

same protein concentration. One hundred per cent of the salivary iduronidase activity was bound to Heparin-Sepharose, and all could be eluted as a single peak by a NaCl gradient (0.15M - 1.0M). The molecular weight of unpurified salivary iduronidase measured about 91,800 daltons by gel filtration chromatography.

α -L-Iduronidase from Human Seminal Fluid. J. KENNETH HERD and I. O. LECLAIR, East Tennessee State University.

α -L-iduronidase (EC 3.2.1.76) is a lysosomal glycosidase utilized in the degradation of residual cellular heteropolysaccharides, the lycosaminoglycans (formerly mucopolysaccharides). A genetically controlled deficiency of iduronidase activity causes storage of mucopolysaccharides resulting in a clinical disease known as the Hurler syndrome. We have purified iduronidase from human seminal plasma, a concentrated source material, and will report some differences from iduronidase others have isolated from organs.

By gel filtration chromatography unpurified seminal fluid iduronidase has a MW of 95,000 \pm 3500 compared to 85,000 - 88,000 MW reported for comparable iduronidase from human lung or urine. Isolation of iduronidase was achieved by chromatography on heparin-Sepharose-4B and hydroxylapatite columns resulting in purification of up to 5300X in some fractions. Seven other enzyme activities present in the starting material were absent from the final product. Only traces of acid phosphatase remained in some fractions. All seminal fluid enzyme appears to be of the high-uptake form.

Caffeine Potentiation of the Teratogenic Effects of 5-Bromodeoxyuridine. SKALKO, RICHARD G. and THOMAS E. KWASIGROCH, Department of Anatomy, Quillen-Dishner College of Medicine, East Tennessee State University, Johnson City, Tennessee 37614.

The methylated xanthine, caffeine, has been shown to modulate the response of mammalian embryos to several well-known embryotoxic (teratogenic) agents. It potentiates the embryotoxic effect of such compounds as chlorambucil, mitomycin C, hydroxyurea, acetazolamide and phenytoin. In this experiment, the effects of caffeine on the ability of a given dosage of the halogenated nucleoside, 5-bromodeoxyuridine to produce cleft palate were studied.

Pregnant female mice (ICR) were treated, initially, with either caffeine (100 or 200 mg/kg) or 5-bromodeoxyuridine (300, 500 or 1000 mg/kg) on day 10 of gestation. Results confirmed that caffeine is a "weak" teratogen in this strain and that bromodeoxyuridine produced a dose-dependent increase in clefts of the secondary palate. If caffeine were administered either 3h before or 3h after bromodeoxyuridine, there was an enhancement of the observed cleft palate response. This potentiation was most pronounced if caffeine were administered after bromodeoxyuridine. This experiment was repeated on day 11, a stage of diminished sensitivity to bromodeoxyuridine. Embryos were refractory to the effects of the low dose of caffeine (100 mg/kg) but the high dose was still synergistic, the greatest response occurring if caffeine was administered as the second treatment.

In view of the known biological effects of both agents, it is suggested that the interaction most probably occurs at the level of the embryonic genome.

ZOOLOGY SECTION A

A. FLOYD SCOTT, *Presiding*

Growth of Female Dusky Salamanders (Desmognathus Fuscus) During Brooding: A Laboratory Study. C. L. HOM, The University of Tennessee.

Female salamanders in the genus *Desmognathus* do not appear to forage while brooding eggs. Several investigators have hypothesized that the energetic constraint imposed by the resultant low food intake may have three possible effects: 1) weight loss experienced by females during brooding is attributable to loss of body mass rather than dehydration; 2) depletion of fat reserves may hinder vitellogenesis; 3) adult female *Desmognathus* grow very little after reaching sexual maturity. These hypotheses were tested in a laboratory study of feeding levels and size of brooding female dusky salamanders (*Desmognathus fuscus*). The results show that females fed *Drosophila melanogaster* and small oligochaetes *ad libitum* during brooding grew significantly more and gained significantly more weight than females that were not fed during brooding. These results will be compared to field observations and interpreted in the context of *D. fuscus* life history strategies.

