

SYMPOSIUM ON BAT RESEARCH IN THE SOUTHWEST

On November 27 and 28, 1970 a conference was held in Tucson, Arizona, concerning current investigations of various aspects of the biology of bats. The meeting was organized by Roy Horst with the assistance of James Findley, Eugene Studier and Terry Vaughan and was hosted by the University of Arizona and the Arizona-Sonora Desert Museum. The meeting consisted for three formal sessions at which 26 papers were presented, as well as two unscheduled reports. The program, with abstracts of each paper, was as follows:

Friday afternoon, November 27, 1970 at the University of Arizona

Anatomy and Physiology, Terry Vaughan, Moderator

SEX-RELATED ENZYME ACTIVITY IN THE KIDNEY OF THE FREE-TAILED BAT (TADARIDA BRASILIENSIS CYNOCEPHALA) AND THE ALBINO MOUSE (ICR STRAIN). Richard M. Webster, Department of Anatomy, Louisiana State University Medical Center, New Orleans, Louisiana, 70119. Spectrophotometric studies indicate sex-related differences in the in vitro enzyme activity of whole kidney homogenates from albino mouse littermates maintained on a light-dark cycle (lights on: 0600-1800) and free-tailed bats captured in November. By centrifugation (37,000 g) of individual kidneys previously homogenized in 0.3 M sucrose, a supernatant (S₁) and a pellet were obtained. The latter was resuspended in 0.1 percent Triton X-100 to disrupt the membranes and was recentrifuged to produce a second supernatant (S₂). Significant differences (p<0.05) between the supernatants of the male and female mice were observed in the specific activity of acid phosphatase (S₁), 6-phosphogluconate dehydrogenase (S₂), and beta-glucuronidase (S₁ and S₂). Enzyme assays on the bat kidneys indicated that only beta-glucuronidase (S₂) might be sex-related. No significant differences were apparent in the glucose-6-phosphate dehydrogenase activity or the renal soluble protein of either bat or mouse supernatants.

THE RENAL ANATOMY OF THE FISH-EATING BAT, PIZONYX VIVESI. Eldon J. Braun, Department of Physiology, University of Arizona Medical Center, Tucson, Arizona, 85724. The kidney of Pizonyx vivesi is unipyramidal with the papilla extending into the proximal end of the ureter. The cortex is thin and sharply demarcated

yielding a high relative medullary thickness. The medullary tissue shows a very distinct boundary between the inner and outer zones. The majority of the nephrons have long loops of Henle which extend deep into the renal papilla. The cell types of the individual components of the nephron have no unusual features; however, as the collecting ducts reach the inner zone of the medulla the cell structure abruptly changes from a cuboidal type to a squamous type.

RESPIRATORY WATER LOSS IN THE VAMPIRE BAT DESMODUS ROTUNDUS. Roy Horst and Tyler Youngkin, University of Arizona Medical Center, Tucson, Arizona, 85724. Previous studies of imperceptible water loss in bats were limited to one or two parameters, with other parameters either lost or ignored, since such measurements were generally made in more or less open systems. This investigation utilizing a closed system simultaneously measured oxygen consumption, carbon dioxide production, imperceptible water loss, urine production, fecal water loss, ambient temperature (T_a) and body temperature (T_b). At T_a 27° and T_b 35° C mean oxygen consumption in 30 resting vampire bats was 2.87 ± 0.66 ml O_2 per gram body weight per hour and mean evaporative water loss was 2.42 mg H_2O per ml O_2 consumed. At T_a 18° C T_b tends to drift downward with a concomitant, but erratic, rise in oxygen consumption to 3.65 ml O_2 /gram body weight/hour in seven animals with an attendant water loss of 1.67 ± 0.80 mg H_2O per ml consumed O_2 . While oxygen consumption rises, suggesting a generally unsuccessful attempt at homeothermy, water lost decreases relative to oxygen consumption so that actual water loss remains surprisingly constant in spite of increased ventilation. This observation may indicate some recovery of water in the exhalation phase of respiration such as described in the kangaroo rat. Such an adaptation would facilitate the vampire bat's occupation of the relatively arid environments in which it is frequently found. Supported by N.I.H. Grant #AM 13345.

