

## Spot-problem Solving: A New Approach to Virginia Herpetology for the Next Millennium

Richard L. Hoffman\*

Virginia Museum of Natural History  
21 Starling Avenue  
Martinsville, Virginia 24112

### ABSTRACT

Recommendations are provided for future studies addressing the geographic distribution of amphibians and reptiles in Virginia. Four categories are discussed: possible additions to the state's fauna, valuable in-state distributional refinements, verification of curious localities, and the potential for new species in Virginia.

When I was first asked to present some commentary on the occasion of the Virginia Herpetological Society's annual meeting in Richmond in October 1999, my initial inclination was to look backward over the 60 years of my interest in the Virginia fauna. It is always tempting to indulge in reconstructing how things were long ago (after all, I was conceived in the year that Dunn's *Salamanders of the Family Plethodontidae* was published), and how they have changed. Often such glimpses of the past are the most interesting things that elders can contribute. After some consideration, however, I decided that a look into the future might be valuable also. I propose such a look to be not one of prophesy, but one of possibility.

As in every other aspect of human activity, herpetology in this country has gone through some remarkable evolution, starting with the great foundation provided by Holbrook's *North American Herpetology* (1836-1842) and Cope's *Crocodilians, Lizards, and Snakes of North America* (1900). In turn we have had the famed checklists of Stejneger & Barbour (1917), the advent of *Copeia* (first published in 1913), the inauguration of generic revisions following the model of Ruthven's (1908) treatise on *Thamnophis*, a number of state herpetologies (each bigger and better than its predecessors), Dunn's (1926) famous salamander book, Ditmars' popular accounts (e.g., 1907), and the first of a flood of field guides, Conant & Bridges' (1939) *What Snake is That?* Then

state and/or regional herpetological societies, more new journals, and upgrading of the old ones. Statistics, karyotypes, cladistics, electrophoresis. Endangered species; conservation biology. In Virginia, we have gone from Dunn's (1918) key and list of state herps to fairly sophisticated baseline summaries in the final decades by Tobey (1985) and Mitchell (1994), the latter closing out the century with an atlas of state records (Mitchell & Reay, 1999). At least we have a general idea now what is here, and where it occurs, about twice as many species as Dunn listed. With this much of a start, perhaps it is justified to consider what might be emphasized in the decades to come.

About a decade ago, I annotated a Virginia county map with what at the time I thought would be good places to investigate for interesting new information about the in-state distribution of our native herp fauna. I mapped four categories: possible additions to the state's fauna, valuable in-state refinements, verification of curious localities, and possible new species, about 20 sites in all (see Figure 1 for an updated map). With the passage of some ten years, only a single speculation has been fulfilled: the discovery of a new salamander (*Plethodon sherando*) in the central Blue Ridge (Highton, 2004). Also, Tilley et al. (2008) recently validated the status of *Desmognathus planiceps*, a species which I helped discover more than a half century ago (Newman, 1955), only to see it relegated to the synonymy of *D. fuscus* a few years later (Martof & Rose, 1962).

I very much doubt that any further new species, even in the boundless genus *Plethodon*, are likely to be found, although Tilley et al. (2008) hinted at the possibility of another new *Desmognathus* along the Blue Ridge

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\*Deceased. This paper was mostly written around 2000 and partially updated in early 2012 several months prior to Dr. Hoffman's death. Some editorial changes, new text, and literature citations were added by Steve Roble, *Banisteria* editor, who also prepared the bibliography and updated map.

escarpment a short distance north of the Virginia-North Carolina border. Nevertheless, there are still a lot of challenges for those looking for something to do, maybe even close to where they live. Bear in mind that the following entries are just some that occurred to me over the years; doubtless the list could be considerably expanded and herpetologists are urged to submit their own contenders.

In trying to organize my thoughts about this, I produced several categories within an overall theme. It seems that with only a few exceptions, most investigations of our herp fauna have been to answer the questions “What?” and “Where?”. And, to be sure, these should and must be prioritized as the first steps in this course of knowledge. We must learn to crawl before we learn to fly, and inventory is basic to anything. I would be the last to denigrate faunistic and local biogeographic studies (I have long been a practitioner of both), or suggest their discontinuation, but so often these approaches are largely opportunistic and casual. “I’ve lived here for X years and these are the species I’ve found” OR “I lucked out with a great roadkill that extends the known range of X. y. some 25 km ...” Cumulatively, all this random and aimless pack-rattling has largely defined our present knowledge of distributions in the state.

