

## THE HISTORY AND LITERATURE OF TENNESSEE HERPETOLOGY

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### ABSTRACT

Prior to 1990, over 1100 pieces of scientific and popular literature had been produced concerning Tennessee herpetology. In this study, these works were surveyed to obtain insights into (1) the historical development of the subject, (2) their geographic, taxonomic, and subject-area emphases, (3) the growth and distribution of herpetological graduate studies at Tennessee institutions, and (4) the needs for future herpetological research in the state. Nearly a century of slow growth, beginning in the 1830s, was followed by steady and dramatic increases between 1920 and 1990. The emphases over this period were on East Tennessee, salamanders, and life history/ecology-oriented topics. Graduate studies began in the 1920s, ceased altogether during the 1940s and 50s, and peaked during the 1970s. The University of Tennessee at Knoxville and East Tennessee State University topped the list of eight schools involved. Future research is needed on many fronts, ranging from classic natural history studies to molecular taxonomy and experimental ecology.

### INTRODUCTION

A large body of information concerning the herpetofauna of Tennessee exists in the scientific and popular literature. A compilation of 1124 titles of works on this subject was published recently by Redmond et al. (1990). The bibliography portion of that document served as the database for this paper.

In considering the titles in the bibliography, I sought to achieve four main objectives:

- (1) determine the historical development of herpetological literature in Tennessee on a decade by decade basis;
- (2) analyze each entry's contents in terms of geographical, taxonomic, and subject-area emphases;
- (3) examine the growth and distribution of graduate studies in Tennessee institutions; and
- (4) establish an information base on which to make recommendations for future research.

Whenever possible, I tried to separately analyze data from titles whose geographic scope extended well beyond Tennessee's boundaries (interstate titles) and data from titles limited to the state or one of its boundary areas, e.g. Great Smoky Mountains National Park (intrastate titles).

Prior to publication of the bibliography in Redmond et al. (1990), much of the literature on Tennessee herpetology had been identified by C.S. Shoup who referred to it in an original (1936) and two updated versions (1939, 1974) of a bibliography of the zoology of Tennessee and the Tennessee Valley region. Limited historical information on Tennessee herpetology (mostly concerning Gerard Troost) was also presented by Shoup (1944) in a paper concerning background knowledge of Tennessee zoology.

### METHODS AND STATISTICAL ANALYSES

The contents of each entry in the bibliography were assessed independently according to (1) the decade published, (2) its regional scope (interstate or intrastate), (3) the geographic region or regions involved, (4) the taxonomic group or groups treated, and (5) the general subject area emphasized. Of course, many titles were counted more than once when considering the geographic region or regions they involved and the taxonomic group or groups they treated.

The state's geographic regions (grand divisions) were defined based on physiography as presented by Miller (1974), and compared based on their approximate land area as gleaned from Luther (1977) and Fullerton et al. (1977). As defined here, West Tennessee (25,600 km<sup>2</sup>) includes the Mississippi River Valley and the Coastal Plain portions of the state; Middle Tennessee (45,600 km<sup>2</sup>), the Western Valley, Highland Rim, and Central Basin; and East Tennessee (41,200 km<sup>2</sup>), the Cumberland Plateau, Valley and Ridge, and Unaka Mountains.

Major taxonomic groups recognized for analytical purposes included salamanders (order Urodela), frogs and toads (order Anura), turtles (order Testudines), lizards (suborder Sauria), and snakes (suborder Serpentes). The basis of comparisons among these groups was the number of species in each occurring in Tennessee (45, 20, 15, 9, and 32, respectively) as given by Redmond et al. (1990).

Subject-area categories were somewhat arbitrary but their contents were fixed with the following types of publications making up each:

Geographic distribution—faunal surveys, distribution studies of one or more taxa, reports of new range records, biogeographic studies, and checklists containing minimal life history data;

Taxonomy—systematic monographs and reviews, species descriptions, and treatises on nomenclature;

Life history/ecology—studies on selected aspects of one species' life history, descriptive and experimental ecology, and papers on ethology, anatomy, morphology, physiology, and parasitology;

Popular literature—articles on conservation and wildlife, newspaper reports, and assorted lay-oriented publications;

Major reference works—field guides, handbooks, reference manuals, texts, and natural history monographs;

Miscellaneous—biographies and biographical sketches, the Society for the Study of Amphibians and Reptiles' catalog accounts, papers on paleontology and anthropology, accounts of state and federally listed species, notices of legislation, and research station reports.

