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DISTRIBUTION AND ECOLOGIC RELATIONSHIPS OF POCKET MICE (*CHAETODIPUS*) IN THE BIG BEND REGION OF TEXAS

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The presence of four species of *Chaetodipus* (*C. hispidus*, *C. intermedius*, *C. nelsoni*, *C. eremicus*) in parts of the Big Bend region of West Texas has been documented by Bailey (1905), Davis and Schmidly (1994), Schmidly (1977), and Yancey (1997). Some details about the relationships of these taxa in the area

were presented by Wilkins and Schmidly (1979), Manning et al. (1996), and Yancey (1997). The purpose of this report is to provide some additional information on geographic distributions and ecologic relationships of these four species of *Chaetodipus* in the Big Bend region of West Texas.

METHODS AND MATERIALS

From January 1994 through August 1995, small mammals were sampled on the Big Bend Ranch State Park, Brewster and Presidio counties, Texas (Fig. 1). Using Sherman live traps, efforts were made to sample small mammals in each of the major types of habitats, based on vegetation and substrata, that occur in the area, and to sample as many sites as possible throughout the Park (Fig. 2). Approximately 7,439 traps were set during the course of this study. Traplines consisted of 40-50 traps baited with rolled oats and set at 10m intervals. Traps were set approximately 1 hour before sundown and retrieved about 1 hour after sunrise the following day. Mammals acquired were identified tentatively and voucher specimens (standard

museum skins and skulls) were prepared. From selected specimens, tissues (muscle, liver, heart, kidney) were removed and placed immediately in liquid nitrogen.

In the accounts that follow, all measurements provided are in millimeters. Geographic localities are based on Universal Transverse Mercator (UTM) coordinates taken from a hand-held global positioning system. Nomenclature of plants follows that given by Powell (1988). Voucher materials are deposited in the Collection of Recent Mammals in the Natural Science Research Laboratory of the Museum of Texas Tech University.

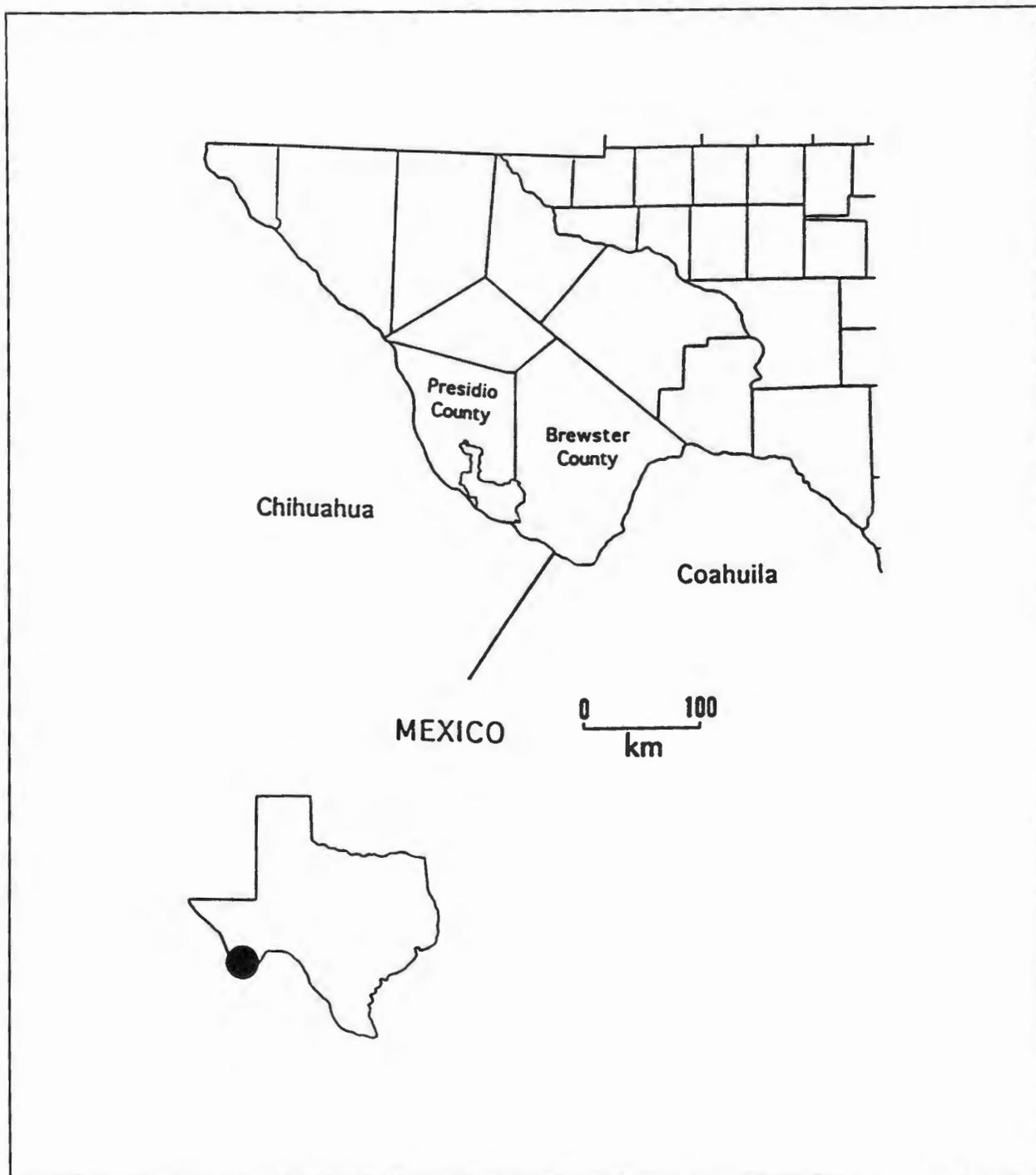


Figure 1.—Geographic location of Big Bend Ranch State Park, Texas.

