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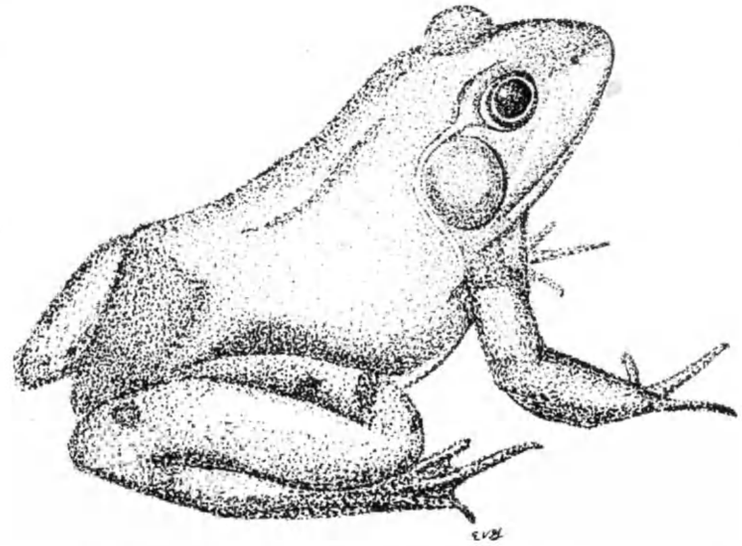

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BULLETIN INFORMATION

The Bulletin of the Virginia Herpetological Society is issued twice a year by the Virginia Herpetological Society. Membership is open to all individuals interested in the study of amphibians and reptiles, and includes a subscription to Catesbeiana and admission to all meetings. Dues are $5.00 per year and include Catesbeiana numbers 1 and 2 for that year. Dues are payable to: Laura Crews, Secretary-Treasurer, Route 1, Box 411, Hayes, VA 23072. See page 34 for additional membership information. Herpetological societies desiring exchange of publications should send copies of their society publications to Charles Neal, Dept. of Biology, Radford University, Radford, VA 24142.

EDITORIAL POLICY

The principle function of Catesbeiana is to publish observations and original research about Virginia Herpetology. Rarely will articles be reprinted in Catesbeiana after they have been published elsewhere. Anyone uncertain about the appropriateness of a manuscript should contact either Charles Neal or Eugene Gourley, Coeditors, Department of Biology, Radford University, Radford, VA 24142. All manuscripts for publication should be submitted to Charles Neal or Eugene Gourley.

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*(Continued on inside back cover.)

C A T E S B E I A N A

Bulletin of the Virginia Herpetological Society

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MEETING NOTICE

The Spring Meeting of the VaHS will be held April 11, 1987 at the Virginia Museum of Natural History, 1001 Douglas Ave., Martinsville, Va. Dr. Joseph C. Mitchell and the Virginia Museum of Natural History are hosting the meeting. See page 29 for details.

Cover: Rana catesbeiana by Eugene Gourley.

HERPFUL HINTS

by

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I chuckled recently upon seeing a Larsen cartoon of a "Boneless Chicken Ranch," with limp, unmoving hens draped in various states of repose, without benefit of a bony endoskeleton for support and locomotion. So what does this have to do with an article on vertebrate species, namely reptiles? Well, it's a good anecdote to lead into problems of shell deformities in turtles and enlarged, yet weakened, bones in a variety of reptilian species.

A major nutritional problem in captive reptiles involves improper calcium and phosphorus balances in their diets, especially a deficiency of calcium. Turtle owners and some lizard owners often feed their animals ground meat or fish as the major dietary components, or exclusively lettuce to "satisfy herbivorous needs." Scrutinizing the contents of these diets one finds that an all fish diet has a calcium to phosphorus (Ca:P) ratio of 1:44, and an all red meat diet has a Ca:P ratio of 1:25. Compare these values to the recommended balance of 1.0-1.5:1, and you can begin to appreciate the low levels of calcium in those diets.

Insectivorous species are especially susceptible to calcium deficiency since there is no calcium in the chitinous exoskeleton of the insects they consume. Herbivorous species fed lettuce exclusively are at risk because the calcium and phosphorus levels within this vegetable are close to zero (Rosskopf et al., 1982). An analogy has been drawn between a tortoise eating lettuce and a human existing solely on cardboard. These calcium-poor diets lead to improper mineralization (decalcification) of the skeleton or shell, when the body attempts to bolster the declining blood calcium levels by removing calcium from the bones.

Besides dietary mineral deficiencies, a vitamin D deficiency can also compound the problem. Vitamin D (especially D3 in reptiles) is needed for proper absorption of calcium in the gut and aids in calcium metabolism and distribution. Reptiles receiving insufficient ultraviolet radiation (from lack of exposure to natural sunlight or artificial UV light sources) cannot manufacture their own endogenous vitamin D, and will exhibit deficiency problems in the face of a diet

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deficient in vitamin D. However, the presence of adequate vitamin D levels can also have an adverse effect in concert with calcium deficient diets: vitamin D facilitates mobilization (removal) of calcium from the bones, leading to a more rapid onset of the pathological condition.

In general, clinical signs which are manifested include deformed shells and weakened bones in turtles. With sufficient loss of calcium reserves, the appendicular skeleton (the limbs) can sustain stress fractures with just the weight of the animal bearing down on them. The carapace softens, becoming more pliable and less protective/supportive, potentially sinking in and crowding the internal organs. Turtles were not, I believe, meant to be pancakes. In lizard species, fibrous osteodystrophy can occur when cortical bone is resorbed and replaced by fibrous connective tissue in the body's weak attempt to shore-up the weakening bones. The diameter of the bones increases with the deposition of the fibrous connective tissue, giving the animal a "fat and healthy" appearance, when in reality behind this enlarging facade, pliable and weakened bones are hidden. This brings to mind the amazing "Rubberman" on display in circus sideshows of yesteryear. Difficulty in climbing, altered gait, or disuse of one or more limbs may be the first signs noted by owners, preceding enlargement of the mandible, long bones, and tail vertebrae. Urinary calculi (bladder stones) may also form, further compounding the problems. On a lighter note, snakes rarely exhibit these problems since most people feed them whole animals, whose bones contribute to the calcium needs of snakes.

Correction of dietary imbalances is quite easy because, for the most part, calcium needs are ridiculously low. Small chelonians and insectivorous lizards may be given lime water in place of their regular drinking water. Rather than feeding ground meat (horsemeat or beef) to reptiles, owners should substitute nutritionally balanced canned dog or cat foods. For aquatic turtles, fish-flavored canned cat food may be frozen in small chunks, and placed frozen into the water for consumption. As the surface thaws, the turtle will consume the outer portion, preventing dispersal of the food throughout the water (reducing the frequency of needed water changeouts). Calcium carbonate may be added to horse or beef meat at the rate of 400-900 mg/100 g of food, and to fish at 1.5 g/100 g of food. Oyster shell calcium may be sprinkled on moist lettuce for those animals "addicted" to a junk food diet of lettuce. Crushed egg shells may also be used in the diet as a ready source of calcium. One commercial pet vitamin (Pet Cal, Beecham) contains both calcium and vitamin D3. Artificial ultraviolet light sources can induce the formation of natural (endogenous) vitamin D within the animal. An example would be the Vita-Lite, manufactured by the Durotest Corp. in North Bergen, NJ.

Boneless chickens in a cartoon may be amusing, but rubber boned iguanas don't tickle my funny bone. Buy a toy lizard if you want a limp, pliable object. But if you want a healthy herp, make sure you concern yourself with meeting its nutritional need for calcium.

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THE HERPETOFAUNA OF ALLEGHANY COUNTY, VIRGINIA
PART 4. BIOGEOGRAPHIC INFERENCES

by

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As summarized in the first three parts of this series (Hoffman, 1985a, 1985b, 1986a), 54 species of amphibians and reptiles have been collected within the political boundaries of Alleghany County, Virginia, most of them in its relatively limited eastern end around the city of Clifton Forge. An additional eight species are, as deduced from geographic probability, almost certain to be found in the circumscribed area, yielding an eventual total of 62 species: 29 amphibians and 33 reptiles.

