

**ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM**

Animal Abstract

Element Code: AMACC07010

Data Sensitivity: Yes

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Euderma maculatum*

COMMON NAME: Spotted Bat; Pinto Bat; Death's Head Bat; Jackass Bat

SYNONYMS: *Histiotus maculatus*; *Euderma maculata*

FAMILY: Vespertilionidae

AUTHOR, PLACE OF PUBLICATION: Allen, J.A. 1891. Bull. Amer. Mus. Nat Hist. 3:195.

TYPE LOCALITY: Near Piru, Ventura Co., California. This is "probably [the] mouth of Castac Creek, Santa Clara Valley, 8 miles east of Piru, Los Angeles County, California" (Miller 1897:49).

TYPE SPECIMEN:

TAXONOMIC UNIQUENESS: *Euderma* is a monotypic genus. No subspecies have been described for *E. maculatum*. Chromosomal analysis (including G-banded karyotyping) indicates that this bat is most closely related to *Idionycteris* and less closely related to *Plecotus*. Chromosomes of all 3 plecotine genera show similarities to those of *Myotis* suggesting derivation from a common ancestor

DESCRIPTION: Medium sized bat, average body length 6.35 cm (2.5 in), forearm 48.0-51.0 mm (1.9-2.0 in.), they have 34 teeth. Upper parts blackish with three large white spots, one on each shoulder and one at base of tail. All hairs black at base, but those on under parts are white tipped and conceal black bases. Ears pinkish-red and long, 51.0 mm (2.0 in.), largest of any North American bat. Ears curled at rest but erect and pointing forward when alert. Circular, bare throat patch is distinctive.

AIDS TO IDENTIFICATION: Black and white color pattern and enormous pink ears are unique and unmistakable. Researchers report that its voice is distinctive and that workers can learn to recognize it in the field. Its voice is described as a series of soft but high-pitched, metallic squeaks. *Idionycteris phyllotis* has been reported to have a similar voice, but *E. maculatum* is higher pitched.

ILLUSTRATIONS: Black and white photo (Barbour and Davis 1969: 160-162)
Color photo (Barbour and Davis 1969: plate XVII)
Color photo (Whitaker 1980: plate 143)

Color photo (Tuttle *in*

http://www.enature.com/fieldguide/showSpecies_LI.asp?imageID=18946)

Color photo (*In* <http://www.wrc.ce.ttu.edu/henrypage/eu-ma.html>)

Color photo (BCI *in*

<http://www.batcon.org/discover/species/emacula.html>)

Color photo (Wilson 1999)

TOTAL RANGE: Locally distributed throughout central western North America from southern British Columbia and Montana, south through California and Big Bend, Texas to Durango and Queretaro in Mexico.

RANGE WITHIN ARIZONA: Specimens from near Yuma, Roll, Maricopa Junction, Tempe and Littlefield. Recently recorded from the Kaibab Plateau (Berna 1990); also 2 captured at a watershed SE of Seligman (Senn 1993). Appears to be a substantial population in Fort Pierce Wash area on the Utah-Arizona border, with 2 individuals netted nearby in Arizona (Herder and Price 1993, 1994). Two individuals captured at a known roost near Marble Canyon (AGFD 1996). Aural record exists for eastern Arizona.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: This species may be active in winter under some conditions. Netting in southwestern Utah from November to March, Poche (no date) captured 7 spotted bats on 2 occasions in January and February at ambient temperatures of -5°C to -4°C and relative humidities between 41% and 76%. *Pipistrellus hesperus*, *Tadarida brasiliensis*, *Myotis californicus*, and *Antrozous pallidus* were also taken at this time. In 2000, *E. maculatum* was a common species in the upper Moapa Valley, southern Nevada, from late spring through fall, and absent by the end of November (Williams, 2001). Apparently relatively solitary but may hibernate in small clusters (Whitaker 1980). In British Columbia, roosted solitarily during active season; appeared to maintain exclusive foraging areas (Leonard and Fenton 1983); foraged up to 6-10 km from day roost each night (Wai-Ping and Fenton 1989).

Poche (no date) suggested, "Winter activity of bats in this region is a result of the poor quality of hibernacula." By poor quality he apparently meant low relative humidity in the hibernacula. Because bats usually hibernate in roosts with high levels of relative humidity, low levels would increase the need for drinking to maintain water balance during arousal. Large drops in ambient temperature, especially for bats in shallow or poorly insulated roosts, have been shown to result in arousal of some bat species. Although flying insects were observed when bats were active and some bats were seen foraging other studies have suggested that foraging and feeding is of minor importance for some species of winter active bats.

