

2003

Serpents of the Ark-La-Tex

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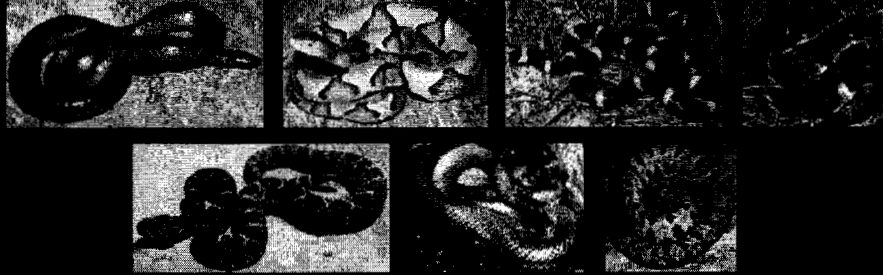
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Serpents of the Ark-La-Tex



with an emphasis on the snakes of western
Arkansas, northeastern Texas, and the
Edwards Plateau of central Texas

Jennifer L. Hollis



University of Northern Iowa
(in conjunction with Texas A&M University-
Texarkana)

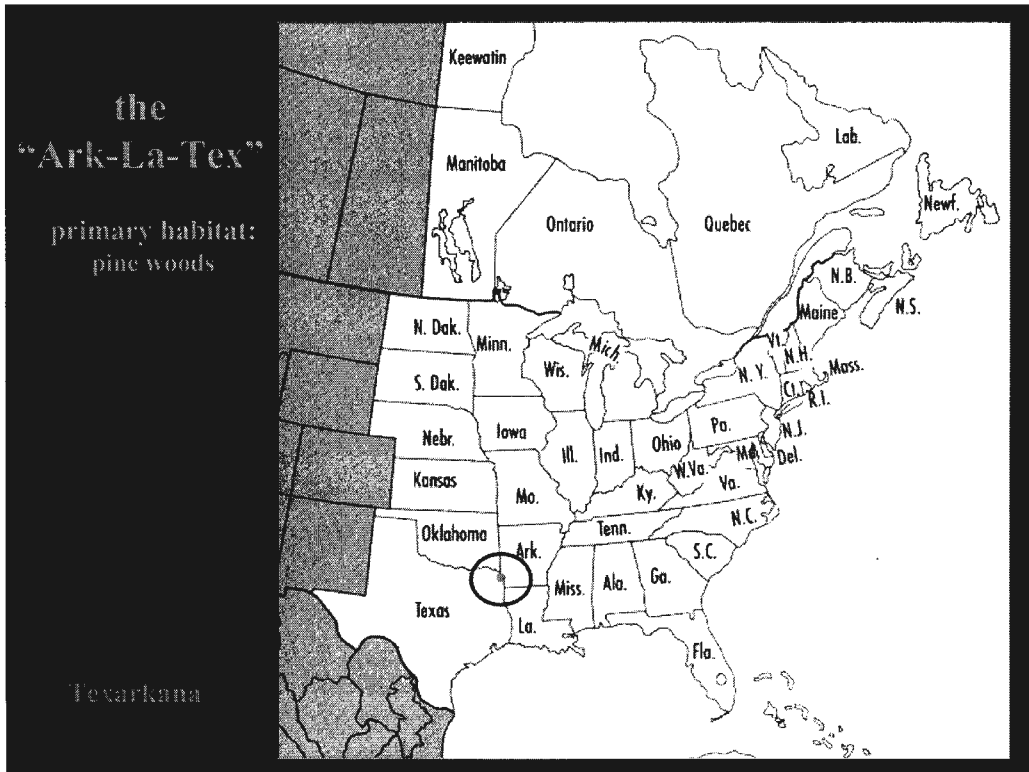
Presidential Scholar Senior Thesis

Before I begin...

This presentation includes special guest appearances by non-venomous snakes, a box turtle, and an aquatic salamander.

If at any time you feel nervous about being near any of these animals, please feel free to move to a different seat!





What is the "Ark-La-Tex"?

Place where Arkansas, Louisiana, Texas (and Oklahoma) come together. Should probably actually be "Ark-O-Tex," but doesn't sound as good!

Texarkana in middle

distribution of amphibian species – United States



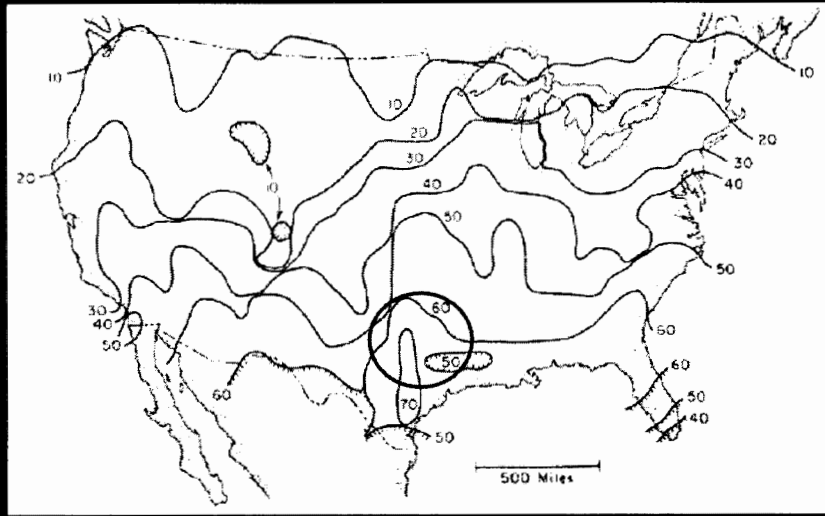
Why Texarkana?

Herpetology: study of reptiles and amphibians

Ark-La-Tex...

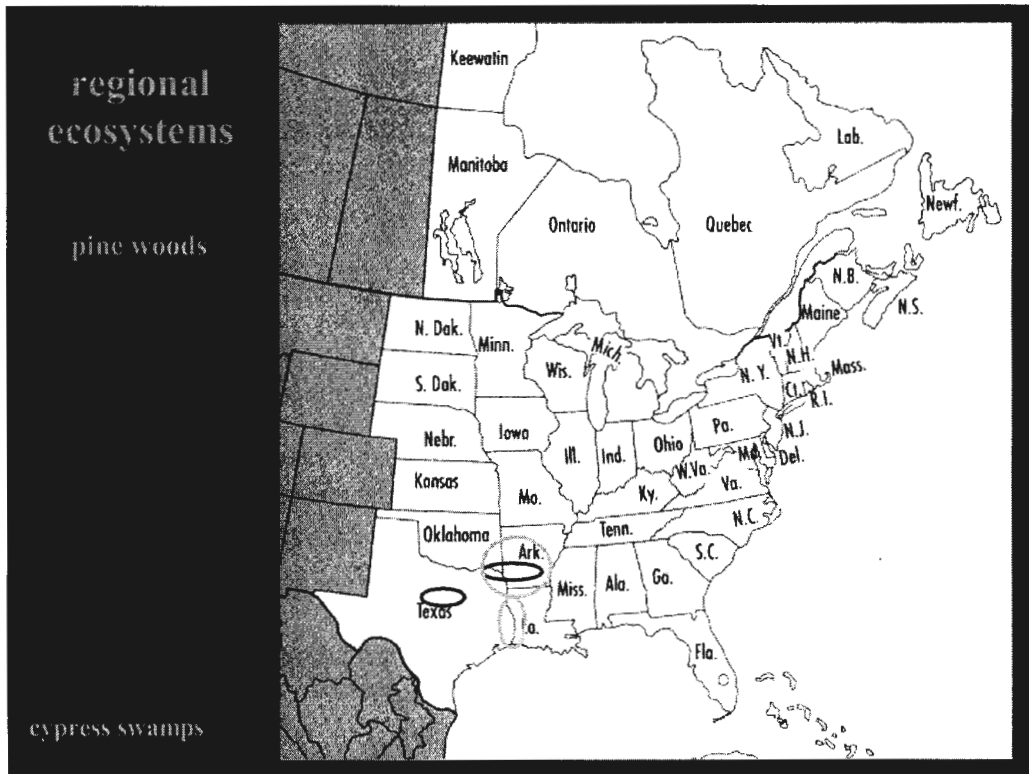
...abundance of amphibians

distribution of reptile species – United States



Ark-La-Tex...

...also an abundance of amphibians



Why so many herps?

I said was pine woods, but several large ecosystems within region

Ouachitas (below Ozarks)...pine woods, moist

Edwards Plateau in central Texas...arid, limestone (and dinosaurs)

Cypress sloughs along Texas-Louisiana border

Vertebrate Field Zoology 2002 Texas A&M University–Texarkana



First, why did I go down here?

Do research with Dr. Mac, also take a vertebrate field zoology class that would expose me to the vertebrates of the region...much more varied than the vertebrates I was used to in Iowa.

Lots of pictures and stories involve other members of that class, so if I should mention them, this is who they are.

The people I spent 5 weeks with, camping, working, playing, stuffing mammals, etc.:

- Dr. Chris McAllister, professor at Texas A&M University, Texarkana
- Jeff Nix, student from University of Arkansas, Little Rock
- Kelly Richey, student from Texas A&M University, Texarkana
- Me
- Shelly Smith, student from Texas A&M University, Texarkana
- Chris Svrcek, Kelly's younger brother (to make sure class would make)

Snakes.....

And on to the snakes, which are hopefully why you came....



- introduce two of my snakes
 - will use them for demonstration of certain things
 - both are captive-bred, never lived in wild
 - both are about 9 years old
 - both are males, despite names
- [Ophelia] (name comes from Greek for serpent)
 - just shed
 - Great Plains ratsnake
- [Zea] (name comes from Latin for corn)
 - corn snake
- it would have been a stretch to see a corn snake where I was, but definitely could have seen a Great Plains rat

comments on some of the snake sensory organs:

- [no] external ear
 - can detect vibrations using inner ear bones
 - airborne sounds are “heard” using jaw bone
- eyes
 - do not focus; have limited range of movement in head
 - no eyelid; covered by a clear scale
- nostrils
- heat pits
- Jacobsen’s organ

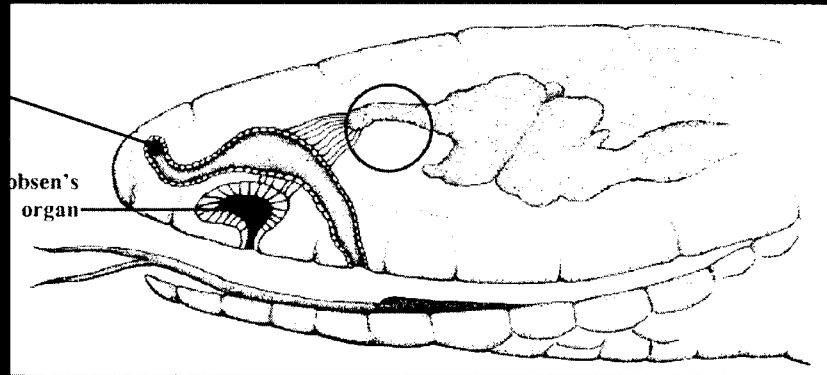
- no external ear opening; does not mean snakes can’t hear
- can pick up vibrations with their inner ear bones
- can sense airborne sounds using part of jaw bone
 - reptiles have more jaw bones than mammals, fewer ear bones...quadrate (snake jaw) became ear bone in mammals

