

ZOOLOGY

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ABSTRACTS

A Preliminary List of the Fishes of Tippecanoe County, Indiana. DON C. ERMAN and RUSSELL E. MUMFORD, Utah State University and Purdue University.—Since 1958, numerous species of fishes have been added to the Tippecanoe County list, as the result of more extensive collecting and improved collecting methods. The total number of fishes known from the county is 66, but this list is incomplete.

Fishes of Vigo County, Indiana. JOHN O. WHITAKER, JR. and DALE C. WALLACE, Indiana State University.—A study of the occurrence, distribution and ecology of the fishes of Vigo County, Indiana was begun in November of 1962. The fishes were collected primarily by seining. Some collections were made in the Wabash River and in deeper waters with the aid of a shocker boat from the Indiana Department of Conservation. To date 252 collections have been made. Ninety-four different species of fish have been taken and twenty-four of these are new records for the county. Eight of the species which were reported by Jenkins¹ Blatchley,² and/or Gerking³ have not been taken during this study. A total of 102 species are now known for the county.

A list of the new records for the county follows: *Icthyomyzon unicuspis*, *Lampetra lamottei*, *Hiodon tergisus*, *Alosa chrysochloris*, *Carpiodes carpio*, *Moxostoma anisurum*, *Moxostoma breviceps*, *Moxostoma valenciennesi*, *Cyprinus carpio*, *Carassius auratus*, *Hybopsis x-punctatus*, *Rhinichthys atratulus*, *Chrosomus erythrogaster*, *Pimephales promelas*, *Noturus cletherus*, *Noturus flavus*, *Aphredoderus sayanus*, *Percina sciera*, *Etheostoma chlorosomum*, *Etheostoma spectabile*, *Etheostoma gracile*, *Micropterus punctulatus*, *Chaenobryttus coronarius* and *Lepomis microlophus*.

The species reported by previous investigators but not seen during this study are: *Icthyomyzon bdellium*, *Acipenser fulvescens*, *Cycleptus elongatus*, *Hybopsis amblyops*, *Notropis whipplii*, *Morone interrupta*, *Stizostedion vitreum*, and *Percina shumardi*.

Ecological information from this study will be further examined.

Amphibians and Reptiles of Vigo County, Indiana. DAVID RUBIN, Indiana State University.—Forty-three species of amphibians and reptiles were collected in Vigo County from 1963 to 1965. Three of these, *Plethodon dorsalis*, *Scaphiopus holbrooki*, and *Eumeces laticeps*, are new county records bringing to 54 (51 species considered to be valid were

1. Jenkins, O. P. 1887. List of Fishes Collected in Vigo County in 1885 and 1886. The Hoosier Naturalist. 2:93-96.

2. Blatchley, W. S. 1938. The Fishes of Indiana. Nature Publishing Co., Indianapolis.

3. Gerking, S. D. 1945. Distribution of the fishes of Indiana. Investigations of Indiana Lakes and Streams, Indiana Dept. of Conservation. 3:1-137.

recorded by W. S. Blatchley in the 1890's) the number of amphibians and reptiles known to occur or to have recently occurred in Vigo County. Fourteen are salamanders: *Necturus maculosus*, *Siren intermedia*, *Ambystoma jeffersonianum*, *Ambystoma maculatum*, *Ambystoma opacum*, *Ambystoma texanum*, *Ambystoma tigrinum*, *Notophthalmus viridescens*, *Plethodon cinereus*, *Plethodon dorsalis*, *Plethodon glutinosus*, *Hemidactylium scutatum*, *Eurycea bislineata*, *Eurycea longicauda*. Twelve are frogs: *Scaphiopus holbrooki*, *Bufo woodhousei*, *Acris crepitans*, *Hyla crucifer*, *Hyla versicolor*, *Pseudacris triseriata*, *Rana areolata*, *Rana catesbeiana*, *Rana clamitans*, *Rana sylvatica*, *Rana pipiens*, *Rana palustris*. Nine are turtles: *Chelydra serpentina*, *Sternotherus odoratus*, *Terrapene carolina*, *Graptemys geographica*, *Graptemys pseudogeographica*, *Chrysemys picta*, *Pseudemys scripta*, *Trionyx ferox*, *Trionyx muticus*. Two are lizards: *Eumeces fasciatus*, *Eumeces laticeps*. Seventeen are snakes: *Natrix septemvittata*, *Natrix kirtlandi*, *Natrix rhombifera*, *Natrix sipedon*, *Storeria deKayi*, *Storeria occipitomaculata*, *Thamnophis sauritus*, *Thamnophis sirtalis*, *Heterodon platyrhinos*, *Diadophis punctatus*, *Carphophis amoenus*, *Coluber constrictor*, *Opheodrys aestivus*, *Elaphe obsoleta*, *Lampropeltis calligaster*, *Lampropeltis getulus*, *Lampropeltis dolia*.