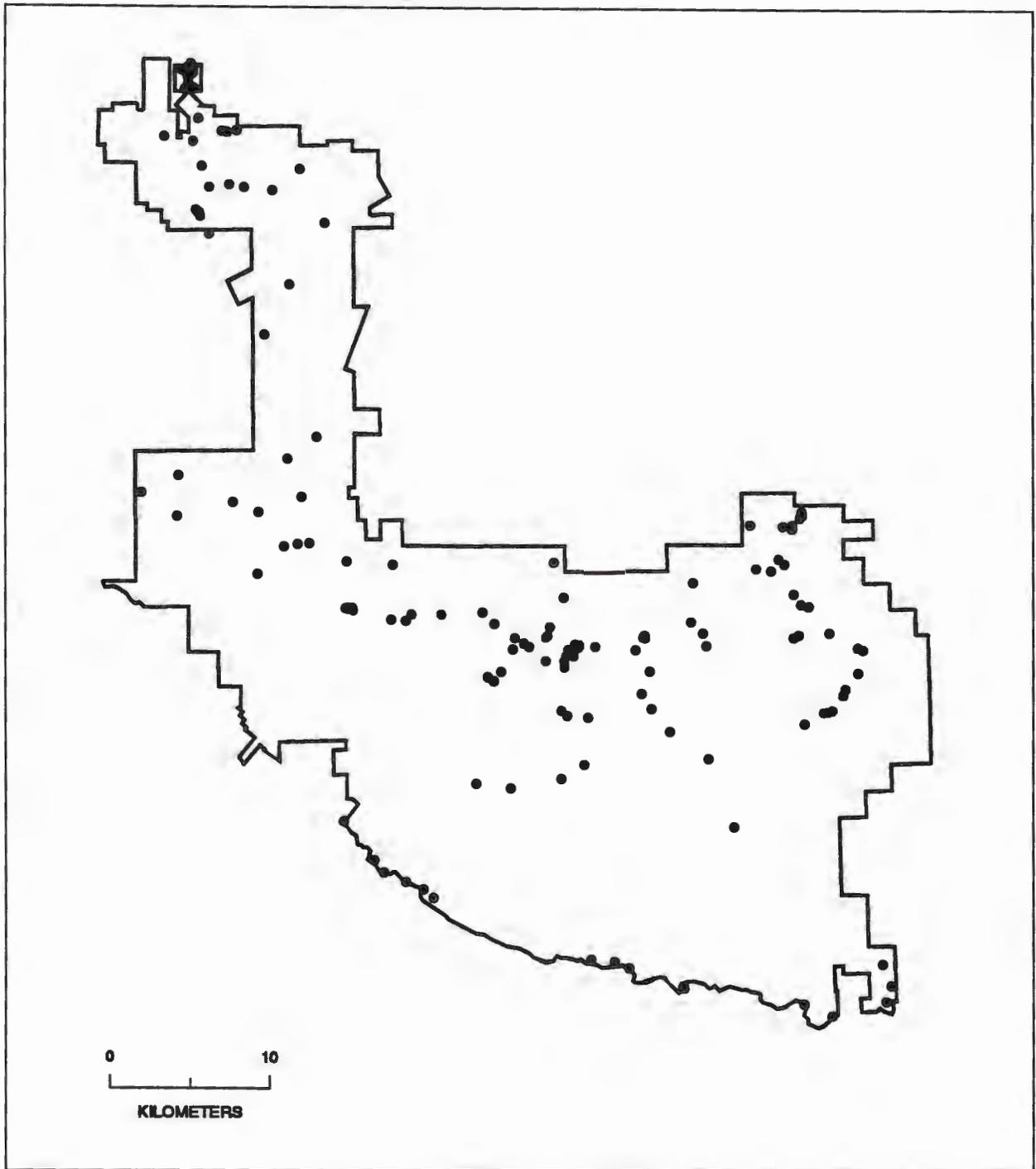


Figure 2.—Locations of sites sampled at Big Bend Ranch State Park from January 1994 through August 1995.

RESULTS AND DISCUSSION

Standard museum specimens (skins, skulls) were identified by the suites of external and cranial diagnostic features of the species given by Anderson (1972), Best (1994), Findley et al. (1975), Hoffmeister (1986) Hoffmeister and Lee (1967), Paulson (1988),

Chaetodipus hispidus paradoxus (Merriam, 1889).—Although essentially state wide in occurrence, the hispid pocket mouse apparently is one of the rarest pocket mice of the Big Bend area of Texas (Schmidly, 1977). For example, a total of eight specimens from four localities constitutes the known records for Brewster County (Schmidly, 1977). Previously known records of the species for Presidio County were based on three males obtained near Marfa by Vernon Bailey on 22 January 1890; another male (no precise locality) was collected in Presidio County by William Lloyd on 1 February 1890. The hispid pocket mouse was recorded from parts of central Chihuahua, Mexico, but the species has not been documented to occur in northern Chihuahua adjacent to the Big Bend region of Texas (Anderson, 1972).

On 3 April 1994, two adult, non-gravid, female *C. hispidus* were captured in the northwest corner of Big Bend Ranch State Park, which is located in southern Presidio County (Fig. 3). An adult male (testes 18 x 5) was taken at the same locality on 5 July 1994. The mammals were trapped in a small area of severely overgrazed grassland that included scattered clumps of mesquite (*Prosopis glandulosa*), catclaw (*Acacia* sp.), false willow (*Baccharis* sp.), and desertwillow (*Chilopsis linearis*). The substrate consisted mostly of hard, fine loam, and some patches of sand and gravel, with a few scattered stones. This area had been graded previously for ditch irrigation. Schmidly (1977) described *C. hispidus* as an inhabitant of desert grasslands, with sandy friable soils covered with moderate stands of vegetation in the Big Bend region of Texas. In Chihuahua, Mexico, this species was found in association with grasslands with less arid conditions than those inhabited by other members of the genus (Anderson, 1972). Other species of rodents collected with *C. hispidus* by us included the silky pocket mouse (*Perognathus flavus*), Chihuahuan

and Wilkins and Schmidly (1979). In addition, identifications of some specimens were confirmed by examinations of preparations of karyotypes (Lee et al., 1991; Patton, 1970).

