

NATIONAL PARK SERVICE

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BIG BEND NATIONAL PARK,
TEXAS

STATUS REPORT:

LEPTONYCTERIS NIVALIS (SAUSSURE)

Mexican long-nosed bat

Prepared for:

Office of Endangered Species
U.S. Fish and Wildlife Service
P.O. Box 1306
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Science and Resources Management
Big Bend National Park, Texas

TABLE OF CONTENTS

Introductory page	1
I. Species Information	
Classification and Nomenclature	2
Present Legal Status	4
Description	4
Significance of Taxon	6
Current Research	6
Geographic Distribution	8
Habitat Description	9
Population Biology	13
Land Ownership and Management Responsibilities	22
Management Practices	23
Evidence of Threats to Survival	23
II. Assessment and Recommendations	
General Assessment	25
Federal Status Recommendation	25
Recommended Critical Habitat	25
Conservation/Recovery Recommendations	25
III. Information Sources	
Acknowledgments	27
Literature Cited	29
Lists of Contacts	33

STATUS REPORT

Taxon Name: Leptonycteris nivalis (Saussure)

Common Name: Mexican long-nosed bat

Family: Phyllostomidae

Distribution: United States; .
Texas
Mexico:
Coahuila
Distrito Federal
Guerrero
Hidalgo
Jalisco
Mexico
Michoacan
Morelos
Nayarit
Nuevo Leon
Oaxaca
San Luis Potosi
Sinaloa
Tamaulipas
Veracruz
Zacatecas

Current Federal Status: None

Recommended Federal Status: Threatened

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I. SPECIES INFORMATION

Classification and Nomenclature

- A. Scientific Name: Leptonycteris nivalis (Saussure)
- B. Original Publication: Saussure, M. H. de. 1860.
Mammiferes du Mexique. Revue et
Magasin de Zoologie. Ser. 2,
12:479-494.
- C. Type Specimen: From near snow line on Mt. Orizaba
De Saussure's specimens were
housed in the Comparative Anatomy
Laboratory of the Museum National
d'Histoire Naturelle in Paris,
where they were dissected by
Saussure. Duplicates were
exchanged with other museums, but
no remaining syntypes are known
(Carter and Dolan, 1978).
- D. Synonyms: M. (= Ischnoglossa) nivalis
Saussure
- E. Common Name: Mexican Long-nosed bat
- F. Family: Phyllostomidae
- G. Subfamily: Glossophaginae
- H. Taxon History: The first specimen was taken by
Saussure from the edge of a pine forest near the snow line
on Mt. Orizaba in the state of Veracruz, Mexico (Saussure,

1860). Two specimens in the British Museum (Natural History), one each from Duenas and Ciudad Vieja, Guatemala, represent the southernmost records of this species (Dobson, 1878). These specimens were collected by Salvin prior to 1878, and L. nivalis has not been reported south of Oaxaca, Mexico since. Lydekker (1891) provided the name Leptonycteris because Ischnoglossa was preoccupied by Ischnoglossa Kraatz, a beetle. Throughout this century, Leptonycteris nivalis has remained taxonomically stable, but until Hoffmeister (1957) described L. n. sanborni, many specimens of that taxon were allocated to L. nivalis. Dwight Davis collected specimens from Emory Cave in Texas in 1937, providing the first U.S. records of this species (Sanborn, 1941).

I. Current Alternative Taxonomic Treatment: Although the validity of the taxon we now know as L. nivalis has never been questioned, there has been a good deal of confusion over the relationships between this species and the closely related L. sanborni. Recent workers have agreed that two species exist, and the primary confusion has been over the correct name for L. sanborni. However, during the course of this investigation, I examined two specimens in the Museum of Southwestern Biology at the University of New Mexico, collected in 1963 and 1967 in Guadalupe Canyon, Hidalgo Co., New Mexico. This is surprising because it is the only record for this species outside of the state of Texas, and the only instance of sympatry

between the two species in the northern part of their range. They do overlap extensively in the southern, or winter range. This means either that the species enjoys a much wider summer range than previously thought, or perhaps the two forms are not specifically distinct. A complete taxonomic revision would be worthwhile to solve this problem.

Present Legal Status

- | | |
|-------------------|------|
| A. International: | None |
| B. National: | |
| United States | None |
| Mexico | None |
| C. States: | |
| Texas | None |
| Mexico | None |

Description

- A. External Characters: These bats are striking compared to other U.S. species, in that they have an elongated muzzle with a small nose leaf on the tip. Choeronycteris mexicana is similar in appearance, but has a broader interfemoral membrane, with a distinct tail. The length of the head and body is 70 to 95 mm, the tail is minute and appears to be lacking but actually consists of three vertebrae, and the length of the forearm is 46 to 59 mm. The weight is usually 18 to 30 grams. These bats are usually yellowish brown or pale grey above and cinnamon

brown below (Nowak and Paradiso, 1983). The single most useful external character for separating this species from L. sanborni is the longer, finer hair extending above and beyond the tail membrane in L. nivalis.

