ZOOLOGY

Chairman: RAYMOND M. CABLE, Purdue University

Professor W. H. Headlee, Indiana University School of Medicine, was elected chairman of the section for 1944.

Studies on a new furcocercous cercaria of the Vivax type. DORCAS J. ANDERSON, Purdue University.—A new longifurcous pharyngeate cercaria of the Vivax type has been found to develop in *Campeloma sp.* collected from the Tippecanoe River. Measurements in mm. of 10 specimens killed in hot 10 per cent formalin are as follows: body length 0.386-.495 (average 0.437), width 0.172-.248 (0.205); length of tail stem 0.694-.819 (0.742), width 0.086-.106 (0.098); furcal length 0.429-.532 (0.471); oral sucker length 0.076-.093 (0.087); prepharynx 0.007-.013 (0.012) long; pharynx length 0.02-.033 (0.027). Body pyriform in outline, flattened, and spinose except posterior part of ventral surface. The tail is attached dorsally; stem and furcae spinose and with delicate hair-like processes; furcae without fin-folds. Esophagus short, intestine prominent with tortuous ceca extending to level of excretory vesicle. Excretory system typical of Vivax cercariae, the vesicle receiving two median and two lateral ascending tubules. The median tubules converge anterior to a mass of nuclei (probably the primordium of the holdfast organ) and fuse to form a single median tubule which extends anteriad to join a cross-commissure connecting the lateral pair of ascending tubules. Slightly posterior to this level, each lateral tubule receives a short common collecting tubule which divides to form an anterior and posterior collecting tubule. The excretory formula is $2[(3+3)+(3+3+3+3)]$, the last group of three flame cells on each side being in the tail stem. An Island of Cort is present. Branches of the caudal excretory tubule extend to the tips of the furcae. The cercariae develop in elongate sporocysts in the digestive gland of the snail.

The use of the factorial design for endocrine experimentation. W. R. BRENEMAN, Department of Zoology and Waterman Institute, Indiana University.—Four synthetic androgens, Testosterone (a), Testosterone-propionate (b), Dehydroandrosterone (c), and Androstenedione (d), were injected into chicks separately and in all possible combinations. The body, comb and gonad weights of the resulting sixteen series were analysed according to the factorial method of Fisher. The use of this method not only permits the analysis of the action of each hormone when given separately but makes it possible to study all possible interactions between the hormones. Statistically the method is excellent because all experimental animals are used for the calculation of standard error.

The experiments demonstated that the effects of the hormones on body weight were insignificant. Hormone b produced the greatest comb

growth followed by a, d, and c in that order. The effectiveness of b was inhibited by the presence of c and ad; c, however, gave an augmentation reaction with a and d especially the latter. With the exception of a b d the high order interactions were negative. The gonads were markedly inhibited by b, bd, and acd. Likewise significant decreases were produced by a, c, and bcd. Significant increases in gonad weights secured with bd, ab, and ac.

This method makes it possible to analyse hormone interactions with a minimum statistical error and with more uniform experimental conditions. The latter advantage is a result of the fact that the smaller number of animals used in each series permits more experiments to be seen simultaneously.

A note on the occurrence of *Sistrurus catenatus catenatus* (rafinesque), massasauga rattlesnake, in Delaware county. R. H. COOPER, Ball State Teachers College.—There has been no record kept of the occurrence of *Sistrurus catenatus catenatus* in Delaware county for, at least, the last twelve years. Hay, "The Amphibians and Reptiles of Indiana," 36th Annual Report Indiana State Board of Agriculture, 1886, states that this species belongs to the northern half of the state and asks for records of its occurrence south of Indianapolis. Hay, "The Batrachians and Reptiles of the State of Indiana," 17th Annual Report Indiana Department of Geology and Natural Resources, 1891, lists the collecting of specimens from Wabash, LaPorte, Hendricks, Hamilton, Montgomery and Marshall counties. Myers, "Notes on Indiana Amphibians and Reptiles," *Proceedings* of Indiana Academy of Science, 1926, reports a specimen from Winona Lake, Kosciusko county. Grant, "Herpetological Notes from Northern Indiana," *Proceedings* of Indiana Academy of Science, 1935, lists two specimens taken in wet ground near the Boy Scout Camp at the Dunes.

