



MOJAVE NETWORK

Inventory Summary Report

INVENTORY OF MAMMALS AT MOJAVE NETWORK PARKS

INTRODUCTION AND OBJECTIVES

In 2002 and 2003, an inventory of the mammal species of Mojave Network (MOJN) parks Death Valley National Park (DEVA), Joshua Tree National Park (JOTR), Lake Mead National Recreation Area (LAME), Manzanar National Historic Site (MANZ), and Mojave National Preserve (MOJA) was done by the USGS Southwest Biological Science Center. The size, complexity and diversity of landscapes of the parks posed significant challenges and it was not considered feasible to attempt park-wide inventories. Instead, park managers expressed the need for targeted inventories of specific locations or habitat types that were previously unexplored or relatively poorly-known. The overall goal was to determine the mammal species composition of each park to at least a 90% level of completeness. Other goals were to provide distribution and relative abundance data for mammal species, museum voucher specimens, and recommendations for long-term monitoring of mammals. Also, where possible, inventories were designed to provide as much information as possible on the distribution and abundance of species of special concern, including rare and non-native species.

METHODS

Museum search – Records from regional museums were reviewed for mammal specimens collected in or near MOJN parks. Data was obtained from all counties in California, Arizona, and Nevada where MOJN parks are located.

Field sampling – Field sampling focused on small mammals, primarily rodents, but included medium-sized mammals, and bats at JOTR and MOJA. Field sampling was done mostly within the priority study areas defined by each park unit. Within these areas, sites were selected based on the particular species or species groups that were being targeted for that area.

Trapping – H.B. Sherman Co. live traps were used in small grids or transects to sample nocturnal small mammals. They were supplemented in a few areas with pitfall traps. Sherman traps are effective for most rodent species, while pitfall traps are useful for shrews. Sherman or wire-type box traps were used for diurnal mammals and were set in short transects or small groups in the particular habitat of interest. Species, weight and size measurements, age, and reproductive status of trapped animals were recorded. Photos of rare or unusual species were taken.



Spiny Pocket Mouse, Joshua Tree National Park - photo courtesy Charles Drost

Visual surveys – For diurnal species, visual surveys and counts were conducted by walking through habitats in the morning and afternoon, for defined periods of time. For all animals seen, notes on species, location, time, general habitat type, and specific microhabitat, as appropriate, were recorded. Field staff noted diurnal mammals seen incidentally during the course of other fieldwork and similar data were recorded.

Automatic cameras – Two automatic camera systems were used along game trails or other areas with high animal traffic to capture medium-sized nocturnal mammals. The “Trailmaster” system used an infrared transmitter and receiver and a modified film camera, and the “Reconyx” system used a passive infrared motion detector and a digital camera.

Sign – Supplemental information on occurrence, distribution, and habitat use of small and medium-sized mammals was collected by recording information from tracks, scat, dens, burrows, and diggings. When identifiable sign was found, field staff recorded species, location, habitat, and nature and condition of sign. Where particularly interesting or pertinent sign was found, it was collected or photographed.

Owl pellets – In some areas, owl pellets were collected and dissected to recover bones of small mammals. Skulls found in good condition were retained as vouchers.

Bat surveys – Ultrasonic surveys of bats' echolocation calls were done using the Anabat II bat detector, a countdown type recorder designed specifically for identifying microchiropteran bats by the pulse rate and time pattern of their calls. Most Anabat surveys were done in conjunction with mist net surveys. Mist net surveys were conducted near open surface water, at areas near mine openings or other potential roost sites, or areas where canyon walls or lanes in vegetation tended to funnel the flight of bats. Captured bats were identified and sexed. Basic measurements were recorded, including forearm, foot, tail, and ear length. Photographs of all species captured, showing diagnostic identifying characters, were taken whenever possible. Some captured individuals were released in front of the Anabat to verify vocalizations. Bats were released promptly after processing.

Voucher specimens – A small number of representative specimens were collected. Photographs were used in lieu of museum study skins as vouchers for species occurrence. Most voucher specimens collected were incidental trap mortalities, or specimens that were found dead.