Desert pocket mouse (*C. eremicus*), Merriam's kangaroo rat (*Dipodomys merriami*), western harvest mouse (*Reithrodontomys megalotis*), cactus mouse (*Peromyscus eremicus*), deer mouse (*P. maniculatus*), and white-footed mouse (*P. leucopus*). This is the only locality on the study area where *C. hispidus* and *C. eremicus* were found in sympatry (Fig. 7).

Specimens examined, total 3. Presidio County: Big Bend Ranch State Park, UTM coordinates 13 576836E 3296251N, 3.

Chaetodipus intermedius intermedius (Merriam, 1889).—The rock pocket mouse has been reported to occur in the western part of the Trans-Pecos area of Texas (Davis and Schmidly, 1994; Schmidly, 1977) and adjacent areas of northwestern Chihuahua, Mexico (Anderson, 1972). Specimens of the rock pocket mouse were obtained at seven localities on the study area (Fig. 4). Vegetation at the collection sites included creosotebush (*Larrea tridentata*), catclaw and white-thorn acacia (*Acacia* sp.), mesquite (*Prosopis glandulosa*), prickly pear (*Opuntia* sp.), yucca (*Yucca* sp.), ocotillo (*Fouquieria splendens*), mariola (*Parthenium incanum*), and scattered grasses. In general, substrata at the study areas consisted of sandy gravel, with scattered small to medium rocks. *Chaetodipus intermedius* was found in rocky habitats of lowland grasslands and deserts in the Trans-Pecos area of Texas (Schmidly, 1977). This species occurred most commonly on rocky, open slopes in Chihuahua, Mexico (Anderson, 1972). Other species of rodents collected with *C. intermedius* in our study area included the silky pocket mouse (*P. flavus*), Nelson's pocket mouse (*C. nelsoni*), Chihuahuan Desert pocket mouse (*C. eremicus*), Merriam's kangaroo rat (*D. merriami*), and cactus mouse (*P. eremicus*). At four localities on the same date, *C. intermedius* occurred in sympatry with *C. nelsoni*; *C. intermedius* and *C. eremicus* were

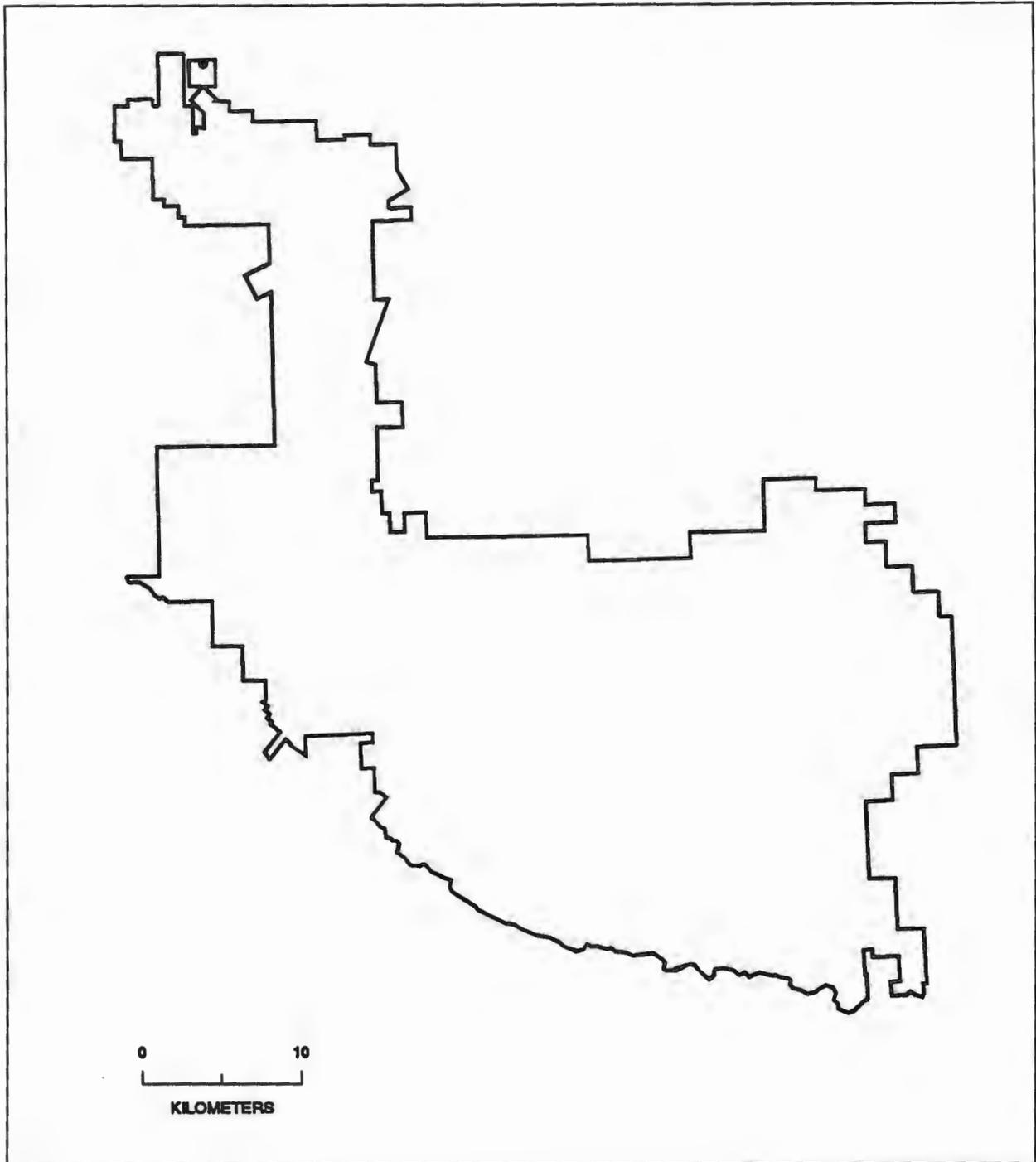


Figure 3.—Location where *Chaetodipus hispidus* was captured at Big Bend Ranch State Park from January 1994 through August 1995.

found together at two places at the same time; all three pocket mice (*C. intermedius*, *C. nelsoni*, *C. eremicus*) were obtained on the same date at one locality (Fig. 7).

