

Investigation and Analysis of the Herpetological Atlases of the East Coast

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Introduction

A herpetological atlas (herp atlas) is a field survey and observation project that develops and produces maps of the distribution of reptiles and amphibians in a particular area. In the summer of 2011 I was fortunate enough to work on a herp atlas in my home state of Maryland. The Maryland Amphibian and Reptile Atlas (MARA) was begun in 2010 and it is a five-year joint venture between the Maryland Department of Natural Resources and the Natural History Society of Maryland (NHSM). Maryland is long overdue for a herp atlas; many other states and even some countries have herp atlases. For my summer project as an intern at Jug Bay Wetlands Sanctuary in Lothian, Maryland, I undertook a research project learning about and comparing the herp atlases of the east coast. I limited the project to the east coast simply for the purpose of time; a more thorough project could have investigated all of the atlases in the United States. The implications my research holds for MARA are threefold: to gather new and innovative ideas to implement into this atlas; to get forewarning and thus time to circumvent future problems that may occur; and to see how the approach and procedures of the Maryland atlas compare with those completed in nearby states.

Author's Note:

In conducting my interviews there were a great many things said. As I had no recording device available, all of the interview transcripts were typed by me while simultaneously conducting the interviews. This process resulted in a lot of paraphrasing of what interviewees actually said into my own words to keep up with their talking speed and the thought processes involved in a two-way conversation. I have cited individuals and given credit where it is due as accurately as possible. For any flubs, snubs, or misinterpretations, the fault is my own and I present my apologies.

On another note, I use the word 'volunteer' frequently in this report. In the context of a herp atlas and citizen science as a whole, using 'volunteer' to define a participant who is helping contribute to science research is somewhat misleading. Many 'volunteers' are not scientists but there are some who are. Numerous herp atlas volunteers are actually professional biologists offering their services, and as such are very knowledgeable about the natural world and the ideals of science. For the purposes of this report when I say 'volunteer' or 'participant' I intend this term to be interpreted as, "an average person who does not have a strong background in the natural or biological sciences".

Background

A state herp atlas is an important source of data for wildlife managers, scientists, and researchers. In some cases – though certainly not all – a state has little comprehensive background information on the distribution of many species that occur in their jurisdiction. In Maryland the last distributional survey on reptiles and amphibians was published in 1975 by Herb Harris Jr.. His publication was based primarily on locality records of specimens collected and held in private collections, universities, and museums, and in the collections at the Natural History Society of Maryland (Therres et al. 2009). Needless to say, 35 years is plenty of time for herp distribution and population to have changed; people have shifted, lands have been developed or left to nature, roads have been constructed, etc. As humans impact the landscape they too impact the populations

and distribution of herpetofauna. Price and Dorcas (2011) note that “the ability to document the response of amphibians and reptiles to anthropogenic threats is often limited by the lack of basic knowledge regarding their population status and distribution.” In Maryland, there is insufficient background knowledge of herpetofaunal distribution, making a herp atlas an invaluable way to gather baseline knowledge for management decisions. Herp atlases also hold special importance in regards to Species of Special Concern or endangered species because an atlas can help to identify critical habitat areas that may not be presently protected.

A study conducted by Gaston and Fuller (2009) indicated that 47% of species listed on the International Union for Conservation of Nature (IUCN) are listed on the basis of their geographic range alone. They also assert that range size is a strong predictor of extinction risk, and that the availability of data on ranges is an important contribution to indices of threat status and prioritization of species for conservation. Knowledge of species distribution in individual states contribute to known range data.

Lastly, herp atlases provide a starting point from which to base future research on species’ ecology, in particular for species which are little known.

In addition to the data they provide, herp atlases are important mechanisms for encouraging citizen science. Citizen science is a research technique that enlists the public in gathering scientific information (Cooper et al. 2009). Citizen scientists uniquely benefit the field of ecology because they can help document species or ecological conditions occurring across broad geographic scales and on private lands where traditional research methods are difficult to implement (Dickinson et al. 2010). Furthermore, citizen science appears “particularly effective at finding rare organisms, including new, invasive organisms, and disappearing native species” (Dickinson et al. 2010). Using volunteers also saves money, as funding the same number of salaried field technicians could deplete funding (Cohn 2008). These components play heavily into the attributes of a herp atlas.

The main role that citizen scientists play is in data collection; they do not write reports, papers or analyze data (Cohn 2008).