B. Internal Characters: The genus Leptonycteris is characterized by dental features. The third molar is lacking and lower incisors are present. Only one other genus of bats, Lichonycteris, lacks a third molar, and that genus also lacks lower incisors. The cheek teeth are elongate and slender. The long tongue (up to 76 mm extended) is covered by tiny papillae. The three phalanges of the third finger are normally longer than the third metacarpal. The forearm averages longer (58.5) than that of L. sanborni, as does the skull (greatest length averages more than 27 mm). The presphenoid ridge is much shorter in nivalis and the basisphenoidal pits deeper and more pronounced (Watkins et al., 1972). Phillips et al. (1969) and Jones and Genoways (1970) reported the presence in nivalis of pitting of the hard palate adjacent to the upper premolars and molars, and occasionally loss of teeth, caused by a macronyssid mite that evidently does not parasitize sanborni (Radovsky et al. 1971).

C. Local Field Characters: The long muzzle and nose leaf immediately eliminate all species other than Choeronycteris mexicana. From that species, L. nivalis is distinguishable in the hand by a somewhat less elongated muzzle and the apparent lack of a tail. The two species

of Leptonycteris can most easily be distinguished by the fine hair extending beyond the interfemoral membrane in L. nivalis. Otherwise, the two species are extremely similar, and occasional specimens are most difficult to identify.

Significance of Taxon

A. Natural: Leptonycteris nivalis used to be locally common and was an important component of high desert ecosystems throughout the Mexican Plateau. Although it barely penetrates into the U.S. in western Texas (and perhaps southern New Mexico), it may be critically important as a pollinator for various species of the plant genus Agave. Colonies of up to 10,000 animals have been reported in the past, suggesting a major role in cave ecosystems where bat guano frequently provides the basis for a complex web of micro- and macro-organisms.

B. Human: The tequilla industry in Mexico is completely dependent on Agave plants. Small scale components of the industry rely on natural populations of Agave, which in turn are dependent upon L. nivalis for pollination. No economic detriments to humans in Mexico are known. No economic benefits or detriments to humans in the United States are known.

Current Research

The objectives of the current study were to locate and census Leptonycteris nivalis in selected areas throughout their range and to evaluate

threats to the species. The goal of the study was to determine the current status of the species.

The initial step was to contact the curators of the forty largest mammal collections in North America and to assemble a list of known specimens and localities. From this list, a three year plan was established to survey for this species and the closely related Leptonycteris sanborni.

Dirk V. Lanning and I, with help from Mexican colleagues Rodrigo Medellin and Hector Arita, surveyed localities in Texas, Nuevo Leon, Tamaulipas, Coahuila, and San Luis Potosi, from July 6 to August 4, 1983. We visited all known roosts, and most sites where L. nivalis had been mist-netted in the Sierra Madre Oriental and surrounding areas. Results of this effort are summarized in Wilson et al (1985).

Dirk Lanning and I, again with help from Medellin and Arita, as well as Alvaro Miranda, surveyed localities in the Distrito Federal, Mexico, Guerrero, Jalisco, Michoacan, Morelos, Sinaloa, Nayarit, and Sonora from May 10 to June 15, 1984. We completed our survey of known roosts of L. nivalis, and began a similar survey of L. sanborni roosts. In addition, we mist-netted almost every night.

Eugene H. Studier and I surveyed all known U.S. localities of L. sanborni, paying particular attention to the possibility of locating occasional individuals of L. nivalis in these areas. None were located.

We traveled throughout Mexico in a field vehicle that allowed us access to almost all known localities of the

species. We allowed our Mexican colleagues to work extensively with local inhabitants to locate little-known caves in remote areas. Once in a cave, we established the presence of L. nivalis by the characteristic yellow stains left by the droppings, and tried to count every individual in the roost.

Each night, we set up 4-10 mist nets over likely water holes, either at known localities of occurrence, or near known roosts. All animals taken in the nets were identified to species before releasing them.

During the course of the project, museum specimens were examined at the National Museum of Natural History, The University of New Mexico, The University of Arizona, and The Universidad Nacional Autonoma de Mexico.