Such an inventory has a nominal value in showing the extent and diversity of a specific faunal module, per se, but more interest derives from an examination of the various components within the fauna, and their geographic antecedents. It has been frequently observed (e.g, by Bradley, 1956) that most organisms fall into only two categories, those which either as individual species or as representatives of larger groups can be defined as warm-adapted (thermophilus) or cool-adapted (psychrophilus). These terms correspond to the concepts of austral (those with primarily a southern distribution) and boreal (those with primarily a northern distribution). In regions which have been subjected to cyclic climatic changes, it is not unusual that the ranges of many taxa have ebbed and flowed to the north and south in response to temperature fluctuations, and one result of such instabilities is often a local aggregation of species having obviously diverse geographical affinities.

It was noted in the first part of this series that central western Virginia is included in the Appalachian mountain system, specifically the Ridge & Valley physiographic province which is characterized by long parallel ranges trending from New England to Alabama. Throughout much of this region elevations often exceed 3000 feet, annual temperatures tend to be much lower than in the lower, eastern part of the state, and, in consequence, cool-adapted organisms find suitable "boreal" habitats extending far southward.

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The majority of Alleghany County is occupied by high ridges and intermont valleys. It is also traversed by the two major headwaters of the James River which has reached near baselevel (at their confluence near Clifton Forge) just above 1000 feet above sea level, cutting westward across a number of north-south mountains in the process. The relatively broad valley thus produced would appear to offer a continuous means of entry into the mountains that might be utilized by austral taxa in the process of expanding their ranges. Almost certainly, some of the species found in Alleghany County owe their presence there to this corridor. At the same time, the local fauna contains species whose main area of distribution lies to the north, with southward extensions along the Appalachians.

The major events of late Pleistocene (and Holocene, if that period is accepted) climatic history are now fairly well identified, including the last glacial maximum advance about 18,000 years ago, and a subsequent warming trend which intensified to the so-called Hypsithermal (or Xerothermic) Interval of 7000-5000 years ago. During this period conditions were much warmer and drier than at the present, and affored opportunities for thermophilus organisms to extend their ranges northward as well as, presumably, into the mountains along larger stream valleys. Subsequently, climates have become progressively cooler and damper down to the present, certainly to the detriment of warm-adapted species. With the enforced contraction of their areas toward the south, some forms have left behind, chiefly in the Coastal Plain but also sporadically in the mountains, outlying populations now apparently correctly identifiable as "relicts." Some discontinuous distributions are clearly shown among for example, the amphibians Hyla andersoni and Ambystoma tigrinum, and the reptiles Natrix erythrogaster and Natrix rigida.

Details on climatic and biotic shifts during this postglacial period may be found in review papers by Blair (1965), Auffenberg & Milstead (1965) and by Watts (1983), Davis (1983) and Semken (1983).

Generalized pictures of previous environmental conditions at various time sections have been deduced primarily from the analysis of pollen samples (fairly numerous over the eastern United States) and from vertebrate remains in caves (rather less numerous), with the premise that the former ecological constraints of the various species or genera identified were the same as those in effect today. Neither source of information is available for Alleghany County in its modern context, so that inferences must be drawn from nearby localities representing a number of time intervals. It is obvious that the physiographic details of the region will have changed little or not at all during the past 18,000 years, except for a general overall downwasting of the

surface effected by streams in their present courses (and doubtless some meandering along floodplains).

Major Distributional Patterns

Most of the 54 herpesian species currently known from Alleghany County fall clearly into several geographic patterns, generally reflecting the austral-boreal dichotomy. Several others are less clear-cut and their best disposition is at present speculative.

1. **Statewide.** About 28 species (52%) are widely enough distributed in Virginia to represent this category. Some extend from sea level to as high as 5000 feet above sea level (Plethodon cinereus, Thamnophis sirtalis). Others, particularly frogs and turtles, being restricted to riparian or lacustrine habitats do not ascend to such heights, but nonetheless are assigned to the statewide category if they occur in all the major drainage systems of the state (including the upper reaches of the Tennessee and Kanawha rivers).

The following species seem referable to this group:

Ambystoma maculatum
Desmognathus fuscus
Plethodon cinereus
Plethodon glutinosus (s.l.)
Hemidactylium scutatum
Pseudotriton ruber (s.l.)
Eurycea bislineata (s.l.)
Bufo americanus
Bufo woodhousei fowleri
Pseudacris triseriata feriarum
Hyla crucifer
Hyla versicolor
Rana catesbeiana
Rana palustris
Sceloporus undulatus
Eumeces fasciatus
Carphophis amoenus
Diadophis punctatus (s.l.)
Coluber constrictor
Elaphe obsoleta
Natrix sipedon
Thamnophis sirtalis
Agkistrodon contortrix
Crotalus horridus
Chelydra serpentina
Kinosternon odoratum
Chrysemys picta (s.l.)
Terrapene carolina

Of the preceeding taxa, several are taken in the broadest sense of the species (s.l.), although some may be represented by subspecies having boreal or austral affinities. The rattlesnake was almost certainly statewide in precolonial times. To this list should be added the very probable county resident Thamnophis sauritus. The musk turtle, referred to as Sternotherus odoratus in Part III, is now placed in Kinosternon as the result of a recent merger of the two nominal genera.

2. **Boreal.** Under this heading may be grouped several subgroups having in common distribution in Virginia largely or entirely west of a line drawn between Danville and Fredricksburg. Either the species per se or the genera to

which they belong occur to the north and/or west of Virginia.

2a. Canadian pattern. The majority of the species' area is transcontinental or nearly so, in northern United States and Canada; the Appalachians and Rockies are often followed far southward at ever increasing elevations. Two of the local taxa seem properly referable here:

Rana sylvatica Opheodrys vernalis

Although it is true that the wood frog occurs in the Del-Mar-Va peninsula, such populations taken in the context of the total range of the species may be regarded as relictual. Elsewhere in the state this frog occurs chiefly in the western Piedmont and mountains. The smooth green snake does not occur east of the Blue Ridge, and extends southward to about the latitude of Asheville, North Carolina.

2b. Appalachian pattern. This category embraces those species whose distributional area is largely montane (with, however, some westward extension) from New York State to Georgia and/or Alabama:

Desmognathus monticola
Plethodon wehrlei
Plethodon hoffmani
Gyrinophilus porphyriticus (s.l.)
Eurycea longicauda (s.l.)
Eurycea lucifuga
Eumeces anthracinus
Lampropeltis t. triangulum

To this list should be added Desmognathus ochrophaeus and Ambystoma jeffersonianum, which almost certainly will be discovered within the county. Some of the included species require notice: Eurycea longicauda is intended in this sense as taxonomically different at the species level from E. guttolineata; Eumeces anthracinus has a "boreal" pattern only in the central Appalachians, elsewhere its range extends south to the Gulf of Mexico and west to Texas and Kansas; Lampropeltis t. triangulum is "boreal" only in terms of the nominate subspecies, other races occur in Piedmont and Coastal Plain Virginia, and west to the Rocky Mountains. Perhaps this latter taxon should be assigned to a different category (of which, more below). It seems likely that this "lowland" component of the local fauna may be composed of two fractions of quite different backgrounds.

