Blood glucose values were within the range reported by O'Meara and Gill (1962) and were slightly higher than those reported by Bandy et al. (1957) for black-tailed deer. The high blood glucose level in young fawns followed by a decline, has previously been described in other young ruminants, and is associated with the physiological development of the ruminant stomach.

In fawns, total serum protein increased steadily from 5.4 g/100 ml near birth to 10.3 g/100 ml at 4 to 6 months. A noticeable decrease to 6.8 g/100 ml occurred at 7 to 10 months. An increase followed in the succeeding age group (11 to 12 months) to 8.4 g/100 ml, an apparently stable total serum protein level for adult deer.

Some of the most dramatic changes occurred in serum protein fractions. Albumin rose steadily from an initial value of 37.4% to 75.5% at 7 to 10 months. From this point a gradual decline occurred with age to 55.7% at 4 to 5 years. Alpha- and β-globulins generally showed slight variations. Gamma-globulin comprised a high proportion of serum proteins initially (31.7%), presumably as a consequence of absorption of colostral γ-globulin shortly after birth. These values decreased rapidly to 10.5% at 15 to 28 days and rose slightly in deer that were 3 years old and older.

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**Literature Cited**


**ACTIVITY PATTERNS OF SOME NEOTROPICAL BATS**

Two recent studies (Jones, 1965; Cockrum and Cross, 1964) have described the patterns of nocturnal activity of bats in the southwestern United States. These bats were almost exclusively insectivorous representatives of the families Vespertilionidae and Molossidae. The present paper presents similar data on eight species of Costa Rican bats representing four families (Molossidae, Noctilionidae, Phyllostomatidae, and Desmodontidae) and includes species that feed on insects, fish, fruit, and blood.
Fig. 1.—Nocturnal activity patterns of eight species of Costa Rican bats. Each graph represents the total catch for two successive nights taken within each two-hour sampling interval.

Temporal patterns of activity were determined by setting two mist nets at different heights (0.8 to 3.0 and 3.6 to 5.8 m) over a body of running water. At each locality these nets were tended for two successive nights and all captures were removed and recorded at two-hour intervals beginning at 1900 hours each night. In February and March of 1966,
eight species, representing three localities, were taken in sufficient numbers to warrant preliminary conclusions about their activity patterns. The samples are as follows: 1) Río Higueron, near sea level, ½ mi. E Finca Jiménez, Guanacaste Province, on 13 to 15 February (34 Noctilio labialis, 10 Noctilio leporinus, 30 Artibeus jamaicensis, 21 Phyllostomus discolor, 15 Sturnira lilium, and 13 Desmodus rotundus); 2) Río Agua Buena, near sea level, Osa Peninsula, Puntarenas Province, on 5 to 7 March (15 Molossus ater); 3) Río Guacimal, elevation 1320 m, Monte Verde, Puntarenas Province, on 25 to 27 February (24 Sturnira ludovici). Diets of these bats were determined by stomach analysis and by referring to the diets reported for members of the same species by Goodwin and Greenhall (1961).

The distribution of the catches of the eight species during the night are shown in Fig. 1. It is apparent that N. labialis and M. ater differ from all other species in having high levels of activity in the evening and low levels during the remainder of the night. The other species all show much more activity in the late night and early morning hours. The three species represented by the largest samples have somewhat different patterns. P. discolor maintains relatively constant activity throughout the night; A. jamaicensis has a prominent peak in the middle of the night; and S. ludovici shows a suggestion of a peak just before dawn.

Although it would be premature to draw definite conclusions before extending this sort of study to include other sampling methods and more populations and species of tropical bats, a tentative generalization is suggested by these data. Both temperate and tropical insectivorous bats tend to be most active shortly after sunset and almost completely inactive during the latter part of the night. This generalization certainly seems to hold for the 19 species of vespertilionids and molossids studied in New Mexico and Arizona by Jones (1965) and Cockrum and Cross (1964), all of which had peaks of activity within 3 hr after sunset and virtually no activity during the last half of the night. Similar patterns are exhibited by the tropical insect-eating species, N. labialis and M. ater, which have pronounced peaks within an hour after sunset.