The Distribution and Breeding Habitat of the Barking Treefrog (Hyla gratiosa) in South-Central Kentucky and North-Central Tennessee. DANIEL E. VANNORMAN and A. FLOYD SCOTT, Austin Peay State University.

The distribution and breeding habitat of a disjunct population of the barking treefrog (*Hyla gratiosa*) were studied in the Pennyroyal Plain region of Kentucky and Tennessee during the period of May through August, 1983 and 1984. A total of twenty breeding sites and sixteen road collections was recorded from six Kentucky and two Tennessee counties. Most breeding took place in flooded sinks of grain fields. Averages for air temperature, water temperature, dissolved oxygen, and pH recorded at the various breeding sites while males were calling were 24.7 C, 27.0 C, 8 ppm,

and 7.3, respectively. During 1983, the species were first observed on 20 May and last seen on 26 July; during 1984, 18 May and 28 August were the earliest and latest dates activity was recorded. Calling was first heard on 8 June in 1983 and on 18 May in 1984; it was last recorded on 26 July in 1983 and on 15 July in 1984. Juvenile individuals were encountered on roads near breeding sites from 25 June to 28 August in 1984. An average of 3.3 males were heard calling at each site. They were routinely observed in an inflated condition at the surface of shallow water (2-120 cm deep), usually among grain stubble within 5 m of water's edge.

Interspecific Associations of Medium-Sized Mammals in Western Tennessee. JOHN P. NELSON, JR. and PAUL L. LEBERG, Memphis State University.

Live-trapping was used to study interspecific associations among raccoons, (*Procyon lotor*), opossums, (*Didelphis virginianus*), skunks, (*Mephitis mephitis*), and cats, (*Felis domesticus*), at Shiloh National Military Park, Hardin Co., Tennessee. During December 1983 - January 1984, a total of 2886 trapnights was compiled. Results were analysed using a variance test for species association and by a pairwise contingency table analysis (Cole's Index of Interspecific Association). The variance test showed no significant association ($P > 0.05$) among the species studied. Cole's Index yielded a significant negative association between raccoons and cats ($P < 0.05$). However, the negative association may not be due to species interactions but instead reflect a concentration of cat captures in proximity to human habitations.

Home Range of the Bobcat (Felis rufus) in Arkansas. RICHARD A. RUCKER, Memphis State University.

Home range of the bobcat (*Felis rufus*) was studied on a portion of the Muddy Creek Wildlife Management Area, Ouachita National Forest, Arkansas. Six bobcats (4 adults, 2 juveniles) were radio-tagged and monitored using radio telemetry. Home ranges were calculated using the minimum area polygon method, and were found to vary between sexes and among age groups.

Additional Notes on the Taxonomic Status of the Coyote (Canis Latrans) in Tennessee. CHARLES LYDEARD, PAUL L. LEBERG, and GEORGE D. BAUMGARDNER, Memphis State University, Memphis, TN 38152.

In order to determine the taxonomic status of the coyote (*Canis latrans*) in Tennessee, 179 wild canids of unknown taxonomic status were compared to known groups of coyotes, dogs (*C. familiaris*), and red wolves (*C. rufus*). A total of 21 skull measurements and four derived ratios were used in the assessment. Discriminant function analysis showed 86.6% of the unknown Tennessee canids (male and female samples combined) to cluster as coyotes. When sexes were assessed independently, 95.0% of the male, and 94.9% of the female unknown canids clustered as *C. latrans*. Hybridization between canid taxa was found to be minimal. The wild canid presently occurring in Tennessee is best referred to as coyote.

Geographic Variation in the Coyote, Canis Latrans, in the Southern United States. PAUL L. LEBERG, MICHAEL L. KENNEDY, and GEORGE D. BAUMGARDNER, Memphis State University.

Geographic variation in coyotes (*Canis latrans*) from the southern United States was assessed using univariate and multivariate statistical techniques. Twenty-one cranial measurements were analyzed from 552 adult specimens. Twenty characters were found to be sexually dimorphic. Fourteen male and 12 female measurements showed significant interlocality variation. A matrix of character correlations was computed, and the first three principal components were extracted. These accounted for 87.89% and 94.13% of the total interlocality phenetic variance in the character sets of males and females, respectively. In general, a west-east gradient of increased size was observed. Environmental-morphological relationships were examined.