RESULTS AND DISCUSSION

Fieldwork recorded a total of 50 mammal species over all five park units. Individual park species counts and inventory completeness results are: DEVA - 16 species, 86% completeness; JOTR – 25 species, 89% completeness; LAME – 21 species, 84% completeness; MANZ – 19 species, 52% completeness; MOJA – 17 species, 89% completeness

Of these totals, 23 occurrences are new at individual park units, with most of these being at Manzanar. Noteworthy additions include western mastiff bat at JOTR, house mouse at a number of wildland sites at LAME, and San Diego pocket mouse at MOJA. There are also species that have been lost from the Mojave Network parks.

The low percentage for MANZ is due in large part to the lack of previous work there; no museum specimens and no literature references providing specific data on mammal species occurrence were found. The mammal inventory completeness for MANZ also suffered from failure to collect any useful information on bats. No bats were captured in the mist nets and an equipment failure prevented collecting data with Anabat.

At DEVA, four species of *Peromyscus* dominated the captures, along with the desert pocket mouse and desert woodrat. At JOTR, the Merriam's kangaroo rat was abundant across all areas trapped. Large numbers of little pocket mice were also trapped, and pallid bat was the most numerous bat recorded. At LAME, cactus mice far outnumbered all other species; canyon mice, Merriam's kangaroo rat, and desert woodrat were captured in moderate numbers. At MANZ, deer mice dominated the trap captures, followed by Merriam's kangaroo rats and brush mice. At MOJA, the desert woodrat was surprisingly numerous, and was the most frequent capture. Large numbers of cactus mice, brush mice, and canyon mice were also caught. Six species of bats were caught at JOTR, with pallid bats by far the most numerous. Big brown bat and western pipistrelle were a distant second in numbers. A total of seven species were netted at MOJA, with pipistrelles and California myotis most numerous.

The extended drought during the 2002 survey season was having serious impacts on trapping and sampling efforts were scaled back to save field time and funding for better conditions. Small mammal live trapping with targeted efforts for particular species of interest were completed in 2003 and 2004 and the higher rainfall in those years showed an evident boost in small mammal numbers. Evident effects of the rain were also seen in small mammal recruitment; this was the first year in which significant numbers of young individuals were seen.

The variety and numbers of small mammals that we trapped is more a reflection of the specific priority study areas and habitats that we surveyed, rather than an overall indication of diversity and abundance over the entire area of any of the MOJN parks. Notable in this respect are the high numbers of white-footed mice at some of the parks. Numbers of these species were quite high in areas where we focused sampling around springs. Numbers of the heteromyid rodents (pocket mice, kangaroo rats) were comparatively low in these dense habitats, compared to surrounding arid shrublands. For example, at DEVA where much of the sampling was done at springs, the three most numerous captures were canyon mouse, deer mouse, and cactus mouse. In contrast, at JOTR where most sampling was done in various desert scrub habitats, heteromyids dominated, led by Merriam's kangaroo rat and little pocket mouse.

Noteworthy species at the other park units include spiny pocket mouse at LAME, at or near the northern extent of the range for this species, and the Arizona woodrat. The latter is a new species for LAME, by virtue of the taxonomic separation of this form from the desert woodrat. House mice were also found in wildland habitats at LAME, at Blue Point and Rogers Spring. Previously, this introduced species was thought to be restricted to areas around human habitations.

At MANZ, the California vole is an important species. The subspecies in this area, the Owens Valley vole, is a California Special Concern species. At MOJA, the spiny pocket mouse, caught in the Piute Springs area near the eastern edge of the Preserve, is at or near the northern edge of its range.

Although field sampling for this project was not designed to assess other aspects of small mammal ecology, such as population size and habitat associations, the data do add to overall knowledge of distribution of the different species. The data also provide general indications of relative distribution and abundance for areas of the park units which had previously been sampled little or not at all. These areas include the Last Chance Range and Darwin Plateau/Argus Range at DEVA, the Eagle and Coxcomb Mountains, and the Long Canyon/Quail Springs/Smith Water Canyon area at JOTR, the Newberry Mountains, Black Mountains, and Shivwits Plateau area at LAME, and the Piute Range, Providence Mountains, and Clark Mountains at MOJA.

