AN ANNOTATED CHECK LIST OF ORDER CAUDATA *(AMPHIBIA)* OF DAVIDSON COUNTY, TENNESSEE

THOMAS E. ASHTON,
Belmont College,
Nashville, Tennessee

ABSTRACT

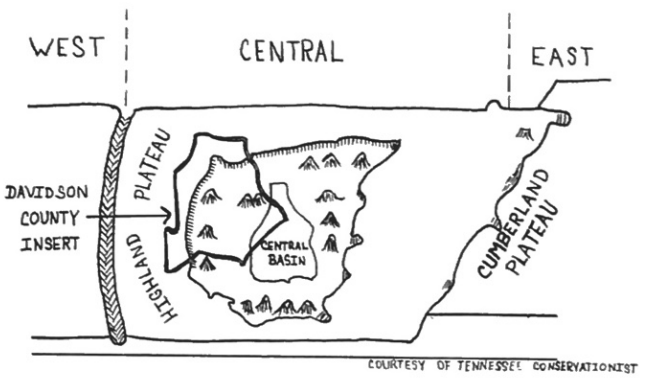
This study of salamanders in Davidson County, Tennessee purposely raises more questions than are answered, since its major objective is to demonstrate the need for a complete taxonomic and geographic (ecologic) re-evaluation of the Caudata (Amphibia) fauna of the entire Central Tennessee area.

Eighteen species and subspecies are assigned to Davidson Co. Two new range records are given which extend the species, *Ambystoma texanum* and *Eurycea aquatica*, into Davidson Co. Two subspecies, *Eurycea bislineata bislineata* and *Eurycea bislineata cirrigera*, previously reported in this region, are deleted, based on a partial *Eurycea* key compiled by the writer. Further studies, currently in progress, are needed on the polytypic *Desmognathus fuscus* group before a subspecific name can be applied. The author does not accept the *Eurycea longicauda pernix* at this time, and applies the name *Eurycea longicauda longicauda* to animals of this species found here.

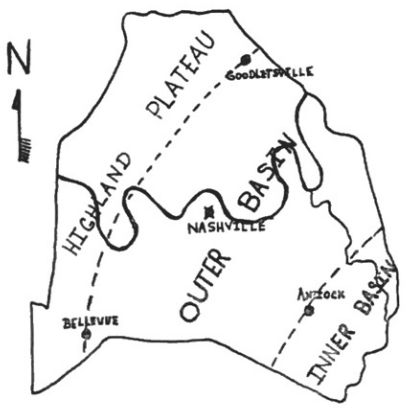
Rather sharp range borders are shown to exist at the peripheries between the Highland Plateau and Central Basin of Tennessee for several salamanders.

INTRODUCTION

Davidson Co., having three distinct geological and botanical areas, offers ideal opportunities for ecological and systematic studies in herpetology (see Fig. 1).



PHYSIOGRAPHIC PROVINCES OF CENTRAL TENNESSEE



DAVIDSON COUNTY
Figure 1

The three physiographic provinces are:

(1) Inner Basin (Cedar Glades)

(2) Outer Basin

(3) Highland Plateau

The diversity of topography of these areas provides a variety of habitat conditions. This is reflected in the large number of species and sub-species of plants and animals present.

The Inner Basin (Cedar Glades) of Central Tennessee, which partially lies in Davidson Co., is the smallest of the three provinces. It is predominantly stony land with shallow soils on relatively impermeable bedrock. The shallow soil is usually saturated with water during the rainy season, but very dry in seasons of infrequent rains. A great portion of the surface area is rock outcrop. The vegetation is generally cedar forest with underbrush consisting primarily of mat-forming grasses, lichens, and much cactus. The entire area has many quick drying wash gullies. The Outer Basin is the largest section in Davidson Co. The residual soil is more fully developed, resulting in much more uniform moisture content than that found in the Inner Basin. The area is occupied by hardwood and cedar with an undergrowth of scrub brush. A few permanent streams and springs are found here; but wet weather springs and branches are more characteristic. The portion of the Highland Plateau which lies in Davidson Co. has shallow soil, steep slopes, and narrow ridgetops. This area supports hardwood forest with a general undergrowth of perennial brush. Surface water is more abundant than in the other areas because of the many permanent springs and creeks.