-
-
- snakes’ eyes do no focus except in one species (Asiatic, arboreal)
 - snakes move heads to focus lens, like a camera
 - trade-off of poor focussing is enhanced sensitivity to movement
 - scale covering eye: spectacle, brille
 - good for burrowers, as snakes all were originally

-
-
- nostrils are used for breathing and some scent detection

-
-
- will talk about in depth about heat pits later

-
-
- Jacobsen’s organ...LEADS TO NEXT SLIDE...



drawing from: Mattison's *The Fauna of Sweden* (1978)

THIS IS A DIAGRAM OF A SNAKE HEAD

=====

eye

=====

nostril

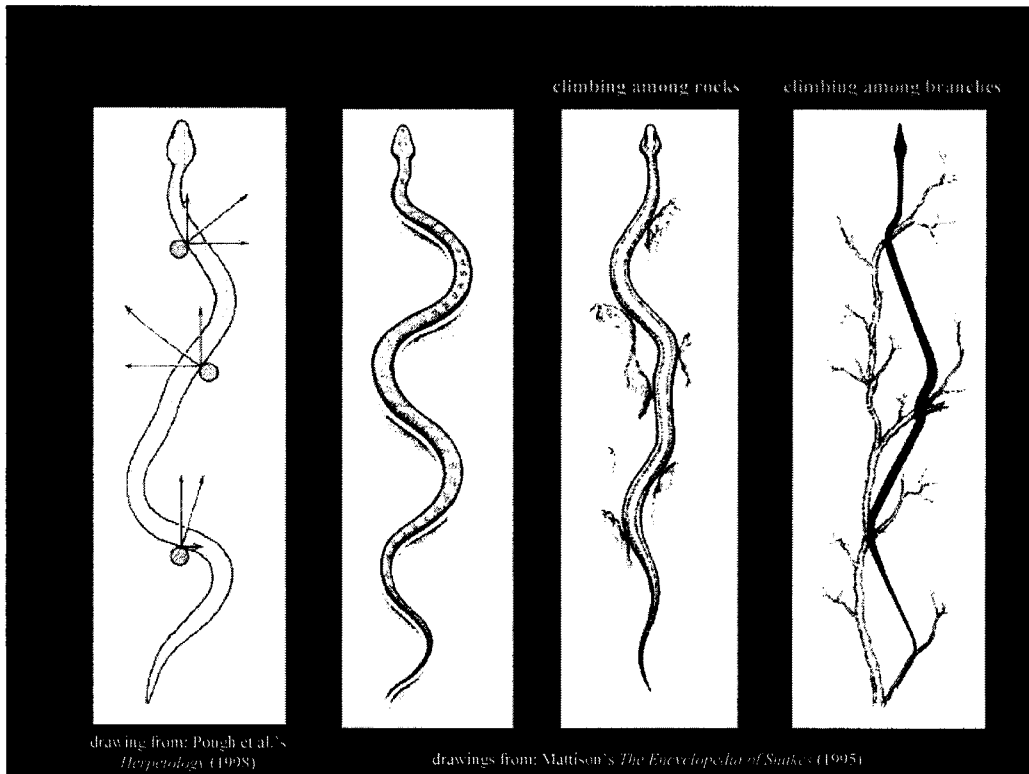
=====

organ

=====

- found only in snakes, some lizard groups
- works with/in addition to the nostrils and olfactory part of brain
- in front of palate: sacs lined with sensory cells
 - open to roof of mouth via narrow ducts
 - ends connected to branch of olfactory nerve
- tongue flicked out through lingual fossa; tips pick up molecules
 - tongue tips inserted into opening of Jacobson's organ
 - molecules, concentrations identified
- active snakes use Jacobson's organ as much as, if not more than, their nostrils

Snake locomotion



- typical “snake”-y movement (snake in S-shape)

-
-
- pushing against small irregularities in substrate
 - different parts of body, same points of contact allow snake to progress

- used when:

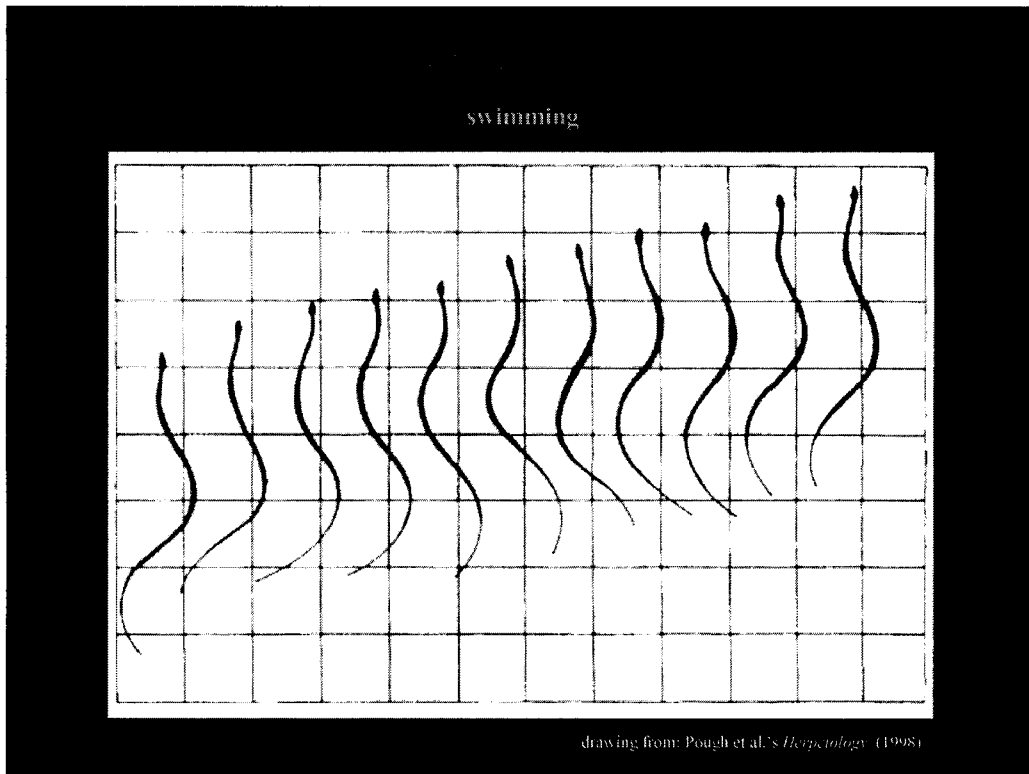
- crawling over uneven ground

- climbing through rocky crevices

- climbing among branches

- even when swimming

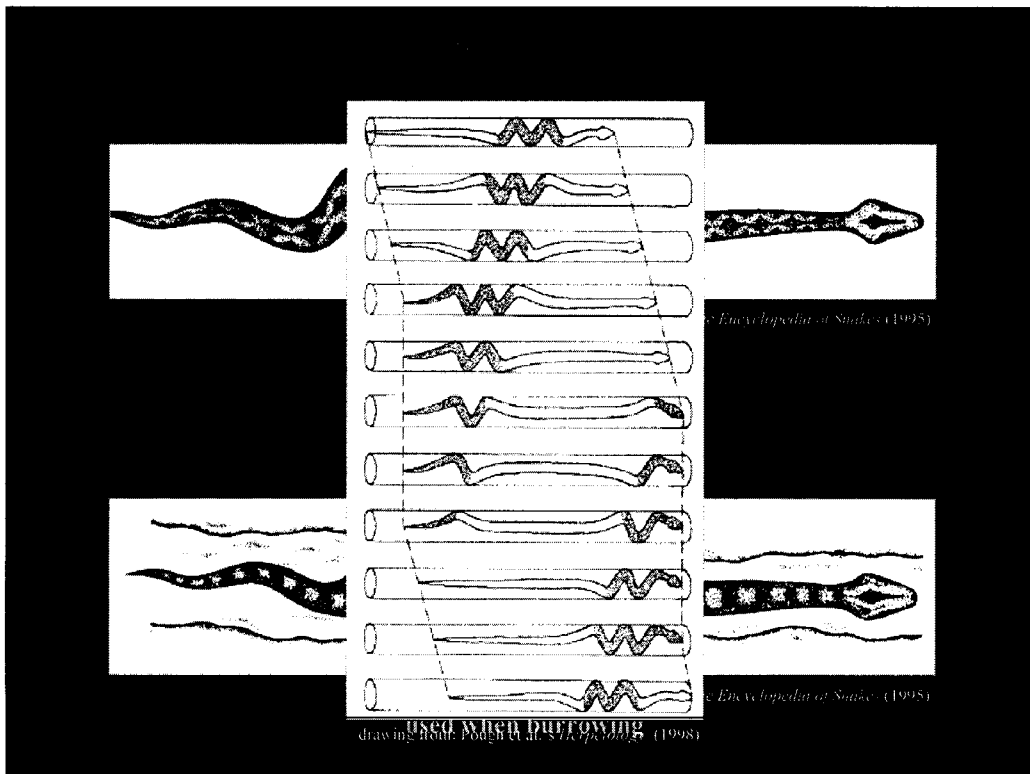
WHICH LEADS TO NEXT SLIDE...



- instead of pushing against the substrate, motion comes from pushing against the water
- certain types of aquatic snake (especially sea snakes) have somewhat vertically compressed tails to act as a rudder

[Zea]

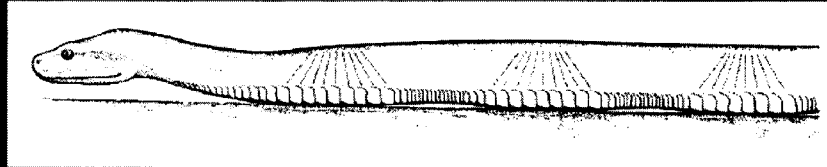
- slide-pushing
 - like lateral undulation on a smooth surface



- “wriggling” movement
- simplified: front half of body is extended while back half is used to anchor; then motion is exchanged between halves

[envison movement through a tube]

- used when moving underground in tunnels, or in other tight spaces
- is also sometimes used vertically for climbing up tree trunks

