freestanding water was also low during this time.

The frequency of mourning doves visiting and drinking at water sites during nocturnal hours is unknown. During our study of guzzlers (Foster, 2002), mourning doves only accounted for 7 of 1,417 pictures (<0.05%) that were distinguishable. However, because the cameras used in our study were designed to capture drinking episodes by large mammals (e.g., ungulates), nocturnal drinking by mourning doves might have been more prominent than our findings indicate. Additionally, previous investigations have focused on observing or monitoring (e.g., radiotelemetry) mourning doves during daylight hours (Howe and Frank, 1989).

Texas Parks and Wildlife Department, Texas Bighorn Society, Houston Safari Club, Dallas Ecological Foundation, Dallas Safari Club, Sul Ross State University Research Enhancement Program, and Houston Livestock Show and Rodeo provided funding. P. M. Harveson and G. Waggerman reviewed earlier drafts of this manuscript.

Literature Cited

Bartholomew, G. A., Jr., and W. R. Dawson. 1954. Body temperature and water requirements in the mourning dove, *Zenaidura macroura marginella*. Ecology 35:181–187.

Foster, J. A. 2002. Guzzler use and habitat selection by desert bighorn sheep at Black Gap Wildlife Management Area, Texas. Unpublished M.S. thesis, Sul Ross State University, Alpine, Texas.

Howe, F. P., and L. D. Flake. 1989. Mourning dove use of man-made ponds in a cold-desert ecosystem in Idaho. Great Basin Naturalist 49:627–631.

MacMillen, R. E. 1962. The minimum water requirements of mourning doves. Condor 64:165–166.

Mirarchi, R. E. 1993. Energetics, metabolism, and reproductive physiology. In: Baskett, T. S., M. W. Sayre, R. E. Tomlinson, and R. E. Mirarchi, editors. Ecology and management of the mourning dove. Stackpole Books, Harrisburg, Pennsylvania. Pp. 143–160.

Submitted 18 November 2003. Accepted 25 February 2004. Associate Editor was Timothy Brush.

WESTERN YELLOW BAT (*LASIURUS XANTHINUS*) IN SOUTHERN NEVADA

Michael J. O'Farrell*, Jason A. Williams, and Bruce Lund

O'Farrell Biological Consulting, 7320 Heggie Avenue, Las Vegas, NV 89131 (MOF)
Nevada Department of Wildlife, 1218 North Alpha Street, Ely, NV 89301 (JAW)
1130 Eiseman Street, Moapa, NV 89025 (BL)
**Correspondent: mike@mammalogist.org*

Abstract—The first record of western yellow bat (*Lasiurus xanthinus*) for Nevada was found at the Moapa Valley National Wildlife Refuge, Muddy River, Clark County in January 1999. Year-round residence and an active breeding colony were verified through 2000. Roosting and foraging seems concentrated within extensive California fan palm groves throughout the upper Moapa Valley. Capture and acoustic sampling showed this to be the second-most abundant species in the valley. The diet included Coleoptera, Diptera, Hemiptera, Homoptera, Lepidoptera, and Orthoptera. This record represents the northernmost distribution of the species.

Resumen—El primer registro del murciélago cola peluda de la laguna (*Lasiurus xanthinus*) en Nevada, fue hallado en enero de 1999 en el Moapa Valley National Wildlife Refuge, Muddy River, condado de Clark. Su residencia durante todo el año y una colonia reproductivamente activa fueron verificadas hasta el año 2000. El uso de perchas (dormideros) y la búsqueda de alimento parecen concentrarse en rodales extensos de palmas con hoja en abanico de California, localizados en la parte superior del Valle Moapa. Mediante capturas y registros acústicos se evidenció que *L. xanthinus* representa a la segunda especie más abundante en el valle. Su dieta incluye insectos de

los órdenes Coleóptera, Díptera, Hemíptera, Homóptera, Lepidóptera, y Ortóptera. Este registro es el más al norte de este murciélago.

