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## SPOTTED BAT AND BIG FREE-TAILED BAT IN NORTHERN NEW MEXICO

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**ABSTRACT.** Mortality in big free-tailed bats, *Tadarida molossa*, led to investigations which resulted in collecting 61 of these bats, 2 spotted bats, *Euderma maculatum*, and other species. Bats were captured in mist nets over water. *T. molossa* flew at air temperatures as low as 55° F; young were generally captured earlier in the evening than adults. Individuals of this species flew at an elevation of 25 feet, singly or in groups of two or three. They flew in light rain and in less inclement weather and appeared to be attracted by captives of the same species. *Euderma maculatum* were captured when air temperatures were 58° and 64°. The rectal temperature of a resting spotted bat approximated its environmental temperatures, and the bat became torpid at lower temperatures. Captive bats of both species died after they developed lung lesions and other pathological conditions not seen in the field. Although rabies is known in *T. molossa* and may have been present, the infection was not confirmed in these specimens.

The spotted bat, *Euderma maculatum* (J. A. Allen), was formerly known from New Mexico by a single adult male found dead during September, 1903, in the Biological Laboratory of the New Mexico College of Agriculture and Mechanic Arts (Miller, 1903), now known as New Mexico State University, University Park, Dona Ana Co., New Mexico. An immature female big free-tailed bat, *Tadarida molossa* (Pallas), captured October 10, 1956, at Carlsbad Cavern, New Mexico, was reported earlier (Constantine, 1958). The present report concerns collections of two *Euderma* and sixty-one *T. molossa* at a locality in northern New Mexico.

In August, 1958, the writer received a report from the New Mexico Department of Public Health indicating that rabies had been diagnosed in bats found moribund at Ghost Ranch, 12 miles NW Abiquiu, Rio Arriba Co., New Mexico. In that month and the next the problem was investigated as time permitted. Field studies and collections were followed by laboratory observations and attempts to adapt bats to captivity for experiments and other purposes. Experiences are as follows.

*Field Studies.* The Ghost Ranch is in the piñon pine-juniper belt, on the boundary between watered canyons and dry open range. The main buildings of the ranch are situated at the entrance of Arroyo del Yeso, the walls of which in this area are composed of one hundred foot cliffs of Entrada sandstone. The elevation at the canyon entrance is

6,500 feet. Immediate water surface was represented by two swimming pools, a wading pool, a small marshy pond, a large earthen stock tank about sixty by one hundred feet in size, and a stream.

Beginning August 9 and terminating August 19, eighteen moribund or dead bats were found on the ranch. Seven males and seven females were recovered and proved to be immature *T. molassa*. Between August 14 and September 17, forty-seven *T. molassa* were mist-netted. Thirty were adult females, all but three of which were lactating, four were immature males, and thirteen were immature females. Two *E. maculatum* and other species were also taken at this locality. Details are given below.

Arriving at Ghost Ranch August 13, the writer was given a retrospective account of the problem by paleontologist John Ostrom. Ostrom had in his possession a live immature male *T. molassa*, clinically normal except for weakness. A number of other immature specimens, previously found dead or moribund, were retrieved from shallow graves and other sources. That evening two mist nets were set up at the larger swimming pool and the wading pool. Rain, which had fallen heavily in the late afternoon, continued intermittently until 11:15 P.M., when activities were terminated. Many bats, judged to be *Myotis*, avoided the nets. A *Myotis evotis* and one *Plecotus townsendi* were captured.

The following evening, August 14, a mist net was erected at one end of the stock tank and another along its side; the tank width was too great to properly accommodate the netting equipment at hand. A bat, possibly a *Myotis*, was seen at dusk. A flying bat, apparently a *T. molassa*, appeared at 8:30. As many as three similar bats were seen at any one time in what seemed to be intermittent visits to the tank until 12:15 A.M., when field activities were terminated. These bats made barely audible intermittent whistling sounds in flight, vaguely suggestive of sounds made by flying mourning doves. They could not be heard squeaking while in flight. They flew over the sides and ends of the tank at an elevation of about 25 feet, generally dropping to about six feet at the center of the tank. When a captive immature *T. molassa* was induced to squeak, the immediate area was "buzzed" by the flying bats, although they flew too high to be captured by a mist net. After about an hour of interrupted squeaking sessions, an adult female *T. molassa* flew directly at the young bat and was captured in the net. At 9:00 P.M. a dry immature female *T. molassa* was found on the bank of the tank, lying ventral side down. It did not squeak, struggle, or attempt to bite when picked up.