Mammals of Vigo County, Indiana. JOHN O. WHITAKER, JR., Indiana State University.—A study of the mammals of Vigo County, Indiana was conducted from August 1962 to August 1965. A total of 2763 mammals were examined, including 1506 taken by means of snap-trapping in 430 of 500 randomly selected 25 x 25 meter plots, 812 taken in snap-traps set in lines in selected areas of the county, 230 mammals observed as roadkills, and 44 bats which were shot. The remainder were taken by other people.

Forty-one species of mammals were observed and are listed below together with the numbers examined of each. MARSUPIALIA: *Didelphis marsupialis* 26, INSECTIVORA: *Scalopus aquaticus* 18, *Sorex cinereus* 8, *Sorex longirostris* 2, *Cryptotis parva* 56, *Blarina brevicauda* 56, CHIROPTERA: *Myotis lucifugus* 6, *Myotis keenii* 4, *Myotis sodalis* 5, *Lasiurus noctivagans* 1, *Pipistrellis subflavus* 17, *Eptesicus fuscus* 92, *Lasiurus borealis* 57, *Lasiurus cinereus* 3, *Nycticeius humeralis* 1, CARNIVORA: *Procyon lotor* 25, *Mustela nivalis* 2, *Mustela frenata* 1, *Mustela vison* 3, *Mephitis mephitis* 16, *Taxidea taxus* 2, *Vulpes fulva* 1, *Urocyon cinereoargenteus* 6, RODENTIA: *Marmota monax* 15, *Citellus tridecemlineatus* 74, *Tamias striatus* 13, *Sciurus niger* 37, *Glaucomys volans* 7, *Castor canadensis*, 1 seen, *Peromyscus maniculatus bairdii* 594, *Peromyscus leucopus* 364, *Synaptomys cooperi* 5, *Microtus pennsylvanicus* 120, *Microtus ochrogaster* 181, *Pitymys pinetorum* 18, *Ondatra zibethica* 53, *Rattus norvegicus* 14, *Mus musculus* 748, *Zapus hudsonius* 42, LAGOMORPHA: *Sylvilagus floridanus* 68, ARTIODACTYLA: *Odocoileus virginianus* 1.

The gray squirrel, *Sciurus carolinensis*, may also be present but no individuals have been seen.

Population Dynamics of a *Myotis lucifugus* Colony in Boone County, Indiana. STEPHEN R. HUMPHREY and JAMES B. COPE, Earlham College.—

Observations were made of a nursery colony of little brown bats (*Myotis lucifugus*) near Thorntown, Boone County, Indiana, from April until October in 1964 and 1965, and other colonies in Indiana were checked in relation to some problems. Investigation within a square mile showed that the entire population roosted in two adjacent buildings. Population fluctuations were followed by counting the bats as they flew out at dusk, and this technique was found to provide a more accurate count than estimating numbers while catching bats in the buildings. The population fluctuations that are discussed are reactions to human disturbance, arrival of bats during spring, the attaining of flight by young bats, and departure of bats in fall; variation in these fluctuations is noted in comparing 1964 and 1965. Observations on reproduction pertain to embryo development and birth data, and sex ratios of young and adults are described. A few interesting movements of bats from the colony are discussed.