Geographic Distribution

A. Geographic Range: Leptoncyteris nivalis is known to occur from Pinto Canyon in the Chinati Mountains, Presidio County, Texas southwards to Ciudad Vieja, Guatemala (Hall, 1981). It may also occur in New Mexico, based on two specimens in the Museum of Southwestern Biology unreported in the literature. Figure 1 shows the range of the species.

B. Precise Occurrence: The solid circles in Figure 1 denote marginal localities where L. nivalis has been collected in the past. Observations made during this survey are summarized in Table 1.

Habitat Description

A. General:

Leptonycteris nivalis inhabits

Upper Sonoran and Transition Life Zones at elevations ranging from 500 m to over 3,000 m. It is probably one of the most arid adapted members of the subfamily glossophaginae (Koopman, 1981). In the northern parts of its range, L. nivalis is found in high desert scrub vegetation dotted with Agaves, mesquite, creosotebush, and a variety of cacti. In the Sierra Madre Oriental, they range upwards through pine-oak woodlands to ponderosa pine forests. Further south, they tend to remain on the Mexican plateau, even in the west where they frequently overlap with L. sanborni.

Vast areas of the northern part of the Mexican Plateau remain in essentially natural vegetation, but in many of the plains areas, these bats may be limited by a lack of suitable cave roosting sites. Human habitations tend to be concentrated in the mid-elevational range along both sides of the Sierra Madre Oriental where climate and soils are more suitable to agriculture.

The climate in the west Texas Mountains that comprise the U.S. habitat of this species is essentially warm and dry with occasional periods of summer rain. Maximum temperatures average around 30 degrees C when the bats are present. Temperatures are more variable in the Sierra Madre Oriental, where elevation plays a large role. In the southern and western parts of the range, climates are

warm and dry with cool night time temperatures year round. This species is known to occur near the snow line on Mt. Orizaba in Veracruz (Saussure, 1860).

- B. **Specific:** At the northern end of its range in Big Bend National Park, Texas, Easterla (1972) found them in five distinct ecological associations, each characterized by dominant species of plants (Wauer, 1971):

Arroyo-mesquite acacia association: 1800-4000 ft; honey mesquite, screwbean mesquite, seep-willow, catclaw acacia, and desert willow. Bats were captured at Rio Grande Village pool.

Lechuguilla-creosotebush-cactus association: 1800-3500 ft; creosote-bush lechuguilla, ocotillo, blind prickly pear, and dog cholla. Bats were captured at Ernst Tinaja Canyon and Los Norias Lake.

Diciduous woodland association: 3700-7800 ft; Grave's oak, Emory oak, evergreen sumac, skunkbush sumac, Texas madrone, bigtooth maple, mountain sage, and scarlet bouvardia. Bats were captured at Pine Canyon Tank.

Pinyon-juniper-oak woodland association: 3700-7800 ft; pinyon pine, drooping juniper, alligator juniper, redberry juniper, gray oak, Grave's oak, Emory oak, evergreen sumac and skunkbush sumac. Bats were captured at Mt. Emory Cave and Basin sewerage lagoon.

Cypress-pine-oak association: 5800-7200 ft; Arizona cypress, Douglas fir, ponderosa pine, pinyon pine, junipers, Texas madrone, birchleaf buckthorn, silktassel,

mountain sage, Grave's oak, Emory oak, bigtooth maple.

Bats were captured at Boot Springs Lake.

On the night of 14 June, 1983, we set six nets around the edges of the water in an earthen tank 5 miles South and 4 miles east of Bella Union, Coahuila. This tank is the type locality for Myotis planiceps, but also had produced L. nivalis in the past. The tank is located in the middle of the Hacienda Los Pinos, and is surrounded by agricultural fields. The Hacienda lies in a broad valley, between rolling foothills on the west side of the Sierra Madre Oriental. The bats are likely drinking at the tank, and foraging on the nearby slopes, which are covered with upper sonoran vegetation including cacti and occasional agaves. We captured 11 bats of 5 species, including five L. nivalis. The L. nivalis were all captured early in the morning, between midnight and 5 am.

We captured a single L. nivalis in the town of San Pedro, San Luis Potosi. Once again, the bat was captured in the early morning hours. Our two nets were set over a relatively small pool near a dam across an arroyo, very near the center of town. San Pedro is essentially a large, crumbling ghost town that enjoyed its boom as a lead mining area during World War II. We explored a huge, rambling, old, abandoned mine with many branches and several levels. Although it contained about 1,000 Plecotus mexicanus, we saw no sign of L. nivalis. The surrounding natural vegetation was scattered hillside scrub forest.

