

ZOOLOGY

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ABSTRACTS

Annual Reproductive Cycle of the Female Mosquitofish (*Gambusia affinis*) in Taiwan. YUN-CHIA CHOU and PAUL S. ALEXANDER, Department of Biology, Tunghai University, Taichung, Taiwan 400, Republic of China. — From January, 1979 to June, 1980 monthly samples of *Gambusia* were netted from spring-fed irrigation ditches in suburban Taichung City. Pregnant fish were found in every month except November and December and comprised about half of the 847 females with total body lengths of 24-61 mm. The rate of pregnancy, based on observation of "eyed" embryos, ranged from 14.0% in January and October to 68.0% in March and June. There was a tendency for the minimum size of pregnant fish to decrease from January (35 mm) to August (21 mm). Only one fish shorter than 24 mm was found to be pregnant (21 mm in August). Winter-born fish began to mature in April at minimum body length of 28 mm. The high mortality of larger fish beginning in May presumably followed production of the third brood.

These data taken at about N latitude 24° are compared with those reported for the same species from the United States (N latitude 30°-41°) and Japan (N latitude 36°). The influences of photoperiod and temperature on reproduction of *Gambusia affinis* are discussed.

The Possible Role of Endurance Training in Diabetic Microangiopathy. LARRY GANION, Ball State University, Muncie, Indiana 47306. — To examine the role endurance training may play in the pathogenesis of microangiopathy in capillaries of diabetic muscle, samples were obtained by needle biopsy from the gastrocnemius of human subjects at the commencement and completion of a ten week training program and prepared for electron microscopy. The participants, four non-diabetics and four diabetics, ran five days per week at a stress level of 75.0% of their maximum work load. The muscle samples were immersed in 3.0% glutaraldehyde for four hours, rinsed in 0.1M Sorenson's phosphate buffer (pH 7.2), postfixed for one hour in 1.0% osmium tetroxide, and embedded in Epon 812. Ultrathin sections were cut on a Porter-Blum MT-2B ultra-microtome, stained with uranyl acetate and lead citrate, and viewed with an RCA EMU-3C electron microscope. Microangiopathy is a vascular disease characterized by the thickening of the capillary basement membrane (CBMT). The CBMT was analyzed via measuring the width of the capillary basement membrane in electron micrographs prepared from muscle samples. The results of this study confirm those of previous studies, namely that the capillary basement membrane of diabetics is thicker than the non-diabetic. The mean CBMT of the diabetic pretrained group and non-diabetic pretrained group respectively were 2598 Å and 1830 Å. Measurements of the capillary basement membranes revealed that the CBMT of the trained diabetic muscle was less than CBMT of the untrained muscle. The untrained group displayed a mean CBMT of 2598 Å and the trained group had a mean CBMT of

2122 Å. These preliminary data suggest that endurance training may favorably alter the pathology of microangiopathy in diabetics.

Effect of Amoscanate on the Tegument of *Schistosoma mekongi*. WILMAR B. JANSMA, Department of Life Sciences, Indiana State University, Terre Haute, Indiana 47809. — Scanning electron microscopy was utilized to study tegumental alterations of *Schistosoma mekongi* resulting from exposure to the anti-schistosomal drug Amoscanate. Female mice (CD-1, Charles River Laboratories, Wilmington, MA) harboring adult *S. mekongi* were treated with a curative oral dose of 7 mg/kg b.w. Amoscanate (4-isothiocyanate-4' nitrodiphenylamine, CGP 4540). Mice were sacrificed by cervical dislocation and worms recovered from host mesenteric veins, hepatic portal vessels and/or liver sinuses at 1, 3, 6, 12, 24 hours and 4, 7, 10, 14, 21, and 24 days post-treatment. Worms recovered were fixed and processed for scanning electron microscopy via critical point drying techniques.

