
Virginia Herpetological Society

Volume 7, Number 2

NEWSLETTER

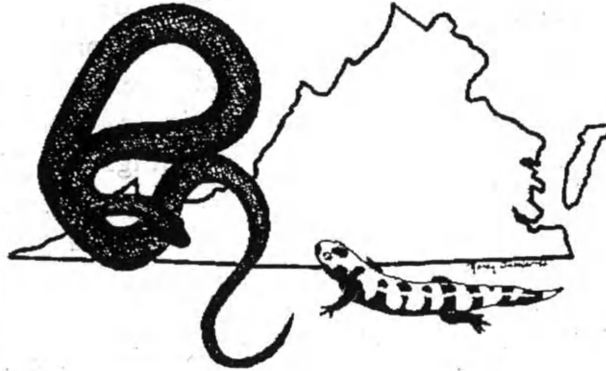
August 1997

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SHELL EROSION AND SKIN LESIONS IN TURTLES

*Submitted by Carl H. Ernst, PH.D., Department of Biology,
George Mason University, Fairfax, VA 22030-4444*

A television commercial that frequently airs on Washington, D.C. stations for the engineering firm ABB features a rather precocious, elementary school student named Bobby standing on a desk and proclaiming that in the future he is going to "invent new technology to stop pollution and save the world." An admirable quest, but what the commercial does not tell you is that technology has created most of our pollution. That our waterways are still polluted is in no doubt, although in some regards they are now less polluted than in the past. Most macropollution is now controlled, but what often remains is much more insidious and hard to trace.

Such is the case with those pollutants that favor the growth of pathogenic microorganisms by either altering the aquatic environment making it more favorable for microbial growth, by changing conditions on the skin of aquatic vertebrates giving

opportunity for invasion by microorganisms, or by lowering the immunological resistance of the animal. Our sister state Maryland is currently experiencing an epidemic of bacterial skin abscesses in fish in some parts of their waters in the lower Chesapeake Bay, and in recent years there have been an increasing and alarming number of reports of abnormal pathogenic skin conditions, such as shellrot and skin lesions in turtles. Since the species involved are terrestrial, marine and freshwater inhabitants, several causative agents and abnormal environmental conditions are involved.

Some populations of the terrestrial desert tortoise (*Gopherus agassizii*) are now experiencing an abnormal skin condition termed cutaneous dyskeratosis in which the shell and thickened forelimb scales are affected. Diseased areas are gray-white and occasionally orange and have a roughened flaky appearance. The plastron seems more involved than other areas of the integument. Perhaps the best known example of an environmentally induced abnormal skin condition is that of fibropapilloma disease in the marine green turtle (*Chelonia mydas*). It takes the form of unsightly tumors caused by a herpes-like virus and eventually leads to an inability

to feed and death of the turtle. Hawaiian green turtles, living in increasingly polluted turtles are particularly involved, but the disease is also known from the warm southern onshore waters of the Atlantic Ocean and the Gulf of Mexico in the United States. It has recently been discovered that more than 50 percent of the green turtles in the Indian River in South Florida are infected with fibropapilloma. Agricultural chemical runoff is suspect in this case. Necrotic, spreading, bacterial skin lesions have also attacked pen-reared hatchling sea turtles.

Freshwater turtles in the southern United States have not escaped such problems. A disease causing emaciation and lesions on the plastra has been reported in Alabama flattened musk turtles (*Sternotherus depressus*). More recently an apparent bacterial caused severe shellrot disease was discovered in river cooters (*Pseudemys concinna*) and sliders (*Trachemys scripta*) from the Flint River, Georgia. Some infected areas contain multinucleate osteoclasts that destroy bone; in fact, in some individuals the bone was so completely dissolved that holes were formed through which the beating heart or internal organs could be viewed. Both the carapace and plastron were involved, and the disease was only found in adults (Does this mean infected hatchling or juveniles die quickly?). Seventy-four percent of the river cooters examined were diseased and 35% of the sliders. The portion of the river where the infected turtles were found is down stream from a large pulp mill and in a region where heavily sprayed cotton and peanut crops are grown, so the contributing environmental factor has not been determined.