Sites where L. nivalis and L. sanborni can both be taken in mist nets are few and far between. One such was near Los Amoles, San Luis Potosi, where we netted on 28 July, 1983. We set seven nets over a large earthen tank. The tank was too large to net effectively and was surrounded by a large bank on two sides, a grassy area on the third, and a mesquite bosque on the fourth. The natural vegetation in the area was low desert scrub with scattered agave and cacti. We caught a single L. nivalis before midnight, and despite intermittent rain between 2 and 4:30 AM, we took 6 more L. nivalis and 2 L. sanborni in the early morning hours.

The only other area of direct sympatry was at Lago de Tequesquitengo in Morelos. There we netted both species as they emerged from Cueva del Cerro. The ratio was 14 L. sanborni to 2 L. nivalis. The cave is in the middle of a plowed field, but the surrounding area is extremely rocky, rolling hills with sparse vegetation. The only emergent trees were Crescentia alata, Ceiba sp., and a strangler fig (Ficus).

C. Associated Bat Species: The following list contains only those species that were taken with L. nivalis during the course of this survey:

<u>Pteronotus davyi</u>	Davy's Naked-backed Bat
<u>Pteronotus parnellii</u>	Parnell's Mustached Bat
<u>Macrotus waterhousii</u>	Waterhouse's Leaf-nosed Bat
<u>Leptonycteris sanborni</u>	Sanborn's Long-nosed Bat

<u>Choeronycteris mexicana</u>	Mexican Long-tongued Bat
<u>Glossophaga soricina</u>	Pallas' Long-tongued Bat
<u>Anoura geoffroyi</u>	Geoffroy's tailless Bat
<u>Sturnira lilium</u>	Yellow-shouldered Bat
<u>Artibeus lituratus</u>	Big Fruit-eating Bat
<u>Artibeus aztecus</u>	Highland Fruit-eating Bat
<u>Artibeus toltecus</u>	Lowland Fruit-eating Bat
<u>Natalus stramineus</u>	Mexican Funnel-eared Bat
<u>Myotis thysanodes</u>	Fringed Myotis
<u>Myotis velifer</u>	Cave Myotis
<u>Eptesicus fuscus</u>	Big Brown Bat
<u>Myotis yumanensis</u>	Yuma Myotis
<u>Rhogeessa parvula</u>	Little Yellow Bat
<u>Plecotus mexicanus</u>	Mexican Big-eared Bat
<u>Plecotus townsendii</u>	Townsend's Big-eared Bat
<u>Idionycteris phyllotis</u>	Allen's Big-eared Bat
<u>Lasiurus cinereus</u>	Hoary Bat
<u>Desmodus rotundus</u>	Common Vampire Bat
<u>Tadarida brasiliensis</u>	Brazilian Free-tailed Bat

Population Biology

- A. **Demography:** There are no comprehensive studies of the life history of L. nivalis. The only attempts to estimate numbers of individuals more than once have occurred at Emory Peak Cave in the Chisos Mountains of Big Bend National Park. The cave is about a three mile hike up Mt. Emory, and the entrance is difficult to locate, but is basically in a notch in the cliff face opposite an old

burn area on the trail at an elevation of about 7400 ft. The cave is a fault block cave with a small, crumbling entrance and about a 20 ft climb to a large room. The cave is actually quite shallow, and the bats roost in an upper level on a high cieling, making them difficult to observe.

D. D. Davis and K. P. Schmidt first discovered L. nivalis in the United States in this cave in 1937 (Sanborn, 1941; Borell and Bryant, 1942). Collection records indicate that they collected 47 females (25 adults, 13 juveniles, 1 baby, 8 unknown) and 13 males (12 juveniles and 1 unknown). William B. Davis (1960) visited the cave in 1944 and collected additional specimens while observing several dozen. Koch (1948) reported no L. nivalis in 1948, but he may been in the cave at the wrong time of year.

David Easterla made careful estimates of the number of L. nivalis in the cave during the late 1960's and early 1970's (Easterla, 1972, 1973). In July of 1967 he calculated 10,650 bats based on 150 per square foot in a single layer on the cieling. The following year, 1968, he found only half as many at the same time of year--5,000. In August of 1969 the estimate was 3,900. A visit on 20 June 1970/ revealed no bats, and the lack of droppings indicated that they had not been there earlier that year. A follow-up visit on 12 August confirmed their absence from the cave that year. On 15 July 1971, he estimated

8,025, but the lack of droppings suggested that the bats had just arrived.

In 1983, we found approximately 1,000 individuals in Mt. Emory Cave. The bats were quite skitterish and difficult to count, so our estimate could be off by as much as 20%. The walls and floor were covered with the characteristic yellowish, sticky, semi-liquid, sweet-smelling droppings of L. nivalis. The amount of droppings was a good indication that this was indeed a substantial colony. It was the largest colony of L. nivalis we encountered during this study, and we saw only one other cave that had even a suggestion of such heavy accumulation of droppings from this species.