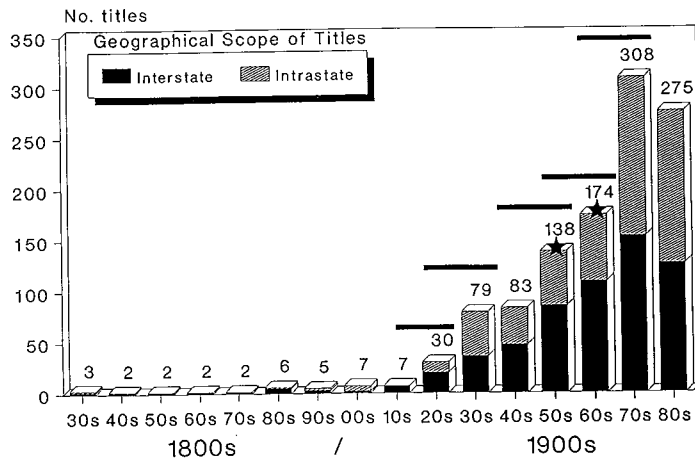
The frequency distributions resulting from the categorical assignments of titles were treated statistically using chi-square analyses. Two versions were used. The chi-square one-sample test for goodness of fit was used to compare observed and expected ratios of geographic and taxonomic emphases data. The expected ratio for geographic emphases data was based on land area per grand division; for taxonomic emphases, it was based on the number of species per major taxonomic group.

The chi-square test of independence between samples was used to test for equality between the frequency distributions of interstate and intrastate title tallies. The latter test was run on three categories of data: geographic coverage of Tennessee's grand divisions, taxonomic groups treated, and subject areas emphasized. An alpha level of 0.05 was the rejection standard for all tests.

**RESULTS AND DISCUSSION**

**Historical Development**

Literature on Tennessee herpetology began appearing in the mid-1830s (Figure 1), based mainly on the work of Gerard Troost, professor of chemistry and natural science at the University of Nash-



**Figure 1. Numbers of titles concerning Tennessee herpetology appearing each decade before 1990, by geographic scope of coverage. Horizontal lines over vertical bars indicate statistically significant step increases from one decade to the next; stars at tops of bars mark decades when there was a significant difference in the observed versus expected interstate and intrastate titles. An alpha value of 0.05 was used in each analysis for assessing significance.**

ville. During that decade, his descriptions of the alligator snapping turtle (Harlan 1835), and of the western cottonmouth and color morphs of the eastern hognose snake (Troost 1836) were published.

From 1840 until 1920 Tennessee's herpetological literature increased slowly, at an average rate of about four titles per decade. Since 1920 it has expanded immensely, with significant increases (chi-squares > 3.84 at one degree of freedom) occurring in five of the last seven decades (Figure 1). Interstate and intrastate titles appeared in about equal numbers each decade after 1920, except during the 1950s and 1960s when works of regional and national coverage significantly (chi-squares > 3.84 at one degree of freedom) outnumbered those whose scope was confined to Tennessee.

Several individuals stand out as significant contributors to Tennessee herpetology in the period before 1970. They are listed in Table 1 along with the period and the geographic area(s) in which they were most active. Of all those persons, Glenn Gentry probably contributed most to our overall understanding of the state's herpetofauna through his two-part "annotated check list" published in 1955 and 1956.

The record of herpetologists active in Tennessee since 1970 is still being made in many cases, thus making it impossible to fairly evaluate their contributions at this time.

**Table 1. Some individuals whose contributions to Tennessee herpetology were outstanding during the period between 1830 and 1970.**

| Name           | When active         | Where active       |
|----------------|---------------------|--------------------|
| G. Troost      | 1830s and 40s       | statewide          |
| S. N. Rhoads   | 1890s               | statewide          |
| C. S. Shoup    | 1930s and 40s       | Middle and East TN |
| C. L. Baker    | 1930s and 40s       | West Tennessee     |
| M. V. Parker   | 1930s and 40s       | West Tennessee     |
| G. Gentry      | 1930s, 40s, and 50s | statewide          |
| J. R. Endsley  | 1950s               | West Tennessee     |
| R. M. Sinclair | 1950s and 60s       | Middle Tennessee   |

**Geographic Emphasis**

The relative attention paid to the state's grand divisions, as reflected by the contents of three categories of Tennessee's herpetological literature (all titles, interstate titles, and intrastate titles), is summarized in Table 2.

