Bites and Stings!



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GENERAL HEMATOLOGY
OHSU

DISCLOSURE

OHSU CPD

Relevant Financial Relationship(s)

Speaker Bureau - None

Consultant/Research – none

Editor – UpToDate (Iron Tx)

The Talk

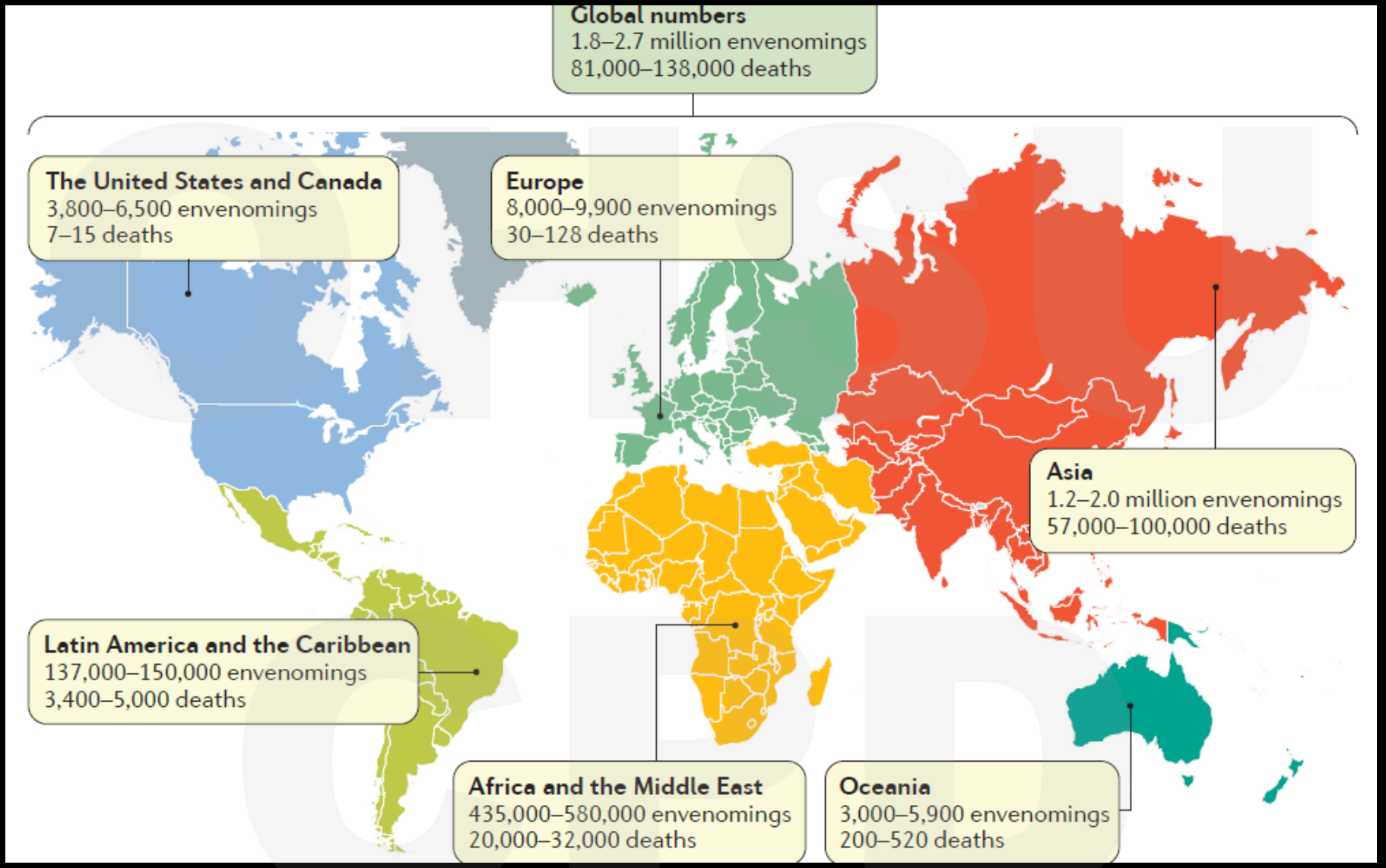
- A cornucopia of various critter bites and stings

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Snake Bites

- Major issue world wide
  - > 140,000 deaths
- USA
  - 6-7,000 bites and ~2.5 deaths/yr
    - US Deaths listed on Wikipedia

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Global numbers
1.8–2.7 million envenomings
81,000–138,000 deaths
The United States and Canada
3,800–6,500 envenomings
7–15 deaths
Europe
8,000–9,900 envenomings
30–128 deaths
Asia
1.2–2.0 million envenomings
57,000–100,000 deaths
Latin America and the Caribbean
137,000–150,000 envenomings
3,400–5,000 deaths
Africa and the Middle East
435,000–580,000 envenomings
20,000–32,000 deaths
Oceania
3,000–5,900 envenomings
200–520 deaths

Name, age, gender	Date	Species	Location, comments
Priscilla Meridith, 62, female	June 12, 2019	Timber Rattlesnake	Waverly, Georgia ; Meridith was bit by a Timber Rattlesnake in a friend's garden on May 17th when she went to sit down. She was in a medically-induced coma for several weeks until her death on June 12th. Meridith was not given antivenom due to allergies.
Oliver "Chum" Baker, 52, male	May 25, 2019	Copperhead	Winston County, Alabama. Baker was at his home near Lewis Smith Lake when he was bitten by a copperhead snake and lost consciousness within 2 minutes. CPR was performed and he was taken to a local hospital in critical condition. Baker was later airlifted to Huntsville Hospital, where he died on May 27.[8][9]
Lawrence Walters, 70, male	June 4, 2018	Rattlesnake	Spearfish, Lawrence County, South Dakota. Walters was playing golf at the Elkhorn Ridge Golf Course in Spearfish. He was looking for a ball in tall grass when he was bitten on the ankle. He was rushed back to the clubhouse in a cart where another employee performed CPR until an ambulance arrived, but was pronounced dead at Spearfish hospital.[10]
Barry Lester, 57, male	April 29, 2018	Rattlesnake	Osage County, Oklahoma, Lester was driving down a road when he spotted the rattlesnake, he tried to move it to safety but ended up being bitten on both hands, Lester collapsed shortly after and was pronounced dead.[11]

USA Venomous Snakes

- Pit Vipers
  - Rattlesnakes
  - Copperhead
  - Water moccasins
- Coral Snakes

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Rattlesnakes

- Has rattle!
  - New button with every skin shed
- Widespread in USA
- 4 main species with multiple subspecies
- Great Basin and Pacific in Oregon

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Great Basin

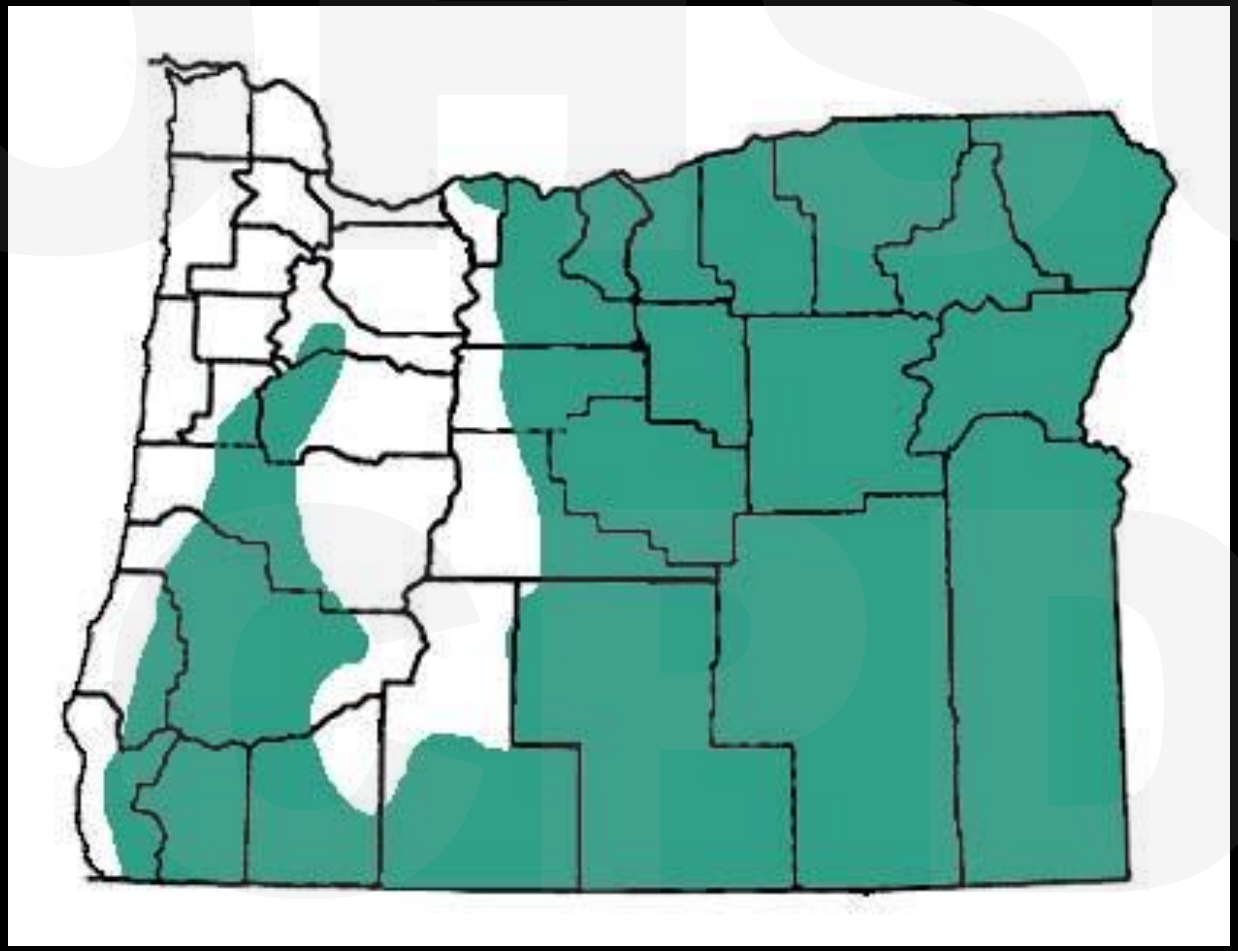


Pacific

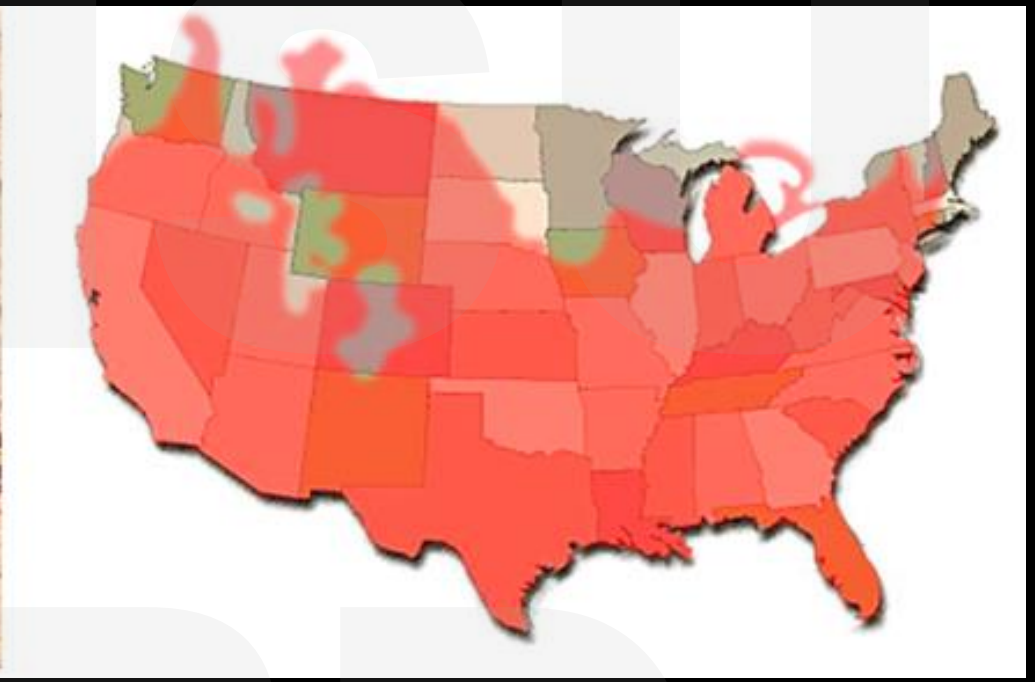




Range in Oregon







Wilderness & Environmental Medicine 2015 26, 472-487DOI: (10.1016/j.wem.2015.05.007)