On August 6, 1937, it was reported from Gaston, Indiana, that a prairie rattlesnake was chopped into pieces when thrown into a grain separator with a bundle of oats. This report was not verified. On July 29, 1943, Claude Rakes, a farmer living about two and one-half miles north of Gaston, Delaware county, Washington township, caught a specimen of *Sistrurus c. catenatus* in his nine-acre hay field just east of the Gaston prairie. This 22-inch individual had four rattles and was kept alive at Ball State Teachers College for some time. On August 9, 1943, the same farmer caught another specimen which was 28 inches long and had eight rattles. This snake was taken as it migrated across the hard surface road in front of Mr. Rakes' house and was also brought alive to Ball State Teachers College.

West of Mr. Rakes' house there is a swamp area of about one hundred acres which was flooded much of the summer. This could be an explanation for the number of prairie rattlesnakes found in the surrounding fields. Fifteen specimens were reported from the Gaston area during 1943.

A summary of data on human intestinal parasite infections in Indiana. WILLIAM HUGH HEADLEE, Indiana University School of Medicine.—The data presented here are a summary of data obtained by various surveys

on intestinal parasite infections in Indiana conducted, during the past five years, by the writer or carried out under his supervision. One or more stool examinations were made on 2,875 individuals, all residents of Indiana, including 360 university students, 258 patients of the Indiana University Hospitals, 1,200 patients of the state hospital at Logansport, 771 patients of the state hospital at Evansville, 185 rural residents of Montgomery, Warrick and Pike counties, 63 individuals of metropolitan Evansville, 12 of Terre Haute and 26 others, most of whom were from Greater Lafayette. Each fecal specimen was examined by two methods. A fecal film was examined, and in addition a concentrate was examined, this being prepared in the earlier surveys by centrifugation, and in later studies by the zinc sulfate centrifugal flotation technique. Combining these groups, the parasites found and the percentage incidence of each were as follows: *Endamoeba histolytica*, 1.2; *Endamoeba coli*, 36.8; *Endolimax nana*, 29.5; *Iodamoeba bütschlii*, 2.6; *Giardia lamblia*, 3.2; *Chilomastix mesnili*, 2.6; *Trichomonas hominis*, 0.14; *Ascaris lumbricoides*, 0.14; *Trichuris trichiura*, 0.17; *Necator americanus*, 0.1; *Strongyloides stercoralis*, 0.9; *Enterobius vermicularis*, 3.3; *Hymenolepis nana*, 0.14; *Taenia sp.*, 0.07, and *Diphyllobothrium latum*, 0.04. Of all individuals examined, 54.1 per cent were infected with one or more species of parasites.

In addition, perianal scrapings were examined from 295 individuals to detect infections of the pinworm, *Enterobius vermicularis*. (Stools were also examined from 46 of these individuals, the data from which are included above). The N.I.H. swab was used to obtain the perianal scrapings, only one swab from each individual being examined. The groups of individuals examined by this method, and the percentage incidence of the pinworm found, were as follows: 240 patients of Riley Hospital, 16.3; 47 patients of Evansville State Hospital, 6.4; 8 others, 100.0, and for the combined groups, 16.9. If this figure were corrected on the basis of a seven-swab examination, the incidence of the pinworm would be 25.6 per cent, this figure more nearly representing the actual incidence of *Enterobius vermicularis* among those examined.

These data clearly indicate that there is considerable incidence of various intestinal parasites among persons living in this temperate region, and the physician should be aware of their presence and of the rôle that they play as etiological agents or factors of disease.

Some observations on androgen treated baby chicks. WILLIAM A. HIESTAND and DONALD E. STULLKEN, Purdue University.—In the course of a series of experiments on the effects of decompression on baby chicks it was thought worthwhile to determine the effect of androgen on anoxic survival. For this investigation a decompression apparatus described elsewhere was employed. Pressure was reduced at a fixed rate until each chick fell over backward in collapse. This "end-point" proved to be very close to death. Immediately upon reaching air it was then admitted to the decompression chamber and the bird allowed to recover. No apparent permanent damage to the chicks was seen. In all 13 male Plymouth Rock chicks were used from a flock of 24, all being hatched at

the same time. Testosterone propionate in oil was injected intramuscularly in the femoral region at the rate of 1.0 mg. twice a week for two weeks only, the total amount injected therefore being 4.0 mg. per chick. The usual androgenic effects began to appear two to three days after the first injection (7 days old) viz. enlargement and hyperemia of the comb, absence of "peeping" sounds common to baby chicks, increased pecking at the eyes of other chicks and fewer signs of fright.

