

ZOOLOGY

Chairman: SEARS CROWELL, Indiana University

C. J. Goodnight, Purdue University, was elected chairman for 1951.

ABSTRACTS

Additions to our knowledge of *Obelia* and *Campanularia*. SEARS CROWELL, Indiana University.—Our texts rarely tell more about *Obelia* than was known in 1872 (Allman). Both *Obelia* and the related *Campanularia* have been studied often since then, especially by experimental morphologists. Much has been added of significance and interest. Attention is called to the contributions of Lund, Huxley, De-Beer, Hammett, Hauschka and especially to those of Berrill. His analysis of the development of hydranths, gonangia, medusae, and stolons offers an explanation of the differences among those components of a colony and also of the differences among species.

The following observations, made in collaboration with Malcolm Rusk, apply to colonies of *Campanularia flexuosa*. Although the growth of a hydranth is more rapid at 21°C than at 17°C, the number of new hydranths produced is much greater at the lower temperature. The development of young gonangia is usually accompanied by (compensatory?) regression of the nearest hydranth. By amputation, colonies were obtained with either reduced stolon systems or reduced stems and hydranths. It was expected that these might show compensatory growth to give typical colony proportions. To the contrary, new components were produced from each locus of growth without reference to the altered composition of the colony.

The polyp stage of *Craspedacusta*. SEARS CROWELL, Indiana University.—Specimens are obtained by setting slides in a quarry where medusae occur, or by careful search among the algal growth. (No original observations.) —Demonstration.

Heterotopic transplantation of neural crest and melanogenesis in salamanders. L. E. DELANNEY, Wabash College.—It is characteristic of most salamander larvae to be devoid of pigment cells on the ventral surface during early development. That the ventral migration of prospective melanophores from the neural crest is actually stopped at the ventral tips of the somites has been demonstrated in the Californian salamander, *Triturus torosus*. Other salamanders do not appear to have any specifically located barrier to migration but nevertheless prospective melanophores fail to descend to the belly region. Only at metamorphosis does there appear any great population of pigment cells

in this region. Transplantation of neural crest cells was made to the belly to demonstrate the influence of this ventral environment on melanogenesis. Under these conditions melanophores develop as normally as in the orthotopic position. The condition is transient, however, and the melanophores soon "de-grade" and appear extremely small, punctate and contracted. The fate of these cells in larval and metamorphosed stages is discussed.

Stability of a stream fish population. II. SHELBY D. GERKING, Indiana University.—Knowledge of the movement of stream fishes is essential to understanding the characteristics of stream fish populations. A quarter-mile section of Richland Creek, Greene County, Indiana was the site of a three-year investigation designed to show the extent of movement characteristic of several species native to the stream. The stream has a maximum width of 60 feet, a maximum depth of 3 feet and flows over bed rock. Fish were marked in 1948 and 1949 by clipping off one or a combination of the pectoral and pelvic fins. The fish were caught with the electric fish shocker. Of the fish marked in the early summer of 1948 and recaptured in the late summer of the same year, 75 per cent of them were caught within 100-200 feet from where they had been marked. A search for the fish marked in 1948 was again made in mid-summer of 1949. In this instance 80 per cent of the fish were found "at home" although a year had elapsed between the time of marking and their recapture. Additional fish were marked in 1949 and a search was made for them in 1950. Again 75 per cent were found in the same place in the stream where they had been marked.

Longear sunfish was the dominant centrarchid species and in the three-year period it was found in the same location where it had been marked 82 per cent of the time. Similar values for other species during the three-year period are: rock bass, 87 per cent; green sunfish 75 per cent; smallmouth bass 58 per cent; spotted bass 79 per cent; three species of suckers 56 per cent.

It should be emphasized that fish found in "foreign territory" had strayed only a relatively short distance because only a quarter-mile section of the stream was worked in all three years. The "homes" of at least three species have very limited boundaries, in the neighborhood of 100-200 feet. This indicates that the Richland Creek population is relatively stable from one year to the next even though violent changes in water level, breeding habits of the fish, seasonal changes in temperature, and many other factors might all be expected to influence their movement.

The development of the pronephros in the leopard frog (*Rana pipiens*). O. C. JAFFEE, Indiana University.—The first sign of pronephric development in the frog is noted in the 2.5mm embryo where a thickening of the mesoderm occurs, just posterior to the gill anlagen. This thickening develops rapidly into a solid rod shaped mass of cells, extending posteriorly about one third of the embryo, lateral to the somites. At the anterior of this mass an opening develops. By the

next stage (muscular response stage) definite division of the somatopleure and splanchnopleure has occurred, and tubular formation is noted. At this stage the duct is seen leading posteriorly and ending blindly. The pronephric body rapidly develops into a compact, tubular body. In the next (heart beat) stage three nephrostomes are noted and the duct has joined the cloaca, so that the pronephros would seem to be anatomically complete before hatching.