Monitoring echolocation calls in British Columbia indicated that during summer activity, temperature, cloud cover, wind, precipitation or phase of lunar cycle does not affect patterns (Leonard and Fenton 1983). Apparently this bat is a rapid flyer. Many of them are injured in the mist nets, indicating a high rate of speed at the collision (Snow 1974).

The spotted bat makes a wide variety of sounds in communicating and foraging. The voice has been described as sounding like a soft, extremely high-pitched metallic squeak; a hissing noise and a ratlike squeak; and a typical bat chirp. This bat has also been heard clicking the teeth together and making grinding noises by gnashing the teeth. Previous to taking flight, the spotted bat makes clicking or ticking notes (Snow 1974).

The low frequency of the echolocation call is useful in both hunting and communications. Due to reduced attenuation and good propagation qualities, the call is good for long-range detection of prey and an increased range of audibility by other bats. The bat is also able to approach the moth more closely and enhance the chance of a successful pursuit due to the moth not being able to detect the low intensity of sound (van Zyll de Jong 1985). Similar calls are made by *Idionycteris phyllotis* (Allen's Big-eared bat), *Nyctinomops macrotis* (big free-tailed bat), and *Eumops perotis* (western mastiff bat) (Snow 1974).

REPRODUCTION: Reproduction is relatively unknown. Limited observations indicate one young per female per year. Young apparently born from late May to early July elsewhere (i.e., no records exist from Arizona). Lactating females have been captured in June, July and August. The young can weigh 20% of their mothers' nonpregnant weight. They are altricial and do not show the color pattern characteristic of adults. Their ears are large and floppy and not fully developed. One study showed that four hours after birth, a male appeared to nurse almost constantly for the first 48 hours. The mother showed great parental care to the young. She was gentle and attentive, licking the young's face, ears, wings, and back. The young stayed with her, attached to a teat, even when the female flew. She did not seem to be hindered by the additional weight. The female shielded the young with her wings when they were hanging upside down. No more is known about the young because the one born in captivity died at four and a half days when it became chilled after crawling through some drinking water (Snow *in* NatureServe, 2001).

FOOD HABITS: Limited evidence suggests that moths (5.0-11.0 mm (0.2-0.44 in.) in size) are dominant food item. These are usually taken by bats hunting alone, using echolocation calls of moderate intensity in the range of 8,000 to 15,000 cycles per second. Sounds in this frequency range are audible to humans, but are of too low a frequency for detection by tympanate moths. These moths have evolved thoracic "ears" which enable them to detect the higher frequency echolocation calls emitted by other insectivorous bats, and subsequently evade them. Other occasional prey items include June beetles and sometimes grasshoppers taken while on the ground.

Observations of 4 individuals in British Columbia indicate that they fly from 0-10 km from their roost to a foraging area (Wai-Ping and Fenton 1989). While in the foraging area they fly

singly, and continuously in large ellipses 200-300 m long, 5-15 m above the ground. Foraging activity was not affected by moonlight. After leaving their roosts from 4 to 21 minutes after sunset, averaging 13 minutes, they spent from 4 to 7½ hours, averaging about 5½ hours, away from their roosts. Time of sunset had the greatest influence on exit times while ambient temperature had almost none. Foraging areas were found to overlap extensively.

In southwestern Utah a single spotted bat was observed by Poche and Bailie (1974) for 4 minutes, after release about an hour before dark, as it fed within 2 meters of the ground and twice hovered for a split-second and then dropped to the ground. The first time it seized and ate a grasshopper and flew within 10 seconds. It then proceeded to a crevice in a cliff. Monitoring of echolocation calls indicate this bat forages throughout the night in British Columbia and Colorado even though capture records from earlier years indicate late-night activity. It has also been seen in these areas foraging at about 10 m above the ground. In Colorado it was heard foraging over pinyon-juniper, riparian vegetation, sand-and-gravel bars, over a river in a deep, steep-walled canyon, and campgrounds. In British Columbia they were documented foraging over marsh areas. According to NatureServe (2001), the spotted bat hunts alone, and at least sometimes appears to maintain an exclusive foraging area (Leonard and Fenton 1983). Neighboring bats show evidence of mutual avoidance and have been observed to turn away when encountering one another near the boundaries of their hunting areas. This mutual avoidance has been interpreted as a mechanism to avoid competition. When the neighbor is absent, an individual may show no hesitation in flying into an area avoided earlier. It is believed that a combination of the bat's echolocation call and conspicuous color pattern are used to maintain the spacing between bats (van Zyll de Jong 1985).

