The unionid fauna of the Little River, Blount County, Tennessee was surveyed to test the hypothesis that the headwater limit of unionid distribution may be predicted by an examination of a physiographic gradient of the stream. Bivalves should not be found above the upstream section of the river where there is a sharp increase in the stream gradient. Our survey documented 11 species of unionids and the literature records the former occurrence of eight additional species not encountered in the survey. Our data for the Little River are consistent with those published for the Powell, Clinch, and Holston Rivers and the Little South Fork of the Cumberland River; the last bivalve species was collected downstream of the sharp continuous increase in gradient. Numerous studies of the fish fauna in the eastern United States have shown that longitudinal diversity in fish species is correlated with stream order, gradient, and drainage area. Fish species diversity increases with increasing stream order. This is important since the unionid glochidia are parasitic on fish gills and dependent on the fish for distribution. Factors limiting fish would directly limit the unionid distribution. From the data on the longitudinal diversity in fish species, the unionids should exhibit a regular pattern of longitudinal diversity similar to the fish. This pattern should be additive from the headwaters downwards and correlated with increasing stream order. Longitudinal diversity of aquatic macroinvertebrates also has been shown to be positively correlated with stream order. This pattern of longitudinal diversity might be explained by changes in several factors: 1. gradient, 2. water temperature, 3. substratum particle size, 4. size of organic particles, 5. water flow fluctuations, 6. water hardness. Stream gradient decreases with increasing stream order as does overall substratum particle size and size of suspended organic particle. As the stream increases order the fluctuation of the stream flow decreases and the number of niches increases. It is suggested that no single limiting factor determines the headwater limit of unionids, but an interaction of the above factors coupled with fish distribution.

OBSERVATIONS ON *LAMPSILIS ALTILIS* (CONRAD) AND *L. PEROVALIS* (CONRAD) FROM THE MOBILE RIVER SYSTEM. Robert W. Hanley, The University of Alabama, Tuscaloosa.

Conrad and Lea described six species of rayed unionid clams from the Mobile River system between 1834 and 1865. Simpson placed these taxa in the genus *Lampsilis*. Most recently only one of these species, Conrad's *altilis*, has been considered valid. After examining over two hundred specimens, I feel that both *altilis* and *perovalis* deserve recognition; while Lea's names represent ecophenotypes of Conrad's species, and hence should be placed in synonomy. The shell of *altilis* tends to be more elongate than that of *perovalis*, and the lateral teeth of the former are straight whereas the lateral teeth of *perovalis* tend to be curved. Whether *altilis* and *perovalis* belong in the genus *Lampsilis* is questionable. The marsupium of *altilis* occupies the entire outer demibranch, a characteristic of the Anodontinae. However, *altilis* also has traits of the Lampsilinae: sexual dimorphism of the shell, and demarcation of the marsupial ovisac by sulci. Until more thorough studies of the anatomy and glochidia of these species are completed, it is best to retain them in *Lampsilis* s.l.

MOLLUSKS FROM AN ARCHAEOLOGICAL SITE IN WOODFORD COUNTY, KENTUCKY. Samuel M. Call, Kentucky Natural Resources and Environmental Protection Cabinet, Division of Environment Services, Frankfort; **Kenneth Robinson,** University of Kentucky, Lexington.
Paper on pages 31–33.

UNIONID MOLLUSKS OF THE MISSOURI RIVER ON THE NEBRASKA BORDER. Ellet Hoke, West Des Moines, Iowa.
Paper on pages 71–74.

NAIAD MOLLUSK POPULATIONS (BIVALVIA: UNIONIDAE) IN POOLS 7 AND 8 OF THE MISSISSIPPI RIVER NEAR LA CROSSE, WISCONSIN. Marian Havlik, Malacological Consultants, La Crosse, Wisconsin.
Paper on pages 51–59.

ORGAN GROWTH IN BIVALVES: AN ANALYSIS OF GROWTH PATTERNS IN A TOPOTYPIC POPULATION OF *ELLIPTIO LANCEOLATA* (LEA, 1828). C. Clifton Coney, Richard H. Moore, and **Silvard P. Kool,** University of South Carolina, Coastal Carolina College, Conway.

Forty females and forty-two males of topotypic *Elliptio lanceolata* collected from the Tar River, North Carolina, ranging from one to five years of age, were selected for growth analysis. Specimens were prepared utilizing methodology described by Coney, Moore, and Kool (1981).

Previously undescribed structures found within stained inner demibranchs are reported. Mature septa arise from immature septa (quasisepta) located within the anteriormost inner demibranch. As determined by maturity and frequency of septa, the anteriormost inner demibranch is younger, while the posteriormost portion is older. As growth stress builds within the demibranch, structurally supportive vertical thickenings of tissue (columna) appear. There are three growth stages of columna: (1) distal columna primordia, which develop from the distal demibranch margin; (2) proximal columna primordia, which develop from the proximal demibranch margin; these two structures eventually joining together as (3) mature columna. While mature septa arise from the anterior quasisepta, septa may also develop from mature columna as a result of growth stress.

The greatest change in growth rate occurred in individuals between two and three years of age. Demibranch length and height were correlated ($P < 0.001$) with age. Asymmetric growth of the inner demibranch is probable as demibranch length increased at a faster rate than demibranch height. The number of septa, filaments, distal and proximal columna primordia were correlated ($P < 0.0$ with age, however the number of quasisepta were inversely correlated ($P < 0.001$) with this factor. Females had longer gills than males ($P < 0.05$), with more distal columna

...sa ($P < 0.05$), and more septa and filaments ($P < 0.01$) ... males. Sexual dimorphism was fully developed by the ... year of growth. Both anal and branchial papillae in... ...ased in numbers with age ($P < 0.001$) but were not signi... ...ly correlated with sex.