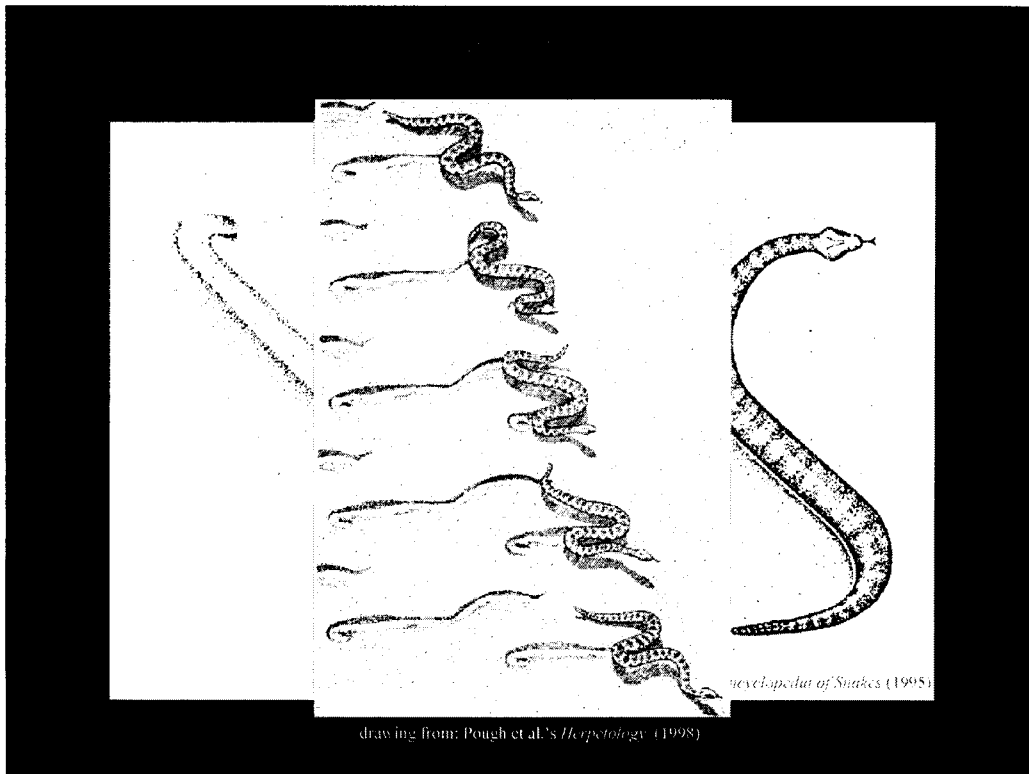


drawing from: Mattison's *The Encyclopedia of Snakes* (1998)

- straightforward movement
- used mostly by large, heavy-bodied snakes (boas, pythons, also viperids such as rattlesnakes)
 - would take lots of energy to move bulk around in S-shape
- large ventral scales (scutes) are used to hook onto substrate and pull snake forward

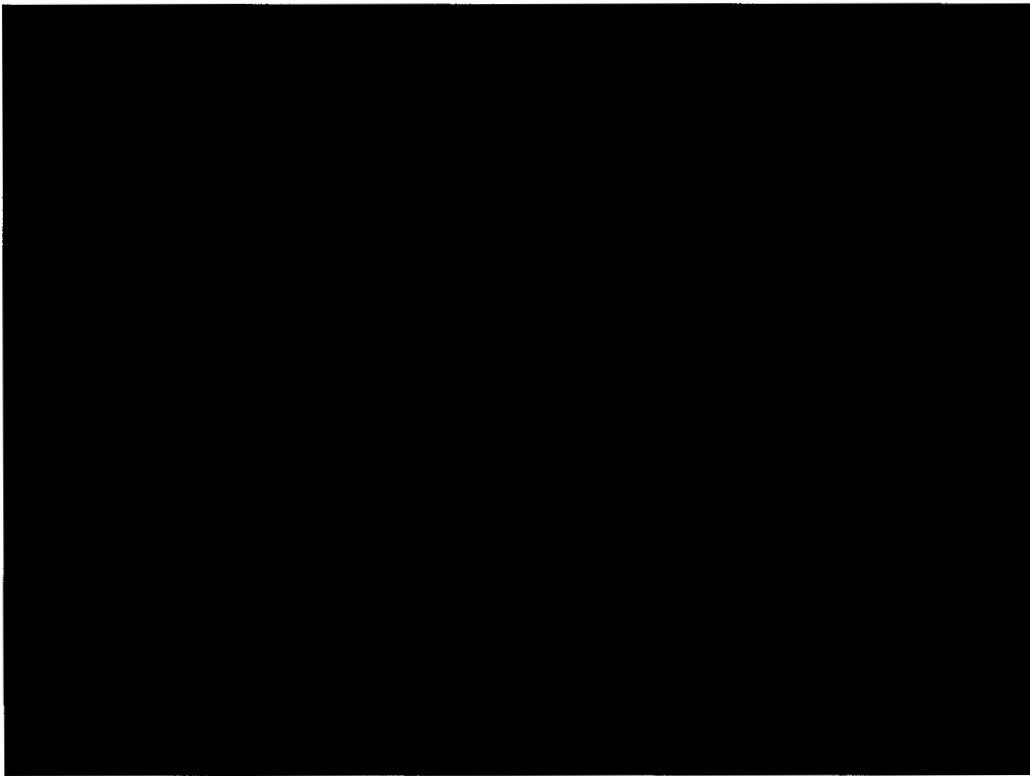
[Zea]

- also used in final moments of prey-stalking--less likely to be noticed



- similar to concertina locomotion, except head/trunk are thrown at 45° angle rather than straight forward
-

- leaves distinctive tracks
- minimizes time spent in contact with hot sand



- these are not the only ones used, just some of the most easily understood
- ones I can demonstrate using pictures
- used by North American snakes, among others

Coloration as a defense mechanism in snakes

(against sight-oriented predators)

- “sight-oriented predators”...birds, mammals, etc. that visually locate prey such as snakes
- obviously is advantage to snake to not be seen as easily by predator
- these are not the only ones used, but are some of the easiest to illustrate using pictures of snakes I saw in the Ark-La-Tex

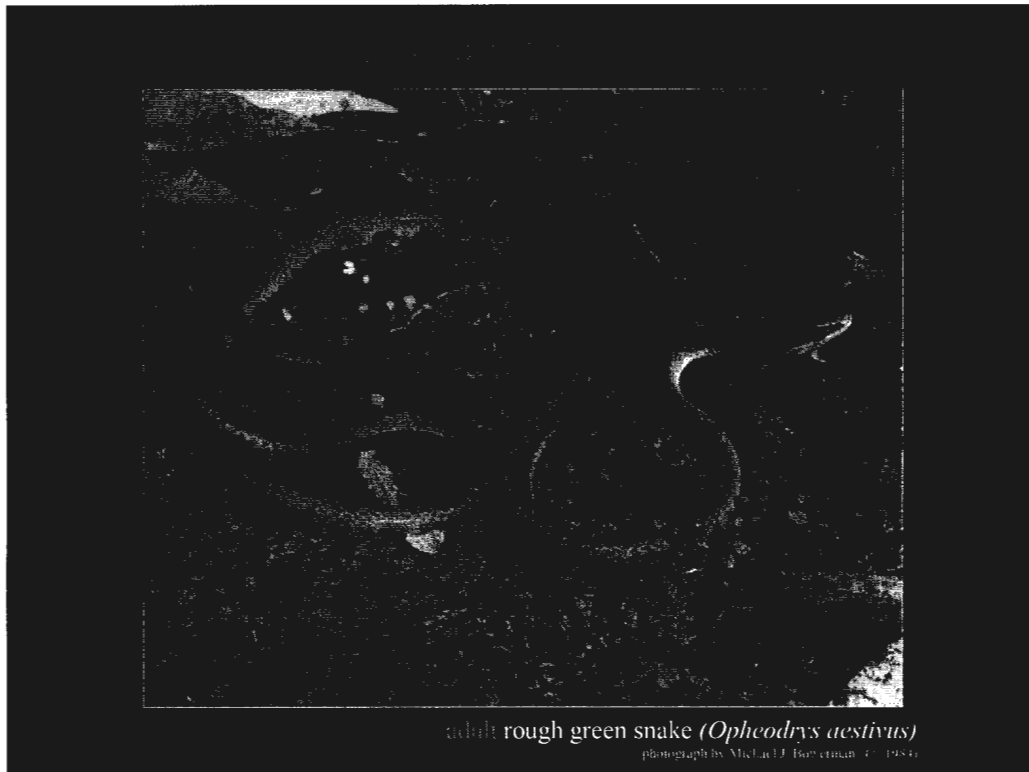
crypsis – countershading



adult yellowbelly water snake (*Nerodia erythrogaster flavigaster*)

photograph by Michael J. Bowerman (© 1984)

- example of countershading [crypsis]
- many water snakes are dark on top, light on bottom
- look down from top, blends well (dark water, mud, etc.)
- look up from underwater, also blends well (light)



- example of matching the substrate [crypsis]
- also note the body shape: vine-like
 - spends lots of time hanging out in shrubs, bushes, trees



adult broad-banded water snake (*Nerodia fasciata confluens*)
photograph by Michael J. Boverman (1984)

- example of disruptive coloration [crypsis]
- disruptive coloration does not mean matching substrate, but breaking up outline of actual animal snake
- eyes are vulnerable parts of snakes; many snakes have stripes over their eyes to make eye location hard to distinguish

[snake I saw along roadside one night, had in all my life seen only one cottonmouth for comparison, etc.]

polymorphism

photograph by Craig McIntyre (© 1984)



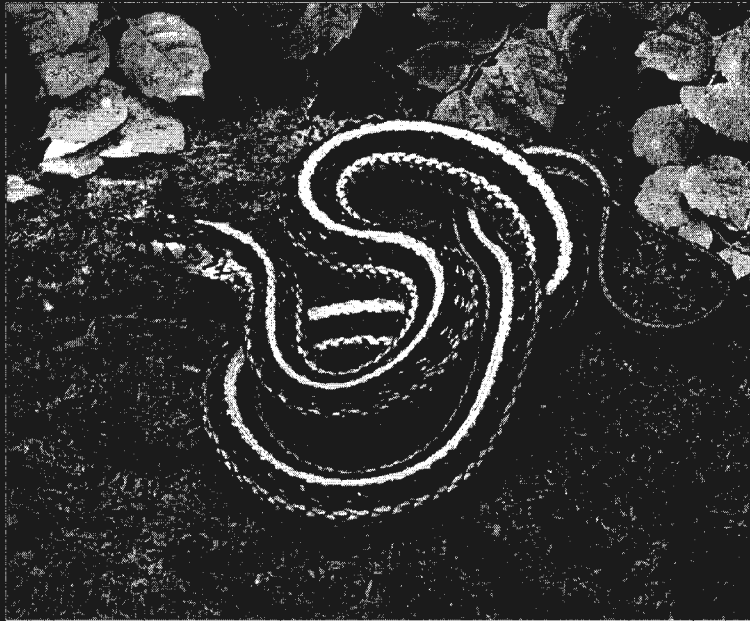
photograph by Michael J. Bowerman (© 1984)



photograph by Michael J. Bowerman (© 1984)

3 color phases of adult ground snakes (*Sonora semiannulata*)

- example of polymorphism
- confuses predators that have formed specific search images
- ground snakes have 5 distinct morphs (2 more not shown here)



adult eastern garter snake (*Thamnophis sirtalis sirtalis*)

