

Appreciating Rattlesnakes

by Harry W. Greene

"IN THE END, we will conserve only what we love, we will love only what we understand, and we will understand only what we are taught." If ever a group of organisms exemplified Senegalese conservationist Baba Dioum's summary of the interplay among nature appreciation, education, and research, it's dangerous snakes. Venomous reptiles encapsulate the problems of living with animals that might kill us, as well as our reluctance to care about slithering, unpopular creatures—empathy is understandably a stretch when it comes to animals without fur or feathers, the more so when they lack limbs and moveable eyelids. Nevertheless, if people can appreciate rattlesnakes then turkey vultures and badgers should be easy, and having focused much of my research and teaching career on pitvipers, I am guardedly optimistic. Rattlesnakes have declined in abundance in many areas and some species are now threatened or endangered, but we have learned much about their ecology and behavior in the last 20 years, and our newfound knowledge is assuming an ever larger role in education and conservation.



In 1991, Pulitzer Prize-winning journalist Natalie Angier visited my lab in Berkeley for a piece she was writing on pitvipers for the *New York Times*. First I explained how surgically implanted radio transmitters had recently revolutionized snake biology, permitting herpetologists to study the predatory behavior and social lives of these generally secretive animals. As we looked over several of my live rattlesnakes, maintained as long-term captives for teaching, I pointed out that many of us have abandoned the old macho way of handling them. Pinning and manually restraining a snake's head often causes it to struggle violently, thereby increasing risk of injury to both animal and researcher. Instead, we now use a shepherd's crook—like “snake hook” to gently prod an animal part-way into a plastic tube, such that it can be carefully grasped at midbody with the front end safely inside the cylinder. One of the major payoffs of our ability to reliably and humanely observe rattlesnakes is that they have turned out to be fascinating animals, exemplifying far more than just their namesake antipredator adaptation.

A few minutes later, while Natalie gingerly touched a “tubed” Great Basin rattlesnake's buzzing tail and marveled at the velvety feel of its gray and charcoal-brown skin, I told her my pipe dream that someday nature tourists would sign up for supervised visits to a timber rattlesnake den. Natalie was obviously open to the beauty of snakes and keen on public education—her “Pitviper's life: bizarre, gallant and venomous” soon ran as a lead article in the weekly *Science Times* section—but the idea of *wanting* to go see wild rattlesnakes must have sounded preposterous because even she reacted with irony: “Ah, yes, get my travel agent.” I was only sorry that because timber rattlesnakes aren't found anywhere near Berkeley, I had no prospects for setting up such a trip.

I deliberately imagined timber rattlesnakes as a test case for appreciating venomous reptiles because of their unusual cultural and conservation status. Captain John Smith mentioned this large species in his “A Map of Virginia, with a Description of the Countrey...” published in 1621, and rattler flags with the motto “Don't Tread on Me” were popular during the Revolutionary War. Unlike Benjamin Franklin [see sidebar], some of the roughly three million Europeans in North America at that time no doubt disliked rattlesnakes, but so few of them could not cause a potentially irreversible decline in a widespread, abundant species.

Scarcely two centuries later, with the U.S. human popu-

lation having increased almost a hundredfold, timber rattlesnakes are endangered or already extinct in some parts of their former range. This unfortunate predicament stems from a collision between their biology and our behavior, despite the fact that these elegant creatures cause few snakebite accidents and are among the larger predators in their ecosystems. Timber rattlesnakes at cold latitudes are evolutionarily designed for low adult death rates and they have slow population turnover: females require nine or more years to reach maturity, breed only every three to five years, give birth to about ten large young in a litter, and thus might only reproduce a few times during a 25-year lifetime. Those life history traits leave a population highly vulnerable to unexpected mortality, and because during winter months the snakes aggregate at rock outcrops, entire populations have been wiped out by marauding humans. The majority of historically active dens in the northeastern United States are now inactive because of persecution and habitat destruction, and only small, isolated colonies persist in areas where rattlesnakes were once common. Moreover, timber rattlesnakes use a winter den, a summer hunting range, and transient areas, annually traveling hundreds of yards or more among them. A healthy population must therefore encompass enough land to include all three sites, and even that might not assure dispersal and gene flow to neighboring den groups.