Copperhead



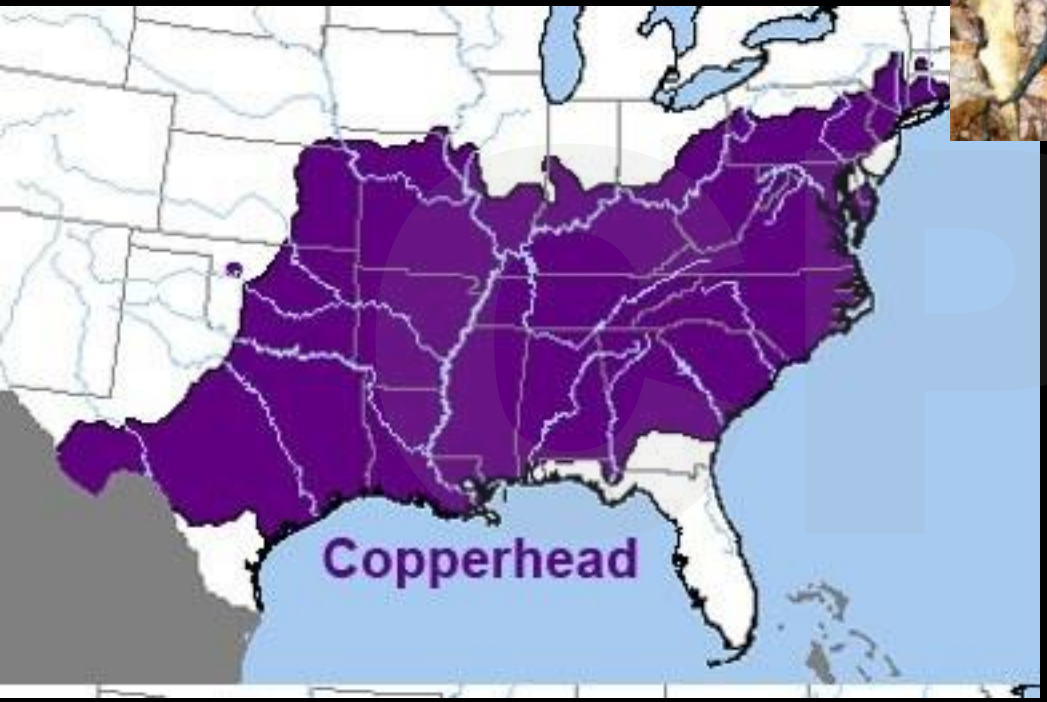
Copperhead

- Southern/Midwest US
- Hides in leaves
- Bites occur when stepped on
- Can reproduce asexually

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Water Moccasin



Water Moccasin

- Southern US
- Lives in/near water
- Can be aggressive
- Very muscular bodies
- Can also reproduce asexually