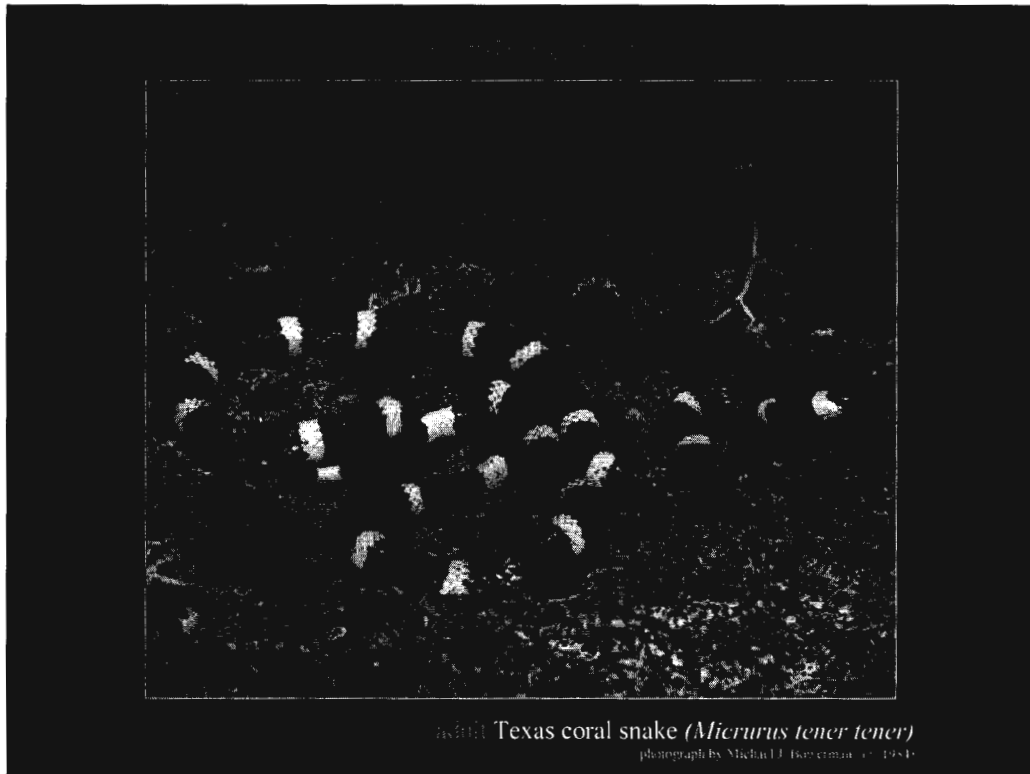
photograph by Michael J. Pöyryman (c. 1984)

- example of longitudinal stripes [flight coloration]
- snake appears to remain in the same place until suddenly it is gone
- typical of slender, fast-moving species



- example of transverse bands [flight coloration]
- can create an optical illusion of sorts, where it is hard to tell in which direction the snake is moving
- also makes it hard to estimate speed of the snake

- [Mario]
 - eastern kingsnake
 - female (theme of mis-assigning genders)
 - no *L. g. getula* where I was, although I could have seen two other subspecies of *getula*
 - this seemed like a good time to introduce him since he has such lovely transverse bands
 - [first type of snake with which I was ever in contact, so spurred my interest of snakes, etc.]



- example of warning coloration
- red, yellow (or white), and black are warning colors in nature -- “Do Not Touch”
- coral snakes venomous (lots of neurotoxic fractions in the venom)
- “Red touch yellow kills a fellow” vs “Red touch black, friend of Jack [or ‘venom lack’]”
- mimicry as defense?

A few other forms of defense
in snakes I saw...

- sheer aggression (hissing, tail-rattling, feint-strikes, etc.)



adult eastern coachwhip (*Masticophis flagellum flagellum*)

photograph by Michael J. Bowerman (© 1984)

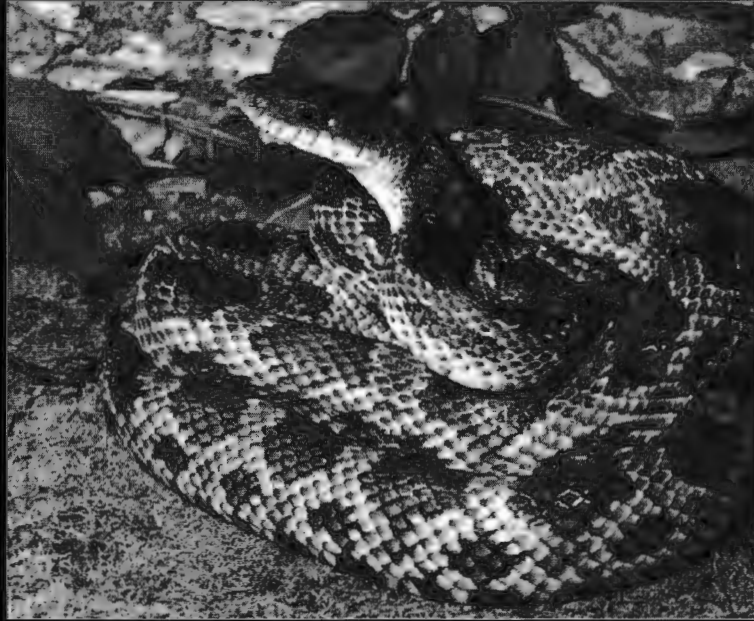
- speed
- sheer size (up to 7+ feet in length)
- diurnal hunter (slender, fast, raises head while hunting)



adult southern black racer (*Coluber constrictor priapus*)

photograph by Michael J. Bowerman (© 1984)

- speed
- “voluntary” loss of tail
- diurnal hunter (slender, fast, raises head while hunting)



adult western rat snake (*Elaphe obsoleta*)
[formerly Texas rat snake, *Elaphe obsoleta lindheimeri*]
photograph by Michael J. Bowerman (© 1984)

- aggression (hissing, tail-rattling, etc.)
- will bite if molested

Western Mud Snake

(Farancia abacura reinwardtii)

- not seen often because they are nocturnal, aquatic, burrow
 - [one of most exciting snakes for me]
 - [a county record (Marion County, TX)]



adult western mud snake (*Farancia abacura reinwardtii*)

photograph by Michael J. Bowerman (© 1984)

- very shiny

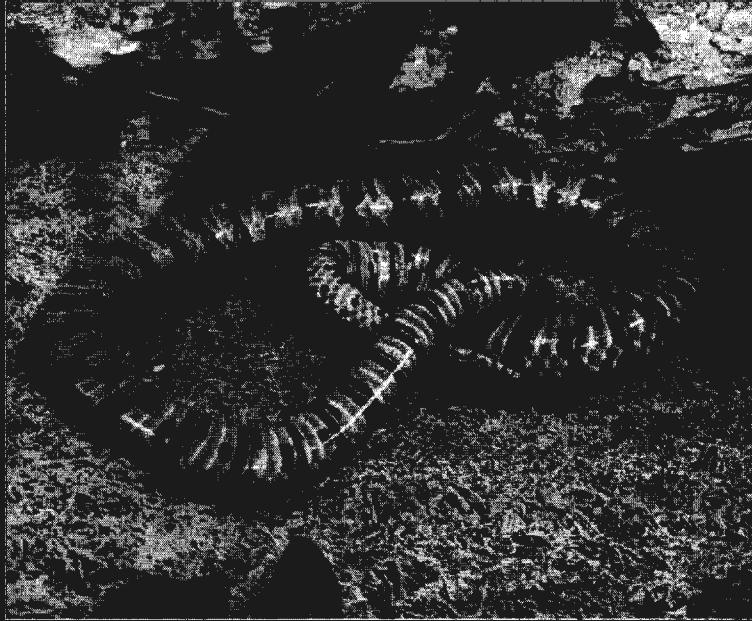


Figure 1 western mud snake (*Farancia abacura reinwardtii*)

photograph by Michael J. Boxcrum © 1984

- vivid pattern underneath
- possible warning coloration?
- snake in picture using yet another defense strategy:
playing dead
 - “when frightened, *F. a. reinwardtii* does nothing more than effect the characteristic defensive posture of most red-bellied snakes by hiding its head in a ball of coils while either everting its bright carmine undertail or flipping over on its back in imitation of a moribund carcass”



- that white area is not a wound, it is the cloaca (vent)



adult western mud snake (*Farancia abacura reinwardtii*)

Texas, Marion County
photograph by J.L. Hollis (2002)

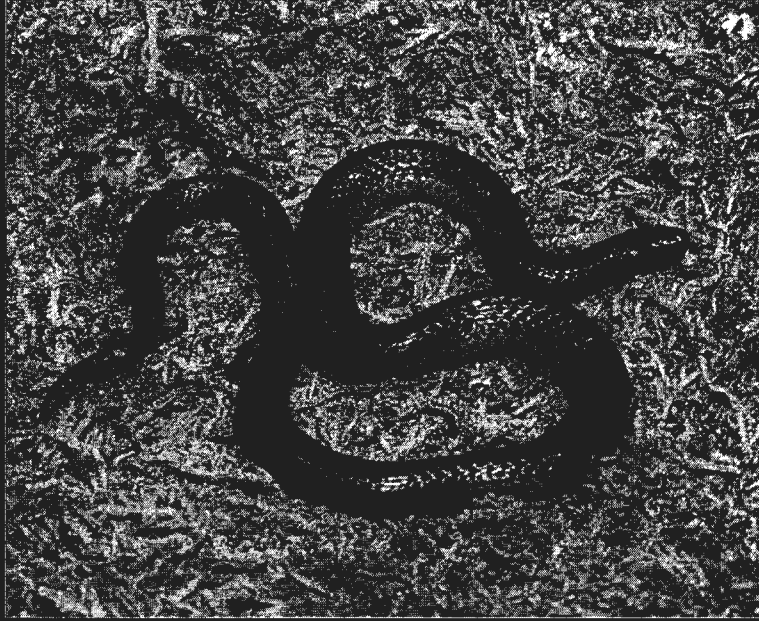


- interesting feature on tip of tail: special, sharp scale
- causes this snake to be called the “stinging snake” or “horn snake”
- uses tail as defense: presses against captor
 - [did this to me]
- snake is otherwise extremely docile

- snake is also known as “hoop snake”
 - “*Farancia*’s habit of lying in a circular coil has evidently also been factored into the theory, resulting in a whopping tale of the horn or hoop snake that can grab its lethal tail tip in its mouth, roll down a fleeing man, and sting him to death with venom powerful enough to kill a tree.”