3a. Austral immigrants. Some of taxa with southern affinities are today most abundant and widespread in the Piedmont and Coastal Plain. They may be represented in the Shenandoah, James, and Roanoke valleys, but do not occur in the upper Kanawha and Tennessee drainage basins so far as known. Those which occur in Alleghany County tend to be abundant, and are to be found at many localities further downstream, suggesting a continuous range:

Acris crepitans

Cnemidophorus sexlineatus
Eumeces laticeps
Opheodrys aestivus
Elaphe guttata

It is not known at what time such organisms might have entered the central Alleghanies, before the Hypsithermal Interval, during that time, or recently. Because of the apparent continuity of the ranges downstream toward Piedmont centers of "origin" I am at present inclined to the last of the three options. This is a subjective choice and the likelihood of a much older pattern is by no means to be excluded.

3b. Relict pattern. Several members of the Alleghany County fauna suggest a continuous distributional pattern; however, the local populations are apparently isolated from the nearest continuous part of the species' range. If this disjunction is maintained by subsequent field studies, we may be justified to interpret it as the result of contraction to the south of previously more extensive ranges.

Four species of reptiles are provisionally placed in this category:

Eumeces inexpectatus
Scincella laterale (county record not certain)
Cemophora coccinea
Virginia valeriae

The southeastern five-lined skink, E. inexpectatus, occupies a dominantly lowland range from southern Maryland to Florida and Louisiana. In Virginia it is abundant in the Coastal Plain, with isolated records for Loudoun, Campbell, Charlotte, and Nottoway counties on the Piedmont, and single finds in Alleghany and Page counties west of the Blue Ridge (Tobey, 1985, p. 78). That one specimen only has been found at Clifton Forge despite many years of collecting implies only a small extant population of the species, perhaps near extinction.

Scincella laterale has a generally austral distribution, and in Virginia one somewhat similar to that of E. inexpectatus: widespread in the Coastal Plain with, however, a substantial number of Piedmont localities. In this case the species had long ago been found on the upper Potomac River in Hardy County, West Virginia, a disjunct locality possibly explainable by upstream migration from central Maryland. Although this species has not been taken with absolute certainty in Alleghany County, a specimen was found within three miles of the county boundary on Bald Knob, Bath Co., at 4000 feet above sea level. I documented this remarkable situation (Hoffman, 1986b) and it is possible that at least

some of the records I noted (Hoffman, 1945) are based on Alleghany County specimens which were not preserved. The apparent absence of S. laterale from the Piedmont of northern Virginia and central Maryland (Tobey, 1985:77) suggests that the West Virginia population may be relictual from the Hypsithermal Interval. One must assume that the utterly unlikely record for Warm Springs Mountain, Va. is also relictual.

Cemophora coccinea is known in Alleghany County from a single immature specimen found dead on the road just west of Covington. Other Virginia records (Tobey, 1985:93) are mostly in the Coastal Plain, with several localities in the eastern Piedmont (Prince Edward, Nottoway, Amelia, Powhatan counties). Aside from the possibility that the Covington specimen was an escape from some snake-fancier's automobile an immediate casualty to one following, it seems plausible to invoke the explanation of Hypsithermal relict.

Lastly, Virginia valeriae has a predominantly eastern distribution in Virginia, although, with several Piedmont localities and isolated finds in Clarke, Alleghany, Botetourt, and Scott counties west of the Blue Ridge. Recent dispersal westward from the Piedmont might account for Clark, Alleghany and Botetourt counties (the Blue Ridge is insignificant as a barrier between Clark and Loudoun counties), and migration upstream along the Tennessee River for Scott County. However, there is also an upland subspecies (V. v. pulchra) in West Virginia and Pennsylvania, and again the aspect of reliction from a previous warmer and drier epoch is appealing. The discovery of additional colonies along the upper James River would tend to tip the scales toward the possibility of upstream migration from the Piedmont, of course.

4. Problematical patterns. Here are gathered several species whose ranges do not fit readily into any of the patterns outlined above. Perhaps some additional categories might be established to accomodate them.

Ambystoma opacum. The known range suggests that this is an austral form. In Virginia it is predominantly eastern and lowland, but widely distributed on the Piedmont and in the Shenandoah Valley. It occurs at Radford, in the New River drainage, and almost certainly will be found in the southwestern counties. Earliest records for Alleghany County were for the vicinity of Clifton Forge, below 1200 feet above sea level, but this implied lowland immigrant pattern was contradicted by the discovery of specimens (larvae, one huge adult female) in a sphagnum bog atop Potts Mountain, near 3800 feet. Perhaps A. opacum could be referred to the "Statewide" category, as it seems to be widely distributed at low to moderate elevations in West Virginia also.

Pituophis melanoleucus is of course widespread across much of southern United States, with a considerable disjunction between eastern North Carolina and New Jersey. The only known Virginia localities are west of the Blue Ridge, and it is tempting to infer that these are all relictual from an earlier warmer and drier time when P. melanoleucus may have occurred as far north as Pennsylvania. It is, therefore, possible that this species should be placed in the relict pattern.

Storeria dekayi is widespread in much of eastern United States. The nominate subspecies is endemic in the northeast, but scarce in the central Appalachians and known from only two Virginia localities west of the Blue Ridge. In the Piedmont, S. d. dekayi is more widespread, and in the Coastal Plain merges into the more southern S. d. wrightorum. As West Virginia localities are extremely few and isolated, it seems possible that post-Hypsithermal contractions of the range might account for the sporadic montane localities in the two Virginias.

The red-bellied snake S. occipitomaculata is probably referable to the "statewide" category despite the present dearth of records for the southwestern third of the state, a status which will eventually be settled one way or another by subsequent field work in the area concerned.

Discussion

The somewhat subjective and arbitrary aspects of the preceeding allocations are obvious enough to the informed reader. Many of the more questionable points will be settled later with the accumulation of material.

Particular interest centers on the several forms of austral affinities which appear to have been left behind in a favorable environmental site. In this connection, particular attention must be given a recent paper (Van Devender & Nicoletto, 1983) which reveals and analyzes in an exemplary way an apparently analogous situation in Caldwell County, North Carolina. These authors discovered in the gorge of Wilson Creek, near Lenoir, four species of reptiles representing substantial extensions of their species' ranges in a northwesterly direction, but at the same time quite disjunct from the next nearest known localities. Van Devender & Nicoletto established that local geographical conditions produced a habitat measurably warmer than elsewhere in the vicinity, one conducive to the survival of thermophilus species. The interested reader should consult their paper for details, and for an illuminating discussion of climatic changes in eastern United States during the past 18,000 years.

The four species highlighted in the Wilson Creek fauna are Eumeces inexpectatus, Scincella laterale, Anolis carolinensis, and Tantilla coronata. The first two named occur, apparently as Hypsithermal relicts, also in the Alleghany County fauna.

It is not known from fossil evidence how far amphibians and reptiles of austral affinities may have extended northward during the height of the warm and dry period of 7000-5000 years ago. Deduced from the fragmentary distribution patterns of some species as now known, such as Pseudemys rubriventris, Natrix erythrogaster, Hyla femoralis, it is quite possible that environments like those of modern southeastern Virginia extended at least as far as Massachusetts. A thermal maximum greater than at present may have resulted in more polar glacial melt, somewhat higher sea levels, and possibly narrower coastal plains than those of the present.

Two present-day austral snakes (Masticophis flagellum and Crotalus adamanteus) are recorded as fossils from Natural Chimneys, Augusta Co., Virginia, by Guilday (1962). At present, neither of these species occurs farther north than central North Carolina, nearly 200 miles to the southeast. The age of these fossils, as determined by faunal assemblages, is considered to be either late Pleistocene or early Holocene, therefore, nearly 18,000 years ago and much older than the Hypsithermal Interval by nearly 10,000 years. Since the climate at the time must have been considerably cooler and wetter, and since mammalian remains thought to be contemporaneous include a number of presently subarctic species, some doubt attaches to the authenticity of the actual age of the snake remains. Possibly, they represent a later introjection into the deposits, but in any event, even if they date only from the Hypsithermal, it suggests that habitats similar to those of today's southeastern States must have occurred as far north as Pennsylvania or even to the Great Lakes. Under such conditions it would not be surprising that Alleghany County would have been occupied by a set of amphibians and reptiles quite unlike those living there today, in fact perhaps more like those of South Carolina or Georgia. In the lack of fossil evidence, such possibilities can exist only as intriguing speculation. That the modern fauna of the region is one of mixed origins can, however, scarcely be doubted.