Virginia's freshwater turtles have not escaped from such problems. Damaged turtles exhibiting various stages of unnatural shell erosion, apparently caused by some disease organism, were first found in the Rappahannock River near Falmouth, Stafford County during the late winter and spring of 1993. Additional infected turtles were found in 1994 and 1995. From late June to early October 1996 personnel from the herpetology program at George Mason University conducted a survey funded by the Virginia Department of Game and Inland Fisheries (DGIF) of

damage in turtles in the Rappahannock River at four sites between the I-95 Bridge Crossing at Fredricksburg to Raccoon Ford on Rt. 611 on the Rapidan River. Unfortunately, atrocious weather resulting in severe flood conditions hampered the study during July and August. Nevertheless, some turtles were collected, and of these 50% had some form of damage: painted turtles (*Chrysemys picta*), 40%; snapping turtles (*Chelydra serpentina*), 37.5%; redbellied turtles (*Pseudemys rubriventris*), 100%; stinkpots (*Sternotherus odoratus*), 50%; and sliders, 50% (Figure 1). The only river cooter caught exhibited no damage. When the numbers of undiseased and diseased turtles caught between 1993 and 1995 are added to this list, 52.4% of the total turtles caught had either visible shell or skin damage (64.5% of adults, 22.2% of juveniles). At the upstream site on the Rapidan, few turtles were caught but 100% were damaged, while at the three downstream sites on the Rappahannock where most of the turtles were caught damage ranged from 50-55%.

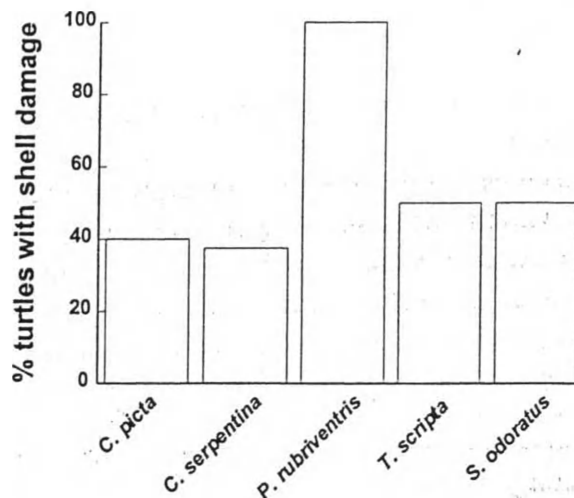


Figure 1. Proportion of turtles with shell damage observed in the Rappahannock River during 1996.



VHS ELECTIONS

Are you interested in determining the direction of one of the oldest nonprofit, regional societies in the United States focusing on the study of amphibians and reptiles? If so, then how about becoming an officer of the Virginia Herpetological Society. Chartered in 1958, the society is dedicated to the conservation, research, and understanding of these reptiles and amphibians. Nominations and elections for VHS officers will be conducted at the Fall '97 meeting. Positions will be President Elect and Secretary/Treasurer. Responsibilities and terms as written in the VHS constitution for each position is as follows:

President Elect shall fulfill the duties of the President when the latter is absent. He/She shall assume the Presidency should that office become vacant during a term. He/she shall select the meeting sites for the Society. The President-Elect shall assume the Presidency for a two year term upon expiration of the current President's term.

President shall preside at meetings of the Society and its officers; shall be nominal head of the Society; shall rule on questions of procedure that may arise; shall appoint ad hoc committees at his/her discretion; the President or his/her designee shall be the VHS representative to the Eastern Seaboard Herpetological League voting board.

Secretary/Treasurer shall maintain the records of the Society and its offices; shall notify the membership of pertinent business; shall be responsible for all general correspondence of the Society; shall be responsible for keeping the mailing list, accepting and processing applications for membership, and putting out all PR for soliciting members; shall keep records and accounts of the Society including all monies received and disbursed; shall collect the annual dues and maintain the membership roster; and shall be responsible for all financial reports required by the business of the Society. The Secretary/Treasurer shall make a report to the membership at each meeting.

Both officers are part of the executive committee that makes policy and planning decisions for the society. Anyone in good membership standing can become an officer. No one individual may hold two or more elective offices concurrently. If yourself or a friend are interested in becoming a VHS officer, be sure to attend the fall meeting or notify Paul Sattler. Remember, a society can only survive with an active and interested membership.

ESA ATTACK DEFEATED

*Submitted by the Endangered Species Coalition, 1101 Fourteenth Street NW, Suite 1400
Washington D.C. 20005 (202) 682-9400 ((202) 682-1331 fax*

The Endangered Species Act has survived its first attack of the 105th Congress. Representatives Pombo and Herger (R-CA) introduced, HR 478, the "Flood Prevention and Family Protection Act of 1997". The bill would have permanently exempted the reconstruction, operation, maintenance, and repair of all dams, hydroelectric facilities, levees, canals, as well as a host of other water-related activities, from the safeguards and protections provided in the Endangered Species Act.