HABITAT: Varied. In Arizona mostly collected in dry, rough desert scrub with a few captured or heard in ponderosa pine forest. This bat has been found from low desert in southwestern Arizona to high desert and riparian habitats in northwestern Arizona and Utah, and conifer forests in northern Arizona and other western states. One specimen in New Mexico was found in spruce-fir. Considered by some biologists to be an elevational migrant. Roost site characteristics and site localities are poorly known, but limited observations suggest that they prefer to roost singly in crevices and cracks in cliff faces. Cliffs and water sources are characteristic of localities where it occurs. Observations from British Columbia suggest that *Euderma* may change roost sites after July. Williams (2001), collected 616 minutes of *E. maculatum* activity during a yearlong intensive acoustic based habitat preference study in the upper Moapa Valley, southern Nevada. In the study region, *E. maculatum* is primarily found over mesquite bosque habitat (62%, n= 381), secondarily over riparian marsh habitat (28%, n = 172), infrequently over riparian shrubland habitat (10%, N = 61), and avoids palm grove habitat (0.3%, n = 2). The only specimen captured was via mist net and was approximately 15 cm above riparian marsh habitat.

ELEVATION: Specimen localities in Arizona range from elevations of 110 to 8,670 feet (34 - 2,644 m). Over its whole range it has been found at localities ranging from 180 feet below sea level in California to 10,600 feet above sea level in New Mexico.

PLANT COMMUNITY: Specimens known from a wide range of biotic communities, from desertscrub of all four North American deserts (Sonoran, Chihuahuan, Mohavean, and Great Basin) through riparian and pinyon-juniper to montane coniferous forests of Rocky Mountains, Sierra Nevadas and scattered ranges in between.

POPULATION TRENDS: Not encountered by biologists until 1891 and then only as dead specimens. No specimens taken alive until the early 1960s after mist nets began to be used for netting bats. Initially thought to be extremely rare and in very low numbers. Increasing numbers of field workers focusing on the species and slowly improving understanding of habitat and roost occurrences seem to have increased reports and captures. It is now known to occupy a wider total range than initially thought and does not appear to be quite as rare as initially thought. Population abundance and densities are very poorly known.

As of the late 1980s there seem to be 5 areas where *Euderma* has been taken in some numbers or fairly regularly. The localities are Fort Pierce Wash area of southwestern Utah and northwestern Arizona; Big Bend, Texas; New Mexico; Dinosaur National Monument, Colorado; and Okanagan Valley, British Colombia.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None (USDI, FWS 1996)
[C2 USDI, FWS 1985]

STATE STATUS: WSC (AGFD, WSCA in prep)
[State Candidate AGFD, TNW 1988]

OTHER STATUS: None (USDA, FS Region 3, 1999)
[Forest Service Sensitive USDA, FS Region 3, 1988]
None (NESL, NFWD 1997)
[Group 4 NESL, NFWD 1994]
None (USDI, BLM AZ 2005)
[Bureau of Land Management Sensitive (USDI, BLM AZ 2000)]
Determined Subject to Special Protection (Secretaria de Medio Ambiente 2000)
[Listed Rare, Secretaria de Desarrollo Social 1994]

MANAGEMENT FACTORS: Limited numbers. Poorly known natural history requirements. According to NatureServe (2001), they are moderately threatened range-wide;

habitat or community lends itself to alternate use. Because of the lack of sufficient information, only speculations can be made about threats. Habitat destruction, such as construction of dams that inundate high cliffs and canyon walls, possibly is a threat (Snow 1974). Fenton *in* NatureServe (2001) stated that the two highest threats to spotted bats appeared to be collection of specimens by humans, and the use of pesticides that the bats may accumulate through their diet and that kill their prey.

PROTECTIVE MEASURES TAKEN:

SUGGESTED PROJECTS: Determine summer and winter distribution, roost characteristics, and foraging areas. According to NatureServe (2001) the following is recommended: determine the presence of the spotted bat by surveying likely habitat, establish and maintain waterholes in likely spotted bat habitat (it is well known that the bat will fly for several miles to find water, and a water hole will benefit many species), support and cooperate in studies to determine more about the impacts by humans.

LAND MANAGEMENT/OWNERSHIP: BIA - Hualapai Reservation and Navajo Nation; BLM - Arizona Strip Field Office; NPS - Glen Canyon National Recreation Area and Grand Canyon National Park; USFS - Apache-Sitgreaves and Kaibab National Forests; Private.

