

ZOOLOGY

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ABSTRACTS

A Study of Cecal Helminths of the House Mouse, *Mus musculus* L., in Delaware County Indiana. DOROTHY ADALIS and LARRY SCHERICH, Department of Biology, Ball State University, Muncie, Indiana 47306. —Cecal helminths were removed from 180 house mice, *Mus musculus* L., that were snap-trapped from two sites in Delaware County, Indiana, over a 4-month period from October through January 1968-69. Two common nematodes found in the cecum of *Mus* were *Syphacia obvelata* and *Aspicularis tetraptera*. More than half of the total number of hosts examined were infected with these two helminths. *Syphacia obvelata* was found in 88 of the 180 mice or 48.8 per cent of the total examined. A single host had 120 worms. *Aspicularis tetraptera* was found in 73 of the 180 mice or 40 per cent. The highest incidence in a single host was 110. Both of these helminths have direct life cycles. The frequency of cecal infection was statistically analyzed using chi-square methods with variables of infected versus non-infected based on the age and sex of the host and the month of trapping. Statistically, there was no significant variation in the number of infected and non-infected hosts due to age, sex, or month of trapping.

Indiana Turtles: Distribution Patterns and Present Status of Populations. SHERMAN A. MINTON, Indiana University Medical Center, Indianapolis, Indiana 46202.—Fifteen species of turtles have been recorded from Indiana. Five species inhabit a variety of aquatic habitats without showing marked preference for a particular type. Five other species are distributed along major stream drainages and show a definite preference for stream situations. *Graptemys* and *Trionyx* have a species in each of these groups. Three species show distribution patterns associated with a particular type of pond or marsh habitat. The two species of box turtle are terrestrial, *Terrapene carolina* being an inhabitant of hardwood forest and *T. ornata* of sandy prairie.

Two turtle species, *Macrolemys* and *Pseudemys concinna*, have not been recorded from Indiana for at least 20 years and must be presumed extinct or nearly so. Both were limited to the extreme southwestern tip of the state. *Kinosternon* has not been recorded for 18 years but is so secretive and inconspicuous that it probably still persists. *Clemmys* and *Emydoidea* have decreased greatly in numbers since the 1930's, and some populations are extinct. Box turtles are declining in abundance. *Chelydra*, *Sternotherus*, *Graptemys geographica* and *Chrysemys*

take advantage of artificial impoundments and may be increasing their numbers. The status of the other species is unknown, but they are not believed endangered over most of their Indiana ranges.

Physiological Response to Submergence Asphyxia of Crocodilian Circulatory Systems. RICHARD G. PFLANZER, Department of Zoology, Indiana University, Bloomington, Indiana 46740.—Three species of crocodilians were investigated with regard to comparative circulatory responses to submergence asphyxia. Species of *Alligator mississippiensis*, *Caiman sclerops*, and *Paleosuchus trigonatus* ranging from 1 to 2 meters in length and weighing from 2 to 18 kilograms were chosen for the study. Cine-angiography of the right and left heart in *A. mississippiensis* and *C. sclerops* confirmed complete separation of pulmonary and systemic circuits under aerobic conditions. Intraventricular and intra-aortic pressures, as measured by direct needle puncture technique with continuous recording, substantiate radiographic data and further indicate maintenance of separation of pulmonary and systemic circuits during submergence asphyxia. Analysis of blood oxygen and carbon dioxide before, during, and after submergence support radiographic and pressure data concerning possible development of a shunt. *Caiman sclerops* and *A. mississippiensis* exhibited during bradycardia, however, *P. trigonatus* was found to exhibit tachycardia in response to experimental diving.

Function of Extraoptic Photoreceptors in Amphibian Behavior: I. Manipulation of the Biological Clock.¹ KRAIG ADLER, Department of Biology, University of Notre Dame, Notre Dame, Indiana 46556.—The circadian locomotor rhythm of eyeless green frogs (*Rana clamitans*) responds to changes in photoperiod in the same manner as do the rhythms of normal sighted individuals. This rhythm can be phase-shifted and entrained, with or without eyes being present, by shifting the timing of the "lights-on" cue. This ability to respond to light is lost, however, in blinded frogs which also lack a frontal organ (also called pineal end organ, but not to be confused with the pineal body), a structure situated in the dermis on top of the head; such animals behave as if they were in constant darkness. These behavioral data are in accord with ultrastructural and neurophysiological studies of the frontal organ which suggest that it is a functional photoreceptor.

