                   | 0                 | 0.7                             |
| REME    | 148                         | 0                   | 0                 | 0                               |
| NEFU    | 148                         | 0                   | 0                 | 0                               |
| MICA    | 148                         | 0                   | 3                 | 3.5                             |
| TOTAL   |                             | 13                  | 15                |                                 |

**Table A-21**  
**Plot 57**

Results of a 2 consecutive night trapping session conducted on plot number 57 between October 31, 1995 and November 4, 1995 (Week 8). Traps were not supplied with cotton batting. Traps were set and baited at approximately 1230 hrs on the first day and were checked at 2100 hrs that night and 0700 hrs the next morning.

| SPECIES | TRAPPING INTENSITY (NO. TN) | NO. OF NEW CAPTURES | NO. OF RECAPTURES | RELATIVE ABUNDANCE (NO./100 TN) |
|---------|-----------------------------|---------------------|-------------------|---------------------------------|
| MBKR    | 148                         | 0                   | 0                 | 0                               |
| CHCA    | 148                         | 2                   | 0                 | 1.4                             |
| PEMA    | 148                         | 9                   | 1                 | 6.8                             |
| PECA    | 148                         | 0                   | 0                 | 0                               |
| REME    | 148                         | 0                   | 0                 | 0                               |
| NEFU    | 148                         | 0                   | 0                 | 0                               |
| MICA    | 148                         | 0                   | 0                 | 0                               |
| TOTAL   |                             | 11                  | 1                 |                                 |

Table A-22  
Plot 59

Results of a 2 consecutive night trapping session conducted on plot number 59 between October 31, 1995 and November 4, 1995 (Week 8). Traps were not supplied with cotton batting. Traps were set and baited at approximately 1230 hrs on the first day and were checked at 2100 hrs that night and 0700 hrs the next morning.

| SPECIES | TRAPPING INTENSITY (NO. TN) | NO. OF NEW CAPTURES | NO. OF RECAPTURES | RELATIVE ABUNDANCE (NO./100 TN) |
|---------|-----------------------------|---------------------|-------------------|---------------------------------|
| MBKR    | 148                         | 0                   | 0                 | 0                               |
| CHCA    | 148                         | 3                   | 0                 | 2.0                             |
| PEMA    | 148                         | 13                  | 0                 | 8.8                             |
| PECA    | 148                         | 1                   | 0                 | 0.7                             |
| REME    | 148                         | 1                   | 0                 | 0                               |
| NEFU    | 148                         | 0                   | 0                 | 0                               |
| MICA    | 148                         | 0                   | 0                 | 0                               |
| TOTAL   |                             | 18                  | 0                 |                                 |