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BAT RESEARCH NEWS

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THE COVER

Except for the spotted bat, this Mexican big-ear, Plecotus phyllotis, is the most spectacular bat occurring in the United States. The animal is somewhat larger than our other two species of Plecotus, but the ears are substantially larger. The peculiar "brow tines", projecting foreward above the nose, are distinctive. Just a few years ago this species was known only from two specimens from Mexico. Then Cockrum and his group at The University of Arizona began netting them in the Chiracahua Mountains. In the last 10 years it has been found to be widely distributed in Arizona and adjacent parts of New Mexico, and in its suitable habitats it is not at all uncommon. It prefers the great stands of ponderosa pine forests that occur at about 6000-8000 feet elevation. Like others of the genus it is a late flyer. Most specimens are captured late at night in nets set over water. In flight they make a loud, piercing sound, similar to that made by Euderma and by Tadarida molossa, but otherwise distinctive among U. S. bats. Last summer, while netting these bats over Iron Mesa Lake near the Willow Creek Ranger Station in Catron Co., N. M., we could sometimes count as many as 4 by listening to them in flight.

The bats are known to inhabit rock shelters and mines. Some winter in mines. The cover photo was made by Roger W. Barbour from a specimen taken last winter by Lee Christianson from the mines west of Kingman, Arizona, and sent to us by Robert Baker.

NO THREAT TO DIXON CAVE

Some stories have a happy ending. Due to the ever increasing pressures of the public on Mammoth Cave, the possibility of opening nearby Dixon as a free walk-in lighted cave has been considered by the Park Service. Apparently the idea was that many of the people who just wanted to see a cave would go into Dixon and not take the long guided tours through Mammoth. When Tom Barr informed me about the idea I wrote to the Superintendent of Mammoth Cave National Park:

"I have heard that there is presently being considered the possibility of opening Dixon Cave to the public, and that you would be interested in getting opinions regarding the desirability of such action.

"Dixon Cave is one of the most important caves for bats in the eastern United States. It serves as the center of congregation for migrating bats from all of Indiana and parts of Illinois, Michigan and Ohio. From July to October migrating bats swarm into the cave by the thousands. The significance of this behavior to the bats is unknown, but it seems most likely that it is of importance in reproduction or orientation. These bats spend the winter in Dixon and other caves in the region.

"Dixon Cave is the only cave known to be inhabited by the Indiana bat, Myotis sodalis, throughout the year. Dr. John Hall has shown that it is an important day roost for the local summer population (. life history & taxonomic study of the Indiana bat, Myotis sodalis by J. S. Hall. Reading Public Museum & Art Gallery Scientific Pub-

lication number 12, 1962, 68 pp). During the time of Hall's study Dixon Cave served as winter quarters for only about 3000 Myotis sodalis, but since the commercialization of the Coach-James cave system many more of these bats have retreated to the caves in the National Park. During the winter of 1963-64 about 20,000 hibernated in Dixon Cave. This is about one-fifth of the known population of this species in that region and represents about 5% of the total population of this species known. Myotis sodalis was included in the list of endangered and vanishing species of North American vertebrate animals prepared last year by Dr. Gottschalk of the U. S. Fish & Wildlife Service. In winter nearly the entire population of this species congregates in 4 cave regions in Missouri, Kentucky and Tennessee. The Mammoth Cave area is one of these and the only one in which protection is afforded the bats. Only three caves used for hibernation by this species are protected; all are in Mammoth Cave National Park. Dixon Cave is a very important one. I think the lighting and commercialization of Dixon Cave would be a tragedy."

I received the following reply from Willard W. Danielson, Acting Superintendent, Mammoth Cave National Park:

"We sincerely appreciate the benefit of your advice concerning the possibility of opening Dixon Cave to Public use. We have been concerned about the possible effect of this proposed use on the bat population of the cave and since your opinion corroborates that of others, we believe we can assure you that the cave will not be opened to the public.

"We appreciate your interest in Mammoth Cave National Park and its management problems."

THE CONFERENCE ON BATS IN CZECHOSLOVAKIA

Dr. Jiri Gaisler has asked that I get the following information to my subscribers from the Czechoslovakian Zoological Society, Institute of Vertebrate Zoology, C. A. S:

Dear Sir (Madam):

We have the pleasure of inviting you to participate in the Conference on Bats as the Object of Research. The conference will discuss the present problems associated with the taxonomy, ecology, population dynamics, behaviour, morphology, physiology, parasitology, epidemiology, protection, etc., of the order Chiroptera. If you intend to participate in the Conference please fill in the enclosed form of Application for Membership and send it in before 31 January, 1967.

The Conference will be held at the Hluboka Castle near Ceske Budejovice, south Bohemia, Czechoslovakia. The Conference will be opened on 2 July, 1967, by an excursion to localities of summer colonies of bats. Seats in a bus will be reserved for members of the Conference wishing to participate in the excursion. The approximate cost of this excursion is 50 Kcs ($4) including refreshments.

Sessions of the conference will be held on 3-4 July, 1967. Papers presented in the sessions may be read in one of the following languages: English, Russian, German, French. The papers will not be translated simultaneously but upon request from the audience, the discussion or the contents of the papers will be translated into any of the above languages by translators present at the sessions. The reading time will be 10 to 15 minutes; for discussion of some important subjects, a period of about one hour each will be reserved. Participants are requested to send brief contents of their papers

(about one typewritten page) before 31 March, 1967. Apart from the papers, it will be possible for the members to arrange expositions and, during evening meetings, show films, demonstrate their apparatus, etc.

Participants will be accomodated at the Interhotel at Hluboka. The following are the approximate prices: single room - 40 Kcs ($3), double room - 70 Kcs ($5), breakfast - 10 Kcs ($1). Also accomodations may be obtained in an auto camp near the castle. There are exchange offices both on the Czehoslovakian frontier and at the hotel. The membership fee will be about 50 Kcs ($4). Detailed information on the organization of the Conference, accomodation and travel communications will be sent to the participants together with the program at the beginning of June, 1967.

Signed on behalf of the Organizing Committee,

Dr. Vladimir Hanak
Dr. Jiri Gaisler
Dr. Jaroslav Figala

The APPLICATION FOR MEMBERSHIP asks for name, address, title of paper, and exposition, film or demonstration. They also need to know what technical facilities are needed, whether you plan to take the bus excursion, what accomodations you might want at the Interhotel, and whom you might want to share a room with if you choose a double room. Also are you interested in a group inspection of the collections at the Hluboka Castle? Finally, your signature. Return the information to the Secretary of the Conference, Dr. J. Gaisler, Institute of Vertebrate Zoology, Drobneho 28, Brno, Czehoslovakia, before 31 January, 1967.

A MYOTIS LUCIFUGUS WITH TWO YOUNG

On 5 June, 1963, Marion D. Hassell, Charles L. Rippy and I banded Myotis lucifugus in a house in Clay City, Ky. One mother bat had two babies clinging to her teats. One was still attached to the umbilical cord and the other appeared to be of the same age. The bats were killed and examined. Each uterine horn contained a placental scar.

Gates (1936, J. Mamm. 17: 272) records a M. lucifugus with two embryos each less than 1 mm in February, and Wimsatt (1945, J. Mamm. 26:27) reports finding two females each with two fetuses far along in development, but I know of no reports of two young being produced.

In M. lucifugus the uterine horns are unequal in development, the right being larger. The single embryo is always in the right horn. The uterus cannot easily accomodate two embryos. Wimsatt (1945) finds that although both ovaries are functional, a single ovum is released. In other species he studied multiple ovulation occurs and more embryos than reach term are normally implanted.
W. H. Davis.

HERE AND THERE

Many people have been asking when our book on the bats of the U. S. will appear. I cannot tell yet, but a reasonable guess is a year from thisspring. Barbour and I worked hard on it every day

during vacation and made good progress. We plan to have enough ms ready to present it to the editorial board this spring.

BERNARDO VILLA says that his book Murcielagos de Mexico was coming off the press at the end of the year. He also says he is on his way to Brasil to work on bats there.

FRANK GOLLEY'S Mammals of South Carolina was also scheduled to come out during December.

I plan to go to the meetings in Czehoslovakia if NSF will furnish the funds. Application is pending.

DON SMITH is spending a year teaching in Uganda. He has been doing some bat netting and getting quite a few specimens. He has 15 species of 7 families so far. He hopes to bring back some specimens to exchange.