Another crucial component of citizen science is the opportunity for science education. Proponents of citizen science not only want citizens to get involved, they want them to learn about the projects that they are contributing to. In this case, citizens would be learning more about the herp species that occur in the state in which they live. This presents an opportunity to set the record straight about some of the misconceptions surrounding reptiles and amphibians. For example, during herping excursions this past summer throughout south central Maryland, I have encountered children who believe that turtles can change their shells and adults who think that the southern Water Moccasin (*Agkistrodon piscivorous*) occurs in Maryland; this snake is only found from mid-Virginia and to the southern states. . These are misunderstandings that might be corrected by participating in a project such as the Maryland herp atlas.

The trick to citizen science is balancing the needs of data collection with the goal of educating the public (Cohn 2008). Ideally the public would come away with an increased appreciation of the scientific process, as well as basic knowledge of the subject they investigated. Implemented the right way, an encouraging experience participating in a citizen science program could positively influence the relationship between the public and ecologists (Dickinson et al. 2010). Our herpetofaunal populations will also benefit

directly from citizens who begin to care about animals that they now understand and appreciate in a much greater capacity.

Methods

This report is based mostly on interviews that I conducted with leaders and coordinators of herp atlases in the other east coast states (see **Figure 1**). I initially emailed them requesting time for a short interview consisting of 12 questions and lasting approximately 20 minutes. All interviewees were asked the same questions and I asked clarification questions when they were warranted. If a phone interview was inconvenient, participants were sent the questions via email.

I wrote the questions to address three separate areas of a herp atlas:

1. The resources
2. The data
3. Reflections on the results or progress of the atlas..

There were four questions in each category. Additionally, each interviewee was asked three optional questions. One was an open ended option to add any additional information, and the other two were yes or no questions asking for permission to send follow-up questions and if the participant wanted a copy of this research paper. **Figure 2** shows the categorical breakdown of the interview questions.

Interviewee	Position	State
Jim Andrews	Prof. at Middlebury College	Vermont
Malcolm Hunter	Prof. of Wildlife at University of Maine	Maine
Scott Jackson	Program Director for the Natural Resources & Environmental Conservation Program, University of Massachusetts, Amherst	Massachusetts
John Jensen	N. American Amphibian Monitoring Program Coordinator (for Georgia)	Georgia
Kenny Krvsko	Herpetology Dept. FL Museum of Natural History	Florida
Tim Maret	Dept. of Biology, Shippensburg University	Pennsylvania
Jonathan Mays	Maine Dept. of Inland Fisheries & Wildlife	Maine
Joe Mitchell	Former Prof. of Biology at University of Richmond, now runs own environmental consulting business.	Virginia
Paul Moler	Florida Fish & Wildlife	Florida
Steven Price	Dept. of Biology, Davidson College	Carolinas
Larissa Smith	Asst. Biologist at Conserve Wildlife Foundation of NJ	New Jersey

Figure 1: interviewees

Resource questions	Data questions	Reflection questions	Additional (optional) questions
1. What were the main sources of your funding?	5. How was progress measured during the project?	9. Did a report or publication result from this project? What is the title?	13. Any other points or recommendations that you would like to make about completing a herp atlas in your state?
2. Did you use social networking to communicate the project? (Y/N) Was it successful (Y/N)?	6. Did you use historical data? (Y/N) Why or why not?	10. What was the most difficult aspect of the project?	14. Would you mind if I sent you a follow up email question? (Y/N)
3. Do/did you accept online data submission? (Y/N) Was this a challenge?	7. How were records verified? Did your method of record verification work?	11. Is there anything you wish you could go back and change about the project?	15. Would you like to be sent my findings after the project is completed? (Y/N)
4. How did you go about gathering volunteers?	8. For distribution mapping, did you use USGS quads or another type of land classification system?	12. On a scale of 1 to 10, 1 being unsuccessful and 10 being a complete success, how would you rate the project in terms of achieving its goals?	

Figure 2: Interview questions.

Hypothesis

Having become familiar with the Maryland herp atlas (MARA), I was under the assumption that (#1) most of the other existing east coast atlases would be relatively similar. In addition, (#2) I predicted that the internet would be widely used due to the pervasiveness of the internet in modern culture. For the most part, these assumptions were decidedly off the mark. While the majority of the herp atlases I examined did share a vaguely similar framework, data collection and evaluation and data summary differed among them in a variety of ways. Internet use was mostly confined to email and online database record submission.