Although Davis and Schmidt collected a newborn in this cave in 1937, Easterla (1973) found no evidence of parturition during his five year study. He suggests that the bats give birth in Mexico before migrating to the cave in late June or early July. Curiously enough, the population at Emory cave consists almost entirely of females and young of the year of both sexes. Easterla (1972) found only 3 adult males in the cave during five summers.

Although early descriptions of localities often prove extremely difficult to use, we managed to locate a number of caves that had harboured significant numbers in the past, judged by the number currently in collections.

Baker (1956) reported 24 specimens from an abandoned mine situated on a mountain slope near Arteaga. We examined a number of likely candidates in the area, but to no avail. A small breakdown cave in the area had only a single L. nivalis in July of 1983. The cave is full of material that has collapsed from the ceiling, so we were unable to catch the animal to examine it carefully. Another single individual was found in a cave near La Reforma, San Luis Potosi. Sites such as these rarely had more than a few spots of the characteristic droppings of L. nivalis. Finding only single individuals of a colonial species is unusual, but not unheard of. Most singletons are males, and they may not always roost with the large colonies of females and young.

In 1938, E. J. Koestner (1941) spent the summer making an ecological study on the 3800 meter Cerro Potosi, located about 65 kilometers west of Linares in the Municipio de Galeana, Nuevo Leon. The study was conducted primarily in the upper regions of the mountain, which is the highest point in the Sierra Madre Oriental. He took more than a hundred specimens of L. nivalis from an abandoned mine near La Joha at an altitude of 11,500 ft. He estimated the population in the mine at 10,000. He never saw the bats in flight at night, and he speculated that the lack of insects at that altitude forced them to forage lower down the mountain, not realizing that they were in fact nectar feeders. We revisited the area in

1983 and located an abandoned mine, but it contained no sign of L. nivalis. It did have a small colony of Myotis thysanodes, but the huge colony of L. nivalis has either disappeared or shifted to an alternate roosting site.

Villa (1967) reported an abandoned mine near Los Ramones, Nuevo Leon that had the ceiling covered with newborn young. With great difficulty, we located what we think is the same mine in 1983, and found only a single individual. Above the tiny village of La Cienega, Nuevo Leon, high in the Sierra Madre Oriental, we scaled a steep talus slope in the Pine-oak woodland to a small cave in the base of a cliff that housed about a dozen L. nivalis in a series of small domes in the twilight zone near the entrance.

At Cueva de los Coyotes near Los Amoles, Nuevo Leon, we found a small colony of 25-50 L. nivalis. The bats were extremely skittish and difficult to census as the cave has many passages and interconnected rooms, making it difficult to avoid counting individuals more than once. This cave had an enormous amount of characteristic stain and droppings, suggesting that it had had many more bats in the past. The freshness of this sign leads me to believe that the cave may be an important Winter roost for this species. The cave should be checked in mid-Winter to verify this.

The Cueva de la Poza de Moctezuma in Oaxtepec, Mexico, had only two individuals of this species. The cave is

adjacent to a resort and swimming pool, so may be accessible to human disturbance on a regular basis.

Cueva de Diablo near Tepoztlan, Morelos had a colony of 30-50 L. nivalis in May of 1984. This cave yielded large numbers of this species in the 1950's and 60's. Cueva del Cerro near Lago Tequesquitengo still houses significant numbers of both species of Leptonycteris, but is impossible to census without climbing gear. We mist-netted both species at the entrance after dark. This cave also yielded significant numbers, particularly of L. nivalis, in the past.

Grutas de Juxtlahuaca, near Colotlipa, Guerrero is a huge commercial cave, and we had to hire a guide to explore it. Although it has thousands of Natalus stramineus and Glossophaga soricina, and a small colony of vampires, we found no evidence of recent occupation by L. nivalis.

Two caves near Valle de Bravo, Mexico still have small numbers of L. nivalis, but these housed much larger colonies in the past, judging from the amount of material in collections. Both caves are high in the pine forest at about 6800 feet.

The single most suggestive bit of evidence that this species may be declining more rapidly than any general decline in bats was found at a small cave south of Chilpancingo, Guerrero. This cave, known locally as Cueva del Salitre or Cueva del Huarache, is a sinkhole with a

difficult entrance requiring ropes and considerable agility. In other words, although entry by humans is possible, it is not likely a common occurrence. The cave is a complicated series of small passages filled with considerable breakdown material. There is a large colony of Macrotus waterhousii and a smaller one of Natalus stramineus. Although we found no live L. nivalis, the floor of the cave contained numerous bits of skeletal material and enough entire skulls for us to identify this species. We found no skulls of other species, although the postcranial material was not identifiable to species. This suggests a specific die-off of L. nivalis that did not affect the other species in the cave. We found similar evidence for L. sanborni at a mine in Sonora.