Specimens examined, total 13. Presidio County: Big Bend Ranch State Park, UTM coordinates 13 573986E 3270053N, 2; 13 576311E 3271128N, 1; 13 577526E 3283816N, 1; 13 582906E 3266716N, 3; 13 583205E 3282984N, 2; 13 584021E 3269813N, 1; 13 584964E 3273523N, 3.

Chaetodipus nelsoni canescens (Merriam, 1904).—The geographic range of Nelson's pocket mouse includes the central and southern parts of the Big Bend area of Texas (Davis and Schmidly, 1994; Schmidly, 1977), southeastern Chihuahua, Mexico (Anderson, 1972), and adjacent Coahuila, Mexico (Baker, 1956). *Chaetodipus nelsoni* was documented to occur at 36 localities on the study area (Fig. 5). Typical vegetation with which *C. nelsoni* was associated included: creosotebush (*Larrea tridentata*), guayacan (*Guaiacum angustifolium*), catclaw and white-thorned acacia (*Acacia* sp.), mesquite (*Prosopis glandulosa*), prickly pear (*Opuntia* sp.), yucca (*Yucca* sp.), lechuguilla (*Agave lechuguilla*), ocotillo (*Fouquieria splendens*), mariola (*Parthenium incanum*), sotol (*Dasylyrion* sp.), sacahuiste (*Nolina texana*), leatherstem (*Jatropha dioica*), agarito (*Berberis trifoliata*), candelilla (*Euphorbia antisiphilitica*), juniper (*Juniperus* sp.), and oak (*Quercus* sp.), with sparse ground cover of scattered clumps of short- and mid-grasses. Some localities along arroyos included riparian vegetation, such as cottonwood (*Populus fremontii*), willow (*Salix* sp.), false willow (*Baccharis* sp.), desertwillow (*Chilopsis linearis*), and scattered patches of grasses. At these study sites, common substrata included sandy gravel, rock rubble, and boulders. In the Big Bend region of Texas, Schmidly (1977) described the typical habitats of *C. nelsoni* as those with shallow soils containing rocks and boulders on uplands and slopes vegetated by grasses, lechuguilla, prickly pear, and sotol. In Chihuahua and Coahuila, Mexico, *C. nelsoni* occurred typically on rocky, open slopes (Anderson 1972; Baker, 1956). During our study, other rodents noted to occur with *C. nelsoni*

included: the silky pocket mouse (*P. flavus*), rock pocket mouse (*C. intermedius*), Chihuahua Desert pocket mouse (*C. eremicus*), Merriam's kangaroo rat (*D. merriami*), fulvous harvest mouse (*R. fulvescens*), cactus mouse (*P. eremicus*), white-footed mouse (*P. leucopus*), and southern plains woodrat (*Neotoma micropus*). Sympatry between *C. nelsoni* and *C. intermedius* was found at four localities. *Chaetodipus nelsoni* and *C. eremicus* were obtained together at two places. The three species (*C. intermedius*, *C. nelsoni*, *C. eremicus*) were found together at one locality (Fig. 7).

Specimens examined, total 73. Presidio County: Big Bend Ranch State Park, UTM coordinates 13 573986E 3270053N, 2; 13 575323E 3292088N, 3; 13 576206E 3268568N, 1; 13 576947E 3295987N, 1; 13 576985E 3295102N, 3; 13 577120E 3295040N, 3; 13 577526E 3287386N, 1; 13 577690E 3290260N, 2; 13 579410E 3289121N, 2; 13 579859E 3292474N, 2; 13 583846E 3290112N, 1; 13 584021E 3269813N, 2; 13 584964E 3273523N, 1; 13 586886E 3265832N, 1; 13 586978E 3262992N, 4; 13 587302E 3262817N, 1; 13 589669E 3262276N, 3; 13 590643E 3262195N, 2; 13 592496E 3244969N, 6; 13 592858E 3262597N, 3; 13 596255E 3262051N, 1; 13 599751E 3261864N, 1; 13 600518E 3256679N, 4; 13 601273E 3260059N, 2; 13 607355E 3255359N, 1; 13 608747E 3264582N, 1; 13 609405E 3261495N, 1; 13 609611E 3260698N, 1; 13 614094E 3266037N, 1; 13 615504E 3263238N, 2; 13 615747E 3255837N, 4; 13 616984E 3256548N, 2; 13 617505E 3256674N, 2; 13 619125E 3258986N, 2. Brewster County: Big Bend Ranch State Park, UTM coordinates 13 617281E 3261484N, 1; 13 620694E 3240946N, 3.

