

Bat Research News

Volume 5: Numbers 1-4

1964



A Family of Red Bats, *Lasiurus borealis*

BAT RESEARCH NEWS

formerly *Bat Banding News*

Volume 5: Numbers 1–4

1964

Original Issues Compiled by Dr. Wayne H. Davis, Editor, of *Bat Banding News* and *Bat Research News*

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BAT RESEARCH NEWS

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BAT RESEARCH NEWS
(BAT BANDING NEWS)

Vol. 5, No. 1

January, 1964

Two reasons for the change in Bat Research News appears quarterly: January, April, July and October. First I am interested in all phases of bat biology and not just those aspects that can be investigated through banding. Second is political: bat banding sounds too much like nit picking and to many people bat research sounds worth while, but bat banding sounds trivial. Subscription rate is \$1.00 for two years. Wayne H. Davis, Zoology Dept., University of Kentucky, Lexington, Ky., U. S. A.

The cover photo on the last issue was an extra. We had more money in the BRN fund than needed. The University of Kentucky Printing Dept. did the work at cost of about \$10.00. I have some nice photos and could put one on each issue. It would mean raising the cost to subscribers; I don't think it is worth it. I will put on a cover photo whenever I think we can afford it, which will probably be about once a year.

I was at the AAAS meetings in Cleveland last month. Several bat workers were there including John Hall, Elizabeth Smith, Donald Griffin, Alan Novack, Helmut Mueller and Robert Henshaw.

A new bat newsletter has appeared. The first issue of Myotis appeared in 1963. It is produced by Dr. Reiner Feldmann, 5759 Bosperde, Westfalen, Friedhofstrasse 22, Germany. The first issue contains a list of German bat workers and the problems they are working on; a list of literature; developments in the last 4 years; sex ratios; artificial bat boxes; and other articles.

Still another bat newsletter may soon be out if it hasn't appeared already. A letter from Elery Hamilton-Smith acknowledges the receipt of the back issues of BBN and says "I will be editing an Australian newsletter of this type, to be known as 'Australian Bat Research News.' The first issue should be with you very soon. It is jointly sponsored by the Wildlife Research Division of CSIRO and the Bat Research Committee of the Australian Speleological Federation." Hamilton-Smith's address is: 17 Helwig Ave., Montmorency, Victoria, Australia.

Dr. Heinz Felten, Natur-Museum und Forschungs-Institut Senckenberg, Frankfurt am Main, Germany, has asked help in obtaining some live bats for a study of flight mechanics which he is doing. He says he would exchange museum specimens of European bats.

I have accumulated a good many reports of rabid bats since the last issue, but since this is getting to be so commonplace I will pass over it quickly. Harry Stephens reports about 17 rabid bats were found in Arkansas since last August. These from 80 specimens examined in the State of Washington two people were bitten by rabid bats last fall. A rabid bat was reported from Louisiana in the CDC Veterinary Public Health Notes for October, 1963. It was identified as M. lucifugus, but this is most likely an error. The species is unknown in that state. The November issue reports rabid bats from Maryland and South Carolina.

I would appreciate receiving reports of banding activities for 1963 from all bat banders. All reports will be used in future issues.

Between October 1962 and October 1963 over 250,000 bands have been issued to bat banders by the banding office in Washington.

NOTICE TO ACTIVE BANDERS

The number of bands issued for use on bats has increased about 2000% since 1953. These bands have been supplied by the Bird-banding Office at Patuxent, Maryland. Our Bat-banding Office, at Washington, D. C., is now

considering taking over the production of No. 2 size bands, those most widely used on bats. Within our limited budget, we hope to provide bands best suited for use on bats. Toward this end, we would welcome the comments of any active banders. Possible improvements, some of which might be feasible, include the provision of bands anodized in several colors, with rounded instead of square ends, pre-opened on flexible plastic tubing instead of closed and strung on wire, and constructed of a more durable metal than aluminum. We would appreciate any additional suggestions you might offer.

We are further considering the preparation of a Bat-banding Manual, to include sections on the use of nets and traps, equipment used in banding, history of bat banding, techniques for collecting, handling and banding bats, keeping records, etc. The manual would attempt to aid both the new bander and the old. Your suggestions will be welcome, and should be sent to:

BAT BANDING OFFICE
Fish and Wildlife Service
U. S. National Museum
Washington 25, D. C.

BAT BANDING, 1962 - R. E. MUMFORD

Species	Indiana	New Mexico	Arizona
<i>Myotis lucifugus</i>	409		
<i>M. sodalis</i>	79		
<i>M. keenii</i>	65		2
<i>M. volans</i>			
<i>M. velifer</i>		4	
<i>Pipistrellus subflavus</i>	25		
<i>P. hesperus</i>		30	31
<i>Eptesicus fuscus</i>	7	1	12
<i>Lasiurus borealis</i>	1	2	
<i>L. cinereus</i>		2	94
<i>L. ega</i>		2	
<i>Tadarida brasiliensis</i>		30	27
<i>Choeronycteris mexicana</i>		3	

BAT BANDING IN KENTUCKY, 1963 - UNIVERSITY OF KY.
BAT RESEARCH WORKERS

Species	Total	Species	Total
<i>Myotis lucifugus</i>	12,808	<i>Eptesicus fuscus</i>	1585
<i>M. sodalis</i>	212,244	<i>P. subflavus</i>	1062
<i>M. keenii</i>	3	<i>Lasiurus borealis</i>	84
<i>M. subulatus</i>	29	<i>Nycticeius humeralis</i>	4
<i>M. grisescens</i>	133	Grand total	36,952

NEW BAT PICKERS

The finest bat picker I have ever seen is now on the market. It is a spring-operated picker-upper gadget which consists of a flexible cable-like housing about 18 inches long with 4 graspers on the end. With it we can grasp a band among a cluster of M. sodalis and extract the one bat we wish to see. This gadget is to be found among that pile of junk now seen in many hardware, drug, building supply stores and probably supermarkets, which has a sign above it saying "Any tool on this table 99¢". It is made in Japan. I expect it to be ideal for extracting bats from drill holes in mines and from crevices in buildings.

Roger Barbour has invented a gadget for picking a single banded bat out of a cluster on the ceiling. It can be made to any length. The one we have is 6 feet. Materials are a piece of half inch pipe or aluminum tubing, some very heavy stiff wire and a short piece of baling wire. The heavy wire has a loop on one end, goes through the tubing, and the other end is soldered to two short pieces of baling wire bent to form 4 grasping tongs as pictured by Walley in the last issue of BBN. When one pulls on the loop at the one end, the grasping tongs are pulled part way back into the tube, causing them to close.

HERE AND THERE

S. C. Downing, Royal Ontario Museum in Toronto, says he was interested in my comments about winter activity of bats outside caves in New England, where I reported in a recent issue that Hitchcock and I have the impression that Eptesicus commonly appears in buildings in winter, but that M. lucifugus almost never does. Downing says that his experiences are very similar to ours. In 27 years he has seen an estimated 30 - 50 bats found active in winter and brought or sent in to the museum. With one exception they were Eptesicus. The exception was a M. keenii (no. 14290 in the R.O.M. collection) found clinging to a tree at Meaford, Ontario on December 24, 1939. The locality is on the edge of the Niagara Escarpment and there are caves in the vicinity.

Dick Myers is finishing up a paper on population statistics of bats in Ozark caves. He says he is still trying to buy the cave where all the M. grisescens hibernate.

Bruce Hayward was in Kenya with Mumford last summer. He says that in 10 weeks they collected 43 species of bats; bats seemed to be everywhere when they went out at night.

Jim Cope and Tony DeBlase were down to Lexington for a visit. We talked over plans for study of fall swarming in Indiana and Kentucky.

In the EBBA News for Nov.-Dec., 1963 I found the following note from Don Bleitz, of the Bleitz Wildlife Foundation which supplies our nets: "I'm enclosing a sample of the mono-filament webbing. This is made for a hairnet and the only problem is that it is made in maximum widths of 3 feet. They must change their machines to make it 8 feet 6 inches wide for out 7 foot nets. They are working on an alteration in their machine in order to do this for me. If you will stretch this mono-filament net you will quickly determine that any small bird which hits it will be caught. It is plenty heavy enough to hold up to thrush size birds without difficulty."

Paul Parmallee, Illinois State Museum, Springfield, needs a pair of live golden mice. He says he would be glad to exchange something.

Elery Hamilton-Smith, in a paper given at the NSS Convention last June and published in the NSS News October, 1963, says that the bands used in Australia are monel metal with turned back ends to avoid injury. Earlier

work was done with aluminum bird bands, but these were found to cause excessive laceration of the wing membrane or of the skin covering the forearm.

Greg Marland was in Tawny's Cave, Giles Co., Va., in October, and found several dozen badly mangled bats and several shotgun shells. The population, which was several hundred last year, is much lower this winter.

The population of M. sodalis in Carter Cave, Ky., seems to be about normal again this year at 100,000. The gate, which was broken last fall, has been fixed by the Cincinnati group who erected it. However, the top bar is bent so that it would now be easy to crawl over it.

On January 14 John Krisko, a naturalist at Mammoth Cave National Park, showed me a dead tree from which a bat had come when the tree was cut that morning. Apparently the bat was torpid or injured, for he described it as flopping around on the ground. He picked it up and released it inside the new entrance to Mammoth Cave, which was about 30 feet away. From the description he gave I think the bat was probably Lasionycteris noctivagans. We looked in the cave but did not find it.