Results

In total, I contacted 27 people to request interviews from the 12 states with herpetological atlases on the east coast. These states included: Florida, Georgia, the Carolinas (North and South Carolina have a combined atlas), Virginia, West Virginia, Pennsylvania, Massachusetts, New Hampshire, New Jersey, New York, Maine, and Vermont. The majority of participants were initially contacted by me; others were forwarded my email by the initial contacts who felt that they were not the right person to talk with. Of the 27, six people were either unavailable for interview or forwarded my

message to someone else, and thus are not counted in the final tallies. From the 21 people remaining, eight never responded to my initial request. Understandably, the summer is a main field season so a large response rate was not to be expected. In the end I triumphed with a 50% interview rate (i.e. 11 total interviews) from 9 out of 12 possible states. Though I could not get in touch with Al Briesch, the coordinator of the New York Amphibian and Reptile Atlas Project, I include some data from the NY Herp Atlas based on information from on the NY Department of Environmental Conservation website (<http://www.dec.ny.gov/animals/7140.html>).

Analysis

Mapping

Most of my base assumptions were grounded in of what I knew of the MARA project. Thus I assumed that most herp atlases used U.S. Geological Survey (USGS) 7.5 minute quadrangle topographic maps to plot their data. Contrary to this belief, six of ten states (VA, VT, ME, FL, GA, CARO) did not use USGS quads to map distribution. Instead, the majority of states mapped herpetological distribution via counties or townships. When I questioned this method, the answers I received were nearly identical: most people know what county or town they lived in, but were very unlikely to know what USGS quad they live in (VT, ME, CARO, GA). In Virginia, the maps were made by putting dots on an 11x14" map, which were then scanned to scale. From there coordinates were generated. Virginia did not fine-tune the generated coordinates (pers. comm. Joe Mitchell). Florida took the locations sent to them and converted them into decimal degrees through various means (pers. comm. Kenny Krysko). Only Pennsylvania, Massachusetts, and New York used USGS quads when mapping out distributions.

Funding

All states had funding at some point in their project, though they might not have kept that funding throughout the entire project. Nine of ten states acquired state funds at some point in their project (PA, VA, VT, ME, FL, GA, NJ, CARO), with Massachusetts being the only state to have a privately funded atlas. The MA atlas was funded initially by the Massachusetts Audubon Society and later by the University of Massachusetts (UMass) (pers. comm. Scott Jackson). Generally the state funds came from the state departments of wildlife or natural resources (VT, ME, FL, VA, CARO, PA, NY), but other public funds came from the U.S. Fish and Wildlife Service (NY), National Science Foundation (FL), nongame conservation funds (GA), state wildlife grants (NJ), and specialty license plates (GA). Over half of atlases were funded by multiple sources (NJ, VT, ME, FL, GA, NY), which were often a combination of public and private money.