HR 478 was defeated. Members of Congress voted to replace 478 with an amendment, offered by Representative Boehlert and Fazio, that narrowed the scope of the Pombo/Herger bill. While the Coalition Steering Committee did not support the Boehlert alternative because we felt it substantively unnecessary, we did ask members to vote for it as a way to prevent final passage of HR 478. Activists across the country flooded the offices of their representatives to voice their opposition to HR 478. Those calls paid off as the final roll call for the Boehlert amendment was 227-196. There were 54 Republicans who voted the right way! The sponsors of HR 478 were disappointed, to put it mildly, and immediately withdrew their bill. Unfortunately, this leaves the door open for reintroduction of 478. We will keep you posted on further developments.

Our win in the House positively influenced Senate negotiations on the same issue. The Craig rider on the disaster relief bill was unanimously replaced with a Chaffee/Reid/Kempthorne alternative rider that was substantially similar to the Boehlert amendment. Again, we do not support the rider, although it is much better than the Craig rider.

Riders attached to appropriation bills became the tool of choice of the 104th Congress to sneak through anti-environmental laws. These tactics have once again been chosen as the vehicle to weaken the nation's environmental standards. We need to send the message to Congress, "NO RIDERS!" You can count on these tactics to reappear time and time again.

The defeat of those like Pombo and Young who used the tragedy of this year's flood to take a swipe at the ESA is encouraging. It reaffirms that a fairly substantial moderate Republican coalition does not share the views of the anti-environmental extreme right. Now is the time to thank your representatives for a yes vote on the Boehlert amendment and chastise those dissidents. We can fend off these frequent attacks to ESA by introducing a strong ESA. Please ask your representative to support and sponsor the endangered Natural Heritage Act (ENHA).

For more information on the Endangered Natural Heritage Act please call or write to the Endangered Species Coalition (see above address).

HERP HAPPENINGS

Spring Meeting - The Virginia Herpetological Society's spring meeting was held May 6, 1997 at the Suffolk Super 8. Topics included selection of a depository site for collection vouchers, the snake information brochure, and selection of a state reptile and amphibian. The VHS would like to thank Alan and Barbara Savitzky for giving an excellent presentation on their research on the state endangered canebrake rattlesnake. Shay Garriock was acknowledged for his ongoing work on the VHS homepage.

Spring Field Trip - Thanks to everyone who attended the spring field trip at Naval Security Group Activity - Northwest in Chesapeake. In all, 42 species, comprising 22 reptile and 20 amphibians were collected. The VHS would like to thank Don Schwab for making the appropriate contacts to survey the base, and Pamela Couch for the use of the facility. A detailed species list will be presented in the next issue of Catesbeiana.

Bog Turtle Study - During the spring of 1997, Virginia Polytechnic Institute (VPI) researchers continued to track 4 turtles and monitored bog turtle emergence from hibernaculas. A mark-recapture program was initiated to obtain data on population size and age structure by using turtle traps. It is hoped that traps will catch a different portion of the population than normal hand-capture techniques. In conjunction with trapping, VPI researchers and Virginia Department of Game and Inland Fisheries (VDGIF) personnel intensively surveyed 8 sites over 4 days. Depending on funding, continued research on this species planned through this summer.

SSAR Meeting - Several VHS members attended the Society for the Study of Reptiles and Amphibians held in Seattle, Washington on June 24-30. Dr. Joe Mitchell gave a presentation on his amphibian monitoring efforts at Shenandoah National Park, while Shawn Carter presented his research on bog turtles.

CITES Listings - The Conference on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is scheduled to take place in Harare, Zimbabwe, June 9-20, 1997. The United States will be submitting all 12 species of map turtles (*Graptemys* spp.) and the timber rattlesnake (*Crotalus horridus*) on Appendix II. Appendix II includes species that may become endangered if trade in them is not controlled and requires an export permit from the country of origin. A mechanism is thereby created to monitor the trade in Appendix II species. If it is clearly determined that the collection of an animal or plant from the wild is not sustainable, trade in that species will be halted.