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Water Moccasin



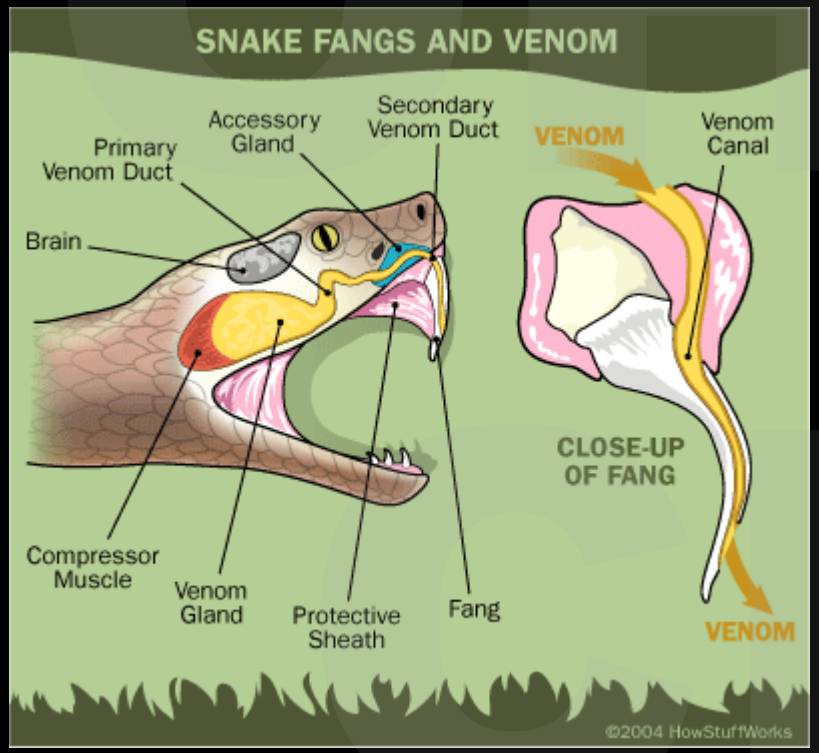


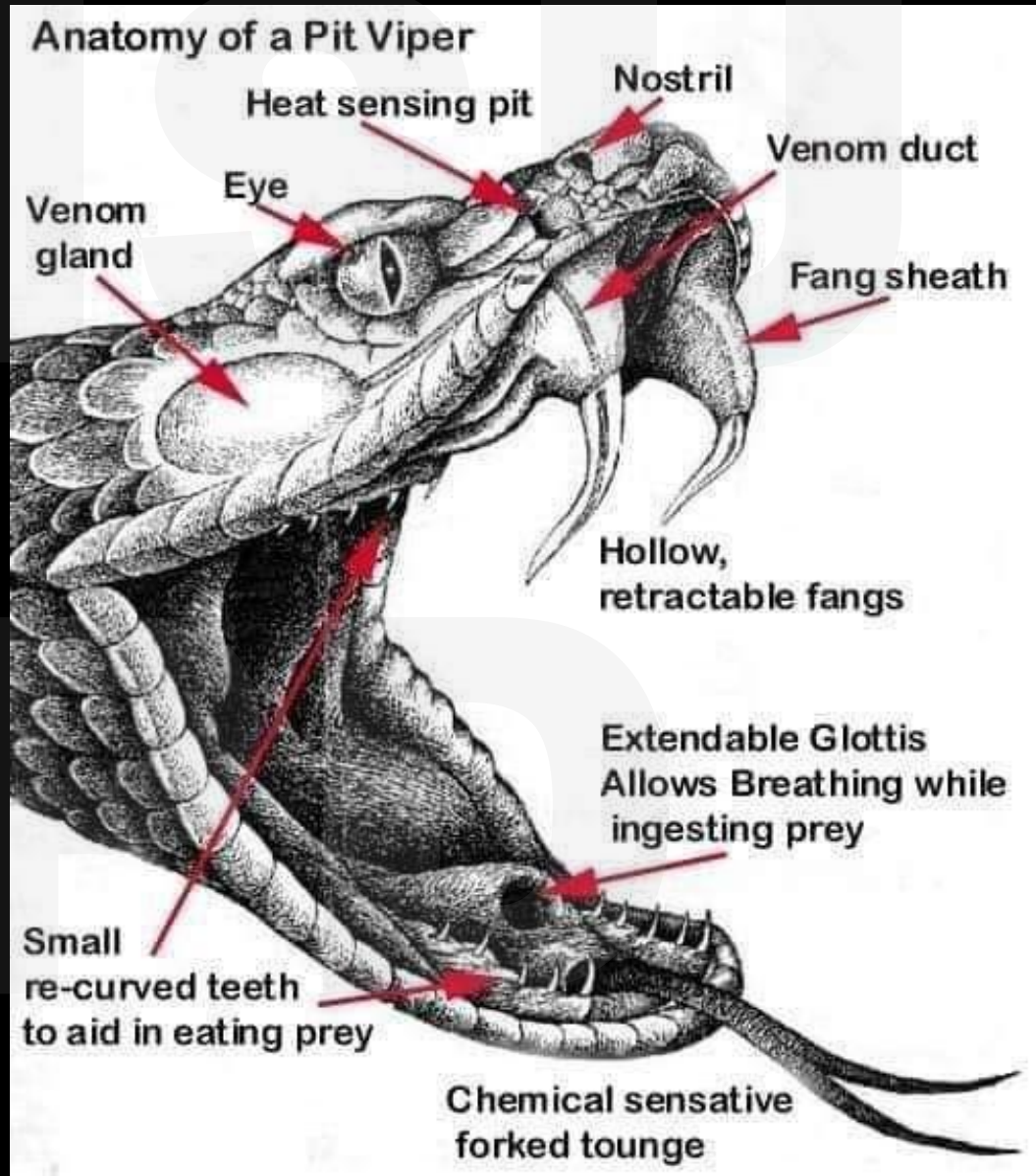
By Geoff Gallice from Gainesville

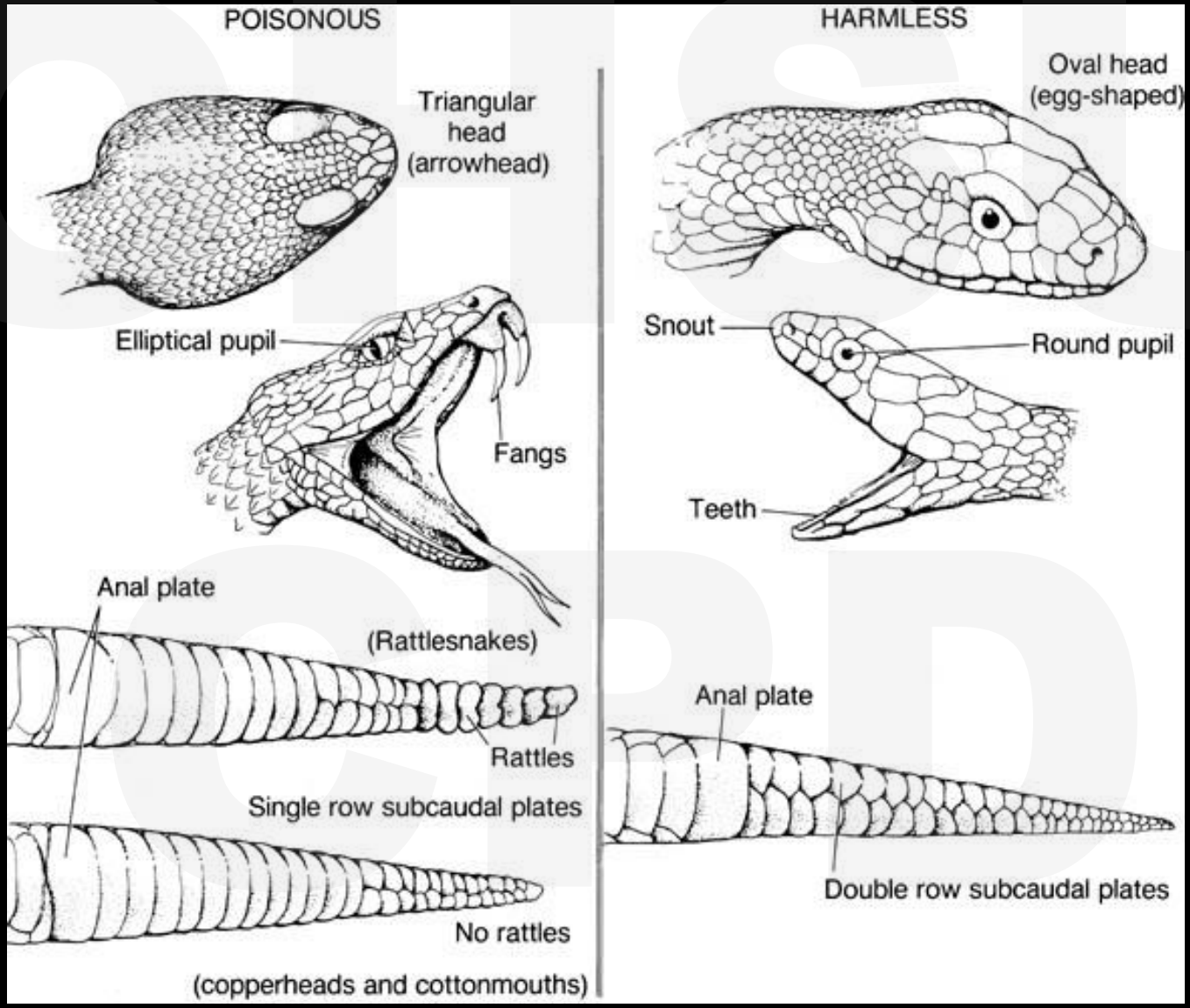
Pit Vipers

- Venom
  - Multiple toxicities
- Retractable fangs
- Heat sensing pit

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SNAKE FANGS AND VENOM
Accessory Gland
Secondary Venom Duct
VENOM
Venom Canal
Primary Venom Duct
Brain
CLOSE-UP OF FANG
Compressor Muscle
Venom Gland
Protective Sheath
Fang
VENOM
©2004 HowStuffWorks


Anatomy of a Pit Viper
Nostril
Heat sensing pit
Venom duct
Eye
Venom gland
Fang sheath
Hollow, retractable fangs
Extendable Glottis Allows Breathing while ingesting prey
Small re-curved teeth to aid in eating prey
Chemical sensative forked tounge


POISONOUS
HARMLESS
Triangular head (arrowhead)
Oval head (egg-shaped)
Elliptical pupil
Fangs
Snout
Round pupil
Teeth
Anal plate
(Rattlesnakes)
Rattles
Single row subcaudal plates
No rattles
(copperheads and cottonmouths)
Anal plate
Double row subcaudal plates



Venom Toxicity

- Venoms composes of a bewildering array of toxins!
  - > 50 proteins
  - Local tissue damage
  - Coagulopathy
  - Neurotoxicity

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Local Tissue Toxicity

- Toxins
  - Phospholipases A2
  - Metalloproteases
  - Hyaluronidases
- Skin necrosis
- Muscle necrosis
- Disrupts vascular integrity

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OSU CPD

WIBM.com



CNN



Reason #1 not to pose for a selfie with a rattlesnake

CNN

Neurotoxicity

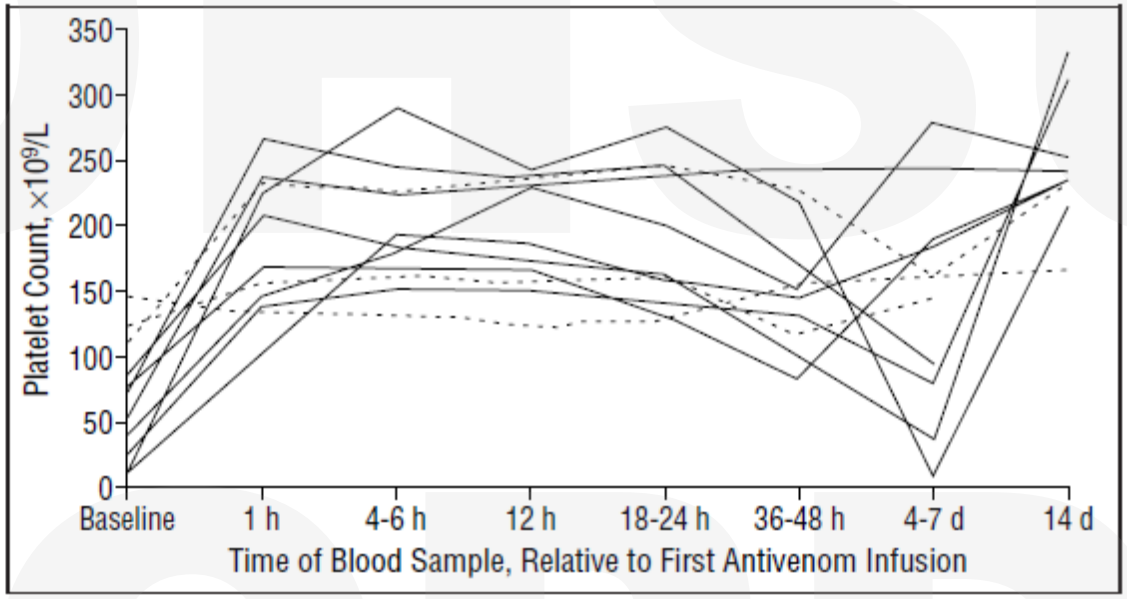
- Not as dramatic as elapids
- Mojave rattlesnake exception
  - Bites tend to behave as elapid bites

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Hemostasis

- Metalloproteases
- Serine proteases
- Tissue factor release
- Interference with platelets
- Can persist for weeks

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Arch Intern Med. 1999;159:706-710



Viper Bites

- Local
  - Pain
  - Swelling and erythema
  - Bleeding/ecchymosis
  - Blistering

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Viper Bites

- Local evolution
  - Swelling and ecchymosis develops in an hour
  - Progression and necrosis worrisome signs
  - 25% “dry bites”

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Local tissue necrosis following a bite from a black-tailed rattlesnake



This picture shows local tissue damage with necrosis after a bite to the finger by a black-tailed rattlesnake (*Crotalus molossus*). The patient was a professional herpetologist who was bitten while handling the snake.
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Ecchymosis following prairie rattlesnake envenomation



Ecchymosis following prairie rattlesnake (*Crotalus viridis*) envenomation. This picture shows the extent of ecchymosis 24 hours after the bite in a 4-year-old child who was bitten while walking in a field behind a tractor.

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Viper Bites

- Systemic
  - Shock
  - Diffuse bleeding
    - Especially sites of trauma
  - Dysrhythmias

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Immediate Treatment

- Get bite victim to hospital ASAP
- DON'T use local therapy to remove venom
  - Cause more harm than good

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Assessment

- Physical exam of wound area
  - Ecchymosis, swelling
  - Location of bite
- Labs
  - INR/PTT/Fibrinogen/Platelets
- Edema
  - Can be marked and confused for compartment syndrome



Envenomation	Observation	Laboratory Studies	Treatment
Dry/no bite	≥8 hours	Initial laboratory studies**	No antivenom
Minor: nonprogressive symptoms without systemic signs	12–24 hours	Initial laboratory studies; repeat laboratory studies†† every 4–6 hours and before discharge	Consider antivenom only if high-risk areas affected (eg, hand or face)
Moderate: progressive symptoms and/or systemic signs	Admit	Initial laboratory studies; repeat every 1 hour after antivenom until initial control	Antivenom administration, supportive care
Severe: progressive symptoms with systemic signs and/or end-organ damage	Admit	Initial laboratory studies; repeat every 1 hour after antivenom until initial control	Antivenom administration, supportive care

Wilderness & Environmental Medicine 2015 26, 472-487DOI: (10.1016/j.wem.2015.05.007)

Emergency medicine care of crotaline envenomations

Envenomation	Observation	Laboratory Studies	Treatment
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Wilderness & Environmental Medicine 2015 26, 472-487DOI: (10.1016/j.wem.2015.05.007)

Antivenin (Vipers)

- Consult with poison center or toxicologist
- CroFab
  - Fab fragments raised to all US vipers
  - T1/2 shorter than snake venom
- Anavip
  - Fab2 fragments
    - Bigger so longer t1/2
  - All US pit vipers

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Antivenom Dosing

- Based on severity of bite and not patient size
- Anaphylaxis very rare

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Elapids

- Bites not as dramatic
- Flaccid paralysis
  - Can progress to respiratory paralysis
- Coral snakes, cobras, death adders, mambas

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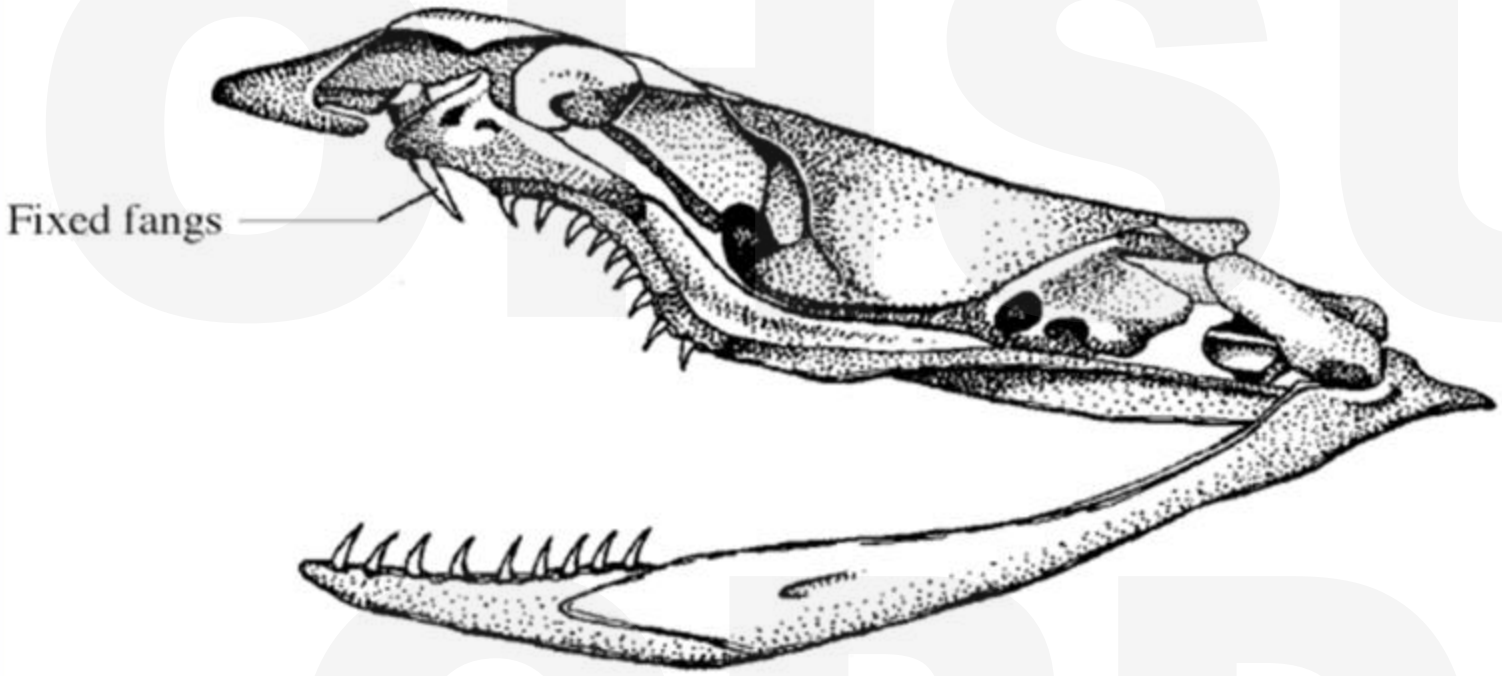
Coral Snake