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HERPETOFAUNA OF THE NEW RIVER GORGE NATIONAL RIVER, WEST VIRGINIA

by

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Introduction

During the summers of 1984 and 1985 I conducted a biological survey of the New River Gorge National River (NRGNR) for the National Park Service. This work was contracted through the Department of Fisheries and Wildlife Sciences at Virginia Tech. I was responsible specifically for surveying the riparian habitats along the river for wildlife and associated vegetation. However, I also found time to search other upland and aquatic habitats within the Gorge and list species of reptiles and amphibians encountered within them.

It is my intent that this paper will provide the interested amateur or professional herpetologist with an introduction to the herpetofauna of the NRGNR and stimulate either study or visit.

Study Area

The 84 km NRGNR is located between Hinton and Fayetteville, West Virginia. It is bordered by Summers, Raleigh, and Fayette Counties. The NRGNR traverses the Appalachian Plateau physiographic region, and the area consists of Pennsylvanian and Mississippian sandstones, shale, and coal seams (Fuerst, 1981). Mean elevation at river level is 427 m. The NRGNR is a sixth order stream consisting of riffles, runs, and pools. Pool habitats, as well as riparian floodplains, exist in the southern section of the Gorge, near Hinton. In the northern section of the Gorge, floodplain forests are replaced by steep slopes of sandstone talus, and riffle habitats are dominant. River flows are regulated by Bluestone Dam, a flood control facility located 4.8 km upstream of the NRGNR boundary and by Claytor Lake Dam, a hydro-electric facility, located 75 km upstream in Virginia.

The climate is mild with an average annual temperature of 11° C and 109-114 cm of precipitation per year. Mean summer (Jun-Aug) and winter (Dec-Feb) temperatures are 20.0° C and 2.2° C, respectively (Fuerst, 1981:32). Winter and summer

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water temperatures range from 0.0-3.9° C and 18.0-21.5° C, respectively. Ice forms on the slower moving pools in mid-January.

Floodplain vegetation is deciduous with sycamore, river birch, black willow, and silver maple constituting most of the canopy. The slopes in the NRGNR are a mixed hardwood type, with white oak, red oak, yellow poplar, black cherry, beech, red maple, and buckeye predominant at the lower elevations, while chestnut oak, black oak, and various hickories are more common on the drier, upper slopes. Pitch pine, Virginia pine, American holly, oaks, and hickories are found on ridgetops along the Gorge.

The mixed hardwood slopes are dissected by many tributary streams. Several are stocked with trout by the West Virginia Department of Natural Resources (WVDNR). Common vegetation along these streams includes hemlock, yellow birch, beech, and rhododendron.

Methods

Reptiles and amphibians in the NRGNR were sampled using a variety of techniques. Some habitats were intensively searched by turning rocks and logs, such as the edges of tributary streams and talus slopes. Several species of amphibians were captured in pitfall traps with draft fences. Aquatic turtles were captured in baited hoop net traps and unbaited fyke nets with leader nets. Some turtles were captured in baskets made from poultry netting which were nailed to the sides of basking logs.

The most productive herptile surveys were conducted at night by automobile. On warm, humid, rainy nights during the summer months, large numbers of frogs, toads, salamanders, and snakes were found on roads (Table 3). The area behind the animal was recorded as its habitat. This may not always be correct but was necessary in areas such as River road, near Hinton, where the road was the dividing line between riparian and upland habitats.

Results and Discussion

Few salamanders were found in riparian habitats, and it appears that terrestrial salamanders cannot colonize sites that are frequently flooded. One red-backed salamander (Plethodon cinereus) was found in a pitfall bucket in a floodplain forest in July, 1985. During night road cruises, some two-lined salamanders (Eurycea bislineata) appeared to be traveling from riparian sites. Daytime searches of these habitats did not turn up any specimens.

The greatest numbers and diversity of salamanders were found in the tributary streams (Table 1). Streams sampled included Fall Branch, Glade Creek, and Dowdy Creek, as well as Mann's Creek in Babcock State Park. The black-bellied salamander (Desmognathus quadramaculatus) is listed as 'special concern' by WVDNR. Specimens of this species and the northern spring salamander (Gyrinophilus porphyriticus) were found only in Dowdy Creek in the NRGNR. These species may be useful in the future as indicators of good water quality.

The green salamander (Aneides aeneus), a species listed as of 'special concern' on the WVDNR's list was found at several wet sandstone cliffs in the NRGNR. These include cliffs along several of the tributaries, and the cliffs around the overlooks at Grandview State Park. Over-collecting is probably the main reason for the green salamander's rarity (WVDNR, 1984). Several other species of salamanders have been recorded for the New River Gorge area by other herpetologists, but were not found during this study (Cupp and Towles, 1983, Highton and MacGregor, 1983, M. Little, pers. comm.) (Table 4).

Common species of anurans included bullfrogs (Rana catesbeiana), green frogs (R. clamitans), American toads (Bufo americanus), and fowler's toads (B. woodhousei fowleri). American toads were frequently found on riparian sites, although fowler's toads were more numerous in mixed hardwood forests. Bullfrogs were found along the river in association with quiet backwaters. Tadpoles of this species were observed in the river near Summers Co. Recreation Facility during August, 1985, a year of low flows. I was told by older local citizens that bullfrogs were numerous along the river prior to construction of Bluestone Dam. Frogs need streambank cover to hide from predators and tadpoles require relatively stable water conditions in which to develop.

Two amphibian breeding ponds were discovered in non-riparian habitats in the NRGNR. A small hardwood swamp along McKendree road was used by spring peepers (Hyla crucifer), woodfrogs (R. sylvatica), and Jefferson's salamanders (Ambystoma jeffersonianum), which are listed as 'status undetermined' by WVDNR. Another breeding pond for Jefferson's salamander was located near Sandstone Falls State Park. This small duckweed-covered pothole between an old cedar field and the river should be protected. Discovery of the Jefferson's salamander in the NRGNR represents the first records for Fayette and Raleigh Counties.

Ditches alongside dirt roads throughout the Gorge were utilized as breeding habitat by red-spotted newts (Notophthalmus viridescens), mountain chorus frogs (Pseudacris brachyphona), and green frogs (Rana clamitans).

Mudpuppies (Necturus maculosus) were found in the riverine habitat. Adult specimens were found under rocks in pool habitats, whereas small immature individuals were captured in submergent weedbeds. Fishermen reported capturing them on fishing tackle during early spring, referring to them as waterdogs, or water lizards.

Intensive searches were conducted for another large aquatic salamander, the hellbender (Cryptobranchus alleganiensis). Although I have found this species in the New River in Virginia, none was found in the NRGNR. Local fisherman provided descriptions of what seemed to be hellbenders, but all stated that they had not seen one in many years. Hellbenders require clear, well-oxygenated water, and it is possible that frequent muddy flows from the Greenbrier river and strip-mine runoff have impacted this species. Hellbenders are listed as 'endangered' by WVDNR and several other states.

Different species of snakes were found in all habitat types sampled in the NRGNR (Tables 1, 2). The northern water snake (Nerodia sipedon) and the queen snake (Regina septemvittata) were closely associated with the river and riparian habitats. The northern water snake feeds on fish, frogs and other small prey. Queen snakes prey heavily on crayfish; thus, also were found in tributary stream habitats.

The copperhead (Agkistrodon contortix mokasen) was common on exposed rock outcroppings and talus slopes in upland habitats in the NRGNR. This snake was never found in riparian habitats. Reports of timber rattlesnakes (Crotalus horridus) were obtained from local residents, and although they probably occur in upland habitats around the NRGNR, they were not encountered during this study.