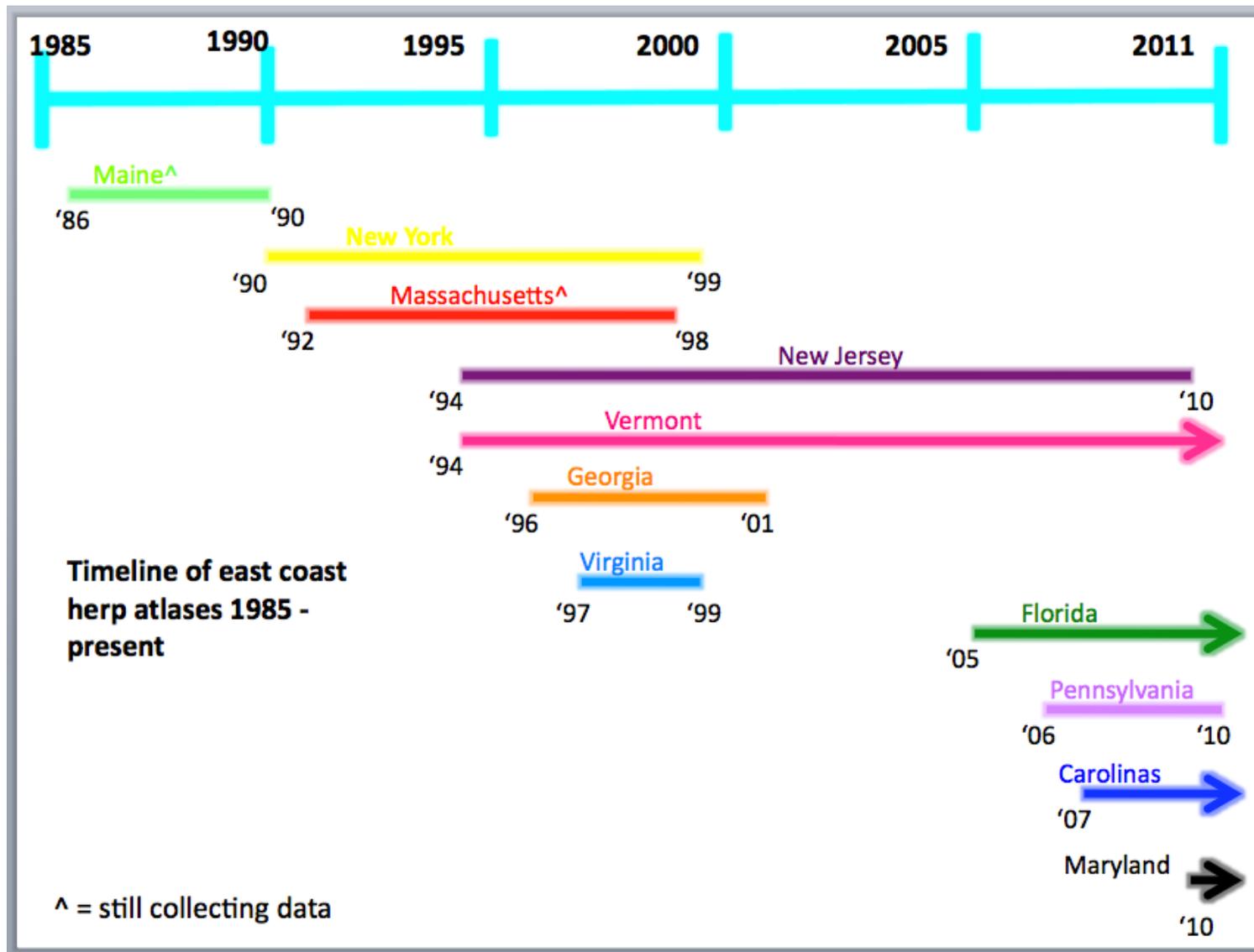
Use of the internet

With the invention of the internet the options for collecting and managing data were greatly expanded. **Figure 3** shows the start and end dates for each atlas. In the 1980s and early 1990s there was not much utilization of the web because the technology was still new. As time and technology progressed, the internet was used for classical methods of social networking such as emails to personal or professional contacts.

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Surprisingly, not a single herp atlas leader I interviewed made use of modern social networking sites like Twitter and Facebook, though to be sure only for those projects collecting data after 2006 would this even be possible.

Figure 3: Timeline of east coast herp atlases 1985 – present. Arrows indicate that herp atlas is still continuing.



Pennsylvania and the Carolinas were the only two herp atlases which collected data exclusively online for the entire duration of their projects. The Massachusetts atlas ended in the late 1980s/early 1990s but continues to collect current data via an online database. The Carolinas, Massachusetts, and Vermont atlases, are the only east coast ones to currently accept online data submission via an online form. Pennsylvania is somewhat unusual, as the official PA Herp Atlas project ended in 2010. However, an involved participant of the former Pennsylvania Herp Atlas maintains his personal website (www.paherp.org) and still accepts data submission. According to his website he forwards all the data to the Pennsylvania Fish and Boating Commission (in PA reptiles and amphibians are considered ‘fish’) and the Pennsylvania Natural Heritage Program. As the current project in Pennsylvania is not run by professional biologists, I did not consider the www.paherp.org website to be part of the official herp atlas of Pennsylvania.

Most of the other atlases, with the exceptions of Virginia and New Jersey, either currently accept (ME, FL) or did accept (GA) data submissions by email. The Virginia atlas occurred too early to take advantage of email and New Jersey discussed the option but never acted on it. Larissa Smith of the Conserve Wildlife Foundation of New Jersey noted in her interview that the internet “would have been wonderful” in helping to gather the 16 years of data that New Jersey collected.

The internet is a great tool but there are definitely problems that need to be addressed. For example, Massachusetts had an issue with volunteers uploading photos to their database that the volunteers did not actually take as Scott Jackson discovered when one of his personal photos was submitted as a record to the MA atlas by a volunteer (pers. comm. Scott Jackson). The volunteer had seen an organism but had not photographed it. The MA atlas, like all other atlases, requires that if a photo is to be submitted as validation for a sighting, it must be a photo taken of the individual herp species in question by the person who witnessed it. In this instance, the volunteer misunderstood the system and they had simply searched the internet for any photo of their species and submitted it as evidence of the validity of their observation. Clearly, this is not how the photographic verification system is supposed to work!

Another point brought up by several interviewees noted that herp atlas researchers are unable to prove that volunteers took a photo where they say they took a photo. Yet on the same note, how can you prove that labeled museum specimens came from where their labels say they came from? You *could* prove it, but it would be costly in both the areas of time and money, which more often than not can’t be spared. Be that as it may, it is in the best interests of all herp atlases that use volunteers to assume that volunteers are always honest. A good question brought up by Steven Price is that of who benefits from a volunteer submitting false records? Why would Average Jane want to lie to a scientific research project? There is really no reason why a person volunteering their time and effort for a herp atlas would want to hobble the project by submitting false data on purpose. It seems implausible in the MA example described above, that the volunteer who submitted the internet photo was trying to purposefully mislead the atlas organizers. He simply did not understand the purpose of photographic validation.