CORRESPONDENCE

READING, PA. (Albright College). I have never seen a M. subulatus in the park (Mammoth Cave) either summer or winter. I would be very suspicious of Bailey's records, unless the specimens are present. Also if you read Claude Hibbard's notes which the park has, he mentions M. subulatus in several caves in winter. I found some alcoholics of his in the park collection which were labeled M. subulatus, but were actually Pipistrellus. I think these persons may have mistaken light-colored Pipistrellus for subulatus. John S. Hall.

PORTLAND, ORE. (Oregon Museum of Science & Industry). Good news about anodizing and banding. All points which have been discussed about the benefits of using the anodized bands seem to hold up. Last winter my wife and I banded a bunch of Corynorhinus townsendii over in the Bend area, and the other day we went in to see if the children had come home. They has! About a third had returned to the lava cave where we banded them. Their health seems to be excellent. No scar tissue or sign of damage to the membrane from the band. They look as though they were just put on yesterday. Jim Anderson.

TUCSON, ARIZ. (Zool. Dept., U. of A.). It has occurred to me that you might be planning on the mammal meetings in Mexico City next June. If so, I would like to extend to you and anyone you might have along, an invitation to visit, and band at, Eagle Creek Cave in Arizona. Banding operations will be Arizona Style. This cave will have about 20 - 30 million T. brasiliensis at that time. I'm sure you would enjoy it - very impressive flights, swimming hole, beautiful canyon, etc. Swampy Schwab.

SANDWICH, ILL. Anxious to hear about your method of tracing the feeding range of Eptesicus. I had hopes of working on this problem, but haven't found a method. Dr. Southern has had excellent results with transmitters on bald eagles, and thought maybe we could use the method on bats. In several cases where I have transferred young between adults they immediately inflicted severe bites upon the head of the young, and in several instances killed the young. Adults keep returning to my maternity colony, but the young which I have banded in the past two years have not been returning to the same colony. I have been trying to locate summer colonies in Illinois and have had pretty fair luck. Newspapers throughout the state have given me excellent support. Banded 5 red bats this past summer which were taken from trees. Certainly would like to locate more. Harlan Walley.

ATHENS, GA. (Forestry School, U. of G.). I still havent had time to straighten out completely the university's bat collection, although there are few specimens. All the Myotis I have found from McIntosh Co. have been M. austroriparius. There are some M. keenii in the collection from Harris Co. These probably are what Golley called M. lucifugus. When I finish straightening out the collection, I will get together with Golley and find out what he based his distribution records on. - Where are all the Pipistrellus going? In your dissertation you mention numbers in caves ranging from maximum of about 30 (sometimes there are about twice this) in southern Indiana to about 500 in southern Georgia. Where are the 1171 I netted in Wind Cave, Ky., going? In NW Georgia I found the most pips (about 60-70) last March-April. Right now (Oct.) there are only a handful. It will be interesting to see how many are in the caves in a couple of months. Wilson Baker.

LITERATURE

EGSBAEK, W & B. JENSEN, 1963. Results of bat banding in Denmark. Vidensk. Medd. fra Dansk naturh. Foren. 125: 269-296. These authors banded 3828 hibernating bats in four localities. Over 3000 were M. daubentonii, mostly in Daubjerg limestone cave in central Jutland. They interpret their results as showing that M. daubentonii migrates from late March to late April; M. dasycneme from April first to mid-May, and that in the former the males leave earlier, while in the latter the reverse holds.

ELIASSEN, E. & W. EGSBAEK, 1963. Vascular changes in the hibernating bat Myotis daubentonii (Kuhl, 1819). Arbok. Univ. Bergen 3: 1-22. Hematocrit, red cell count, oxygen capacity, freezing point of serum, spleen weights, blood volume, and water content of muscles were measured on hibernating and active bats. They found that spleen storage was not sufficient to account for the differences in circulating volume when a bat goes into hibernation (only 15% of it), and postulate a pooling in the great veins and perhaps liver.

HERREID, CLYDE F., JR., 1963. Temperature regulation and metabolism in Mexican freetail bats. Science. 142: 1573-1574. In the caves bats maintained a high temperature when ambient temperatures ranges from 12 to 36°C, but in the laboratory they behaved differently, dropping temperatures to within a few degrees of ambient when cooled.

DAVIS, R. & E. L. COCKRUM, 1963. Bridges utilized as day-roosts by bats. J. Mamm., 44: 428-430. Seven species of bats and numbers up to several thousand are found under certain types of highway bridges in Arizona.

MELMAN, A & R. M. ROSENBAUM, 1963. Histochemical correlates for differences in functional activity of kidneys from active and cold-stored summer bats (Myotis lucifugus). Anat. Rec. 145: 401-411. Differences in enzyme activity and structure of cells of tubules suggest differences in kidney function between active and cold stored bats.

mailed January 27, 1964

April is the finest month to band hibernating bats. The bats are nearly ready to leave and recoveries come in soon. It is a pleasant time to be in the field. Also at least as far south as Kentucky most of the bats are still in the caves. The Myotis sodalis

here leave mostly during the last week of April and first week in May. This spring for the first time in several years I have been doing very little bat banding. I have so many bats banded and so many recoveries to process that I think I can better spend the time working on the data I have.

Less news has come in this term than ever. I guess I will have to start writing to the people who make the news. This usually works.

Recent visitors to the Institute of Speleology at the University of Kentucky have included Wilson Baker, Phil Krutzsch, and S. Edward Sulkin. Dr. Sulkin is very interested in getting the cave laboratory started here. He has some problems in virology and immunology in bats which would require such a facility. We are rather optimistic that our cave laboratory will be built here this year.

One new bat banded: Dr. Larry N. Brown, Department of Zoology and Physiology, University of Wyoming, Laramie, Wyoming. He has a University Council grant to study populations and movements of Myotis in Wyoming.

An editorial in Cave Notes Vol. 5, no. 3, May-June, 1963, is entitled The Fallacy of the Cave Gate. It points out that it is nearly impossible to maintain a gate unless an owner or caretaker is on the immediate premises. Spelunkers will [^]in through the very best of gates.

Last fall Emmet T. Hooper, President of the American Society of Mammalogists, appointed a committee to study the problem of reduction of bat populations. The committee is: Wayne Davis, chairman, Russ Mumford, Denny Constantine, and E. L. Cockrum. A report will be given at the meetings in Mexico in June. If you have any information concerning this problem, we would like to hear about it. Cockrum suggested the possibility that insecticides might be affecting bats. He says it appears as if there may be fewer bats in the agricultural areas in Arizona than there used to be. We are now set up to study this possibility at Kentucky. A toxicologist and I have a grant to study insecticide residues in bats, cholinesterase levels in bat blood, and toxicity of insecticides to bats. We are just now getting set up, and it is unlikely that any definitive results will be available by June.

Little things keep coming to my attention which may be having an effect on the bat population. A clipping from the Charlottesville Daily Progress (Va) August 7, 1963, says, "The management of Meramec Caverns in Stanton, Mo., has hired dozens of college boys to drive the bats from the cave and then put up a screen to keep them out. They're calling it Operation Com-bat".

When working at Mammoth Cave last August and September I heard from local people that they "had to sweep the dead bats away from the gate at Coach Cave every morning." This cave system contained about 100,000 each of Myotis sodalis and M. grisescens before it was commercialized a couple of years ago according to John Hall. Last month M. D. Hassell visited the cave. He says the bats could easily get through the gate, and he doubts the sweeping away stories we heard. He found about 35,000 M. sodalis. We do not know the fate of the grisescens. I have never seen these. Perhaps Hassell did not visit the place where they are (seems they are supposed to be in the James Cave part of the system?). However, from other evidence we suspect that this colony no longer exists. Hall has shown that this winter colony of grisescens is the same group of bats which populated the caves of

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

Kentucky and southern Illinois in summer. Investigations during the last two summers have failed to turn up any of this species in Kentucky caves. Dix Dam Cave, Daniel Boone Cave, Jones Cave and Blue Hole all have large guano piles that look recent but no bats. Barr was in the latter two on August 7, 1963, and expressed surprise at not finding the bats. I visited them later that month to try netting at the entrances. We did not see any bats at all. Blue hole is within sight of a house. The people told us that there used to be clouds of bats come out at night but in the last few years there hadn't been many.

Wilson Baker reported that the bats at Wind Cave, Ky., drowned in the flood this spring. There had been a colony of about 2,000 hibernating bats there.

I have a copy of a letter from an M. D. in Kingston, Ontario, reporting some banded bats. He says, "In the course of dissecting several hundreds of bats taken from Craigmont Mine, Renfrew County, Ontario, I carefully collected the bands from all the small brown bats - *Myotis lucifugus* - which were brought to me by an official of the Ontario Department of Health, between November, 1962, and November, 1963. I enclose a list of 130 bat numbers as given in my records with the corresponding band numbers."

These bands are Hitchcock's. He has been working in this remote Canadian mine for about twenty years. Some of the bands reported here go back to 1947. The fellow's own record numbers for these bats begin at 179 and end at 4,420. I wonder if this means he has dissected over four thousand bats in the last year or so? I wonder what sort of research project would require the use of bats in numbers like these?