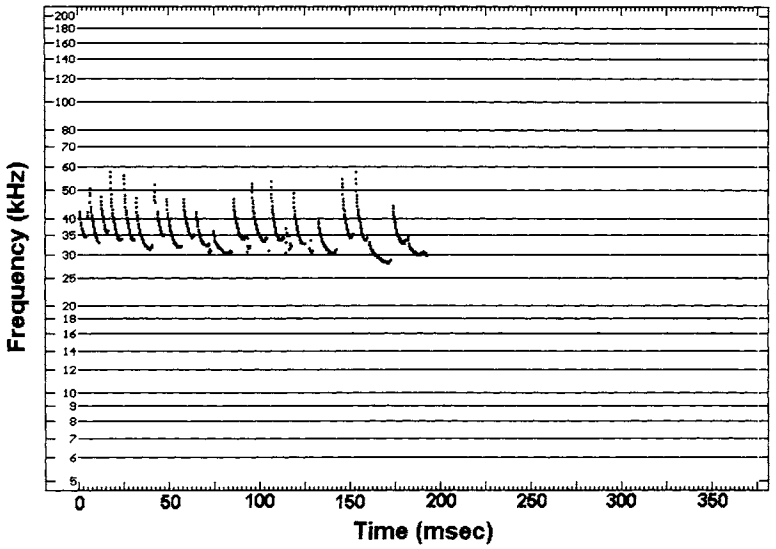

FIG. 1—Frequency-time display (Analook software) of a representative vocal sequence produced by *Lasiurus xanthinus* at the Moapa Valley National Wildlife Refuge, Clark County, Nevada. The time between calls is compressed by the software to allow more calls per screen.

The western yellow bat (*Lasiurus xanthinus*) occurs throughout northern Mexico, southern California, southern Arizona, extreme southwestern New Mexico (Kurta and Lehr, 1995), and southwestern Texas (Higginbotham et al., 1999). Its range in southern California recently was extended north to southern Los Angeles and San Bernardino counties, establishing its northernmost record at 34°09′N latitude (Constantine, 1998). This species apparently uses palms as primary day roosts (Higginbotham et al., 2000). Constantine (1998) speculated that increased use of palms as ornamentals in rapidly growing urban areas has provided roost sites in previously unsuitable areas.

In January 1999, one of us (BL) found a grounded *Lasiurus* in a palm grove at the Moapa Valley National Wildlife Refuge (MVNWR), Muddy River, Clark County, Nevada (36°42.6′N, 114°42.7′W). The animal was photographed and placed onto a palm trunk, and was gone the next day. Identification based on the color slide was clearly established as *L. xanthinus*. On 28 March 2000, the palm grove was surveyed acoustically with the Anabat II system (Titley Electronics, Ballina, New South Wales, Australia) linked to a laptop computer. Vocal signatures obtained (Fig. 1) were identical to those recorded by one of us (MO'F) from confirmed *L. xanthinus* in the Anza Borrego Desert of southern California (voucher vocal signatures are on deposit in the bat call library, Museum of Southwestern Biology, University of New Mexico). Individuals that appeared to be *L. xanthinus* were observed exiting and entering the dead-leaf skirting of palm trees with a Nightsight PalmIR 250 thermal infrared camera (Raytheon Systems Company, Dallas, Texas).

Additional preliminary acoustic and visual surveys were conducted at various points within the MVNWR as well as at other localities within the upper Moapa Valley on 7 April, 20 April, and 18 May 2000. On 7 April, double-frame harp traps and mist nets were placed around a concrete tank at the Plummer Unit, MVNWR. Four adult male *L. xanthinus* were captured. A voucher specimen from this date, as well as another taken on 21 May 2000, were deposited in the New Mexico Museum of Natural History (NMMNH 4043 and 4048, respectively). In June 2000, routine acoustic and capture sampling was established at riparian habitat sites throughout the upper Moapa Valley

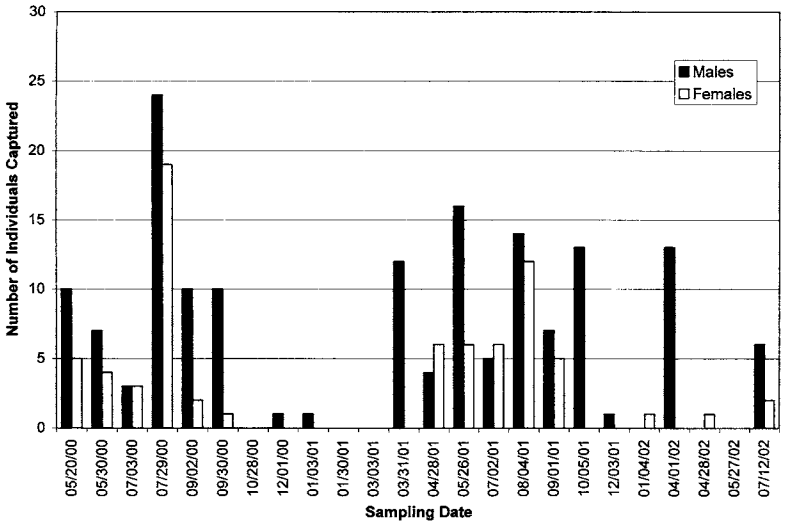

FIG. 2—Number of *Lasiurus xanthinus* captured at the Moapa Valley National Wildlife Refuge, Clark County, Nevada from May 2000 to July 2002.

including at or near the Plummer Unit tank (Williams, 2001).