Historical Data

In the initial planning stages, herp atlases are faced with the decision of whether or not to include historical data in their projects. For this paper, historical data can be defined as records based on museum specimens, and from publications, reports or other reptile and amphibian locality records in the state, that were made before the start of the herp atlas. Half of the herp atlases used historical records (FL, NY, ME, VT, VA) and half did not (NJ, MA, PA, GA, CARO). New Jersey did not use historical data because the organizers lacked the time and manpower to deal with the additional data. Massachusetts did not want to use historical data because the goal was to gather data for a ‘snapshot in time’ (pers. comm. Scott Jackson), and Pennsylvania already had an existing herpetofauna publication using historical data (pers. comm. Tim Maret). Herp atlas organizers that did include historical data did so because they felt that it would be negligent to leave it out (VA, FL, ME) and when I asked them why, their response was “why not?” In Vermont, historical data were not used in the project itself, but as a starting point for the project.

Historical records are a good supplement to data that a herp atlas collects because a comparison of distributions over time can be made. However, historical data can complicate a herp atlas because it adds to the total amount of data that has to be dealt with.

Reports and Publications

Often, one of the main goals of a state herp atlas is a report or publication. This was the case in all states except Pennsylvania, New York, and Massachusetts. Of the other state atlases, all have either written a report or publication (VA, VT, ME, FL, GA, CARO) or have the data collected but have not yet written a report (NJ). Maryland is only in year two of five in terms of data collection but intends to write a book when their project is complete. New York intends to eventually create a database of the amphibians and reptiles of New York (NY DEC website).

Massachusetts considered writing a report some day but instead opted to put all of the data online (pers. comm. Scott Jackson). Pennsylvania did not write a report or publication because that was not a goal of their project (pers. comm. Tim Maret). Figure 4 lists some of the reports and publications of the east coast herp atlases.

Figure 4: List of reports and publications using herp atlas data

STATE	PUBLICATIONS USING HERP ATLAS DATA
GEORGIA	<ul style="list-style-type: none"> •Camp, D.C., Elliott, M.J., Gibbons, J.W., and Jensen, J.B. <i>Reptiles and Amphibians of Georgia</i>. 2008. University of Georgia Press. •The Georgia Herp Atlas: Year II county records. 1999. <i>Herpetological Review</i> 30: 240 – 247. •Early rewards from the Georgia Herp Atlas. 1998. <i>Herpetological Review</i> 28: 212 – 214.
FLORIDA	<ul style="list-style-type: none"> •Quarterly reports to the Florida Fish & Wildlife Commission
MAINE	<ul style="list-style-type: none"> •Hunter, M.L., A.J.K. Calhoun, and M. <u>McCullough</u>. 1999. <i>Maine Amphibians and Reptiles</i>. The University of Maine Press. <u>Orono</u>, ME. 252pp. •Hunter, M.L., J.A. Albright, and J. Arbuckle. 1992. <i>The Amphibians and Reptiles of Maine</i>. Maine Agricultural Experiment Station, Bulletin 838. <u>Orono</u>, ME. 188pp.
VIRGINIA	<ul style="list-style-type: none"> •Mitchell, J. <i>Reptiles of Virginia</i>. 1994 •Mitchell, J. and <u>Reav</u>, K. <i>Atlas of Amphibians and Reptiles in Virginia</i>. 1999. Virginia Department of Game and Inland Fisheries.
MASSACHUSETTS	<ul style="list-style-type: none"> •data is available online (http://www.massherpatlas.org/)
CAROLINAS	<ul style="list-style-type: none"> •Price, S.J., and <u>Dorcas</u>, M.E. <i>The Carolina Herp Atlas: An Online, Citizen-Science Approach to Document Amphibian and Reptile Occurrences</i>. 2011. <i>Herpetological Conservation and Biology</i> 6(2):287–296.
NEW JERSEY	<ul style="list-style-type: none"> •Schwartz, V. and Golden, D. 2002. <i>Field Guide to Reptiles and Amphibians of New Jersey</i>. • full data not yet published
PENNSYLVANIA	<ul style="list-style-type: none"> --
VERMONT	<ul style="list-style-type: none"> •Andrews, J.S. 2002. <i>The Atlas of the Reptiles and Amphibians of Vermont</i>. James S. Andrews, Middlebury, Vermont 90pp. •Andrews, J.S. 2005. <i>The Atlas of the Reptiles and Amphibians of Vermont. 2005 Update</i>. James S. Andrews, Middlebury, Vermont 53pp. •Andrews, J.S. 2009. Reptiles and Amphibians. <i>In Where the Great River Rises: An Atlas of the Connecticut River Watershed in Vermont and New Hampshire</i>. The Connecticut River Joint Commission. Rebecca A. Brown, Editor. Dartmouth College Press, Hanover New Hampshire.