Fast forward to June, 2001, two years after I'd moved to Cornell University and met with leaders of a regional group dedicated to preserving wild places in upstate New York. The Finger Lakes Land Trust was purchasing Steege Hill because it encompassed a timber rattler den, and that property was just across the Chemung River from a Nature Conservancy preserve that also harbors rattlesnakes. Now the Trust wanted to spotlight rattlesnakes in their new summer “Talks and Treks” series for the public, and I finally got my chance. I began by recounting a 15-year field study of 50 telemetered Arizona black-tailed rattlesnakes, done in collaboration with Tucson physician David L. Hardy. We've watched some individual blacktails for more than nine years, and Dave's superb color photographs have captured most aspects of their behavior in Nature. I explained that the first slide was the only one I'd show of a rattlesnake in full threat display, head drawn back and ready to strike, and that rather than being aggressive the snake was reacting defensively, out of something akin to fear, to a different photographer's close approach.

As researchers we strive to not disturb snakes and thus rarely see defensive postures, and so Dave's images instead illustrate their complex, sometimes idiosyncratic lifestyles. Like most other rattlesnakes that have been studied, blacktrails hunt for wary rodents and rabbits, find safe places to lay around after big meals, search for mates and wrestle with sexual opponents, court and copulate, give birth, and even briefly attend their young. Blacktrails repeatedly visit certain places within their well-circumscribed home ranges; they occasionally and thus far inexplicably climb trees; and once we saw one seemingly solve an unexpected dilemma in a surprising fashion. No. 41, a large male, crawled into a shady ravine, tongue-flicked around a rodent runway for 13 minutes, and moved back into a hunting coil with his head aimed across the prospective ambush site. Then after two minutes he extended

his head and neck in a stereotyped posture typically used to fight with other males and pressed down a dried fern a few inches in front of him. Will future studies confirm the tantalizing possibility that male 41 knew a dead plant might thwart his strike, hours or even days later, then acted accordingly? Did that animal really exhibit what psychologists call inferential reasoning, whereby a novel problem is solved by generalizing from some previous experience, in this case perhaps the toppling of a rival male?

After the slide lecture, with the audience seated at a safe distance, I used a snake hook to lift an adult timber rattlesnake out onto the floor. I kept a careful eye on the four-foot-long reptile as it coiled quietly or crawled slowly nearby, and I described the rational dangers of snakebite; accidents with this species are rare and with proper medical treatment

The Rattlesnake as a Symbol of America by Benjamin Franklin

EDITOR'S NOTE During the American Revolution, many colonists adopted the serpent as one of their own—it appeared on money, buttons, pamphlets and newspapers, and, of course, flags. One famous arrangement bears a coiled rattlesnake, ready to strike, against a yellow background. Why a rattlesnake? Its symbolic merits were expounded in the following letter, published in the *Pennsylvania Journal*, December 27, 1775. Signed "An American Gunner," most scholars now believe it was penned by the patriot Benjamin Franklin.

I OBSERVED, ON ONE of the drums belonging to the Marines now raising, there was painted a Rattle-Snake, with this modest motto under it, "Don't tread on me." As I know it is the custom to have some device on the arms of every country, I supposed this may have been intended for the arms of America; and as I have nothing to do with public affairs, and as my time is perfectly my own, in order to divert an idle hour, I sat down to guess what could have been intended by this uncommon device—I took care, however, to consult on this occasion a person who is acquainted with heraldry, from whom I learned, that it is a rule among the learned of that science "That the worthy properties of the animal, in the

crest-born, shall be considered," and, "That the base ones cannot have been intended;" he likewise informed me that the ancients considered the serpent as an emblem of wisdom, and in a certain attitude of endless duration—both which circumstances I suppose may have been had in view. Having gained this intelligence, and recollecting that countries are sometimes represented by animals peculiar to them, it occurred to me that the Rattle-Snake is found in no other quarter of the world besides America, and may therefore have been chosen, on that account, to represent her.