Certainly for every such incident such as this that we hear about there must be many others that we do not know of. It is so easy to go into a cave and remove bats without anyone's knowing it. A couple of years ago a spelunker told me he saw some "people from New Jersey" carrying out sacks of bats from a cave where I had been studying survival of a population of pipistrelles for 10 years. The cave contains only pipistrelles.

M. D. Hassell visited the laboratories of Dr. Wiebers and Dr. Stones at Purdue last week to study their methods of raising bats in captivity. He is now setting up a lab at Kentucky, and plans to do some studies on behavior and growth. He has been doing some interesting work with homing from different directions and finding some rather striking differences in homing ability. He and I plan to follow up his work on this with some studies on Eptesicus this summer.

CORRESPONDENCE

BOSTON, MASS. (Northeastern Univ.). Your comments in Vol. 4 (4) of B.B.N. concerning bat nets were interesting. We have had different results with suppliers, apparently. We used Bleitz's nets in Costa Rica in 1961 and had a terrible time with them. They were put together sloppily and in several cases some of the main cross strands were crossed so that no. 2 at one end would be no. 3 or 4 at the other. They were near impossible for one person to set due to the way they were packed. They were also very flimsy and ripped easily - I once watched a motmot fly right through one (small mesh), leaving a gaping hole, but hardly twitching the net. They apparently also deteriorated rapidly in the tropical climate, for they seemed to get worse as the summer progressed - so did our tempers. I believe that Bleitz, since changed suppliers. The nets we used in 1962 and 1963 were much better, mostly purchased from Bill Davis, I believe. They bagged well and were fairly strong. The bagging problem, by the way, can be adjusted for by proper placement of tension of the cross strands.

You might be interested to know that we have been keeping track of the Costa Rican colonies of Carollia perspicillata, reported on in a previous

issue of B. B. N. by Linsky and Casebeer. The bands we used damaged the membrane, so Casebeer tagged more animals with ear tags in 1962. When we checked the colonies last summer, we found several of the original arm bands, but none of the ear tags. Some of those bearing the bands had been moving back and forth between the two colonies, and we strongly suspect that at least a third roost is involved, possibly explaining the disappearance of the ear-tagged individuals and the large influx (overturn?) of untagged animals. We ear-tagged more and will try to keep track of these colonies over the next few years, at least. Andy Starrett.

STILLWATER, OKLA. (Okla. State Univ.). The latest copy of B. R. N. arrived in the same mail with notification of one of the most interesting band recoveries I have ever received. A female banded as a newborn at Selman's Cave, Woodward County, Oklahoma, July 7, 1963, was recovered November 14 at Estacion Tamuin on the railroad between Valles and Tampico in the state of San Luis Potosi. This is my first recovery from South of the Tropic of Cancer, and is approximately one thousand miles south of the point of banding.

We put on 20,000 No. 2 bands on female young of the year Tadarida during 1963. My boys also found a fair population of freetail in Merrihew Cave, Woods County, that throughout the summer was consistently made up of a predominance of males.

I was interested in the remarks about Mumford's experience in Kenya. I noticed in Nairobi that the streetlights show lots of bats flying in the city at night. They don't seem to be nearly so common in Ethiopia. Bryan P. Glass.

PLATTSBURGH, N. Y. (State Univ. College). We have banded over 5,000 little browns here in 1963, plus a few big browns, subulatus, and pips. We just got a new batch of no. 2 bands, and have discovered that it takes both hands to close them. I don't know what we are going to do, as it took 2½ hours for two of my best banders to band 70 bats.

We plan to do a bit of collecting in Tamaulipas on the way to Mexico City, and would like to drop by Mammoth Cave on the way. As you probably know, I banded some pips there a number of years ago, and tried to find out something about the distribution of woodrats in the cave. Bob Martin.

BELLINGHAM, WASH. (W. Wash. State College). I have just moved to Western and have located a colony of Corynorhinus in a nearby cave which I would like to study. I wonder if you know of anyone else in this area who is interested in bats. I would like to contact them. Clyde M. Senger.

DAVIS, CALIF. (Zool. Dept., U. of Calif.) Bat banding has picked up in California with Phil Leitner joining me in chasing bats around the state. Bats banded by me in 1963 are:

Myotis yumanensis	1352	Myotis thysanodes	49
Tadarida brasiliensis	711	Eptesicus fuscus	31
Myotis velifer	661	M. lucifugus phasma	26
Antrozous pallidus	188	Myotis evotis	3
Macrotus californicus	128	Myotis californicus	3
Plecotus townsendii	79		

As before my major banding efforts have been with Myotis yumanensis. I am finally in the process of programming my results for a computer, a necessity because of the variations in weather in California. I am also running into a familiar problem--vandalism at my major banding sites. I will probably have to terminate my seasonal movement studies if things get any worse.

I just received a copy of Verschuren's monograph on his work in Garamba National Park in the Congo on bat ecology, biology and systematics. It is the most complete study on bats that I have ever encountered. It is too bad that more copies aren't circulated as an example or goal for people turning out natural history studies! Al Beck.

TORONTO, ONT. (Royal Ontario Museum). The following is a report of the bat banding done by the O.B.B.A. during 1963. Long Point was the only station at which banding was done, and fewer bats were banded than during the previous year. Most of these were taken while roosting during the day.

<i>Myotis lucifugus</i>	18
<i>Lasiurus borealis</i>	2
<i>Eptesicus fuscus</i>	1

It is hoped that we will have more success this year, but as most of the bats are taken from the few buildings at the Point we have to chance being there at the time that they are moving through. M. J. Wilcox

BRANFORD, CONN. (1 Hill St.). Regarding W. B. Stallworthy's hybridization between *M. lucifugus* and *M. keenii* (B.B.N. Vol 4, # 4): I have specimens from Mass and Conn very similar to *lucifugus* except with an ear half again as long. Have you had similar experience in New England? These individuals have caused me much puzzlement. Rollin Bauer.

HERE AND THERE

CLYDE HERBID is writing a review article on longevity of bats for the J. Expt. Gerontology. It includes a list of longevity records for various species. He is now at the University of Alaska.

DON SMITH sent the following note from the Ottawa Journal of March 31, 1964: "A team of bat recorders is being recruited to compile a map showing distribution of bats in Britain. They will visit barns, belfries, caves, tunnels, outhouses, attics and hollow trees. Naturalist Michael Blackmore says "The study of bats is about 50 years behind the times compared with the study of birds."

DL SMILEY sent the following advertisement: "Ultrasonic Rodent Sentry operates at very high frequency sound levels---directly aimed at the upper end of the rodent's hearing range. It cannot be heard by humans and other forms of animal life. Tests in the field, along with typical plant installation experiences have confirmed that Ultrasonic Sound effects nothing but rodents, bats and pigeons." There are different models which protect areas from 5,000 to 40,000 square feet. They are made by Dynamic Sound Sales Corp., 8116 Old York Road, Philadelphia 17, Pa. Anyone want to try one?

JOHN HALL was written up in Science World February 28, 1964. The article was about his work with bats in the Mammoth Cave area. Several good pictures of bats.

LITERATURE

HAYS, H. A. & D. C. BINGMAN. A colony of gray bats in southeastern Kansas. J. Mamm. 45: 150, 1964. A colony of about 400 *Myotis grisescens* occupies a storm sewer in the city of Pittsburg, Kansas. Two bats banded by Myers in Missouri have been taken among them.

HELLEN, V. Le baguement des chauves-souris au col de Bretolet (Valais). 1962. Arch. des Sci. 14: 365-392. Along a mountain ridge in Switzerland, well known to the dicky-birders as a migrating route, bats were discovered, apparently in transit. Mist netting during 1958, 1959 and 1960 captured over 300 bats of 12 species. Numerous bats were seen flying high over the nets.

GAISLER, JIRI. Nocturnal activity of the lesser horseshoe bat, Rhinolophus hipposideros. Zoölogické Listy-Folia Zoologica. Vol 12? no. 3? p 223-230, July, 1963. Night-long observations were made at a cave and a castle occupied by these bats. The bats come and go all night. Neither temperature nor relative humidity influence the duration of hunting flights. Bats do not mind a light rain, but a medium heavy steady rain shortened activity. So did medium wind.

_____. The ecology of lesser horseshoe bat (Rhinolophus hipposideros Bechstein, 1800) in Czechoslovakia, Part 1. Acta Societatis Zoologicae Bohemoslovenicae, Vol? 27, no.? 3 p 211-235, 1963. A study of habitats at various seasons, based upon observations at 98 localities. Measurements of temperature and humidity at the hiding places.

NEVRLY, MILOSLAV. Zimoviste netopyru v Jizerskych horach (A winterquarter of bats in the Iser Mountains ?). Severoceske Museum Prirodovedecke Oddeleni. Liberec, 1963. 46 pp. This booklet in Czechoslovakian seems to report an extensive study. The German summary indicates that it contains a wealth of information. An extensive sewage canal was discovered in the Iserbirges in northern Bohemia where bats are scarce in both summer and winter. Several species of bats winter in the canal (3 X 3 X 1150 meters) in considerable numbers. Bats were marked with bands in 96 color combinations and numbers were marked on the walls so that activities of individual bats could be studied. Female M. myotis appeared Sept. 14; males a month later. In winter there were more females than males. Males left earlier in spring. M. mystacinus appeared earliest in fall and was latest to leave. M. daubentonii appeared in mid-September; females came first, but in spring they left a month earlier than the males. M. nattereri appeared in mid-October and left during the first half of April. M. dasycneme was scarce. Eptesicus nilsoni was irregular and sporadic, appearing from October to January. Plecotus auritus - only the females spent the winter. Occasional males appeared.