At hatching considerable development of the pronephros has taken place and this proceeds rapidly so that at the stage where the operculum has been completed, the pronephros has increased a great deal in size and vascularization. The mesonephros is noted in the 15mm. tadpole; the mesonephros becomes the recipient of the pronephric duct, and its duct, in turn, leads to the cloaca. But degeneration of the pronephros does not seem to be as rapid as hitherto reported. Well developed pronephri, as well as mesonephri are noted in the 17mm., 23mm., and 37 mm. stages.

Alkaline glycerophosphatase in the developing thyroid, thymus, pituitary, and parathyroid of the albino rat. RICHARD J. MCALPINE, Indiana University.—The technique of Gomori was used with slight modification in this study. The differentiative phase of the thyroid cells is characterized by a marked increase in phosphatase content. This increase occurs during the differentiation of cells from the ultimobranchial bodies as well as from the median thyroid diverticulum. The decrease in phosphatase consequent upon differentiation corresponds in time with follicle formation. A moderate increase in phosphatase occurs during the differentiative phase of the thymus. In this case the disappearance of phosphatase is correlated with the appearance of large numbers of thymocytes. A marked increase in phosphatase, followed by a decrease during late fetal life, occurs in the developing pituitary. The parathyroid exhibits no increase in phosphatase activity.

The clear-cut association of phosphatase with the differentiative phases of the thyroid and pituitary suggests that the enzyme is associated with the actual chemical mechanism of differentiation. The fact that the parathyroid does not exhibit these changes serves to indicate the existence of a multiplicity of chemical mechanisms of terminal differentiation. In addition, these findings yield data pertinent to the problem of thyroid formation from ultimobranchial tissue, and to the problem of the relationship between the epithelial and lymphocytic components of the thymus.

Segmental vascular patterns and behavior in *Nereis virens* and *Nereis limbata*. PAUL A. NICOLL, Indiana University.—The absence in both species studied, of any specialized part that functions as the heart, focuses interest on the segmental vascular details that are essentially repeated in each of the numerous segments. The modifications present in the head and tail portions are related to body structure and make no specific contribution to vascular function.

The slides shown indicate semi-diagrammatically the structural com-

ponents of the vascular system in a typical segment of *N. virens* and *N. limbata*. The outstanding modification is the presence of dead-ending capillary-like vessels that apparently form the chief, if not only, terminal supplying vessels to muscle and other internal structures. Each segment also possesses capillary nets on the surface just beneath the chitinous layer, which are thorough-fare channels and probably serve only as respiratory exchange sites. The intestine also is served by a complex, continuous capillary net. The structural organization of the dead-ending capillary-like vessels in the two forms differ in that in *N. virens* they arise as branches from larger vessels that eventually continue on and break up into the superficial capillary nets; while in *N. limbata* the closed vessels arise mainly from a special branch of the ventral vessel.

Blood flow is achieved by means of peristaltic waves of contraction that pass over all of the vessels except the large mid-ventral vessel and the true capillary plexuses. Direction of flow, which is usually from ventral to dorsal through the parapodia, is determined by different frequencies of the peristaltic waves in the major vessels.

These contraction waves are due to a peristaltic spread of activity in slightly branched, essentially circularly placed, smooth muscle cells. It does not appear to be either induced, controlled nor regulated by nervous means since no nerves could be demonstrated in the vicinity of any vessel by vital staining techniques.

A method of collecting assorted protozoa for class study. THEODORE T. ODELL and SEARS CROWELL, Indiana University.—Slides in racks are placed 4 to 6 feet deep in a suitable body of water. After about 10 days these acquire representative species of most of the fresh water orders of Sarcodina and Ciliata. Students in our invertebrate class have given a better response in studying these slides than they did when we furnished the usual pure or mixed cultures of protozoa. (Demonstration).