Museum records – Eleven museums held pertinent specimens for one or more of the MOJN parks. Over 7,200 specimen records were reviewed from the counties in and around the parks and 996 of these records were verified to be from within the current boundaries of one of the parks. There were 674 records representing 46 species from DEVA, 167 records of 23 species from JOTR, 82 records of 8 species from MOJA, and 73 records of 24 species from LAME. No museum specimen records were found for MANZ.

RECOMMENDATIONS AND FUTURE WORK

Inventories of large areas are rarely fully complete, particularly considering the difficulty of detecting rare, cryptic, or marginally-occurring species, coupled with changes in occurrence and numbers of some species. However, the combination of careful review of museum and literature information, together with extensive, targeted field sampling over multiple years covering a range of environmental conditions, provides a sound inventory baseline that should satisfy most requirements of natural resource managers at the Mojave Network parks.

From a management standpoint, most of the species included in this inventory's species list as "Probable" or "Unconfirmed" for the parks are common, widely distributed species that are simply near the edge of their geographical or ecological habitat range and are not likely to be high priorities

for management. However, there are some unconfirmed species whose documented presence in an area would be of great interest, and these species may merit further targeted survey work.

Observations by park staff, researchers, and visitors to these areas will be useful in adding to the mammal lists. It is likely, too, that in-house materials at the park areas, such as unpublished reports and perhaps even well-documented observation cards may hold additional information. This is particularly true of the species that are at least partly diurnal, such as long-tailed weasel at JOTR and ground squirrels and chipmunks at several of the areas.

Shrews are the most problematic group among the nocturnal small mammals. They are sparsely distributed, may be rather specific in their habitat requirements, and are generally difficult to sample for. Field sampling for this project added little knowledge of the presence or absence of shrew species. Additional surveys targeted for shrew species are likely to yield much better understanding – both in terms of presence or absence of species and of habitat occurrence.

There is also a comparatively limited base of knowledge for bats. In particular, less is known of habitat affinities and the overall distribution of bat species in this area, to guide targeted survey efforts. Additional work on bats should focus on broader general surveys to help overcome this limitation, as well as targeted surveys at specific sites of interest. Remotely recording ultrasonic bat detectors should also be used. These systems can be set out at various sites, left to record for one or more evenings, then retrieved and downloaded.

Fieldwork for this study included some diurnal surveys in various areas for species such as ground squirrels and chipmunks. For DEVA, in particular, further surveys for this group may be of substantial interest for potential further additions to the Park species list, because of the occurrence of rare, limited-distribution species in the Park, and because some of these species are represented by isolated populations at the edge of their range. Such marginal species are most susceptible to long-term changes in their habitat, and repeated surveys could provide valuable data for evaluation of long-term trends.

Other marginal or isolated populations within the MOJN parks may also merit further study and monitoring. A disjunct population of the chisel-toothed kangaroo rat in JOTR, previously found in the Stubbe Spring area, could not be located and appears to have been extirpated. Isolated and edge-of-range species like this kangaroo rat population may be expected to be the first populations to disappear with regional changes in climate and habitat.

Project Synopsis

Partner: USGS Southwest Biological Science Center
Principal Investigator: Charles Drost
Documented: 50 Mammal Species at 5 parks
Project Duration: 2002-2007
Cost: \$180,514

SPECIES OF CONCERN

Bat species are of special interest at these parks. Particular species include the Townsend's big-eared bat which is a widely-distributed species found at most or all of the parks and the California leaf-nosed bat and the spotted bat which are rare or marginal species documented at only one or two areas. Other mammal species that may be of particular management interest for individual parks include:

DEVA: the Mojave ground squirrel, a restricted, special concern species whose range edges into the southwestern portion of the Park; and the pale kangaroo mouse, a restricted-range species that may occur marginally in the northernmost part of the Park.

JOTR: the chisel-toothed kangaroo rat.

LAME: the spiny pocket mouse, which reaches the northern edge of its range in the southern part of Lake Mead, in the Newberry Mountains area; and the house mouse, an introduced species which has recently been confirmed around some of the springs in the northern part of Lake Mead.

MANZ: the Owens Valley subspecies of the California vole, a California "Special Concern Species."

MOJA: the spiny pocket mouse, which reaches the northern extent of its range in the eastern part of the Preserve.