A Comparison of Food Habits of Two Species of *Microtus*. EARL G. ZIMMERMAN, Indiana State University (Present address: University of Illinois).—A system of stratified random sampling was employed in the Terre Haute Quadrangle, Vigo County, Indiana, to obtain *Microtus ochrogaster* and *M. pennsylvanicus* for a food habits comparison. Epidermal structures of plants found in the field were compared with those found in stomachs to determine foods eaten. The important foods of *M. pennsylvanicus* were *Poa*, *Panicum*, and *Muhlenbergia* comprising 32.1%, 24.7%, and 14.6% of the volume, respectively. The more important foods for *M. ochrogaster* were *Poa*, roots, and *Trifolium* making up 15.8%, 10.0%, and 9.7% of the volume, respectively. *M. ochrogaster* stomachs contained a greater variety of foods than *M. pennsylvanicus*, probably due to the greater numbers of species of plants in the habitat. *M. ochrogaster* ate 4.7% insect material and .6% *Endogone*, and *M. pennsylvanicus* ate 3.6% insect material and 2.1% *Endogone*. In general the more abundant plants in the habitat were the most important foods. Certain plants, *Ambrosia*, *Aster*, and *Solidago*, were avoided.

Persistent Rhythms of Locomotion Activity in the Turtle, *Pseudemys scripta*. WILLIAM J. BRETT, Indiana State University.—The spontaneous activity of small turtles (1½-2 inches in diameter) under conditions of constant low illumination and relatively constant temperature was recorded for four periods of roughly 30 days each. The activity of six turtles was recorded for each of the four periods. During the last two periods additional groups of turtles were placed in a large fine mesh copper screen container and the spontaneous activity of six of these turtles was recorded. Analyses of the activity data revealed an average solar day cycle in both the controls and the experimentals with an increase in activity from midnight to 7 a.m. and then a sudden decrease in activity until noon remaining low until the rapid increase at midnight. A randomizing of the solar day cycle revealed a lunar day cycle in both groups but the phases of the cycle were almost completely reversed between the two groups. Using total daily activity for all animals, it was possible to demonstrate the presence of a lunar

month cycle with a minimum at new moon and maxima closely related to the other three phases.

Development of Dusting Pattern in Young Quail *Coturnix coturnix japonica*. WILLIAM J. BRETT and MARILYN KRUSE, Indiana State University.—Groups of 8-12 quail were maintained from hatching until three weeks of age in plain wire bottom brooders. The quail were removed from the brooder each day and placed in a container with a substrate of ground corn cobs. The activities of the birds over a 15-minute period were observed and recorded. The activities were categorized as related to the normal adult dusting pattern. It was found that a definite chronological sequence of activities occur. Pecking occurs on the first day, scratching on the fourth or fifth day and complete dusting on about the ninth day.

Some Studies of the Succession of Saprophagous Arthropods on Carcasses of Animals. J. HILL HAMON and JAMES S. HASEMAN, Indiana State University.—Carcasses of turtles and chickens were placed in ground cages in xeric, mesic, and hydric ecological localities in Alachua County in north-central Florida, and in Vigo and Sullivan Counties in western Indiana. Saprophagous arthropods were observed and collected as they came to the carcasses. A basic succession in order of appearance of the various species of arthropods at the observation sites was apparent. The greatest variation in the different ecological habitats was in the number of arthropods, and the rate of decay of the carcasses. Some seasonal variations in this succession probably exists.

Some Preliminary Studies in the Succession of Bacteria Responsible for Maceration of Birds. BARBARA TROYER, Indiana State University.—Standard bacteriological methods were employed to isolate and identify the bacterial organisms responsible for the maceration of birds in water. Factors influencing the rate of decay include the type of water used, the age of specimens, container size, temperature, and frequency of "pouring-off." Members of *Aerobacter*, *Escherichia*, *Alcaligenes*, and *Clostridium* groups appeared to dominate. Preliminary studies indicate an aerobic and anaerobic bacterial succession does exist.

Some Problems in the Osteology of Passeriform Birds. J. HILL HAMON, Indiana State University.—The order Passeriformes includes over half of the birds of the world, yet no complete osteological study has ever been made for a single species. Some groups are presently undergoing explosive radiation, and many taxa created by the taxonomists are artificial. Some problems involved in the use of osteology as a taxonomic criterion are discussed.