Herp Atlas Project Update - Work is progressing on the VA Herp Atlas Project. Most of the amphibian and reptile county distribution records have been reviewed within the Biota of Virginia database. In addition, collection points that were in the system have been reviewed by Dr. Joe Mitchell.

Approximately 600 new collection records from the Carnegie Museum have been entered and points digitized. The next step is a second review of maps for point verification and addition of Smithsonian Museum records. Progress on the Herp Atlas Project was presented at the national Organization of Fish and Wildlife Information Managers (OFWIM) meeting in Reston, Virginia on August 4, 1997. There was a lot of interest in the project from attendees that came from around the nation, particularly from states that are starting their own herp databases. For anyone interested in more information, contact Becky Wajda or Karen Reay, VDGIF, 4010 W. Broad St., Richmond, VA 23230-1104.



Mark Your Calendar for the VHS Fall Meeting



The VHS will be holding its Fall meeting at the Virginia Museum of Natural History in Martinsville on October 25th. The society will conduct a business meeting, a reptile and amphibian workshop for teachers, and a paper session. Anyone interested in presenting should submit a title by September 29th to Paul Sattler at Liberty University, Department of Biology, Liberty University, 1971 University Blvd., Lynchburg, Va 24506 call (804) 582-2209. Directions and additional information regarding the meeting can be found in the next issue of Catesbeiana.



Virginia Herpetological Society
on the
World Wide Web

<http://www.fw.vt.edu/fishex/VHS.html>

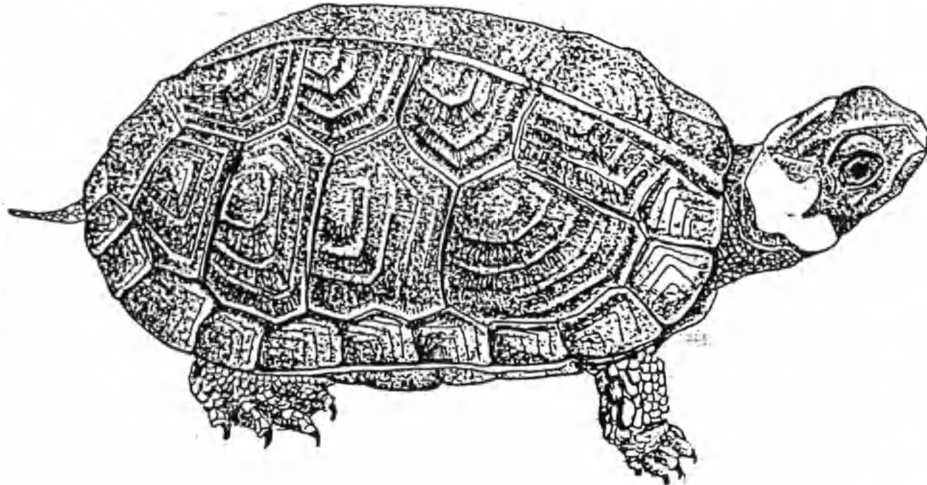
Comments, suggestions, submissions
welcome at:

cgarrioc@vt.edu



VIRGINIA NATIVE

Bog Turtle *Clemmys muhlenbergii*



Status in Virginia: Federally threatened by similarity of appearance

Description

The bog turtle is a small freshwater turtle reaching a maximum carapace length of 4 1/2 inches (112 mm). The surface of the carapace is black to brown or mahogany in color. The plastron is hingless and is usually black with irregularly shaped yellow blotches of yellow to cream along the midline. The plastron of males is concave while females is flattened.

The bright orange patch behind the eye of hatchlings turns to a large conspicuous orange, yellow, or red blotch in adults. Although little information is known about the life span of this species in the wild, captive specimens are known to live for more than 30 years..

Habitat

Bog turtles inhabit mountain wetlands in meadows, open fields, slow moving streams, ditches and boggy areas associated with sphagnum moss, alders, skunk cabbage, and sedges. In winter, these turtles hibernate in muskrat burrows, beneath alder thickets, and under sedges. During warmer months, bog turtles can be seen basking on grass mats near small rivulets and using the moving through the runways of meadow voles. When startled, turtles will dive head-first into soft mud.

Food

Bog turtles are omnivorous. They eat a diet of insects, worms, mollusks, duckweed, skunk cabbage, blackberries, and strawberries. When the opportunity arises, they have been known to scavenge.