Duration of sleep in individual animals-. M. myotis- Most had unbroken sleep of a few weeks; the longest was 23 weeks. M. mystacinus - the longest unbroken sleep was 14½ weeks. M. daubentoni- longest sleep was 14½ weeks. In many instances this species came and went during the coldest. Plecotus auritus - the longest unbroken sleep was 13 weeks.

The paper also has sections on choice of hibernating sites and comparison of the various species' choice of sites, and foreign recoveries of banded bats.



A FAMILY OF RED BATS, LASIURUS BOREALIS

THE COVER

Grady Franklin, photographer for the Crawfordsville, Indiana, Journal Review, sent me this picture. He took it in July, 1962, in a yard in Montgomery Co., Indiana. He said a zoology professor at the local college guessed that they were myotis and that they were all adults. My guess is that they are red bats and that only the one in the middle is an adult.

Red bats are among our most common bats in the eastern U. S., but little study has been made of them because they are solitary and until recent years have been very difficult to obtain alive in any numbers. By picking the orange groves in southern California and by mist netting in the East, these bats can now be obtained in fair numbers rather easily. The echolocation boys are quite interested in red bats. Don Griffin told me that a red bat was one of the best performers they ever had for catching insects.

Phil Krutzsch needs material for his study of reproduction of the lasiurid bats. It would be appreciated if some of you people who do some bat shooting would save reproductive tracts for him. They should be fixed in 10% formaldehyde immediately after death. If the whole bat is fixed, be sure to open up the abdominal cavity so the fixative can get to the reproductive tract. They can be shipped easily sealed in a plastic bag. If you have an opportunity to collect red bats at any season write to Phil at: Department of Anatomy, School of Medicine, University of Pittsburgh, Pittsburgh, Pa.

NEWS & CHATTER

The meetings of the American Society of Mammalogists just concluded at Mexico City included by far the finest program on bats that we have ever had. I also think it was attended by more bat workers than any past meeting. An innovation at the meetings was the mimeographing of abstracts of the papers presented. I hope to give you these abstracts, but first have written asking permission of the Society and each author. There were many interesting papers on bats.

One new bat bander: R. Mark Ryan, Research Zoologist, Deep Canyon Desert Research Center, box 113, Rancho Mirage, California 92270. He is starting a study of local movements of Pipistrellus hesperus and Myotis. He has recently been associated with the bat work in Australia.

Our bat pole finally wore out last spring and we have obtained a new one which is even better. It is an 18' telescoping fibre glass rod which Sears, Roebuck sells for a fishing pole.

We have a fine mealworm colony going now- produces about 30 adults per day on a sustaining yield basis. We feed adults to our Eptesicus or make glop out of them. For better textured glop - use adults; they grind up much better than larvae. We keep our meal worms in bran in shallow aquaria provided with wadded newspaper. Every few days we splash in some water. We got our mealworm stocks for \$3.00 per thousand from Dix Dock, box 427, West Palm Beach 3, Fla. They give excellent service. I found their ad in Audubon Magazine. They also offer for a dollar a book on how to raise mealworms. Think I may buy one.

In April a toxicologist and I received a grant to study the effects of insecticides on bats. We already have substantial results and they are alarming: our big brown bats are far more sensitive to insecticides than any other mammal yet tested.

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

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New Banding Tools
by Donald A. Smith

Very shortly after I started bat banding in the fall of 1962, I decided that it was important to develop easy and efficient techniques for opening and closing bands evenly and painlessly - to both bat and bander. (My thumb and index finger were tired and very sore after manually closing my first fifty no. 2 bands!) Accordingly, Mr. A. A. Raffler, Science Workshop Supervisor, Carleton University and I developed tools for performing each of these operations, and subsequent field tests have proven their worth. Hal Hitchcock saw them in use the winter before last and told Dr. Greenhall at Washington about them recently. On seeing a photo and sketches of them, Dr. Greenhall thought that I should send you descriptions for B. R. N. and also that I should send a note about them to J. Mammalogy. If you do use some of the following in B. R. N., it will be interesting to learn the reaction of the Editor of J. Mammal. to the preliminary 'publication' of the descriptions. Have you ever resolved the problem of whether B. R. N. constitutes a publication or not? If not, here is a test case for you. (Perhaps the Editor of J. Mammal. will throw the matter in your lap as Associate Editor!)

Both tools are basically conventional items that have been modified for our particular purposes. The band-opener (Fig. A) was made from a pair of 7-inch bow opening pliers manufactured by Peer, Germany. The sides of the terminal 10 mm of the tapering tips (1) were filed down until they were approximately parallel. The width across the two tips is 3.5 mm at the end (2). Ten mm proximal from the end (3), the width is 4.0 mm. The depths of the filed tips are 2.0 mm at (2) and 2.5 mm at (3). An adjustable set-screw (5) is mounted in one handle near the joint (4) and its flat end parallels the flat side of a notch (6) cut in the other handle opposite. By adjusting the set-screw (5) one can regulate the distance the handles move towards each other when squeezed and thus the distance the tips separate, and the amount of opening of the band. To open no. 2 bands for Myotis, the outer sides of the tips are about 5.5 mm apart when the handles are squeezed.

To open a band, one merely places it with the 'seam' between its apposed ends facing either up or down over the closed tips of the opener and squeezes the handles slightly. The evenly opened band may either be placed on a bat if one is doing the whole operation at once or it may be placed in a container or in series on a cord to be used later.

Our band-closers (Fig. B) were made from 4.5 inch flat-nose pliers made by Lindström, Sweden, but any similar plier would do. Part way up the inner face of each jaw, we cut out a semi-circular opening (7) half the size of a closed no. 2 band. Thus when the jaws of the pliers are closed, the two matching openings approximate the size and shape of a closed no. 2 band. Incidentally the depth of the jaws at this point is about 5 mm or almost as long as a no. 2 band. The original tips were rounded off approximately parallel to the inner curvatures and the flat inner surfaces of the new tips (8) filed so that when the pliers are closed, there is a 1 mm gap (9) between the tips. To keep the band-closer from getting lost in caves or attics, we attached a light chain (10) and belt-loop to one handle.

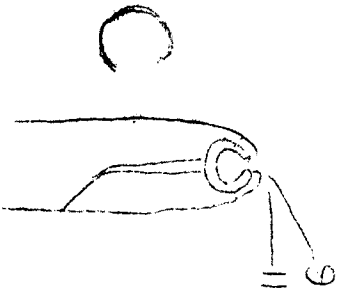
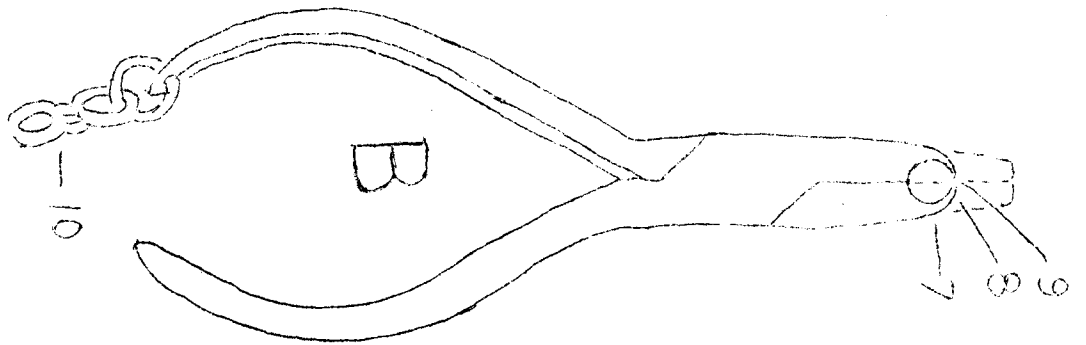
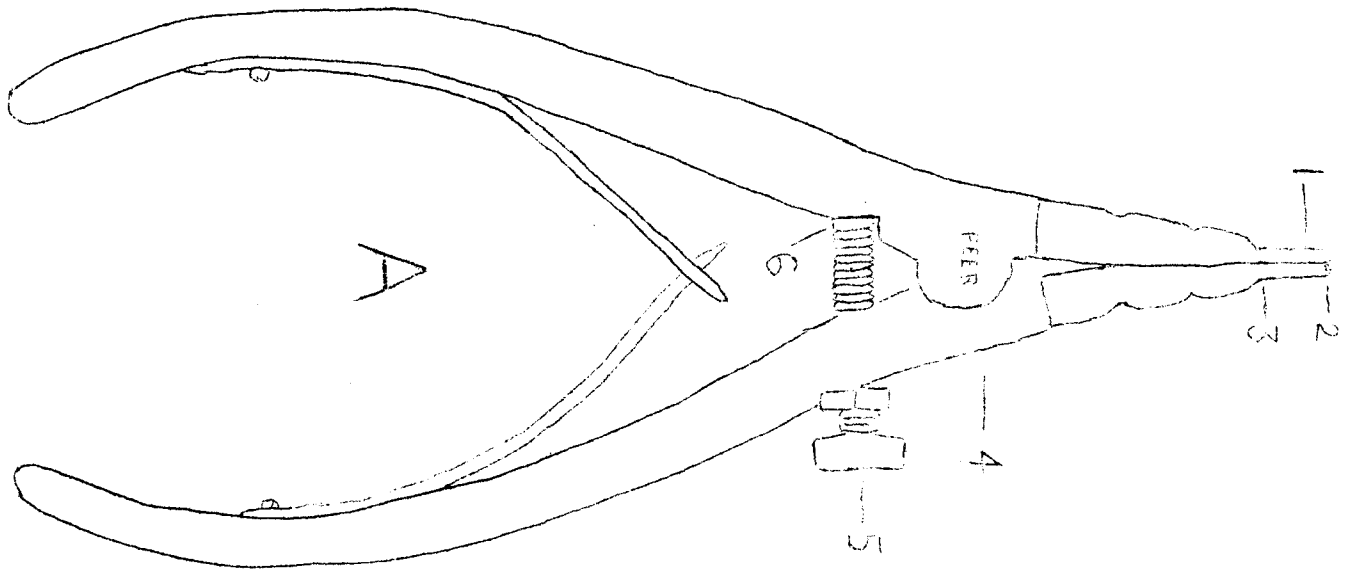
In use, an opened band may either be placed over the distal part of the forearm with the bander's fingers and the pliers placed evenly over the band and used only to clinch it, or the pliers may be used to apply the band as well as to clinch it. In the latter case, the opened band is placed in the band-closer with the gap between its ends (11) opposite the gap (9) between the tips of the closer - as in Fig. C. Both band and closer are slipped over the radioulna from directly in front, the band is clinched and the closer removed. Although when the pliers are closed the ends of the band are touching, when the pliers are withdrawn, the slight springiness of the aluminum band causes the ends to separate ever so slightly. Consequently, the wing membrane is neither cut nor squeezed (except perhaps momentarily) by the band and is not touched by the pliers. I find it worthwhile to carry a small file the first time a new band-closer is to be used, so that the degree of closure can be adjusted slightly by a few file strokes if necessary. I try to adjust the closer so that an applied band will not slide along the wing by itself, but it can be moved proximally along the radioulna and back again with the fingers without cutting or tearing the membrane.

