

# NEWS FROM THE PIT

Arizona Poison and Drug Information Center



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## The Notorious “Mohave Green” Rattlesnake

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I am frequently asked at public presentations, “What’s the difference between a Mohave rattlesnake and a Mohave green?” Such questions always remind me of this quote, often attributed to Mark Twain:

*“It ain’t what you don’t know that gets you into trouble. It’s what you know for sure that just ain’t so.”*

The answer to the question is that there is no difference ; they are the same animal. Except that the species’ popular reputation has suffered from seventy or so years of conjecture and third-hand storytelling, although it is anchored in some original hard science. But the result is a rich folklore that has invented the notorious and much feared “Mohave green.”

### NEWSLETTER HIGHLIGHTS

Delving into the folklore surrounding Mohave Rattlesnakes

**Image 1: Mohave Rattlesnake  
(*Crotalus scutulatus*)**

# The Notorious “Mohave Green” Rattlesnake

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Remarkably, myths and misinformation about “Mohave greens” have thoroughly permeated society, especially in the southwestern United States where they are widely believed to be highly aggressive and the deadliest of rattlesnakes. Tales about “Mohave greens” chasing people and automobiles are not uncommon and many people believe that they have some mysterious origin or are recent hybrids. Others claim that antivenom is useless against their bites, or that their venom lies dormant in a person’s body for years, only to be reactivated later in life.

Remarkably, during a radio interview in the early 1990s, a listener called in to tell me that “Mohave greens” were deadly hybrids produced by the U.S. government to put down enemy tunnels in Vietnam and, after the war, the excess snakes were released at Fort Irwin in the California desert – and that is why there were no “Mohave greens” before the 1970s!

I have concluded, after looking into this phenomenon extensively, that the seed of these myths can be found in the 1930s, with some of the first comparisons of lethality between the venoms of North American snakes. Dr. Thomas Githens, working at the Mulford Biological Laboratories in Pennsylvania, began comparing venoms by determining the median lethal dose (MLD) for each species, using 350g pigeons as test subjects.

In those days, Mohave rattlesnakes (*Crotalus scutulatus*) were already known to inhabit most of the arid regions of the southwestern United States and mainland Mexico. In 1935, Githens reported his comparison of the venoms of twenty-six North American pitvipers, with Tiger rattlesnakes (*C. tigris*) being the most lethal with an average MLD of 0.004 mg, followed closely by *C. scutulatus* at 0.007 mg (smaller dose = greater lethality). In this and subsequent publications, he described the pigeons dying from paralysis of the muscles of respiration.

## Mojave or Mohave?

I use the “h” spelling for the rattlesnake and for most other uses of the word. See Crother 2017, pp 64-65; and my own book (Cardwell 2020) for the explanation. But I keep the “j” spelling when I know it was used for an original name or title, such as “Mojave toxin”.



Arizona. His two-year-old son is in critical condition there, after being bitten three times by a snake that authorities say is a new breed of rattler.

was bitten three times by a snake that experts in Arizona say is a spine-chilling combination of the Coontail Rattlesnake and the deadly Mojave Green Rattlesnake.

**Image (middle): Mohave Rattlesnake**

**Image (bottom): From the Apple Valley News, Apple Valley CA; September 1, 1995**

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But the folklore didn't seem to take off for another fifty years. In 1956, the University of California Press published *Rattlesnakes, Their Habits, Life Histories, and Influence on Mankind* by renowned rattlesnake expert Laurence Klauber. This highly acclaimed two-volume 'rattlesnake bible' was widely considered the ultimate record of what was known about rattlesnakes at the time. In his discussion of venom on page 788, Klauber quoted Githens before stating:

*“...if future tests of the quality of the venom of C. scutulatus corroborate the m.l.d. figures now available, this may prove to be a very dangerous rattler.”*

Then, in 1965, several of the most prominent medical snakebite authorities of the day, including Drs. Sherman Minton and Findlay Russell, produced a manual for the U.S. Navy entitled *Poisonous Snakes of the World*, in which they stated on page 41 regarding *C. scutulatus*:

*“...for its venom is more toxic and has a more marked effect on respiration than that of any other North American rattlesnake.”*

Interestingly, neither Klauber (1956) nor Minton et al. (1965) made similar remarks about *C. tigris*, whose venom exceeded the lethality of *C. scutulatus* in Githens' analyses and continued to score high in later tests. This omission was likely due to the more limited distribution and restricted habitat of *C. tigris*, bringing it into contact with people far less frequently than *C. scutulatus*.