Chaetodipus eremicus (Mearns, 1898).—*Chaetodipus eremicus* occurs throughout the Big Bend region of Texas (Davis and Schmidly, 1994; Lee et al., 1996; Schmidly, 1977). This species ranges in about the northern half of Chihuahua, Mexico (Anderson, 1972), and throughout Coahuila, Mexico (Baker, 1956). The Chihuahuan Desert pocket mouse was found at 34 localities on the study area (Fig. 6). Vegetation at most of these collecting sites included: creosotebush (*Larrea tridentata*), guayacan (*Guaiacum angustifolium*), catclaw and white-thorned acacia (*Acacia* sp.), mesquite (*Prosopis glandulosa*),

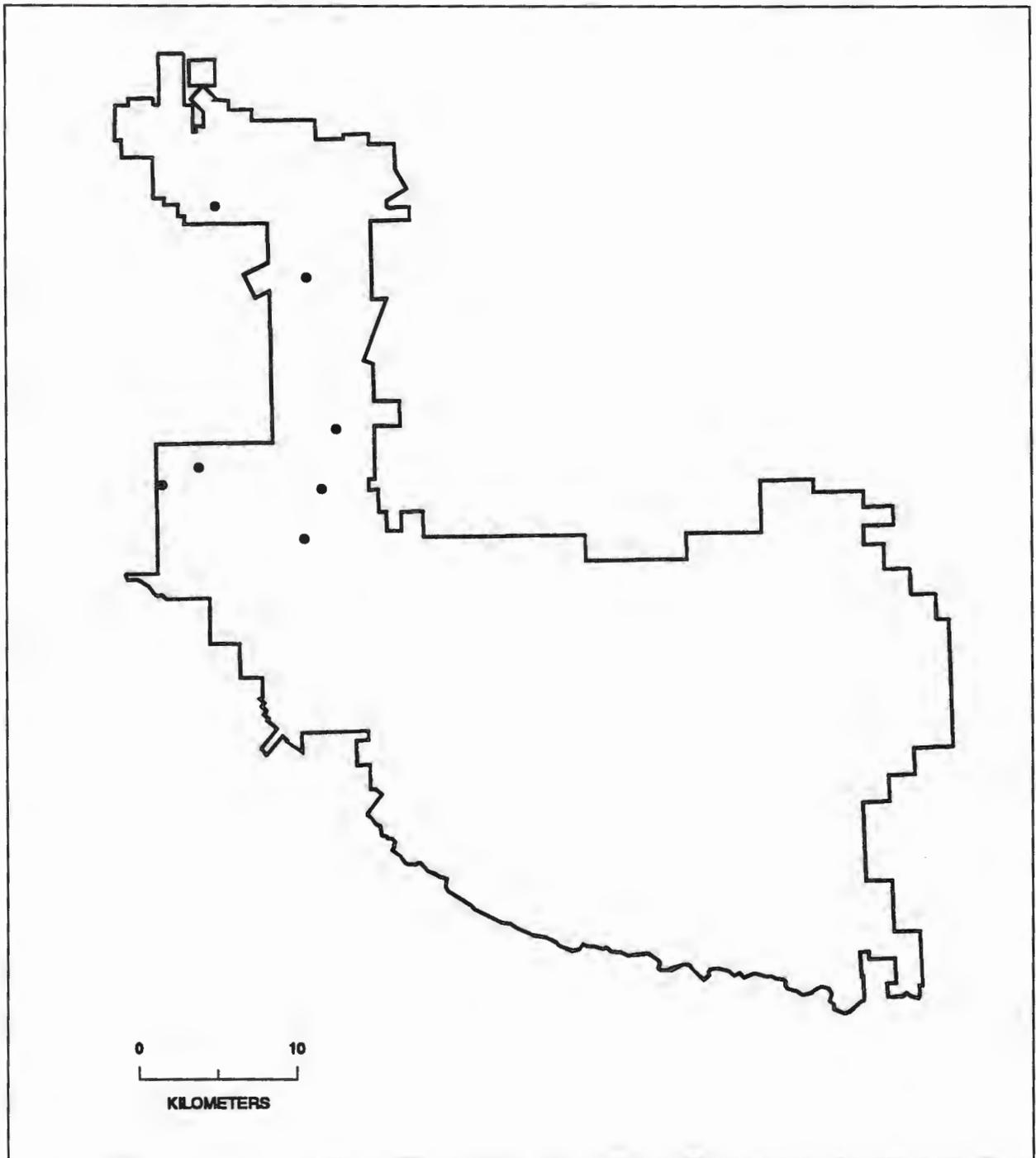


Figure 4.—Locations where *Chaetodipus intermedius* was captured at Big Bend Ranch State Park from January 1994 through August 1995.

prickly pear (*Opuntia* sp.), tasajillo (*Opuntia leptocaulis*), yucca (*Yucca* sp.), lechuguilla (*Agave lechuguilla*), ocotillo (*Fouquieria splendens*), mariola (*Parthenium incanum*), crucifixion thorn (*Holacantha stewartii*), and nightshade (*Solanum triquetrum*), along with scattered clumps of short- and mid-grasses. Some localities were adjacent to riparian areas where the mosaic of vegetation also included: cottonwood (*Populus fremontii*), willow (*Salix* sp.), false willow (*Baccharis* sp.), desertwillow (*Chilopsis linearis*), lotebush (*Ziziphus obtusifolia*), leatherstem (*Jatropha dioica*), apacheplume (*Fallugia paradoxa*), and some salt cedar (*Tamarix* sp.), as well as scattered patches of relatively dense grasses. Although rocks and pebbles were present in some areas, substrata at most of the localities consisted of rather loose sands and gravels, with some more packed soils containing sand and clay loams. According to Schmidly (1977), *C. eremicus* seemingly occurred mostly on sandy, rock-free, alluvial soils with desert scrub vegetation, especially adjacent to arroyos and bottoms of streams in the Big Bend area of Texas. In Chihuahua, Mexico, this species was most likely to be found on sandy soils near mesquite (Anderson, 1972). In Coahuila, Mexico, Baker (1956) found Chihuahuan Desert pocket mice frequently on deep, sandy soils of lowlands with desert scrub vegetation. In our investigation, other rodents associated with *C. eremicus* included: the spotted ground squirrel (*Spermophilus spilosoma*), Botta's pocket gopher (*Thomomys bottae*), silky pocket mouse (*P. flavus*), hispid pocket mouse (*C. hispidus*), rock pocket mouse (*C. intermedius*), Nelson's pocket mouse (*C. nelsoni*), Merriam's kangaroo rat (*D. merriami*), fulvous harvest mouse (*R. fulvescens*), western harvest mouse (*R. megalotis*), cactus mouse (*P. eremicus*), white-footed mouse (*P. leucopus*), deer mouse (*P. maniculatus*), white-ankled mouse (*P. pectoralis*), and southern plains woodrat (*N. micropus*). *Chaetodipus eremicus* occurred in sympatry with *C. hispidus* at one locality. The Chihuahuan Desert pocket mouse was found with *C. intermedius* at two places; *C. eremicus* and Nelson's pocket mouse were obtained together at two localities. Three species of pocket mice (*C. intermedius*, *C. nelsoni*, *C. eremicus*) were found to occur in sympatry at one study site (Fig. 7).