It seems to have taken a lot of words to describe these two essentially simple but extremely useful tools. Since using them, I would never voluntarily go back to using a tapered spreading rod for opening bands nor raw and bloody fingers for closing them! I suspect that others too would find tools such as these valuable additions to their bat-banding bag of tricks. Incidentally, two recent items in your newsletter suggest an increasing need for tools such as I have described. In B. B. N. 4 (4): 25 you mention the great difficulty in opening and closing no. 2 bands after they've been anodized. In B. R. N. 5 (2): 9 you quote Bob Martin's complaint about the increased hardness of his new batch of no. 2 bands and the consequent difficulty in closing them. I'm certain that my tools will help in both these new situations. Eventually if the U. S. Fish and Wildlife Service start issuing opened bands, the need for the opener will disappear but the closer should be useful indefinitely until something better comes along.

I am hopeful that a few people will try out these tools and perhaps improve on them. I'll be looking forward to reading further ideas on the subject in future numbers of B. R. N.

Department of Biology
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(Figures on next page)



NEWS & CHATTER (CONT.)

The intervening dozen pages are where they are because I had the opportunity to get the secretary to type them at that time. I am trying to get this out before I go to Minnesota.

Is glop obsolete? Al Beck told us that he never bothers with it. He says he feeds his bats entirely on canned dog food. This would certainly simplify things. I tried it yesterday on my Eptesicus, and they didn't go for it very enthusiastically. But then dogs won't eat the stuff either unless they have to, yet it will keep them healthy.

A couple of news items from the press have been sent to me. One note from an unidentified newspaper says: Mexicans destroy bats nests with fire. Puerto Vallarata, Mexico - Health teams used fire yesterday to destroy bats nests and started immunizing persons believed to have been bitten by bats in this Gulf Coast port. Also under way was a campaign to prevent rabies from extending to cattle in the area which may have been attacked by bats. Health authorities said newspapers exaggerated reports of vampire bat infestation.

An article in Medical World News July 5, 1963, Vol 4 # 14, p. 62b is entitled: Cave sickness borne on bat wings. It says that bats that inhabit caves do a lot worse than get in the hair of spelunkers. When a certain fungus that flourishes in the excreta of bats gets into the bloodstream, the result is histoplasmosis. It says that in Mexico the disease has been invariably tracked down to bat excrement in mines, caves and tunnels, and that in Mexico mortality rate is 17%. The strain in the U. S. is less virulent.

KENTUCKY EPTESICUS STUDY

Our project on the colony behavior of big brown bats has been getting excellent results this summer, primarily as a result of the superb gadgeteering of Roger Barbour. He has things rigged up so as to record just about everything the bats do. We have learned that mothers leave their young in a mass when feeding, and pick out their own young when they return. When babies are very young the mothers stay away only a few hours, and do not use the night roosts which are so popular later in the season. As the young grow up, mothers stay out later. Mothers will carry their baby from one building to another, and will readily come down to the floor and pick him up when he falls. A mother missing a baby will come down to a tray of strangers and look them over, but will not take them. Methods, details, and evidence for all this will be written up to be published soon after we complete this study next summer.

To work out the feeding range of bats in the colony we are putting tiny flashlights on them. There are a few bugs in the system yet, but it is very promising. The bats can carry them nicely, and, very strangely, don't seem to object to them. I expected the bats to try to scratch them off, but they don't.

CORRESPONDENCE

LITTLE SINGLETON, ENGLAND. Concerning Don Smith's note from the Ottawa Journal published in the last issue: I thought you might be interested to know more about the scheme and so I enclose a few details. Enclosed is one of the record cards used in the distribution survey. All people concerned in the scheme fill out cards as they find bats and send the cards to Dr. Gordon Corbet at the British Museum where he will plot them on a map. Eventually it is hoped to print these maps and make them available to those who

want them.- I would be interested to know if any of your readers have discovered any dyes suitable for partially staining bats, preferably ones that last til the next molt. Duncan W. Harrington.

HUNTINGDON, PA. I plan to start banding bats sometime this year in central Pa.- local caves in Huntingdon Co. Robert L. Fisher.

MT. VIEW, CALIF. I think I wrote you last fall that I thought the apparent low population of bats in the cranberry area of Cape Cod might be related to the spraying done there; perhaps I also mentioned that the same thought occurred to me when searching for bats in the Connecticut Valley, in the tobacco area. I suspect there is a relation between abundance of bats and the extent of pesticide control. It will be interesting to see what your studies show. Harold Hitchcock.

RICHMOND, IND. On Dec. 8, 1963, Cope and I and several other Earlham students visited Wind Cave near Big Spring, Breckenridge Co., Ky. At that time we handled 2,634 bats and estimated the total population at 6,500. On Feb. 7, 1964, Ward and some Earlham students revisited the cave. There was no evidence of any change in the population. On March 19, 1964, Steve Humphry and I visited the cave. At this time we discovered that the spring floods had swept through the cave and nearly wiped out the winter population. The estimated population was only 500 bats. The cave floor was littered with dead bats; we counted 1,343 carcasses and removed 597 bands. The remainder were probably washed on through the cave or buried in the mud. During the March visit to the cave, Humphrey, Hendricks and I mist netted 4 Myotis subulatus, 3 males and 1 female. Tony DeBlase.

TUCSON, ARIZ. I don't really know what to say about the status of bat populations in relation to humans here in the Southwest. Obviously, many of the mine tunnels and other colonies that 10 years ago had large numbers of bats are today vacant. This seems to be a direct result of human disturbance. The Sunday afternoon spelunkers and amateur miners go into the more readily accessible mines and caves, start fires, make the usual series of vandalistic tactics. One reaction would be that certainly the bats have suffered and have become fewer. However, many of the bats that were banded in those caves have since been recovered in alternate roosts in the same general region.

Another bad effect on bat population, and again one of which I have no real measure is that in the irrigated areas populations are extremely low. I suspect that insecticides are killing these bats, but I have no before and after population comparisons.

One of the problems here in Arizona is that the county and state public health officials are blaming all rabies in the area on bats, even though rabies is turning up in cats, wolves and dogs. It has been a constant battle to try to educate the public not to exterminate bats. Some populations have been so exterminated. How many I don't know. E. L. Cockrum.

LAFAYETTE, IND. Our knowledge of population cycles in bats is practically non-existent. We need data on natural changes before we can assess any changes brought about by pesticides, etc.

I suspect that bats are more numerous than we think and that there are many caves sheltering large populations that have not been found. Where we do know of large concentrations we should make some effort to protect them.

Bat banding is undoubtedly a factor contributing to mortality. This is difficult to determine, but we know that it cannot be beneficial. The way some persons conduct banding operations, I suspect mortality may be considerable. I think we need to sit down and decide whether wholesale bat banding is worthwhile. Maybe we need more selective banding with effort to visit caves in late winter to band just before the bats leave. We know we can band large numbers by netting at caves in Aug & Sept. Why not leave the mid-winter concentrations alone? Russell E. Mumford.

HERE & THERE

STEVE HUMPHRY and the others at Earlham are doing an intensive study of a colony of Myotis lucifugus in Boone County, Indiana, this summer. TONY DEBLASE, who graduated at Earlham, is going to spend next year on the staff there at the Museum.