In developing conservation strategies, we have gone from protecting individual species to protecting entire ecosystems. What I will propose here for future in-state studies is just the reverse: going from the collective (faunistic) approach to the individual. For lack of a better name, I suggest “Spot-problem Solving”: which is to say, considering various aspects of local herps on a deliberate, intentional, per-species basis. Let me give a few of the larger categories that I can imagine, and a few examples for each. The geographic bias will be obvious enough, but the same thing can be extended into studies on ecology, life history, population structure, or whatever you wish. The examples given are just the tips of icebergs of ignorance and can be indefinitely expanded.

### I. Adding species to the known state faunal list

There are a LOT of species known from adjacent states, in localities virtually on the Virginia state borders. The recent discovery of *Pseudacris nigrita* in southeastern Virginia (Hobson & Moriarity, 2003) is a prime example of this sort of potential new state record. There being no obvious physical or ecological barriers, there is every reason to suspect that some or all of the following species will also be added if somebody simply makes a personal crusade to search as long and intensively as necessary to turn them up. Starting with the southeast we have:

(1) *Anolis carolinensis*, not yet documented with a real Virginia specimen, but with enough circumstantial evidence to suit me that it occurs in the Dismal Swamp. Residents living south of Cypress Chapel described the species to me accurately enough, in 1947, and I think the old literature record (Stansbury, 1924) for Lake Drummond is also definitive, although Mitchell et al. (1999) argue otherwise. The northern limits of this species’ range extend entirely across North Carolina from about Edenton to the Blue Ridge, at about 40-50 miles south of the Virginia border (Palmer & Braswell, 1995). At what point might not this line lobe northward into southside Virginia? I think that any state-line county/city from the coast as far west as Clarksville stands a good chance of harboring small populations of this lizard.

(2) The northernmost locality cited for *Nerodia fasciata* by Palmer & Braswell (1995) is Urahaw Creek, Northampton Co., NC, which is 16 miles/26 km south of the Virginia line near Boykins, with absolutely no break in habitat continuity. Water snakes are not usually hard to find, and would not a prolonged search in Fontaine Swamp be a reasonable effort to expend to add another native snake to our list?

(3) *Rhadinaea flavilata* and *Seminatrix pygaea* have nearly the same range in eastern North Carolina, both occur as far north as the Outer Banks at Nags Head (Braswell, 1988; Palmer & Braswell, 1995). These snakes should be sought in extreme southeastern Virginia, such as in the Back Bay/False Cape area.

(4) *Eurycea chamberlaini*, a species recently distinguished from *E. quadridigitata*, has been found just 13 miles/21 km south of Virginia (in line with Buggs Island dam), just east of Henderson, Vance Co., NC (Harrison & Guttman, 2003). Again, without a physical or ecological barrier in the way, can we believe that this species would not be found by a search through springs and seeps in Mecklenburg County? For whatever the rumor may be worth, I was told many years ago by Maurice K. Brady (a Washington, DC herpetologist) that he had seen Virginia specimens, taken by the entomologist Titus Ulke in Warwick Swamp [Prince George or Sussex Co.], while he was pulling moss from cypress trunks and knees in his search for beetles. Brady was certainly familiar with the local fauna, and he was at pains to assure me that he could distinguish *E. quadridigitata* from small *E. bislineata* (local populations now referable to *E. chamberlaini* and *E. cirrigera*, respectively). Of course, Ulke’s material was not preserved, but would not this lead be worth pursuing during the cooler months of the year?