Considering all titles, East Tennessee has (by a margin of .14%) been involved in the largest number of works. Middle and West Tennessee follow at a distant second and third, differing from each

**Table 2. Numbers of titles\* and percentages of totals (in parentheses) for literature relating to each of Tennessee's grand divisions (see text for definitions).**

| Grand division   | All titles combined | Interstate titles | Intrastate titles |
|------------------|---------------------|-------------------|-------------------|
| West Tennessee   | 501 (28)            | 357 (32)          | 144 (21)          |
| Middle Tennessee | 524 (29)            | 290 (26)          | 234 (35)          |
| East Tennessee   | 763 (43)            | 465 (42)          | 298 (44)          |
| Totals           | 1788 (100)          | 1112 (100)        | 676 (100)         |

\* The combined titles total (1788) exceeds the number of titles (1124) in the bibliography (Redmond et al. 1990) because many of these works involved more than one grand division and were, thus, counted more than once.

other by only one percentage point (29% and 28%, respectively). Broken down according to geographic scope, interstate titles favor East Tennessee (42%), followed in order by West (32%) and Middle Tennessee (26%); intrastate titles deal mainly with East Tennessee (44%), followed by Middle (35%) and West Tennessee (21%).

Based on the percentage of Tennessee's total land area in each grand division (23% West, 41% Middle, and 36% East), the tallies in each of the title categories listed in Table 1 deviate significantly from the expected (chi-squares = 110.68, 110.84, and 19.41, respectively, for each as listed; df = 2). This is borne out by the contents of Figure 2, which gives the percentage of titles above (positive) and below (negative) expected for each grand division in each category. Overall, West and East Tennessee are involved in 5% and 6%, respectively, more titles than expected, while Middle Tennessee is considered in 11% fewer. Among interstate titles, West and East Tennessee are treated more than expected (9% and 5%, respectively), and Middle Tennessee less (14%). Intrastate titles treat East Tennessee 7% above the expected, and Middle and West Tennessee 5% and 2%, respectively, below expected. It is readily apparent that, despite the combination of titles being considered, East Tennessee always comes out ahead and Middle Tennessee behind.

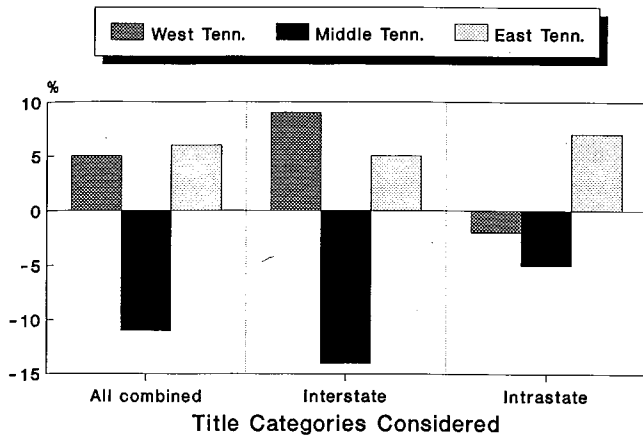


Figure 2. Percentage of herpetological titles observed in various categories above and below expected (0% on the graph) for each of Tennessee's grand divisions.

The difference revealed in grand-division emphasis between interstate and intrastate titles is further supported by results of the chi-square test of independence, which revealed the frequency distributions for the two categories to be unequal (chi-square = 28.47, df = 2).

**Taxonomic Emphasis**

The overall results of tallies for taxonomic groups covered by titles in the bibliography are presented in Table 3. Disregarding regional

Table 3. Numbers of titles and percentages of totals (in parentheses) for literature dealing with each of the major groups of amphibians and reptiles in Tennessee.

| Taxonomic group | All titles combined | Interstate titles | Intrastate titles |
|-----------------|---------------------|-------------------|-------------------|
| Salamanders     | 587 (31)            | 301 (35)          | 286 (27)          |
| Frogs and toads | 311 (16)            | 114 (13)          | 197 (19)          |
| Turtles         | 370 (20)            | 164 (19)          | 206 (20)          |
| Lizards         | 231 (12)            | 91 (11)           | 140 (13)          |
| Snakes          | 400 (21)            | 185 (22)          | 215 (21)          |
| Totals          | 1899 (100)          | 855 (100)         | 1044 (100)        |

scope, salamanders were treated most often (31% of all tallies) followed in decreasing order by snakes (21%), turtles (20%), frogs (16%), and lizards (12%). This contrasts significantly (chi-square = 204.74, df = 4) with the expected rank order and ratio of emphasis based on the numbers of species per group in Tennessee, which from largest group to smallest group is salamanders (37%), snakes (27%), frogs and toads (17%), turtles (12%), and lizards (7%).