SODIUM CHLORIDE EXCRETION IN AUSTRALIAN BATS. Roger E. Carpenter, Department

of Zoology, San Diego State College, San Diego, California, 92115. Previous calculations of the water turnover of bats concluded that the success of insectivorous bats in the Sonoran Desert was dependant on their abilities to fly to fresh water. Some preliminary measurements were made on urine concentrating abilities of five species of bats from Australia, where deserts are of greater extent than those of North America. Doses of approximately 600 mEq NaCl/liter were given by stomach tube to Miniopterus schreibersii, Chalinolobus gouldii, Macroderma gigas, Eptesicus pumilus, and Taphozous georgianus. Subsequent urine samples were collected and analyzed for chloride concentration as an index of urine concentrating abilities. Mean maximum urine concentrations ranged from 403 mEq Cl⁻/liter for M. schreibersii to 549 mEq Cl⁻/liter for T. georgianus, but with few significant differences between species. When these values are compared with original data from four North American species, the few differences are more closely associated with diet, rather than with habitat. The five Australian species appear equally dependant on fresh water, assuming similar behavior for all nine species, and recognizing renal function as the chief mediator of water balance. This conclusion is supported by collecting data and distributions of the species.

COMPARATIVE GASTRO-INTESTINAL HISTOLOGY OF SELECTED AMERICAN BATS. C. Stanley Rouk, Department of Biology, Baylor University, Waco, Texas, 76703. Apparent trends in gastro-intestinal histology of bats are discussed. The stomachs of frugivorous and nectivorous bats tend to be more saccular than in insectivorous bats. The stomach of sanguivorous bats is greatly elongated, containing acinar gastric glands unlike the tubular gastric glands of other species. Chief cells are virtually absent from the gastric glands of nectivorous Leptonycteris sanborni. Well developed villi are present in the small intestine of all species examined, although they tend to be most numerous in nectivorous and frugivorous species. The lamina propria of the villi in sanguivorous bats contains large

numbers of lymphocytes, the functional significance of which may be associated with protection against undigested dietary immuno-globulins. Some epithelial cells in the small intestine of Myotis lucifugus occultus are connected to lacteals by long slender basal processes. These cells may have an important role in lipid absorption.

SEASONAL TEMPERATURE RELATIONSHIPS IN MYOTIS LUCIFUGUS AND MYOTIS THYSANODES.

Eugene H. Studier and Michael J. O'Farrell, Institute of Scientific Research, New Mexico Highlands University, Las Vegas, New Mexico 87701. Studies of thermal relations of Myotis lucifugus and M. thysanodes throughout their tenure in summer colonies show that summer populations of both species tend to regulate body temperatures (T_B) at relatively low ambient temperatures (T_A). Although more pronounced in M. thysanodes, these bats regulate during pregnancy and post-lactation but not lactation. Individuals of both species "shift" from regulating to conforming and vice versa at relatively low T_A s. The tendency to regulate during pregnancy is significantly greater in mid-pregnancy than in early or late pregnancy. Regulating, lactating bats maintain T_B s significantly lower than pregnant or post-lactating regulators. Regulated T_B of M. thysanodes always exceeds that of M. lucifugus in comparable reproductive conditions. Regulators can be distinguished from conformers only at T_A s below 24 and 20° C in M. thysanodes and M. lucifugus, respectively. Bats become partially hyperthermic in T_A s above 24 and 20° C in M. thysanodes and M. lucifugus, respectively. Thermal patterns of males and females are similar in these species. Minimum T_B required for flight averages 30.3 and 24.3° C for M. lucifugus and M. thysanodes, respectively. Adult-like metabolic patterns appear no later than 4.6 and 9.6 days after birth in M. thysanodes and M. lucifugus, respectively.