Some Studies of the Ossification of the Skull of *Coturnix coturnix japonica*. MARILYN F. CAMPBELL, Indiana State University and Danville Junior College, Danville, Illinois.—The skulls of one hundred Japanese quail (*Coturnix c. japonica*) of known ages were cleared and stained and examined under a binocular microscope. Sixteen skulls of selected ages were photographed and subjected to radiological examination.

At the time of hatching, definite centers of ossification are found in the occipital region of the cranium, the nasals, and the hyoid apparatus. Ossification follows a definite pattern, moving anteriorly and laterally from the occipital region at a rapid rate.

All of the non-kinetic bones of the skull except the maxillaries, jugals, and quadratojugals, and some in the hyoid are fused by the twenty-fourth day. A period of increased skull density and development of the hyoid occurs from thirty to forty days of age. At the end of this period, the maxillaries, jugals, and quadratojugals are fused. At sixty days the hyoid apparatus is complete and the cranium begins to take on the characteristics of the adult skull. At this time the quail is reproductively mature.

The degree of ossification and measurements of the skull can be used to determine the age of hatchlings up to three weeks in age. The development of the hyoid apparatus appears to be the best indicator of age in the Japanese quail between the ages of twenty-four and sixty days.

The Number of Contour Feathers in Some of the Falconiformes. J. HILL HAMON and WILLIAM W. MORGAN, Indiana State University.—There has been only one feather count made for a falconid bird, that of an immature bald eagle. Because of lack of information about this neglected area of basic avian anatomy feather counts are being made at Indiana State University. Four species have been counted to date, *Accipiter striatus*, *Falco sparverius*, *Buteo jamaicensis*, and *Cathartes aura*. Individual pterylae were counted, and observations were made on the characteristics of the contour feathers.

Weight Reversal in Heat-Stressed Chick Embryos. W. C. GUNTHER, Valparaiso University.—Previous reports by Gunther and Jones in 1961 indicated that chicks hatched from eggs incubated initially for 3 days at the nonoptimally high temperature of 41° C. weighed significantly less at hatching than did the controls. However, during the initial phases of incubation at least, it had been ascertained that heat-stressed embryos weighed nearly twice as much as the controls. In an effort to learn when during the incubation period experimental chicks began to lose weight, a total of 428 presumably healthy, living embryos were removed from eggs. They were trimmed of all membranes and were wet-weighed, after which they were killed and fixed. Statistical tests indicated that the experimental embryos began to lose weight relative to that of the controls from the 6th day of incubation, and that by the 10th day of incubation there was no significant difference in their weights. Embryos were not weighed beyond the 10th day of incubation.

Beta-alanine utilization in *Drosophila* with notes on other amino acids. M. E. JACOBS, Goshen College, Goshen, Indiana.—Injection of early pupae and adults of *Drosophila melanogaster* with C-14 labeled beta-alanine disclosed that non-ebony deposited much more beta-alanine in the integument than did ebony and excreted C¹⁴O₂ at a diminished rate, while heterozygotes were intermediate in these activities. Gamma-aminobutyric and aspartic acids behaved somewhat similarly but to a much lesser

degree. The effect was not observed with glycine, leucine, valine, or phenylalanine.

The Effect of Diet on Fatty Acid Profiles in the Cockroach, *Blaberus discoidalis*. JOHN L. MCGUIRE¹ and ARNOLD E. S. GUSSIN, Butler University.—Some investigators have suggested that the lipid composition of an insect's tissues may be influenced by the lipid components of the diet; indeed, some have ascribed all unusual fatty acid profiles encountered in the insect to dietary influences. Other workers have found that the insect can biosynthesize tissue fatty acids from other dietary fatty acids and/or from dietary carbohydrate. In order to determine whether or not diet influenced the fat body fatty acid composition of the cockroach, the insects were maintained on two experimental diets. One diet contained 22 percent of short chain fatty acids and about 8 percent of an unknown longer chain fatty acid (Diet I); the other consisted of about 4 percent of the short chain acids and none of the unidentified acid (Diet II). Both were essentially identical with regard to other fatty acids.