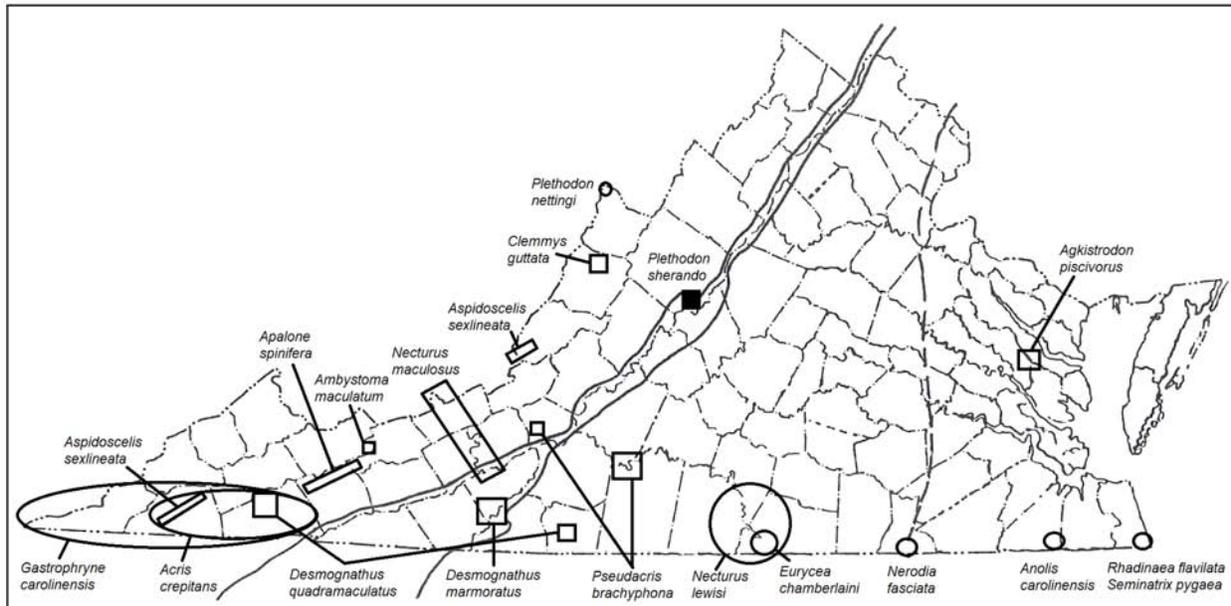


Fig. 1. Generalized locations of areas in Virginia that warrant targeted surveys for selected species of amphibians and reptiles. Circles along the state border indicate areas to survey for potential new state records. All other symbols refer to either questionable or unsubstantiated records that require verification, or indicate areas where a species may occur in Virginia outside of its currently documented range. The solid square denotes the range of *Plethodon sherando*, a recently described species (Highton, 2004). Solid lines traversing the state indicate the limits of the Blue Ridge physiographic province and the dashed line marks the location of the Fall Line separating the Coastal Plain and Piedmont regions. See text for further details.

(5) *Necturus lewisi* may in fact be confined to the Neuse River in North Carolina, but the headwaters of that system oppose tributaries flowing north into the Roanoke River basin in Virginia. There is thus the chance that stream captures might have given *N. lewisi* access to the north, and this can never be discounted until somebody initiates extensive trapping in Halifax and Mecklenburg counties, VA, using the exact protocols specified in Braswell & Ashton's (1985) detailed account of this aquatic salamander.

(6) *Plethodon nettingi* has been found only a few miles west of the upper corner of Highland Co., VA, and the Locust Springs region should be worked over carefully. Dr. Richard Highton has collected there, but he admitted that he had not gone up into the red spruce forest above the camping area. I'd consider the odds for success in adding *P. nettingi* to the Virginia fauna as "not bad."

## II. Verification/confirmation of undocumented or suspect records

In one guise or another, some species have shown up in the literature at sites outside the probable local range. While such wraiths are extremely difficult to eliminate by subsequent collecting (a specimen with even a dubious

locality always trumps any amount of unsuccessful attempts at verification), at least the case for skepticism can be reinforced. There are really a lot of loose ends that need to be checked out. The following list is only a tithe of what's lurking in the record books:

