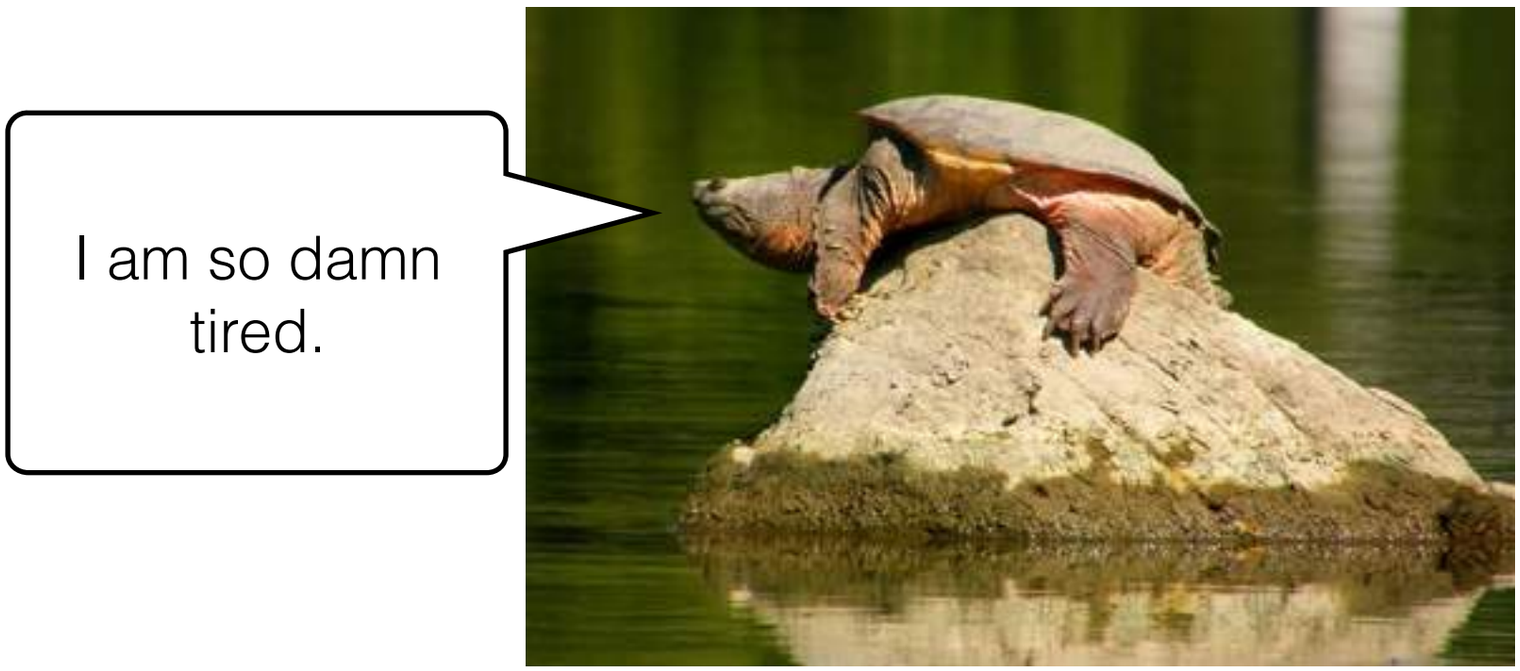
Reptilian Physiology

Announcements

- More exemplar introduction and methods will be posted today
- Today is the **last** new field location (we'll be revisiting old locations, but sometimes we'll do new sites)
- Reserve office hours sooner rather than later for draft questions!



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What kind of herp is this?

