

ZOOLOGY

Chairman: WM. A. HIESTAND, Purdue University

W. E. Martin, DePauw University, was elected chairman of the section for 1941.

ABSTRACTS

The actions of the neurophil drugs on invertebrates. WM. A. HIESTAND, Purdue University.—A review of the bibliography of this subject is presented. The detection of reciprocal inhibition by the reversal action strychnine is discussed. Not all invertebrates show the strychnine reversal while others have been shown to exhibit a reversal of reciprocal inhibition with other drugs than strychnine. The effects of certain neurophil drugs on certain invertebrates was studied by the author with special consideration of the effects on decapod crustaceans, echinoderms, and molluscs. Crustaceans show characteristic effects on different muscle groups resulting in various postures. A mutual antagonism exists between caffeine and picrotoxin in the starfish. Great activity of the chromatophores occurs in the squid as a result of stimulation by caffeine, strychnine, picrotoxin, or atropine.

The value of a commercial meat meal as a food for Largemouth Black Bass. MARKLAND MORRIS, Earlham College, and ARTHUR HALE, Indiana University.—An attempt was made to find the effect upon the rate of growth of largemouth black bass (*Huro salmoides* Lacepede) of an artificial food. Several thousand bass fry were placed in each of six hatchery ponds. Three experimental ponds received treatments of a commercial meat meal product; three control ponds received none, and all the ponds received weekly treatments of soy bean meal to aid in the production of natural plankton food. Weekly counts of plankton, and analyses of the water for silicates, carbonates, nitrates, phosphates, oxygen, and pH were made. Biweekly samples of 50 fish were taken from each pond and weighed and measured. The number of fish put into and removed from each of the ponds was recorded. No significant difference between experimental and control ponds was found as regards the number of fish recovered, the weight of fish produced per acre, or the increase in length or weight during the period of the experiment.

An exploratory investigation of the relation of radio-activity to the automaticity of the turtle and frog ventricle. CARL D. HUCKLEBERRY, Purdue.—Rubidium may be substituted for potassium in Ringer's solution and will maintain the beating of the turtle ventricle as long as the normal potassium-containing solution. The turtle ventricle will not continue to beat in solutions in which thorium, cesium, or uranium has been substituted for potassium. Under the conditions of these experiments, the radiation from neither thorium nor uranium can replace potassium in maintaining the beating of the turtle ventricle.

Insect fauna of Steuben County. GEORGE RYAN, Angola.—The report deals with the records and studies of various insects of Steuben County which are in the Alleghenian fauna. The purpose of this work is to establish permanent records which can be used by various organizations in the state, and to make a very thorough study of the insect life in this county. This report is based upon seven years work in Steuben County. These records were obtained from the area of approximately nine square miles which comprises some of the best collecting grounds in this region. However, a large number of the records were obtained from material caught in the city of Angola.

A study of the Virginia White Tailed Deer (*Odocoileus virginianus*) in the Allegany State Park Region, New York. DONALD E. STULLKEN, DePauw University.—This paper is a discussion of the increasing population of the white tailed deer (*O. virginianus*) in the Allegany State Park, New York, and of its devastating effect on the deer and on the hemlock (*T. canadensis*) of this region. The paper briefly covers the evidences of the increasing population beginning with the winter of 1936-37, and finally centers the discussion on the conditions as they exist at the present time. Statistics on the death toll of deer due to starvation during the past winter, 1939-40, and an estimate of deer losses for the coming winter are given. Damage to the hemlock is described. In conclusion, the paper offers four possible methods of remedy for this situation.

Notes on the genus *Wellcomeia*; nematoda. W. E. MARTIN and D. E. STULLKEN, DePauw University.—The geographic and host distribution of this genus of parasitic nematodes is considered. An apparently new member of the genus, parasitic in porcupines, is described.