The author has gathered and compiled data on the Order Caudata, (Class Amphibia) in Davidson Co. in an attempt to: (1) Add to and delete from species and subspecies ranges, thereby hoping to eliminate existing discrepancies, (2) stimulate increased interest in herpetology, thus encouraging investigation in areas from which more specimens and habitat data are needed, and (3) point out the valuable ecologic and taxonomic opportunities available in Central Tennessee.

This paper is presented not as a comparison or replacement of any of the very fine herpetological check lists or keys presently in wide use, e.g., Conant (1958), Bishop (1943), or our own state check list by Gentry (1955), but as a supplement covering this particular geographical area. The author refers the reader to the above check lists for detailed information except for subspecies deleted from this area. On these subspecies, statistical keys are included which confirm that their

exclusion is based on morphological evidence. Observations are given under each species and subspecies. These indicate that much work is yet to be done.

The author has carried on this work for a period of two years. A minimum of 150 field trips were made, which covered all seasons and weather. Night collecting proved most fruitful. Collecting equipment included a 4 ft. x 8 ft. ⅛ in. mesh dip net, a six volt sealed-beam torch, a small flashlight, a collapsible pick, and sufficient specimen containers. Well insulated waders were essential.

More than 500 specimens were examined, from which representative types, including hetermorphic forms, were kept for reference. All specimens included within this check list, with the exception of *Cryptobranchus alleganiensis alleganiensis*, are in the author's private collection. Other specimens used for reference are in the amphibian collections of Ralph Sinclair and Belmont College, both in Nashville.

This paper discusses six families and twenty-four species and subspecies, of which eighteen are in Davidson Co. These eighteen are listed below.

CRYPTOBRANCHIDAE
Cryptobranchus alleganiensis alleganiensis

PROTEIDAE
Necturus maculosus maculosus

SIRENIDAE
Siren intermedia nettingi

AMBYSTOMIDAE
Ambystoma maculatum
Ambystoma opacum
Ambystoma texanum
Ambystoma tigrinum tigrinum

SALAMANDRIDAE
Diemictylus viridescens viridescens

PLETHODONTIDAE
Desmognathus fuscus
Plethodon cinereus dorsalis
Plethodon glutinosus glutinosus
Hemidactylium scutatum
Pseudotriton montanus montanus
Pseudotriton ruber ruber
Eurycea bislineata rivicola
Eurycea aquatica
Eurycea longicauda longicauda
Eurycea lucifuga

Range Extensions

Ambystoma texanum (Matthes). Small-mouthed Salamander.

Although Conan (1958) predicts this salamander's range to be in this area and well eastward, it had not been thought by local (state) herpetologists to be east of the Tennessee River. Gentry (1955) reported one colony in Montgomery Co., which suggests that Conant's range extension east of the Tennessee River was valid. Sinclair (1950) reported finding one specimen in Davidson Co. in a plant hotbed under the ground. However, despite extensive searches, no other specimens could be found and the possibility of human transplantation could not be overlooked. On January 22, 1965, this writer was shown some curious larvae, which had been previously identified as *Ambystoma tigrinum tigrinum*. Not knowing what they were, except that they were not *tigrinum*, the source was quickly sought. It turned out to be an intermittent stream in a bare vacant lot. This lot is located in the Green Hills area in Davidson Co. A fair sized colony of *Ambystoma texanum*, including adults, eggs, and larvae was found. Searches in similar habitats proved very successful. Five more rather large colonies were found. These colonies are spread geographically over many miles, a fact which indicates a well entrenched and extensive population. An interesting observation is that so far none of these animals have been found on either side of the Outer Rim area. This finding should not be taken as an indication of geographical isolation, since future collections undoubtedly will show a continuous range from the Tennessee River to the Davidson Co. populations. However, the presence of this species in the Cedar Glade ecological province is doubtful.