Fatty acids were extracted from the insect's fat bodies and assayed by gas-liquid chromatography. Insects fed Diet I contained about 5 percent of the unknown fatty acid. There was a marked decrease in the percentage of short chain fatty acids in the fat body relative to that of the diet. Other fatty acids maintained their same relative percentage in the fat body. The insects maintained on Diet II did not exhibit a marked variation in the percentage of short chain fatty acids and did not biosynthesize the unknown longer chain fatty acid. Thus, the fatty acid profile of *Blaberus discoidalis* is probably influenced by both diet and biosynthetic interconversions.

Uptake and Retention of Zirconium-95, Niobium-95 in the Sea Squirt (*Molgula manhattensis* De Kay). RAYMOND E. HENZLIK, Ball State University.—It is well established that a variety of bottom-dwelling organisms living in estuarine environments can accumulate and concentrate radioisotopes. Some of these organisms are of direct economic importance to mankind; others are of ecological interest as steps in food-chains, as evidence of nuclear activities by man, and as biological indicators of the presence and degree of radioactive contamination. This particular investigation deals with the common benthic animal, *Molgula manhattensis* (a simple ascidian) that is abundant in the estuarine ecosystems around Beaufort, North Carolina. The accumulation and retention of the radionuclides zirconium-95 and niobium-95 were followed, and comparisons were made with other sessile benthic invertebrates whose role in the cycling of certain radionuclides had been previously elucidated. Localization of the radioactivity in the tissues and organs of the tunicate was also investigated.

The facilities of the Radiobiological Laboratory of the Bureau of Commercial Fisheries, U.S. Fish and Wildlife Service, Beaufort, North Carolina, were made available for this study in conjunction with an NSF summer research grant to North Carolina State University.

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Absence of Hyperglycemic Response at or After Ecdysis in *Xiphosura polyphemus*. HENRY TAMAR.—Groups of 6 small Limulii (carapace width 6.2-8.2 cm.) were selected either for a hard exoskeleton or a soft one with resilient carapace. A 0.5cc. pre-injection blood sample was drawn from the pericardial sinus of each specimen, and then 0.5cc. of filtered sea water was injected at the same site. After 3 hours (at 26.5°-30°C) a post-injection pericardial sinus blood sample over 1.5cc. was drawn. Blood glucose level was determined with the enzymatic Glucostat reagent and a Beckman DU spectrophotometer.

The average pre-injection blood glucose level for 30 Limulii with a hard exoskeleton was 4.0 mg./100 ml., s.d. 2.1. The post-injection average for 24 of these hard-skeletoned animals was 20.1 mg. glucose/100 ml., s.d. 10.4. Their average increase in blood glucose was 15.9 mg./100 ml. The pre-injection average of 24 soft-skeletoned specimens was 2.6 mg. glucose/100 ml., s.d. 1.4, and their post-injection average was 1.0 mg./100 ml., s.d. 0.8. This represents an average drop of 1.6 mg. glucose/100 ml. of fluid. The differences between the means for post-injection hard and post-injection soft, pre-injection hard and post-injection hard, and pre-injection soft and post-injection soft animals were significant beyond the .001 level. Apparently the appearance of hyperglycemic response in *Xiphosura* can be dependent on the stage of the molting cycle.

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The Effects of Amino-glutethimide on the Rat Ovary. D. J. THOMPSON and W. J. EVERSOLE, Indiana State University, Terre Haute, Indiana.—Amino-glutethimide, a central nervous system depressant and anti-convulsant, was injected subcutaneously daily in a dose of 25 mg/Kg or 50 mg/Kg for two weeks into Charles River CD strain immature female rats. One set of rats was 21 days and another 28 days of age at initiation of the injections. Control rats were injected with either physiological saline or water. At autopsy the ovaries were dissected free of fallopian tube and extraneous fat, weighed on a torsion balance, and fixed for histological study. During the two-week treatment period the animals exhibited normal body weight gain and appeared to tolerate the drug without showing obvious symptoms of decline in general activity. The ovaries of the "21 day-old" treated groups were heavier than their controls, whereas the ovaries of the "28 day-old" treated groups were approximately the same weight as their controls. Histological studies of the gonads in the latter groups of treated rats showed an increase in number of vesicular follicles and a decline in number of corpora lutea. Studies are in progress on the histological structure of the ovaries from the "21 day-old" groups, and further plans are being made to extend these studies to various age groups and different dosage levels.