Fence lizards (Sceloporus undulatus) were found on dry upland sites and along cliffs. A large population was also found at an old excavation near Fall Branch (Raleigh Co.). Another lizard, the five-lined skink (Eumeces fasciatus) was encountered twice during the study. One was seen on the old bridge across Glade Creek (Raleigh Co.); another ran across River road, near Fall Branch.

The terrestrial eastern box turtle (Terrapene carolina) was found in all habitats sampled in the NRGNR. Within the riverine habitat, five species of turtles were found (Table 2). The painted turtle (Chrysemys picta) is represented by two subspecies in the NRGNR, (C. p. picta) and (C. p. marginata). In most places, the Applachian mountains separate the two subspecies. However, since the New River cuts across those mountains from east to west, the two subspecies are in contact and do interbreed. Most painted turtles in the NRGNR show traits of both. The common

snapping turtle (Chelydra serpentina), called 'mud' turtle by local residents, is abundant in the NRGNR, as is the musk turtle (Sternotherus odoratus), also called 'stinkpot' or 'pot.' Musk turtles are commonly caught on hook and line by fishermen.

The river cooter (Pseudemys concinna) was discovered in the NRGNR in 1984. This represents a range extension for the species (Buhlmann and Vaughan, 1985). Populations exist in the New River from Hinton to the I-64 bridge, but have not been seen farther downstream. During this study, a few individuals were seen a few miles up the Greenbrier River from its confluence with the New River. A population also exists in Bluestone Reservoir (Seidel, 1981). River cooters are found in pools with slow moving water, basking sites, and aquatic weedbeds. They do not occur in riffle habitats. Turtle habitat in general, decreases with distance downstream from Hinton, and is poor in the lower Gorge, where riffle habitats and whitewater predominate.

One male specimen of the map turtle (Graptemys geographica) was captured in a basking trap in August, 1985. Further study is being planned to determine whether this species is established in the NRGNR.

Conclusions

The New River Gorge National River is an interesting place for the study of reptiles and amphibians. The river cooter occurs here, apparently isolated from the rest of its range. The New River also seems to mark the boundaries of such herps as the valley and ridge salamander (Plethodon hoffmani), ravine salamander (Plethodon richmondi), and both species of gray treefrogs (Hyla versicolor and Hyla chrysocelis). I hope that this brief overview will stimulate some future study and research, as well encourage the reader to visit the New River Gorge National River and become acquainted with the herpetofauna. The National Park Service will be able to provide maps of the area. Please keep in mind that the area is under jurisdiction of the National Park Service and collecting is prohibited.

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TABLE 1. Terrestrial amphibians and reptiles in the NRGNR.

	SWB	TSG	UPH	DIS
Frogs and Toads				
Pickerel frog (Rana palustris)	X			
Bullfrog (R. catesbeiana)	X			
Green frog (R. clamitans)			X	
Wood frog (R. sylvatica)			X	
Gray treefrog (Hyla sp.)			X	
Spring peeper (H. crucifer)			X	
Mtn. chorus (Pseudacris brachyphona)			X	
American toad (Bufo americanus)	X	X	X	X
Fowlers toad (B. woodhousei fowleri)			X	
Salamanders				
Red-spotted newt (N. viridescens)			X	
Slimy (Plethodon glutinosus)		X	X	
Red-backed (P. c. cinereus)		X	X	
Green (Aneides aeneus)		X		
Two-lined (Eurycea b. bislineata)		X	X	
Long-tailed (E. longicauda)			X	
Spotted (Ambystoma maculatum)			X	
Jefferson's (A. jeffersonianum)			X	
N. dusky (Desmognathus f. fuscus)		X		
Mtn. dusky (D. ochrophaeus)		X		
Black-bellied (D. quadramaculatus)		X		
Seal (D. monticola)		X		
No. spring (Gyrinophilus porphyriticus)		X		
Northern red (Pseudotriton r. ruber)		X	X	
Snakes				
Ringneck (Diadophis punctatus edwardsi)			X	X
Red-bellied (Storeria occipitomaculata)		X		
Garter (Thamnophis s. sirtalis)			X	X
Rough green (Opheodrys aestivus)			X	
Milk (Lampropeltis triangulum)			X	
Black rat (Elaphe o. obsoleta)	X		X	
Black racer (Coluber constrictor)			X	
N. water (Nerodia s. sipedon)	X			
Queen (Regina septemvitta)	X			
Copperhead (Agkistrodon c. mokasen)				X
Lizards				
5-lined skink (Eumeces fasciatus)			X	
N. fence (Sceloporus undulatus)				X
Turtles				
E. box (Terrapene c. carolina)	X		X	

SWB=Sycamore/Willow/Birch riparian forest; TSG=Tributary Stream Gorge; UPH=UPland Hardwood forest; DIS=DISturbed areas.

TABLE 2. Aquatic amphibians and reptiles of the New River.

Species	Status	Habitat Description
Common musk turtle (*Sternotherus odoratus*)	A	pools and backwaters
Common snapping turtle (*Chelydra serpentina*)	A	pools and backwaters
Painted turtle (*Chrysemys picta*)	C	backwaters
River cooter (*Pseudemys concinna*)	U	pools and backwaters
Map turtle (*Graptemys geographica*)	R	pools
Northern water snake (*Nerodia sipedon*)	C	pool edges with cover
Queen snake (*Regina septemvittata*)	C	pool and riffle edges
Mudpuppy (*Necturus maculosus*)	U	pools, backwaters, and riffles
Bullfrog (*Rana catesbeiana*)	U	backwaters

Status: A=Abundant, C=Common, U=Uncommon, R=Rare.

TABLE 3. Results of night road surveys for herptiles.

Species	Rt. 41	Rt. 25	Rt. 20	River Rd.
Two-lined salamander (Eurycea bislineata bislineata)	X	X		X
Red salamander (Pseudotriton ruber ruber)	X			
Spotted salamander (Ambystoma maculatum)	X		X	
Seal salamander (Desmognathus monticola)	X	X		
N. dusky salamander (D. fuscus fuscus)				X
Slimy salamander (Plethodon glutinosus)			X	X
Long-tailed salamander (Eurycea longicauda)			X	
Red-spotted newt (Notophthalemus viridescens)		X		
Gray treefrog (Hyla sp.)	X	X		X
Spring peeper (H. crucifer)	X	X	X	X
Mtn. chorus frog (Pseudacris brachyphona)			X	
Amer. toad (Bufo americanus)		X		X
Fowlers toad (B. w. fowleri)			X	
Wood frog (Rana sylvatica)	X		X	
Pickerel frog (R. palustris)			X	X
Green frog (R. clamitans)				X
Bullfrog (R. catesbeiana)				X
Garter snake (Thamnophis sirtalis sirtalis)				X
N. water snake (Nerodia sipedon sipedon)			X	X
Queen snake (Regina septemvitta)				X
Milk snake (Lampropeltis triangulum)				X
N. ringneck snake (Diadophis punctatus edwardsi)				X

Routes: (1) Rt. 41 traveled from National Park boundary sign to McCreery--Upland hardwood habitat type. (2) Rt. 25 traveled from Thurmond to National Park boundary sign--Tributary stream gorge habitat type. (3) Rt. 20 traveled from Bass Lake Camp to Sandstone--Upland hardwood habitat type. (4) River road traveled from Hinton to Sandstone Falls State Park--boundary between riparian floodplain and upland hardwood habitat types.

TABLE 4. Amphibians and reptiles that may occur in the New River Gorge National River.