Variation in Food Habits of the Coyote (Canis latrans) in Western Tennessee. ROBERT M. LEE, III, Memphis State University.

Due to recent immigration and rapid population growth in western Tennessee, the coyote, *Canis latrans*, has sparked considerable interest. A major concern is the impact the coyote will have on native faunal populations. Between 1981 and 1984, 246 coyotes were collected from 25 western Tennessee counties. Digestive tracts were removed and examined. Relationships among food items, localities and years were determined. The coyote appeared to have an opportunistic feeding strategy, taking a wide variety of foods in all seasons.

Estimating Body Weight of Tennessee White-Tailed Deer From a Chest-Girth Measurement. FLOYD W. WECKERLY, PAUL L. LEBERG, RONALD A. VAN DEN BUSSCHE, Memphis State University.

Predictive linear regression equations for body weight (kg) were determined from chest-girth (mm) taken from 92 white-tailed deer. Animals were collected in October 1983 and January 1984 from two western Tennessee counties. Dummy-variable analysis indicated three linear regression equations were required: $\hat{Y} = 0.3056 X + 4.0101$ ($r^2 = 0.22$ for fawns, $\hat{Y} = 0.12695 X - 59.3118$ ($r^2 = 0.84$ for adult males, and $\hat{Y} = 0.7668 X - 19.7554$ ($r^2 = 0.45$ for adult females. Regression equations for Tennessee deer differ from those developed for deer in other regions.

ZOOLOGY SECTION B

CHARLES N. BOEHMS, *Presiding*

Tardigrade Populations in an East Tennessee Stream after Habitat Disturbance. C. J. KINCER and D. R. NELSON, East Tennessee State University.

In 1979-80 a twelve-month study of aquatic tardigrade populations in a stream on the campus of East Tennessee State University, Johnson City, was conducted by T. C. Williams and D. R. Nelson. The dominant tardigrade species were determined and seasonal trends in population changes were established. After the completion of the study, a section of the stream above the collecting site was modified by the addition of cement and rock walls lining the stream bed. To assess the effect of the tardigrade habitat disturbance, a follow-up study was initiated in February 1983 by C. J. Kincer and D. R. Nelson. The same collecting procedures were used as in the previous investigation. Although species diversity remained basically the same, the relative abundance of the three major species was significantly different after the habitat disturbance. In addition, two aquatic species of *Isohypobius*, previously unreported in Tennessee, were found, and some accidental tardigrade inhabitants were present. A new species of *Isohypobius*, originally common in a preliminary sample collected in March 1978, was present in very low numbers during both the initial and follow-up study.

Predation Upon Tardigrades by Midge Larvae (Diptera: Chironomidae) in the Littoral Zone of an East Tennessee Lake. CHARLES N. WATSON, JR. and DIANE R. NELSON, East Tennessee State University.

The littoral zone of Bays Mountain Lake, Sullivan County, Tennessee, was sampled monthly for one year, beginning in October, 1981. Nearly 3000 larvae belonging to the chironomid subfamily Tanypodinae were collected and their gut contents analyzed. The diet consisted of a wide variety of algae and invertebrates. Tardigrades varied from 2-35% of the invertebrate diet component, depending upon the species and instar of the midge predator. Predation on tardigrades also varied with season and depth. It was heaviest in the spring, with a smaller peak in the fall, and was concentrated at depths of one meter or less. Since Tanypodinae are opportunistic predators, generally taking prey in proportion to availability, such spatial and temporal fluctuations in predation intensity may reflect the distribution and changing population densities of tardigrades in the littoral zone.

Water Mites (Genus Arrenurus, Subgenera Arrenurus and Micruracarus) in Tennessee. JAMES L. WILSON, Tennessee State University.

The twelve species of the Subgenus *Arrenurus* and eight species of the Subgenus *Micruracarus* will be discussed with relation to their taxonomic characteristics and distribution in Tennessee.