MRS. YVONNE WEBER (2158 S. Main St., Portland) is a new subscriber who is interested in Oregon bats and bat banding.

Another new subscriber is Michael Bonnell at the Zoology Dept., University of Idaho. He is working on the behavioral ecology of bats in Idaho.

MICHAEL KRANBUHL is planning a population study of the bats of southwestern Ohio. He is a student at the University of Cincinnati Biology Dept.

ARTHUR GREENHALL, who is in charge of the bat banding program says that his office wants to cooperate with banders in getting the type of band we need. He says he must have evidence that the banders are in agreement as to what they want. If he got a letter signed by the most active banders listing what we want, he would then seek the additional funds necessary to get it. I list the most important features for a bat band as: legibility, legend on outside, hard enough that it is not easily chewed, ends rounded and smooth, the bands open with a gap of about 2 mm and strung in groups of 100 on plastic tubing. If you agree with this write a letter so stating to Greenhall and send a copy to Hitchcock, who has been working on this problem

GERALD S. T. PEREZ, Wildlife Biologist, Fish & Wildlife Div., Dept. of Agriculture, Government of Guam, Agana, Guam, is working on an inventory survey of the Marianas fruit bat, Pteropus mariannus.

DR. RONALD J. MORRIS, Commonwealth Serum Laboratories, Research Unit, Wewak, Sepik District, Territory of Papua and New Guinea, asks if I have any references on bat species in the Southwest Pacific. I do not know of anything. Could someone help him?

DAVID BASTIAN noticed the cover photo of the bats on the burdock and wrote to tell about finding a Tadarida brasiliensis impaled on a cactus about 50 yards from a cave containing a colony 4 mi NE Browns Crossing, Yuma Co., Arizona

WILSON BAKER is now working for E. V. KOMAREK at Tall Timbers Research, rt. 1, box 110, Tallahassee, Florida. He is also working on some of his data on Myotis grisescens in Georgia, getting it ready to publish

RUSS MUMFORD found a few Myotis austroriparius in Indiana caves last winter, so the species still exists there.

JOHN HALL reports a mine in Pennsylvania contains several thousand Myotis sodalis. This is a pleasant surprise. He also saw a winter colony of about 400 Plecotus townsendii in a cave in W. Va. where they have been known for several years.

DAN SMILEY sent a clipping from the New York Times of 12 Dec. about histoplasmosis in a bat-infested cave in the Canal Zone. Six of seven soldiers who visited the cave came down with the disease. Dan also sent a clipping from the Kingston Daily Freeman about a rabid

bat found in Ulster County, N. Y. last spring.

The CDC Veternary Public Health Notes for October, 1966, describes the death of an 11 year old boy who was bitten by a rabid skunk and succumbed in spite of what appeared to be an ideal series of medical treatments. The boy was bitten repeatedly on several parts of the body.

The November issue describes the attack of a rabid bat on a Boy Scout at a camp in Michigan. The bat was said to have bit him on the lip while he was asleep.

TONY DEBLASE is working on a PhD with Bryan Glass at Oklahoma State. His thesis will be a monograph of the mammals of Oklahoma. He would like to learn about any collections which include Oklahoma mammals.

JOEL MEADOR is interested in Dr. Campbell's bat towers and the Texas law protecting bats, which apparently was enacted in 1925 primarily as a result of Dr. Campbell's malaria-mosquito-guano campaigns. The law protecting bats in Texas was repealed by the legislature in 1955.

Meador has been able to find only one of the Bat Towers still standing. It is at Tampa, Florida. He asks if anyone knows of others? His letter inspired me to dig up the following story:

BAT HOTEL

On a hill near San Antonio, Texas, stands one of the strangest structures ever conceived by man - a tower especially designed as a roosting place for bats. Dr. Charles A. R. Campbell spent his life and a small fortune working out the involved design of the structure, which cost $2900 to build in 1911. Many old-time residents of San Antonio believe that the "bat roost" saved the city from a plague of malarial mosquitoes, and the doctor's heir still derives an annual income from the nitrogen-rich guano which collects in a special bin at the bottom of the roost.

At the beginning of the century, thousands of mosquitos bred in the desert pools, called tanks, near the city, and because the tanks were the only water supply for range cattle, they could not be drained or oiled. Doctor Campbell conceived the idea of encouraging mosquito-eating bats to form colonies near the pools.

When the city commissioners refused to build living quarters for the bats, Doctor Campbell constructed his forst roost at a cost of nearly $10,000. The roost was a complete failure- bats declined to move in. Then the doctor spent ten years exploring caves where bats lived, studying their habits and gathering information on the type of architecture they preferred. After that, he built the tower now in use. But at first the creatures still refused his hospitality.

A few miles from the tower was an old hunting lodge where many bats were in residence. The owners of the lodge were not particularly attached to them, and Doctor Campbell tried to make the colony move over to his bat hotel, even hiring the San Antonio Fire Department to play persuasive streams of water on them. At last the doctor found that the only thing the bats couldn't stand was listening to the Cascade of Roses Waltz as played by the Mexico City Police Band. "After a few bars of the music, the terror-stricken bats were fighting with each other to escape", the doctor happily recorded. The swarm fled across the desert in panic and moved into the tower. They have lived there happily ever since, and now num-

ber over a quarter of a million.

Almost at once, farmers in the neighborhood of the tower reported a falling off in the mosquito nuisance. The roost proved such a success that it created a mild sensation among health authorities. Gen. W. C. Gorgas, whose work in controlling the yellow-fever mosquito made possible the building of the Panama Canal, took a special trip to San Antonio to study the roost. The Italian Government purchased blueprints of the tower and started building similar structures near the Pontine Marshes. Municipal and health authorities established bat towers in Florida, Louisiana and California. But as more efficient methods for mosquito control were discovered, the towers were gradually destroyed, until today only the original one remains.

The roost stands thirty-three feet high and the interior is honeycombed with carefully milled shafts corresponding to fissures in a cave. The shafts are interconnected, so that all the guano funnels into a cone-shaped bin. The tower is now the property of Mrs. Milton Campbell, last of the family, who receives about $500 a year from the guano crop. She hopes that after her death the state will preserve the tower as a memento of San Antonio's past. Although the roost is not advertised, it is visited yearly by hundreds of naturalists and students of Americana. - Daniel P. Mannix.

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BAT RESEARCH NEWS

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Bat Research News appears quarterly: January, April, July and October. Subscription rate is $ 1.00 for 2 years. All back issues are available for $3.00. Single copy $ 0.25. Wayne H. Davis, Dept. of Zoology, University of Kentucky, Lexington, Ky. 40506 U. S. A.

THE COVER

This male Eumops glaucinus was sent to us by Gordon Hubbell, Director of the Crandon Park Zoo in Miami, Florida. This one is number 39 and leaves us with but one species of bat yet to photograph.

Although this species is known only from Miami and suburbs within the United States, it is apparently fairly common in that region. There are many specimens in collections now, and it is said that one can frequently hear mastiff bats calling at night over the city.

With the loan of a couple of skulls from Dr. Cockrum at the University of Arizona last month Dr. Barbour completed our skull photos. The distribution maps are completed, although they may be revised up to the last minute. The bibliography is now all on file cards. So that new literature can be easily inserted it will be kept in this form until everything else is completed. First draft of species accounts is complete for all but 12 species.

It has become rather urgent that we obtain a spotted bat this summer. We have obtained funds from the University of Kentucky Research Foundation to use in trying to get one. We can now offer $ 150.00 for a Euderma maculatum adult which arrives here in good health. We will pay $ 50.00 for the second one. If you get one that you would send us call one of us at once collect. The bat should be sent Air Express collect. It should be sent in a rather small container (half-gallon metal bucket, for instance) with a few air holes. Holes must be small enough that he does not get a forearm through, and must not have rough edges on which he can injure a claw. Avoid screening of any kind. We cannot purchase a a specimen with blemishes which would spoil a photograph. A couple of moist (not wet) paper towels should be placed in the can. Wet the towels and wring them out. Offer the bat a drink before putting him in.

If we do not get a Euderma we are planning a pilgrimage to the West to make another attempt ourselves.