RON LINSKY, who has been observing Myotis colonies in Orange County, California, says that the influx of people has been so great that the bats have gone elsewhere. He says he will spend the summer looking for new colonies.

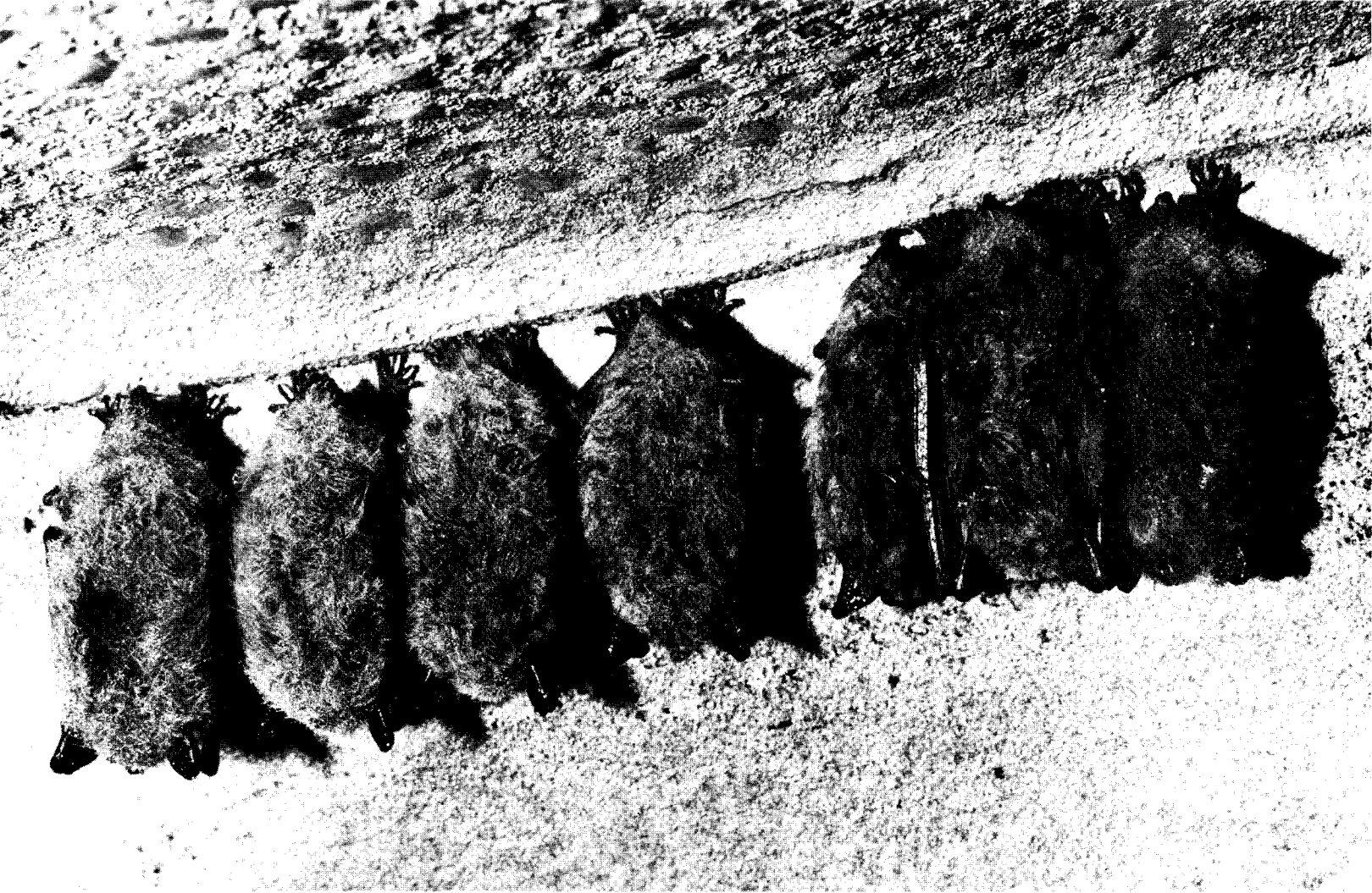
ROBERT STONES, who took a PhD at Purdue and stayed on in research with bats for a while, has taken a job at Michigan Tech.

LITERATURE

Hamilton-Smith, E. 1964. Australian Cave Bats A provisional guide to identification. C. S. I. R. O. Canberra. This is an annotated list and key to all bats found in the caves in Australia.

_____. 1964. Field equipment for collecting bats. Bull. Australian Mammal Soc. 7: 7-10. This is a description and drawings of the equipment used in the bat work in Australian caves.

WEBSTER, F. A. (no date on my reprint; probably 1963 or 1964). Active energy radiating systems: the bat and ultrasonic principles II; acoustical control of airborne interceptions by bats. Proc. Internatl. Congress on Technology and Blindness. 1: 49-135. This extensive paper on the problems of echolocation of insects and other moving objects by bats is fascinating reading. The paper contains numerous magnificent photographs of bats catching mealworms and moths in flight.



MYOTIS LUCIFUGUS HIBERNATING

THE COVER

This photo of a row of little brown bats, Myotis lucifugus hibernating in Bat Cave, Carter Caves State Park, Ky., was taken by Roger W. Barbour.

Although the cave is best known for its spectacular colony of 100,000 M. sodalis, it also serves as winter quarters for 4,000 M. lucifugus, 500 Pipistrellus subflavus, and a varying population of Eptesicus fuscus.

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

BITS OF NEWS

Ed Sulkin was a recent visitor at the University of Kentucky. He is now working on encephalitis in bats and is interested in mosquito-bat-human relationships. A paper he presented on this last week made the wire service and was mentioned in newspapers across the country. He and his colleagues brought out the possibility that bats might be an important reservoir for encephalitis virus.

The CDC Morbidity and Mortality report for September 30, 1964, summarizes U. S. rabies data for 1963. The only human death was a woman in Alabama probably bitten by a dog. Total positive animals reported by all states included: dog 568, cattle 456, other domestic 284, fox 622, skunk 1,462, bat 303, raccoon 162, other wild 54, total 3,929.

Need good colored plastic bands for marking bats? We are very well pleased with what we got from A. C. Hughes, First High Street, Hampton Hill, Middlesex, England. He has a large variety of colors. Bands are available plain or numbered. Prices seem reasonable. We learned about these from Al Beck. M. D. Hassell is using them in a study of intra-cave movements of bats in several Kentucky caves.

The Huntsville Grotto Newsletter of July, 1964, has the following report by Bill Varnadoe: "Everyone seems to be developing ulcers over the fact that for the past several years few bats have been seen in Sauta. Well, relax. I was up there on June 12th and, believe me, they're there! Howard Sloan estimated the colony in the Bat Room to be between 300,000 and 500,000."

Does anyone have any ideas he has found useful in repairing bat nets. We ran through quite a few nets in August. Bats are hard on them, and even when a net is closely attended it will get chewed up. We sometimes patch a hole by drawing it up with a thread but this is tedious. I have wondered if a dab of some sort of glue might work.

MIST NETS - HOW TO GET THEM

Send a stamped and self-addressed envelope (4 x 9") for a listing of the nets now available. Write: EBBA Net Committee, Mrs. Eleanor E. Dater, Chairman, P. O. Box 111, Ramsey, N.J. 07446

Nets sold by NEBBA. The Northeastern Bird-Banding Association imports nets as a service to members and other netters. Write: E. A. Bergstrom, 37 Old Brook Road, West Hartford 17, Conn.

Bleitz Wildlife Foundation. As a service to scientific investigation, the Bleitz Wildlife Foundation has available a price list containing several new types of mist nets, net poles, and other banding supplies. Write: Bleitz Wildlife Foundation, 5334 Hollywood Blvd., Hollywood 27, California. (Reprinted from: EBBA News, July-Aug, 1964.)

SUMMARIES OF PAPERS ON BATS PRESENTED AT THE
44TH ANNUAL MEETING OF THE AMERICAN SOCIETY
OF MAMMALOGISTS. MEXICO, D. F. JUNE 14-18, 1964

Title: Netting bats in the American Tropics, by Charles O. Handley, Jr.

History of mist netting in Japan and America. Personal netting experience in the American tropics. Discussion of netting sites and situations. Overcoming net avoidance. Value of netting in the study of bats.

Title: Migration in the guano bat Tadarida brasiliensis, by Robert G. Schwab and E. Lendell Cockrum.

In the past few years investigators from the University of Arizona have banded nearly 200,000 Tadarida brasiliensis in Arizona, New Mexico, and Mexico. This paper will summarize the chronology and pattern of migration. Certain caves used by this species during migration and as maternity sites will be discussed in detail. Techniques used to capture and band large numbers of T. brasiliensis from caves and bridges will be presented.

Title: Aspects of the functional morphology of Molossid bats, by Terry A. Vaughan

The morphology of three bats of the family Molossidae (Tadarida brasiliensis, T. molossa, Eumops perotis) is considered in relation to the rapid, enduring flight characteristic of bats of this family. The following anatomical features of importance in allowing this type of flight are discussed: the structure and position of the ears; specializations of the scapula, the scapulohumeral joint and the manus; the bracing of the wing membranes by muscles and connective tissue; and the strongly muscled hind limbs.