Distribution

In Virginia, bog turtles inhabit the southern Blue Ridge Mountains of Carroll, Floyd, Grayson, and Patrick counties. In North America, bog turtles are found in two widely separated populations. The northern population ranges from Maryland to New York and Massachusetts, while the southern population ranges from Northwestern Georgia to Virginia and Tennessee.

Breeding Biology

Mating occurs from late April to early June. Approximately 3-4 eggs are laid from May to early June in shallow nests in grass tussocks, moss, or soft soils. Most hatching occurs in August, but some young do not emerge until early October or the following May or April. Hatchlings from captive individuals average one inch in length.

Current Status and Threats

Mountain wetlands occupied by bog turtles represent a unique and biologically diverse assemblage that includes other rare or endemic species such as the Gray's lily, sundew, and yellow-eyed grass. The wetlands that provide critical habitat for bog turtles also have cultural significance in the Appalachians. They have a natural beauty provided by their open aspects and the agricultural benefits that occur from high productivity, compared to dry, rocky soils common elsewhere in the mountains.

Habitat loss from the drainage of wetlands for development and agriculture poses the primary threat to bog turtles. Because many of these wetlands are small and isolated, they are not adequately protected by wetland laws. Predators of bog turtle eggs and adults include raccoons, opossums, skunks, and fox, all of which thrive in areas altered by humans. An unknown number are killed crossing roads

each year by vehicles.

Many bog turtles were collected and sold as pets before receiving state endangered status in 1987. Although now protected, poaching still remains a problem throughout their range. Additional protection has recently been proposed by the U.S. Fish and Wildlife Service. The northern populations will receive full federal threatened status, while the southern population will be federally threatened by similarity of appearance. Consequently, bog turtle possession is illegal without a permit, so any found should be left in their natural environment.

To learn more about bog turtles and other Virginia reptiles, we suggest the following material:

Conant, R. and J.T. Collins. 1991. The Peterson Field Guide Series - A Field Guide to Reptiles and Amphibians of Eastern and Central North America. 3rd edition. Houghton Mifflin Company, Boston. 450 pp.

Mitchell, J.C. 1994. The Reptiles of Virginia. Smithsonian Institution Press, Washington. 352 pp.

Terwilliger, K. and J. Tate. 1994. A Guide to Endangered and Threatened Species in Virginia. The McDonalds & Woodward Company, Blacksburg. 229 pp.

Editor's Note:

This is a draft copy of what will eventually be a fact sheet for the bog turtle. Fact sheet was modified from the bog turtle description by Joe Mitchell and Kurt Buhlmann, and Carl Ernst in Terwilliger and Tate (1994). Art work contribution was by Mike Pinder. Any suggestions or corrections should be sent to the editor.

Literature Review

The purpose of this column is to inform members of recent herpetological research pertinent to Virginia or of special interest to the Society's membership. Papers or notes from professional journals, new books, "gray literature" reports, and popular magazine articles are acceptable for inclusion. Members are encouraged to send recently published items of interest to the editor. Submissions will be accepted subject to the approval of the editor.