Specimens examined, total 82. Presidio County: Big Bend Ranch State Park, UTM coordi-

nates 13 573986E 3270053N, 2; 13 576206E 3268568N, 1; 13 576311E 3271128N, 1; 13 576390E 3296223N, 2; 13 576646E 3296118N, 1; 13 576699E 3296276N, 2; 13 576721E 3296287N, 4; 13 576757E 3296109N, 4; 13 576808E 3295784N, 1; 13 576836E 3296251N, 8; 13 576842E 3296279N, 2; 13 576846E 3296245N, 1; 13 576931E 3296613N, 2; 13 576970E 3296222N, 2; 13 577321E 3287548N, 1; 13 577472E 3287353N, 1; 13 579684E 3269447N, 14; 13 580342E 3288931N, 1; 13 581230E 3264998N, 4; 13 581659E 3279903N, 1; 13 585434E 3286791N, 1; 13 587184E 3262927N, 1; 13 589348E 3246503N, 9; 13 591851E 3245491N, 3; 13 592496E 3244969N, 1; 13 599495E 3261227N, 1; 13 601273E 3260059N, 2; 13 604886E 3240689N, 1; 13 606085E 3259112N, 1; 13 606207E 3256765N, 1; 13 608309E 3239482N, 3; 13 609770E 3253645N, 1. Brewster County: Big Bend Ranch State Park, UTM coordinates 13 617281E 3261484N, 1; 13 620927E 3238664N, 1.

Of the *Chaetodipus* studied on Big Bend Ranch State Park, *C. eremicus* (82 specimens, 34 localities) and *C. nelsoni* (73 specimens, 36 localities) were the most common and widely distributed species encountered (Figs. 5-6). Some comments about the relative abundance of these two species in the Big Bend region were presented by Manning et al. (1996) and Yancey (1997). Compared to the aforementioned species, *C. intermedius* was relatively uncommon on the study area (13 specimens, 7 localities). However, the rock pocket mouse was distributed more extensively in the area (Fig. 4) than thought previously (Schmidly, 1977; Wilkins and Schmidly, 1979; Yancey, 1997). *Chaetodipus hispidus* (3 specimens) was found only at one place during the study (Fig. 3).

Interesting sympatric relationships among the three small species of *Chaetodipus* (*C. intermedius*, *C. nelsoni*, *C. eremicus*) in the Big Bend region of Texas were discussed by Wilkins and Schmidly (1979), but the degree of sympatry observed amongst species of *Chaetodipus* during this study (Fig. 7) has not been reported previously. During this study, sympatry was documented for *C. hispidus* and *C. eremicus* (1 locality), *C. intermedius* and *C. nelsoni* (4 localities), *C. intermedius* and *C. eremicus* (2 localities), and *C. eremicus* and *C. nelsoni* (5 localities). Three species (*C. intermedius*, *C. nelsoni*, *C. eremicus*) were found