SOURCES OF FURTHER INFORMATION

REFERENCES:

- Allen, J.A. 1891. Description of a new species of big-eared bat, of genus *Histiotus*, from southern California. Bull. Amer. Mus. Nat Hist. 3:195.
- Arizona Game and Fish Department. 1988. Threatened Native Wildlife in Arizona. p. 26.
- Arizona Game and Fish Department. 1996. Mammal Diversity Review Notes.
- Arizona Game and Fish Department. In prep. Wildlife of special concern in Arizona. Arizona Game and Fish Department Publication. Phoenix, Arizona. 32 pp.
- Barbour, R.W. and W.H. Davis. 1969. Bats of America. The University Press of Kentucky. pp.161-163.
- BCI, Available <http://www.batcon.org/discover/species/emacula.html>.
- Berna, H.J. 1990. Seven bats from the Kaibab Plateau, Arizona with a new record of *Euderma maculatum*. Southwestern Naturalist. 35(3):354-356.
- Cockrum, E.L. 1960. The recent mammals of Arizona: Their taxonomy and distribution. The University of Arizona Press, Tucson. p.56.
- Davis, W.B. 1974. The mammals of Texas. Texas Parks and Wildlife Department. Austin, Texas. pp.66-67.
- Easterla, D.A. 1976. Notes on the second and third newborn of the spotted bat *Euderma maculatum*, and comments on the species in Texas. American Midland Naturalist. 96(2):499-501.
- Fenton, M.B., D.C. Tennant and J. Wyszecski. 1987. Using Echolocation calls to measure the distribution of bats: the case of *Euderma maculatum*.

- Findley, J.S., A.H. Harris, D.E. Wilson, C. Jones. 1975. Mammals of New Mexico. University of New Mexico Press, Albuquerque. pp.58-59.
- Hall, E.R. 1981. The mammals of North America. Second edition. The Ronald Press Company. New York. Vol.I:231-232.
- Handley, C.O. Jr. 1959. A revision of American bats of the genera *Euderma* and *Plecotus*. Proc. U.S. Nat. Mus. 110:95-246.
- Harvey, M. J. et al. 1999. Bats of the United States. Arkansas Game and Fish Commission, p 26.
- Herder, M., R. Price. 1993. Personal communication.
- Hoffmeister, D.F. 1986. Mammals of Arizona. University of Arizona Press, Tucson. pp. 103-104.
<http://www.wrc.ce.ttu.edu/henrypage/eu-ma.html>
- Leonard, M.L. and M.B. Fenton. 1983. Habitat use by spotted bats (*Euderma maculatum*, Chiroptera: Vespertilionidae): roosting and foraging behavior. Can. J. Zool. 61:1487-1491.
- Leonard, M.L. and M.B. Fenton. 1984. Echolocation calls of *Euderma maculatum* (Vespertilionidae): use in orientation and communication. Journal of Mammalogy 65(1):122-126.
- Miller, G.S. Jr. 1897. Revision of the North American bats of the family Vespertilionidae. N. Amer. Fauna 13:1-135.
- NatureServe Explorer: An online encyclopedia of life [web application]. 2001. Version 1.6. Arlington, Virginia, USA: NatureServe. Available: <http://www.natureserve.org/explorer>. (Accessed: November 19, 2002).
- Navajo Nation, Department of Fish and Wildlife. 1994. Navajo Endangered Species List. p.3.
- Navajo Nation, Department of Fish and Wildlife. 1997. Navajo Endangered Species List. p.1 attachment.
- O'Farrell, M.J. 1981. Status Report: *Euderma maculatum* (J.A. Allen). WESTEC Services, Inc., Las Vegas, Nevada.
- Poche, R.M. [No Date]. Ecology of the spotted bat (*Euderma maculatum*) in southwest Utah. Utah Division of Wildlife Resources Publication No. 81-1.
- Poche, R.M. 1975. New record of *Euderma maculatum* from Arizona. Journal of Mammalogy. 56(4):931-993.
- Poche, R.M. and G.L. Baillie. 1974. Notes on the spotted bat (*Euderma maculatum*) from southwest Utah. Great Basin Naturalist. 34(4):254-256.
- Poche, R.M. and G.A. Ruffner. 1975. Roosting behavior of male *Euderma maculatum* from Utah. Great Basin Naturalist. 35(1):121-122.
- Reynolds, R.P. 1981. Elevational record for *Euderma maculatum* (Chiroptera: Vespertilionidae). Southwestern Naturalist. 26(1):91-92.
- Ruffner, G.A. R.M. Poche, M. Meierkord, and J.A. Neal. 1979. Winter bat activity over a desert wash in southwestern Utah 24(3):447-453.
- Secretaría de Desarrollo Social. 1994. Diario Oficial de la Federacion. p. 26.
- Secretaría de Medio Ambiente. 2000. Diario Oficial de la Federacion. p. 44.
- Senn, M. 1993. Personal communication.