(1) *Desmognathus marmoratus*, formerly placed in the monotypic genus *Leurognathus*, has been repeatedly found in the Laurel Creek drainage basin between Damascus and Troutdale in Washington Co. It has also been recorded for two Patrick Co. localities, both of which remain to be confirmed: one being the headwaters of Laurel Fork at mile 174.3 on the Blue Ridge Parkway, the other a so-called "Crumpacker's Mill" on the upper Dan River. The former record (plotted in Conant, 1975 and all subsequent editions of his field guide) originated from a reputable collector (Samuel H. Sweet), but one who also picked up aquatic salamanders farther south, in North Carolina, where *D. marmoratus* does occur, on the same collecting trip. I have, alone or with colleagues, worked at the Parkway locality and many others on the headwaters of the same stream for about 20 years, using the seine-downstream-to-kicked rocks technique, which produced plenty of *D. monticola* and *D. quadramaculatus*, but nothing that might pass for *D. marmoratus*. To the best of my knowledge, there is not

nor ever was a Crumpacker's Mill in Patrick Co. (local residents are also unaware of such a locality), and seining in the upper Dan around Cockram's Mill, on U.S. Rt. 58 near Meadows of Dan, has been negative so far. This purported record is based on a specimen in the Duke University collection obtained by the distinguished herpetologists Carl Gans and Joseph R. Bailey and family (Tobey, 1985). Maybe a general and intensive all-purpose survey of the region might turn up specimens, but to my mind, the overall stream structure there does not look like *D. marmoratus* habitat. These two records strike me as a sort of "cold cases" but I suppose they cannot be discredited by the assumption of mislabeling. Let's keep on looking even as a "long shot" venture.

(2) *Clemmys guttata* in the Cowpasture River? The range maps in Mitchell (1994) and Mitchell & Reay (1999) show the majority of dots in the Coastal Plain and outer Piedmont, with a few in the Shenandoah Valley, and none at all in the folded Alleghanies. Around 1935, when I was about 8 years old, a Sunday afternoon family automobile excursion had me standing on the bridge over the Cowpasture River at Fort Lewis in Bath Co. Directly below, some 15 feet beneath my feet, were two black turtles with numerous yellow spots on their carapaces. Subsequent inspection in "Compton's Pictured Encyclopedia" disclosed a photograph of this very species, identified with the same Latin name as in current usage. I do not believe it is possible that I could have mistaken the animals for anything else. Many visits to the site in subsequent years have never revealed spotted turtles again. But only a hundred meters downstream, on the eastern side, is a rather long floodplain pond, formerly a part of the original channel, and it may be possible that this pond, rather than the river, was the source of the two turtles that I saw. It may take nothing more than a pair of binoculars to confirm this record, or perhaps some turtle traps would be more effective. In any event, the locality merits an adequate follow-up.

(3) *Ambystoma maculatum* is widespread in Virginia although records are scarce west of the Blue Ridge (Mitchell & Reay, 1999). I was recently advised by a resident of Burkes Garden, Tazewell Co., that his son had discovered a black "lizard" about a foot long, with two rows of yellow spots, in an empty fishpond at his house. I never listed *A. maculatum* in several accounts of the Burkes Garden amphibian fauna (Hoffman & Kleinpeter, 1948; Hoffman, 1955, 1983), as the paucity of breeding sites seemed to be an excluding factor, but I apparently underestimated the ability of the species to improvise, as the nearest surface water to the capture site could not have been less than a mile (1.6 km). If the record is confirmed,

Burkes Garden will probably be the highest place (3200 ft/975 m) at which *A. maculatum* is known, and the question can be addressed, where do they breed in that strictly karst topography?

(4) All of the verified localities of *Pseudacris brachyphona* in Virginia lie west of the New River and north of the Iron Mountain foothills (Hoffman, 1981; Tobey, 1985; Mitchell & Reay, 1999). In 1950 I heard this species calling at Wabun in western Roanoke Co., which is farther east, but was unable to voucher the record. The Duke University collection has a specimen of *P. brachyphona* from the Smith Mountain gorge, Pittsylvania Co. This locality seems somewhat too removed from the known eastern periphery of the species' range (Pulaski Co.) to accept without verification, and Mitchell & Reay (1999) judiciously did not include it on their map for *P. brachyphona*. Some road-cruising on rainy spring nights would seem mandated as the easiest way to pick up new records if indeed the species does occur there in an extremely disjunct population.

(5) What about *Necturus maculosus* in the upper Kanawha River? I previously mentioned (Hoffman, 1984) a specimen of this species supposedly taken in the New River just above Radford, at a site long since inundated by Claytor Lake. As the specimen had been lost some time after I saw and recorded it (Hoffman & Mitchell, 1994), the locality was omitted from the Mitchell & Reay (1999) atlas map. Nonetheless, *N. maculosus* has been captured farther downstream in the New River Gorge in West Virginia, using search techniques developed by Kurt A. Buhlmann. Dr. Buhlmann informed me that this species is usually found in emergent beds of riverweed (*Justicia americana*) along this river. Could these techniques not be applied to appropriate reaches of the New River in Virginia in an attempt to verify the species' presence here? What a nice warm-weather pastime for a canoer!