Verification of Records

“Proper species identification is crucial in studies that rely on citizen scientists to collect data” (Price and Dorcas 2011). Every herp atlas organizer that I interviewed indicated that they verified records for accuracy of identification. Unlike all of the other atlases, Virginia and Florida* did not actively solicit volunteers to assist with their projects. Using volunteers as data collectors can throw data into some uncertainty because volunteers may have little to no background in biology or the sciences. Thus a herp atlas needs to have a system for determining the accuracy of the data.

For example, submission of a record consisting of “I saw a Snapping Turtle (*Chelydra serpentina*) at place X” should not be taken at face value. Science is about backing up your assertions with evidence. If that record is submitted with a photo of said Snapping Turtle in which the field markings are clearly visible, then that record would be considered valid because there is *proof*. Accepting photo verification is the most common method of record verification – probably because it is the easiest. Cameras are a common personal item to carry around and nearly all cellphones come with cameras these days. Especially in the digital age where photos can easily be uploaded to the internet en masse, photography as a means of verification is an important tool. All herp atlases, excepting Virginia, accept or accepted photos as a means of verification.

Other methods of verification include a highly detailed species account, remains (shed skin, shell, carcass, etc.), audio recording (for frog calls), video, and specimens. In biology, a specimen that is properly mounted or preserved in a museum is considered the ‘gold standard’ of verification. However, herp atlases are not the same as collecting museum specimens and should not be treated as such. Of all the methods of verification, collecting a new specimen is probably the least desired because mapping distribution and collecting at the same time (especially for rare species or species of concern) could be detrimental to the outcomes of a herp atlas. Additionally, anyone wishing to collect animal specimens may need special federal or state permits. This is not to say that specimens are not valuable – they are, especially as historical records – however for a herp atlas the value of a specimen is greatly increased when it is alive and well and surviving in its natural habitat.

In many cases verification was categorized using a tiered system (VT, ME, MA, CARO, PA). Two or three tiers are identified with records accompanied by the most convincing evidence at the top tier (very certain) and records with more dubious evidence at the bottom (uncertain). Sometimes a third middle tier was also included with records that fell somewhere in between the two extremes. Records are examined either by a committee of experts or the coordinator of the atlas. Generally records with clear audio or visual evidence that show identifying characters are tiered highly, while, for example, poor photos or vague written descriptions are tiered in the middle or at the bottom. It is not unusual for a sight record to be rejected entirely if the committee determines it lacks substantial or credible details.

**Florida does not actively solicit volunteers but it will accept data submission with photo verification via email. However, the bulk of Florida’s data is in museum specimens.*

Use of Volunteers

The vast majority of herp atlases use volunteers to assist in data collection. In my report I learned that eight out of ten atlases (PA, VT, ME, MA, GA, NJ, CARO, NY) actively solicited volunteers (volunteers meaning the general public). The remaining states, Florida and Virginia, have herp atlases that are/were primarily executed by professional biologists.

Using volunteers not only saves money but it also reaps the benefits of citizen science as mentioned earlier. A handicap of using volunteers as data collection agents is having to frequently replenish your volunteer base.

Biggest Difficulties

All interviewees were asked the question “What was the most difficult aspect of the project?”. Their answers can be divided into three categories: people, data, and simplicity. By far the most common issue with herp atlases that used volunteers to collect data was keeping the volunteers engaged and involved.

Holding a single-year herp atlas would not present enough time to gather a sufficient amount of data. Multiple biotic and abiotic factors contribute to the distribution of reptiles and amphibians and in many cases these factors vary by year. Collecting data for multiple years allows for natural fluctuations in populations and distribution to occur and permits enough effort to reasonably find all possible species. Yet because herp atlases are prolonged there is a frequent turnaround in volunteers. Thus atlas organizers must not only try and recruit new volunteers but also replaces the ones they have lost due to the extended nature of the project.

Rather oddly, New Jersey reported an *overabundance* of volunteers. In fact, the NJ herp atlas was only intended to be a five-year project, but eventually lasted 16 years because of tremendous volunteer support. The mandatory training sessions put on by the NJ herp atlas is the only factor that sets NJ apart from the rest of the east coast states. Every volunteer had to attend a training session where they were given a field guide and a CD of New Jersey frog calls (pers. comm. Larissa Smith). I am skeptical that it was simply the idea of ‘free stuff’ that made New Jersey’s herp atlas such a hit with volunteers but I found no other explanation for the unusual number of volunteers except the training sessions.