Coral Snakes

- Coloration can be variable
- Fixed fangs
  - Need to chew on victim

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Skull
Texas Coral Snake
(Micrurus fulvius tenere)
Redrawn from Bulletin 31 published by T.P. & W..
Drawn by: Marlin Sawyer



photo credit: Image by Brad Glorioso via Houstonia Mag



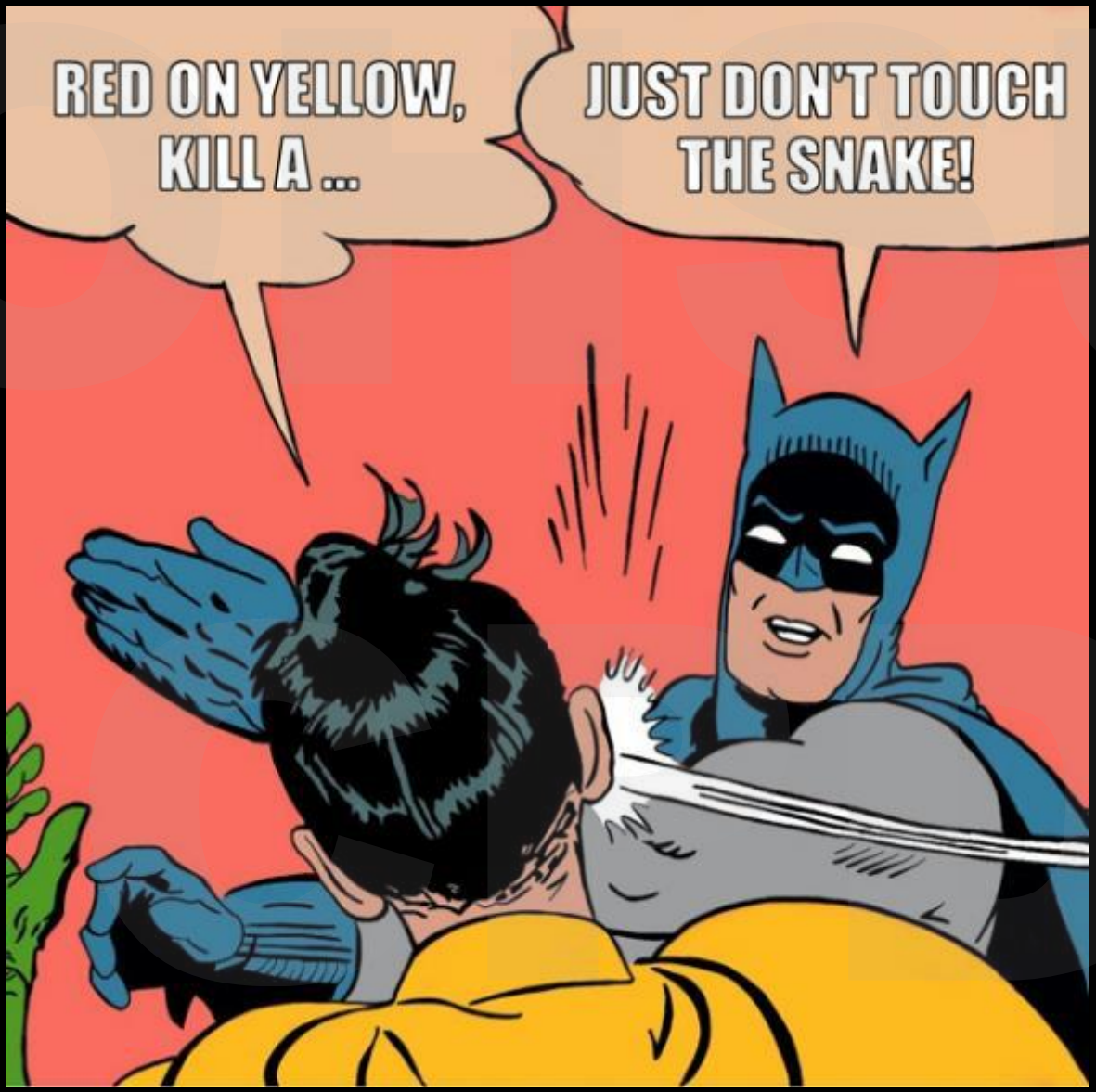
photo credit: Larry Jones



photo credit: Tyler Sladen



photo credit: Chris Harrison


RED ON YELLOW,
KILL A ...
JUST DON'T TOUCH
THE SNAKE!

Neurotoxicity

- α-neurotoxins
  - Bind cholinergic receptor->paralysis
- β-neurotoxins
  - Bind pre-synaptic and lyse nerve terminal membraned
- Very tight binding to receptors
- Leads to prolong and severe paralysis

Coral Snakes

- May need intubation
- Trial of anticholinesterase therapy
- Antivenin for severe cases
  - Limited available
  - Lots expired

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Necrotic Spider Bites

Necrotic Arachnidism:

- Brown Recluse Spider

(a.k.a.. fiddle-back, violin spider)

Loxosceles reclusa

Loxosceles deserta

- Hobo Spider (Pacific NW)

Tegenaria agrestis

Brown Recluse Spider: violin back spider





Hobo/Brown Recluse Spider Distribution



Brown Recluse

- Approx. 2000 bites/yr in US
- Begins with minor “bite” pain
- Enlarging erythema over 2 to 6 hrs
- Onset necrotic central ulcer > 24 hrs
- No ulcer by day 4 = no risk skin loss
- Nausea, vomiting, fever, arthralgia,
- Hemolytic anemia (1%)
- Delayed skin grafting (3 -5 %)

Brown Recluse

- Very potent venom
- Sphingomyelinase D
  - Dissolved cell membranes
  - Leads to a cascade of inflammatory effects
- Systemic reactions
  - Hemolysis

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DAY 3



DAY 5



DAY 6



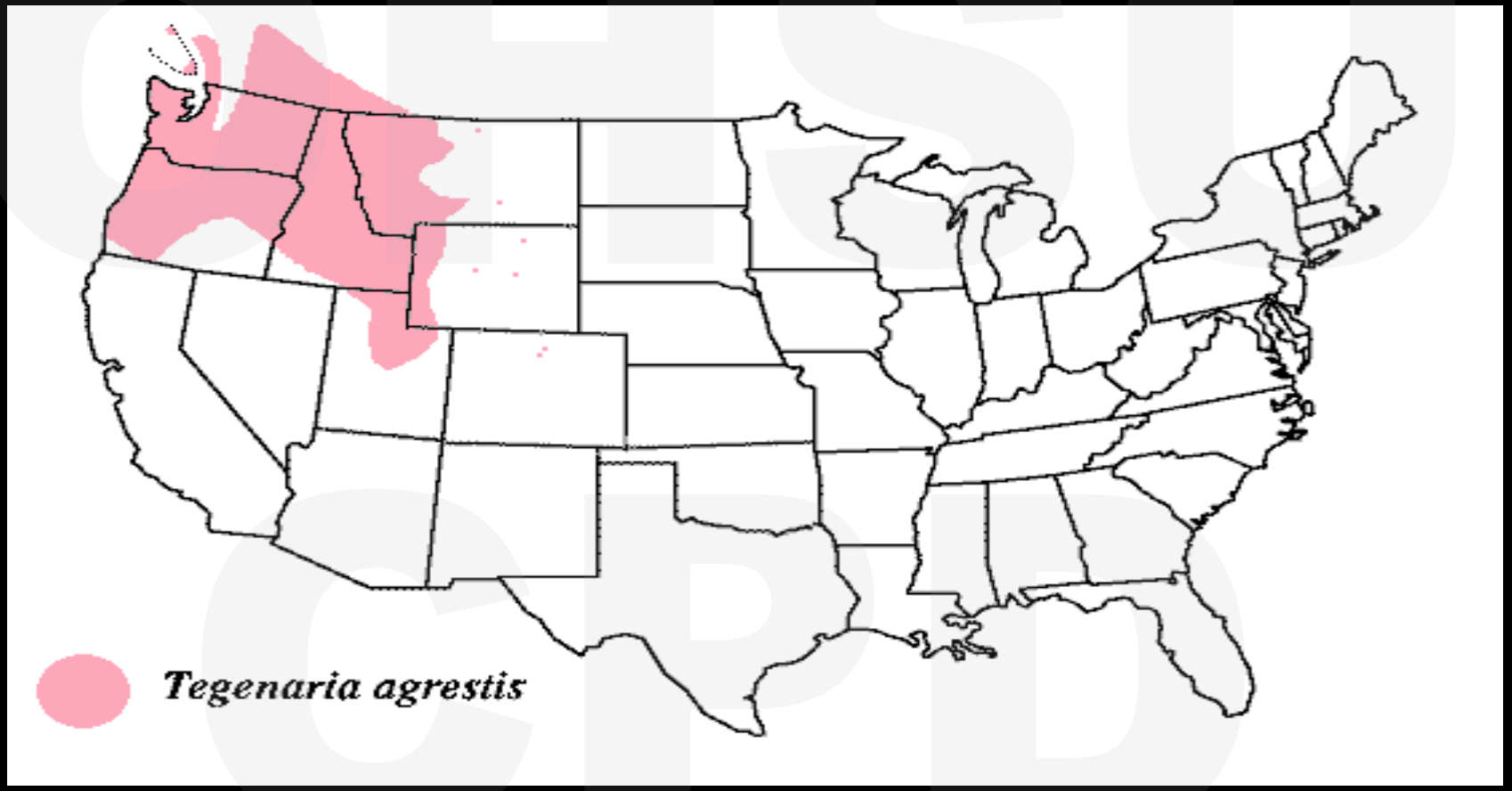
DAY 9



DAY 10



Hobo Spider Range



Hobo Spider

- Similar painless bite
- Headache and myalgias may occur within ½ to 1 hour and be persistent
- Blisters 1st day
- Lesion can form with central ulcer