Function of Extraoptic Photoreceptors in Amphibian Behavior: II. Compass Orientation.² DOUGLAS H. TAYLOR, Department of Biology, University of Notre Dame, Notre Dame, Indiana 46556.—Extraoptic photoreceptors (EOPs) located in the brain of the cricket frog (*Acris gryllus*) and tiger salamander (*Ambystoma tigrinum*) are capable of receiving light for entrainment of biological clocks and also capable of perceiving celestial cues to be used for compass orientation. Eyeless frogs and salamanders continued to orient on a trained compass course in a test arena devoid of all landmarks but in view

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of the sky; if the dorsal surface of the head in such animals was covered with light-proof plastic they gave random responses. In control tests, eyeless frogs and salamanders which had the dorsal surface of their head covered with clear plastic continued to make correct directional choices.

Effects of Prolonged Subculturing on Morphology of Nasal and Gastric Porcine Trichomonads. JAMES W. TOWNSEND, Department of Life Sciences, Indiana State University, Evansville Campus, Evansville, Indiana 47712, and BENTON W. BUTTREY, Department of Zoology and Entomology, Iowa State University, Ames, Iowa.—Nasal and stomach trichomonads of swine were cultured in a modified cysteine monohydrochloride-peptone-liver infusion-maltose medium (CPLM) for a period of 12 years. Preparations of the original populations and of cultures were stained with iron haematoxylin and with protargol. Measurements of general size and form, blepharoplast, nucleus, parabasal body, axostyle, costa, undulating membrane, anterior flagella and recurrent flagellum were used in the comparison. Initial morphological differences between the two strains became less pronounced upon prolonged subculture. Results obtained with the stomach trichomonad showed most of the morphological changes to have occurred by the second subculture. Original morphological differences were attributed to environmental differences in the sites of infection, and both strains were concluded to be *Tritrichomonas suis*.

NOTE

Calorigenic Contribution of Brown Fat in *Tamias striatus*. RICHARD E. SCHAFFER, Department of Zoology, Indiana University, Bloomington, Indiana 47401.—The effects of extirpation of most of the axillary brown fat pad on the calorigenic response to intravenously infused l-norepinephrine (NE) in cold-acclimated and warm room control *Tamias striatus* were investigated. Chipmunks had been cold-acclimated at least 6 weeks during the winter months at 5 degrees Centigrade and complete darkness. Many of these animals were observed in torpor. Control chipmunks had been housed at 22 degrees Centigrade and a 12-hour photoperiod for 6 months. Norepinephrine was intravenously infused through the tail vein for 30 minutes at a rate of 0.3 micrograms/100 grams/minute. Calorigenic responses were determined by oxygen consumption changes in an open system and heart rate measurements. Infusions were performed in intact, sham-operated and post-operated chipmunks, each animal usually serving as its own control. Post-operative infusions were performed immediately after or the next day, and on days three and seven.

Extirpation of most of the axillary brown fat pad of control *Tamias striatus* had virtually no effect on the enhanced calorigenic responses to norepinephrine, neither immediately nor up to 7 days after removal. Similarly, no effect could be detected in the cold-acclimated, non-torpor experiencing chipmunks. Both these groups of animals evidenced mean fold oxygen consumption increases of

1.5 to 2.0 upon norepinephrine infusions. Cold-acclimated, torpor experiencing *Tamias striatus*, on the other hand, evidenced significantly ($P < .01$) greater mean fold oxygen consumption increases of 4.0 to 4.3 during the intact and sham-operative infusions. After extirpation of most of the axillary brown fat pad these mean fold increases were significantly ($P < .01$) reduced to means of 2.2. Extirpation effects were immediate and did not change through days 3, 7 and up to 60 days post-operative. These results have indicated that in *Tamias striatus* which have experienced several periods of torpor the brown fat tissue is the principal site of the enhanced calorogenic response to intravenously infused norepinephrine. It is further postulated that the calorogenic activity of brown fat in *Tamias striatus* plays an important role in the rewarming of this species from natural torpor.