Alteration of the tegument of male *S. mekongi* was observed as early as 1 hour after drug exposure. Folds of the tegument initially ballooned outward and progressive damage resulted in large flattened outpocketings as the tegument lost its overall integrity. After 24 hours, nearly all worms had shifted to the liver and widespread cratering of the surface and shrinkage of the tegument was observed. Worms recovered from the liver at later times (10, 14, and 21 days post-treatment) showed progressive surface damage and large tegumental regions were denuded exposing underlying tissue. Numerous host blood cells were observed attached to the male tegument. The entire surface of male worms recovered 24 days after treatment appeared as a sponge-like layer, being highly cratered and vacuolated and lacking any resemblance to the normal highly convoluted surface of *S. mekongi*.

Female *Schistosoma mekongi*, in contrast, were far less affected by the schistosomicidal drug Amoscanate. Only slight damage to the female surface was noticed after 4 days and only after 14 days was extensive tegumental damage observed on the surface of female worms. Tegumental alterations consisted of uniform raised protuberances over the entire female surface.

Evidence of tegumental damage caused by anti-schistosomal drugs may provide clues regarding the biochemical mode of action of these drugs and their cytotoxic foci within these medically important parasites.

Further Information on the Specificity of the Male Cricket, *Acheta domesticus* (L.), Requirement for Vitamin E. JAMES R. LITTON, JR., Department of Biology, Saint Mary's College, Notre Dame, Indiana 46556. — Vitamin E is required for spermatogenesis in the house cricket. While selenium and tocopherol quinone cannot substitute for α -tocopherol (vitamin E), the further specificity of this requirement for vitamin E had not been exhaustively investigated.

Antioxidants (ethoxyquin and menadione), selenium (with and without methionine), hexahydro coenzyme Q₄, tocopheronolactone, N-methyl- γ -tocopheramine, 5,5'-methylene bis (γ -tocopherol), 2,5,7,8-tetramethyl-2-(4',8'-dimethylnonyl)-6-hydroxychromane, and a series of chromanol derivatives were compared with recent data for the tocol and tocotrienol series. All of these derivatives showed a varied pattern of substitution for natural *d*- γ -tocopherol. The newly evaluated compounds ranged in activity (*d*- γ -tocopherol = 100%) from 0-34.6% based on assay of egg viability and examination of the testes for the presence of motile sperm.

Information on the relative effects of these compounds on larval and adult

growth rates was also obtained. The specificity and pattern of response of crickets to these and previously tested compounds facilitates a comparison of cricket, rotifer and mammalian vitamin E requirement.

The Marine Interstitial and Planktonic Rotifer Fauna of Puerto Rico. JAMES R. LITTON, JR., Department of Biology, Saint Mary's College, Notre Dame, IN 46556. — Investigations of the fauna of coral reefs and surrounding waters have never carefully examined the microfauna, and specifically the rotifers, in a detailed manner. While rotifers are predominantly freshwater forms they can be regularly found in the interstitial and planktonic fauna of marine systems if particular care (mesh size of nets and detailed sample sorting techniques) is given to sample collection.

Five marine sites in Puerto Rico (southern shore coral reef, northern coral reef, Phosphorescent Bay, a mangrove cay, and northern shore coral sand) were sampled during daylight hours using a 125 mesh (No. 25) nylon plankton net. Wet sand samples were placed in the net, eluted with a known volume of seawater, and treated as plankton samples. All samples were examined live and then preserved in 10.0% formalin for later specific and quantitative observations.

The following rotifer genera were found in the samples: *Keratella*, *Notholca*, *Philodina*, *Collotheca*, *Lecane*, *Proales*, and *Lepadella*. The diversity, abundance, and salinity tolerance of these genera and species forms an interesting comparison with data from northern European and north American marine locations. While the rotifer component of the marine plankton and interstitial fauna may not be large it is probably always present.