- Babbitt, K. J. and G. W. Tanner. 1997. Effects of cover and predator identity on predation of *Hyla squirella* tadpoles. *Journal of Herpetology* 31:128-130.
- Beachy, C. K. 1997. Effects of predatory larval *Desmognathus quadramaculatus* on growth, survival, and metamorphosis of larval *Eurycea wilderae*. *Copeia* 1997:131-137.
- Blem, C. R. 1997. Lipid reserves of the eastern cottonmouth (*Agkistrodon piscivorus*) in the northern edge of its range. *Copeia* 1997:53-59.
- Britson, C. A. and R. E. Kissell, Jr. 1996. Effects of food type on developmental characteristics of an ephemeral pond-breeding Anuran, *Pseudacris triseriata feriarum*. *Herpetologica* 52:374-382.
- Buhlmann, K. A. and J. C. Mitchell. 1997. Ecological notes on the amphibians and reptiles of the Naval Surface Warfare Center, Dahlgren Laboratory, King George County, Virginia. *Banisteria* 9:45-51.
- Faragher, S. G. and R. G. Jeager. 1997. Distributions of adult and juvenile red-backed salamanders: testing new hypotheses regarding territoriality. *Copeia* 1997:410-414.
- Grafe, U. 1997. Use of metabolic substrates in the gray treefrog *Hyla versicolor*: Implications for calling behavior. *Copeia* 1997: 356-362.
- King, R. B. and J. R. Turmo. 1997. The effects of ecdysis on feeding frequency and behavior of the common garter snake (*Thamnophis sirtalis*). *Journal of Herpetology* 31:310-312.
- Layne, J. R. Jr. and J. Kefauver. 1997. Freeze tolerance and postfreeze recovery in the frog *Pseudacris crucifer*. *Copeia* 1997:260-264.
- Mitchell, J.C. 1997. Life in a pothole II. *Virginia Wildlife* 58: 23-28.
- Mitchell, J. C., D. J. Schwab, and G. M. Williamson. 1997. Juvenile green turtles (*Chelonia mydas*) stranded by cold in the Chesapeake Bay. *Banisteria* 9:60-61.
- Minx, P. 1996. Phylogenetic relationships among the box turtles, genus *Terrapene*. *Herpetologica* 52:584-597.
- Packard, G. C., et al. 1997. Cold tolerance in hatchling slider turtles. *Copeia* 1997:339-345.
- Roosenburg, W. M. and A. E. Dunham. 1997. Allocation of reproductive output: egg- and clutch-size variation in the diamondback terrapin. *Copeia* 1997:290-297.
- Simons, R. R., R. G. Jeager, and B. E. Felgenhauer. 1997. Competitor assessment and area defence by territorial salamanders. *Copeia* 1977:70-76.
- Sugalski, M. T. and D. L. Claussen. 1997. Preference for soil moisture, soil pH, and light intensity by the salamander, *Plethodon cinereus*. *Journal of Herpetology* 31:245-250.
- Tilley, S. G. and M. J. Mahoney. 1996. Patterns of genetic differentiation in salamanders of the *Desmognathus ochrophaeus* complex. *Herpetological Monographs*, 1996:1-42.
- Verrell, P. A. 1997. Courtship in Desmognathine salamanders: the southern dusky salamander, *Desmognathus auriculatus*. *Journal of Herpetology* 31:273-277.

SHELL EROSION

FROM PAGE 2

Damage consisted of lesions on the skin of the head or limb sockets and lesions and eroded patches on the carapace or plastron, and did not resemble that of the Georgia turtles. It was not as severe, but the problem may only be in the infant stage. That the redbellied turtle, a strict herbivore as an adult, showed 100% incidence of damage may indicate an ecological correlation. It is possible that damaged tissues on the turtles are the result of a secondary bacterial or protozoan infection(s) after initial chemical pollutant damage to skin and shell scutes. From studies elsewhere, it seems that increases in some pollutants (or introduction of a new pollutant) initiates damage to turtles which then allows viruses, bacteria, protozoa or fungi to invade causing greater damage or even death of the individual. Natural environmental factors, such as increases in ultraviolet radiation, may cause damage, especially basking individuals, in view of recent studies on declining amphibian species.

As the data now stand after the 1996 study, due to small sample size, all that can be accurately inferred is that the damage is widespread among turtles in the Rappahannock River (5/6 species collected), it is of high incidence (about 50% of individuals), and that it extends along the river from the confluence of the Rapidan River to Falmouth/Fredricksburg.

A very serious health problem exists among the turtle species in the Rappahannock River. Turtles, due to their relative long lifespans and normally stable populations, are considered excellent indicators of health of an ecosystem. If a sickness exists within the turtles in the Rappahannock, it is an indication of a much more widespread problem that probably is affecting other animals as well. Turtles or other animals from other watersheds within the Commonwealth showing cutaneous damage should be reported to DGIF, as such abnormalities may be more widespread than we realize.

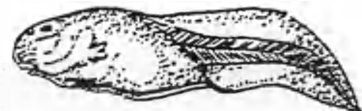
Although requested, funding for additional study in 1997 to determine both the biological agent of the damage and any contributing environmental pollutant(s) was not available by DGIF. However, additional studies may be funded for spring 1998. It is hoped that the problem in the Rappahannock will be controlled in the near future.

TEAMING WITH WILDLIFE

The Teaming with Wildlife Initiative (the effort to establish a long-term, stable funding source for nongame wildlife conservation, recreation, and education) is still alive and well. We're in this for the long-run and we intend to build towards a situation where success is assured. We'd all like to get the legislation submitted as soon as possible, and that's the plan, but only if it is under the right conditions. On the national scene we're over 2200 organizations and businesses including some fairly well-known names. We have formal endorsements from 11 governors and informal endorsements from many members of congress. If the stars align properly legislation will be introduced this fall.