When the androgen treated birds were placed in the decompression chamber and the air pressure reduced to the point of collapse very little distress seemed apparent as compared with the untreated controls, nor were the peeping sounds heard which invariably occurred with the controls. Thus the maturity influence of androgen was further demonstrated. Just before collapse the untreated chicks panted, the polypneic rate often being too fast to count visibly. In the androgen treated chicks panting was absent. Collapse in both groups occurred at about the same pressure (220 mm. Hg.) there being no apparent advantage in either group, in other words androgen did not increase hypoxic resistance.

The baby chicks definitely demonstrated the androgenic influence on social dominance (peck order) while young but after the lapse of several weeks (4 to 8) they gradually assumed a social inferiority whereupon they were dominated by the other (non-androgen treated) birds. In fact, two of the androgen treated birds were killed by the pecking of the non-treated birds. It was also apparent that the combs of the androgen treated birds had lagged far behind the development of the others, indicating the influence of (1) anti-hormonal effect or (2) a suppressed action of the gonadotropins of the anterior lobe or (3) both.

Additional observations on *Cercaria loossi* Stunkard developing in an annelid. W. E. MARTIN, DePauw University.—*Cercaria loossi* Stunkard is unique among digenetic trematodes because it uses an annelid, *Hydroides hexagonus* Bosc, as a first intermediate host. The sporocysts develop in the muscles and coelom of their host. The sporocysts and cercariae leave the annelid via definite pores that are also used as exits for the genital products of the host. The similarity of this cercaria to the cercariae of the members of the genus *Sanguinicola* strongly suggests that *Cercaria loossi* develops to adulthood in the blood of some marine fish.

Observations on a new xiphidiocercaria belonging to the Virgula group. PHILIP G. SEITNER, Purdue University.—A new cercaria of the Virgula type has been found to occur in *Goniobasis depygis* collected from McCormick's Creek, Indiana. Measurements in mm. of 10 specimens killed in hot 10 per cent formalin are as follows: Body length 0.137-.167 (average 0.149), width 0.045-.06 (0.053); tail length 0.068-.091 (0.08), width near base 0.016-.018 (0.017); length of oral sucker 0.037-.05 (0.045), width 0.038-.04 (0.039); ventral sucker diameter 0.018-.019; stylet length 0.018-.02 (0.019), maximum width (near base) from dorsal aspect 0.007; diameter of pharynx 0.01. Entire body spinose; tail simple, aspinose. Cuticle thick, with several hair-like processes near mouth. Oral sucker with large Virgula organ which is trilobed in appearance when flattened,

and orange colored when stained with neutral red. Ventral sucker at beginning of posterior body half. Prepharynx short, intestinal ceca undeveloped. Three pairs of large cephalic glands behind anterior margin of ventral sucker, not staining appreciably with neutral red; posterior pair granular; ducts a single bundle on each side with a transverse row of openings at side of stylet. Genital primordium a C-shaped mass of nuclei dorsal to ventral sucker. Excretory vesicle U-shaped, with shallow lobes, and surrounded by granular cells; main excretory tubules join arms of vesicle and divide at level of ventral sucker to form anterior and posterior collecting tubules. Develop in small, oval sporocysts in the digestive gland of the snail and encyst in ephemerid and odonatid naiads. Possibly the larva of a species of *Loxogenes*.