This research was supported in part by a grant from ... S.C. Coastal Carolina College Faculty Development ... funded by the Horry County Higher Education Commis...

...MPARISONS OF MORPHOMETRIC AND SOFT ANAT... CHARACTERS BETWEEN TOPOTYPIC POPULA... ...NS OF *ELLIPTIO LANCEOLATA* (LEA, 1828) AND *E. ...GUSTATA* (LEA, 1831). Richard H. Moore, C. Cliff ...oney, and **Michael R. Creitz,** University of South Carolina, ...astal Carolina College, Conway.

Collections of 209 topotypic *Elliptio lanceolata* (Lea, ... from the Tar River, North Carolina, and 80 topotypic *E. ...gustata* (Lea, 1831) from the Congaree River drainage, ... Carolina, were subjected to a multivariate analysis of ... morphometrics. Nine three-year-old females of each ...ies, all eight three-year-old male *E. lanceolata,* and all ... three-year-old male *E. angustata* were used in an ...lysis of soft anatomical characters.

Fourteen measurements were made on each pair of ...es. Linear measurements were logarithmically trans... ...ed and principal components extracted from the correla... ...matrix. The two species separated almost completely in ...ivariate space defined by the first two principal com...ents. Examination of loading coefficients showed the two ...ies differed in the angle between the left pseudocardinal ... the angle between the right pseudocardinal teeth, the ... interdentum angle, and the anterior development paral... ...the hinge line. A multiple discriminant analysis of these ... assigned all but one *E. lanceolata* and all *E. angustata* ...her correct taxon.

A number of obvious distinctions were noted in the soft ...omy. The mantle of *E. lanceolata* was plain and almost ...nsparent, while that of *E. angustata* was orange and darkly ...ted. The posterior gill ligament was short, thick, and ...ous in *E. lanceolata,* but long, thin, and straight in *E. ...gustata.* Anal papillae were longer and spaced further ... in *E. angustata.* Branchial papillae in *E. lanceolata* were ... and almost pyramidal in shape, while in *E. angustata* ... were thin, and finger-like. *E. angustata* males typically ...essed dark pigmented areas at the bases and between ... branchial papillae. *E. lanceolata* possessed broad ...branchs, while *E. angustata* had narrower, elongated, ...ring demibranchs.

The species differed significantly in the number of ...nchial papillae, total gill filaments, and in the numbers of ...ective tissues in the gill. Total anal papillae and numbers ... septa did not differ.

In conclusion, *E. angustata* (Lea, 1831) should be re-

ECOLOGICAL RELATIONSHIPS OF SYMPATRIC SPECIES OF LAMPSILINAE (BIVALVIA: UNIONIDAE) IN THE WACCAMAW DRAINAGE OF EASTERN NORTH AND SOUTH CAROLINA. Hugh J. Porter University of North Carolina, Morehead City and **Karen J. Horn,** Marshall University, Huntington, West Virginia.

Paper on pages 61–66.

ALLOMETRIC GROWTH AND SEXUAL DIMORPHISM OF *VILLOSA VILLOSA* AND *ELLIPTIO ICTERINA* (PELECYPODA: UNIONIDAE) FROM LAKE TALQUIN, LEON CO., FLORIDA. M. Bowie Kotrla and **Frances C. James,** Department of Biological Science, Florida State University, Tallahassee.

The objectives of the study were 1) to find shape variables by which functional sex may be deduced from shell characters, and 2) to describe allometric growth. *Villosa villosa* (Wright, 1898) and *Elliptio icterina* (Conrad, 1834) were selected as examples of species having shells with obvious and cryptic sexual dimorphism, respectively. Measurements of the length, width, and distance from umbo to perimeter at various angles from the hinge line were taken. Maximum distance from umbo to perimeter, and angle at which it occurs were also measured.

Under the lognormal assumption, differences among shape variables, such as log x–log y, can be tested with parametric statistical tests. Of 13 shape variables, seven were found to be significantly different between males and females of *V. villosa* by T-tests, and 100% of these individuals were correctly classed as to sex by discriminant analysis. Linear regressions of shape on size reveal a trend from an ovate to an elliptical shape as size increases in *V. villosa.* The rate at which this occurs in the posterior region of the shell is greater in females than in males. The shape change in *E. icterina* during growth is more complex than that of *V. villosa.* Rate of change is greater in males than in females as measured by eight of 13 variables.

HISTOLOGY OF THE TESTIS OF *TAREBIA GRANIFERA* (LAMARCK). Harold D. Murray, Trinity University, San Antonio, Texas.

Males were unknown in North American *Tarebia granifera* until 1977 when spermatogenesis was observed in electron micrographs in association with the digestive gland. Later studies revealed motile eupyrene and oligopyrene sperm in 4.7% of the population. The histology of *T. granifera* testis is unreported.

Testis and associated digestive gland were fixed in Bouin's solution, dehydrated in a graded alcohol series, and paraffin embedded. Sections were cut at 7 μm and stained with Delafield's hematoxylin and eosin.

The testis lies on top of the digestive gland from which it is separated and is composed of numerous V-shaped folds with their apices facing the digestive gland. In females, the