Sexuality, sex behavior and inheritance in the unicellular animal, *Paramecium aurelia*. T. M. SONNEBORN, Indiana University.—The sex act in *Paramecium* is conjugation, in which two individuals unite, fertilize each other, and separate. Although each individual is thus functionally comparable to an hermaphrodite, it is sexually distinct in a physiological sense, for the species consists of six different mating types (I to VI). Conjugation occurs only between types I and II, between III and IV and between V and VI. The vegetative progeny of an individual of any one type are all alike, so that large cultures of each mating type are obtainable. When two such cultures (belonging to types that can interbreed) are mixed together, there is an immediate agglutination of the animals. Within the resulting clumps the animals pair off and conjugate. This sex reaction occurs under conditions of light and temperature that differ for different pairs of mating types. Among the results that have followed from these discoveries are: (1) modifications in ideas concerning sexuality; (2) revision of the concept of the "life cycle" in ciliate Protozoa; (3) discovery of lethal interactions between different races of *Paramecium*; (4) discovery of simple Mendelian inheritance; (5) demonstration that the periodic nuclear reorganization process commonly known as endomixis is in fact a self-fertilization; and (6) discovery of a new type of inheritance limited by genes but not determined by them.

The effect of the limitation of diet on growth in chicks and their response to prolactin injection. W. R. BRENNEMAN, Indiana University.—White Leghorn cockerels were placed on a limited ration for twenty days after hatching and a study made of body, comb, gonad, pancreas, liver, thyroid, and intestine weights as well as intestine length. These animals were compared with chicks which received a normal diet and chicks in both series were also injected with Prolactin (Difco Laboratories, Inc.). A total of 193 chicks were used in this work and all weights were expressed as a percentage of body weight. Limited diet chicks were 50% lighter than the normal animals but testes and comb weights were proportionately much lighter, indicating that pituitary secretion had been inhibited. Weights of other organs were heavier in proportion to body weight than in the controls with the exception of the thyroid which did not differ significantly. Administration of Prolactin resulted in lower comb and gonad weights in normal diet birds but although the testis weight was lower, combs were slightly heavier than those of the controls in the limited diet birds. Adrenal weights were slightly greater in both series and in the normally fed animals the pancreases, liver, and intestine weights and intestine length were distinctly heavier. Thyroids appeared to be very slightly stimulated. Prolactin did not produce an hypertrophy of the viscera in the limited diet cockerels but at the heaviest dosages used (10 units daily third to nineteenth day) the thyroids were heavier than those of the controls.

Accessory motor responses in birds and mammals during panting, their central control, and modifying influences of the stretch receptors of the lungs. W. C. RANDALL and W. A. HIESTAND, Purdue University.—Accessory respiratory motor reactions occur in birds and mammals which are synchronous with breathing movements. In the duck during panting these consist of movements of the bill, tongue, and floor of the mouth. Salivation also results. In the rabbit movements of the nose flap occur synchronously with breathing movements. Tracheotomy does not abolish these accessory movements although it results in "sham" panting when the need for lowering the body temperature occurs. Inflation of the lungs during artificial respiration abolishes panting entirely in the rabbit but in the duck serves only to modify the rate by slowing it. Maintained expansion of the lungs of the duck causes a gradual slowing of respiration until apnea results. Vagotomy in the rabbit and duck abolishes the inhibitory influence of the stretch receptors and allows the panting rate to be maintained entirely by the central mechanism independently of reflex influences from the lungs. Inflation of the lungs of the muscovite duck does not reduce the heart rate either before or after vagotomy.

The life history of *Deropristis inflata* (Molin) (Trematoda: Acanthocolpidae). R. M. CABLE, Purdue University.—The adults of *Deropristis inflata* occur in the intestine of *Anguilla rostrata*. The cercaria develops in simple rediae in the digestive gland of *Bittium alternatum* and encysts in *Nereis virens*. It is a modified trichocercous form, the tail bearing 6 apposed pairs of ventrolateral tubercles, each set with a delicate "hair"; smaller irregularly distributed tubercles may occur on the distal third of the tail. A short ventral fin-fold is present. The body contains at least 8