A few tips for those who would like to have a try for Euderma this summer but are not familiar with the animal and its habits. Put nets over the water of ponds or small lakes up in the ponderosa country. Pick a spot where water is scarce for a couple of miles or so around you. Run your nets all night. Most spotted bats have been caught after midnight.

HERE AND THERE

In our experiments in homing of Myotis sodalis we have found this past winter that they home readily without vision from distances of 5, 10, 15, 25 & 40 miles, but it takes them longer than the controls. Apparently vision is one factor used in homing. We suspect the possibility that they navigate by the stars as do other animals. To test this we have set up to detect action potentials on the optic nerve. This is going smoothly, but next we need to expose the retina to measured light intensities. The visual acuity work of Suthers is interesting, but it does not tell

us whether or not a bat can see the stars.

Also here, CHARLES L. RIPPY and I have finally finished up our work on the nomenclature and distribution of the bats Myotis lucifugus and M. austroriparius and have sent in a manuscript. We are not suggesting any changes in the nomenclature as it is now used.

BOB MARTIN writes that he expects to be spending a couple of years in Uganda.

SIDNEY MCGUIRE, L. S. U. School of Medicine, International Center for Medical Research & Training, Apartado 5140, San Jose, Costa Rica, is working on bat parasites. He says his library facilities down there are almost nil in this particular subject, and so he is trying to get reprints. He wants reprints on bat parasites and anything on the Chiroptera of Costa Rica.

I got a nice letter from PAUL ALEXANDER who is at Tunghai University in Taichung, Taiwan. He will be spending the next academic year in Louisville. He is working on parasites of birds and plans some work on bats in Taiwan.

HARLAN WALLEY has spent a couple of months recently working on some problems at the Smithsonian Institute.

CLYDE SENGER has been doing some bat banding in a cave at 3200' on Mt. St. Helen, Washington. He lists bats banded in Washington during 1966 as:

Plecotus townsendii	353	M. evotis	5
Eptesicus fuscus	6	M. yumanensis	14
Myotis lucifugus	20		

WILBUR GUNIER has banded several M. lucifugus, M. grisescens and L. borealis. He plans to work on bats full time this summer by running mist nets at night.

JOHN G. WOODS writes that his interest in bats began at the bird banders' station at Pt. Pelee in the fall of 1965 when he found a Lasiurus borealis entangled in a burdock and met Russ Mumford who was trying to net bats.

JAMES SIMMONS of the Psychology Dept at Princeton, is working on experiments trying to isolate the sensory cues used by bats in discriminating targets of different sizes. He would like to get some long-eared bats to work with.

ROY LANDSTROM wrote to describe an interesting incident at Ft. Jackson, S. C. At noon on a warm summer day he saw what he thinks was a red bat flying straight over a pond about 12 feet above the water. It suddenly dropped to the surface of the water and remained on the water for about 20 seconds. It had its wings outstretched on the surface of the water and was lapping water like a dog. When finished drinking, the bat took off from the water without difficulty.

KUNWAR P. BHATNAGAR is working in Kallen's laboartory at Buffalo. He wants to know how he can get Verschuren's monograph on the bats of the Congo, Miller's families & genera of bats, and Ryberg's studies on bats and bat parasites. The way I get some out of print works I need is to borrow one and Xerox it. I have our print shop staple and bind it with cardboard.

WILLIAM B. DAVIS has commented on the problem of storage of mist nets. He ties the net at 3 foot intervals with strips of cloth before removing it from the poles. He then has no difficulty

in erecting and taking down the net by himself and no problems of tangling when the net is folded and placed in a plastic bag. He finds it unnecessary to use an assistant in a netting operation, and the only difficulty comes in setting up a new net by himself. Davis also mentioned that Texas A & M now has over 12,000 specimens of bats from tropical America.

HAROLD HITCHCOCK says that there will be a get together at the mammal meetings in North Carolina in June for bat banders to draw up some unanimous recommendations to the Fish & Wildlife Service regarding bands.

GUSTAV KIRK sent me a copy of his new (1967) book entitled Theriophylaxe. It is about laws protecting the mammals of the world, and has a section on bats, including a map of Europe showing areas where bats are protected.

JOEL T. MEADOR sent me a copy of the 1957 repeal of the Texas state law protecting bats. He also sent me a copy of the 1914 patent issued to Charles A. R. Campbell for his "new and useful Bat-Roost."

WILSON BAKER was in Waterfall Cave, Grady Co., Ga., on March 4 and found 262 pipistrelles. No other species was seen. That is nearly as many as I banded there 12 years ago. I found no other species in the cave either. None of those I banded was found by Baker. He notes that the first bat he banded and released was caught by a Coopers hawk.

CLYDE SENGER has been doing some netting and banding and plans to increase operations this summer. He is interested in the problem of what happens to all the western Myotis in winter. He finds one only occasionally hibernating in caves. On November 11 he set up a mist net at a cave where they were seen in summer, but caught nothing.

DON SMITH says he has now caught specimens of all 8 families of bats known to Uganda, but that specific identification is still a problem.

The quarterly rabies summary for July-September 1966 has appeared. It shows 1,029 cases of rabies in the U. S. for that three month period - about the same as other recent years. Included are 241 bats from 35 states. Wildlife accounts for about 70% of the cases. The single human death from rabies in the U. S. for the quarter was the boy in South Dakota. Since the boy received ideal medical treatment the question of post-exposure treatment has arisen again. CDC now recommends "pre-exposure prophylactic immunization of people who camp and sleep out-of-doors in rabies epizootic areas. As long as protection is based upon post-exposure anti-rabies treatment, we can expect occasional treatment failures".

A BAT REPELLENT

Nearly everyone who works with bats has been asked for advise on how to get rid of bats in a house. Although I find that most people who have asked me that arent really interested in getting rid of the bats if it involves any work or does not involve killing the animals (most people I encounter who would not have bats in the house have already shut them out), occasionally someone means it. For those people I supply the following note taken from CDC Veternary Public Health Notes for February 1967:

The following are recommendations for preparation and use of a

bat repellent. Other methods may be used to eliminate bats such as screening or poisoning, but there are many occasions when use of a repellent is the technique of choice.

Mix in order: 330 ml water (110°F)
5 ml Emtarate 9183
20 ml aromatic oil mixture
645 ml water (60-65°F)
1000 ml total volume

Emtarate 9183 is an emulsifying agent produced by General Aniline Film Corp., commonly used in pesticides, available from pesticide or chemical supply houses.

Aromatic oil mixture -- 50% oil of mustard and 50% oil of sassafras, both produced by Magnus, Mabee, and Reynard, Inc., New York city. Available from chemical suppliers.

Ingredients in this repellent are highly irritating, and contact with the eyes or skin or prolonged inhalation of vapors should be avoided. Goggles and protective clothing are recommended.

Two methods of application have proven satisfactory. Apply with a brush or spray on with a garden sprayer. Thus far, no ordinary finishes or surfaces have been damaged or stained by this repellent. Treat all surfaces on which bats are known to rest. One treatment is usually sufficient for up to several months depending on the kind of bat, exposure and other factors. If repellent is used when flightless young are in the roosts, adults may abandon the roost, leaving the young to die. Most young are born in May-July, so it is best to spray before or after these months.

BATS NEEDED FOR CANCER RESEARCH?

I have a letter that was sent to Dr. W. G. Winkler from a " supplier of animals, animal parts and blood to research laboratories". The letter writer says he has "several requests for bats to be used in cancer research" and he wants to know from whom he can buy these animals.

This is the third such letter I have seen from different suppliers in recent years. The demand for bats in research is large and surely will increase. Unfortunately this demand will be met one way or another, and if a responsible person does not come foreward soon and take over this area, I think commercial raids on the most susceptable bat caves will become inevitable for a few years until such populations are gone.

Professional exterminators probably kill hundreds of thousands of unwanted bats in buildings each year, and these could just as well be going to research. Substantial money could be made (Jim Beer's daughter earned her college expenses supplying ground squirrels for research) in this work. If anyone is interested I will give him the address of the supplier and some tips on how to locate summer bat colonies in buildings. A person could set himself up in business here with just an announcement in BR. which I would be glad to run for anyone who would get his bats from the right sources.

BAT CONFERENCE IN CZECHOSLOVAKIA

I have sent in a reservation to Jiri Gaisler to attend the conference in July, but have still not heard from my application to NSF for travel funds. A couple of months after sending it in I got a letter saying the application had been received.