THE COMPOSITION AND PROPERTIES OF BATS' MILK. Robert Jenness, R. L. Glass, and E. H. Studier, Department of Biochemistry, University of Minnesota, St. Paul, Minnesota, 55101 and Department of Biology, New Mexico Highlands University, Las Vegas, New Mexico, 87701. Milk specimens were collected in the summer of 1969 from bats of 22 species representing five families. Gross analyses were not very accurate because of the small samples but in any event they did not reveal important systematic differences in the proportions of fat, sugar, and proteins. The milk fats of insectivorous species contained much more linoleic acid than those of nectar- and fruit-eating species. Milks of all species contained considerable concentrations of citrate which probably means that bats do not synthesize a major portion of the milk fatty acids from glucose. The principal dialyzable carbohydrate was lactose in all cases. Electrophoretic patterns of the whey proteins revealed a number of milk specific proteins not present in blood serum and the patterns were also species specific.

SPECIES DISTRIBUTION OF A TOXIC PROTEIN IN THE SEMINAL VESICLE OF BATS.

William J. Bleier and Robert J. Baker, Department of Biology, Texas Tech University, Lubbock, Texas, 79409. Hunter and his colleagues found a toxic protein in the seminal vesicle of Myotis lucifugus. They hypothesized that this protein functions in delayed fertilization by inhibiting smooth muscle contraction in the uterus and inhibiting phagocytic action of the white blood cells. Our study was designed to determine what other species of bats produce a toxic protein in their seminal vesicles. The seminal vesicle protein of Eptesicus fuscus, Lasiurus cinereus and a single Myotis velifer were toxic to white mice, whereas seminal vesicle homogenate from Myotis thysanodes, Plecotus townsendii, Anthrozous pallidus, and Macrotus waterhousii were not. Certain seminal vesicle extracts that were toxic to white mice were not toxic to Tadarida brasiliensis or Macrotus waterhousii even in tripled dosages. Toxicity also appears to vary with

reproductive condition of the male bats and also with respect to geographical distribution.

Saturday morning November 28, 1970 at the Arizona Sonora Desert Museum

Development and Systematics, E. Lendell Cockrum, Moderator

GROWTH AND DEVELOPMENT IN TWO SPECIES OF BATS, MYOTIS LUCIFUGUS AND MYOTIS THYSANODES. Michael J. O'Farrell and Eugene H. Studier, Institute of Scientific Research, New Mexico Highlands University, Las Vegas, New Mexico, 87701. A preliminary study on selected aspects of pre- and postnatal growth and development revealed that when logarithmic regression lines were calculated for prenatal weight increase for both species, intercept and slope were significantly different ($P < 0.001$), with Myotis lucifugus showing more rapid growth rate. There are no significant differences between prenatal linear measurements of growth, such as forearm and crown-rump length, in either species. Regression equations for postnatal weight, forearm, span and fifth finger length for M. thysanodes were calculated and these measures are good criteria for estimating age to about 21 days, at which time this species has attained adult size. M. thysanodes was capable of limited flight at 16.5 days and capable of adult-like flight at 20.5 days. M. lucifugus closely parallels this attainment. Wing loading for both species increases slightly from birth to 6 days followed by a decline to one-half the birth value by day 20. Aspect ratio for both species increases steadily from birth to about 16 days at which time it decreases slightly until the adult value is attained.

CHROMOSOMAL VARIATION IN RHOGEESSA. Brent L. Davis and Robert J. Baker, Department of Biology, Texas Tech University, Lubbock, Texas, 79409. Chromosomal variation in the genus Rhogeessa ranges in diploid number from 30-44 with the fundamental number staying at 50. Diagnostic features to separate R. parvula

from R. tumida have been limited in number and have required study in each geographic area. Chromosomal characteristics appear to readily separate the two species.

HORMONAL CONTROL OF "DELAYED DEVELOPMENT" IN MACROTUS WATERHOUSII, I. ROLE OF THE THYROID. John M. Burns, Robert J. Baker, and William Bleier, Department of Biology, Texas Tech University, Lubbock, Texas, 79409. Studies were begun over a year ago in our laboratory to gain insights into the unique reproductive physiology pattern displayed by the California leaf-nosed bat. Females were collected from southern Arizona in all possible stages of reproductive condition ranging from immature to lactation. Pregnant animals were placed in a 10-20 foot greenhouse which had been especially modified for that purpose. The animals were maintained at 72° F and fed a more than sufficient diet of crickets and meal worms. The new environment had no effect on the gestation period and pregnancy proceeded in a normal pattern. Plasma thyroxine concentration and histological sections of the thyroid gland were also studied from animals in various stages of reproduction. It was found that during the diapause in embryonic growth the plasma thyroxine concentration fell from one-fourth to one-fifth the concentration of animals in very early or late pregnancy or of that in lactating individuals.