From May 2000 to July 2002, 232 *L. xanthinus* were captured in the study area (Fig. 2), second only to *Pipistrellus hesperus* in abundance. Males generally were captured in greater numbers regardless of age. Juveniles were captured during July through September 2000 and August and September 2001. Both sexes were captured during all seasons. Capture rates were low during late fall through early spring.

Seasonal capture rates and acoustic surveys documented similar bat activity (Fig. 3). Acoustic surveys, based on the number of files recorded and the number of minutes of activity present, established that *L. xanthinus* was the second-most abundant species after *P. hesperus*. The greatest amount of nocturnal activity occurred during the summer. Moderate levels of nightly activity were found during the spring and fall months, with consistent but minimal activity throughout the winter.

During 2001, 43 individual *L. xanthinus* were held in cloth bags and scat was collected. Samples were segregated by sex (25 males and 15

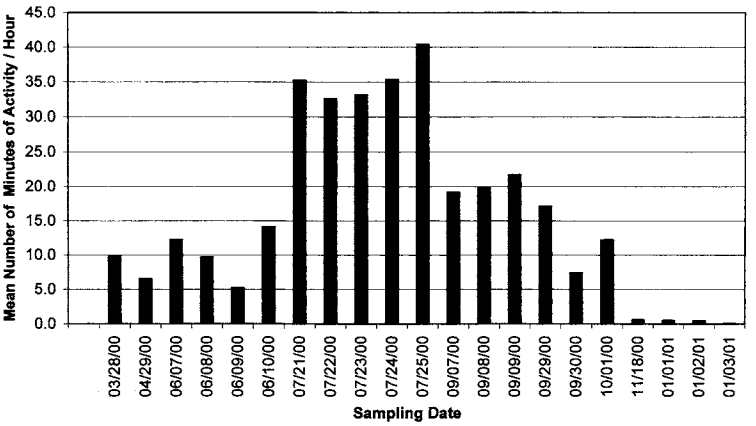

FIG. 3—Mean number of minutes of activity per hour of acoustic monitoring at the Moapa Valley National Wildlife Refuge, Clark County, Nevada from March 2000 to January 2001.

TABLE 1—Dietary composition of *Lasiurus xanthinus* based on fecal analysis (% volume by visual examination) from the Moapa Valley National Wildlife Refuge, Clark County, Nevada. Samples from 2001 were lumped seasonally (15 females, 25 males). Three males from 2002 were captured on 1 April.

	2001		2002		
Order/Family	Females	Males	1	2	3
Coleoptera					
unknown	50	20		25	15
Carabidae (likely)			100		
Scarabaeidae	15	0			
Diptera					
unknown		10			
Hemiptera					
unknown	10	30			
Pentatomidae		10			
Homoptera					
Cicadellidae		10			
Lepidoptera					
unknown	10	10			
Orthoptera					
Gryllidae	15	10		75	85

females) but lumped for all seasons. On 1 April 2002, separate fecal samples were obtained from 3 additional males. Fecal samples were processed and analyzed following the methods of Whitaker (1988). The insect orders identified from a single sample in Texas (Higginbotham et al., 1999) compare well with those found in our study and include: Coleoptera, Diptera, Hemiptera, Homoptera, Lepidoptera, and Orthoptera (Table 1).

Palm groves in the upper Moapa Valley are monotypic stands of California fan palm (*Washingtonia filifera*). These palms, introduced along the lower Muddy River in the 1890s, quickly became naturalized and subsequently were planted in other locations along the river (Williams, 2001). Palms initially were planted at least 60 to 70 years ago at warm-spring resorts, which now form the MVNWR. Palm groves extend beyond the boundaries of the refuge and dominate the riparian woodland habitat (<31 ha) in the Muddy River headwaters area of the upper Moapa Valley.

Infrared thermal imaging within the palm groves verified ingress and egress of *L. xanthinus* from the dead-leaf skirting of palm trees. No concentration was observed, suggesting that yellow bats roost individually or in small groups. Surveys of habitat use by bats within the upper Moapa Valley revealed that *L. xanthinus* spent significantly more time within riparian woodland than in other available habitat types ($P < 0.05$; Williams, 2001). It is clear that palm groves in the upper Moapa Valley dictate the presence of *L. xanthinus* in Nevada.