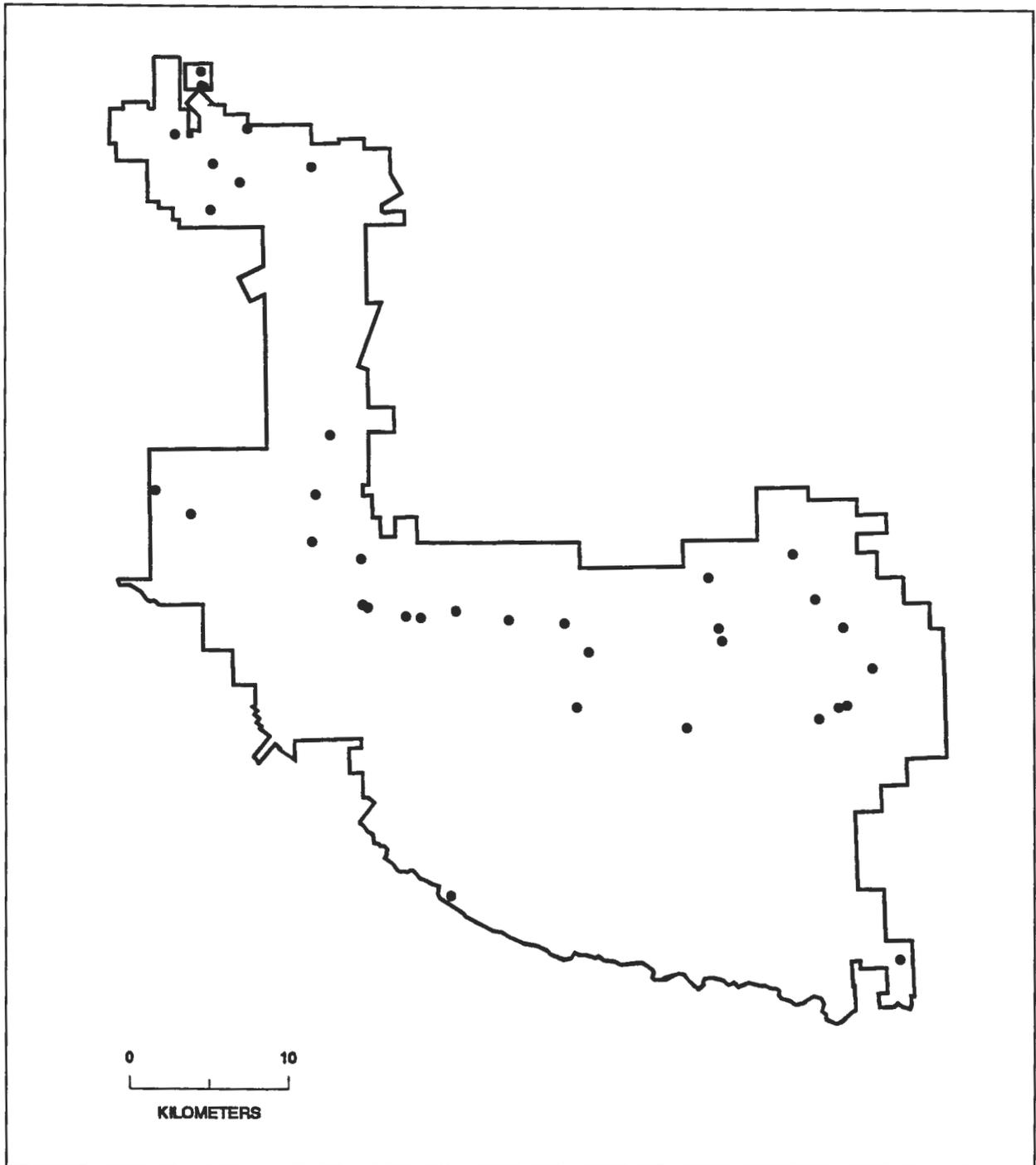


Figure 5.—Locations where *Chaetodipus nelsoni* was captured at Big Bend Ranch State Park from January 1994 through August 1995.

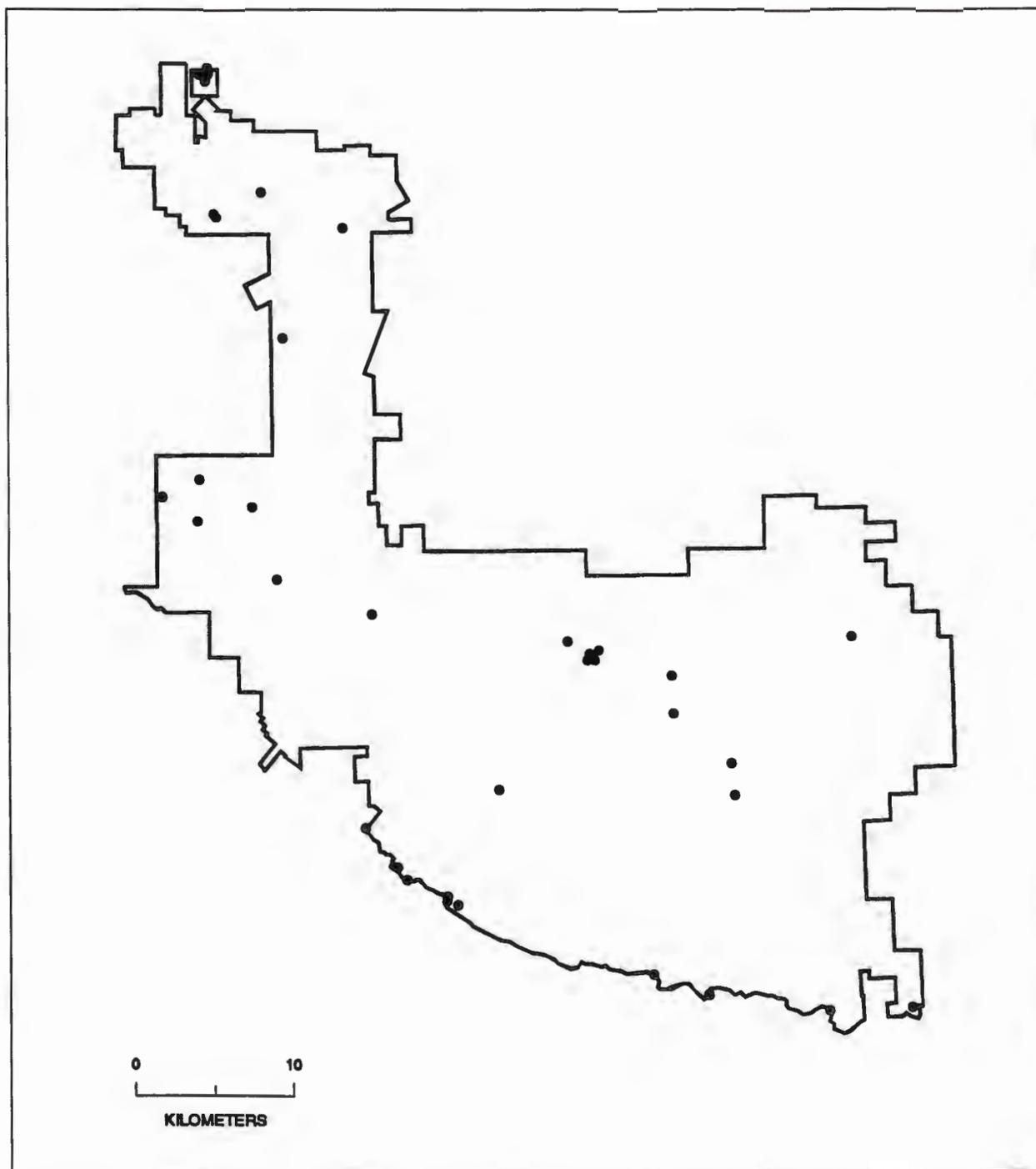


Figure 6.—Locations where *Chaetodipus eremicus* was captured at Big Bend Ranch State Park from January 1994 through August 1995.