Hans Neuhauser plans to attend and to visit some European museums this summer. Knox Jones says he will not be able to get to the conference.

THEORETICAL SIGNIFICANCE OF TOLERANCE TO HIGH TEMPERATURES BY MYOTIS LUCIFUGUS

A couple of recent papers and some of my observations on little brown bats have set me to thinking about some interesting problems regarding this bat. Myotis lucifugus nursery colonies are found in extremely hot places with temperatures ranging at least to 54°C (Henshaw and Folk, 1966) and 55°C (Davis, et. al., 1965). Body temperatures of 48° have been maintained for a half hour (Henshaw & Folk, 1966) and Stones tells me that he has had them higher. Myotis yumanensis, its closest relative, moves away from temperatures that reach 42° (Licht & Leitner, 1967). M. yumanensis lives in desert regions and M. lucifugus is our most northerly ranging bat, being found across central Alaska. The significance of its choosing a hot niche for the nursery colony is evident. During the shorter summer seasons up north the young must be born, grow up, learn to fly and to capture insects, and store enough fat to survive the long winter in hibernation. The neutral temperature for the species is 92°F (Stones & Wiebers, 1965), a temperature at which we find that big brown bats in Kentucky begin to abandon their roosts. Apparently as a result of the high temperature selected growth rates of the young are very rapid. The members supporting the wing grow more rapidly than other body parts (Dymond, 1936). The young of M. lucifugus can withstand higher body temperatures than can the adults (Henshaw & Folk, 1966).

If my speculations are correct perhaps the northward limit of distribution of a bat species (except for the strongly migrant tree bats which may not lay down so much fat) may be its ability to tolerate high temperatures. Of the 7 North American bats thus far studied M. lucifugus appears unique in that no other even approaches its temperature tolerance. I have put in for a grant with Eugene Crawford, our comparative physiologist, for funds to study some of the obvious interesting problems in temperature regulation in these remarkable animals. Wayne H. Davis.

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From:
Wayne H. Davis
Dept. of Zoology
University of Kentucky
Lexington, Ky. 40506
U. S. A.

BAT RESEARCH NEWS

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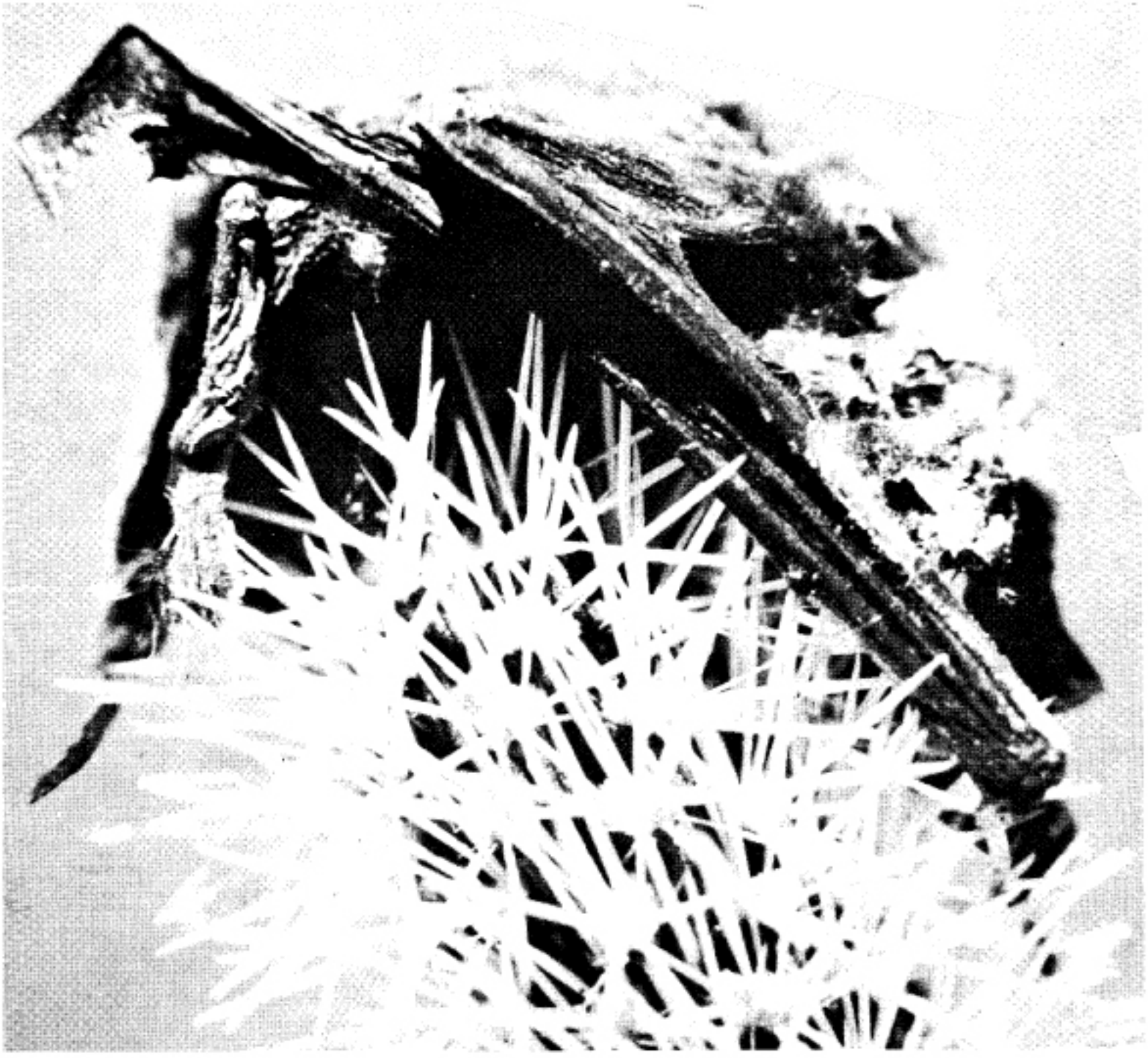

Bat Research News appears quarterly: January, April, July and October. Subscription rate is $ 1.00 for two years. All back issues are available for $ 3.00. Wayne H. Davis, Dept. of Zoology, University of Kentucky, Lexington, Kentucky 40506 U. S. A.

THE COVER

This free-tailed bat, Tadarida brasiliensis, met with tragedy when it encountered a cactus about 50 yards from a cave inhabited by a colony of this species about 4 mi. NE Browns Crossing, Yuma Co., Arizona. David Easterla took this picture, and from the color slide Roger Barbour made an enlarged print in black and white.

There are several records of accidental deaths of bats upon encountering plants such as burdock (J. Mamm. 1925, 6: 280; 1933, 14: 156; BRN 1966, 7 (2): cover) and sandpaper plant (J. Mamm. 1943, 24: 396; 1949, 30: 434). There are also several reports of bats' becoming impaled on barbed wire. This has been noted especially with Lasiurus, but was also recently reported for Myotis sodalis (Am. Midl. Nat. 1967, 77: 238). In these situations the bats apparently mistake the barb for an insect, for they are usually caught through the lower surface of the interfemoral membrane, the region which forms the pouch used for catching insects.

Interesting pictures such as this are always welcomed for use on the cover. Send in the pictures that you would like to see here. I have used all that have been sent to me except a couple in which the contrast was not great enough to stand the reproduction method used for the cover plates. It is a cheap process which loses considerable detail.

PHOTOGRAPHER MEETS EUDERMA

On July 9 Michael Bogan, a graduate student at the University of New Mexico netted a spotted bat. He got it back to Albuquerque alive and called us. Although he did not want to part with it, he was willing to have it photographed for our book. Barbour got on the first airplane heading that way at midnight July 11 and by 3:00 AM he was in Albuquerque taking pictures. He continued to take pictures until the next afternoon, at which time the bat seemed to be getting tired of the procedures and began to appear unhealthy. Some of the pictures taken in the morning are rather good and will fulfill our needs. We are paying Mr. Bogan $ 50.00 for his help and for letting us get some pictures. Our offer of $150.00 made in the last issue of BRN for a healthy spotted bat delivered at Lexington still stands. We would like to try some more pictures, and we would like to have the specimen.