- Snow, C. 1974. Habitat management series for endangered species. Report 4. Spotted bat *Euderma maculatum*. USDI Bureau of Land Management.
- Spicer, B. 1991. Wildlife Views. Arizona Game and Fish Department, 4-1991, pp17.
- Stock, A.D. 1983. Chromosomal homologies and phylogenetic relationships of the vespertilionid bat genera *Euderma*, *Idionycteris*, and *Plecotus*. Cytogenet. Cell Genet. 35:136-140.
- Tuttle, M. D. Available http://www.enature.com/fieldguide/showSpecies_LI.asp?imageID=18946).
- USDA, Forest Service, Region 3. 1988. Regional Forester's Sensitive Species List.
- USDA, Forest Service, Region 3. 1999. Regional Forester's Sensitive Species List.
- USDI, Bureau of Land Management. 2000. Arizona BLM Sensitive Species List. Instruction Memorandum No. AZ-2000-018.
- USDI, Bureau of Land Management. 2005. Arizona BLM Sensitive Species List.
- USDI, Fish and Wildlife Service. 1985. Endangered and Threatened Wildlife and Plants; Review of Vertebrate Wildlife; Notice of Review. Federal Register 50(181):37965.
- USDI, Fish and Wildlife Service. 1989. Endangered and Threatened Wildlife and Plants; Animal Notice of Review. Federal Register 54(4):561.
- USDI, Fish and Wildlife Service. 1991. Endangered and Threatened Wildlife and Plants; Animal Candidate Review for Listing as Endangered or Threatened Species; Proposed Rule. Federal Register 56(225):58807.
- USDI, Fish and Wildlife Service. 1994. Endangered and Threatened Wildlife and Plants; Animal Candidate Review for Listing as Endangered or Threatened Species; Proposed Rule. Federal Register 59(219):58985.
- USDI, Fish and Wildlife Service. 1996. Endangered and Threatened Wildlife and Plants; Animal Candidate Review for Listing as Endangered or Threatened Species; Proposed Rule. Federal Register 61(40): 7596.
- Van Zyll de Jong, C.G. 1985. Handbook of Canadian Mammals. Volume 2. Bats. National Museums of Canada, Ottawa, Ontario, Canada. 212pp.
- Wai-Ping, V. and M.B. Fenton. 1989. Ecology of the spotted bat (*Euderma maculatum*) roosting and foraging behavior. Journal of Mammalogy. 70(3):617-622.
- Walker, E.P. 1975. Mammals of the World. Third Edition. Volume I. The Johns Hopkins University Press, Baltimore. p. 368.
- Watkins, L.C. 1977. *Euderma maculatum*. Mammalian species. No.77:1-4. American Society of Mammalogists.
- Whitaker, J.O. 1980. The Audubon Society field guide to North American mammals. A.A. Knopf. New York. p. 327; plate 143.
- 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.
- Wilson D.E. et al. 1999. The Smithsonian Book of North American Mammals. Smithsonian Institution Press, Washington, in association with the American Society of Mammalogists, pp 118-119.
- Woodsworth, G.C., G.P. Bell and M.B. Fenton. 1981. Observations of the echolocation, feeding behavior and habitat use of *Euderma maculatum* (Chiroptera: Vespertilionidae) in south-central British Columbia. Can. J. Zool. 59:1099-1102.

MAJOR KNOWLEDGEABLE INDIVIDUALS:

E.L. Cockrum - University of Arizona, Tucson.
M.B. Fenton - Carleton University, Ottawa, Canada.
D.F. Hoffmeister - University of Illinois, Urbana.
G.A. Ruffner - Phoenix.
M. Herder - Bureau of Land Management

ADDITIONAL INFORMATION:

From the Greek *eu* meaning good or nice and *derm* meaning skin (refers to the unique color pattern) and the Latin *macula* meaning spotted.

Revised: 1991-08-08 (RBS)
1992-05-03 (BKP)
1992-09-30 (RBS)
1994-01-18 (SMS)
1994-03-25 (DCN)
1998-01-23 (SMS)
2002-11-20 (AMS)
2003-01-19 (AMS)

To the user of this abstract: you may use the entire abstract or any part of it. We do request, however, that if you make use of this abstract in plans, reports, publications, etc. that you credit the Arizona Game and Fish Department. Please use the following citation:

Arizona Game and Fish Department. 20XX (= **year of last revision as indicated at end of abstract**). X...X (= **taxon of animal or plant**). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.