CHROMOSOMAL RACES IN URODERMA BILOBATUM. V. R. McDaniel, Brent L. Davis, and Robert J. Baker, Department of Biology, Texas Tech University, Lubbock, Texas, 79409. Three chromosomal races are known for Uroderma bilobatum. One race (2N=44, FN=50) is known only from southern Chiapas, and involves part of the subspecies U. b. convexum. Another race (2N=42, FN=50) is known from eastern and southern Colombia and Trinidad, and involves the subspecies U. b. bilobatum and U. b. trinitatum. The third race (2N=38, FN=44) is known from Tabasco,

Veracruz, and western Colombia, and involves the subspecies U. b. molaris and part of U. b. convexum. The data gives rise to interesting systematic implications.

THE TADARIDA BRASILIENSIS POPULATIONS OF CALIFORNIA. Philip Leitner and Albert J. Beck, Biology Department, Saint Mary's College of California, St. Mary's College, California, 94575 and School of Public Health, University of California, Berkeley, California. We have studied Tadarida brasiliensis populations in northern and central California intensively at about 100 roosting localities over the past seven years. More than 75,000 bats have been banded and over 10,000 recoveries obtained to date, giving quite a complete picture of the biology of these populations through their annual cycle. T. brasiliensis in our study area are non-migratory and winter-over in the same general regions where they are found in summer. No recoveries of banded animals have been reported east of the Sierra Nevada, in the Mojave Desert, or in the coastal areas of southern California. While local population shifts occur (for example, the dispersal of young from maternity colonies), these very rarely involve movements of more than 100 miles. In northern and central California, T. brasiliensis populations depend almost exclusively on man-made structures both for maternity roosts and hibernacula. Most maternity colonies are located in the hot, dry interior valleys, while adult males tend to spend the summer in the cooler coastal valleys. During the colder winter months these bats characteristically hibernate in buildings at ambient temperatures of 15 to 20° C.

TAXONOMY OF MYOTIS YUMANENSIS AND MYOTIS LUCIFUGUS IN THE INTERIOR SOUTHWEST. Arthur H. Harris, Museum of Arid Land Biology, University of Texas at El Paso, El Paso, Texas, 79999. An NSF sponsored study of Myotis yumanensis in the interior Southwest indicates four populations showing geographic isolation from each other. Bats from the Upper Colorado Drainage in Arizona, Utah, Colorado

and New Mexico are large in most dimensions. Bats from the Lower Colorado, Rio Grande, and most eastern drainages are medium sized, though tending to be somewhat larger in the northern portions of their range. Bats from northern Chihuahua and from the eastern foot of the Sierra Nevada are small. Myotis lucifugus in eastern California is highly variable in color and varies clinally from large at Mono Lake to small at Owen's Lake (Keeler). The Keeler specimens show no evidence of hybridization with M. yumanensis. Myotis lucifugus and M. yumanensis show little overlap in mastoid breadth, regardless of overall size. The dark ear membranes and burnished fur of M. lucifugus are external characteristics usually sufficient for separating the two species.

A TENTATIVE DEMOGRAPHIC ANALYSIS OF A MATERNITY COLONY OF PALLID BATS.