BATS AVAILABLE FOR RESEARCH PURPOSES

My plea for someone to help supply some of the bats needed for research purposes from colonies in buildings where the bats are not wanted got a response from Glen Koehler, 3275 North 93 St., Milwaukee, Wisconsin 53222. He can supply bats from a colony near his home. Write him for a price list.

G. Douglas Mampe of the National Pest Control Association, Buettner Bldg., 250 West Jersey St., Elizabeth, N. J. 07202, has written to suggest that people who need bats for research contact their local pest control operators. These people are frequently called upon to remove bats from buildings.

NOTES OF INTEREST ON BATS
from J. Frederick Bell

In the course of 13 years of study of bats and rabies in bats, we have made several observations that were of interest to us but not of a nature suitable for publication. The first involved a Myotis californicus that attacked a hunter in western Montana. This bat, the first of this species collected in Montana, was also the first naturally infected insectivorous bat to transmit rabies by bite to a laboratory animal (Science, 1959, 129: 1490-1491.). The peculiar action of the animal in spontaneously attacking (i. e., alighting on and biting) the shirt over the precardial area of one man of a group on two separate occasions was not emphasized in the publication because it was not contributory. Nevertheless, the apparent predeliction for the one site, when other sites and other people were available, continued to intrigue me. Some years after the event, I attended a symposium at which Dr. D. R. Griffin discussed his studies on the sonar of bats. It occurred to me at that time that perhaps the attacked person might have a cardiac murmur that attracted the bat. Frequently when banding bats in the field, we have had released animals fly many rods away and then return to alight on our persons or on the box containing the unbanded bats. When I returned from the symposium, I sought the person attacked and inquired whether he had a heart murmur. He had, and he readily granted permission for auscultation. The murmur was unusually loud.

A second observation was on a Myotis lucifugus found dead on the floor in a room in our laboratory, where we keep individually caged bats under close observation. A technician who usually cares for the animals approached me with a dead bat in hand and asked me to read its band number. I was perplexed because his sight is better than mine, and I was more perplexed when I found the number clearly legible. He then told me the circumstances of finding the bat, the fact that none of our bats was missing, and that this animal had been banded and released by us 4 years previously about 25 miles away. We have inferred that the animal entered the room through the vent of a non-functioning fan, was attracted to the occupied bat cages by sound or other perception, and died of thirst or starvation. Other unbanded bats have been found in the laboratory, but not near the cages. They are usually brought to our attention because it is assumed that they have escaped from our cages.

SURVIVAL OF EPTESICUS FUSCUS

On 30 June 1964 exterminators gassed the colony of Eptesicus fuscus in the Baptist Church at Midway, Kentucky and gave the dead bats to me. Since I had banded the bats in this colony the previous year, data on survival could be obtained from them. They yielded the following information:

Banded 9 August, 1963	Recovered 30 June, 1964	Percentage Recovered
76 adult females	46	60.5
23 juv females	8	34.8
39 adult males	20	51.3
24 juv males	2	8.3

These percentages represent the minimum survival rates. Some of those banded in 1963 may have been residing elsewhere. One of the adult females was in a colony 3 blocks away on 29 May, 1964. Some may have escaped, and others may not have been found or gathered by the workmen. Nevertheless, these recovery percentages for the females are remarkably similar to the survival rates of female eastern pipistrelles (J. Mamm., 1966, 47: 383-396), a related species which also has a litter size of two. The recovery of the yearlings is essentially the same, and the 60% for the adults is the same as the combined survival rate of female pipistrelles which have survived one or more winters.

Two tests were used to measure the probability that males were less likely to return to the colony than females. The difference in recovery percentages between the two were compared and were not significant (P is about 0.5). The proportion of banded among the males gassed (22/32) was compared to the proportion of banded among the females (54/92). Again P is about 0.5. Chi-square tests were used, taking as the expected value that proportion obtained by combining the sexes. Thus it appears that adult male bats present in this colony in August were just as likely to return the following June as were the females, and there appears to be no influx of new males. This contrasts to maternity colonies of Myotis lucifugus in Kentucky where there is a considerable turnover among the adult males throughout the summer (Am. Midl. Nat. 1965, 73: 161-165).

With the yearlings a substantially larger percentage of the females than males returned. However the samples are small and the difference not significant (P is less than 0.10); it might be due to chance. W. H. Davis.

SPECULATIONS ON FEEDING HABITS OF BATS

Do all big-eared bats feed exclusively on moths? Data available suggest that Plecotus townsendii and Euderma do. Is better hearing needed to detect moths with their soft scaly surface and probably poor echolocatability? Some species of bats (e. g. Eptesicus fuscus) apparently never take them. Eumops perotis also seems to feed exclusively on small moths. It is a late flyer as are the big-ears. Do little moths emerge late in the evening? I wonder about the feeding habits of the early flying Tadarida brasiliensis as compared with our other species of the genus which fly late. W. H. Davis.

BAT BANDERS MEET IN JUNE

At the meeting of the American Society of Mammalogists at Nags Head, N. C., the bat banders got together to discuss problems concerning bands used on bats. Harold Hitchcock has been collecting information on this problem for years in trying to develop the most satisfactory band. Arthur Greenhall and Richard Manville, who are in charge of the bat banding program in Washington, are interested in supplying the best types of bands, but they must have agreement among banders as to what is needed. In the past there have been contradictory suggestions from banders, and some find faults with all types of bands we have yet tried. The purpose of the meeting was to list areas of agreement and make specific recommendations for improvement of bands. Hitchcock recorded the results of the meeting and distributed summaries of the findings among all participants. The following is taken from this summary:

Twenty-six people were present at the meeting. Arthur Greenhall outlined the position of the U.S. Fish & Wildlife Service regarding bat bands. Dr. Hitchcock then summarized the results of a questionaire circulated among 24 of the most active banders. After a considerable period of discussion the following recommendations to the Fish & Wildlife Service were passed without dissent:

1. Bat bands should be supplied opened, ready for use, but strung in numerical sequence as at present.
2. Rounded end bands should be supplied instead of the present pattern with right-angle corners.
3. New dies should be used with sharper differences in the shape of the digits.
4. The metal should be as hard as practical for closure by finger pressure. (Hardness helps keep digits legible if bat chews band; digits in soft metal are quickly obliterated.)
5. The Fish & Wildlife Service is urged to budget for experimental types of bands and tags for bats.

After the meeting broke up the following suggestions were made:

1. To aid those who anodize the bands, the bands should be strung on aluminum wire. Copper wire is not good because it gets anodized instead of the bands. (Bryan Glass). Dr. Glass gets good anodizing work done at a reasonable rate by Mac's Plating Works, Southwest Blvd., Tulsa, Oklahoma.

2. For a given band hardness, thinner than standard thickness bands should provide the same protection for the lettering, while being easier to close. A limiting factor here, however, is that thinner metal might increase wing injury.

ON CAVES AND BATS AND RABIES

At the meetings of the American Society of Mammalogists at Nags Head, N. C., in June an interesting paper entitled "Re-examination

of reported relationships between caves and fox rabies in Tennessee" was presented by Don W. Hayne and Douglas L. R. Neeley of the Institute of Statistics at North Carolina State University, Raleigh. They considered the report of Fredrickson and Thomas (Publ. Hlth. Repts., 1965, 80: 495-500) that there is a relationship between the number of rabid foxes and number of caves in a county, a relationship presumably mediated in some manner by bats. These authors suggested a continued presence of rabies in cave bats and a continual reinfection of foxes through a fox-bat relationship.

Hayne and Neeley re-examine the data and conclude that the interpretation of Fredrickson and Thomas is more a function of their method of summarizing than of any relationship in the data. Fredrickson and Thomas grouped the data into units of three caves per county, and grouped all counties with more than 15 caves and considered them as though all had 16 caves. Hayne and Neeley found that when they grouped the caves in units of two caves per county and in units of four caves per county in both cases the apparent relationship disappeared. It also disappeared when the counties having more than 15 caves each were distributed according to units of successive numbers of caves.

Hayne and Neeley also did some statistical studies concerning the data on rabid foxes in Tennessee and several other factors. They found a correlation between the number of positive foxes, the number of positive cattle, and the number of positive other animals, but no important relationship between the number of caves per county and any of the factors they examined.

HERE AND THERE

WILLIAM WIMSATT is editor of a book in preparation on the Biology of Bats which will be published in 1968 or 1969 by Academic Press. The chapters will be written by various people active in work with bats.