Managing all of the data that comes with putting on a herp atlas was another common obstacle. Five states – Maine, Vermont, Pennsylvania, Massachusetts, and Florida – cited dealing with data as one of the most difficult aspects of their project. Often sorting through the data is the job of a single coordinator (VA, VT, GA, CARO). In other cases data management is taken on by a small committee, such as those in Maine and Massachusetts. Either way, the sheer mass of data, and the time that it takes to sort through the data, is no simple task. In more recent years, the internet has surely helped to take on some of this strain, but in the days of the early atlases the workload might have been high.

Based off of the ‘most difficult aspect’ question and an open-ended question that I asked in my interviews, I’ve come to the conclusion that herp atlases have difficulty keeping the project simple. This sentiment was nicely stated by Scott Jackson (MA),

“Keep it as simple as you can. There is a tendency to say, well while we have people out there let’s have them complete this data too and then you end up with a complicated data form. The more complicated your data form the more likely that [volunteers] aren’t going to complete it.”

He later told me that they never did use any of the habitat information that they collected (pers. comm. Scott Jackson). Most volunteers are “amateurs who volunteer to assist ecological research because they love the outdoors or are concerned about environmental trends and problems and want to do something about them” (Cohn 2008). However, this does not mean that volunteers want to deal with collecting all small details in the field. The purpose of a herp atlas is to map reptile and amphibian *distribution*. The purpose is *not* to gather data concerning habitat, temperature, weather, time of day, elevation, etc. These extra categories simply complicate your data. While it might be nice to collect those data, few volunteers will have the ability to collect those data correctly.. To retain volunteers data collection should be fun and as easy as possible, which means only gathering the data that are necessary.

The final difficulty was only mentioned in two interviews (Tim Maret and Steven Price), but by the very nature of the issue it most likely had a significant effect on the majority of the herp atlases. Inherently, herping is a very invasive activity. A birder could go for a hike on a trail and at the end of their walk list twenty or more species of bird that they saw. A herper in the same area would tear that forest apart, flipping rocks and logs and anything else that looked like a likely spot for a reptile or amphibian. After all of that, a herper might have found zero species. It is not uncommon for herpers to be secretive about sharing their herping sites or their herping finds. The reason for this is that they don’t want other herpers to come in to their herping sites and cause more of a disturbance than the initial herper already causes. They are also hesitant about sharing rare and unusual finds because of the risk the illegal pet trade poses. This means that there are people out there with herpetological experience who keep what they know about herp distribution to themselves to protect both their interests, and the interests of the critters they see. Herp atlases in general need to state explicitly in their intentions what is to be done with their data to alleviate these concerns in regards to amateur herpetologists.

Suggestions

Based on my research for this report, I detail three main areas that could be improved upon in the MARA project. The first is to take full advantage of the opportunities that the internet presents. Currently, MARA does not have an online database, nor does it accept online data submission via its website. Emailed sightings are accepted, though they are not heavily solicited. The herp atlases that accept online data submission have had great success in doing so, thus I suggest that MARA implement an online database that accepts online data submission.

I also have some suggestions to improve the usability of the website. When viewing the MARA webpage there is no clear indication that the sidebar links are for MARA and not the NHSM. Users might click on the top links, which lead to other areas of the NHSM website, and become confused when they are not relocated to a MARA page. Putting the MARA logo above the side links and below the NHSM logo would fix this issue. In addition, throughout the site the text is small and compact; enlarging the

font would make for easier readability. Within the ‘Resources’ section the resource links are dense and it may help for them to be explained or separated into groups so that it is easier for users to find what they are looking for.

Additionally, I would urge MARA to create a user-friendly space on their webpage for tricky species identification as well as providing common frog calls for users to reference. Presently there are only links to other sites that assist in species identification. Along with providing information for people already familiar with the project, presenting these resources could garner internet search hits for queries like ‘reptiles of Maryland’, and thus garner more interest for MARA in an incidental fashion.

As a result of a suggestion that Holly Badin and I made at the June MARA meeting, MARA has decided to go forward with creating a Facebook page. This is an excellent resource for networking with volunteers and other like-minded organizations (for example, ‘liking’ the Partners in Amphibian and Reptile Conservation (PARC) page). It also provides an opportunity to connect with young people interested in herpetology that might not be members of groups traditionally courted for volunteers, such as the National Audubon Society or the Natural History Society. Posting to pages affiliated with undergraduate or graduate students (example: the Towson Herpetology Club) eliminates the burden put on professors to spread the word to their students. Professors are a great resource, but they are frequently bombarded with other requests for their attention and spreading the word for MARA is not their job. Social networking would alleviate them as middlemen and put MARA directly in contact with potential student volunteers.