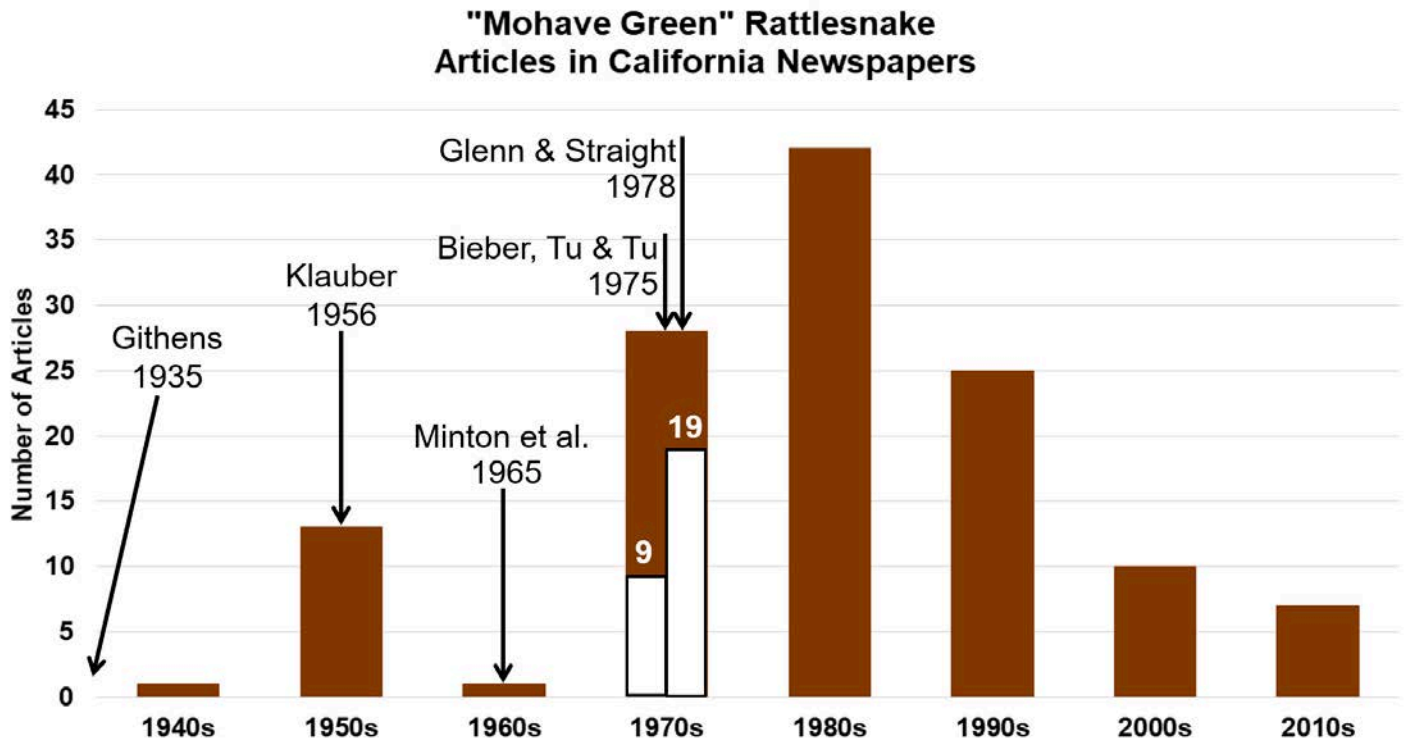
Dr. Githens data were, indeed, corroborated by many subsequent researchers, mostly using mice instead of pigeons. In 1975, Bieber, Tu, and Tu published the original description of the PLA<sub>2</sub> neurotoxin in *C. scutulatus* venom and named it Mojave toxin. Shortly thereafter, Glenn and Straight (1978) discovered that *C. scutulatus* found in a large area of southcentral Arizona produced venom lacking Mojave toxin and failing to produce exceptionally lethal MLD scores. This extreme dichotomy of venom types in neighboring populations of the same species garnered lots of attention.