Western Worm Snake

(Carphophis vermis)



adult western worm snake (*Carphophis vermis*)

photograph by Michael J. Rosenman © 1994

- also has very shiny scales and pink to red underside
- burrower: narrow skull, tiny eyes



- very small snake
- name: Latin “vermis” meaning “worm” refers to small size



- hiding head as defensive technique
- extremely docile (never tried to bite or strike)



(R11) western worm snake (*Carphophis vermis*)
Arkansas, Pope County
photograph by J.L. Hollis (2002)

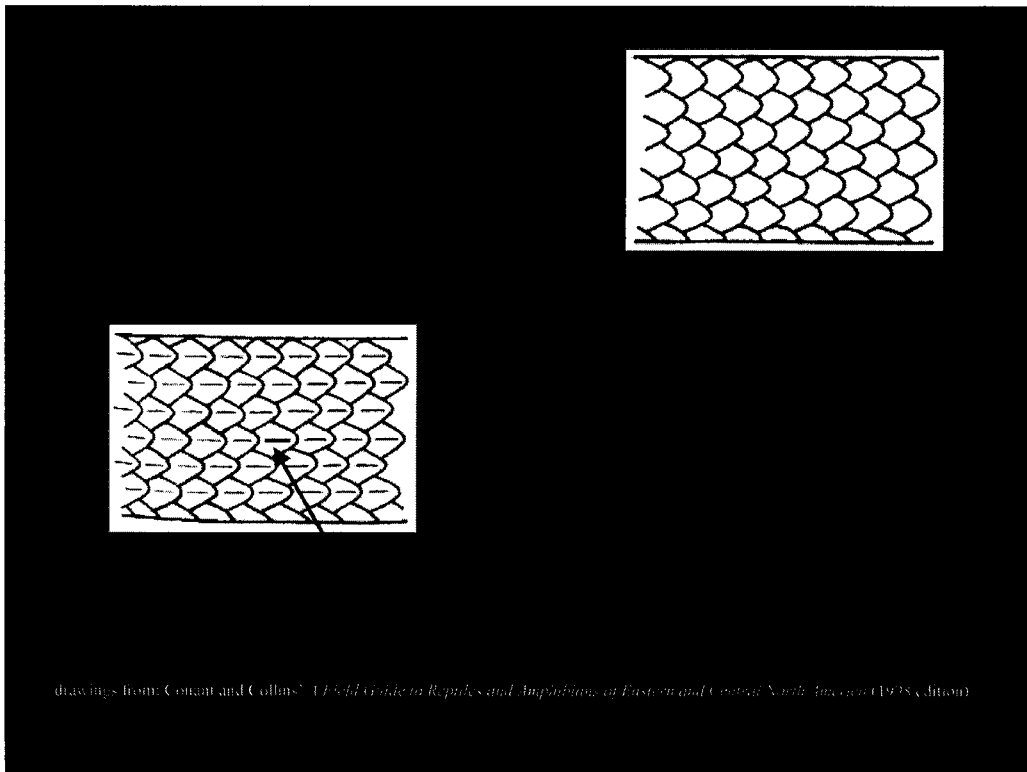
- like the mud snake, also has a sharp tail tip
- used as leverage while the snake tunnels

dorsal
scales



adult western worm snake (*Carphophis vermis*)
Arkansas, Pope County
photograph by J. L. Hollis (2002)

- very shiny scales



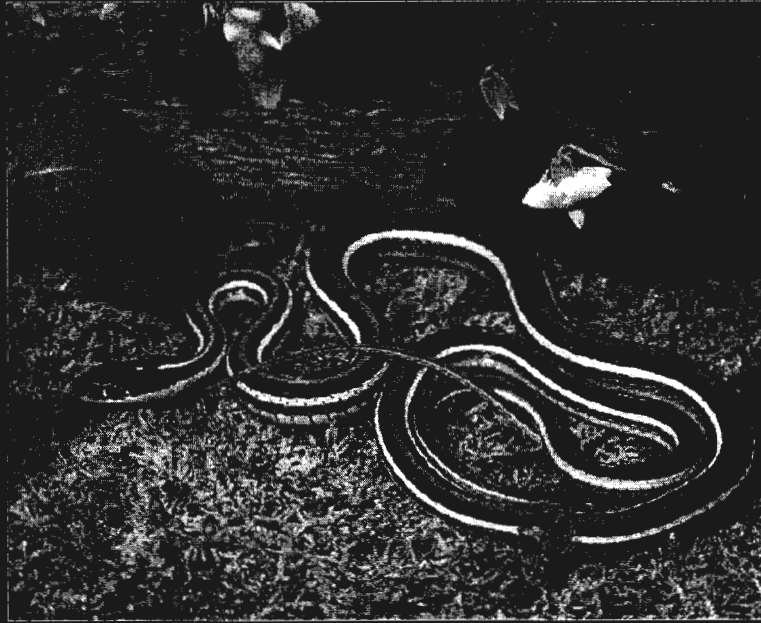
- snakes so far have had smooth scales, including my snakes

-
-
- also keeled scales, particularly in aquatic and semi-aquatic species
 - keel = raised middle

-
-
- smooth scales may produce less drag in terrestrial environments for fast-moving snakes
 - keeled scales may help provide leverage in the water (maximize surface area for pushing), also improve traction in muddy/wet environments

Redstripe Ribbon Snake

(Thamnophis proximus rubrilineatus)



redstripe ribbon snake (*Thamnophis proximus rubrilineatus*)

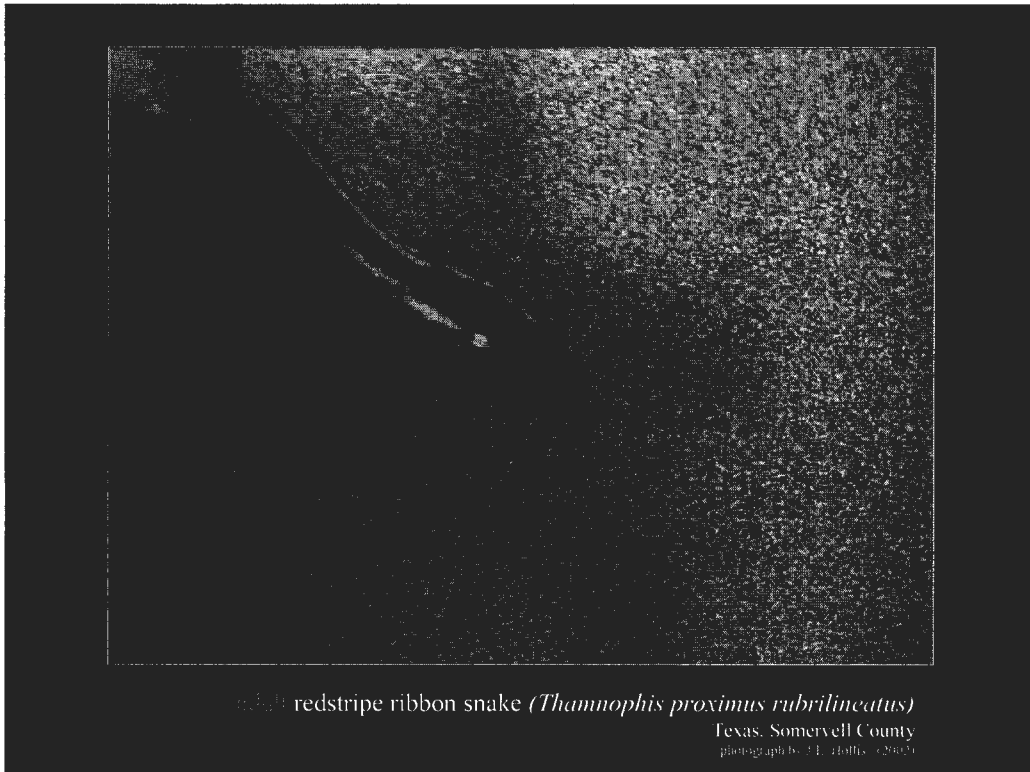
photograph by [unreadable] 1984

- example of semi-aquatic snake
- related to garter snake
 - note lateral stripes (flight pattern defense)
- also has voluntary loss of tail



redstripe ribbon snake (*Thamnophis proximus rubrilineatus*)
Texas, Somervell County
photograph by J.L. Tjeltveit (1992)

- stripe...perhaps mimicry?
 - other garter snakes in region also have stripes
 - all produce musk=foul odor

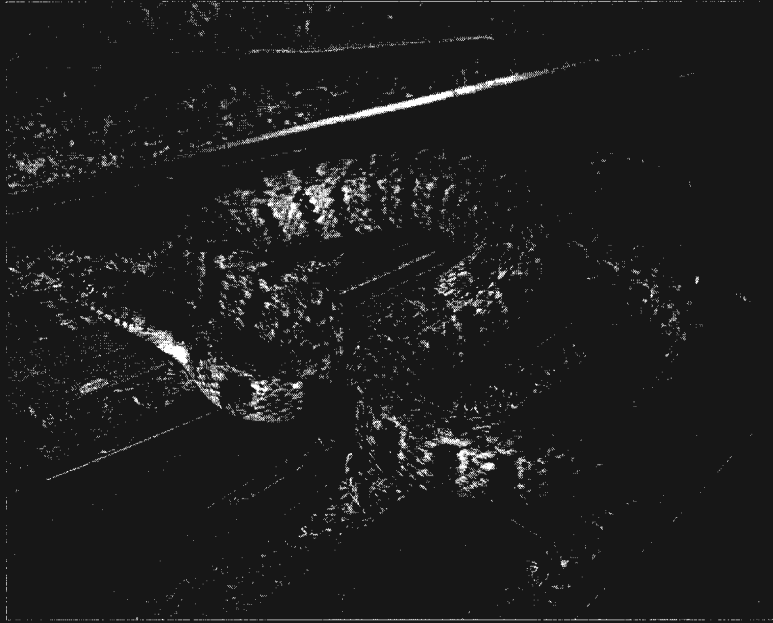


- spot on head
- also slightly concave sides to snout, forward-tilted eyes...diurnal, sight-aided hunter

Diamondback Water Snake

(Nerodia rhombifer rhombifer)

- NOT venomous, simply has diamond-shaped pattern on back



141 diamondback water snake (*Nerodia rhombifer rhombifer*)

photograph by Michael J. Bawa (man) © 1984



- caught this little juvenile in dinosaur track
- [roped-off area, must have looked like nutcases, bit the heck out of me, snuck out wrapped around hand, etc.]
- note defensive coil, head in middle, tail left out as sacrifice



juvenile diamondback water snake (*Nerodia rhombifer rhombifer*)
Texas, Somervell County
photograph by J.L. Hollis (2002)

- angry snake...head flattened
- white stuff on my hand...snake poop from angry snake

Midland Water Snake

(Nerodia sipedon pleuralis)

- another water snake...



adult female midland water snake (*Nerodia sipedon pleuralis*)
Arkansas, Clark County
photograph by J.L. Hollis (2002)

- note lack of distinctive pattern



adult female midland water snake (*Nerodia sipedon pleuralis*)
Arkansas, Clark County
photograph by J.L. Hollis (2002)

- better look at pattern
- good for water snake to be drab when lounging on shore
- pattern is more evident when snake is wet--breaks up shape in water (disruptive coloration)



adult female midland water snake (*Nerodia sipedon pleuralis*)
Arkansas, Clark County
photograph by J.L. Hollis (2002)

- note broad head...these guys catch fish, do not constrict so must get fish down with jaw strength alone



- story about name
 - water snakes often cranky
 - this one was not
 - I did not want to pickle it
 - what will she do with it instead
 - Dr. Renn Tumblison: “Take it home and make it a friend and name it George, of course!”
 - so I did; gender didn’t matter to me
- problem was...
 - George was not really a “George”
 - George was a Georgia
 - on August 31st of last year, George had babies

the Georgettes



“Band”



“Long Right Blotch”



“Stripe”



“X-Neck”

“Grey Spot”



“Brown Spot”