Title: Survival of bats banded during hibernation, by Harold B. Hitchcock

Data on the survival of three species of bats, Myotis l. lucifugus, Myotis subulatus leibii, and Eptesicus f. fuscus, banded in eastern Canadian caves, 1939-61, are analyzed. Males outnumber females in M. lucifugus and E. fuscus and survive longer. Approximately equal numbers of males and females are found in M. subulatus and the two sexes survive equally. It is suggested that a difference in summer colony formation may account for the greater mortality of females in M. lucifugus and E. fuscus. In these species chiefly the females crowd into very hot, parasite-ridden quarters. The males of these species and both males and females of M. subulatus appear to spend the summer in uncrowded, cooler places. The oldest specimens were as follows: M. lucifugus, 20 years; M. subulatus, 12 years; Eptesicus, 19 years.

Title: Differential homing in the Indiana bat Myotis sodalis, by Marion D. Hassell and Michael J. Harvey

Myotis sodalis used in this study were taken from those in hibernation in bat cave, Carter Caves State Park, Carter County, Kentucky, on October 4, 1963. One hundred were banded and released in the cave as a control. Three groups of 500+ each were caged and transported directly to the release sites, each 200 air miles from Bat Cave. Five hundred bats were banded with red anodized bands and released near Dallville, Ohio, beside the Sandusky River, 500 near Morgantown, North Carolina, beside the Catawba River and 472 beside the Ohio River near Cloverport, Kentucky. All bats were banded and released individually between 11:00 p.m. E.S.T., October 4 and 2:00 a.m. E.S.T., October 5, 1963. After a period of three months 66.4% from Ohio, 26% from North Carolina, 13.6% from Kentucky and 33% of the controls had been recovered in Bat Cave.

Title: Migration of the hoary bat Lasiurus cinereus, by James S. Findley

Hoary bats migrate in sexually segregated waves, females proceeding males northward in spring. Females bring forth young in northern U.S. and in Canada while males seem to summer throughout the western part of the continent. Fall migration is less well documented. Some winter in southeastern and southwestern U.S., but the main wintering area remains undetected.

Title: Spatial orientation by the Mexican freetailed bat Tadarida brasiliensis mexicana, by Albert J. Beck

The ability of Tadarida brasiliensis to detect and avoid obstacles in flight by both auditory and visual means was measured. The importance of the colliculi caudalis in acoustical orientation was confirmed by studying the effects of unilateral and bilateral lesions of this subcortical center. Bilateral lesions produced a total loss of echolocational ability in one bat, which compensated by flying slower and using visual means of orientation. Unilateral lesions reduced the ability of the animals to detect and avoid obstacles. The visual response and flight behavior compensation observed indicated that it is part of normal orientation.

Title: Seasonal differences in metabolism and body temperature of the bat, Myotis lucifugus, at various ambient temperatures, by Robert C. Stones and Jacob E. Wiebers

Myotis lucifugus were found to remain homeothermic when the body temperature was 35 F and above. The body temperature is stabilized at a higher level and the metabolic rate is greater in winter than in summer bats. Tolerance to hyperthermia is better in summer bats. The adjustment of the acclimatized bat to cold is metabolic rather than insulative, opposite to that observed in most other mammals. Thermal neutrality and critical ambient temperatures are shifted to higher limits with acclimatization of bats to heat.

Title: Observations on the gular gland of Molossus nigricans, by R. Horst and W. A. Wimsatt

The adult males of all the genera of molossid bats examined possess a large "gland" in the gular region. It is most highly developed in the genus Molossus. In M. nigricans the "gland" in the gular region. It is most highly developed in the genus Molossus. In M. nigricans the "gland" consists of an aggregate of sudoriparous, highly F. A. S. positive glands situated peripherally, and more centrally, a complex of intensely sudanophilic sebaceous units. The gland is surrounded by a capsule of dense connective tissue which also extends into the interior region between the various lobes. Female molossids possess only a vestige of this structure. Ovariectomy of M. nigricans, followed by the administration of testosterone, did not cause any change in the gland. Castration of M. nigricans males was followed by the atrophy of the gland, while castration followed by testosterone administration maintained the gland in its normal state. Little is known of the gland's function but its great sexual dimorphism suggests that it serves some role in reproduction.

Title: Body temperature regulation in Australian flying foxes, by Phil Leitner

The relations of body temperature and oxygen consumption to ambient temperature were studied in two large Australian flying foxes, Pteropus poliocephalus and Pteropus scapulatus, and one very small one, the blossom bat, Syconycteris australis. The two species of Pteropus maintain body temperatures extending from 5° to 40° C. At low ambient temperatures they can surround themselves with a layer of air as much as 10° C. above ambient by inclosing their bodies in their wings. At ambient temperatures above the usual level of body temperature a variety of mechanisms are used for heat dissipation - panting, wing-flapping, salivation, and licking of the wings and chest. When the animals are hyperthermic the wings and the interfemoral membrane become conspicuously engorged with blood, and the normally abdominal testes become conspicuously scrotal.

Both species tolerate some hyperthermia without apparent distress, but Pt. scapulatus allows its body temperature to rise more than does Pt. poliocephalus before activating its mechanisms for heat dissipation. In cool weather Pt. scapulatus huddles in dense clusters while Pt. poliocephalus does not.

Syconycteris australis is unable to maintain its body temperature when ambient temperature approaches 0°, but body temperature is independent of ambient temperature between 10° and 30° and remains between 36° and 37°. At ambient temperatures between 30° and 35° hyperthermia develops.

Neither of the species of Pteropus studied undergoes daily or seasonal periods of torpor. We cannot make such a positive statement about S. australis, but we observed no cycles of torpidity.

In Pt. poliocephalus the basal metabolic rate is 0.53 cc O₂/gm/hr. The upper critical temperature is about 35°, and the lower critical temperature as well as the slope of the increase of metabolism with ambient temperature depend on whether or not the wings inclose the body.

Pteropus scapulatus has an upper critical temperature of approximately 35° and a lower critical temperature of about 24°. The basal metabolic rate is 2.67 cc O₂/gm/hr.

Myconcteris australis has a thermoneutral point at about 33°. Its basal metabolic rate is 1.93 cc O₂/gm/hr.

The ecological implications of the thermoregulatory performance of the two species of Pteropus are discussed, and it is concluded that the major challenge presented to these animals by the physical environment is high summer temperatures. This is probably particularly important in the arid interior of Australia where populations of Pt. scapulatus, but not Pt. poliocephalus, occur. The former species appears to be better adjusted to high ambient temperatures than the latter.

Title: Natural history observations on east African bats, by Bruce J. Hayward

Kenya is bisected by the equator and hence has a widely divergent bat fauna. The elevations range from sea level to 17,000 feet. Approximately 70 species of bats occur in this country. The greatest diversity of bats may be found along the Indian Ocean and in a band of low country adjacent to Lake Victoria. The "white highlands" of Kenya have a lesser number of species because of the higher elevation. A brief natural history of some of the more common species is discussed and their ecological equivalents in North America were discussed.

Title: The microanatomy of the tongue of the vampire bat, Desmodus rotundus, by Luis de la Torre and Donald E. Bedford

A feeding mechanism has been described by Mann (1950) in the vampire bat, Desmodus, by which blood is drawn into its mouth by means of two lateral lingual canals. In the present work the tongues of Desmodus, Diphylla, and Eiaemus were studied in an attempt to learn the details of this interesting adaptation.

These canals or grooves are actually the folds between the tongue proper and the sublingua which is present in many mammals. In Desmodus the sublingua is well developed but is lacking in Eiaemus and Diphylla. The folds may subdivide medially into several branches thereby increasing the volume of blood that can be handled without increasing the internal "diameter" of the fold. Such an increase in cross-sectional area might decrease the effectiveness of the mechanism. Noteworthy is the complete absence of taste-buds in the epithelium lining these grooves. The taste-buds occur on the dorsal surface of the tongue, along the labial edges, and a small cluster of taste-buds is located on the underside of the tip of the tongue. This last group appears to be the only group of taste buds directly involved in feeding since it is the only one which actually makes contact with the blood. None of the vampires has vallate papillae and thus, the taste-buds are not associated with epidermal pits, but lie immediately below and perpendicular to the surface of the tongue. From the structure of the

tongue it follows that the vampire genera differ in their manner of feeding, the "double-pipette" method being unique to Desmodus. The other general may always feed, as Desmodus sometimes feeds when the volume is small, by wiping the wound with modified lapping movements.

Title: The evolution and systematics of the neotropical bats of the genus Sturnira,
by Luis de la Torre

The Neotropical bats of the genus Sturnira have been studied with special reference to the adaptive significance of their general anatomy, the phylogenetic implications of their dentition, their individual variation, their differentiation, and their geographic distribution. The raw data comprise quantitative and qualitative information derived from specimens throughout the geographic range of the genus. The dentition of all described genera of the family Phyllostomidae has been studied and interpreted with regard to aspects of molar formation and of phyletic lines represented. The estimated relationships, phyletic lines, and derivation of the phyllostomid genera are presented.

The main conclusions dealing with systematics are the following:

1. On the basis of cranial and general morphology the genera Chilonycteris Gray, Pteronotus Gray, and Mormoops Leach are excluded from the family Phyllostomidae and are considered as composing the family Chilonycteridae.
2. The genera Sturnira Gray, 1842, Corvira Thomas, 1915, and Sturnirops Coolwin, 1933, are considered congeneric.
3. The genus Sturnira is differentiated into eight species, two of which are described as new.
4. The widespread species S. lilium B. Geoffroy is divided into five geographic races, three of which are new.