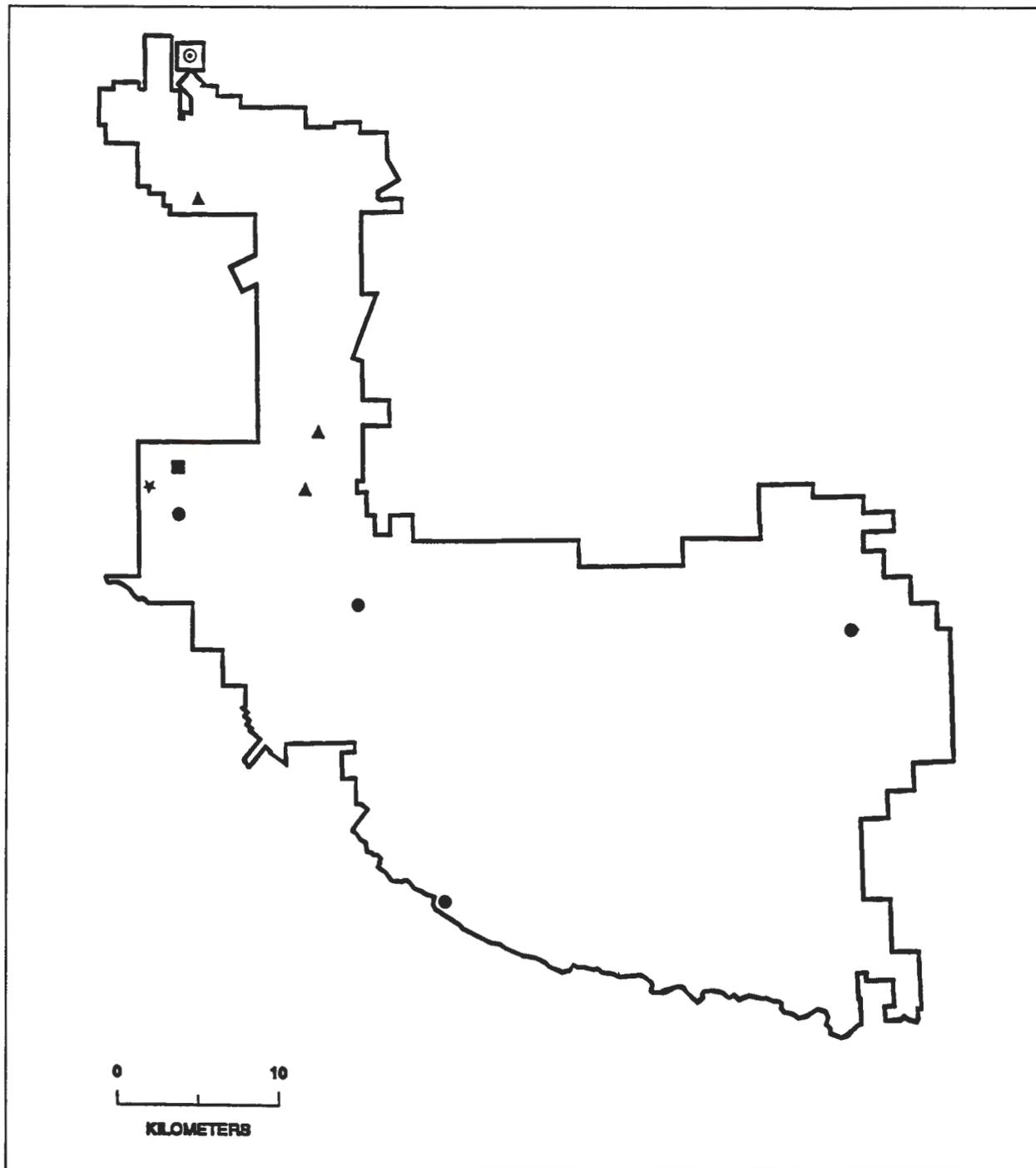


Figure 7.—Map depicting locations where sympatry was noted amongst the four species of *Chaetodipus* that occur at Big Bend Ranch State Park. An open circle with a dot in the center (⊙) represents sympatry between *C. hispidus* and *C. eremicus*, a closed triangle (▲) represents sympatry between *C. intermedius* and *C. nelsoni*, a closed square (■) represents sympatry between *C. intermedius* and *C. eremicus*, a closed circle (●) represents sympatry between *C. eremicus* and *C. nelsoni*, and a closed star (★) represents a location where *C. intermedius*, *C. nelsoni*, and *C. eremicus* were all found in sympatry.

in sympatry at one locality (Fig. 7). However, these three species were allopatric in distribution throughout much of their geographic ranges on the study area (Figs. 4-6).

Vegetation obviously is an important component of the habitats of the species of *Chaetodipus* in the Big Bend region of Texas (Schmidly, 1977), as well as in adjacent areas of northern Mexico (Anderson, 1972; Baker, 1956). However, on the Big Bend Ranch State Park, distribution of these pocket mice is

correlated more closely with substrata than with vegetation. Perhaps this is due, in part, to the complex, mosaic pattern of distribution of vegetation on the area.

The presence of four species of *Chaetodipus* on the Big Bend Ranch State Park, sympatric and allopatric relationships of the species, and the complex mosaic of habitats provide unique opportunities for detailed studies of the relationships between these species, as well as ecologic interactions with other species of mammals that occur in the area.

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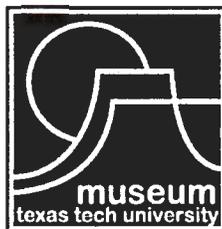
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It was through the efforts of Horn Professor J Knox Jones, as director of Academic Publications, that Texas Tech University initiated several publications series including the Occasional Papers of the Museum. This and future editions in the series are a memorial to his dedication to excellence in academic publications. Professor Jones enjoyed editing scientific publications and served the scientific community as an editor for the Journal of Mammalogy, Evolution, The Texas Journal of Science, Occasional Papers of the Museum, and Special Publications of the Museum. It is with special fondness that we remember Dr. J Knox Jones.

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