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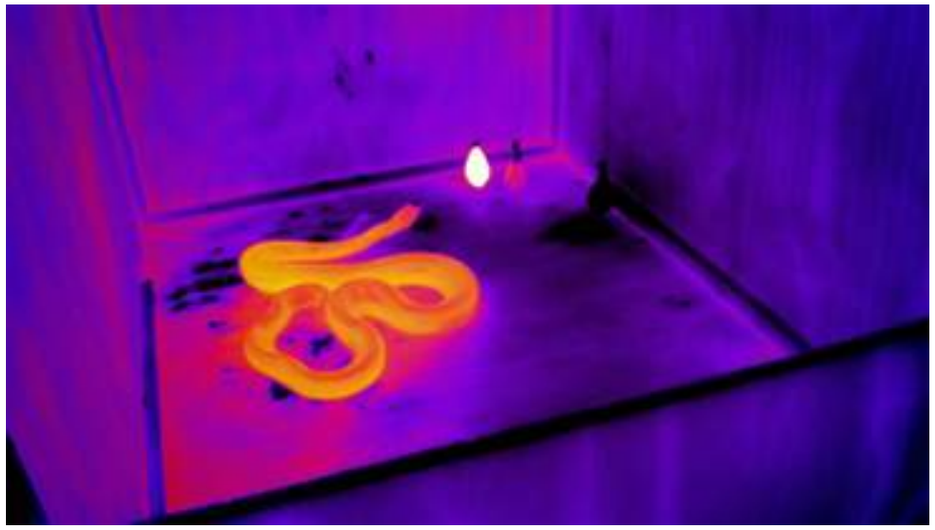
What kind of herp is this?

Physiology, part deux

- The study of **chemical** and **physical processes** in the organism

- Aspects of the physiology can be informative for understanding organisms in their environment
  - Thermoregulation
  - Water Regulation
  - Development



Reptile Thermoregulation

- Reptiles regulate their temperature by…

    1. Controlling heat gain from environment

        - Microhabitat selection

    2. Controlling heat loss

        - Basking

    3. Redistributing heat in the body

        - Part of body in water, part in the sun

    4. Controlling metabolic heat generation

        - Found in female pythons (so not an adaptation seen in CT)

Reptile Thermoregulation

- We are most familiar with reptiles basking, which improves…
    - Brain function
    - Muscle function
    - Digestion
- Moving in and out of hot spots allows them to maintain a high body temperature throughout the day
    - Digesting food?
        - Vipers (like the copperhead and timber rattlesnake) lose digestive tissue between meals
    - Gravid?
- **What times of day are we most likely to see basking?**

Overwintering

Snakes

- No snake is freeze tolerant
- Most snakes overwinter in communal dens
    - Used by many species simultaneously
        - *Agkistrodon contortix* and *Crotalus horridus* often den together
        - *Thamnophis sirtalis* does not necessarily hibernate

Overwintering

Turtles

- Many turtles burrow into muds at the bottom of ponds
  - Danger of freezing
  - Anoxia
- Some turtles have cloacal bursae
  - Allows for oxygen exchange in water… out of their butts

Overwintering

Juvenile Painted Turtles

- Hatchlings remain in nest during winter
- Baby turtles build up glucose in their blood
- Dry nests also result in **supercooling**, the process of water cooling below freezing, but remaining liquid

[Video]

Reptile Water Regulation

- Proper water balance is critical to reptiles, but non-permeable skin makes adaptations very different from amphibians
    - Preventing evaporative water loss*
    - Ensuring water intake*
    - Storing water
    - Excreting nitrogen*
    - Salt glands

* Important for CT species

Evaporative Water Loss

- You might think keratinized scales are extremely effective in preventing water loss
    - You'd be wrong
        - Lipids in the skin
- 20-30x less evaporative water loss than in amphibians
- However, reptiles cannot uptake water through the skin
    - Many reptiles have behavioral and anatomical features for aiding in water collection

Water Intake

- Reptiles that drink either lap up water, or pump it into the mouth
- Some reptiles rely entirely on free water in food
- Some reptiles rely solely on water generated during metabolic processes