The egg laying season of *Ambystoma texanum* apparently begins in the latter part of December if there has been sufficient winter rain to activate streams. Fresh eggs were seen as late as April 1. Egg laying habits of the species appear to be most unusual, with 50-125 eggs laid in clusters, in sheets, or singly. These are found under rocks, on top of rocks, on submerged plant life, in the main current and out of it. New eggs were often seen laid on top of old eggs. In many cases where eggs had been laid on top of rocks, the water level had dropped, exposing them to sun and consequent desiccation. Similar habits and habitats are reported by Smith (1961) in Central Illinois.

Eurycea aquatica (Rose and Bush)

This recently described species has been collected for years in Davidson Co., Tenn., and has been continually identified as one of the polytypic *Eurycea bislineata*. At the onset of this study, marked differences were evident in morphology and habitat characteristics among animals which had been collected as *Eurycea bislineata*. Compiled statistics obtained in field and laboratory studies showed that this totally aquatic animal was not a *Eurycea bislineata* (see Table 1), but rather the *Eurycea aquatica* described recently by Rose and Bush (1963).

Insofar as this writer knows, the only range reported on this salamander is that given in the original Rose and Bush (1963) paper. The type locality specimens were collected just south of Birmingham, Alabama, in Jefferson Co., but notations are made by Rose and Bush (1963) concerning collections of this species by Suttkus in Chattanooga Co., Georgia, and by Johnson on the Cumberland Plateau region of Tennessee. These data give this species a considerable north and east range from the type locality. Rose and Bush (1963)

observed that these collections in conjunction with area topography indicated a rather wide distribution, which should include *southwest* Tennessee.

With the finding and identification of *Eurycea aquatica* in Davidson Co., now reported, and a re-evaluation of the topography, this species now has a known range in Tennessee covering the entire area east of the Tennessee River, and continuing to the eastern edge of the Cumberland Plateau. This extension brings the range of this animal considerably northward from the original suggested range. Topographical considerations suggests an even more northward boundary, and searches into Western and Central Kentucky should prove fruitful. Within this extended range lies the Tennessee Central Basin. Although diligent searches have been made, in no instance was this animal found in either the Outer Basin, or the Cedar Glades areas, which together make up the Central Basin. These drier areas would seem to exclude this species because of its aquatic nature.

Deletions

This author would not presume to delete a species or subspecies from any region solely on his inability to collect it. Deletions are made on the basis of current keys, and a partial *Eurycea* key compiled from collected material (see Table 1). The results indicate the use of two misnomers among the salamanders of this area.

Eurycea bislineata bislineata (Green)

Northern Two-lined Salamander

This writer submits, after careful re-evaluation of all available data, that *Eurycea bislineata bislineata* has been the name erroneously applied in Davidson Co., to both the *Eurycea aquatica* and *Eurycea bislineata rivicola* for years (see Table 1). This error has resulted in marked confusion concerning the actual or systematically correct *nomen specificum* of the animal found here.

Bishop (1943) shows an area approximating Davidson Co., as being an isolated range of *Eurycea bislineata cirrigera*. Mittleman (1949) gives the whole of Central Tennessee area exclusively to his newly described subspecies *Eurycea bislineata rivicola*. Davidson Co. specimens were included in his initial studies and are on deposit in the United States National Museum (USNM #85689). Sinclair (1950) reports several of this new subspecies collected in Central Tennessee, including Davidson Co. Gentry (1955) gives Central Tennessee, of which Davidson Co. is an integral part, as the range for both *Eurycea bislineata bislineata* and *Eurycea bislineata cirrigera*. Conant (1958), using the same Tennessee area as Mittleman, lists only the *Eurycea bislineata bislineata* as being present. In twelve selected collecting stations a total of 178 *Eurycea* specimens were taken for laboratory study. On the basis of this study and the comparative key (Table 1), it has been concluded that the subspecies *Eurycea bislineata bislineata* is not present in Davidson Co.

Eurycea bislineata cirrigera (Green)

Southern Two-lined Salamander

Eurycea bislineata cirrigera is another subspecies name being applied to both *Eurycea aquatica* and *Eurycea bislineata rivicola* in Central Tennessee. Bishop (1943) and Gentry (1955) both report *Eurycea bislineata cirrigera* in or about Davidson Co. Mittleman (1949), Sinclair (1950), and Conant (1958) all report *Eurycea bislineata cirrigera* as being found only west of the Tennessee River. The key (Table 1) refers to characteristics which indicate that indeed *Eurycea bislineata cirrigera* is not found in Davidson Co.