Species	Probable Habitat
Ravine salamander (*Plethodon richmondi*)	UPH, TSG
Valley and ridge salamander (*P. hoffmani*)	UPH, TSG
Cumberland plateau woodland salamander (*P. kentucki*)	UPH, TSG
Wehrles salamander (*P. wehrlei*)	UPH, TSG
Marbled salamander (*Ambystoma opacum*)	UPH
Four-toed salamander (*Hemidactylium scutatum*)	UPH
Midland mud salamander (*Pseudotriton montanus*)	TSG
Cave salamander (*Eurycea lucifuga*)	limestone caves
Hellbender (*Cryptobranchus allegheniensis*)	river riffles
Coal skink (*Eumeces anthracinus*)	RGT, UPH
Broad-headed skink (*E. laticeps*)	UPH
Timber rattlesnake (*Crotalus horridus*)	UPH, RGT
Eastern ribbon snake (*Thamnophis sauritus*)	UPH, SWB
Northern brown snake (*Storeria dekayi*)	UPH
Eastern hognose snake (*Heterodon platyrhinos*)	DIS, OLD
Smooth green snake (*Opheodrys vernalis*)	UPH, SWB
Eastern worm snake (*Carphophis amoenus*)	UPH

TSG=Tributary Stream Gorge; RGT=RidGeTop; OLD=OLD field; SWB=Sycamore/Willow/Birch riparian forest; UPH=Upland Hardwood Forest.

BOOK REVIEWS

Virginia's Amphibians and Reptiles, A Distributional Survey, by Franklin J. Tobey. 1985. Privately published by the Virginia Herpetological Survey. 114 pp.

This publication is the result of the primary activity of the Virginia Herpetological Survey during the period 1958-1980 and, more than anything else, is a tribute to the untiring efforts of one amateur herpetologist, F. J. Tobey. Most of the publication presents the set of distribution maps for Virginia's amphibians and reptiles. Common and scientific names follow Conant (1975. A Field Guide to Reptiles and Amphibians of Eastern and Central North America, Houghton Mifflin Co., Boston). Each specific locality is represented by a black dot on county-outlined maps. There are two maps per page and each has several lines of text on distributional notes, historical records and literature notations. In addition, there are maps illustrating physiographic regions and major drainage patterns, and line drawings of the three venomous snake species. An index is included and is cross-referenced with Conant's field guide. The publication is 8 1/2 by 11 inches in size. The only printing problems were slightly blurred pages (50, 59) in one of our copies, and some of the scientific names (in italics on the maps) printed lightly, although all can be read. The scientific name of Thamnophis sauritus is incorrect, but we found few typographical errors. The map for Eurycea bislineata wilderae is out of place.

We commend Tobey on the much needed compilation of a massive data base. He has taken great pains to seek out literature records from obscure sources. The historical information alone credits the work. In addition, Tobey has included an interesting, although somewhat rambling, discussion of the origins of attitudes toward amphibians and reptiles, sources and fate of introduced species, sources of the survey data, conservation, and the justification for preserved material. Much of this is useful advice, especially for the general reader.

One of our primary concerns is that the locality records are largely based on unverified lists of specimens from museum and university collections and that an undetermined number are based on unverified observations reported to Tobey via correspondence. Virtually all localities are represented by solid black dots, including literature and correspondence records. It would have been desirable to distinguish between verified and unverified sites. The problems generated by these procedures attest the need to verify

(reidentify) specimens, at the very least at range margins, before localities are posted on distribution maps. Acceptance of unverified and unverifiable information is a dangerous practice.

The proper treatment of subspecies is a controversial point. Tobey has clarified his view by including as an appendix a note written by the late James A. Peters to the Virginia Herpetological Society in 1965. This note provides an excellent summary of the subspecies concept and points out the pitfalls encountered with attempts to apply a typological view. Yet, the maps of each subspecies are presented separately in the Virginia survey. This only reinforces misunderstandings of the subspecific taxon and, in our experience, proves confusing to many potential users of the survey. The succinct mention of a few localities with intergrades does little to clarify the misunderstanding.

Once the most important distributional problems are clarified (Mitchell and Pague, in press, Herp. Review), the maps in this publication can be considered reasonably accurate and useful. Despite the errors, F.J. Tobey and other VaHS workers are to be commended for the efforts they have put into this long-term project. The result certainly demonstrates the contribution an amateur herpetological society can make. These maps provide the basis for further elucidation of the ranges of these species in Virginia. In particular, amateur herpetologists now have the basis for determining where the distributional gaps are and can make contributions to our understanding of biogeographical patterns. Because these maps are the most comprehensive to date, they will also be useful to those studying distributional patterns on a national scale.

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Kinosternon subrubum subrubum (Eastern Mud Turtle): Sussex County, Co. Rt. 606, 0.2 km S. of Co. Rt. 614 intersection. May 20, 1986. D. Schwab.

A female turtle was collected crossing road. Tobey (1985, Virginia's Amphibians and Reptiles - a Distributional Survey, Virginia Herpetological Soc.) does not show any specimens of this turtle from Sussex County. The specimen will be given to the Smithsonian Institution collection via C.A. Pague of Old Dominion Univ.

Don Schwab
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Suffolk, VA 23434

Elaphe obsoleta obsoleta (Black Rat Snake): Isle of Wight County, town of Zuni, St. Rt. 460 at intersection with Co. Rt. 644. May 20, 1986. D. Schwab.

A large road-killed male black rat snake was collected at the eastern boundary of the town of Zuni in Isle of Wight County. Neither Linzey and Clifford (1981, Snakes of Virginia, Univ. of Virginia Press, Charlottesville) nor Tobey (1985, Virginia's Amphibians and Reptiles - a Distributional Survey, Virginia Herpetological Soc.) show specimens of this species from the county of Isle of Wight. The specimen will be donated to the Smithsonian Institution via the collection of C.A. Pague.

Don Schwab
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Observations of courtship behavior in Elaphe obsoleta (Black Rat Snake): City of Virginia Beach, False Cape State Park, Wash Woods. 26 May, 1986. T.M. Padgett.

On 26 May, 1986 at 1700 hrs. EDT, I observed a pair of black rat snakes engaged in courtship. The pair was discovered in the hollow of a live oak (Quercus virginiana) located beside the residence of the park superintendent, Wash Woods, False Cape S.P. The hollow was located within a limb 3 m above the ground and 2.5 m from the trunk of the tree. When first observed, only the heads of the pair were visible from within the hollow. The female initiated the

courtship by slowly emerging from the hollow until approximately three fourths of her body was suspended below the limb. I estimated the length of both individuals at approximately 1.5 m. With the female suspended the male would emerge and slowly coil himself around the female until his entire body, including the tail, was tightly wrapped around his mate. This behavior of both individuals suspended in mid-air lasted approximately three minutes, at which time the male would release his grip and rapidly uncoil and plummet to the ground. The male would then proceed immediately to the base of the tree and begin to climb, joining the female who had returned to the hollow. This entire behavioral sequence of the female suspended with the male coiled around her, followed by the male consequently falling to the ground was repeated two additional times. After the last attempt, the male did not return to the tree, moving slowly away into a brushy area north of the tree. I did not observe direct copulation between the two individuals during the time that I observed them, however, this may have occured prior to my arrival.