Although all 95 counties in Tennessee were collected, no suitable habitats (such as lakes, ponds and marshes for the Genus *Arrenurus*) were found in many of them due to my unfamiliarity with the areas, so, the distribution given for these two subgenera are, at best only preliminary.

Micromorphological Descriptions of Selected Mite Species From Middle Tennessee. CHARLES S. MURPHREE, Middle Tennessee State University.

The micromorphological features of representatives of the arachnid order Acarina were investigated with a scanning electron microscope. The integuments of 24 species were examined and compared for relative similarities and differences at the familial and subordinal levels. The features of each specimen were photographed at relative magnifications and described utilizing available arthropod terminology. In some cases, diminutive surface features are illustrated and described for the first time. A number of species exhibit unique cuticular patterns and setal morphologies. The descriptions and illustrations presented in this paper provide an initial survey of the wide diversity in surface features among the Acarina which may be used as supplemental taxonomic information.

An Outbreak of Toxoplasmosis in Marsupials at the Knoxville Zoological Park. S. PATTON, J. M. JENSEN, D. G. LOEFFLER, B. G. WRIGHT, S. L. STRAWBRIDGE, The University of Tennessee, College of Veterinary Medicine.

Fourteen marsupials from KZP died within a 24 day period. Histopathological findings were suggestive of toxoplasmosis. Lung, intestines, brain and heart were the most frequently involved organs. Blood obtained from two kangaroos after death was positive for antibodies to *Toxoplasma gondii* by an indirect hemagglutination test. Six of 7 other adult marsupials living at the zoo were also positive for *T. gondii* antibodies. Tissues from the animals that died were collected at necropsy and homogenates were inoculated into mice. *T. gondii* tachyzoites were obtained from mouse peritoneal fluid on postinoculation day 11. All mice died within 2 weeks of inoculation and *T. gondii* tachyzoites were observed in cells on impression smears from brain, lung, liver, and spleen of these mice.

Serological Detection of Dirofilaria immitis in a Population of Naturally Exposed Dogs. SHARON PATTON and S. L. STRAWBRIDGE, The University of Tennessee, College of Veterinary Medicine.

Sera collected from the clinic dog population at the UT College of Veter-

inary Medicine were classified on the basis of apparent exposure to filarial worms and examined in an ELISA test, using a *Dirofilaria immitis*-derived antigen. This sera was frozen at -20C for 1 month to 4 years until examined by the Daryl Lab TRACK XI IFA System. This system also employs a *D. immitis*-derived antigen. In the ELISA, the amount of IgG antibody in serum is typically low in noninfected dogs, somewhat higher in previously infected and microfilaremic dogs, and highest in dogs with occult dirofilariasis. Of 188 ELISA-positive samples (log₂ titer ≥ 9), 154 were positive by the IFA procedure for an 81.91% concurrence between tests. Of 315 samples that were negative by ELISA, 248 were negative by the IFA system for a concurrence rate of 78.73%. Patent *D. immitis* infections accounted for 7% of the differences.

Glycogen Depletion and the Absence of Glucose-6-Phosphatase from the Swimbladder Gas Gland. JAMES E. DECK, The University of Tennessee at Martin.

In some fish the swimbladder gas gland cells have a glycogen store that is used for lactic acid production during gas secretion. Glycogen depletion was demonstrated when gas was secreted to fill the swimbladder of sunfishes (*Lepomis*). Gas secreting ability would be reduced if the cells could release glucose instead of lactic acid from the glycogen stores. Glucose-6-phosphatase is the enzyme required for glucose release. This enzyme was sought in the gas gland but could not be demonstrated by the detection of glucose in the culture medium of gas glands isolated in organ culture, by the assay for phosphate of tissue homogenates in the presence of the substrate, or by an enzyme histo-chemical technique. Glucose-6-phosphatase is therefore presumed to be absent from the cells of the gas gland.

Hogjowl Creek Water Quality. R. G. LITCHFORD and P. A. PERFETTI, The University of Tennessee, Chattanooga.