The weekly Morbidity & Mortality Report for May 13, 1967, has an article on RABIES PROPHYLAXIS containing the recommendations of the Public Health Service Advisory Committee on Immunization Practices for rabies in the United States. Some points of general interest include the following:

Neurological complications associated with duck embryo vaccine have been reported for one of every 25,000 persons treated; the old rabbit brain vaccine results in a rate about 3- 5 times this.

. Immediate and thorough local treatment of all bite wounds and scratches by copious flushing with water, soap and water, or detergent and water is perhaps the most effective means of preventing rabies.

Rates of failure are about 1: 20,000 - 25,000, and are not significantly different with the two vaccines.

Immunized persons with continuing exposure should receive a 1.0 ml booster shot every 2 to 3 years.

The immunized person with antibody should receive a dose of vaccine following mild exposure and 5 daily doses plus one 20 days later following a severe exposure.

The CONFERENCE ON BATS scheduled for the first of July in Czehoslovakia has been postponed until next year. A letter from Dr. VLADIMIR HANAK of May 15 says the postponement was necessary "due to some technical obstructions that have been told to the Organizing Committee just a few days ago".

CLYDE SENGER has sent me some Myotis to identify from his part of western Washington. Charles Rippy and I enjoyed the opportunity to look at some of these problem bats. The M. lucifugus and M. yumanensis along the coast from there to California present some difficult problems. We recognized that he had both species from Bellingham, and we were able to identify most of the specimens. Some were quite distinct, others less so, and one looks intermediate. Perhaps some of the problems are caused by immigrations from Wyoming. LARRY BROWN, who has been banding M. lucifugus in summer colonies in buildings in Laramie, tells me that he has had recoveries from the Pacific Northwest!

JOHN HALL plans to spend the second semester in Trinidad studying population ecology of bats by banding techniques. He would like to correspond with anyone who has done banding in the tropics. I dont know who has done any banding there except Bernardo Villa. Perhaps Arthur Greenhall, Ed Tyson, or Paul Klite ?

RODERICK SUTHERS is working on Vision and Orientation of Echolocating Animals, and has sent me a copy of his progress report. He is working mostly with tropical bats on visual discrimination of stationary patterns.

Volume 4 of MYOTIS, a European newsletter annual on bats is out. It contains major articles on parasitological problems in bats and on the results of bat banding in the Soviet Union. It is produced by Dr. H. Roer, Zoologisches Forschungsinstitut und Museum A. Koenig, 53 Bonn, Koblenzer Strasse 150-164.

J. FRED DENTON, of the Medical College of Georgia, is studying the role of bats in the ecology of human pathogenic fungi. He asked for tips on how to locate bats in summer colonies in buildings. I suggested a technique we have found very useful: run an ad in the paper saying bats are needed for research and will be removed free of charge. Give a phone number. Dr. Denton tried this and was successful in locating a colony of big browns and a colony of twilight bats in Augusta. Also several red bats were brought in.

DAN SMILEY sent a clipping about rabies in New York from the April-May 1967 issue of the Conservationist. One of the subheadings is:Bats a New Menace. This discusses rabies in bats in New York. There have been 55 such cases since 1961.

DAVID EASTERLA is a naturalist this summer at Big Bend National Park in Texas. He went up to the cave on Mt. Emery on July 4 to check on the status of the only known colony of the rare bat Leptonycteris nivalis known in the United States. He found 4 large clusters, which he estimated as 10' x 4' ; 12' x 2'; 2' x 2' ; and 3' x 1'. He says the bats were two deep and the cluster sizes are very conservative estimates. He suggests I compute from this.

Based upon an estimate of 150 bats per square feet, which is about what would be in a tightly packed single layer cluster, I figure at least 13,650 Leptonycteris. Easterla also observed a single Plecotus townsendii in the cave. In netting he has taken Leptonycteris at 3 sites - one on the Rio Grande 20 miles from Mt. Emery.

JOHN SEALANDER has recently captured a Myotis grisescens in Logan Springs Cave, Arkansas. It was banded in Marvel Cave, Missouri, by Dick Myers on December 30, 1957.

RECENT BOOKS

VILLA-R, BERNARDO. Los Murcielagos de Mexico. Universidad Nacional Autonoma de Mexico, Instituto de Biologia, Mexico, D. F., Mexico, 6 February, 1967. 491 pp. This book on the bats of Mexico is a culmination of more than 30 years of work by Dr. Villa. The book contains a wealth of information and is an essential part of the library of anyone interested in the bats of tropical America. My quick perusal has revealed a few minor errors. The pictures on p 122 do not seem to be of the bats named. The distribution maps of Natalus and of Leptonycteris are inaccurrate. Taxonomists who have studied the problems of nomenclature of Glossophaga and Leptonycteris may question his treatment of these genera.

PETERSON, RANDOLPH L. The Mammals of Eastern Canada. Toronto, Oxford University Press, 1966. 465pp. This is one of the very finest regional mammal books yet published. The area covered includes Ontario, Quebec and the Maritimes. Unfortunately the bat fauna of this region is rather poor. The author shows a fairly good awareness of the pertinent Chiropteran literature, and the accounts of bats are for the most part accurrate; both of these are characteristics rarely found in comparable publications. I question the statement that the young pipistrelles cling to the mother in flight for the first week or two. I doubt that any bat carries its young in flight, except when disturbed or frightened or when moving the young from one roost to another.

HUSSON, A. M. The bats of Suriname. Brill, Leiden. 28 November, 1962. 282 pp plus 30 plates. Though several years old, this book has just recently come to my attention. This is a taxonomic treatment of the 61 species of bats known from Suriname. Plates show skull photographs of 57 species. The author seems to have an excellent command of the ancient literature and a good understanding of problems of nomenclature. Perhaps of greatest importance to those interested in the bats of the United States is his treatment of our largest Tadarida. This species, which has already had a long and painful nomenclatorial history, apparently has again become Tadarida macrotis (Gray) 1839. Apparently the description of Vespertilio Molossus by Pallas 1766 is based upon several specimens consisting of two different species. One is a Tadarida; the other is not. Since the type of the genus Molossus E. Geoffroy 1805 is Vespertilio molossus Pallas, this name must be applied to a Molossus and not a Tadarida, according to Husson.

OTHER RECENT LITERATURE

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follow-up on the discovery that these bats commonly winter among the stones on the floor of quarries. Forty-nine of these bats plus a Myotis natterëri were excavated from depths up to 60 cm. From mid-August to October the bats seem to search the quarries for suitable winter quarters. They fly about where loose stone covers the ground uttering echolocating calls. Finally they spiral downward to the floor and crawl into holes. Mating occurs in winter when males, uttering calls, discover others of their species, cling to them, and induce them to wake up. In the spring individuals are often found with their fur and forearms covered with mud, probably as a result of wintering among the gravel. Several interesting photographs.

Ed. note: When netting in late summer and fall at Dixon Cave, Ky., we often take Myotis lucifugus which have mud on them about as that shown in the photo in this paper. We have watched the bats in the cave at night and noticed some traffic into an inaccessible area in the lowest part of the cave along the left wall near the rear of the cave. We speculated that this activity on the floor and this area were involved in reproduction, but perhaps the bats were locating wintering areas there. Hitchcock and I believe that many thousands of this species winter in Aeolus Cave, Vt., beyond the rocky breakdown at the end of this short cave. We saw them coming out in the spring; as best I remember, we also had muddy ones. We thought that there were probably chambers beyond where man could go, but perhaps these bats just winter down among the rocks.

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From:
Dr. Wayne H. Davis
Department of Zoology
University of Kentucky
Lexington, Kentucky
40506 U. S. A.

BAT RESEARCH NEWS

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ENTRANCE USED BY A COLONY OF BIG BROWN BATS

Bat Research News appears quarterly: January, April, July and October. Subscription rate is $1.00 for two years. All back issues are available for $ 3.00. Wayne H. Davis, Department of Zoology, University of Kentucky, Lexington, Kentucky, 40506, U. S. A.

THE COVER

This house in Clay City, Kentucky is occupied by a colony of big brown bats. Bat colonies can often be located simply by looking at the outside of buildings. Notice the spattering of bat droppings on the side of the house. Notice also the dirty area beneath the opening. Birds often make a dirty spot below an entrance hole in a building, but their markings are less diffuse. A regular pattern is usually formed by birds as the tail marks a semicircle beneath the hole. And birds never leave such spatterings on the side of the house.