CORRESPONDENCE

BRNO, CZECHOSLOVAKIA. With a great interest, I read every new No. of Bat Banding News. Among others, two little contributions in the "Correspondence" captivated my attention: of Mr. L. W. Harrington and, of Mr. R. E. Murnford.

Mr. Harrington says: "I would be interested to know if any of your readers have discovered any dyes suitable for partially staining bats, preferably ones that last til the next molt." In Czechoslovakia, we successfully used coloured bands to trace hibernating bats. The different combinations of these bands enabled us to distinguish the single bats from a distance without an unnecessary disturbing their winter torpidity. We used either painted aluminium bands or coloured celluloid ones. Coloured celluloid bands were found to be the most suitable of the bands used. Their main advantage is that they do not lose their colour after a time (thus, I found bats wearing coloured celluloid bands after two and three years) and further their elasticity allowing their quick application. More details are given in: Gaisler, J. and M. Nevrlý, 1961: The use of coloured bands in investigating bats. Acta Societatis Zoologicae Bohemoslovenicae, 25 (2): 135-141; and in the paper of Nevrlý, referred to in the B.B.N. 5 (2): 11. On the Annual meeting of "Deutsche Gesellschaft für Säugetierkunde"

in Wien (Austria), September/October 1964, I will read a paper on the problems of colour marking in bats.

I fully agree with Mr. Mumford, who says: "I suspect that bats are more numerous than we think and that there are many caves sheltering large populations that have not been found." In fact, we found new bats sheltering quarters every year, incl. new cave roosts, in the small and well fathomed Czechoslovakia. After some quiet period, the bat colonies came back into places which they had left before, due to human disturbance. It is still more true for the tree-dwelling species! Finally, as to the losses caused to bats by banding operations: of course we need more selective banding. Why not apply the coloured bands? It is possible to limit, to a considerable extent, the disturbance of the life of bats by using them, in winter as well as in summer period. There are more possibilities, e. g. in using the phosphorescent dyes, which you, American chiropterologists, might try. CSc J. Caisler.

KANSAS CITY, KANSAS. I am interested in joining "Bat Banding News". Please find enclosed a dollar which I believe covers the annual dues. I have had a very interesting summer in Utah; among other species I picked up four Buderma maculatum. David A. Basterla.

ED. NOTE: New subscriber Basterla gave his address as "Biology Dept., Kansas City Kansas State College, Kansas City, Kansas." Apparently such does not exist, as mail I send wanders forward to Emporia, Pittsburg, and Manhattan and is returned. Does anyone know where I might contact this lost client?

RICHMOND, INDIANA. While working some of the best of Jim Cope's nursery colonies of Myotis lucifugus this summer, considerable extermination activity was noted. Seventeen colonies were visited, and the estimated aggregate population was 10,000 bats. At four of the 17 colonies there had been unsuccessful attempts at extermination, such as the application of naphthalene mothballs or inadequate screening. In two colonies, new roofs were being built in hopes of destroying the bats' roosting places; almost all the bats from one of these colonies had moved to a nearby barn. A new colony of undetermined population was exterminated with two gallons of DDT. One building of a four-building complex was exterminated and caulked. And two other colonies with an estimated aggregate population of 1275 are to be exterminated in the future. We learned of, but did not visit, a colony of 1500 that was also exterminated. At both this colony and the one which had been sprayed with DDT were several of our bands, although we have never banded at either. Steve Humphrey.

FALSO VERDE ESTATES, CALIFORNIA. I have been informed (sic) that you control (sic) the Bat Cave at Carter Caves State Park. For the last month I have been studying the bat. I would like to know if it would be possible for you to send me a bat for further study. I would be quite happy if you could send me a bat for further study. I will pay all shipping fees from Kentucky. I would be quite pleased if you could send me a bat. I will be glad to pay from one at a reasonable price. I am now studying the bats (sic) structure. And his echos which he sends out. If you do send me one I will go into deeper study. Yours, Dr. Tom Engelhardt, Naturalist. Dr. Tom Engelhardt, 2449 Via Anacapa, Falos Verdes Estates, California.

ED. NOTE. In reply to Dr. Engelhardt I told him how he might locate a bat in his home town and also referred him to our friends Beck & Leitner.

SAINT MARY'S COLLEGE, CALIFORNIA. It's been a busy summer here in California. With Al Beck's help I've managed to band about 3000 Tadarida brasiliensis so far and we expect to get quite a few more. Not many by comparison with the efforts

of the banders in the Southwest, but it should be interesting to see what happens this fall. In addition, I've almost finished a study of body temperature and metabolism in Macrotus californicus and have some other experimental work in progress. I hope things are churning along well for you. Maybe we can get together this winter at the meetings in Knoxville. Phil Leitner.

WARRENBURG, MISSOURI. I have attempted August netting--get lots of M. keenii and P. subflavus plus a smattering of other species--in the central Missouri caves. However, mine has not been sustained effort; only one night at a time. R. F. Myers.

BOUCHERTON, MICHIGAN. Have you or anyone else that you know, ever collected growth rate data for hibernating or non-hibernating species of bats by measuring body length or body weight? I have been trying for several years to establish a growth curve for young M. lucifugus by taking body weight measurements. This has been carried out at 92°F and at room temperature. As you might expect the rates differ, the curve at room temperature is flatter than the other. I feel that my data are somewhat inconclusive without body length measurements. I would be willing to cooperate with yourself or anyone else in co-authoring a paper on these data. To my knowledge growth data for bats is not found in the literature.

I have been housing pregnant and lactating bats in the laboratory since late June. The young were born almost two weeks later in northern Michigan than those we studied at Purdue two summers ago. The thermoregulatory pattern for adult females is also very interesting. I just completed drafting a grant proposal entitled, "A Comparative Study of Temperature Regulatory Responses and Mechanisms in Microchiroptera." I haven't yet finished the proposal regarding a comparison of environmental factors and their influence on bat behavior in caves and mines. The mine shafts here are loaded with bats in winter as well as summer. The mining corporations are willing to cooperate and might even screen off the mines I need for such a study. I'll keep you posted on developments. I do believe a study of this nature has definite advantages in this area. The mines are accessible and the bats are very numerous. R. C. Stones.

NEW IDEAS IN GLOP

We have been experimenting with the making of glop and have come up with some ideas which seem to have merit. Yolk of boiled egg is rather expensive when needed in quantity and is a nuisance to prepare. We have been substituting canned dog food. We supplement our adult mealworms with insects collected at several beetle traps on campus. During June-bug season this catch consists mostly of these large Scarabaeids and they can be picked up in great quantity. Many businesses such as drive-in restaurants which operate at night have insect traps which collect insects by the gallon. This source of supply should be available to anyone anywhere. We store these in gallon jars in a freezer. Using beetles, cream cheese, bananas and dog food we can mix up a weeks supply of food for 20 Hptesicus for about 50¢. So far they seem to be doing quite well on it. Stewart Peck tried it and reported that it is quite tasty. He says it should go well as a dip for potato chips. Sulklin says he uses cottage cheese instead of cream cheese and then adds agar to improve consistency.

RAISING MEALWORMS

Mealworms (Tenebrio molitor) are easy to raise and make excellent food for bats. We raise them in three aquaria. Fatt Engineering and Manufacturing Co., 16539 So. Main Street, Box 110, Gardena, California, makes square shallow aquaria which are ideal for this purpose. We get bags of bran from a local feed store to feed the larvae and beetles. Some trash such as newspaper, cardboard and rags is added. The adults need cover; this suppresses cannibalism. Productivity is increased strikingly by supplying some water. We dump about a cup into each container at least twice a week.

LITERATURE

Lawrence, B., and A. Novick. 1963. Behavior as a taxonomic clue: relationships of Lissonycteris (Chiroptera). Breviora. No. 134: 1-16. This paper contains more than the title implies. Behavioral and morphological studies are used to evaluate the relationships among Lissonycteris, Rousettus, Myonycteris, Bidolon, Pteropus, and Eonycteris. There are also excellent photographs of Lissonycteris angolensis.

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DeCoursey, G. and P. J. DeCoursey. 1964. Adaptive aspects of activity rhythms in bats. Biol. Bull. 126: 14-27. Bats have precise nocturnal activity rhythms. Although amount of light determines time of emergence the bats anticipate the dark and begin light sampling before dusk. Captive bats were tested for adjustment of time of activity to artificial light-dark schedules.

Bartholomew, G. A., Leitner, P. and Nelson, J. W. 1964. Body temperature, oxygen consumption, and heart rate in three species of Australian flying foxes. Physiol. Zool. 37: 179-193.

Culkin, S. E., Sims, R., and Allen, R. 1964. Studies of arthropod-borne virus infections in Chiroptera. II. Experiments with Japanese B and St. Louis encephalitic viruses in the gravid bat. Evidence of transplacental transmission. Amer. J. Tropical Med. & Hygiene. 13: 475-491.

Herreid, C. F., 1964. Bat longevity and metabolic rate. Exp. Geront. 1: 1-9. This paper contains a short discussion of metabolic rate as a factor in longevity and of the variable metabolic patterns among different families of bats. A table gives known longevity records of different species of bats including some previously unpublished data.