The Virginia Coalition stands at 70 organizations and businesses including many "friends of rivers' groups, a few canoe liveries, bed and breakfasts, conservation organizations, land conservancies, birding clubs, etc... We've contacted all our congressional members on several occasions and we feel confident that when the legislation is brought to a vote, our congressional delegation will vote for it.

If you would like to get involved with Teaming with Wildlife in Virginia, you can contact Jeff Waldon, PO Box 345, Shawsville, VA 24162 (540) 268-2735 or email fwixchg@vt.edu. We need everyone to keep up the pressure on our congressional delegation to not only vote for it but to help cosponsor it, and contact more businesses and organizations for membership in the coalition. Teaming with Wildlife is a grassroots effort that is working mostly because of the willingness of many people in Virginia and the nation to get personally involved. Please do what you can to help out. Success will mean the creation of a much-needed new funding base for amphibian and reptile conservation in Virginia.



BOOKS

Reptiles of Virginia By Joseph C. Mitchell

Beginning with Captain John Smith's observations of the region's reptilian fauna, this book offers the first complete catalog of the reptiles of Virginia, from the sea turtles of the Atlantic Coast to the snakes, turtles, and lizards of the Piedmont and Blue Ridge Mountains.

Including full-color illustrations of numerous habitats and thirty-two of the species, distribution maps for each species, and easy-to-use keys for quick identification (with a separate key for young snakes), *The Reptiles of Virginia* is a practical resource and an essential overview of this faunal group and its habitats.

The book is based on data derived from examination of some 10,000 Virginia specimens, yielding a wealth of new information on the ecology, life histories, and biogeography of reptiles in the state. Each of the 62 individual species accounts provides local-common names, the historical context for scientific names, present habitat affinities, and information about geographic variation in color, pattern, and morphology, as well as reproduction, predators, and prey. The book also explores the human impact on Virginia's natural habitats and species' distribution patterns, presenting a historical perspective on the conservation of these animals.

About the Authors

Joseph C. Mitchell is an adjunct professor of environmental and conservation biology at the University of Richmond and is a research associate of the Virginia Museum of Natural History. John M. Anderson, a curatorial assistant at the Virginia Museum of Natural History, participated in a herpetological survey of Assateague Island funded by the National Park Service.

Amphibians and Reptiles of Assateague and Chincoteague Islands

By Joseph C. Mitchell and John M. Anderson

Assateague and Chincoteague islands are among the best-known barrier islands off the Atlantic coast of North America. Millions of people visit them every year for recreation. Most visitors are well acquainted with the famous Assateague ponies, but few know that these islands are home to unique assemblages of plants and animals.

This book provides information on some of the islands most secretive inhabitant, the amphibians and reptiles. Most of the frogs, salamanders, turtles, lizards, and snakes have occupied these islands since they were formed thousands of years ago. The reptiles and amphibians have learned to live in a harsh environment characterized by hot and dry sand, scarcity of freshwater, and periodic overwash by saltwater. Each of the seven species of amphibians and eighteen species of reptiles can be readily identified using the keys, color photographs, and descriptions in this book. Many interesting aspects of their biology are summarized in highly readable form.

Within these pages we discover why the islands are inhabited by far fewer species than are known to occupy the Delmarva mainland. We also learn about measures proposed to insure their longterm conservation, and how to observe these animals in their natural habitats. This book is the only source available that provides a window into the biology and ecology of two fascinating groups of animals on these barrier islands.

Order Form

All books purchased through the VHS are 20% discounted from the list price. This offer is open to everyone, members and nonmembers, as quantities last.

____ copies of *Reptiles of Virginia* @ \$32.00 each. Postage \$2.25 for first book; \$1.00 each additional book.
 ____ copies of *Amphibians and Reptiles of Assateague & Chincoteague Islands* @ \$11.96 each. Postage \$1.00 for the first book; \$0.50 each additional book.

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Please sign me up for membership in the Virginia Herp Society. Membership begins and ends on a calendar year.

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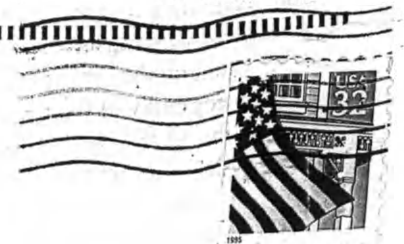
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