The Ghost Ranch was again visited August 19. Ostrum explained

that four bats, including an immature *T. molossa* at hand, had been found on the ground. Ostrum and Binx Little set up two mist nets at the large swimming pool and by 10:00 P.M., when they terminated their vigil, they had captured three immature *T. molossa* and one *Myotis subulatus*. Meanwhile, the writer and Elliott J. Wescott, Jr. had installed three double-length mist nets at three points across the earthen stock tank, perpendicular to its long axis. A life raft had been obtained to recover captured bats. The watch began at 7:00 P.M. and lasted until sunrise. Light sprinkles fell sporadically throughout the night, following a heavy shower that afternoon. Temperatures ranged between 60 and 70 degrees Fahrenheit during the night. Occasional winds were present in the early evening, but the air was nearly motionless after 9:00 P.M. At 8:20 P.M. the first *T. molossa* was captured. During the forty-five minutes that followed nearly all the immature *T. molossa* taken that night were captured. Practically all adults were taken from then until dawn. The bats were usually captured singly, although three were taken at 4:00 A.M., and event repeated shortly thereafter. Bats were captured during very light rain, but not during somewhat heavier showers. The last *T. molossa* were seen flying together at 4:45 A.M., when one of two was captured, the other seeming to dodge over the net. The following *T. molossa* were netted that night: twenty-five lactating and three nonlactating adult females, eight immature females, and four immature males. About two-thirds of these bats were captured at one end of the center net, adjacent to the bat holding cage, which contained squeaking captured bats, suggesting attraction of the flying bats by the caged bats.

Other bats captured that night included an adult male *Lasionycteris noctivagans* (Le Conte) with descended testes, netted at 2:30 A.M. An adult male *Euderma maculatum* was netted at 3:00 A.M., during a lull between light showers, when the temperature was 64 degrees Fahrenheit and the relative humidity was 78 per cent. The gonad position could not be determined. At 3:45 A.M. an adult male *Lasiurus cinereus* was captured; again, the gonad position was obscured by hair. At 5:00 A.M. a non-lactating adult female *Myotis subulatus* was captured.

The writer returned to Ghost Ranch September 17, accompanied by Floyd W. Worrell. It was learned that no bats had been found on the ground since the last trip. Three double-length mist nets were again suspended over the earthen stock tank and attended all night. The weather that day had been clear and warm. The sky remained clear throughout the night. A nearly constant moderate wind was present until 1:00 A.M., when it subsided for about an hour, then returned sporadically until dawn. At 7:00 P.M. an immature female *T. molossa*

was captured and another at 7:35 P.M. Three more immature females were taken singly between the latter time and 10:30 P.M., when a lactating adult female *T. molossa* was taken. This species was heard on the wing until midnight, but no more were captured.

At 8:38 P.M. an adult male *Euderma* was captured. Its abdomen was distended. The position of the testes could not be determined. At that time the temperature was 58° F., the relative humidity 42 per cent. At 11:00 P.M. an adult male *Tadarida brasiliensis* was captured. By 12:30 A.M. the temperature was 55° F., becoming progressively cooler throughout the morning. At 1:00 A.M. an old female *Tadarida brasiliensis* was taken, and an adult male *Antrozous pallidus* was captured at 4:00 A.M.