pairs of cephalic glands with ducts both median and lateral to the eye-spots. Each main excretory tubule extends forward to the pharyngeal level where it receives an anterior and posterior collecting tubule. The anterior receives two secondary tubules, one extending forward to join the capillaries of 3 flame cells near the oral sucker, the other backward to join a similar group of flame cells between the eye-spot and ventral sucker. The posterior collecting tubule receives secondary tubules from 5 groups of 3 flame cells each, the complete excretory formula being $2 [(3+3) + (3+3+3+3+3)]$. The posterior ends of the main tubules are ciliated and the excretory vesicle contains refractile concretions. The cercaria swims almost continuously, tail first, and is strongly photonegative. After encystment in *Nereis*, little growth occurs, the most noticeable changes being dispersal of eye-spot pigment and development of the fore-body spines characteristic of the adult. Since the summer flounder was found not to harbor natural infections of *D. inflata*, this fish was fed experimentally infected annelids and large numbers of young worms were recovered.

The incidence of human intestinal Protozoa and helminths among patients of a state hospital in southern Indiana. WILLIAM B. HOPP, Purdue University.—A survey was conducted at the Evansville State Hospital for the Insane to determine the incidence of human intestinal parasitic infections. A total of 842 stools from a group of 771 patients was examined. Of these individuals, 457 were males and 314 females. Each specimen was subjected to examination by both the direct smear and the zinc sulfate centrifugal flotation techniques. The parasites found, with their percentage incidences, were as follows: *Endamoeba histolytica*, 3.1; *Endamoeba coli*, 61.3; *Endolimax nana*, 30.7; *Iodamoeba butschlii*, 3.8; *Giardia lamblia*, 1.8; *Chilomastix mesnili*, 8.4; *Trichomonas hominis*, 0.1; *Trichocephalis trichiurus*, 0.3; *Strongyloides stercoralis*, 3.2; *Enterobius vermicularis*, 7.3; *Hymenolepis nana*, 0.1, and *Heterodera radicola*, 0.1. Of the total patients examined, 579, or 75.1 per cent, were parasitized with one or more species of protozoa, helminths, or both; 556, or 72.1 per cent, were infected with protozoa; 77, or 10.0 per cent, were infected with helminths; and 56, or 7.3 per cent, were infected with both protozoa and helminths. In addition, a number of perianal scrapings, collected by means of NIH swabs, were examined. Of the 47 persons examined by this method, 3, or 6.4 per cent, were found to be infected with *Enterobius vermicularis*. In no case were negative results obtained if the person had previously been found positive by other methods. Sweepings and scrapings from floors of bathrooms and dormitories were examined for ova and larvae of helminths. Ova of *Enterobius vermicularis*, *Syphacia obvelata*, and *Heterodera radicola* were found. Both rhabditiform and filariform larvae of *Strongyloides stercoralis* were isolated from some of the bathroom floors. From these same localities numbers of adult and larval free-living species of nematodes were also obtained. The epidemiological studies seemed to indicate that the *Strongyloides stercoralis* infections of some of these individuals may have been obtained after admission to the institution, despite rather rigid sanitary practices.