Texas Night Snake

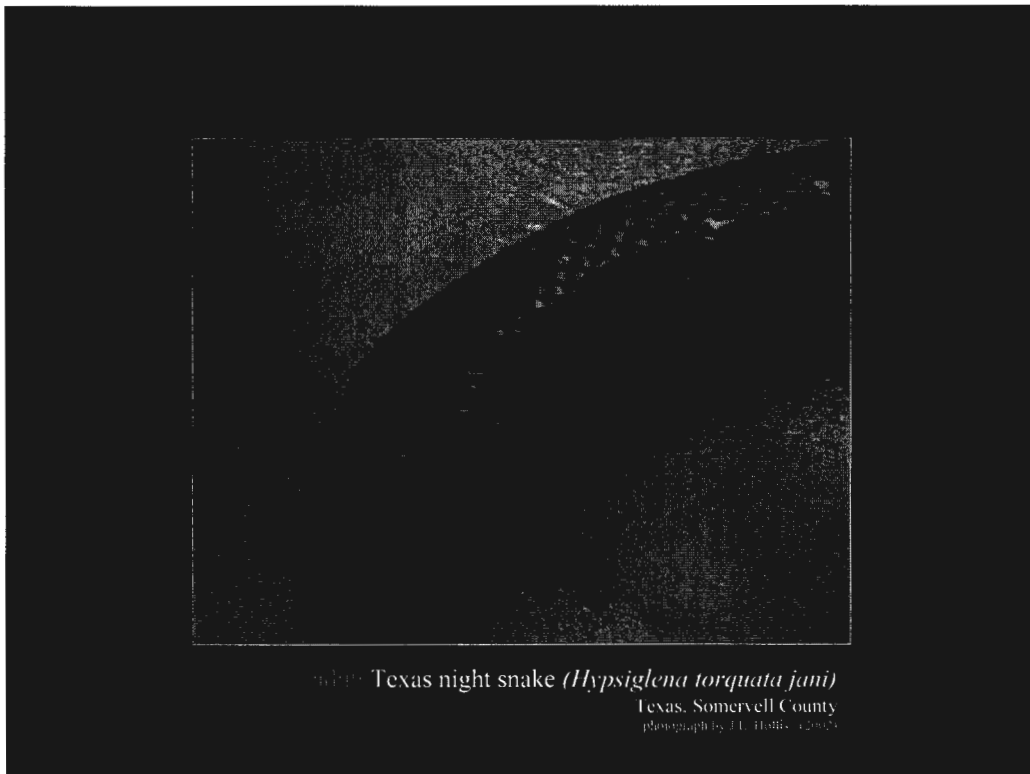
(Hypsiglena torquata jani)



- small size



- common theme
 - darker and/or highly patterned dorsal surface
 - lighter and/or less patterned ventral surface



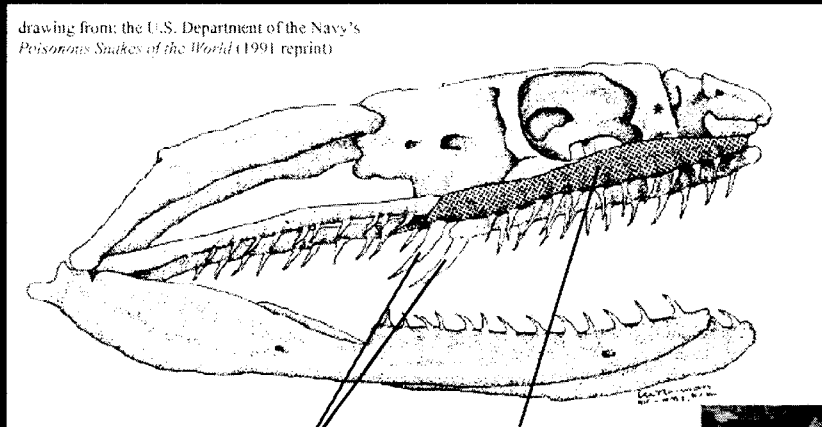
- close-up of head to see vertical pupil
-
-

- “name is night snake”...primarily active at night
- vertical pupil an advantage for nocturnal snakes
 - highly flexible pupil...protects sensitive light-rods
 - expands more quickly/wider in low-light situations than a circular pupil would

- believe it or not, this little guy is venomous

(WHICH LEADS TO NEXT SLIDE...)

venomous snakes: fang type A
xenodontid snakes
(includes night snakes, mud snakes, boomslangs, etc.)



on a

- example of xenodontid snake
- “venomous” is all relative
 - “xenodontid” means “strange-toothed”
 - most of these snakes incapable of fatal bites
 - specific prey (North America...toads, amphiumas)
- characterized by:

- short fangs

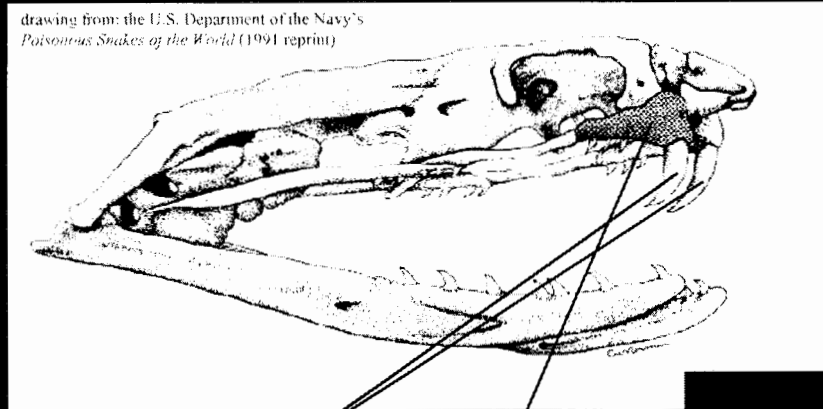
- long maxillary bone (fangs at back)

- boomslang (Africa) fatal to humans
- most are not, like

- night snake, worm snake, night snake, etc.

venomous snakes: fang type B
elapid snakes

(includes coral snakes, sea snakes, cobras, etc.)



on a

- contrast with elapid snakes, very dangerous to humans
-
-

- fangs, although short, are in front
-
-

- much smaller maxillary bone, leaves room for venom glands

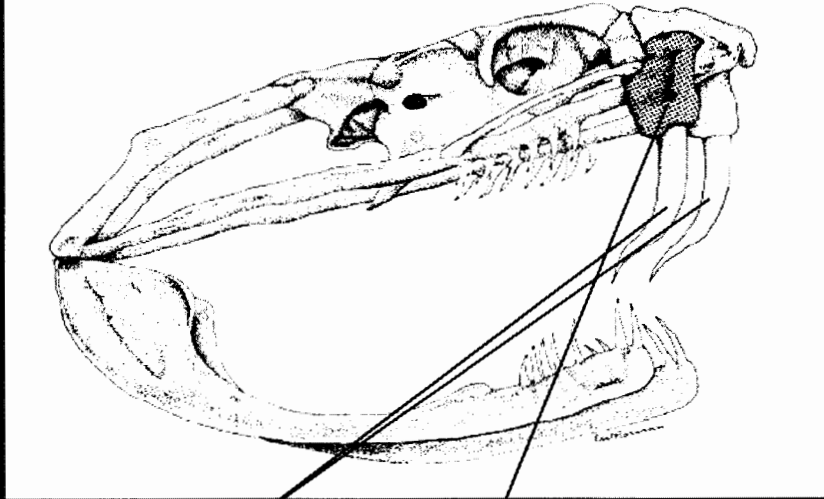
- I did not see any elapids

- most are sea snakes, cobras etc.

- coral snakes are only North American elapids

venomous snakes: fang type C
viperid snakes
(includes rattlesnakes, moccasins, adders, etc.)

drawing from: the U.S. Department of the Navy's
Poisonous Snakes of the World (1991 reprint)



on a relatively

- third basic type of dentition in venomous snakes
- vipers include:
 - rattlesnakes
 - European/African adders

-
-
- long curved fangs in front

-
-
- short modified maxillary bone
 - room for venom gland
 - fangs can fold back in mouth (also in elapids)

- common joke is not true:

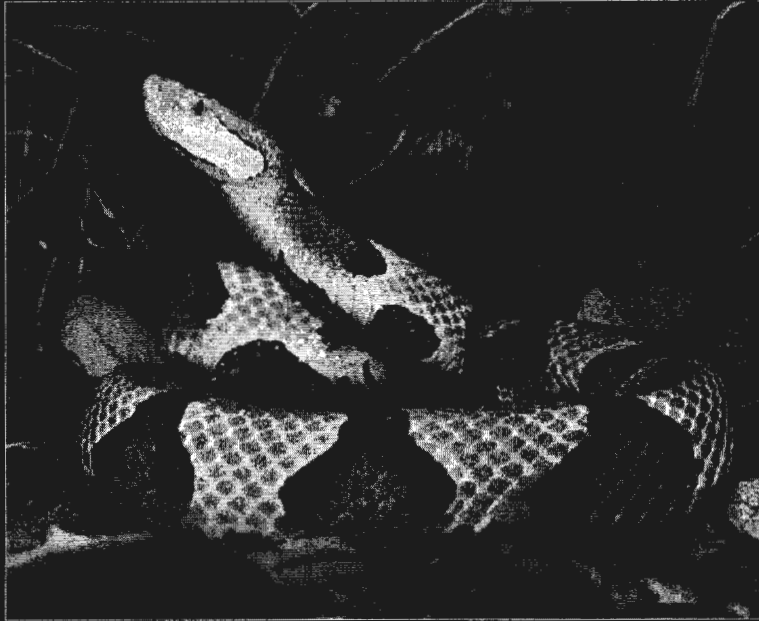
Q. What is a rattlesnake most afraid of?