**Image: Venom extraction from an adult Mohave Rattlesnake**

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White bars indicate the number of 1970s articles before (9) and after (19) Bieber et al. described Mojave toxin.

In attempting to understand the chronology of the developing folklore, I queried newspapers.com for mentions of Mohave rattlesnake and “Mohave green,” using both the “j” and “h” spellings. Full disclosure: the results are not comprehensive, as the website contains many but not all U.S. newspapers. Nonetheless, the results are informative.

Interestingly, of the 161 articles returned, 121 were from California newspapers. Second was Florida with 6 articles, then Texas with 5, Illinois and Utah with 3 each, plus six states (including Arizona) with 2 each, and 16 states with 1 article each. (At the time of the inquiry, newspapers.com claimed to list 11,900 newspapers, of which 162 were from California).

The mysterious origin myth was bolstered in the minds of some people by Klauber’s footnote (1956:42) stating that the type specimen (i.e., the museum specimen used for the original description of a species) listed for *C. scutulatus* by the United States National Museum was the wrong species.

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“Except in Arizona and parts of Texas and California--home to the deadly Mojave rattlesnake--most humans bitten in the United States could expect to survive.”

Steve Grenard  
Natural History Magazine  
(7/00-8/00;46)

One of the more poignant sources of misinformation was the cover story of the July/August 2000 issue of *Natural History* magazine, a popular and well-respected publication of the American Museum of Natural History. In an article entitled, “Is rattlesnake venom evolving?”, a respiratory therapist from Staten Island asserted that “recent reports suggest that the venom of North America’s rattlesnakes is growing increasingly potent, making their bites more difficult to treat.” He went on to speculate “that contiguous populations of rattlesnakes are interbreeding, creating hybrids” and allowing Mojave toxin to spread to other species. He claimed that the neurotoxic venom variant can cause death to “occur in as little as ten minutes, usually due to abrupt cessation of respiration.”

Biologist Andrew Holycross of Arizona State University wrote an accurate and compelling rebuttal to the ideas of rampant hybridization and rapid evolution contained in the *Natural History* article. However, his rebuttal was published without fanfare on page 8 in the next issue. A more robust rejection of rapid venom evolution was published in 2010 by Drs. William Hayes and Stephen Mackessy.