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Fig. 4 left - giant house spider
right - hobo spider
Photo by R. Vetter



Black Widow



Black Widow Spider

- Occurs in every state except Alaska
- Hourglass on underside of abdomen
- Only female has venom
- Typically outdoor near woodpiles, outhouses, sheds

Black Widow Spider

- Very painful bite
- May spread centrally over hours to days
- Diaphoresis
- Hypertension
- GI sx – esp. leg bites
- Needs parental narcotics plus benzodiazepines

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Alpha-latrotoxin

- Alpha-latrotoxin: calcium mediated presynaptic neurotransmitter release
- Muscle contractions, but iv calcium probably does little to resolve it.
- Antivenin available for refractory cases but effectiveness is uncertain

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The Killer Bees



"We've come for your pollen"

Hymenoptera Stings

- Usually local reactions
- Multiple stings
  - Lethal dose 20 stings/kg
  - Shock/DIC/MOF
- Anaphylaxis
  - Deadly

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Wasp Venom

- Rich in histamine
- Bradykinins
- Phospholipases, etc.
- Marked pain and local reactions
- 10% of patients with large local reactions

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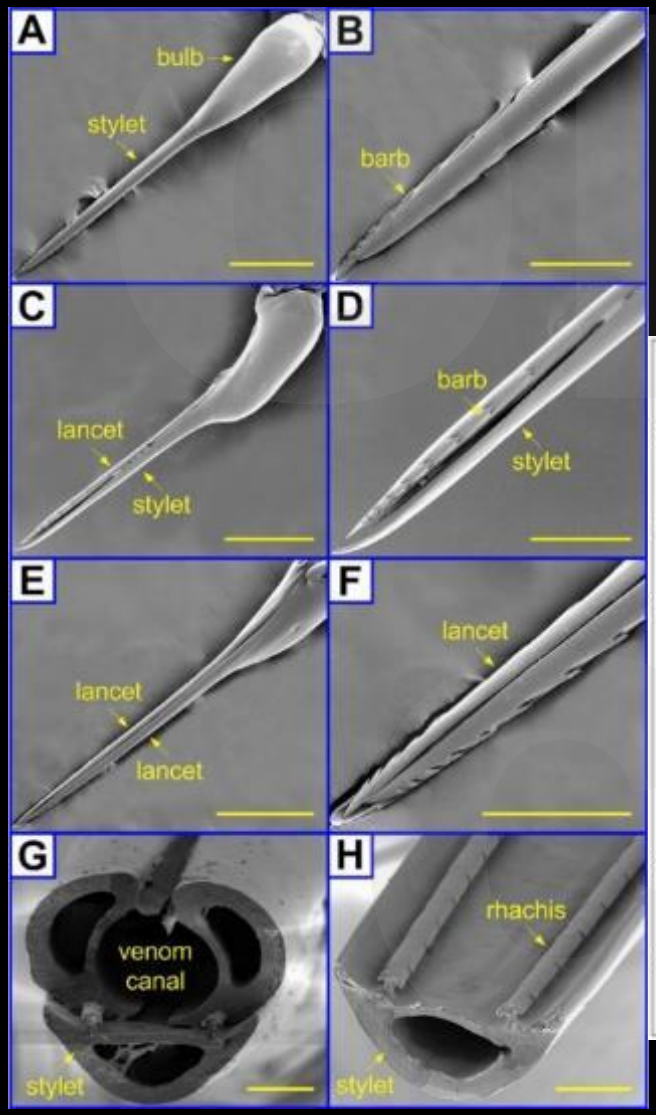


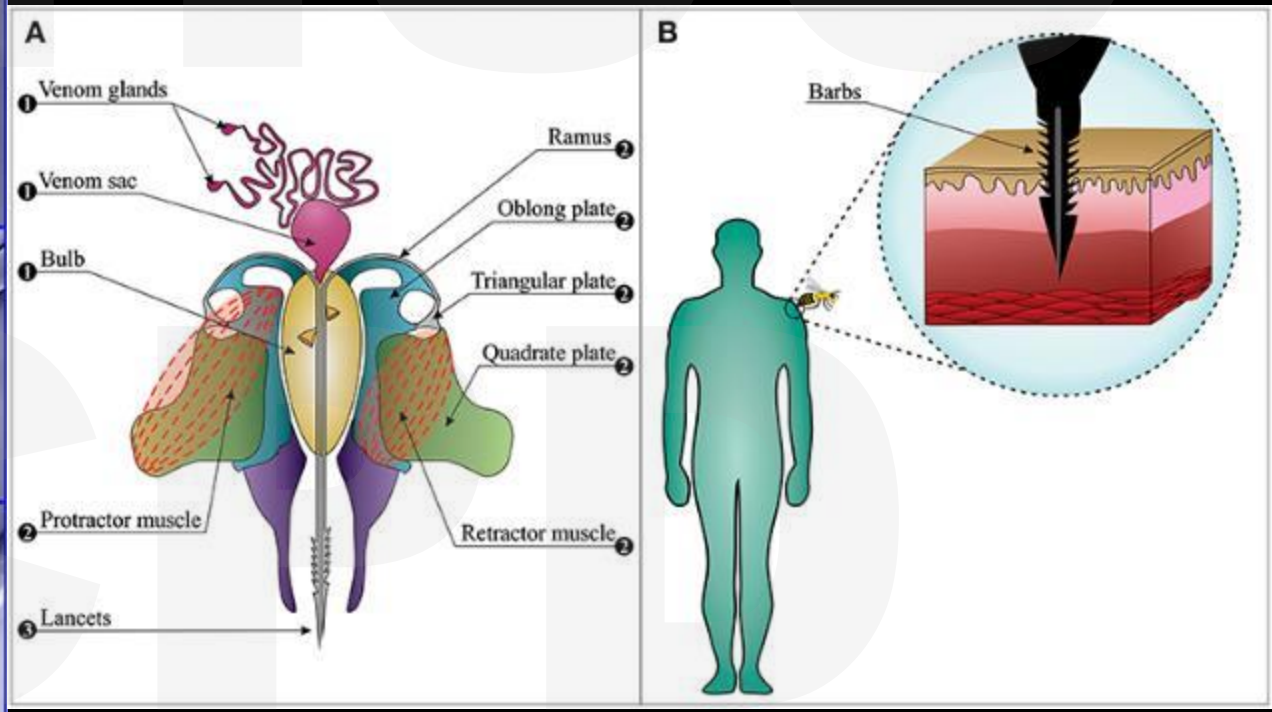
Bee Stings

- Bee's live 1-5 days after sting
- 90% venom delivered first 20 seconds
  - 150 ug venom
  - LD50 is 2.8-3.5 mg/kg
- Melittin main component
  - Act on pain fibers
  - Lytic protein
- Phospholipase A2

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A
bulb
stylet
B
barb
C
lancet
stylet
D
barb
stylet
E
lancet
lancet
F
lancet
G
venom canal
stylet
H
rhachis
stylet


A
Venom glands
Venom sac
Bulb
Protractor muscle
Lancets
Ramus
Oblong plate
Triangular plate
Quadrate plate
Retractor muscle
B
Barbs

Stinger Removal

- Venom injection very rapid
- Most within seconds
- Concerns about “squeezing more out” false
- Flick off as fast as you can

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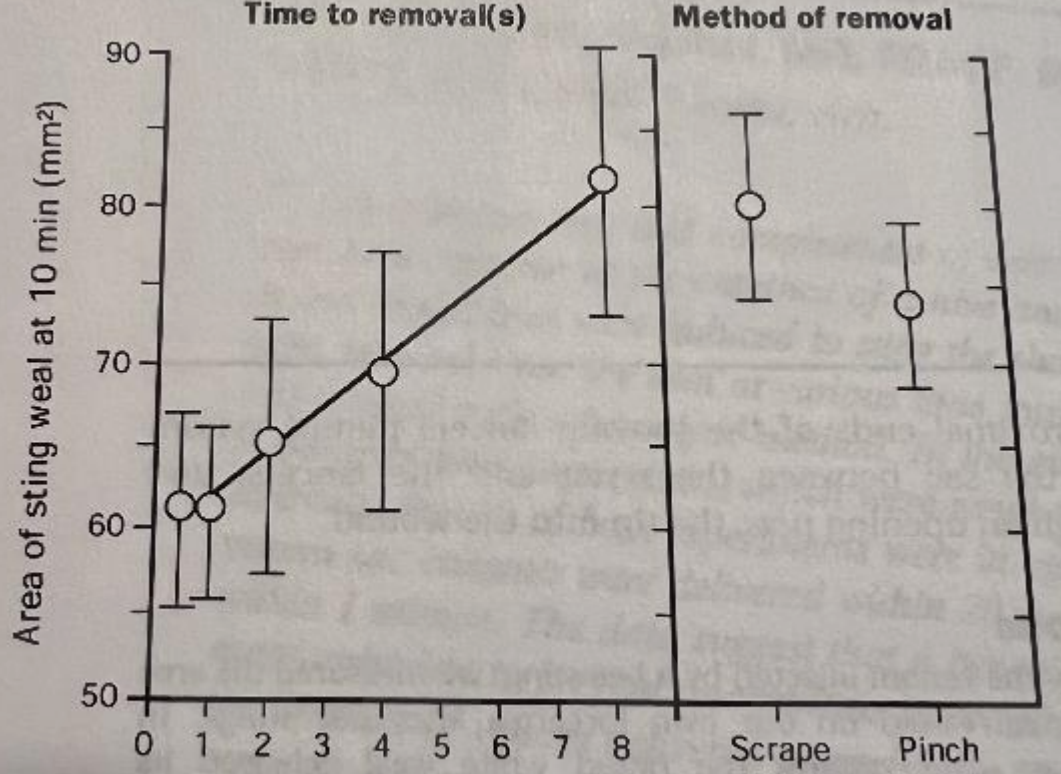


Figure 2: **Mean (±SE) responses to stings as a function of time to removal and method of removal**

Lancet 348:301, 1996

Anaphylaxis

- Up to 8% population effects
  - ~ 40 deaths/yr (prob higher)
  - ½ never knew they had allergy
- Skin: urticarial, angioedema
  - Most common in kids
- Respiratory: pharynx edema and bronchoconstriction
- Cardiovascular: shock

Anaphylaxis

- Clinical history
- High tryptase
- Future risk with stings 30-60%
  - Reduced with venom immunotherapy
- Need to carry epinephrine