- B. Reproductive Biology:** Surprisingly little is known about reproduction in this species. Easterla's (1972, 1973) findings suggest that reproduction occurs in Mexico prior to the time the animals migrate northwards into Big Bend Park. We found lactating females in Coahuila in July, 1983 and a single juvenal female later the same month in San Luis Potosi. Davis (1960) suggested "In Texas the breeding season appears to be restricted to April, May, and June. The number of young is one or two." I suspect that this is based on his finding young animals later in the summer in Emory Cave, rather than on direct evidence of breeding in Texas. The suggestion that they might have two young per year is also without evidence. No member of

the family Phyllostomidae is known to bear twins on a regular basis.

I would suggest that these bats have the typical monoestrous pattern of giving birth to a single young in the spring of the year throughout their range, except for two highly suggestive reports in the literature. Hall and Dalquest (1963) reported 6 pregnant females in Veracruz in late September, and Alvarez (1963) found 12 pregnant females in Tamaulipas in August. These data strongly support the possibility of a second breeding season in the fall after the northern animals migrate back to Mexico (Wilson, 1979). This would be most unusual, except that the same possibility has been raised for L. sanborni (Hayward and Cockrum, 1971).

- C. **Population Ecology:** Ecological relationships of L. nivalis are poorly known. Day roosts seem to be limited mainly to caves and mine tunnels, although Hall and Dalquest (1963) reported a colony of 200 in a dark, archlike tunnel in the basement of the an old hacienda near Boca del Rio, Veracruz. Clearly they commonly form large colonies in caves, but smaller groups roosting in mine tunnels are also common. In both of these types of roosts, the bats frequently are found quite near the entrance, in the twilight zone.

There are a few reports of night roosts in man made structures. Dalquest (1953) found a night roosting area inside buildings on the Hacienda Capulin in San Luis

Potosi. When these bats were collected, their stomachs were full of a thick, brilliant red fruit juice. Dalquest (1953) assumed it be of a cactus common to the area which he called organ cactus. This is almost surely a species of Myrtilocactus known locally as garambullo. It seems to be a major food source for L. nivalis in this area, particularly in the spring and early summer, perhaps before the agaves are in full bloom.

W. B. Davis (1960) allowed individuals from Emory Cave in Big Bend Park to land on Agave flowers, and they fed avidly from the blooms. Donna Howell (1975, 1979; Howell and Roth, 1981) conducted an elegant series of field experiments documenting the interactions between L. sanborni and agaves. Easterla (1972) suggested that Agave scabra and A. chisosensis might be the main food plants for L. nivalis in Big Bend Park.

Baker and Cockrum (1966) pointed out the ecological separation between most populations of the two species of Leptonycteris. Although we now know of several sites of sympatry, in general L. nivalis is an inhabitant of higher regions on the Mexican Plateau, frequently above 5,000 ft, and up as high 11,500.

This species is parasitized by a variety of small batflies, mites, and ticks. Webb and Loomis (1977) summarized reports of batflies of the families Nycteribiidae (Basilis corynorhini) and Streblidae (Trichobius sphaeronotus), mites of the families

Macronyssidae (Macronyssus unidens and Radfordiella oricola) and Spinturnicidae (Periglischirus vargasi), and ticks of the family Argassida (ornithodoros rossi).

Colonial species frequently are parasitized heavily, so this parasite burden may be normal for the roosting habits of this species.

Our knowledge of the migratory habits of this species is based primarily on circumstantial evidence. Easterla (1973) found them in Big Bend Park only between 18 June and 9 August. He speculated that the onset of the fall migration might be triggered by the rainy season, which sometimes begins in July. In 1971, he found 8,000 in Emory Cave on 15 July, but on 27 July after several days of heavy rain, there were only a few hundred left. Their arrival in the Park in June corresponds with the onset of flowering by agaves. Apparently males do not migrate into the park, as Easterla (1973) found only 3 adult males during the course of his five-year study.

Land Ownership and Management Responsibilities Aside from a single record from private land in the Chinati Mountains, the entire known range of the species in the United States is in Big Bend National Park, Texas. By far the bulk of the range lies in Mexico. The lands on which the bats roost and forage are owned by a broad spectrum of private and public interests. Management responsibilities are unlikely to be taken too seriously by Mexican authorities given the current economic climate of that country.