But then, "the worldly properties" of a Snake I judged would be hard to point out. This rather raised than suppressed my curiosity, and having frequently seen the Rattle-Snake, I ran over in my mind every property by which she was distinguished, not only from other animals, but from those of the same genus or class of animals, endeavoring to fix some meaning to each, not wholly inconsistent with common sense.

I recollected that her eye excelled in brightness, that of any other animal, and that she has no eye-lids. She may therefore be esteemed an emblem of vigilance. She never begins an attack, nor, when once engaged, ever surrenders. She is therefore an emblem of magnanimity and true courage. As it is famous to pre-

even a serious bite is likely to be survivable. Then I pointed out that there are about 2,500 species of snakes, all of them capable of an array of limbless locomotor styles that we can scarcely imagine: undulatory, rectilinear, concertina, and so forth. About ten percent of all snake species are vipers, characterized by hypodermic needle-like, folding fangs with which they inject a cocktail of immobilizing agents and digestive enzymes into their prey. Thus armed, a viper can subdue and digest prey up to about one and a half times its own weight—imagine the average American male eating a 250-pound hamburger without benefit of hands or silverware! Roughly two-thirds of the species of vipers, including North American copperheads and cottonmouths, have heat-imaging pits between the nostrils and eyes, and of those pitvipers, about 30 New World species possess an amazing noise-mak-

ing namesake on the ends of their tails. The rattle itself is an interlocking set of shed skin segments, vibrated at around 60 times per second by specialized tail shaker muscles, and is used only to warn away enemies.

I closed the lecture by briefly telling my audience about the natural history and conservation status of timber rattlesnakes, using information gleaned mainly from William S. Brown's pioneering studies in eastern New York. Newly informed about snake biology, people responded to the live rattler with comments like "beautiful," "awesome," and "Isn't it wonderful to be able to see this animal up close!" There were inevitably questions too, ranging from, "Can you tell a rattlesnake's age by the number of rattles?" (no; a segment is added each time a snake sheds its skin, usually several times each year, and old segments are worn off) to, "Are rattlesnakes

vent all pretensions of quarreling with her, the weapons with which nature has furnished her, she conceals in the roof of her mouth, so that, to those who are unacquainted with her, she appears to be a most defenseless animal; and even when those weapons are shown and extended for her defense, they appear weak and contemptible, but their wounds however small, are decisive and fatal. Conscious of this, she never wounds till she has generously given notice, even to her enemy, and cautioned him against the danger of treading on her.

Was I wrong, Sir, in thinking this a strong picture of the temper and conduct of America? The poison of her teeth is the necessary means of digesting her food, and at the same time is certain destruction to her enemies. This may be understood to intimate that those things which are destructive to our enemies, may be to us not only harmless, but absolutely necessary

to our existence. I confess I was wholly at a loss what to make of the rattles, till I went back and counted them and found them just thirteen, exactly the number of the Colonies united in America; and I recollected too that this was the only part of the Snake which increased in numbers. Perhaps it might be only fancy, but, I conceived the painter had shown a half formed additional rattle, which, I suppose, may have been intended to represent the province of Canada.

'Tis curious and amazing to observe how distinct and independent of each other the rattles of this animal are, and yet how firmly they are united together, so as never to be separated but by breaking them to pieces. One of those rattles singly, is incapable of producing sound, but the joining of thirteen together, is sufficient to alarm the boldest man living.

The Rattle-Snake is solitary, and associates with her kind only when it is necessary for their preservation. In winter, the warmth of a number together will preserve their lives, while singly, they would probably perish. The power of fascination attributed to her by a grosser superstition, may be understood to intimate, that those who consider the liberty and blessings which America affords, and once come over to her, never afterwards leave her, but spend their lives with her. She strongly resembles America in this, that she is beautiful in youth and her beauty increases with her age, her tongue also is blue and forked as the lightning; and her abode is among impenetrable rocks. — *An American Gleaner*



evil?" I answered that last one by saying I have no special theological knowledge, but as a former ambulance driver and army medic, what I've seen and regarded as evil has always been perpetrated by humans. With venomous snakes, I speculated, perhaps we can contemplate violence and mortality without anthropocentric implications, and thereby gain a little clarity in such matters.