**FASCINATING EARTH By Philip Seff, Ph.D.**

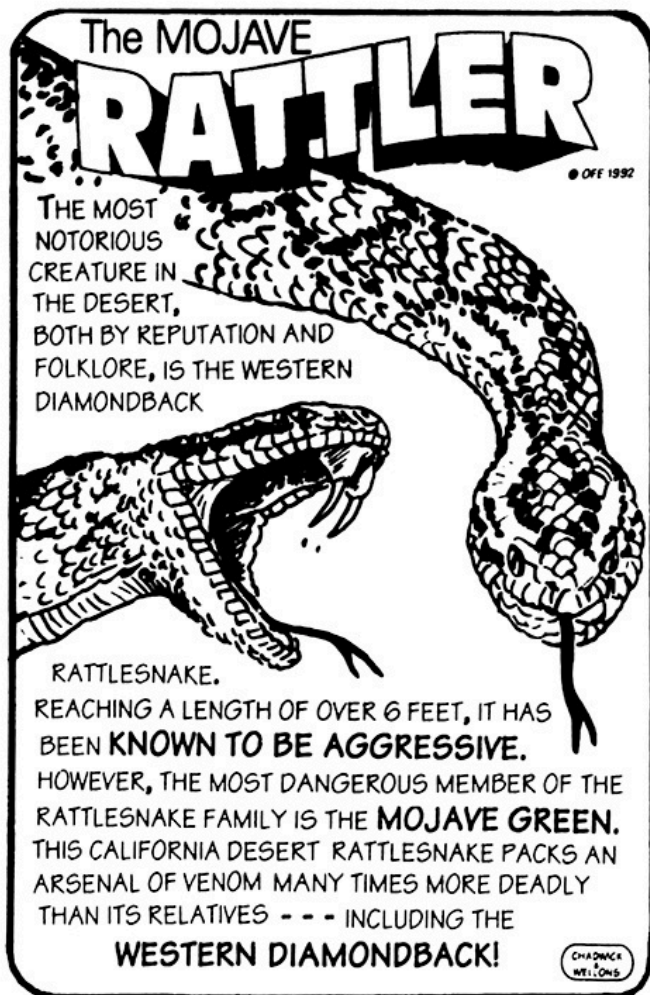


Image: This warning appeared in the Provo, Utah *Daily Herald*, August 5, 1992, edition, page B5. But it was carried by other newspapers nationwide at the time.

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Of course, it has been well known for decades that despite an estimated 7000-8000 annual venomous snakebites in the U.S., only about 6 deaths are recorded per year – a fatality rate of less than 0.1%. (Kanaan et al., 2015) This is despite Mohave rattlesnakes being responsible for most rattlesnake bites in California’s Mohave Desert and believed to be second only to Western Diamondbacks (*C. atrox*) for snakebites in southern and western Arizona (many of which admittedly occur in the non-neurotoxic area). Indeed, a study of snakebite fatalities in the United States between 1989 and 2018 indicates as many or more fatalities occur in the southeastern U.S. than in the southwest (Green et al., 2021), even though Mohaves are restricted to the arid southwest where they bite dozens of people a year.

And there is more encouraging news. Both FDA-licensed rattlesnake antivenoms available in the U.S. today contain specific antibodies raised against Mojave toxin (CroFab®) or a close analog (ANAVIP®). Plus, a recent retrospective study of 3,440 Arizona rattlesnake bites failed to identify a single case of neurotoxic respiratory paralysis, even though many neurotoxic Mohave rattlesnake bites are believed to be represented in those data (determining with certainty the species of rattlesnake responsible for a bite is impossible in most emergency department presentations). A corresponding literature search disclosed only one case of neurotoxic respiratory paralysis following a North American rattlesnake bite: a young woman bitten by a Mohave rattlesnake in California. (Smelski et al., 2023; Jansen et al., 1992)

As it turns out, *C. scutulatus* does have a rather typical history in the biological record. The species was described in 1861 at the United States National Museum (Kennicott 1861) but the record was confused by a specimen tagging error and the type specimen designation published in 1900 was, indeed, erroneous. But some detective work more than a century later identified the correct specimen (Cardwell et al., 2013).



Image: A large male Mohave rattlesnake investigates my telemetry antenna at my feet while I record data.

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So, the bottom line is that the “Mojave green” is a fantastically dangerous creature with little link to reality, while actual neurotoxic Mohave rattlesnakes are apparently one of the deadliest rattlesnakes – to pigeons and lab mice! But, whether the neurotoxic form or not, real Mohave rattlesnakes seem to be no more or less dangerous to people than other rattlesnakes of similar size, according to available objective data. And contrary to popular belief, neurotoxic respiratory paralysis is almost unheard-of following Mohave bites. Toxicologists hypothesize that this effect is likely dose dependent and if the intentionally lethal doses given to all those lab animals were scaled up to humans, the clinical picture might be different.

For those of us who study wild rattlesnakes, including lots of Mohaves, we find their behavior to be not much different than other species. Make no mistake, they can deliver a potentially lethal bite in a split second when bothered – whether the bother is accidental or intentional. But like other rattlesnakes, Mohaves are mostly shy, cryptic, and try to avoid confrontations with creatures as large as people. When we need a venom or blood sample, they are often difficult to catch, especially when in thick brush or next to a rodent burrow where they can quickly disappear. I often remind people who claim to have been chased by rattlesnakes that we all now carry a video camera in our pocket (cellular phones). Where are all the YouTube videos of rattlesnakes chasing people?

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