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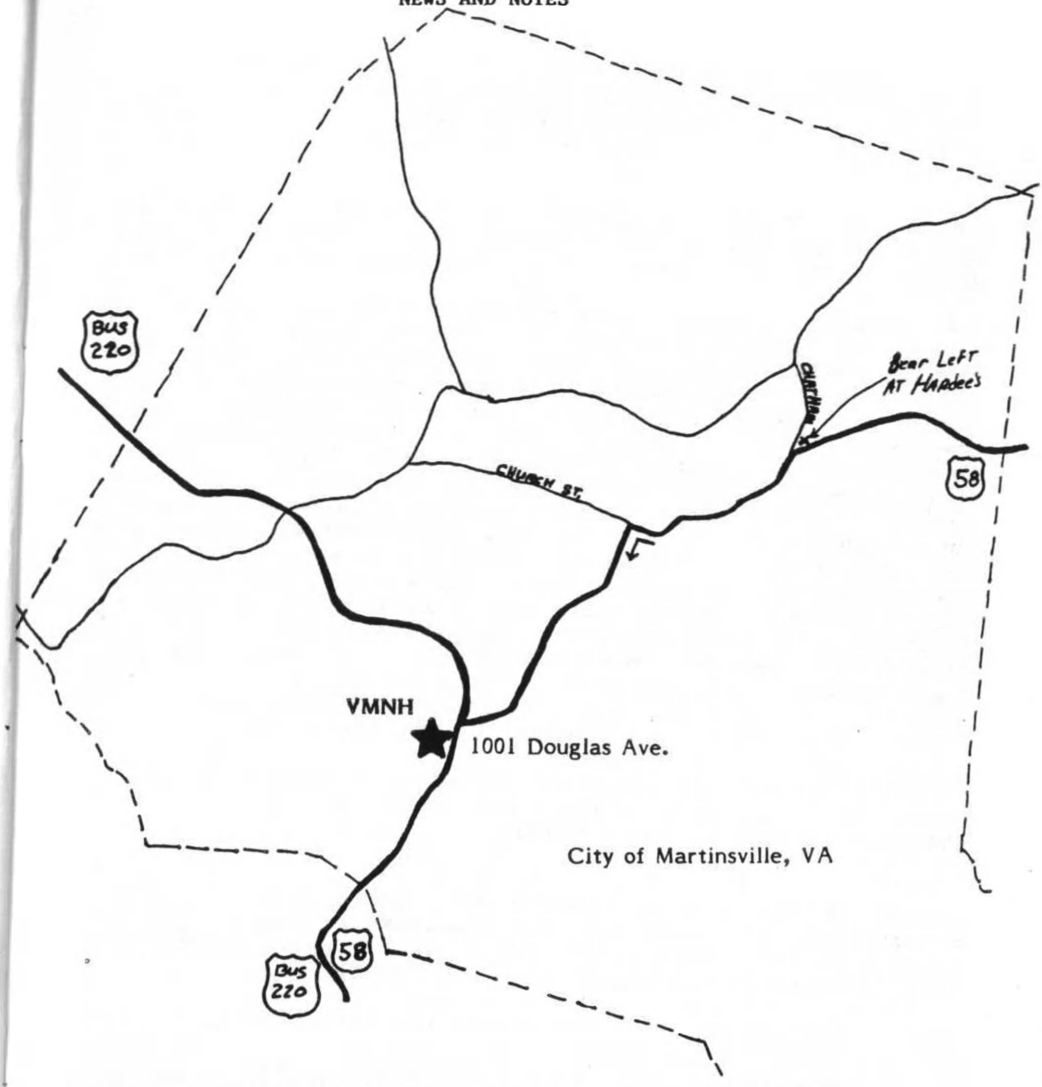

Spring Meeting of the Virginia Herpetological Society - April 11, 1986

Location: Virginia Museum of Natural History, 1001 Douglas Ave., Martinsville, VA
(Note that US Business 220/58 is Douglas Ave.)

From eastern and northern VA take US 58 west (US 58 from Norfolk and US 360 from Richmond [3 hr]). From Lynchburg take US 29 south to VA 57 which connects with US 58 just east of Martinsville. From Roanoke take US 220 south. From VPI and Radford take VA 8 to VA 57 to US Bus. 220. From points in SW VA take US 58 east.

Time: 11:00 AM

Host: Dr. Joseph C. Mitchell and the Virginia Museum of Natural History

Note: This is a field trip meeting. There will be excursions locally (this is an area where little work has been done) and possibly to Fairy Stone State Park.

Abstracts of Herpetology Papers given at the
Virginia Academy of Science Meetings
held May 13-16, 1986
at Harrisonburg, Va.

Comparison of the Life Histories of Immature Loggerhead and Ridley Sea Turtles in the Chesapeake Bay, Virginia. Richard Byles, Va. Inst. of Marine Sci., Gloucester Point, VA 23062.

Sea turtles display three distinct life history stages marked by special habitats and ecology (Carr, Carr and Meylan, 1978, Bull. Amer. Mus. Nat. Hist., Vol. 162). The post-neonatal developmental stage of immature sea turtles occurs in inshore, estuarine or reef habitats. The Chesapeake Bay is habitat for the immature stage of loggerheads (Caretta caretta) and Kemp's ridley (Lepidochelys kempi) which migrate to the estuary each spring. Adults and very small turtles of both species are conspicuously absent from the bay. Similarities between the two species were reflected in activity (foraging), residence seasonality (May through October), philopatry and migratory routes (coastal, nearshore). Also evident were contrasts in behavior, prey items and habitats. The duration of dive and respiration periods were shorter for ridleys than for loggerheads. Ridleys fed predominantly on blue crabs (Callinectes sapidus) and foraged over less area than loggerheads, which ate primarily horseshoe crabs (Limulus polyphemus). The difference in prey items was also reflected in habitat selection with ridleys preferring shoal areas of seagrass beds and loggerheads tending to deeper channels leading to river mouths.

Ground Skinks and Milkweed Bugs: A Test of Olfactory Recognition of Palatable and Unpalatable Prey. Anne C. Wells & Paul F. Nicoletto, Dept. of Biol., Va. Polytechnic Inst. & State Univ., Blacksburg, Va. 24061.

The objective of this experiment was to investigate the sensory modalities lizards use to recognize normal prey versus unpalatable novel prey. Ground skinks, Scincella lateralis, were randomly presented five different prey types, a palatable milkweed bug, an unpalatable milkweed bug, a dusted milkweed bug, a cricket covered with a milkweed bug extract, and a cricket. The lizards initial response to prey among the five treatments was similar, as there were no significant differences in the rates of tongue flicking prior to approach, latency time to approach, and number of approaches. Upon approach to within one centimeter, the lizards immediately attacked and ingested the control cricket. However, in the other four treatments, lizards first investigated the prey using olfaction as evidenced by increased tongue flick rates. All milkweed bug prey was apparently rejected on the basis of chemical cues.

Crickets covered with milkweed bug extract received some protection, as only 5 of 12 crickets were ingested. Ground skinks predominantly rely on visual cues to identify normal prey, but when confronted with novel prey, rely heavily on olfactory cues.

Life History Patterns in a Central Virginia Anuran Community. Joseph C. Mitchell, Dept. Biol., Univ. of Richmond, Richmond, VA 23173.

Anurans worldwide exhibit a wide variety of reproductive modes. This diversity has made it difficult to categorize these animals into a manageable number of discrete life history groups. Collins (1975), who focused his attention on local adaptations of eight anuran species, deduced there were two primary life history patterns exhibited by the community he studied. Data derived from a contrasting wet and dry, two-year study of a central Virginia anuran community consisting of 12 species are examined to determine if this more diverse assemblage can be similarly partitioned with Collins' criteria. My results indicate his dichotomies can be used with some modification to categorize the life histories of the Virginia community. Life history correlates of the primary criterion, probability of metamorphosis, include body size, larval and adult survivorship, length of larval period, habitat type, maximum clutch size and age at maturity. These aspects are summarized for each of the 12 Virginia species.

Origin of a Hybrid Population of Long-tailed and Three-lined Salamanders in the Piedmont of Northern Virginia. Walter Bulmer, Nat. Sci. Div., Annandale, Va. 22003.

Long-tailed and three-lined salamanders were found to hybridize in a limited environment in the piedmont of Northern Virginia. The population of hybrids exhibit a variety of patterns and colors ranging from "typical" three-lined forms to "typical" long-tailed forms. This hybrid population is sympatric with the coastal plain three-lined subspecies, but is approximately 50 miles east of the nearest long-tailed subspecies. The unique habitat created by Bull Run River eroding a gorge through the piedmont, producing steep, north-facing slopes is comparable with habitats found at higher elevations in the Blue Ridge Mountains to the west. It is hypothesized that the appearance of the displaced long-tailed salamander types at the locality could result from flooding of mountain streams sending larva salamanders into lower elevations.