A. Biting his tongue.

- common viperid in southern USA...moccasins

Southern Copperhead

(Agkistrodon contortrix contortrix)



adult southern copperhead (*Agkistrodon contortrix contortrix*)

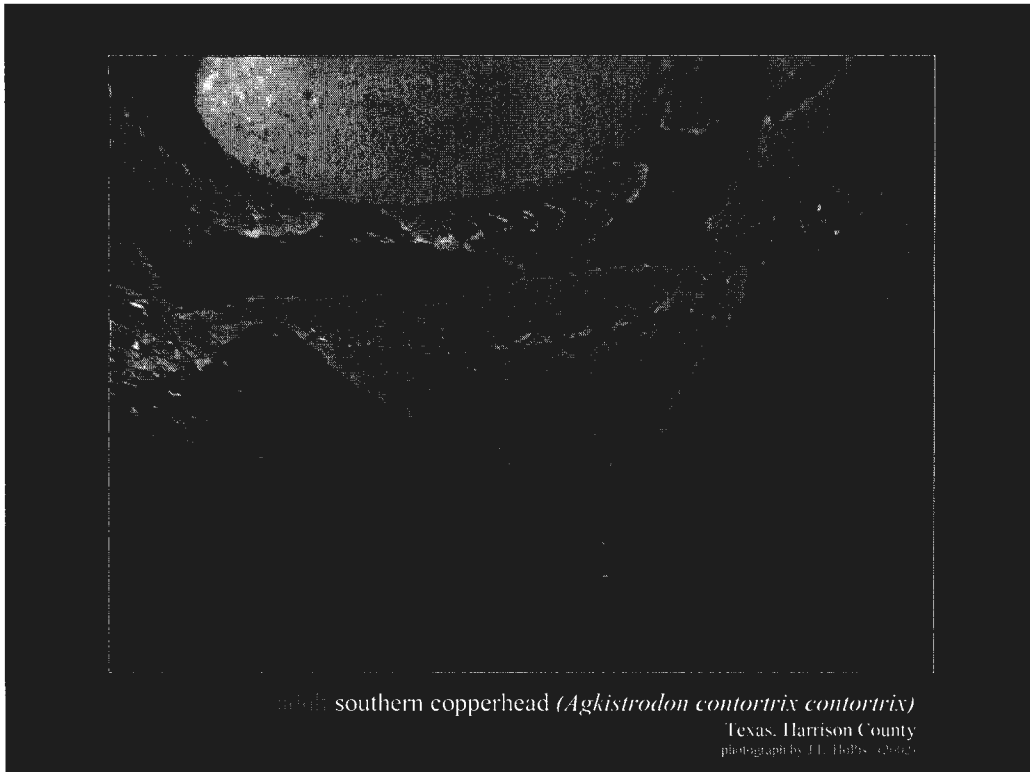
photograph by Michael J. Bosman © 1984

- snake found near water
- usually are very reddish-copper in color



adult southern copperhead (*Agkistrodon contortrix contortrix*)
Texas, Harrison County
photograph by J.L. Hollis (2002)

- we found a very brown-individual
- copperheads are one of the most common snakes in the South...might be six or seven per acre in relatively undisturbed [i.e. rural] habitats



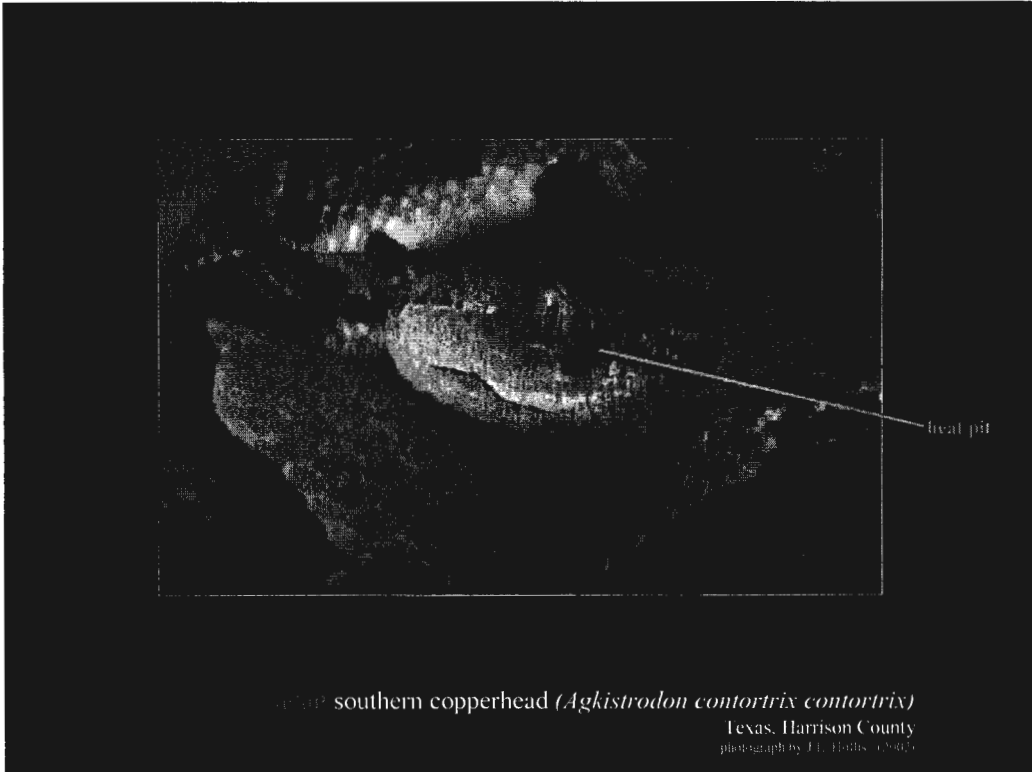
- these guys are called moccasins because their skin and pattern remind some people of the tanned leather used to make moccasins



adult southern copperhead (*Agkistrodon contortrix contortrix*)
Texas, Harrison County
photograph by J. L. Hollis (2002)

- I mentioned heat pits earlier...
 - ...one thing that makes viperids unique is heat pits
 - can see them in this snake's head
-

- between the nostril and the eye
- for a better look...



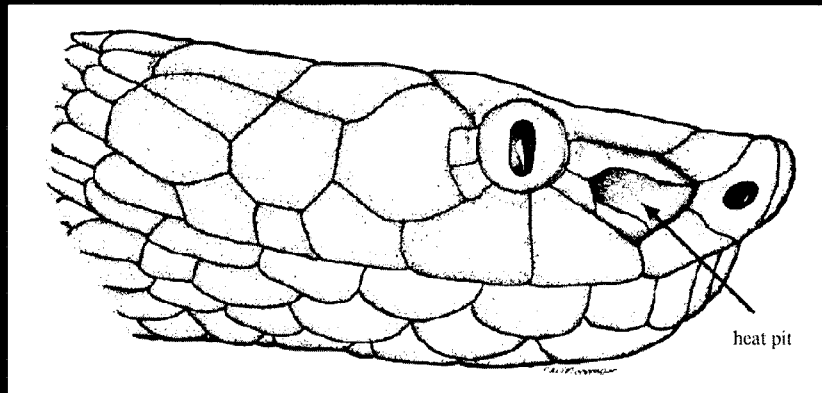
Close-up southern copperhead (*Agkistrodon contortrix contortrix*)
Texas, Harrison County
photograph by J.L. Hall, ©2005

- close-up of the head
-
-

- here is the nostril
-
-

- here is the heat pit

position of the loreal [heat] pit



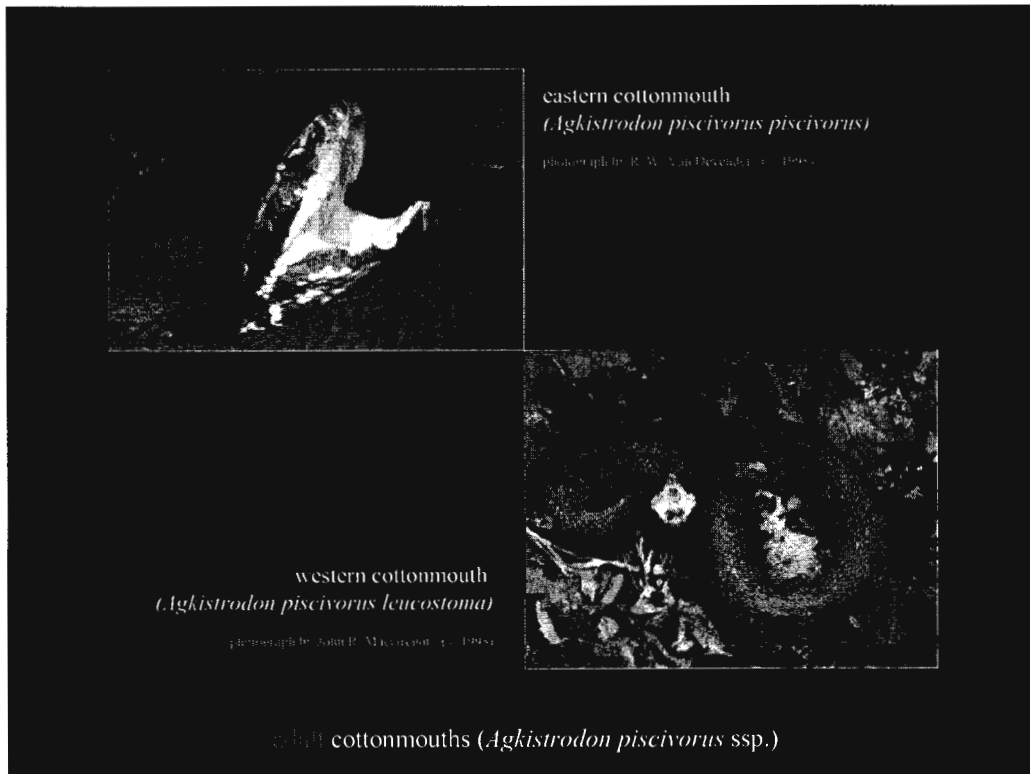
(drawing from: the U.S. Department of the Navy's *Poisonous Snakes of the World* (1994 reprint))

- lined with thermoreceptors
- specialized in pit vipers: two compartments separated by a thin membrane
 - two chambers equalize air pressure
 - ambient air pressure is “stored” in inner chamber
 - heat from animals is detected on the outer surface of the membrane
 - snake moves head to balance the heat detected in the two chambers, at which point the snake strikes
- blind rattlesnake
 - vibrations → tongue/Jacobsen’s organ → heat pits
 - hit 48 of 49 times
 - hit 4 of 15 times with heat pits covered

Western Cottonmouth

(Agkistrodon piscivorus leucostoma)

- another snake equipped with heat pits
- same genus as copperhead; also a moccasin



Why are they called cottonmouths?

- defensive technique called “gaping”
- inside of mouth is white
- picture to lower right is western
- scientific name:
 - Gr. ankistrion fishhook & Gr. odontos tooth
= curved fangs
 - L. piscis fish & L. voro to devour
= fish-eater
 - Gr. leukon white & Gr. stoma mouth
= white mouth



adult western cottontail (*Agkistrodon piscivorus leucostoma*)

Texas, Marion County
photograph by J.L. Hollis (2002)

- didn't like having to show you dead pictures of last snake...these were actually taken in the field
- beautiful gold color (this one unusual in having almost no other markings)
 - see how well snake is camouflaged



western cottomouth (*Agkistrodon piscivorus leucostoma*)
Texas, Marion County
photograph by J.L. Hollis (2003)

- see how chin is very differently marked than back
- point out eyes, lip, etc.