Considering regional scope, interstate and intrastate titles differed significantly (chi-square = 21.35, df = 4) from each other in their relative treatment of the major taxonomic groups. Interstate literature favored salamanders (35%), followed by snakes (22%), turtles (19%), frogs (13%), and lizards (11%). Intrastate works showed the same rank order of emphasis but differed substantially in the percentage

(27:21:20:19:13) of attention paid, especially in the cases of salamanders and frogs. Title tallies in both categories were significantly different (chi-squares of 68.64 and 157.84 for interstate and intrastate, respectively, at 4 df) from the expected based on species richness per group across Tennessee.

**Subject Area Emphasis**

The results of tallies for subject areas represented by titles in the bibliography appear in Table 4. Overall, life history/ecology-oriented literature topped the list (at 32%) followed by taxonomy (20%), geo-

Table 4. Numbers of titles and percentages of totals (in parentheses) for Tennessee's herpetological literature as it concerns various subject areas.

| Subject area            | All titles combined | Interstate titles | Intrastate titles |
|-------------------------|---------------------|-------------------|-------------------|
| Geographic distribution | 206 (18)            | 102 (17)          | 104 (19)          |
| Taxonomy                | 221 (20)            | 192 (31)          | 29 (05)           |
| Life history/ecology    | 353 (32)            | 135 (22)          | 218 (39)          |
| Popular literature      | 104 (09)            | 5 (01)            | 99 (18)           |
| Reference works         | 59 (05)             | 59 (10)           | 0 (00)            |
| Miscellaneous           | 178 (16)            | 113 (19)          | 104 (19)          |
| Totals                  | 1121 (100)          | 606 (100)         | 554 (100)         |

graphic distribution (18%), miscellaneous (16%), popular literature (9%), and major reference works (5%).

Titles of interstate scope favored taxonomy (31%), followed by life history/ecology (22%), miscellaneous (19%), geographic distribution (17%), major reference works (10%), and popular literature (1%). Differing significantly (chi-square = 291.19, df = 5) from this, intrastate titles emphasized life history/ecology (39%) followed by geographic distribution (19%), miscellaneous (19%), popular literature (18%), and taxonomy (5%). No major reference works were identified among intrastate titles.

**In-state Graduate Studies**

Ninety-one graduate theses at eight Tennessee institutions have been written that involved research in herpetology (Table 5). Twenty-seven of these (14 doctoral dissertations and 13 master's theses) were written by students at The University of Tennessee-Knoxville (UTK). The remainder, all master's theses, came from board-of-regents schools (Austin Peay State University [APSU], East Tennessee State University [ETSU], Middle Tennessee State University [MTSU], Memphis State University [MSU], Tennessee Technological University [TTU], Vanderbilt University (VU), and George Peabody College (GPC). Of the regents schools, ETSU produced the greatest number (20), followed closely by MTSU (17). All others (APSU, TTU, GPC, MSU, and VU) produced fewer than 10 each.

All of the theses and dissertations written at Tennessee schools appeared after 1920: nine (10%) from 1920 to 1940, none from 1940 to 1960, and the remaining 82 (90%) from 1960 to 1990. The decade of the 1970s was the most productive, with 43 (47% of the state's total output of 91 theses and dissertations written since 1920) being completed.

**Table 5. Numbers of graduate theses concerning Tennessee herpetology written at Tennessee colleges and universities, by school and decade. See text for explanation of abbreviations.**

| School | Decade |       |       |       |       |       |       | Totals |
|--------|--------|-------|-------|-------|-------|-------|-------|--------|
|        | 1920s  | 1930s | 1940s | 1950s | 1960s | 1970s | 1980s |        |
| UTK    | 1      | 1     | -     | -     | 2     | 4     | 19    | 27*    |
| ETSU   | -      | -     | -     | -     | 3     | 17    | -     | 20     |
| MTSU   | -      | -     | -     | -     | 1     | 15    | 1     | 17     |
| APSU   | -      | -     | -     | -     | 4     | 2     | 1     | 7      |
| TTU    | -      | -     | -     | -     | 1     | 4     | 2     | 7      |
| GPC    | 2      | 4     | -     | -     | -     | -     | -     | 6      |
| MSU    | -      | -     | -     | -     | 2     | 1     | 2     | 5      |
| VU     | -      | 1     | -     | -     | -     | -     | 1     | 2      |
| Totals | 3      | 6     | 0     | 0     | 13    | 43    | 26    | 91     |

\*Thirteen of this total represent all of the doctoral theses written in herpetology at in-state universities.