(6) And speaking of canoe opportunities, there is an unconfirmed sighting of the Eastern Cottonmouth (*Agkistrodon piscivorus*) in Dragon Run, upstream of the U.S. Rt. 17 bridge near Saluda (Middlesex Co.). Many years ago I was assured by Paul Donnelly, on the landscape architecture staff at UVA, that he had made such an observation, and staunchly defended his ID against my claims of old male *Nerodia sipedon*: he asserted that he knew the difference, that water snakes did not display a wide, white mouth. If such a find, anywhere along Dragon Run, could be confirmed, a nice northern extension of range would be established. Even if his snake turned out to be only *Nerodia taxispilota*, that would not be all bad, either.

### III. Fine-tuning ranges

Although of a low order of scientific importance, it is nonetheless a harmless and pleasant occupation to map out the present distribution of various species with precision. Salamanders lend themselves well to this pastime (most reptiles are out of the question!), and not long ago I published (Hoffman, 1992) in *Catesbeiana* what I still consider as the definitive statement about the range of *Plethodon yonahlossee* in Virginia. This same approach can be applied to any species that is not actually statewide, to finally locate the peripheral populations.

(1) I have collected many records for *Desmognathus quadramaculatus* over the past several decades, but there remain many unresolved issues, in particular with respect to the western boundary. Dunn's (1918) early record for "Abingdon" needs confirmation, as does a spot on Tobey's (1985) map representing Brumley Creek, in the western part of Washington Co. The species apparently is not in Tumbling Creek, 10 miles to the northeast along Clinch Mountain, at any rate. The map for this species in Mitchell & Reay (1999) shows a spot in Henry Co., VA, based on material in the Carnegie Museum said to have been collected by George W. Burton at Spencer. I have so far been unable to confirm this outlying site, and suspect mislabeling (Burton spent summers at Mountain Lake [Giles Co.], where *D. quadramaculatus* is common), but I may have missed just the one cool spring branch, and the matter remains open pending still more field work. I know that the species extends northward along the Blue Ridge escarpment in Franklin Co., but that area too, remains open-ended as it is in adjoining Floyd Co. I believe that the locality spotted in Alleghany Co. IS in fact the northernmost population in Virginia.

(2) *Aspidoscelis* (formerly *Cnemidophorus*) *sexlineata* occurs over much of Virginia east of the Blue Ridge, and follows the valleys of the Roanoke and James rivers westward into the folded Alleghanies. It is abundant around Clifton Forge, for instance, and has been found southwest of Covington along Potts Creek. How far north does it extend into Bath Co., and how far southwest along Potts Creek, where dry shale barren habitats provide continuous habitat? Just 20 more miles in that direction would place the species in Monroe Co., WV. This species was recently added to the fauna of West Virginia based on records obtained in the Eastern Panhandle (Morgan Co.) near the Potomac River (Humphries et al., 1999). It is also known from eastern Tennessee almost to the Virginia border (Conant & Collins, 1998). In far southwestern Virginia, one can expect *A. sexlineata* in Scott Co. in the Clinch River valley. This lizard is partial to railroad rights

of way so perhaps some time invested in walking along the tracks in the stretch between Clinchport and Dungannon might yield some sightings and specimens, as would the parallel fallow fields in the Clinch River floodplain.

(3) Almost the same statements could be made for *Acris crepitans*. Cricket frogs are known from the Eastern Panhandle region of West Virginia (Green & Pauley, 1987), as well as eastern Tennessee along the Holston River (Redmond & Scott, 1996), but confirmed Virginia records are lacking for this species west of Roanoke (Mitchell & Reay, 1999). It occurs along rivers, even small rocky creeks, but is rarely evident except where an impoundment is made. The Holston and Clinch river floodplains in Washington and Scott counties should be surveyed for this species.