If seeking bats and you locate such a house as this, all you need to do is approach the owner and tell him that in passing you noticed that he had bats in his attic and that you would like to go up and see them. Photo by Roger W. Barbour.

THE NEW FORM

After seven years I have decided that this operation is getting too time-consuming to do everything by hand. Circulation has grown slowly but steadily, and it is becoming ever more work to put together and address an issue, so I am now in the process of arranging to have everything except the typing done mechanically.

WHY BATS IMPALE ON BARBED WIRE

There are so many reports of bats being impaled on the barbs of wire fences (Bailey, 1931, N. Am. Fauna 53:382; Johnson, 1933, J. Mamm. 14: 156-157; Hooper, 1941, Univ. Michigan Mus. Zool. Misc. Publ. 51:21; Hibbard, 1963, J. Mamm. 44:265; Long, 1964, Trans. Kansas Acad. Sci. 67:201; DeBlase and Cope, 1967, Am. Midl. Nat. 77:238) that such accidents must not be particularly unusual. All involve Lasiusus borealis or L. cinereus except the last report which concerned Myotis sodalis. The top strand of a barbed wire fence is always involved.

In all cases except the first the barb was noted to have pierced the interfemoral membrane. Johnson (1933) noted that the barb which caught the bat was slanted downward, so that the tail and interfemoral membrane must have been depressed, and he described an elaborate hypothetical flight manuever to explain how the bat could accidentally have struck the wire in such a way.

Since it has been clearly established that our common insectivorous bats capture insects in the wingtip and/or tail membrane (Webster & Griffin, 1962, An. Beh. 10: 332-340) it seems more likely that the bats mistake the barb for a bug. I have often thought about this possibility since discovering how easy it is to capture a bat with a burdock dangling on a thread where bats are feeding. Long (1964) thought that perhaps the bats are attracted to the barbs on the wire.

That bats can mistake a foreign object for an insect that they are chasing has been shown by Webster (Experimental studies on target detection, evaluation, and interception by echolocating bats. Aerospace Med. Res. Lab. Document; see photo p 91). W. H. Davis.

DO BATS CARRY THEIR YOUNG WHILE FEEDING?

Writing about bats catching insects reminded me of the question of bats carrying their young while feeding. The statement that they do so is very common in the literature. For instance, read the accounts of Lasiurus borealis in the various state and regional books on mammals. Many say that the mother carries the young while foraging for the first few days or a week or until the combined weight exceeds hers.

I do not know of any evidence to support these ideas. Considering the problems that a bat would have in capturing insects while laden with young, it would be surprising to me if the mother carried them along while foraging. I also wonder how efficient a pregnant bat near term is at catching insects.

The idea that bats carry their young while feeding probably arose from speculation after bats have been shot in flight with young attached, as occasionally happens (see, for example, Golley, 1966, South Carolina Mammals, p. 60). But is the mother foraging or is she just transporting her young? We have noticed in Kentucky that Eptesicus fuscus always leaves the young behing when foraging, but will not hesitate to pick them up and move them to another roost when a colony is disturbed. The question is difficult to resolve. The only evidence I have seen that really suggests that the mother may be feeding while carrying her young is in Nyholm (1965, Ann. Zool Fennici 2: 77-123). In a study of foraging habits over a 6 year period he captured numerous Myotis with a portable bug trap he invented. Two bats were carrying young when captured.

One possibility of the source of the common idea that red bats carry a large burden of young with them while feeding may be the rather common findings of mother red bats with four young on the ground. Why such observations should suggest that the mother flies with such a load, let alone feeding, I do not understand, but as recently as 1965 such an observation has been reported under the misleading title of "Female red bat carrying four young" (J. Mamm. 46: 333). In this case the group of bats was found lying on a lawn. The adult female weighed 12.9g, and attached to her were young whose weight totaled 23.4g. The author notes that, although 4 young are not uncommon for red bats, the weights carried by this female have not been recorded. I think the choice of a word here is unfortunate. My dictionary defines the word carry as meaning to transport from one place to another. I do not know how red bats get onto the ground with a mess of youngsters as they so often do in June and July, but I suspect that they are probably dislodged from their diurnal roost and fall.

A likely possible cause of the appearance of red bat families on the ground is attack by blue jays. These birds frequently prey upon red bats (for review of the literature on this see Hoffmeister & Downes, 1964, SW Nat. 9: 102), and have been observed to molest a mother bat repeatedly while stealing young from her. W. H. Davis.

THE BOOK

Several people have asked about progress on our book on the bats of the United States. It is now completely in manuscript, but needs considerable reworking in many places. I took out the month of August to write a chapter for Wimsatt's book, but still hope to finish by the end of this year.

THE MYOTIS OCCULTUS PROBLEM

The last issue of the Journal of Mammalogy (August) contained the results of a study by Findley and Jones on Myotis lucifugus and M. occultus. They found the two easily separable through most of the range, but they examined 4 specimens from the southern Colorado-northern New Mexico region that seem to be intermediates between these two forms. This is a region where the two might be expected to overlap in range. On the basis of these specimens Findley and Jones tentatively conclude that Myotis occultus is only subspecifically distinct and that it should therefore become Myotis lucifugus occultus.

Most likely they are correct. However, there seem to be three possible explanations for the occurence of the intermediates: (1) they might represent hybrids between two species; (2) they may be intergrades between two subspecies; and (3) they may represent chance deviations from the mean within a population of M. occultus (length of the maxillary toothrows falls within the range of variation of this form, but not within the range of variation of M. lucifugus from Colorado; p 435).

The first possibility seems unlikely, but the third seems to me quite reasonable on the basis of the evidence presented. For instance, three of the four intermediates fall within one standard deviation of the meanof the large sample (64) from Blythe, California, but even the smallest individual falls outside two standard deviations for the sample from Ft. Collins, Colorado. With so small a sample from the critical areas one can only speculate on the true nature of these populations.

Roger Barbour and I have applied for a little money to enable us to spend some time in the west next summer to collect bats. We shall try to obtain a series of specimens of these interesting intermediates, and study the variation in these populations. W. H. Davis.

LONG-EARED MYOTIS OF THE PACIFIC NORTHWEST

Clyde Senger has been having trouble identifying the bats he nets in Washington. First was the problem of the M. yumanensis which looks so similar to M. lucifugus in that part of the country. He has got to where he can separate these with reasonable assurance, but now has a problem with the long-eared Myotis he is catching in SW Washington. He says some have fairly well-developed keels and others little or none. Some have almost no bristles on the interfemoral membrane, others have a few scattered clusters of bristles, and others have a well-developed fringe of evenly-distributed bristles.

He sent me a specimen to identify for him. It is about the most interesting Myotis I have ever seen. It seems to be a M. thysanodes, but does not look much like any of this species I have ever seen before. It has a scant fringe, less than any I have seen on this species before, but more than I have seen on any other. It is dark and does not have a light belly. It looks strikingly like a M. keenii. These two species should separate easily on measurements, the latter being much smaller. The specimen is larger than M. keenii, but it is smaller in most measurements than the smallest M. thysanodes whose measurements are available.

If this specimen is typical of M. thysanodes in western Washington (the species has never been recorded from there before), it may represent a well-marked undescribed subspecies. However, I am borrowing the available specimens of M. k. keenii to check the possibility that the two may intergrade. I had never thought of these two as being particularly similar.

Remarkably few specimens of long-eared Myotis are yet available for study from the northwest. When Walter Dalquest, a chiropterologist who lived in Washington and collected extensively for many years, wrote his book on the mammals of that state, he had never collected M. keenii, M. evotis or M. thysanodes in Washington. Probably nothing definitive can be done until more specimens are collected. W. H. Davis

TOXICITY OF DDT TO BATS

In 1964 Mark Luckens and I found that big brown bats were extremely sensitive to DDT (Science. 146: 948). All bats receiving doses of 40mg/kg or more died. We have since found that bats could be fed concentrations about 20 times that and survive when put through a hibernation. However, we did not publish on this (it is mentioned in BRN) because we had reason to suspect a seasonal difference; perhaps the hibernation was not a factor. We are now running a test on the toxicity of DDT to autumn bats and getting some interesting results. Test animals were given varying doses up to more than 700mg/kg, and kept in the laboratory at room temperature. Within a few hours the heaviest dosed animals were in distress, and several seemed moribund. Next morning all bats appeared rather normal, and now after a week nearly all appear sleek and healthy.