The Role of Habitat Partitioning in Chesapeake Bay by the Loggerhead (Caretta caretta) and Kemp's Ridley (Lepidochelys

kempi) Sea Turtles. Sarah A. Bellmund, Dept. of Fisheries Sci., Va Inst. of Marine Sci., Gloucester Pt., VA 23062.

Virginia waters and Chesapeake Bay are a major juvenile foraging habitat for sea turtles and are reflective of habitat partitioning between life stages of the group. These stages are described by Carr, Carr, and Meylan (1978) as occurring in developmental habitats. Of the stages described by Carr et al. turtles in Virginia waters are partitioned so that the immature stages forage within Chesapeake Bay, while large subadults and adults are found offshore during the summer foraging season. Loggerhead sea turtles in Chesapeake Bay have an average straightline carapace length (CLS) of 66.7 cm (SD=10.8, N=238). Turtles found on coastal beaches have a CLS of 72.3 cm (SD=17.4, N=46). Aerial surveys show that animals moving along the coast during migration are of many sizes. This distribution changes during the summer when primarily large turtles are seen offshore.

Abstracts of Papers Concerning Virginia Herpetology given at the Society for the Study of Amphibians and Reptiles/ Herpetologist League Meetings held August 10-15, 1986 in Springfield, Missouri

Environmental Resources and Behavioral Interactions Among Desmognathus Salamanders. Keen Hubert, State University of New York College at Cortland.

Evidence from field enclosure and laboratory experiments, and from field observations, indicates that Desmognathus salamanders defend their refuges and expel intruders from occupied sites. Refuges may be critical resources because of their moisture retention, effectiveness as predator refuges, or suitability as bases for foraging. Salamanders attempting to invade territories held by others often incur injuries which may affect growth and reproduction. I hypothesize (1) that Desmognathus salamanders defend their refuges as critical resources, (2) that the site defended changes on the scale of a few days because of temporal habitat variability, and (3) that growth and reproduction are affected by the success of individuals in acquiring and defending refuges or cover sites.

Reproduction of the Timber Rattlesnake in Northwestern Virginia. William H. Martin, Harpers Ferry, W. Va.

From 1973 to 1986 studies were done on the timber rattlesnake, Crotalus horridus, in Shenandoah National Park, Virginia, and in other nearby sites. Field observations exceed 4000. Among snakes, the timber rattlesnake

represents the extreme in K-selection. Females bear first young at five to eight years of age and thereafter at two-, three-, and four-year intervals, depending on the weather, nutrition, and age, fecundity increasing with age. The proportion of females reproductive in any one year varied from 10% to 70%. Mating begins late July with onset of vitellogenesis and continues through mid-September. Ovulation occurs early June of the following year with gestation and birthing at ancestral-communal rookeries located within 400 meters of hibernacula. Small litters of 4 to 12 are born in September, with mother and young staying together about 10 days. Only about 30% of the neonates spend their first winter in the communal hibernacula. Overwinter mortality on the neonates is about 50% and for the first year is 67% in contrast to 10% annual mortality for the adults. Adults comprise about half of the population which is estimated at 5400 for Shenandoah's 115,000 hectare ecosystem.

Membership Application

I wish to ☐ initiate ☐ renew membership in the Virginia Herpetological Society for the year 19_____.

☐ I wish only to receive a membership list. Enclosed is $1.00 to cover cost.

Name _____

Address _____

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Dues category: ☐ Regular (5.00) ☐ Family (7.50) ☐ Under 18 (3.00)

Interests: ☐ Reptiles ☐ Amphibians ☐ Captive husbandry
☐ Distribution ☐ Research ☐ Specifically: _____

Make checks payable to the Virginia Herpetological Society and send to the treasurer.

Virginia Herpetological Society

Help make Herpetology come alive in Virginia...

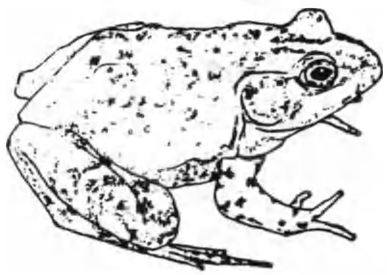
with the Virginia Herpetological Society

The Virginia Herpetological Society

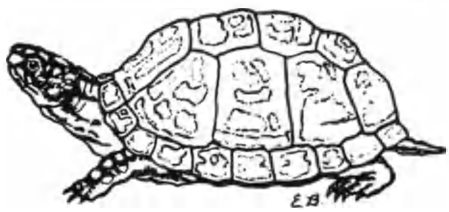
A society open to everyone with an interest in the conservation, study and care of reptiles and amphibians

The Virginia Herpetological Society was organized in 1958 to bring together people interested in advancing the knowledge of Virginia's reptiles and amphibians. The VaHS encourages the scientific study of Virginia's herpetofauna and its conservation. Educational activities continue to be important society functions.

Meetings are held twice each year, in Spring and Fall, at different locations throughout the state. The program is open to all members and includes a business meeting and a contributed papers session, during which members present information on their work with reptiles and amphibians, particularly in Virginia. An afternoon field trip usually follows.



The VaHS publishes a bulletin, CATESBEIANA, twice each year which contains articles, news and information on various aspects of Virginia herpetology. Members publish field notes and observations, distributional information and suggestions for improving husbandry techniques. Review articles appear occasionally. Material for inclusion should be sent to the CATESBEIANA editor.



Society dues are $5.00 per year ($3.00 for members under 18, and $7.50 for families).

Inquiries should be addressed to the secretary.

Membership can be initiated at meetings. Dues may be paid at that time.

President: Richard L. Hoffman, Dept. of Biology, Radford University, Radford, VA 24142

Vice President: Christopher A. Pague, Dept. of Biological Sciences, Old Dominion University, Norfolk, VA 23508

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Coeditors: Eugene Gourley and Charles Neal, Radford University, Radford, VA 24142

Advantages of VaHS membership

- Spring meeting with talks, slides, and field trip
- Fall meeting with lectures, film or workshop
- Society bulletin published twice per year
- Extensive research material available
- Awareness of current herpetological events
- Opportunity to meet others who share your interest in herps
- Support of VaHS education and conservation goals

Major Papers

Manuscripts being submitted for publication should be typewritten (double spaced) on good quality 8 1/2 by 11 inch paper, with adequate margins. Consult the style of articles in this issue for additional information. Articles will be refereed by at least one officer (past or present) of the VaHS in addition to the coeditors. All changes must be approved by the author before publication; therefore, manuscripts should be submitted well in advance of March or September.

Reprints of articles are not available to authors; however, authors may reprint articles themselves to meet professional needs.

Field Notes

This section provides a means of publishing natural history information on Virginia's amphibians and reptiles that does not lend itself to full-length articles. Observations on geographic distribution, ecology, reproduction, phenology, behavior and other areas are welcomed. Reports can be on a single species, groups of species or fauna from selected areas, such as a state park or county. The format of the reports is TITLE (species or area), COUNTY AND LOCATION, DATE OF OBSERVATION, OBSERVERS, DATA and OBSERVATIONS. Names and addresses of authors should appear one line below the report. Consult published notes or a coeditor if your information does not readily fit this format.

If the note contains information on geographic distribution, a voucher specimen or color slide should be sent for verification and deposited in a permanent museum or sent to the VaHS. Species identification for observational records should be verified by a second person.

The correct citation format: Croy, S. 1984. Field notes: Lampropeltis getulus niger. Catesbeiana 4(1):12.

Herpetological Artwork

Herpetological artwork is welcomed. If the artwork has been published elsewhere, we will need to obtain copyright before we can use it in an issue. We need drawings and encourage members to send us anything appropriate, especially their own work.