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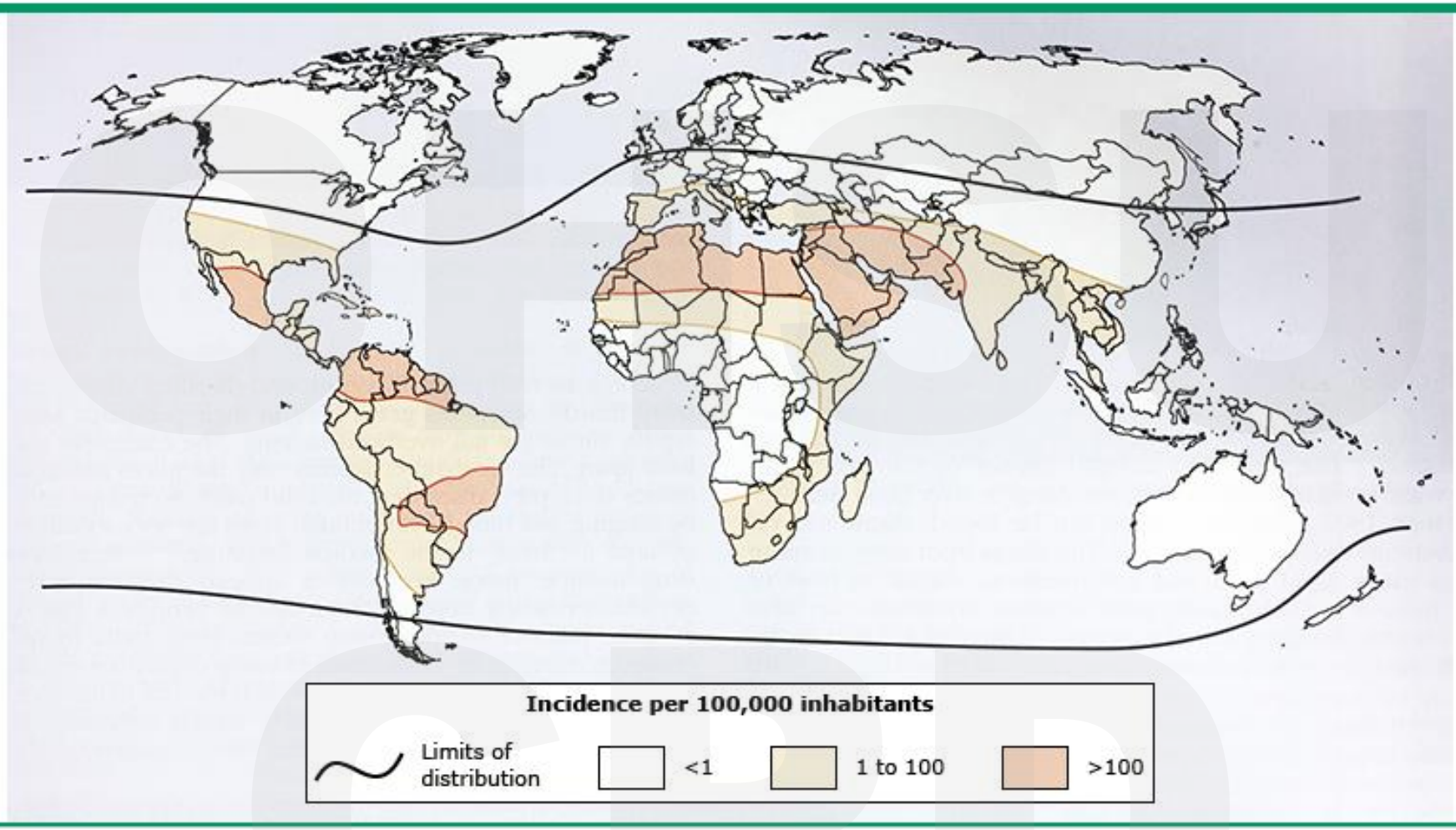


Scorpion Stings

- Found mainly in SW USA
- All scorpions sting

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Annual scorpion sting incidence



This figure shows the estimated annual incidence of scorpion stings by geographic region.

Reproduced from: Suchard JR. Scorpion envenomation. In: Auerbach's Wilderness Medicine, Auerbach PS (Ed), 7th ed, Elsevier, Philadelphia 2017. Illustration used with the permission of Elsevier Inc. All rights reserved.

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Bark Scorpion

- Only poisonous US scorpion
- Can climb walls
- Bark scorpions have neurotoxin
  - α-toxin inhibits inactivation of sodium channels
  - No local wound effects
- Antivenin for severe cases

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Symptoms

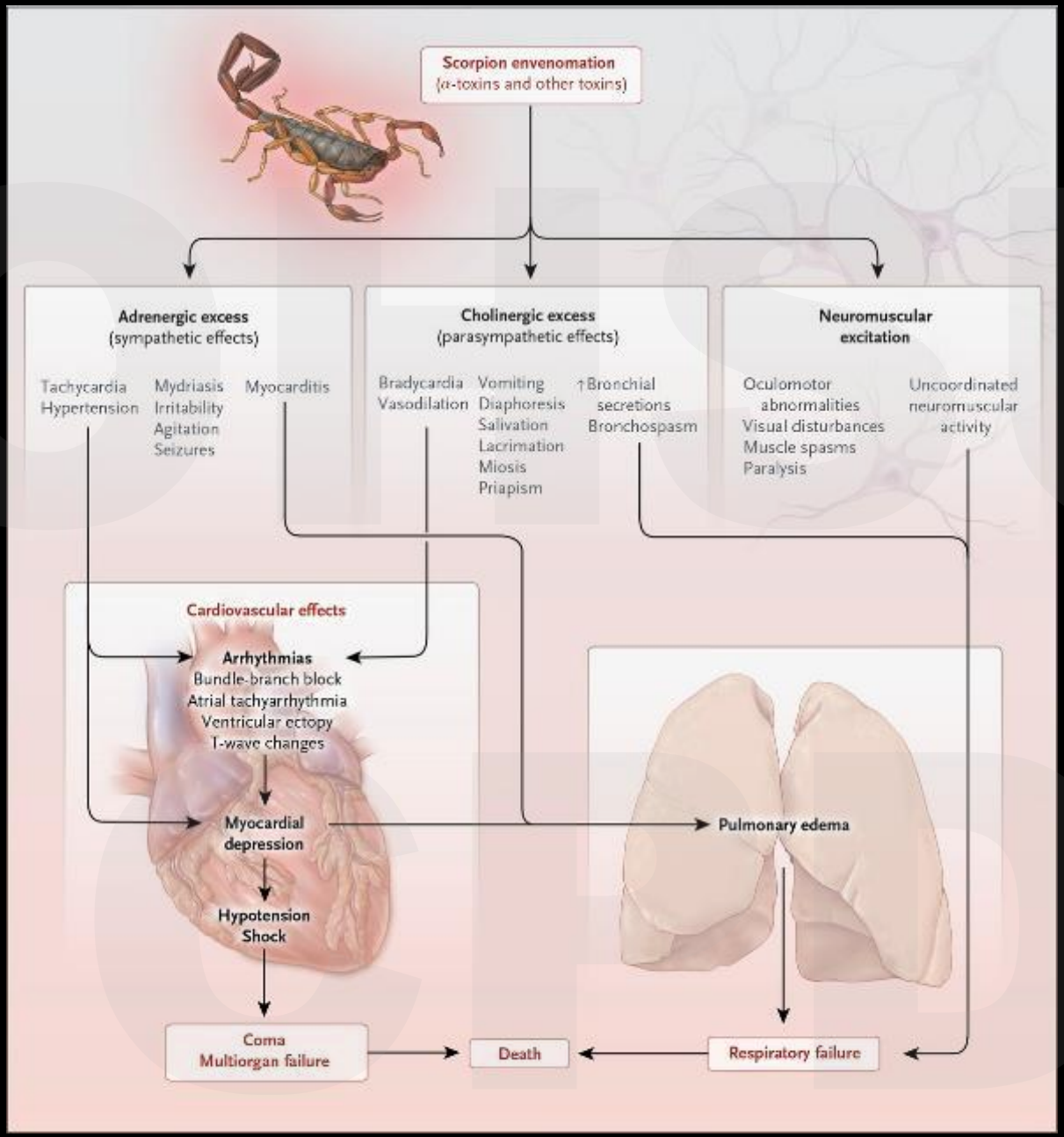
- Sting very painful
  - "Tap test"
- Neurotoxicity
  - Parasympathetic (early)
    - Diarrhea, hypersalivation, bradycardia, priapism
  - Sympathetic (persistent)
    - Hyperthermia, agitation, tachycardia

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Symptoms

- Cardiovascular
  - Conduction issues
  - Hypertension
  - Hypotension with severe envenomation

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Isbister GK, Bawaskar HS. N Engl J Med 2014;371:457-463.

The NEW ENGLAND JOURNAL of MEDICINE

Treatment

- Atropine: Bradycardia
- Benzodiazepine: agitation, seizures
- Prazosin: Excess catecholamines
- Antivenom: severe envenomation
  - May not be that effective
-

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Bear Attacks



Bear Attacks

- Responsible for most “wild” animal deaths
- Increasing bear-human interactions
  - Black bears “habituated”
  - Grizzlies – not so much

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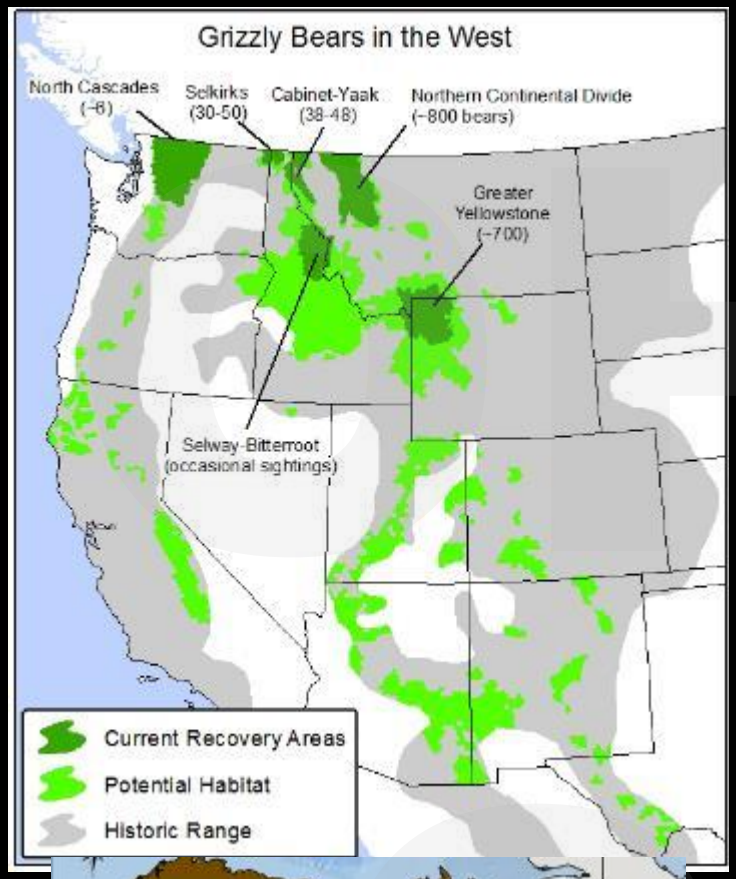
Black vs Brown