On the following Saturday morning a dozen or so snake enthusiasts, primed with background knowledge of their quarry, joined me at the Tanglewood Nature Center in Elmira. Our leaders were Art Smith and his daughter Polly Blackwell, lifelong area residents and stewards of The Nature Conservancy's Frenchman's Bluff Preserve. Art, a retired optometrist, seems to know every rattler on the property, and over the next three hours he and Polly guided us to several rock outcrops, situated under openings in the forest canopy. By early summer, males and the adult female snakes that are not breeding this year have dispersed into the surrounding woods, lying in ambush for mice and chipmunks. Pregnant timber rattlesnakes, however, remain at good basking sites close to the winter dens, the better to maintain elevated body temperatures for their developing litters. The first few clearings we visited that morning yielded several common garter-snakes, resplendent in their black and yellow stripes, but no rattlers. As we approached the last rock pile though, while we were still about 20 feet out, Art signaled with upraised hand for us to halt quietly. Other than the leaders, no one in our group had ever seen a wild timber rattler in New York.

Art and I scanned ahead for a few seconds, then began pointing out the snake to our companions, and one by one they distinguished the set of scaly body loops from similar looking accumulations of leaves, fallen branches, and other litter. Soon our newly minted snake hunters looked like run-of-the-mill amateur ornithologists, except that their binoculars were angled *downward* and they were talking excitedly about an adult female timber rattler. Birds fluttered and sang overhead but these people stared straight ahead at the snake. She was perhaps three and a half feet long and coiled in dappled sunlight on a loose stack of slabs; she had probably recently molted, judging from the lustrous, rich appearance of her golden yellow and dark brown crossbands. Her hindparts and tail were velvety jet black, and her abdomen was swollen enough with young that stretched bluish skin was visible among the scales. We kept a respectful distance and soon

everyone stopped talking, just stood there watching the immobile coils. No obstreperous TV personality dangled that animal by the tail and crowed about how she was so "aggressive." No one poked her with a stick. And that beautiful snake didn't move in our presence, never so much as nervously *chick-chick-chicked* her rattles.

The first Talks and Treks program was consistent with my experience teaching undergraduate natural history classes in California—that with a little preparation people readily treasure an encounter with a live rattlesnake, and I am indeed optimistic about conserving such dangerous animals. We've got a long way to go though. A preliminary assessment in 1992 concluded that 50% or more of all species of pitvipers might already be threatened with extinction, and more than a decade later only a couple of dozen of those have achieved special protected status. Meanwhile people are still slaughtering rattlesnakes by the thousands every year at "roundups" in New Mexico, Oklahoma, and Texas, and not long ago two Missouri legislators tried (unsuccessfully) to exempt snakes from protection by their state's wildlife laws. Terapielos, large tropical relatives of rattlesnakes, are routinely killed around buildings at a well known Costa Rican field station because they are hazardous to scientists and ecotourists, despite the fact that only a single serious snakebite has occurred at that site in 40 years. And just this spring a staff member at a Texas state park I visited, when asked if she saw many snakes, responded "They're bad this year!" Think about that, she said they are *bad*....

Conserving snakes ultimately depends on controlling our impact on their environments, as is of course also true for giant pandas and whales and other more typically charismatic organisms, but Baba Dioum's comments emphasize the extent to which research and education are linchpins for appreciating and thus valuing unpopular organisms. We can all be teachers in some sense or another, whether in classrooms or over backyard fences. If you agree with me that our lives are richer for the existence of dangerous animals, that the Earth is wilder and more wonderful because of their presence, then learn what you can and tell others something good about rattlesnakes. ☺

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