Table 1.
Partial *Eurycea* Key

	No. of specimens examined	Costal grooves	% found in Davidson Co.	Costal grooves between appressed toes	Mental gland (male)	Males with cirri	Male tubercle prominence	Lateral line extension	Average body-tail ratio	% tail of total length (average)
E. b. bislineata [1]	14	15+1	0	3—4	0	0	sl	Broken ½—¾	1:1.18	54.0
E. b. cirrigera [1]	21	14—1	0	1½—2	0	+	—	Solid ½—total	1:1.36	57.7
E. b. rivicola [1]	111	13—1	100	2½—3½	0	rare	mod	Solid ¾—total	1:1.30	56.6
E. aquatica [2]	67	13—1	100	3½—4	+	0	—	Solid—total	1.28:1	43.9

[1] Brookside habitat

[2] Completely aquatic

Annotated List of Davidson County Salamanders

Order Caudata (Amphibia)

CRYPTOBRANCHIDAE

Cryptobranchus alleganiensis alleganiensis (Daudin)

Hellbender

The Hellbender is a large, permanently aquatic salamander with a flattened, wrinkled body; the adults having no gills. Although fishermen report this salamander as being abundant in the Cumberland, Stone, and Harpeth River systems, this writer used preserved material in his identification. Collecting techniques to date have been unsuccessful, but are being studied.

PROTEIDAE

Necturus maculosus maculosus (Rafinesque)
Mudpuppy, Waterdog

This large aquatic salamander has four toes on each foot and retains its gills throughout life. This animal is found in the river systems of Davidson Co.

According to Gentry (1965), these animals are numerous enough to stop commercial fishing at the mouth of the Harpeth River during their winter breeding season. This fact is certainly verified by the large number of these animals one is able to collect simply by wading the river shallows at night, during November through February. Diligent collecting attempts have failed to produce *Necturus* in any of the remaining months. Despite the many reports of these animals being taken the year around in other geographical areas, further study will probably show that extensive migrations to the deeper cooler waters occur during the warmer months.

SIRENIDAE

Siren intermedia nettingi (Goin)
Western Lesser Siren

Gentry (1955) reported that the only specimens of this two legged, eel-like salamander taken east of the Tennessee River were found in 1938 in Davidson Co. by workmen on an excavation project. This writer collected several specimens during May and June, 1965, in one location, and saw one specimen in another. Although separated by several miles, both locations were in Cumberland River bottoms. Larvae, four to ten days old, were collected in numbers on May 19. Complete data on their year around active seasons and other habits are being studied.

AMBYSTOMIDAE

Ambystoma maculatum (Shaw)
Spotted Salamander

This is one of our most beautiful mole salamanders. It has brilliant yellow or orange spots that appear to be applied with oil paint. Adults are quite numerous in all sections of Davidson Co. in January through March in both permanent and temporary ponds.

An unforgettable experience to any naturalist, whether he be a herpetologist or not, is to see the mating dance of these animals as they swarm together in groups of twenty to thirty, each shooting periodically towards the surface of the pond, all in a radius of approximately 2½ feet. A noteworthy observation is made here for those who would make a polytypic species of this animal based on the presence or absence of orange spots between the eyes in contrast to yellow spots. In the mating dance of the Spotted Salamander, one is able to stand in the midst of this gyrating mass and choose at will orange or yellow marked specimens.

Ambystoma opacum (Gravenhorst)
Marbled Salamander

This is truly a beautiful salamander with silver saddles across its back. The Marbled Salamander has been found in all of Davidson Co. except the Cedar Glades area, and indications are that it may occur in this region also. Contrary to reports of this animal being found the year around in the more northern states, they are found at the surface here only during their October breeding season in forest depressions, which fill with the first steady winter rain. When the rains come the eggs have been laid and the adults burrow underground until the following season, leaving the eggs to hatch at maturity if they are enveloped by the rising water. In years when rainfall is subnormal and the depressions remain dry, the embryos develop at the normal rate during the resulting dry spell, and mature embryos survive in the egg sack for many weeks without fatality. This fact agrees with Lantz (1930), who reported an encased embryo living 207 days when kept out of water.