Western Diamondback Rattlesnake

(Crotalus atrox)

- saved “best” for last
- this guy is one of the reasons I went to Texas instead of staying in Iowa

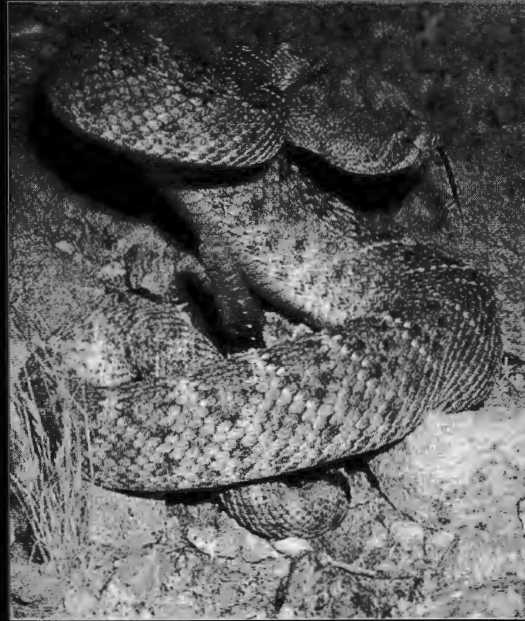


western diamondback rattlesnake (*Crotalus atrox*)

photograph by Richard D. Bartlett © 2009

- these guys are well-camouflaged as well
-

- can barely be seen, except for tail
- found in drier parts of the state, so match substrate perfectly



adult western diamondback rattlesnake (*Crotalus atrox*)

photograph by B. Grismore (© 2000)

- name:
 - Gr. Krotalon...a rattle
 - = rattle on tail
 - L. dark, fierce,
 - = sometimes savage disposition
- here it is in defense posture...note S-shape of body
- “(When approached abruptly, free-living adults typically hold their ground and, with or without rattling, quickly rear the head and forebody into an S-shaped curve poised above a circular base coil that anchors the striking jab, allowing them to hit and envenomate an adversary at least half their body length away. Extremely agitated individuals may even advance a short way toward an assailant.)”



adult male western diamondback rattlesnake (*Crotalus atrox*)

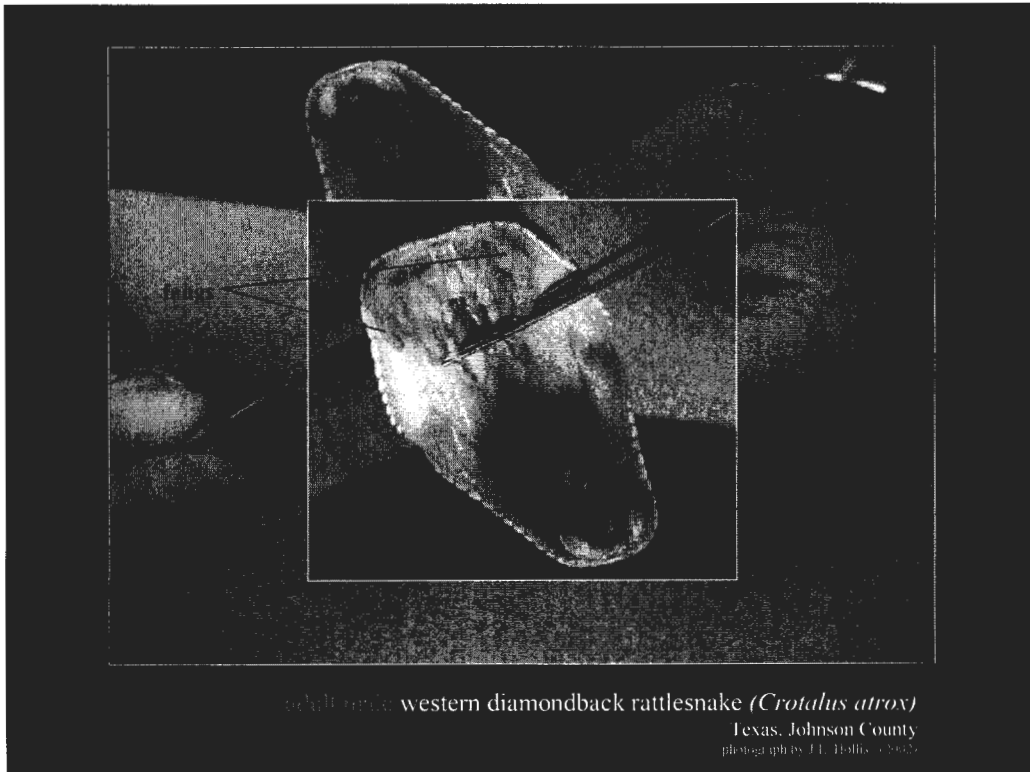
Texas, Johnson County
photograph by J.L. Hollis (2002)

- ours was a fairly young adult male
- probably about 4.5-5 ft long
- as thick as my upper arm
- extremely agitated [and no wonder...]

- sometimes called “coon tail”...note striping on tail

-
- zoom in for a closer look at rattle

 - rattles generated from scale covering tip of tail
 - scale conical in other snakes
 - hour-glass shape in rattlesnakes, with constriction in middle;skin (keratin) to accumulate as it is shed
 - button often falls off; other pieces get torn off

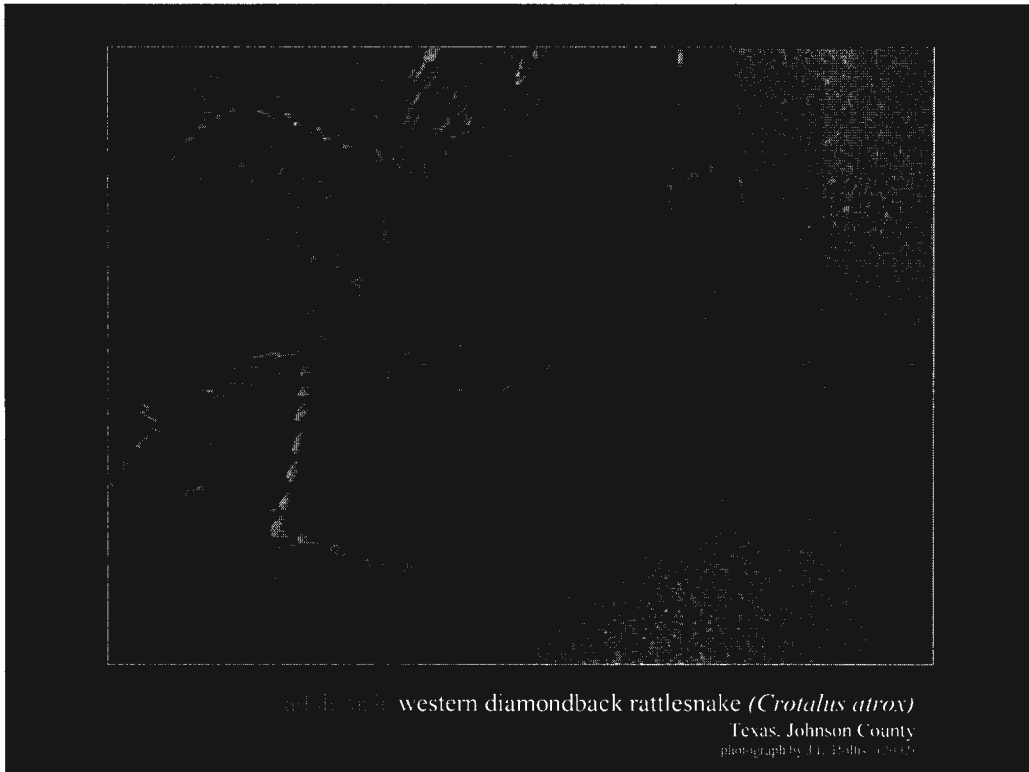


- here are fangs (Dr. Mac holding it upside down)
-
-

- right-side up, if it was striking
-
-

- fangs

- glottis (windpipe); allows snake to eat without suffocating

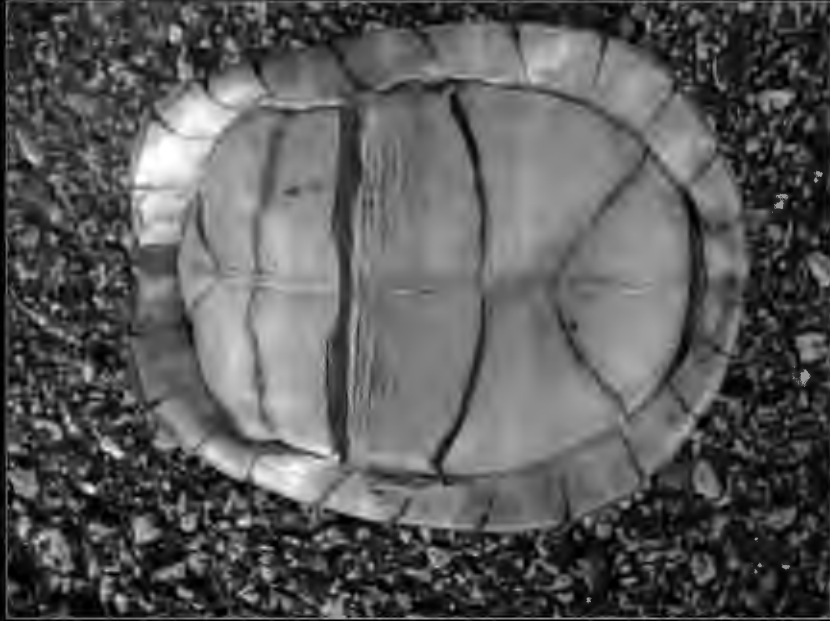


- huge head
- wide “cheeks” to accommodate venom glands

A few other herpetofauna
from my trip (that are here
today).....

Three-toed Box Turtle

(Terrapene carolina triunguis)



adult female three-toed box turtle (*Terrapene carolina triunguis*)
Arkansas, Van Buren County
photograph by J.L. Hollis (2002)



adult female three-toed box turtle (*Terrapene carolina triunguis*)
Arkansas, Van Buren County
photograph by J.L. Hollis (2002)



an adult male three-toed box turtle (*Terrapene carolina triunguis*)

Arkansas, Van Buren County

photograph by J.L. Hollis (1990)



adult female three-toed box turtle (*Terrapene carolina triunguis*)
Arkansas, Van Buren County
photograph by J.L. Hollis (2002)



“Shirley”

three-toed box turtle
(Terrapene carolina triunguis)



- ambling across the road near Shirley, AR
- saw me and started to scoot
- brave little turtle; lots of spunk

Western Lesser Siren

(Siren intermedia nettingi)

Many thanks to:

- Dr. Chris T. McAllister, Department of Biology, Texas A&M University–Texarkana
- Dr. Stanley E . Trauth, Department of Biology, Arkansas State University
- Dr. Renn Tumblison, Department of Biology, Henderson State University
- my fellow members in Dr. Mac’s Vertebrate Field Zoology course, 2002, at Texas A&M University–Texarkana:
 - Jeff Nix
 - Kelley Richey
 - Shelly Smith
 - Chris Svrcek
 - Zach Ramsey (unofficial class member)



Additional thanks to:

- Dr. Robert Seager, Department of Biology, University of Northern Iowa
- Dr. Gretta Berghammer, Presidential Scholars Board Chair and mentor to the Presidential Scholars senior class of '03
- Richard and Janet Hollis
- Jeffrey Church

Special appearances by:

- “Ophelia,” the male Great Plains rat snake [captive-bred in Sharon Center, IA]
- “Zea,” the male corn snake [captive-bred in Minneapolis, MN]
- “Mario,” the female eastern kingsnake [origin unknown]
- “George,” the female midland water snake [from near Caddo Valley, AR]
- “Band,” “Brown Spot,” “Grey Spot,” “Long Right Blotch,” “Stripe,” and “X-Neck,” the midland water snake babies (aka “The Georgettes”) [born 31 August 2002, in captivity in Iowa]
- “Poseidon,” the western lesser siren [from Texarkana, TX]
- “Shirley,” the female three-toed box turtle [from near Shirley, AR]

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NOTE: Photographs, diagrams, and or illustrations from sources cited in *bio* that were used in this visual presentation.

THE END