Secondly, I propose that MARA hold training sessions. Even though volunteers do not really have to know anything about herps to contribute to a herp atlas – in Georgia, people submitted photos (with a location) without even knowing specifically what the photos were of (pers. comm. John Jensen) – a big part of getting the public involved in a herp atlas is wanting them to come away from the project with an increased knowledge of herps and the processes involved in field biology. A training session is an excellent strategy for making this happen. Training sessions would also provide a good opportunity to issue reference materials like the MARA Handbook or possibly a state field guide, such as the *Field Guide to Reptiles and Amphibians of New Jersey* (Schwartz and Golden, 2002) that New Jersey presented at their own training sessions (pers. comm. Larissa Smith). Additionally, it provides people with the opportunity to ask clarification questions about subjects or protocols that are unclear.

On the subject of the MARA Handbook, I would like to note that it is an excellent resource, but almost to a fault. The amount of information it provides to a potential volunteer is quite substantial. As mentioned before, keeping resources and materials simple is a common issue among herp atlases. It could be that holding training sessions would alleviate the need for a printed handbook and it could then be housed entirely online through the MARA website. Another solution might be to slim down the manual so that it only houses information that is absolutely critical to data collection, making it more user-friendly.

Lastly, MARA could be improved by increasing the positive reinforcement given to volunteers. The MARA state coordinator, Heather Cunningham, presently writes a monthly newsletter detailing events, She does a wonderful job presenting photos and anecdotes from volunteers. Yet more positive reinforcement would not be misplaced.

This could be accomplished by finding opportunities to bring volunteers together. Examples of this might include events like throwing a giant potluck where people can network or hosting a photo contest (pers. comm. Scott Jackson) with an award ceremony. These present occasions for the volunteers to come together and bond over a shared experience, further reinforcing the positive feelings that should come from helping participate in a project like MARA.

National Herp Atlas?

Throughout the duration of this project I have come to realize that states create a herp atlas to aid them in making educated decisions to effectively manage and protect their wildlife. It is worth mentioning that species rarely occur in only one state. Species ranges regularly incorporate multiple states and even entire regions of the continent. This begs the question of whether a state-by-state approach to gathering baseline data on the distribution of amphibians and reptiles is really the direction in which we ought to be heading. Why not create a national herp atlas?

Creating a national atlas could relieve issues of funding, staffing, and differing data collection and verification methods. It would also help to plug the gaps in current distribution data, as there are many states that do not have herp atlases.

Herp Camp

By far the most interesting idea that I came across in my interviews was the herping camp put on by the Vermont Herp Atlas. **Jim Andrews** described it in an email to me:

“For nine years VT Audubon and I ran a camp for teen-aged herpers from across the country. Students applied for the camp, applications were reviewed, and then [they] paid a regular camp fee to cover expenses. After an initial training at our base near Brandon, VT where students stayed in tents, we stayed in a handful of state parks across the state. From the state parks we ventured out to do daily herp surveys either on state lands or on private lands with advance permission. I picked locations that needed survey[ing] the most...The camp lasted two weeks in the early summer. We traveled in vans with two counselors helping to organize and supervise the students. Many students came back for a series of years...It is certainly a model that could be used in any state. Many teenagers enjoyed it.”

This idea could not be any more brilliant. It solves the problem of low-coverage areas while at the same time providing valuable field experience for students interested in field biology and herpetology. It also appears to pay for itself (or possibly even turn a profit), with the only real cost being in the time commitment of the coordinators/counselors and logistical planning.

Conclusion

By and large, herp atlases use multiple routes that eventually serve a similar purpose. They are much more dissimilar than I could have imagined when starting this research. What’s more, I was surprised to find that more recent, and even current herp atlases are not all that inclined to be harnessing the internet to its fullest potential. I

believe that this hinders them in expanding their volunteer base, communicating to volunteers, and dealing with the immense amount of data that result from their projects.

In the two years that MARA has been working on their project, they have made tremendous progress and have established a solid foundation on which to build. It is my hope that they will take some of my suggestions into consideration as they move progressively into the future.

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For More Information on currently running herp atlases:

The Carolinas: <http://www.carolinaherpatlas.org/aboutus.aspx>

Maine: <http://www.maine.gov/ifw/wildlife/species/marap.htm>

Massachusetts: <http://www.massherpatlas.org/index.html>

Maryland: <http://www.marylandnature.org/mara/index.htm>

Vermont: <http://community.middlebury.edu/~herpatlas/>

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