Russell Davis, Department of Biological Sciences, University of Arizona, Tucson, Arizona, 85721. A maternity colony of pallid bats (Antrozous pallidus), located near St. David in southern Arizona, has been studied continuously from 1966 through 1970. In the colony in 1970, the following age groupings of 79 adult females were noted: five years or older - 14 (17.6%), four years old - 4 (5.1%), three years old - 18 (22.8%), two years old - 20 (25.3%), one year old - 23 (29.1%). Long-line matrilineal relationships do occur, but the data do not indicate that relationships are essential to the structure of the colony. Of the adult females present in 1970, only 35% had any known relationship with any other members of the colony. The possibility still exists, however, that relationship may be the basis of sub-groups within the colony. The size of the colony and the production of young have remained relatively stable throughout the period of the study: production for 1966 - 174% (65 adult females), for 1967 - 151% (55 adult females), for 1968 - 139% (49 adult females), for 1969 - 137% (74 adult females), and for 1970 - 144% (71 adult females).

STATUS OF LEPTONYCTERIS NIVALIS IN BIG BEND NATIONAL PARK TEXAS, David A. Easterla, Department of Forestry and Conservation, Purdue University, Lafayette, Indiana, 47907. Seven capture sites are reported for the Mexican Long-tongued Bat (Leptonycteris nivalis) at Big Bend National Park, Brewster County, Texas. Data are given on a four-year decline and disappearance of L. nivalis at Mt. Emory Cave, the only colony location known for the United States. Three capture sites were in the Lower Sonoran Life Zone (arroyo-mesquite-acacia, and lechuguilla-creosote bush-cactus plant associations). This is the first report indicating L. nivalis is not limited to the Transition and Canadian Life Zones (pine-oak forests).

THE ROLE OF THE UTERUS IN THE REPRODUCTIVE BIOLOGY OF HIBERNATING BATS. Philip H. Krutzsch, Department of Anatomy, University of Arizona Medical Center, Tucson, Arizona, 85724. One of the most intriguing reproductive adaptations of hibernating vespertilionid and rhinolophid bats is the remarkable survival of the spermatozoa without loss of viability or fertilizing capacity for many months in the reproductive tract of the torpid bat. Preliminary studies have produced evidence that in Myotis lucifugus there seems to exist a specialized site for sperm storage which is different from the rest of the female tract in the relative numbers of sperm present. The nature of the sperm's physical positioning with respect to the uterine epithelium is also different since sperm orient themselves intimately in respect to epithelial cells with special histochemical characteristics. Some sperm destruction occurs here at the tubo-uterine junction, but is abundantly in evidence elsewhere in the uterus. The entire uterus appears not to serve as a winter sperm storage organ in Myotis lucifugus. Biochemical characterization of the uterus and its accumulated luminal secretions has demonstrated nonseminal fructose. Manipulation of the levels of this sugar by parenteral administration of female hormones (estrogen-

progesterone) following surgical ablation of the primary female sex glands (ovaries) has further defined this uterine role.

Saturday afternoon, November 28, 1970 at the Museum

Ecology and Behavior, Eugene Studier, Moderator

PHENETIC RELATIONSHIPS IN THE GENUS MYOTIS. James S. Findley, Museum of Southwestern Biology, University of New Mexico, Albuquerque, New Mexico, 87106. Centroid factor analysis reveals that the species of Myotis occur phenetically in three major clusters, suggestive of three major modes of feeding and foraging. These are: (1) water surface foragers, (2) hovering surface gleaners, (3) aerial insect capturers. Each group is distinguished by a suite of morphological traits which seems to equip it for the postulated mode of life. Limited behavioral data seems to support the morphological hypothesis.

MUTUALISTIC ADAPTATIONS OF BAT POLLINATORS AND THEIR HOSTS. Donna J. Howell, Department of Biological Sciences, University of Arizona, Tucson, Arizona, 85721. The syndrome of chiropterophily is discussed with regard to mutualistic physiological adaptations of Leptonycteris and a floral complex extending from Arizona through Mexico. Amino acid content of pollens and insects ingested was measured. Experimental animals were given nectar diets with controlled nitrogen content; waste products were analyzed for gross nitrogen. The resistant exine of pollen as a limiting factor for utilization was investigated. Standard culture methods were used to determine the possibility of a symbiont urea-hydrolyzing bacteria. Field locations of the bat were correlated with the range and phenology of chiropterophilous plants. Stomach and guano pollens were identified. These data indicate that certain pollens provide sufficient nitrogen to maintain adult Leptonycteris and that pollens of chiropterophilous plants are higher in amino acids than related species pollinated by other means. A bacteria that can

be maintained on a urea medium is present but gives a negative test for amino acids. Field locations of leptonycterids coincide with blooming times of certain plants, in fact, plant ranges may be determined by the range of these bats.