### Possible Explanations for Results

Differences observed in the results of this study probably reflect interactions among a number of factors which, both historically and currently, vary across Tennessee. Included among these are the range of habitat diversity occurring in an area, the accessibility of study sites to researchers, the richness and diversity of the herpetofauna, the individual interests of investigators, the distribution and productivity of universities, the background and training of research directors, and the amount of interstate research occurring.

### CONCLUSIONS

The major conclusions of this study are:

- (1) the growth of knowledge concerning Tennessee herpetology was slow for nearly a century following its beginnings in the 1830s, but increased dramatically after 1920;
- (2) geographic emphasis has favored generally East and West Tennessee over Middle Tennessee;
- (3) taxonomic emphasis consistently has been on salamanders, followed by various combinations of rank order depending on geographic focus of literature being considered;
- (4) subject-area emphasis has been mainly on life history and ecology; and
- (5) in-state graduate studies have occurred mainly at UT-Knoxville, and at East and Middle Tennessee state universities.

### RECOMMENDATIONS FOR FUTURE RESEARCH

Several avenues of inquiry remain open to persons interested in studying amphibians and reptiles in Tennessee. Species inventories of unsurveyed private and government lands (e.g. corporate timber lands, state parks, and natural areas) augment existing information on geographic distribution, and provide baseline data for other studies. Studies concerning the distribution and life history of taxa being considered or already designated as endangered, threatened, or otherwise in need of special attention will assist resource managers and legislators in making informed decisions concerning the fate and welfare of these animals. Long-term monitoring programs designed to understand the interactions between abiotic variables and changes in populations and communities will help assess the present and predict the future health of the state's ecosystems. Investigations of unresolved taxonomic questions involving Tennessee's herpetofauna will promote standardized nomenclature and facilitate an understanding of the evolutionary relationships among these animals. Studies aimed at documenting the impacts of habitat alterations on amphibians and reptiles will enable researchers to better predict the ultimate influence of such impacts on man and his quality of life. Projects that attempt to restore and maintain high levels of herpetofaunal diversity will help enrich the state's natural resources. And finally, the production of a comprehensive state field guide or guides is needed to bring the state in line with surrounding states and to augment and summarize knowledge of Tennessee's herpetofauna.

### LITERATURE CITED

- Fullerton, R. O., H. G. McDowell, O. M. McMillion, J. Phelps, J. B. Ray, and R. P. Terrell. 1977. Tennessee geographical patterns and regions. Kendall/Hunt Publ. Co., Dubuque, IA.
- Gentry, G. 1955-56. An annotated check list of the amphibians and reptiles of Tennessee. *J. Tenn. Acad. Sci.* 30:168-176;242-251.
- Harlan, R. 1835. Genera of North American Reptilia and a synopsis of the species. Pp. 84-163 in: *Medical and Physical Researches*. L. R. Bailey, Philadelphia, PA.
- Luther, E. T. 1977. *Our restless earth: the geologic regions of Tennessee*. Univ. of Tennessee Press, Knoxville.
- Miller, R. A. 1974. The geologic history of Tennessee. *Tenn. Div. Geol. Bull.* 74.
- Redmond, W. H., A. C. Echternacht, and A. F. Scott. 1990. Annotated checklist and bibliography of amphibians and reptiles of Tennessee (1835-1989). Misc. Publ. No. 4, The Center for Field Biology, Austin Peay State University, Clarksville, TN.
- Shoup, C. S. 1936. A bibliography of the zoology of Tennessee. *J. Tenn. Acad. Sci.* 11:53-67.
- Shoup, C. S. 1939. An annotated bibliography of the zoology of Tennessee and the Tennessee Valley region. *Am. Midl. Nat.* 21:583-635.
- Shoup, C. S. 1944. Notes from the background of our knowledge of the zoology of Tennessee. *J. Tenn. Acad. Sci.* 19:126-136.
- Shoup, C. S. 1974. A bibliography of the zoology of Tennessee and the Tennessee Valley region. U. S. Atomic Energy Commission, Office of Information Services, Technical Information Center, Springfield, VA.
- Troost, G. 1836. On a new genus of serpents, and two new species of the genus *Heterodon* inhabiting Tennessee. *Ann. Lyceum Nat. Hist. NY* 3:174-190.