The obvious hypothesis is quite interesting. The chlorinated hydrocarbons are fat soluble, but poorly soluble in water. The massive doses got enough DDT into the bloodstream quickly to poison the animals, but did not stay long enough to kill them before moving into the stored fat. About a third of the bat is fat in October. The condition of the bats today suggests that the poisoning may not do permanent damage to an animal, even though it is massive enough to put him into what would ordinarily be a fatal convulsion. It also suggests that the amount of fat present in an animal is a very important factor concerning the toxicity of DDT to an animal. It will be interesting to see if the bats can survive as their fat store is slowly used up. W. H. Davis

VAMPIRE STUDY IN MEXICO

The U. S. Fish & Wildlife Service is initiating a research project in Mexico which will seek to reduce livestock losses resulting from rabies transmitted by vampire bats. The 5 year project will be under the direction of the Denver Wildlife Research Center and is financed by the Agency for International Development. The Mexican field station will be located at the Centro Nacional de Investigaciones Pecurias, Km. 15 1/2 Carraterra a Toluca, Mexico D. F., Mexico.

Studies will include telemetry to determine movements and feeding patterns, collection of reproductive and age distribution data to determine the population dynamics of Desmodus rotundus , development of toxicants or repellents, methods of applying these compounds, toxicological studies involving application of chemicals directly to livestock, and certain ecological studies which will hopefully provide clues as to feasible control methods. Support studies will be un-

dertaken at the Denver Center, primarily chemical screening, basic physiological studies and statistics.

We are seeking a qualified biologist who would be interested on working in Mexico for a minimum of two years. The salary would be at the GS-11 level. I will be leaving at the end of September to get things underway. The position mentioned above should be filled by January or February. Inquiries should be sent to Weldon B. Robinson, In Charge, Division of Behavioral Research, Wildlife Research Center, Building 16, Federal Center, Denver, Colorado 80225.

We are attempting to get together some of the bat literature for our field station and would appreciate any reprints that could be sent. I would like to extend an invitation to those engaged in bat research to visit our Mexico station. Samuel B. Linhart.

UNUSUAL BEHAVIOR OF BATS

In July I observed two bats in the street in front of my house in Columbia, Missouri. A large brown-colored bat was dragging a gray one across the street and up into the grass. The brown bat climbed up onto a tree and hung head down; the gray one was head upward under the first bat and holding onto it. The brown bat was holding onto the gray one as if preparing to eat it. After about an hour the gray bat came out and climbed upon the brown one and both went to sleep. What kind of bats could they have been and what were they doing? Gene Hargrove.

Ed. note: My guess is that it was a grounded hoary bat with her young.

HERE AND THERE

H. ELLIOTT MCCLURE sent me the annual report of the migratory animal pathological survey of the applied scientific research corporation of Thialand. He has been banding birds over there for many years. This report contains an appendix on the bat banding program in Malaysia by AL J. BECK.

JOEL T. MEADOR writes that while inspecting the guano mining equipment at Bracken Bat Cave, Comal County, Texas, in August, he noticed three bats impaled on prickley pear cactus. They were on the west side of the entrance sink and very near the entrance. Meador also sent a copy of the bill enacted by the Texas legislature making it unlawful to kill, harm or disturb animal life found in a cave without the owner's permission. Enclosed was a clipping from the San Angelo Standard-Times for August 20, 1967, entitled "Lions threaten Bronte Bat Cave. It says that the Bronte Evening Lions Club and the city of Bronte have teamed up to bring about the end of the threat of bats on main street in the town. The bats live in an abandoned building.

DAVID KERRIDGE has gone to the University of British Columbia to work on a PhD on bat behavior, ecology and taxonomy in the lower B. C. area.

RICHARD LAVAL has gone to Texas A & M to work on a PhD.

DAVID E. DAVIS has a new address. He is now head of the Department of Zoology

at North Carolina State University at Raleigh.

LARRY N. BROWN has moved to the University of South Florida at Tampa.

ROBERT J. BAKER has finished his PhD at Arizona and has taken a job at Texas Tech

DAVID EASTERLA spent an interesting summer in Big Bend National Park in Texas. He did a lot of bat netting and plans to continue work for a couple of years on the bats of the park. He has looked into the supposed record of Desmodus for the park. I had wondered about this one for some time. My only knowledge of it was the range map in Hall and Kelson. Easterla learned from Gerald G. Raun that the record is from a paper entitled "An apparently extinct Euglandina from Texas" by T.D.A. Cockerell, Proc. Colorado Mus. Nat. Hist. 9, 1930. The specimen, a skeleton, has apparently been lost, as Raun has been unable to track it down. The reference to bats is in a footnote in this paper which reads: "Through the thoughtfulness of Mr. Henry C. James and Mr. F. Warren Oaks the Museum came into the posession of the shell described herewith together with fragments of bones with which it was associated. The discovery of these specimens was made by Mr. Oaks in a limestone crevice, 350 feet below the present surface while engaged in developing a deposit of cinnabar in the Terlingua district, located about 90 miles north of Alpine, Texas..... While the bones are too fragmentary for specific identification they include Equus, Bison, and Ovis. A quantity of bat remains were also recovered, in which Dr. Gerrit S. Miller recognizes Macrotus californicus and a race somewhat larger than Desmodus rotundus murinus." Apparently the vampire was not recent material, but a fossil deposit. Easterla did not catch any last summer. He did pick up a couple of new species for the state of Texas, however.

The state of RHODE ISLAND became the last of the old 48 to report rabies in bats when a little brown bat which bit a boy in Providence in June was diagnosed as positive.

The C.D.C. ZOONOSES SURVEILLANCE report for May is the annual rabies summary. During 1966, 4,198 laboratory confirmed cases of rabies were reported in the United States. Forty-seven states reported animal rabies. Forty states reported rabies in bats. The June issue of this report contains the summary of rabies for the first quarter (January-March) of 1967. It shows 1,080 cases.

GLEN KOEHLER had planned to help with the problem of supplying bats for use in research in response to my plea for someone to take bats from places where they are not wanted, and thus protect our bat caves. He has recently written that he will not be able to supply them any longer, because the farmer who had them has burned the bats alive.

THOMAS H. KUNZ is now a graduate student at the University of Kansas Museum of Natural History working under J. Knox Jones. He is studying seasonal and nocturnal periodicity of bats in central Iowa. Last summer he netted and banded over 80 Lasiurus borealis, about 30 Lasionycteris, and about 150 of several other species. He found that the new lipped bands of the BAT series were not satisfactory for red bats. They caused considerable damage to the wing. He changed to the number 2 bands, which seemed to be more satisfactory.

DAN SMILEY sent a clipping from the New Paltz, N. Y. Independent and Times for 19 July, 1967, concerning rabies in Ulster County. During the past 4 years they have had one case eash year. All were in bats.

JAMES HEDGES sent a couple of clippings from the Cedar Rapids Gazette. One concerns a boy bitten by a rabid bat. The bat fell out of a tree in his yard. His mother said the neighborhood is infested with bats which roost in trees and under the eaves of houses. The police tried to shoot some of them next evening. Police asked residents of the area to check their houses to see if bats were living in them during the day. Police were not able to determine from where the bats were coming. If the roost place is discovered police will attempt to destroy it and the bats. --The second clipping concerns the USDA Bulletin number 96 which tells how to control bats by spraying the woodwork where they roost with a mixture of one pound of DDT wettable powder per gallon of water. ---- Hedges also sent me a map of an Iowa cave. Iowa has some quite extensive caves which should be suitable for bats.

LARRY DAVIS' bat work has been inhibited temporarily as he is now aboard ship in the navy. Perhaps he will get to spend some time in an interesting area.

DAVID HICKS is a new subscriber who is interested in hibernation and arousal and their causes.

D. S. THAKAR at the University of Udaipur in India is a new subscriber who is working on the nervous system of bats. He has a paper in press in Acta Histochemica. He wants to know if anyone knows of a published description of the structure and anatomy of the brain of bats. I suspect that there is something on this, but I do not know of it.

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From: Dr. Wayne H. Davis
Department of Zoology
University of Kentucky
Lexington, Kentucky 40506
U. S. A.