Excreting Nitrogenous Waste

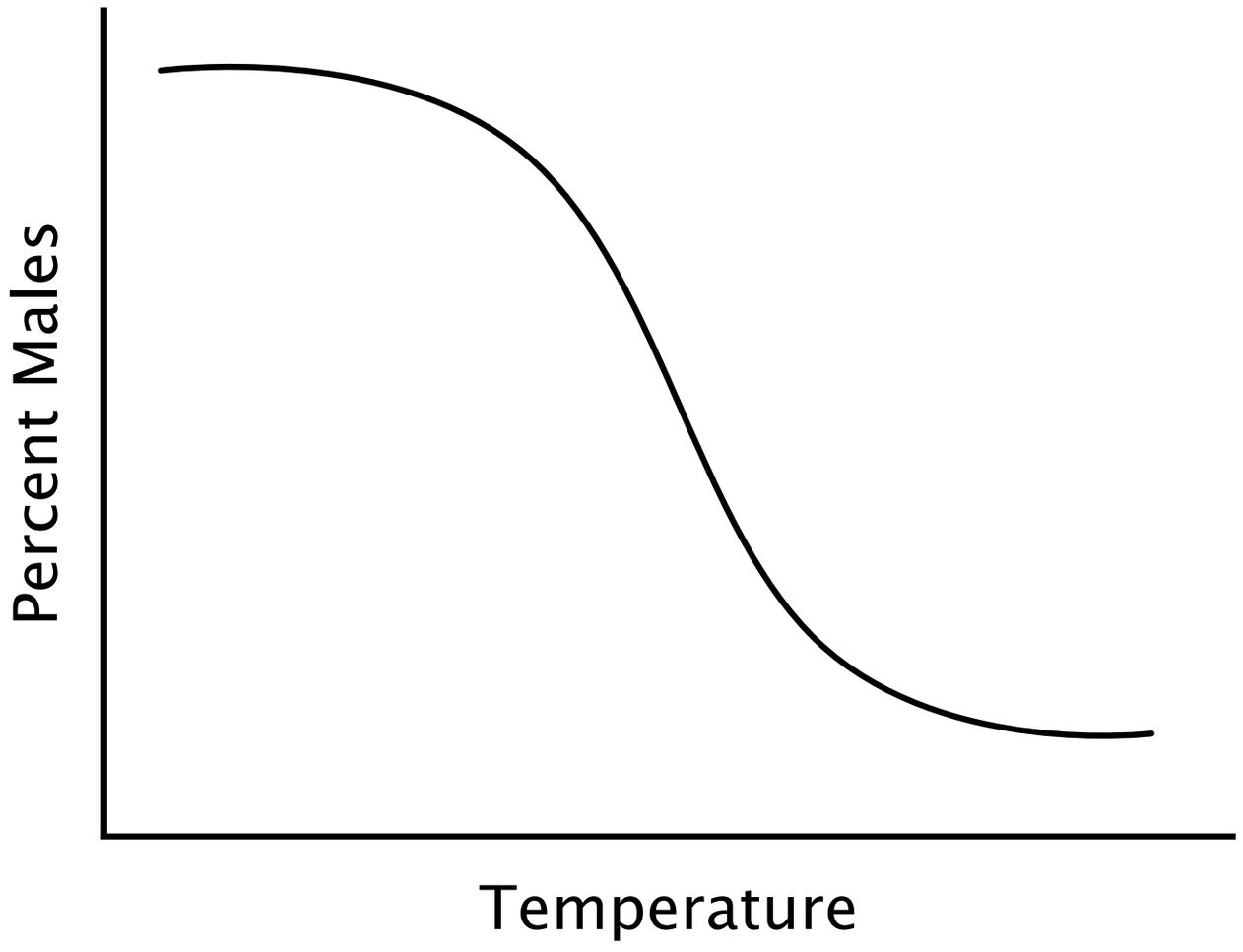
- Reptiles in general have difficulty getting rid of salts
    - Incapable of concentrating urine higher than bodily fluids (unlike the mammalian kidney)
- Turtles excrete **urea**
    - Water soluble, non-toxic, but eventually becomes toxic
    - Terrestrial animals with easy access to water typically use urea
- Snakes and lizards excrete **uric acid**
    - Water insoluble, non-toxic
    - Almost no water loss

Reptile Development

- Turtles
    - Follow Egg, Juvenile, Adult pattern
    - Interesting temperature dependent sex determination
- Snakes
    - Generally follow Egg, Juvenile, Adult pattern, with some species bearing live young

Turtle Temperature Dependent Sex Determination

- General method for sex determination in turtles
- Adaptive significance?
- May just be “phylogenetic inertia”
- Sexes are differentially fitter in different temperatures



Snake Birthing Strategies

- Oviparity - typical egg development
    - *Carphophis amoenus, Coluber constrictor, Diadophis punctatus, Elaphe obsoleta, Heterodon platyrhinos, Lampropeltis triangulum, Opheodrys vernalis*
- Ovoviviparity - egg is retained in the female, young are born in membraneous sacs
    - *Nerodia sipedon, Storeria dekayi, Storeria occipitomaculata, Thamnophis sauritis, Agkistrodon contortrix*
- Viviparity - live young are born
    - *Thamnophis sirtalis, Crotalus horridus*