Management Practices

No management has been directed towards L. nivalis, although a certain amount of protection is provided by the National Park Service. They require permits to take animals, and access to the Emory Cave roost is controlled de facto by the necessity of having someone from the NPS serve as a guide in order to find it. Management of this species in Mexico is non-existent.

Evidence of Threats to Survival

A. Present and Potential: The US range is reasonably secure but much of the range in Mexico is subject to habitat disturbance and destruction from an ever-increasing human population. For a colonially roosting species, the most devastating potential danger is in the destruction of cave and mine roosts for whatever reason. This could result in the loss of large numbers of animals at a time. Vandalism is a continuing problem with cave-roosting bats, and in Mexico, the general public frequently confuses all bats with vampires, and practices destructive control programs that kill all species in a cave.

A more nebulous, but perhaps also more pernicious, threat lies in the continued loss of populations of agaves, which serve as the major food source, at least in the northern parts of the range. Howell (1981) suggested that the linkage between the bats and the plants is such that a downward spiral could be triggered by a decline in the population of either.

Unfortunately, documenting an overall decline in agave populations throughout the range of L. nivalis is a difficult task indeed. However, the potential threat provided seems clear from Howell's studies.

- B. Overutilization:** There is no commercial utilization and the only direct kill is due to vandalism or misdirected control programs. Although there are considerable numbers of specimens in museum collections, scientific collecting is not a significant threat to otherwise undisturbed populations.
- C. Diseases and Predation:** Bats in general are susceptible to a variety of diseases, but there is no evidence to suggest that any are having a direct effect on current population sizes. Predation pressure on this species is unknown, but is generally believed to be light on most species of bats.
- D. Inadequacy of Existing Regulatory Mechanisms:** Existing regulations appear to be adequate in the United States. The bats are well protected by the National Park Service. There are no regulations in Mexico other than those imposed on scientific collectors. The scientific collecting regulations are misguided in the sense that such collecting probably constitutes no threat to current populations. Regulations against control programs directed against bats might be useful in controlling the incidental kill when roosts of suspected vampires are destroyed.

II. ASSESSMENT AND RECOMMENDATIONS

General Assessment

The bulk of the U.S. population of L. nivalis is adequately protected and controlled by the National Park Service. That population, however, is a tiny fraction of the entire population, because most of the range is in Eastern Mexico, and on the Southern part of the Mexican Plateau. Although much of this area is still in a natural state, constant inroads of habitat destruction by an increasing human population pose a threat that is difficult to quantify given our current state of knowledge about this species.

Federal Status Recommendation

I recommend that, pursuant to the Endangered Species Act of 1973, as amended, Leptonycteris nivalis, be listed as Threatened.

Recommended Critical Habitat

None.

Conservation/Recovery Recommendations

- A. **General Recovery Recommendations:** None are needed for U.S. populations. The Government of Mexico should be urged to undertake a complete survey of potential roosts of this species, and to effect protection for those sites harbouring large colonies.
- B. **Monitoring:** The National Park Service should set up a regular monitoring program to census the summer population in Emory Cave. It would be very useful to design the program in such a way that approximate dates of arrival and departure could be recorded each year.

A similar monitoring program should be instituted at selected sites in Mexico. It would be best if such a program were handled exclusively by the Mexicans, but that is unlikely. The FWS should institute a cooperative monitoring program such as the one currently done for Peregrine Falcons. Selected roosts could be visited at appropriate times of year by a team consisting of a U.S. biologist and one from Mexico.

III. INFORMATION SOURCES

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The curators of the forty largest collections in North America provided data on specimens under their care; a major task for some of the large collections, and I greatly appreciate the effort. The study was conducted under and supported by the U.S.-Mexico Joint Committee on Wildlife Conservation of the U.S. Fish and Wildlife Service and the Direccion General de Flora y Fauna Silvestre. DGFFS employees Jose Maria Reyes, Victor Sanchez, Ramon Perez-Gil, and Wilfrido Contreras,

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Table 1. Localities where Leptonycteris nivalis was observed during the status survey.