Hogjowl Creek is a part of the headwaters of South Chickamauga Creek, a tributary of the Tennessee River. Studies indicate little change in the water quality since 1979. This is in spite of major changes in the land use practiced in Hogjowl valley. The land use changes, water quality parameters used, and the results of studies in 1979 and 1984 will be discussed.

COLLEGIATE DIVISION

RICHARD J. RARIDON, *Presiding*

Characteristics of Shad Hybrids from Cherokee Reservoir. JANICE R. CARMICHAEL, The University of Tennessee.

Shad less than 100 mm were collected monthly from Cherokee Reservoir during the period August 1983 to August 1984 using nighttime shoreline electrofishing. Gizzard shad (*Dorosoma cepedianum*), threadfin shad (*D. petense*), and hybrids of these two species comprised 6.2, 90.6, and 3.2 percent, respectively, of the total collection (n=3630). Young-of-year hybrids were intermediate between young-of-year gizzard and threadfin shads in predorsal length, upper jaw length, mandible length and anal fin ray count; they exhibited the greatest values for body depth, caudal peduncle depth and dorsal filament length. Mean total length and weight of hybrids were comparable to those of gizzard shad, but greater than those of threadfin shad. In general, hybrids had a rounded snout shape similar to that of gizzard shad, but with a more terminal mouth. Hybrids also exhibited the elongated dorsal filament and yellow pigmentation in the fins characteristic of threadfin shad.

Effects of various prostaglandins on ovarian function in the rat. MARY TOMLINSON, DEANNA HATMAKER and THOMAS CHEN, Department of Zoology, University of Tennessee, Knoxville, TN 37916.

In mammals, the corpus luteum (CL) is formed by the ruptured ovarian follicle following ovulation and secretes progesterone, which plays a key role in the maintenance of pregnancy. When conception does not occur, or when pregnancy is interrupted, prostaglandin F_{2α} (PGF_{2α}) is the agent responsible for regression of the CL, which is followed by a sharp drop in progesterone. Many hypotheses have been proposed to explain the mechanism of PGF_{2α}'s action. One hypothesis states that luteal regression (luteolysis) results from restriction of blood supply to the CL due to the potent vasoconstrictive property of PGF_{2α}. To test this hypothesis, several vasoactive prostaglandins were administered to rats bearing functional CL. Their effects were assessed by measuring serum levels of progesterone and its metabolite 20α-DHP following treatments. Our results showed that vasodilators (PGA₂, PGE₁, PGF_{1α}, and PGI₂) behaved in accordance with the blood flow hypothesis, i.e. they are luteotrophic (increasing or maintaining progesterone levels). Prostaglandin F_{2α} also behaved predictably, reducing serum progesterone levels markedly by 3 hours post treatment. However, PGB₂, also a vasoconstrictor, actually raised serum progesterone levels significantly. Therefore, it appears that a vaso-constricting property does not ensure luteolysis, indicating that prostaglandin induced luteolysis is caused by factors in addition to decreased ovarian blood supply. The overall significance of these studies is in determining the possible physiological roles of these prostaglandins in ovarian function.

Kinetics Studies of o-Terphenyl and Fluorene, ROBERT L. HARVEY JR. and EUGENE A. KLINE, Tennessee Technological University.

Fluorene reacted with o-terphenyl at high temperatures in sealed tubes at high temperature and produced biphenyl by cleavage and triphenylene by coupling. A study of concentration effects of the model H-donor, fluorene, showed increased amounts of both biphenyl and triphenylene with decreased concentration of the H-donor.

Temperature effects in another kinetic study of the first order rate gains of triphenylene showed 65 kcal mol⁻¹ less activation energy for the cleavage to biphenyl compared to that for the coupling to triphenylene. The study was carried out from 410°C to 470°C.

Deuterium labelling studies were carried out to further elucidate the mechanisms involved.

The Effect of Temperature on the Formation of Perithecia Development of Diaporthe phaseolorum var. caulivora, KIM GOODE and J. W. HILTY, The University of Tennessee.

Diaporthe phaseolorum var. caulivora which causes soybean stem canker, is of major economic importance because of its ability to invade and kill actively growing plants.

The ascogenous state of *D. phaseolorum var. caulivora* was studied under laboratory conditions to determine the effects of temperature on the development of perithecia.