Observations on *Acetodextra amiuri*, a digenetic trematode from the ovary of catfish. KENNETH W. PERKINS, Purdue University.—*Acetodextra amiuri* is unique among digenetic trematodes in that it occurs as an adult in the gonads of the definitive host. Almost every female catfish taken from the Wabash River has proved to be infected; over 2000 worms were recovered from the ovaries of one fish. Evidently the parasite destroys the eggs in the ovary since young worms have been observed within the egg and the intestine of older ones is filled with yolk. Whereas other digenetic trematodes lay eggs within the host, *A. amiuri* apparently does not. Instead, the eggs accumulate in the uterus which becomes greatly distended. When worms are removed from the host and placed in tap water, either directly or after remaining in saline for several days, the body bends ventrally and strong muscular contraction causes the uterus to rupture through the dorsal body wall and burst, projecting eggs several millimeters. This behavior suggests that the life cycle is continued by passage of mature

worms into the water when the host spawns. Investigations of the life cycle of this species are in progress. It is especially favorable for observing stages of gametogenesis and embryology. Pseudoreduction observed in both spermatocytes and oöcytes indicates that the diploid number of chromosomes is twelve.

The effects of various species of bacteria on the growth of *Trichomonas vaginalis* in vitro. ENOS G. PRAY, Purdue University.—The growth of *T. vaginalis* with single species of bacteria in the medium of Sprince and Kupferberg (1947) has been compared with that in bacteria-free controls. Observations included determinations of pH and oxidation-reduction potentials. Controls showed a growth curve reaching a peak of almost 2,000,000 flagellates/ml. on the third day after inoculation. Thereafter, the number decreased gradually until the eighth day and then rapidly, flagellates disappearing from the cultures on about the tenth day. The results obtained when grown with single species of bacteria varied with the bacterium employed. With *Escherichia coli*, *Aerobacter aerogenes*, and *Pseudomonas aeruginosa*, growth of the flagellate was retarded during the first 24 hours and living ones disappeared from the medium within 48 hours. With *Bacillus subtilis*, *Staphylococcus albus*, *Staphylococcus aureus* and *Pseudomonas fluorescens*, flagellates persisted about as long as in control cultures but never reached as high a reproductive rate. With *Alcaligenes faecalis*, the growth curve of *T. vaginalis* attained a peak above and sooner than that in controls, but the flagellates disappeared from the medium more rapidly. Filtrates of cultures of all the bacteria used gave results which were similar to those obtained when the bacterial cells were present but were less pronounced. Present evidence indicates that the effects of bacteria are primarily nutritional in nature, and when unfavorable, are not due to specific antagonistic substances or changes in the oxidation-reduction potential or pH of the medium.

Experimental thyroid tumors derived from ultimobranchial tissue in the rat.¹ JOHN H. VAN DYKE, Indiana University School of Medicine.—The origin, circumstances and mode of development of thyroid neoplasms in mammals has been regarded as an enigma. Recent investigations indicate, however, that thyroid *metaplasia*, which can be induced, invariably, in both lobes of the thyroid gland of the rat by an actual or latent state of vitamin A deficiency, is a manifestation of ultimobranchial tissue, an accessory epithelial component of the mammalian thyroid gland, and can be an associated phenomenon in the genesis of thyroid tumors. "Thyroid-like" vesicles, indistinguishable from typical thyroid tissue at birth, but formed during embryonic development from a "plastic" (and therefore labile) ultimobranchial body, transform in postnatal rat thyroids into more or less formidable cysts (frequently multiple) lined by stratified squamous epithelium after variable periods of vitamin A deficiency (depending on age of the animal).

Simultaneous feeding of a goitrogen (Allylthiourea—2mg. daily)

and a carcinogen (2-Acetylaminofluorene—2 mg. daily) in vitamin A deficient diet, utilizing different age groups, has resulted in the production of *demonstrable* thyroid neoplasms of distinct ultimobranchial cyst origin in a large percentage of the animals. These tumors, at present, are single, of a relatively solid (epithelioid) type, potentially malignant, although possessing a variable blood supply, and arise from the basal or germinative layers of such cyst walls. They occupy the position in which the fetal ultimobranchial body would be expected to lie.

The evidence indicates that metaplasia is (or can be) a fundamental preneoplastic manifestation during thyroid ontogenesis. Under the stimulatory conditions of our experiments the evidence points toward ultimobranchial tissue as the source of certain "true" neoplasms in the mammalian thyroid gland. (Demonstration)

Systematic notes on the tapeworm family Acolecidae. J. DAN WEBSTER, Hanover College.—The genera *Progynotaenia* and *Proterogynotaenia* are rediagnosed, and new species are described from North America. *Shipleyia inermis* and *Gyrocoelia milligani* are recorded from new hosts. The family *Progynotaeniidae* is regarded as inseparable from *Acolecidae*.