THE MYOTIS NIGRICANS COMPLEX IN SOUTH AMERICA. Richard K. LaVal, Prairie View A & M College, Prairie View, Texas, 77445. Of 11 species of bats of the genus Myotis in South America, six have been widely identified as M. nigricans. M. nigricans, a nondescript blackish species lacking a sagittal crest, is widespread in South America. M. keaysi, a cave bat restricted to the Andes, is distinguished by a heavily furred uropatagium and a narrow sagittal crest. M. riparius, a species characterized by short, woolly fur and a high sagittal crest, is widespread but rare in tropical and subtropical lowlands of South America. M. albescens, a lowland species widespread in South America, is normally easily distinguished by the very narrow white or yellow tips of the black dorsal hairs. A few populations lack this characteristic. M. atacamensis, restricted to the coastal desert of Peru and Chile, resembles the North American M. californicus in pale coloration and small size. M. sp. nov., known only from three localities in the coastal scrub-desert of northwestern Venezuela, is unique among South American Myotis in that the third metacarpal equals or is but slightly exceeded by the forearm in length, whereas in the other species the forearm is always longer.

REPRODUCTIVE PATTERNS AND DEVELOPMENT OF MYOTIS VELIFER IN KANSAS. Thomas H. Kunz, Museum of Natural History, The University of Kansas, Lawrence, Kansas, 66044. Essential features of reproduction and development of Myotis velifer were examined. The von Bertalanffy decaying exponential growth analysis was used to describe weight and linear growth of young. Growth functions were computed to provide measures for descriptive comparisons. The inception of parturition

occurred in the second week of June and the period of parturition extended for approximately four weeks. By the end of the third week of June, more than one half of the gravid females had given birth. No differences between sexes in weight or linear measurements of young were noted at birth or in early stages of development. Growth of young was rapid for the first three weeks and most ventured on foraging flights between the ages of three and four weeks. Young bats lost body weight once they began to forage, reflecting their reduced capture efficiency in early weeks of flight. Shifts in foraging behavior and food consumption of adults corresponded with changes in reproductive condition and with stages of prenatal and postnatal development.

A STUDY OF THE STOMACH CONTENTS IN THE VAMPIRE BATS DESMODUS ROTUNDUS AND DIPHYLLA ECAUDATA. Bernardo Villa-R., Universidad Nacional Autonoma de Mexico, Mexico, D. F. Examination of the stomach contents of 97 haematophagous bats, 18 Diphylla ecaudata ecaudata and 79 Demodus rotundus rotundus, showed 100% bird blood in the former; while of the latter, 58 held only mammal blood (equines and/or undetermined species) and 8 held the same plus bird blood; in the other 13, which appeared adult by size, color, and type of teeth, we found the stomach full of fresh milk. All the study material was obtained in Brazil, in various localities. The red corpuscles of birds differ from those of mammals in being oval and nucleated; there are differences in the leucocytes as well. Aside from these, there are other differences in the blood on which we based our identification of the vampires' victims under natural conditions.

NARROW-BAND AND BROAD-BAND BAT SONAR SYSTEMS. James A. Simmons, Auditory Research Laboratories, Princeton University, Princeton, New Jersey, 08540. Interspecies differences in bat sonar cries suggest that divergent species of echolocating bats have achieved alternate ways of target ranging with minimal errors due to echo Doppler shift from relative motion of the bat and target.

Bats using broad-band FM cries (Eptesicus fuscus, Phyllostomus hastatus) process the entire sonar cry and echo in a crosscorrelation receiver in the inferior colliculus. The sonar waveforms of these bats are subject to relatively small and tolerable Doppler target-ranging errors. These bats have a range acuity of 10 to 15 mm. Bats using narrow-band FM cries (Rhinolophus ferrumequinum) encounter larger Doppler ranging errors. These bats must transmit long-duration constant frequency signals to measure echo Doppler shift and compensate for it before extracting accurate target range information from the FM portion of the cries and echoes in the correlation receiver. Narrow-band bats separate the FM and constant-frequency parts of their cries with sharply-tuned auditory mechanisms. These bats have a range acuity of about 30 mm.