Investigations on the incidence of human intestinal parasite infections among inhabitants of rural and urban Indiana. WILLIAM HUGH HEADLEE and WILLIAM B. HOPP, Purdue University.—Microscopic examinations of stools from five groups of persons were made to determine the incidence of intestinal parasite infections. Rural groups included 185 individuals from 47 families of Montgomery, Warrick and Pike counties. Of these 185 individuals, 87 were males, 10 months to 79 years of age, and 98 were females, ranging in age from 3 months to 56 years. The parasites noted, with the percentage incidences, were as follows: *Endamoeba histolytica*, 3.8; *Endamoeba coli*, 33.5; *Endolimax nana*, 19.5; *Iodamoeba butschlii*, 2.2; *Ascaris lumbricoides*, 0.5, and *Enterobius vermicularis*, 2.2. Ninety-five, or 51.4 per cent, were infected with one or more species of protozoa, or helminth, or both. Persons examined from one of the urban areas were members of families that had children under the care of Public Health Nursing Clinics of that city. Of the 63 persons examined, 29 were males and 34 were females. Fifty-five were under 15 years of age, and 8 were older than 15 years. The infections noted, with the percentage incidences, were as follows: *Endamoeba coli*, 6.3; *Endolimax nana*, 4.8; *Giardia lamblia*, 9.5; *Enterobius vermicularis*, 1.6, and *Heterodera radicola*, 1.6. In addition, one case of intestinal myiasis was noted. Twelve, or 19.0 per cent, were infected with protozoa, helminths or both. Stools from 12 adult persons of another urban area (from individuals attending the free city clinic), were examined for intestinal parasites. The following parasites, with their percentage incidences, were noted: *Endamoeba coli*, 16.6; *Endomilax nana*, 16.6; *Iodamoeba butschlii*, 8.3, and *Hymenolepis nana*, 8.3. Of the 12 persons examined, 5 were found to be infected, and one of these had had a double infection of *Hymenolepis nana* and *Endamoeba coli*.

Studies on the morphology of *Cystidicola cristivomeri* sp. nov. (Nematoda: Thelaziidae), from the swim bladder of the Lake Trout. FRANCIS M. WHITE, Purdue University.—Examination of 40 specimens of *Cristivomer namaycush*, from Flack Lake, Ontario, Canada, showed all of the fish to be heavily infected with a new species of *Cystidicola*. Over 900 worms were removed from the swim bladder of one specimen. *Cystidicola cristivomeri* sp. nov. differs from described species of *Cystidicola* in body length (males 15-21 mm., av. 19.7; mature females 23-32 mm., av. 26.7); the number of caudal papillae in the male (5-7 double pairs and 1 single pair of preanal and 5 pairs of postanal papillae, the second and third forming a double pair); and egg structure, which is the most obvious characteristic of *C. cristivomeri*. The eggs lack polar filaments and when completely formed, have a pair of conspicuous longitudinal mammillate ridges which resemble superficially the floats on the eggs of anopheline mosquitoes. Such ridges have not been described for the eggs of other species of *Cystidicola*. Embryonated eggs of *C. cristivomeri* measure 0.043—.048 mm. in length by 0.025—.039 mm. in breadth.

Laboratory animals for research in animal behavior—a query. J. P. SCOTT, Wabash College.—A rough survey of the higher animals reveals that their behavior and social structure is closely related to the environ-

ment. Those animals which most closely resemble man are found to be diurnal in habit and living in the open water, air, or plains. The uses of certain available forms are discussed, and information regarding others is requested.

Autoplastic and homoplastic transplantation of skin in adult *Rana pipiens*, Schreber. HOWARD H. VOGEL, JR., Wabash College.—A type of skin transplant, composed of an anterior autograft and a posterior homograft, both placed within the same wound area, was used to study the incompatibility of homotransplants. Autografts usually showed good circulation within one week after transplantation.

Insects of Indiana for 1940. J. J. DAVIS, Purdue University.—A review of the major insects of the year, with special reference to those of significant economic importance, and predictions for the coming year.

Experimental factors that influence the effectiveness of ovarian follicular hormones (estrogens) in ovariectomized and normal rats. ROBERT L. KROC, Indiana University.—Three different estrogens were assayed at weekly intervals for their effectiveness in inducing vaginal cornification in ovariectomized rats. After a range of dosages were assayed, the following experimental procedures were employed with different groups: double adrenalectomy (in one or two stages) without and with 3% NaCl ad libitum, thyroidectomy, and starvation. Normal and normal-adrenalectomized rats were also treated with a range of dosages. The results indicate that removal of one adrenal is followed by no change or slight increase in vaginal responsiveness whereas removal of the second adrenal is followed by a very marked increase. This is also true of the uterine reaction. Animals receiving salt solution appear to be intermediate or nearly as sensitive as those not receiving it. Thyroidectomy or starvation also appear to increase the responsiveness but to a lesser degree than does adrenalectomy.