In contrast, tropical fruit-eating bats, and perhaps fish-eating and blood-drinking forms as well, tend to have their activity more evenly distributed over the dark hours, and some species have definite peaks later in the night when the insect-eating bats are least active. Certainly the frugivorous (A. jamaicensis, P. discolor, S. lilium, and S. ludovici), sanguivorous (D. rotundus), and partially piscivorous (N. leporinus) populations studied here seem to support this generalization. The diets and activity patterns of the two species of Noctilio are described in more detail elsewhere (Hooper and Brown, 1968).

The most reasonable explanation of these differences between the activity patterns of the insect-eating bats on the one hand, and the fruit-eating, fish-eating, and blood-drinking species on the other, is a simple one. The evening peak in the activity of insectivorous species probably represents an adaptation to a corresponding peak of the crepuscular and nocturnal insects on which they prey. Data on diel periodicity of activity in either tropical or temperate insect communities are difficult to obtain. Corbet (1966) found that some Trichoptera tend to emerge and oviposit shortly after sunset. Clements (1963) summarized the data on mosquitoes, most of which have swarming or foraging flights at twilight. It is probable that many other groups of insects commonly fed upon by bats, including small Coleoptera, Lepidoptera, and Hemiptera, behave similarly.

The non-insectivorous species apparently have more generalized nocturnal habits with peaks of activity, if any, relating to specific aspects of the biology of particular species. Thus, D. rotundus is active in the darkest part of the night when the diurnal vertebrates from which it obtains blood are most likely to be inactive and asleep. The apparent peak just before dawn in the activity of S. ludovici is perhaps related to weather. In the cloud forest where this species was taken, the almost continual mist and rains are often interrupted by clearing weather just before dawn. I can offer no explanation for the peak near midnight in the activity of A. jamaicensis, but it is interesting that a similar study of this species on the Osa Peninsula in early August of 1967 revealed a pattern almost identical to that reported here (R. W. McDiarmid, personal communication).
These data were gathered as part of a class project by the students of the Biology of Tropical Vertebrates course of the Organization for Tropical Studies. I am grateful to E. T. Hooper, G. A. Bartholomew, and T. R. Howell for critically reading the manuscript, and to T. H. Hubbell and R. M. Bailey for assistance with the identification of stomach contents.

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FIRST RECORD OF THE PLAINS POCKET MOUSE IN NEW MEXICO

Two adult plains pocket mice, Perognathus flavescens, a male and female (TT nos. 5393, 6126), were collected on 10 August 1967 at a place 8 mi. W Caprock, Chavez Co., New Mexico. Two subadult females (TT nos. 5391, 5392) were taken at the same locality on 21 October 1967. These four specimens (all deposited in the Texas Technological College Mammal Collections) provide the first record of occurrence of this species in New Mexico. Extreme eastern New Mexico was postulated by Hall and Kelson (The mammals of North America, 1: 477, 1959) as within the range of Perognathus flavescens. To my knowledge, the nearest localities of record are in Bailey and Andrews counties, Texas, approximately 75 miles northeast and 110 miles southeast, respectively, of the New Mexico station (Davis, Bull. Texas Game and Fish Comm., 41: 151, 1960).

External measurements (mm) of the two adult specimens from New Mexico are as follows: total length, 131, 127; length of tail vertebrae, 58, 56; length of hind foot, 17, 16; length of ear from notch, 8, 7.

The adult specimens from New Mexico were compared by me with specimens collected near the type locality of both P. f. copei (9 mi. E Stinnett, Hutchinson Co. Texas) and P. f. flavescens (Valentine Wildlife Refuge, Cherry Co., Nebraska). From P. f. flavescens, they differ in being yellow (10YR 7/6) instead of pale brown (10YR 6/3) dorsally (color terms are from the Munsell Soil Color Charts, Baltimore, Maryland, 1954); in external measurements they have a shorter tail, hind foot, and ear. From P. f. copei, they differ in being shorter in total length and in length of ear, but there are no appreciable differences in dorsal pelage color. Because the specimens from New Mexico resemble P. f. copei in external appearances, I tentatively assign them to that subspecies.

The pocket mice from New Mexico were collected in live traps and snap traps from a mesquite-scrub oak-grass association on the Mescalero Sands in association with Dipodomys ordii, Onychomys leucogaster, and Peromyscus leucopus.—DAVID J. SCHMIDLY, Department of Biology, Texas Technological College, Lubbock, 79409 (present address: Museum of Natural History, University of Illinois, Urbana, 61801). Accepted 20 March 1968.