Ambystoma texanum (Matthes)
Small-mouthed Salamander

See range extension, page 107.

Ambystoma tigrinum tigrinum (Green)
Tiger Salamander

The Tiger Salamander is our largest terrestrial salamander, averaging about eight inches in length, and is found in all sections of Davidson Co. During late December, it migrates to permanent or wet-weather ponds situated in or near cultivated fields for breeding. Adults are numerous, but usually must be seined or taken by minnow traps set in the ponds. The finding of large two-year-old larvae in permanent ponds is not uncommon in the Inner Basin.

SALAMANDRIDAE

Diemictylus viridescens viridescens (Rafinesque)
Red Spotted Newt, Red Eft (=subadult, land stage)

This rough skinned animal is undoubtedly the most numerous salamander in all Davidson Co. areas and is found the year around. One is able with one sweep of the seine to pick up 50-100 specimens from most small fishless ponds. Although in Central Tennessee the land stage is a rare find, they may be taken in numbers the first part of October, when they have just migrated from the woods to the ponds.

This salamander, as found in Davidson Co., is the *Diemictylus viridescens viridescens* by virtue of its characteristic black-bordered red spots. However, this writer agrees with Sinclair (1950) that integration with its Mississippi Delta counterpart, *Diemictylus viridescens louisianensis*, is apparent. Davidson Co. appears to be the eastern edge of an integration zone between these two subspecies. The westward boundary of this integration would be the Tennessee River.

PLETHODONTIDAE

Desmognathus fuscus (Rafinesque)
Dusky Salamander

This "Spring Lizard" is the most common salamander found along Davidson Co. branches the year

around, and is widely used as fish bait. None of these animals have been taken in the Inner Basin by this writer. The variation in pattern is almost without limit, and it is difficult for the uninitiated to believe that he hasn't several different species in hand. In fact, the subspecific group in this area is currently in question. Rossman (1958) lists the adjacent westward county (Cheatham) as being included in the range for his newly described *Desmognathus fuscus conanti.* Prior to this time, *Desmognathus fuscus fuscus* was the accepted subspecies found in this area. Studies are currently in progress to obtain statistical data from type locality specimens, and the results will be published in the near future in order to clarify subsequent range maps.

Plethodon cinereus dorsalis (Cope)
Zigzag Salamander

This is a rather small, slender, terrestrial salamander, which may be found with one of three different patterns: one is a uniformly dark phase; one has an orange zigzag dorsal stripe; and one, a straight dorsal orange stripe. This subspecies is found in all areas of Davidson Co., from dry open areas to moist caves.

Of special interest is the habit it has of forming a tight coil when disturbed or handled. This habit is in sharp contrast to that of its Highland counterpart *Plethodon cinereus cinereus,* described by Dunn (1926) as being very agile in its escape attempts. Further notes on this characteristic could prove valuable as another characteristic differentiating these two similar subspecies.

Plethodon glutinosus glutinosus (Green)
Slimy Salamander

This rather large, black terrestrial salamander with white spots is found in all areas of Davidson Co. Until recently only scattered specimens were collected; but, then this writer luckily found a very large colony in an artificial stone embankment. Since that time, specimens have been found in abundance in this type habitat. In this respect, the Slimy Salamander is similar to the *Eurycea lucifuga,* which abounds in road culverts and other rocky structures.

Hemidactylium scutatum (Schlegel)
Four-toed Salamander

The inclusion of this salamander in the Davidson County check list is based on past incontestable records; that is, Nashville, Davidson Co., Tennessee being the original type locality for this species (Schmidt 1953). This writer has collected this species only in adjacent Cheatham county on the Highland Plateau. However, his limited collection is undoubtedly due to the scarcity of this salamander's unique habitat of moss or root mats, which overhang the periphery of permanent woodland ponds or swamps. The effect of expanding civilization probably explains the absence of *Hemidactylium* colonies in Davidson Co.

In the coming breeding season, which lasts from the latter part of February through March, extended efforts will be made to locate a new colony of these animals in Davidson Co. It will be of particular interest to see whether these animals are found away from the Highland Plateau or in the Cedar Glades area.