A PHOTOELECTRIC CELL SYSTEM FOR RECORDING NOCTURNAL ACTIVITY OF BATS.

Larry C. Watkins, Museum of Natural History, The University of Kansas, Lawrence, Kansas, 66044. A system of photoelectric cells was used in the summer of 1970 to record the nocturnal movements of evening bats (Myotis humeralis) at a maternity roost near New Hampton, Missouri. Light beams focused on the photoelectric cells produced a screen of light that intersected the entire pathway of the entrance-exit to the roost. Bats passing through this screen closed the electrical circuit and this event was recorded on the drum of a Bendix 7-day, constant-recording, hygrothermograph. The red-filtered lights used on the photoelectric cells had no detectable effect on behavior of the bats, and the system provided a reliable index of activity. The number of photoelectrically-recorded movements correlated well with the total number of bats counted leaving and returning to the roost at dusk and dawn. A further check on activity was made using a modified Constantine harp trap. Ambient temperature, relative humidity, season, and stage of growth and development of the young were the principal factors that influenced nocturnal activity.

PARAMETERS RELATING TO THE ONSET OF FORAGING IN THE CAVE BAT MYOTIS VELIFER. Earl McKinley, Department of Biological Sciences, University of Arizona, Tucson, Arizona, 85721. During the summer of 1970 various environmental parameters were measured concomitantly with the onset of the daily foraging flight of Myotis velifer from a humid cave near Winkelman, Arizona. Mensuration of the following factors was conducted about 25 feet above the cave entrance: visible and infrared light, temperature, relative humidity, barometric pressure, wind speed and direction. Temperature and relative humidity within the cave were determined remotely using a potentiometer and A.C. bridge respectively. Preliminary investigation suggests that visible light and/or ambient temperature may be important variables relative to flight initiation. Conclusive statements, however, must await further statistical analysis.

USAID-BSFW VAMPIRE BAT CONTROL PROGRAM IN LATIN AMERICA. G. Clay Mitchell, Instituto Nacional de Investigaciones Pecuarias, Mexico, D. F. The Bureau of Sport Fisheries and Wildlife in conjunction with the United States Agency for International Development are working toward a species specific control of vampire bats (Desmodus rotundus) in Latin America. Control is directed toward those areas of the vampire bat's home range where they are a threat to mankind by transmitting rabies and through heavy predation on livestock. Need for this program has arisen due to a population explosion for vampires in areas of increased cattle production and the increasing incidence of "derriengue" or vampire bat transmitted rabies. It is estimated over 100,000 livestock die annually in Mexico and approximately 1,000,000 yearly in South America due to vampire transmitted rabies.

The symposium closed with a short business meeting. It was decided (by unanimous vote) to hold a second meeting in the Fall of 1971, with hope that it will become an annual event. James Findley extended an invitation to the assembly that we meet at the University of New Mexico in Albuquerque in November

of 1971. His invitation was accepted by acclamation. Lendell Cockrum urged that each participant bring to next year's meeting, in addition to his formal paper, any data that each might have concerning the conservation of bats. This suggestion was well received and the program committee hopes to have a special section on conservation, pesticides, and endangered species at the next meeting.

Any one interested in attending next year's meeting should contact Roy Horst, University of Arizona, Department of Anatomy, Tucson, Arizona, 85721. Inquiries are being made concerning outside fiscal support for next year's meeting.

A note of recognition is due Eldon Braun, Patricia Broome, James Irish and Sharron Pierce for their efforts in helping to organize and carry out the program and attendant activities. A special note of gratitude is due Miss Margaret Langworthy, who served as secretary to both the local committee and the program committee.

Submitted by the Program Committee
Roy Horst, Chairman
James S. Findley
Terry A. Vaughan