*Laboratory Studies.*—The *Euderma* captured the morning of August 20 had a gentle disposition, did not seem to resent handling, and made no effort to bite or escape. It rarely uttered audible vocal sounds in captivity. By that afternoon the bat had been placed in a cage within a room maintained at about 86 degrees Fahrenheit. The following day the bat consumed five mealworms, increasing this to sixteen mealworms a day on the days that followed. On August 22 the bat was photographed in an adjacent room. On August 27 it was found dead on the floor of its cage. Autopsy revealed the bat was molting. Testes were in the inguinal ring and measured 2 by 4 mm. in size. This bat was negative for rabies. It was made into a skin, field number C1137, and is now in the care of the Southwest Rabies Investigations Station.

The *Euderma* captured September 17 had an unpleasant disposition, biting and fighting desperately when handled and scolding with continuous utterances similar in sound to a somewhat run-together “tic-tic-tic-tic.” This vocalizing was stimulated even as one would walk past the bat’s cage. Its rectal temperature, taken with a Schultheis thermometer, was 26.4° C. after the bat had remained motionless for an hour at a room temperature of 25.4° C. After remaining in a refrigerator for two hours, the bat’s rectal temperature was 8.9° C., when the temperature of water in the bottom of a small bottle, kept in the refrigerator, was 8.8. In its artificially-induced state of torpidity, the bat’s enormous ears assumed a position also seen during periods of slumber at room temperatures: curled laterally and downward over the forearm, continuing medially and then upward until the distal end of the ear lay in a position between the forearm and the head. At other times, during light naps or when resting at room temperature, the ears either failed to encircle the forearms or were in positions intermediate between the completely “rolled” state and the erect position assumed

in flight, when the medial ear margins touched for about half their length. The first guano pellets eliminated by this bat following capture were saved for studies of the natural diet. They consisted of moth particles (Ross, 1961). This bat responded at once to the routine diet of mealworms and vitamin drop supplement. However, on November 6, 1958, it failed to eat and was found dead the following day, still hanging from the top of its cage. Autopsy revealed no evidence of molt. The testes, measuring 2 by 4 mm., were in the inguinal ring. The liver was unusually pale, and the lungs contained irregular and widely disseminated areas of hemorrhage. This bat was negative for rabies. It was made into a skin, field number C1175, and it is now in the mammal collection of the University of New Mexico, Albuquerque.

*Tadarida molossa* is more difficult to adapt to life in captivity than is *T. brasiliensis*. It reacts to handling with wild struggles to escape and by biting. These bats were subjected to a captivity program successfully employed on a smaller scale in *T. brasiliensis* (Constantine, 1952). They never learned to feed themselves, and the young bats died within several weeks. Although many of the bats learned to accept mealworms when these were placed in their mouths, a greater number were fed with great difficulty. The mealworm diet was supplemented by vitamin drops, but eventually the oral mucosa, especially the gums, would bleed at the slightest irritation. Upon autopsy several bats showed ascites, pneumonic lesions, and enlarged, yellow, friable livers. An associated purulent conjunctivitis disappeared when strict sanitary procedures were imposed. Many bats broke their own humeri while struggling to avoid hand restraint. By November 18, all but twelve had died. By February 1, 1959, only three were left. At that time their gums bled when gently rubbed with a wetted cotton swab. They were sacrificed in experiments shortly thereafter. All specimens were saved as skins, skeletons or in formalin and distributed to various institutions, including University of New Mexico, Texas A&M College, Harvard University, California Academy of Sciences and Los Angeles County Museum. Most of them were decomposed when it was discovered they had died, so rabies infection rate could not be determined. The Southwest Rabies Investigations Station tested thirty-one netted bats and two moribund bats for rabies by the mouse inoculation test, and whereas tests on thirteen of the former and one of the latter showed the possible presence of rabies, in each instance the suspect agent could not be perpetuated or reproduced in subsequent mouse passage. Thus, it was not possible to confirm rabies infection by the neutralization test. The state laboratory reported rabies-positive mouse

inoculation tests representing two of the moribund *T. molossa* found August 9 and another retrieved from the mouth of a dog on August 17. However, the agents were not subjected to final confirmation by the neutralization test and the diagnosis of rabies must be considered tentative. The Southwest Rabies Investigations Station has since confirmed the presence of rabies by the specific neutralization of an agent isolated from a moribund immature female *T. molossa* from another part of the state.

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