We have surveyed other areas with palms throughout southern Nevada without finding *L. xanthinus*. Palms are scattered along the lower Muddy River, through the Lake Mead National Recreation Area, and down the Colorado River. However, such palm occurrences are limited to single trees or a few trees, and few have the dead-leaf skirts necessary for suitable roost sites. One of the larger clusters of palm trees within the Lake Mead National Recreation Area (at Rogers Springs) was surveyed acoustically on 29 May 2000 but no *L. xanthinus* were detected. Similar clusters of palms on the Arizona side of the Colorado River were examined at Willow Beach on 7 August 2000 and Davis Camp, Bullhead City on 12 September 2000, both with negative results. In September 2000, driving surveys were conducted through the southeastern residential portion of the Las Vegas Valley, which contains numerous mature landscape palms, but no bats were

detected. More recently, acoustic and visual surveys were conducted throughout the Clark County Desert Wetlands Park, Las Vegas Wash on 29 May, 7 and 11 July, 1 August, and 3 November 2002. Nine files were recorded containing vocal sequences of *L. xanthinus* on 29 May between 2027 h and 2106 h. However, the species was not detected during subsequent surveys.

Lasiurus xanthinus at the MVNWR represent the northernmost records for the species. They further represent a viable breeding population with residents present and active throughout the year. Seasonal migration southward from northern portions of the range has been inferred, although accumulated records indicate year-round presence in southern Arizona and California (Kurta and Lehr, 1995). Sexual segregation during the parturition period has been suggested due to a paucity of male captures from April through June (Kurta and Lehr, 1995). In southern Nevada, there is no suggestion of seasonal sexual segregation. Males predominate in captures throughout the year and both sexes have been captured during all seasons (Fig. 2). Although there is year-round activity, the number of individuals captured and the number of minutes of activity (determined acoustically) decline substantially during the winter months (Figs. 2 and 3, respectively).

We hypothesize that a portion of the breeding population migrates southward. The obvious route would be along the Muddy and Colorado rivers, where scattered palms and patches of standard riparian habitat would provide necessary stopping points for migratory individuals. This was probably the route of initial northward colonization. Moreover, the presence of *L. xanthinus* in Las Vegas Wash only in late May suggests migratory movements in southern Nevada. Reduced activity during winter months clearly reflects periods of torpor. Further study is necessary to adequately determine seasonal movements.

The occurrence of *L. xanthinus* at the MVNWR represents a new addition to the fauna of Nevada. The presence of well-established palm groves in the upper Moapa Valley is critical to the maintenance of this species at the northern extent of its range. Restoration of riparian habitat along Las Vegas Wash and an increase in palms for landscaping might result in establishment of additional breeding populations of *L. xanthinus* in southern Nevada.

We thank T. M. O'Farrell for assistance in the field. J. O. Whitaker, Jr. provided invaluable assistance with the identification of insects through fecal analysis. J. Ochoa-G. assisted preparation of the resumen. D. Hafner provided many useful comments to an earlier draft of the manuscript. A use permit for the MVNWR was issued from the United States Fish and Wildlife Service.

Literature Cited

Constantine, D. G. 1998. Range extensions of ten species of bats in California. Bulletin of the Southern California Academy of Science 97:49–75.

Higginbotham, J. L., L. K. Ammerman, and M. T. Dixon. 1999. First record of *Lasiurus xanthinus* (Chiroptera: Vespertilionidae) in Texas. Southwestern Naturalist 44:343–347.

Higginbotham, J. L., M. T. Dixon, and L. K. Ammerman. 2000. Yucca provides roost for *Lasiurus xanthinus* (Chiroptera: Vespertilionidae) in Texas. Southwestern Naturalist 45:338–340.

Kurta, A., and G. C. Lehr. 1995. *Lasiurus ega*. Mammalian Species 515:1–7.

Whitaker, J. O., Jr. 1988. Food habits analysis of insectivorous bats. In Kunz, T. H., editor. Ecological and behavioral methods for the study of bats. Smithsonian Institution Press, Washington, D.C. Pp. 171–189.

Williams, J. A. 2001. Community structure and habitat use by bats in the upper Moapa Valley, Clark County, Nevada. Unpublished M.A.S. thesis, University of Nevada, Las Vegas.

Submitted 15 May 2003. Accepted 29 December 2003. Associate Editor was Cody W. Edwards.