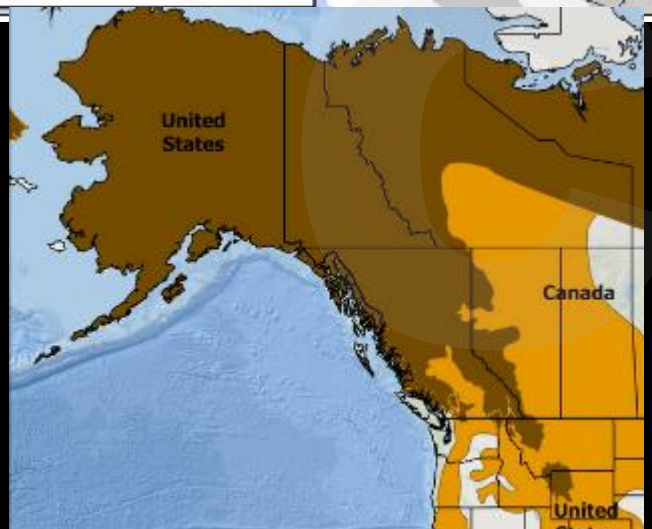


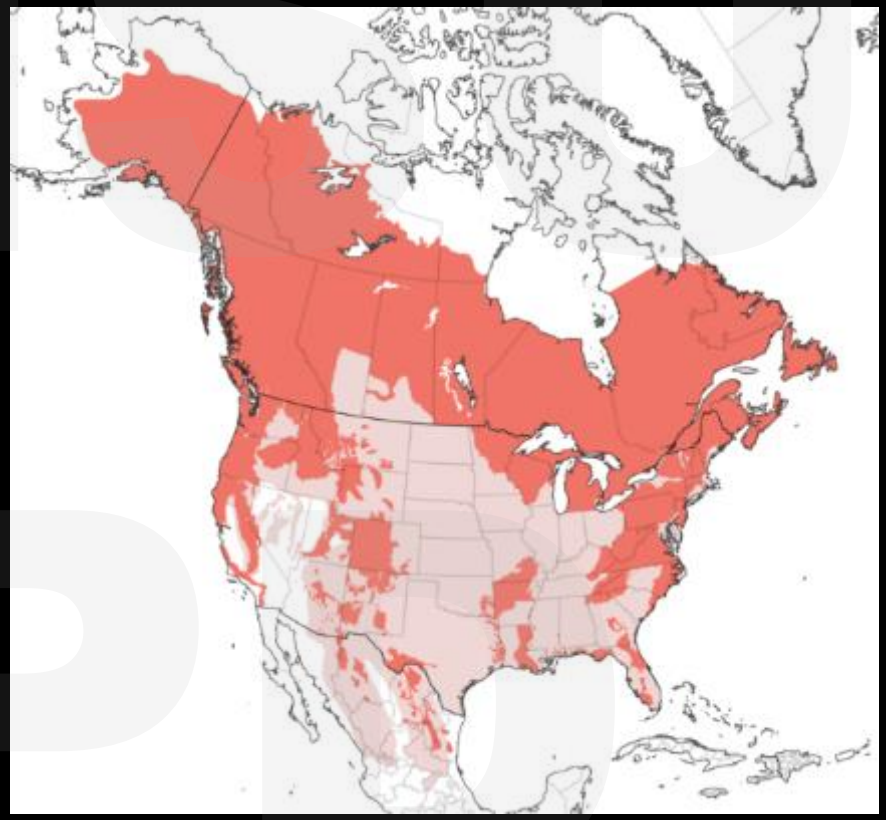


	Black Bear	Grizzly Bear
Shoulder:	No hump	Hump
Ears:	Taller	Short and rounded
Face:	Straight profile	Dished profile
Front Claws:	Dark ~ 1.5" long	Light ~ 2-4" long




Grizzly Bears in the West
North Cascades (~6)
Selkirks (30-50)
Cabinet-Yaak (38-48)
Northern Continental Divide (~800 bears)
Greater Yellowstone (~700)
Selway-Bitterroot (occasional sightings)
Current Recovery Areas
Potential Habitat
Historic Range


United States
Canada
United



Black Bears

Bears

Black

- Widespread US
- 650 pounds
- Small claws
- Range of colors
- Mothers not as aggressive
- Oregon – 25-30,000
- Washington – 25,000

Grizzly

- Restricted range
- 850 pounds
- Large claws
- Range of colors
- Mothers very protective
- Washington – 12-30
- Oregon – 0



Source: https://www.vox.com/2016/10/6/13170344/bear-attacks-national-state-parks

Source: Wikimedia commons

Bear Attack Injuries

- Face often attacked
- Mechanisms of trauma
  - Teeth: chewing, biting
  - Claws: slashing
  - Bulk: pining down, crushing
  - Can pull or push you out of tree

Bear Attack

- Provoked:
  - Perceived threat
    - Mom with cubs
  - Surprise encounter
  - Getting too close
- Unprovoked:
  - Predatory

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Avoidance

- Make noise!
- Travel in groups
- Avoid leaving food on trail
- Camping – keep food downwind

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Sometimes the best relationship is a long-distance relationship



Distance is the key to admiration.



25 yards



Distance gives us new perspective.



50 yards



Distance makes the heart grow fonder.



100 yards


FRIENDS DON'T USE FRIENDS
AS BEAR BAIT
NATIONAL PARK SERVICE



"Honestly, I only asked you out because I panicked and forgot what to do when you encounter a bear on a trail."

Grizzly Bears

- Encounter
  - Don’t run
  - Walk slowly way
  - Be non threating
  - Bear spray at 25 yards
- Charged/attacked
  - Play dead
  - Face/belly in dirt with hands over neck

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Black Bear

- Encounter
  - Don’t run
  - Look big, yell etc
  - Bear spray at 25 yards
- Charged
  - Fight back
    - Nose/eyes other sensitive areas

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Bear Spray

- Red pepper oil
- 90% effective
- 98% uninjured in close encounters
- Firearms not effective

- J Wildlife Mgt 72:640, 2008

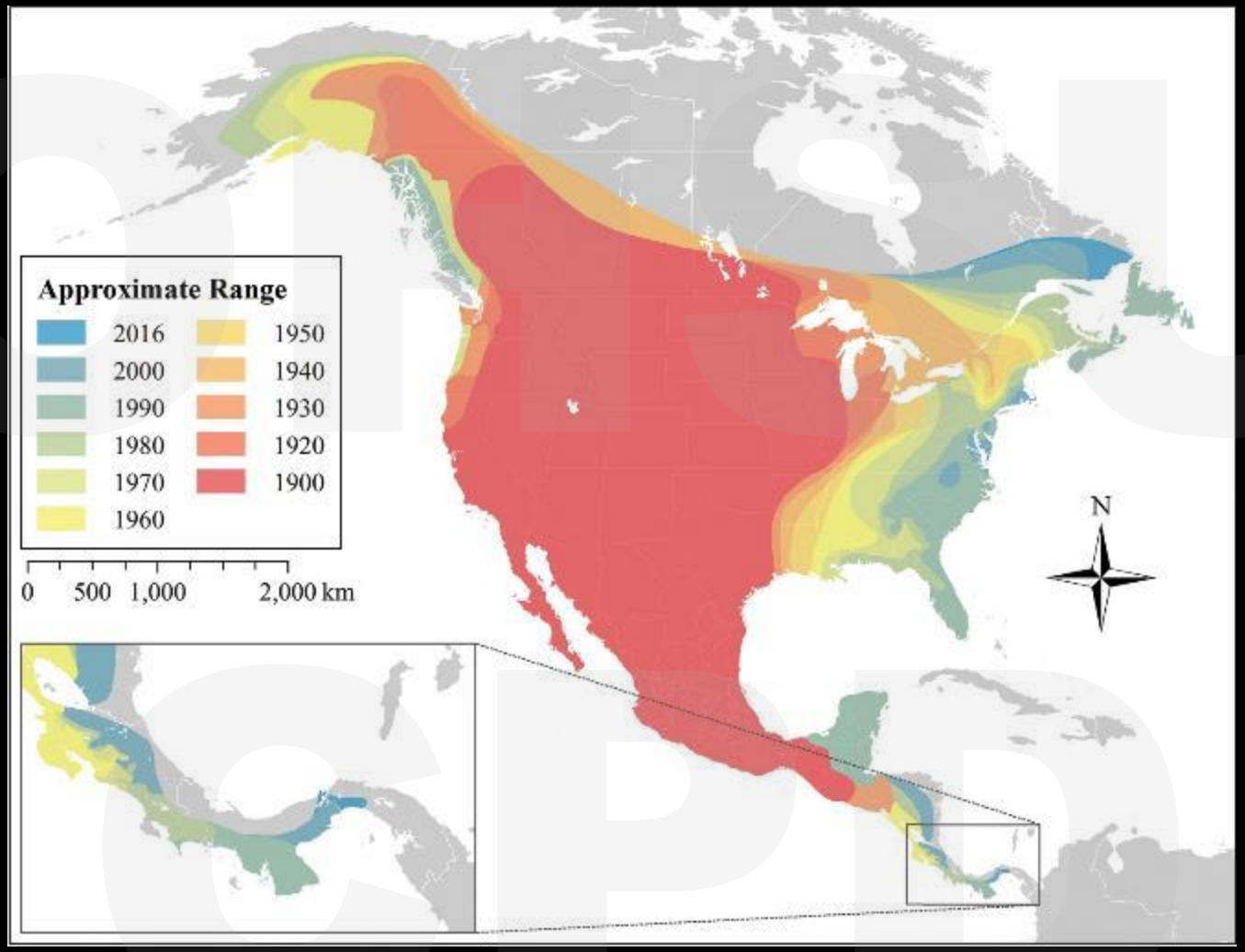
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Portland Urban Coyote Project