Inoculated stem segments were incubated at 15, 20, 22, 24, 25, 26, and 30 C. Perithecia were formed more abundantly at 22 C.

The number of perithecia formed per unit of stem was inversely proportional to temperature at 24 C and above. No perithecial development occurred at either 15 or 30 C.

Perithecial ontogeny was followed histologically.

Species Composition and Relative Abundance of Dog Biting Mosquitoes From a Suspected Focus of Dog Heartworm Disease in Knox County, Tennessee. LAWRENCE J. HRIBAR, University of Tennessee.

Veterinary records, soil survey maps, and topographic maps were used to locate a suspected focus of the Dog Heartworm, *Dirofilaria immitis* (Leidy), in Knox County, Tennessee. Mosquitoes were collected nocturnally and diurnally from April until September 1983, using a dog-baited modified Magoon trap. Eight hundred thirty-four mosquitoes were collected nocturnally. *Psorophora ferox* was the most abundant species, comprising 72.9% of the specimens collected. Other nocturnal collections were: *Aedes sticticus* 11.8%, *Culex salinarius* 6.4%, *Aedes trivittatus* 6.2%, *Psorophora horrida* 1.3%, *Aedes triseriatus* 0.4%, *Aedes vexans* 0.2%, *Culex erraticus* 0.2%, and unidentified *Culex* species 0.2%. Twenty mosquitoes were collected diurnally: *Psorophora ferox* 40%, *Aedes trivittatus* 35%, *Aedes triseriatus* 15%, unidentified *Aedes* species 5%, and unidentified *Psorophora* species 5%.

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INJURY TO AUTOMOBILE PAINT BY *SPHAEROBOLUS*

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GLEBAL COLLECTION AND DISCUSSION

During the summer of 1983, in several areas in the vicinity of Nashville, Tennessee, numerous small black masses slightly less than 1 mm in diameter were observed on automobiles in certain parking areas. Up to three hundred such spots were counted on a single car which had been parked in the area. These small black masses were also observed on buildings, doors, curbs, paved surfaces, sidewalks, and on lamp posts up to a height of 10 feet.

Small metal plates with a surface area of one square foot were positioned at different angles and heights to determine the direction of origin of the small black masses. Observations revealed the accumulation of the small black masses on the underside of the plates. As many as 68 masses accumulated on the plates exposed for 1½ hours during the morning periods. It was determined that the masses originated from the ground cover.

Microscopic analysis of the hardwood chips, which were used as mulch, revealed the presence of a fungal growth. The surface of the chips revealed the presence of numerous small glebal masses. Hardwood chips were placed in a culture dish containing moistened filter paper. The dishes were covered with glass plates and observed periodically. Numerous small black masses accumulated on the surface of the glass exposed to the fungus. The small black masses were identified as glebal masses of the puffball relative *Sphaerobolus stellatus*. While the fungus occurs in temperate climates throughout the world (Brodie, 1978), it is relatively uncommon, and no record of its occurrence in such profusion as in the present instance has been reported.

The fruiting body of *Sphaerobolus* consists of a peridium surrounding the gleba. The gleba is spherical, 0.6-0.9

mm in diameter, has a sticky outer surface, and is brown or black in color. At maturity the outer layer of the peridium breaks in a stellate fashion while the inner peridium everts, remaining attached to the outer peridium only at the periphery, and forcibly discharges the gleba for a considerable distance. The glebal mass contains gemmae as well as basidia and basidiospores, and remains viable for periods of 11 years or more (Walker, 1927; Buller, 1933; Ingold, 1971).

The force responsible for glebal discharge is generated in the inner peridium. The mechanism is osmotic and involves the hydrolysis of glycogen to glucose. The glebas have been discharged up to 14 feet 6 inches vertically and 18 feet 7 inches horizontally (Walker and Anderson, 1925; Walker, 1927; Engel and Schneider, 1963).

The glebas which adhered to the painted surfaces of the automobiles eroded and pitted the paint. This action is presumably due to some metabolic product of the fungus. The glebas were difficult to remove and left the painted surface defaced.

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