Anoxic survival in decompressed atmospheres of air and of oxygen. DONALD E. STULLKEN and WM. A. HIESTAND, Purdue University.—Experiments were carried out with a decompression chamber in which the atmosphere was either air or oxygen. Adult white mice, males and females of approximately the same weight (17 grams) and baby chicks, all males of the same age were exposed to gradually decreasing pressures of air or oxygen in a decompression chamber connected by way of a ballast jar to a vacuum pump. The rate of decompression amounted to a fall in barometric pressure averaging 114 mm. Hg. per minute equivalent to a rate of ascent from sea level averaging 6440 feet per minute. During decompression air or oxygen was admitted slowly into the decompression chamber by means of an inlet valve. Mice were placed in the chamber in pairs and decompressed at the above rate until dead. The barometric pressure existing in the decompression chamber at the time of death was recorded and the average of 20 such experiments determined which proved to be 158.6 mm. Hg. Following this an equivalent number of mice were exposed to decompression in an atmosphere of oxygen and the average pressure of death determined which proved to be 70.7 mm. Hg. To insure as nearly pure an atmosphere of oxygen as possible the decompression chamber was flushed out with 14 times its own volume of oxygen.

The same procedure was followed using baby chicks singly instead of pairs. The birds died at an average decompression pressure in air of 218.3 mm. Hg. and at an average pressure in oxygen of 89.5 mm. Hg.

The significance of the findings is the difference in pO_2 at death in air and in oxygen indicating a possible factor other than simple alveolar hypoxia which is the universally accepted cause of death from decompression or ascent to high altitude. Unless the pCO_2 and pH_2O of alveolar air are extremely low in mice and chicks it is difficult to imagine the results being caused by anoxia per se.

The social behavior of captive bobwhite quail, with some observations on interspecific social behavior in birds. (Motion pictures in kodachrome). HOWARD H. VOGEL, jr., Wabash College.—Several adult bobwhite quail were secured in December, 1942 from local sportsmen. A pair of these birds has been kept in captivity, in a heated greenhouse, for the

past ten months. Allelomimetic behavior (mutual imitation) is very strong in these birds. Although the birds paired in early February, no sexual mating was observed. The female showed no interest in quail eggs or in young chicks placed in the aviary. Experiments, devised to test the strength of pairing, showed this bond to be a strong one. The two birds have remained paired in all their activities. Territory played an important role in their daily behavior. The individual male studied was much more excitable, both in sounds and activity, than the female. All the quail showed a definite tendency to run back and forth along linear surfaces. The birds often formed a temporary shelter by pulling excelsior over their heads. Comparisons were made between the behavior of solitary and paired birds.

Field observations were made on bobwhite quail throughout the year, to compare the conditions in the wild with the experimental conditions in the laboratory.

Quail eggs were secured from the Indiana Department of Conservation and were incubated successfully in a small incubator as well as under a brooding hen. Motion pictures were taken of the hatching process, and the early behavior of the quail chicks was observed.

During the year the behavior of several species of birds was studied. At different intervals a starling, a pigeon, several small chicks, and a Cooper's hawk lived with the bobwhites. Several modifications of interspecific social behavior were noted. After living with the starling for a week, the quail often flew to overhead water pipes for a perch. This behavior had not been noted previously. Another interesting social group was formed by a pigeon and two chicks. The pigeon acted as a foster parent to the chicks, remained with them constantly, and even exhibited fighting behavior when quail approached "her" chicks too closely. The pigeon, although capable of flying, no longer did so except when badly frightened, but remained on the ground with the chicks. The chicks, although fairly closely related to the quail, paid little attention to those birds, seeming to prefer the quiet pigeon to the nervous, active quail.

These preliminary studies indicate marked differences and modifications in the social behavior of various species of birds.

Contributions to the osteology of the skull in various amphisbaenids.[1] RAINER ZANGERL, University of Notre Dame.—The amphisbaenids represent a strange family of reptiles which are generally considered as a heavily modified group among the lizards. An accurate, comparative study of the cranial construction in these animals revealed features, in addition to some already reported by earlier students, which leave little doubt that the amphisbaenids are neither lizards nor snakes. Some skull characters seem to indicate amphibian affinities. The amphisbaenid skull type corresponds in every essential detail to that of the Paleozoic amphibian genus Lysorophus. Future study of embryonic brain cases of amphisbaenids will in all probability reveal the real systematic position of this interesting reptile group.

---

[1] Complete article in Amer. Midl. Nat. **31**(2)—1944.