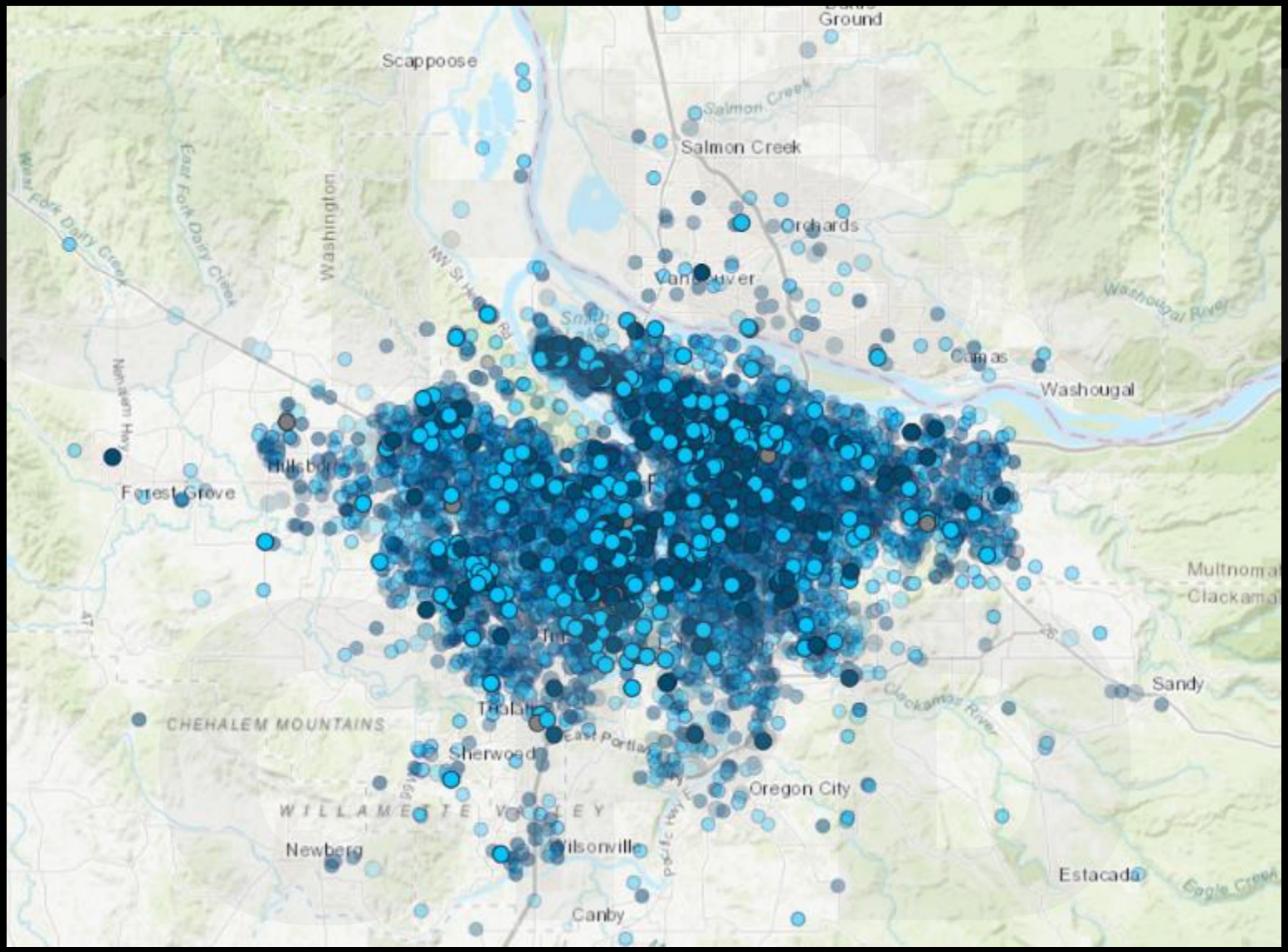


ZooKeys 759:81-97, 2018

Portland Coyotes

- First seen 1980
- Territory 4.5 mi^2
- 3-8,000 metro area
  - 2-4,000 in Chicago
- Up to 20% diet cats
- Attacks similar to dog attack
  - Biting

OHSU CPD



Portland Urban Coyote Project



one beat

Produced by John Goodmanson
Cover paintings by Annabel Wright

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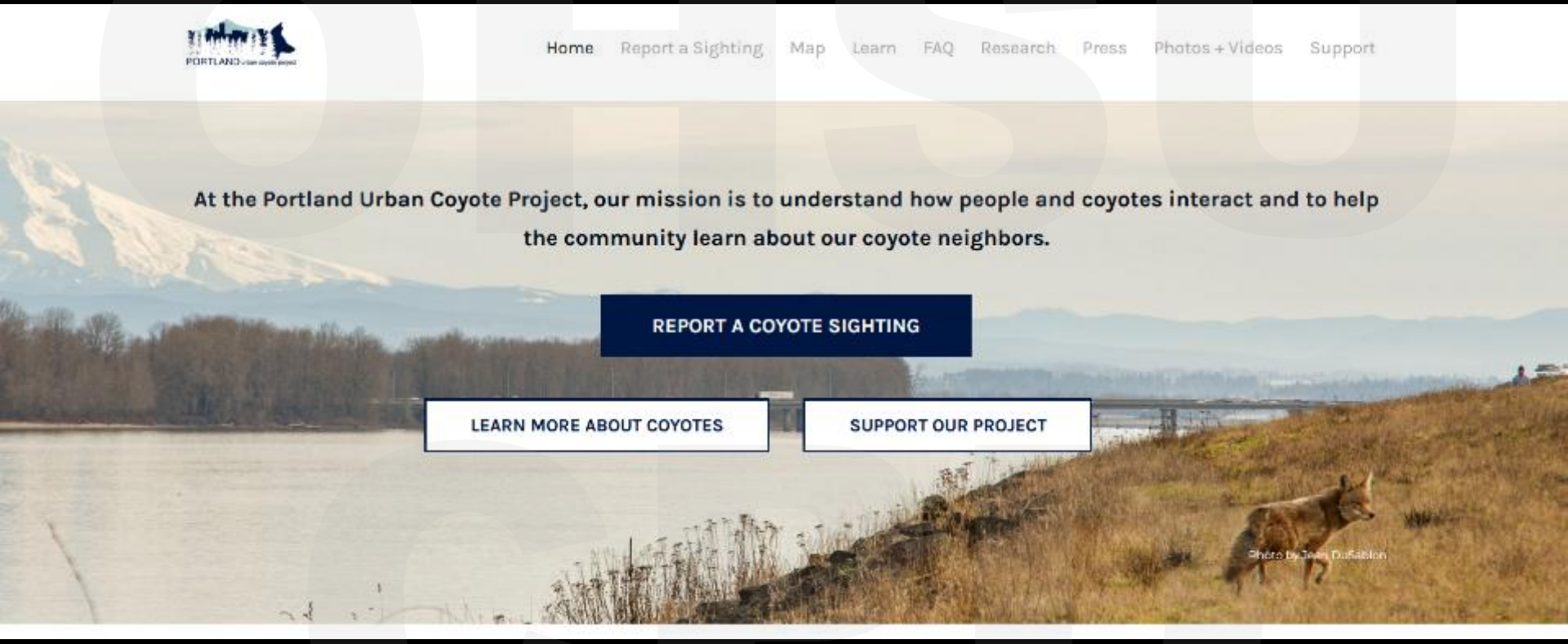
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1. one beat
2. faraway
3. oh!
4. the remainder
5. light rail coyote
6. step aside
7. combat rock
8. O_2
9. Pristina
10. Funeral Song
11. Hollywood Ending
12. Sympathy



Coyote Rules

- Do not feed coyotes!
- Do not let pets run loose
- Do not run from a coyote
- Repellents or fencing may help
- Do not create conflict where it does not exist
- Report aggressive, fearless coyotes immediately



www.portlandcoyote.com



Cougar Attacks

Biker's death near Seattle is Washington's first cougar fatality in 94 years



Pacific Northwest

Oregon hiker killed in Mount Hood cougar attack suffered broken neck, puncture wounds

Published: Oct. 24, 2018, 7:48 p.m.

OHSU
CPD

Mountain Lion Killed Colorado Hiker Found Dead on Trail, Officials Confirm

The encounter is the state's first fatal cougar incident since at least 1999.



- **Oregon: 6000**
- **Washington: 3600**

Cougar Attacks

- Increasingly frequent:
  - Over 50 attacks since 1970
  - At least five adult and five child fatalities
- Most occurring in:
  - California
  - Vancouver Island
  - Colorado

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WWW.ANDYWOODPHOTO.COM

Characteristics of Cougar Attacks

- Younger cougars more likely to attack
- Children more at risk
- Pushed to establish their own territory at about 18 months
- Forced into more human-inhabited areas
- Surprise attacks more common

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The 3 most intrusive cases involved a cougar crashing through the window of an isolated cabin to attack a telephone lineman (Table 1: Kelsey Bay, B.C., 1951), a

Target of Cougar Attacks

- Aims at victim's head and back
- Bites through great vessels and airway
- Causes forcible hyper-extension and C-spine fracture
- Puncture wounds from teeth are often much deeper than suspected

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Prevention of Cougar Attacks

DO:

- Fight back
- Look larger, threatening
- Make noise
- Bear spray

DON'T:

- Stoop down
- Make direct eye contact
- Run

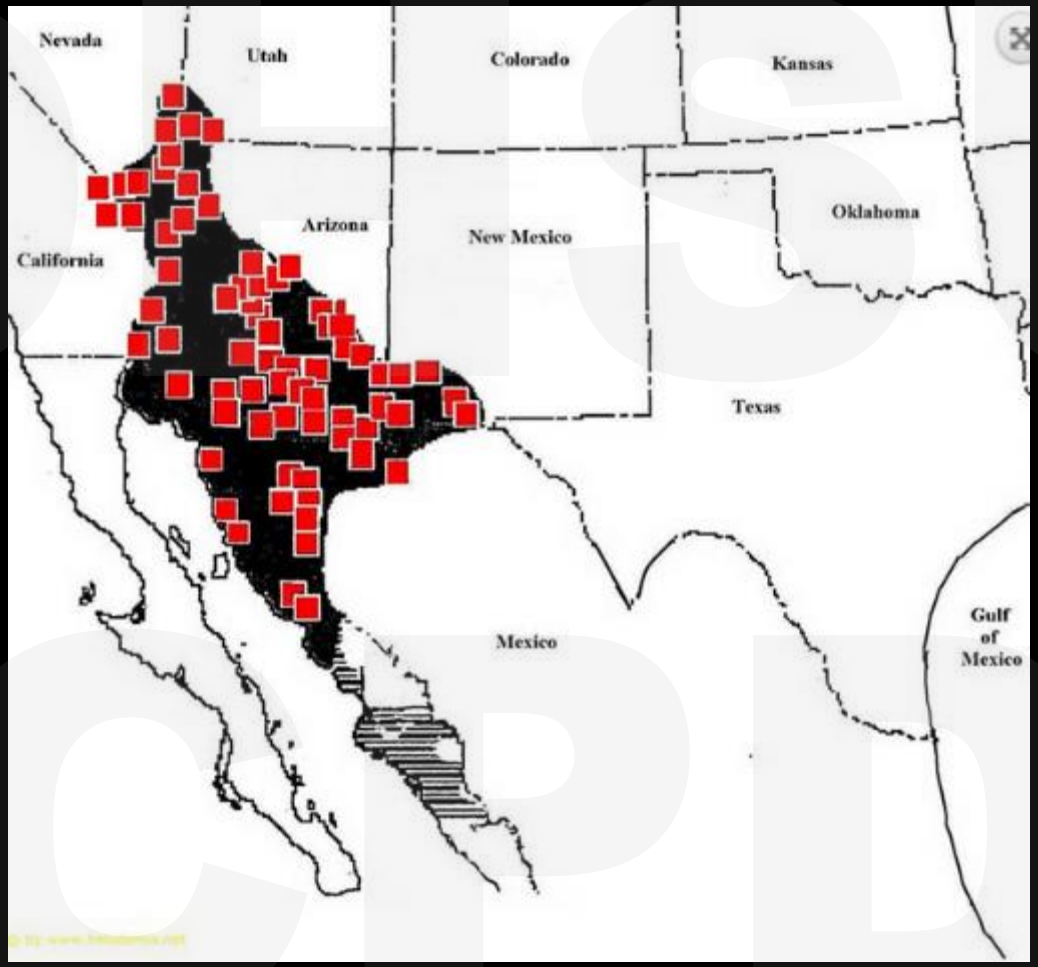
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Gila Monsters

- SW USA
- Can be up to 2 ft long
- Official State Reptile of Utah
- Eats 5-10 times/year

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Nevada
Utah
Colorado
Kansas
Arizona
New Mexico
Oklahoma
California
Texas
Mexico
Gulf
of
Mexico



Gila Monsters

- Only small amounts of venom
  - Drips into salvia
- Fatal bites children or repeat bites
- Very painful!!!
- Rare reports of anaphylaxis
- Venom help developed GLP-1 agonists
  - Ozempic (semaglutide)

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First Aid

- Lizard bites and doesn't let go
  - Banging on ground
- Examine wounds for broken teeth
- Pain control
- IV fluids for hypotension

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CURES OBESITY
STILL CALLED MONSTER

Conclusion

- Don’t be stupid with animals!

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