This is one of the most interesting salamanders in the world. Its tail constriction certainly gives it a positive survival factor against natural predators. On the other hand, because of its very selective habitat, human effects may well lead to the extinction of the species. One of nature's greatest contrasts is seen in this very small animal. Dorsally, it is an inconspicuous brownish-orange; ventrally, an enamel white background on which are gleaming black spots. In contrast to all other terrestrial salamanders in this area, it has only four rear toes, thus its common name, "Four-toed."

Pseudotriton montanus montanus (Baird)
Eastern Mud Salamander

This is a large-bodied red animal with well-rounded separated black spots. This salamander has never been reported in Davidson Co. except by Gentry (1955); nor have I collected any west of DeKalb Co., Tenn., where one specimen was taken. However, the possibility that it continues northward around the Highland Plateau to a westward range is quite feasible, and the search for established colonies in this area should continue, taking care not to confuse the Eastern Mud Salamander with the prevalent Northern Red.

Pseudotriton ruber ruber (Sonnini)
Northern Red Salamander

This large-bodied red salamander, with irregular and sometimes coalesced black blotches, is quite common in the small permanent streams and springs in both the Highland Plateau and Outer Basin areas of Davidson Co. None have been found in the Cedar Glades region.

This writer has collected adult specimens from November through April. However, adults are rare, and the term "common" is based on the hundreds of larvae seen. Undoubtedly, collecting techniques for adults need further study.

An interesting habitat is a very dry rock crevice, some twelve yards above a spring, in which an unusually large specimen has been observed for the past two seasons.

Eurycea bislineata rivicola (Mittleman)
Mid-West Two-lined Salamander

This subspecies was first reported in Davidson Co. by Mittleman (1949), and again by Sinclair (1950). According to recent studies, this small, yellow, two-lined salamander seems to be gaining general acceptance as a legitimate taxon (Smith 1961), (Martof 1956). This common brookside salamander is found throughout Davidson Co. except in the Cedar Glades area. This writer collected a real curiosity when he found a two-tailed specimen, which has been kept alive.

Eurycea aquatica (Rose and Bush)

No common name given. See range extension, page 107. See Table 1.

Eurycea longicauda longicauda (Green)
Long-Tailed Salamander

Two subspecies have been reported in Central Tennessee: the *Eurycea longicauda longicauda* by several writers, and *Eurycea longicauda pernix* by Barr (1952). Observations by this writer suggests that *Eurycea longicauda longicauda* should apply to animals in Central Tennessee until a re-evaluation of the species is made.

This long, slender, yellow animal is found in small numbers in Davidson Co., and none have been collected by me except on the Highland Plateau. Considering its habitat, the Long-tailed Salamander should be found in caves within the Inner Basin area.

Eurycea lucifuga (Rafinesque)
Cave Salamander

This slim-bodied, reddish-orange salamander is found all year in all areas of Davidson Co. in large numbers around caves, stone walls, and road culverts. Of interest is the fact that no complete description of this salamander's life history has been given. Indeed, no one has seen their eggs in the normal habitat, although larvae are abundant from the latter part of December through March. This writer collected one specimen with an extremely large head, which was mentioned by Sinclair (1965).

Summary

In this annotated check list of Order Caudata, (Amphibia) of Davidson County, Tennessee, six families are represented by eighteen species and subspecies. Range extensions are made for two species, *Ambystoma texanum* and *Eurycea aquatica*. Two subspecies, *Eurycea bislineata bislineata* and *Eurycea bislineata cirrigera*, both of which had been previously reported here, are deleted from Davidson Co. A re-evaluation of the species *Desmongathus fuscus* is needed before a subspecific name can be applied conscientiously to the Davidson Co. specimens. Of the eighteen species and subspecies, one *(Cryptobranchus allequeniensis allequeniensis)* was not collected by the author. In this case, preserved material was used. *Hemidactylium scutatum* and *Pseudotriton montanus montanus* were collected outside of Davidson Co., but were included in the check list because of past records.

County range distribution is given, which in some cases denote a very sharp range discontinuation for several salamanders between the Highland Plateau and Outer Basin.

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