The Effect of Single and Divided Dose Administration on the Efficacy of Cambendazole against *Trichinella spiralis*. R. O. MCCracken, A. GARCIA, D. NIERSTE and D. DOCK, Department of Biology, Indiana University-Purdue University at Indianapolis, Indianapolis, Indiana 46223. — Mice infected with adult *Trichinella spiralis* were used to compare the anthelmintic efficacy of cambendazole (CBZ, 2-[4'-thiazolyl]-5-isopropoxycarbonylamino-benzimidazole) given as a single oral dose or administered as a series of divided daily oral doses during the enteral phase of infection. Given as a single oral dose of 300 mg/kg 72 hr after exposure to infection, CBZ reduced the worm burden by 61.0% as determined at necropsy on day 7 postinoculation; as a single dose of 600 mg/kg it removed 88.0% of the adult worms. Twice daily oral doses of CBZ at 25 mg/kg for 3 consecutive days during the intestinal phase (i.e., a total dose of 150 mg/kg body weight) was equally effective against the drug resistant adults; this treatment regimen reduced the worm burden by 79.0%. The demonstrated role of the duration of exposure to the anthelmintic as a determinant of its efficacy and spectrum of action has important therapeutic implications for extending the range of life cycle stages of *Trichinella* against which CBZ is effective, and for achieving efficacy with low dosage rates.

Ontogenetic Lipid Metabolism of *Abystoma tigrinum*. ERIC D. MOULD and DAVID M. SEVER, Department of Biology, Saint Mary's College, Notre Dame, Indiana 46615. — Collections of *Ambystoma tigrinum* were made at weekly intervals from a pond in St. Joseph Co., Indiana from March 22, 1982 when egg masses were observed until August 16, 1982 when no salamanders remained in the pond. Lipid content of the collected specimens was determined by Soxhlet extraction and a randomly selected sample was saved for length measurements and stomach analysis. Lipid content of egg masses was 10.81% and was generally lower in subsequent larval collections, presumably due to yolk consumption. From late

May until collections were terminated, larva varied dramatically in size, two to three fold variation in snout-vent (SV) lengths were common. In latter stages of larval development, lipid content was directly correlated with S-V length. Ecological and evolutionary consequences of the diversity in larval length, lipid content and developmental stage are considered.

Differences in Feeding Patterns among Three Age Groups of Walleye (*Stizostedion vitreum vitreum*) in Western Lake Erie. ELLEN K. PIKITCH, Department of Biology, Indiana University, Bloomington, Indiana 47405. — Information concerning feeding patterns is often a critical component in the management of fish populations. Studies of feeding patterns are most useful when they take into account not only the species of prey consumed, but also the availability of various forage species in the environment. However, when different predator age groups possess differential capabilities for utilizing prey, the concept of forage availability becomes more complex.

To examine age-specific forage availability and utilization, walleye and their potential prey were collected over a seven month period in 1981 from western Lake Erie. Nearly 2,200 walleye were collected, of which only 65.0% contained food. It was found that the frequency of feeding decreased, whereas numbers and size of prey consumed increased with age. The walleye diet varied from month to month in response to changes in the forage community. Generally, the dominate species in the diet were those that were most abundant in the environment, but there were some notable exceptions. In addition, young-of-the-year (y-o-y), yearling and older walleye utilized different prey species during each month. These differences in prey selection can largely be explained by examining the size distribution of each prey species during each month, in relation to the average gape of each age group of walleye.

Of particular interest was the differential utilization of the gizzard shad (*Dorosoma cepedianum*). Gizzard shad grow much more rapidly in western Lake Erie than in most other lakes. A previous study of y-o-y and yearling walleye feeding habits in Lake Erie did not find gizzard shad to be a significant component of the diet. The combination of high growth rates and lack of evidence to the contrary led to the belief that gizzard shad were an insignificant source of food for western Lake Erie walleye. In contrast, this study shows that when gizzard shad are abundant, they are an important source of food for all age groups of walleye, but at different times of the year. From July through October, gizzard shad consecutively grew into the preferred size ranges of y-o-y, then yearling, and finally older walleye. Consequently, the percent of the walleye diet composed of gizzard shad peaked in August, September and October for y-o-y, yearling and age II+ walleye, respectively. Gizzard shad comprised over 65.0% of the diet of each age class during its respective peak month.