Date	Site	Situation	Number
07/10/83	TEXAS: Big Bend Park	Roost	1000
7/14/83	COAHUILA: near El Cedrito	Roost	1
07/15/83	COAHUILA: near Bella Union	Net	5
07/18/83	SAN LUIS POTOSI: San Pedro	Net	1
07/19/83	SAN LUIS POTOSI: La Reforma	Roost	1
07/23/83	NUEVO LEON: near Los Ramones	Roost	1
07/25/83	NUEVO LEON: near La Cienega	Roost	10
07/27/83	NUEVO LEON: near Aremberri	Roost	1
07/28/83	SAN LUIS POTOSI: Los Amoles	Roost	25-50
07/29/83	SAN LUIS POTOSI: Los Amoles	Net	7
05/19/84	MORELOS: Oaxtepec	Roost	2
05/20/84	MORELOS: near Tepoztlan	Roost	30-50
05/21/84	MORELOS: near Tequesquitengo	Both	2
05/24/84	GUERRERO: near Palo Blanco	Roost	Many Dead
05/25/84	MEXICO: near Tonatico	Net	5
05/26/84	MEXICO: near Valle de Bravo	Roost	10
05/27/84	MEXICO: near Avandaro	Roost	5

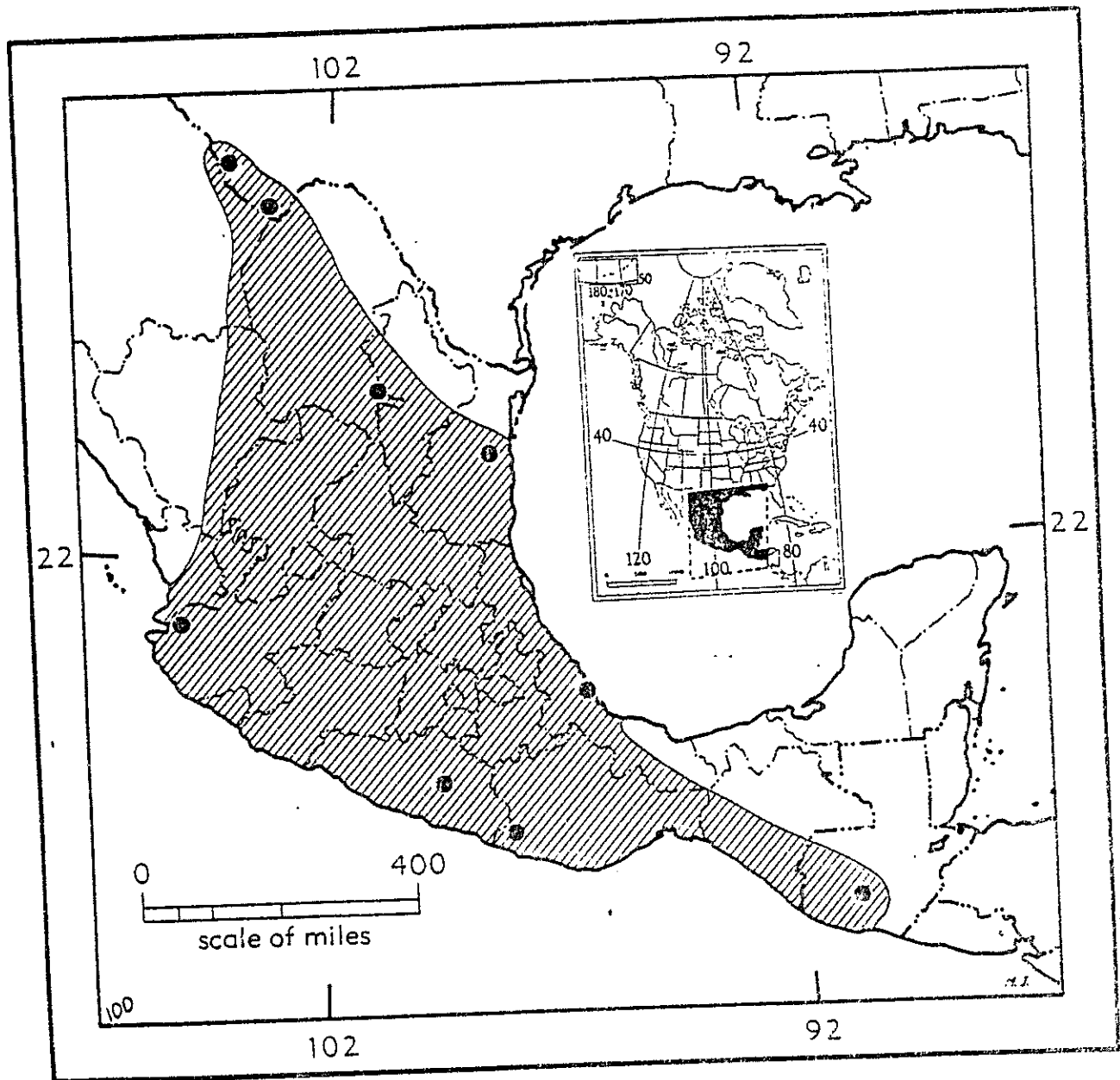


Fig. 1. Distribution of *Leptonvcteris nivalis*.