(4) A breeding chorus of *Gastrophryne carolinensis* was discovered in 1950 from a site along U. S. Rt. 58 west of Jonesville, Lee Co., VA by Fowler & Hoffman (1951). The specimens were later misplaced or lost, and the original site has since been converted into a cornfield. Two additional localities along the Powell River in Lee Co. were documented in 1958 by Burger (1974), but the species is obviously uncommon there and his specimens were also lost. Due to the loss of all vouchers, none of these records was plotted in the Mitchell & Reay (1999) atlas. Roble & Hobson (2000) found another small breeding colony of *G. carolinensis* west of Jonesville in 1995 (which is plotted in the atlas). This species was reported from Bluff City, TN, by Bailey (1936), only a few miles south of Bristol on the South Fork of the Holston River, presaging discovery in that part of Washington Co., VA. Redmond & Scott (1996) plotted a second record in Sullivan County, TN (borders Scott and Washington Cos., VA). In that connection, some years ago Douglas Ogle gave me a newspaper clipping that featured an odd small frog found under a board at a sawmill site near Damascus. The caption account of an inch long, wedge-shaped animal match the blurry photograph well enough to strongly suggest that the creature was indeed a *Gastrophryne*. There is in fact no reason why this species will not be found in the larger river valleys of Lee, Scott, and Washington counties, perhaps most effectively by road-cruising after heavy summer rains with low atmospheric pressure.

The distribution of *G. carolinensis* in the southern Piedmont is also worthy of further study. I thought that Pittsylvania and extreme eastern Henry Co. formed the western range limit of this species in this region (Hoffman, 2000), but, astonishingly, Fredericksen et al. (2007) reported the capture of a specimen near Ferrum in

Franklin Co. to the northwest.

(5) How far upstream does the spiny soft-shelled turtle (*Apalone spinifera*) extend in the North Fork of the Holston River? Douglas Ogle told me that it is not uncommon around Saltville. Voucher specimens from anywhere along this river (and the Clinch as well) would be very desirable.

I recently happened across a paper (Redmer et al., 1999) treating the occurrence of two species of treefrogs in southern Illinois, and take this opportunity to use it as a kind of model of what can be done. In the example shown, *Hyla cinerea* was cited for only four localities in P. W. Smith's herpetology of Illinois (1961), but in the more recent paper, 127 sites are mapped and the known area of distribution more than tripled for the state.

#### IV. Non-distributional problems

There are again a lot of intriguing issues in other domains to be worked up by patient local studies. Here are two obvious examples:

(1) Until just recently, we had only one species of *Kinosternon* in Virginia, *K. subrubrum*, the well-known mud turtle which is widespread east of the Blue Ridge. Now confusion has been introduced by the recognition of *K. baurii*, a Coastal Plain resident which can be primarily distinguished by resort to morphometric comparisons (Lamb & Lovich, 1990). If these two concepts really represent actual species, there must be some kind of effective isolating mechanism that prevents interbreeding, as shades of difference in body form and proportion are unlikely to be perceived and respected by the animals themselves. In the Coastal Plain where two taxa reportedly occur, concentration on this problem might reveal differences in breeding season, different chemical attractants, or some totally unanticipated mechanism. The regrettable effect of basing biological studies on organisms that have not been adequately defined taxonomically is that whatever was published about the original species is instantly invalidated when it is found to be two (or more) sympatric species!

(2) Why, as I have noticed repeatedly in southeastern Virginia, as well as locally here in Martinsville (Hoffman, 2007), will a particular site suddenly burgeon with vast choruses of some frog or another, despite showing no evidence of being there in previous years, under what seemed to be optimal conditions for calling and at virtually the same dates. I have no idea how this might be investigated, but it is a curious and exasperating

phenomenon.

In conclusion, while opportunistic captures and sightings will always be a useful source of information and should not be denigrated, I believe that selection of specific problems and application of concentrated effort toward their solution should be given increasing emphasis in the future. Such narrowed focus offers the reward of both increased understanding of our local species, but the added pleasure of achieving often elusive goals. A similar approach can be applied to address distributional problems of many other taxonomic groups.

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Lawrence M. Carter and Richard L. Hoffman with an Eastern Ratsnake (*Pantherophis alleghaniensis*) along the North Landing River in southeastern Virginia, May 1948 (photo provided by Richard L. Hoffman).