

2019 HERPETOLOGY (B/C) TRAINING HANDOUT

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National Committee Chairman – Life Science

Overview: This event will test knowledge of amphibians & reptiles.

The Official National Herpetology List will be used for taxonomy questions. The taxonomic scheme is based upon a **combination of traditional and current categories** (designed to utilize familiar terms widely used in published resources available to students). States may have a **State Herpetology List** for regional and state competitions. It must be posted **by Nov. 1**. Check your state website.

Event Parameters: Teams may bring *one unaltered Official Herpetology List* and *one resource binder (up to 2 inches)*. *Items may not be removed from the binder during the competition.*

Event Format: Timed stations or power point presentations will be used for the competition. Specimens/pictures will be lettered or numbered at each station. Each specimen will have one or more questions accompanying it on some aspect of its life history, distribution, etc. No more than 50% of the competition will require giving common or scientific names (order, family, genus).

Training Materials

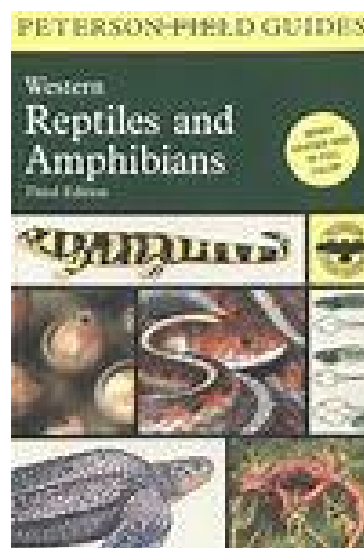
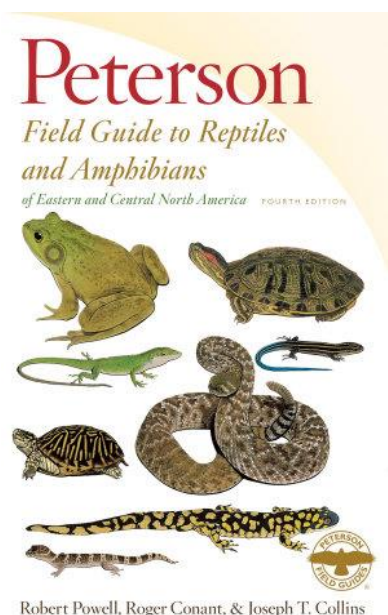
- **Training Power Point** ó content overview
- **Training Handout** - background information
- **Resource Binder Handout** ó guide to making a Resource Guide Binder.
- **Sample Tournament** ó sample problems with key based upon the National Herpetology List
- **Event Supervisor Guide** ó event prep tips, setup needs and scoring tips
- **Posted Training Materials & Internet Resource links**ó on the Science Olympiad website at www.soinc.org under Event Information ó Herpetology
- A **Biology-Earth Science** (2019) CD, and the **Taxonomy** CD (2016) are available from SO store at www.soinc.org

Field Guide Resources:

- Many of the current field guides for Herpetology are out-dated for the updated taxonomy. Be sure to check the national list for the current updated taxonomy.
- Be sure to check the publication date when choosing a resource to use.
- Field guides can still be good resources guides for other information.

The following seem to be the most up-to-date field guides.

- *Peterson Field Guides: A Field Guide to Reptiles & Amphibians: Eastern and Central North America*, 4th Edition by Roger Conant and Joseph T. Collins (2016)
- *A Field Guide to Western Reptiles and Amphibians*, 3rd Edition by Robert C Stebbins (2003)



- See the Handout on *Making A Field Guide Binder* to help you to prepare your own field guide.
- For additional information on Herp taxonomy, see <http://www.cnah.org/>

Game Plan for Using Resources to Learn the Amphibians and Reptiles

1. Use the **POWERPOINT** for an overview
2. Study the **TWO HANDOUTS** for background information and as a guide to making a binder and learning the competition
3. Use the **INTERNET RESOURCES and CD'S** for more help or see the Science Olympiad National website at www.soinc.org under event information and the Science Olympiad store
4. Prepare a **FIELD GUIDE, FIELD GUIDE BINDER** and use **OTHER TOOLS** to LEARN THE AMPHIBIANS AND REPTILES and then **MODIFY THE BINDER** for effective use in competition
5. Do the **SAMPLE TOURNAMENT** under timed conditions to experience being timed in competition.
6. Prepare and do **PRACTICE STATIONS, OLD TESTS**, and **INVATIONALS** to master knowledge, teamwork, and using your binder effectively under timed conditions.

Learning the Amphibians and Reptiles ó learn the characteristics of the **Classes**, the **Orders and Suborders**, and then the **Families**. Finally become familiar with the characteristics of the **Genera** within each Family

Binder Tips – See Handout on Making a Field Guide Binder

- The most effective resources are the ones produced by the students.
- The process of producing the resources is a major learning tool.
- Have a copy of the rules in your binder
- Have a copy of the lists (herps, insects, birds, fossils if applicable) in your binder
- Prepare and organize materials by major topic divisions.
- Place materials from many different sources into your topic divisions
- Reduce the size of pictures where possible to get more information on a page.
- Color code information to help you locate or emphasize key items.
- Put pages in sheet protectors ó two per protector to save space.
- Use tabs to separate sections.
- Label tabs so items can be located with ease.

Power Point Slides for Learning the Herps

- Make power point slides for Order, Family, and/or Species
- Make them like sample stations with pictures and questions
- Prepare them so they can be reorganized to make practice competitions for study

Flash Cards for Learning the Herps

- Make flash cards with pictures on one side and information on the back
- Use the flash cards to make up sample competitions
- Use the flash cards to learn the herps

Doing the Competition

- Place information in appropriate place on answer sheet
- Print legibly so information is understandable
- Work as a team ó use time effectively
- Use Binder or Field Guide effectively
- Identify to Order and then to Family and Genus
- Be sure to spell names correctly
- Carefully read all questions and use common sense in answering
- Relax and Have Fun ó Let the competition show you what you have learned!!

Comparison of Amphibians and Reptiles

Introduction	Amphibians mean living two lives (on land as well as on water). Amphibians usually have to stay near water sources to prevent drying out, and have smooth skin.	Reptiles are groups of animals that breathe air, have scales on their bodies, and lay eggs.
Examples of animals	Frogs, toads, and salamanders (including newts)	Snakes, lizards, crocodilians, and turtles
Method of Breathing	Skin, gills, and lungs	Lungs
Body Metabolism	Ectothermic (cold-blooded)	Ectothermic (cold-Blooded)
Metamorphosis	Yes. Usually breathes water through skin and gills until it develops lungs.	No metamorphosis. Young Look like a miniature adult when born.
Defense	Toxic skin secretions and can bite. No claws. If teeth are present, they are pedicellate teeth.	Claws and teeth (some have venom: a few lizards, and many snakes). Reptiles have scales, which act as a kind of armor to physically protect the body.
Heart structure	3-chambered	Most reptile hearts have three chambers: two atria and one, partially divided, ventricle. However, crocodilians have four-chambered hearts with two atria and two ventricles (although the wall between the ventricles is somewhat incomplete).
Limbs	Short fore limbs and long hind limbs; usually with five webbed digits.	Reptiles usually have four limbs, but some reptiles (snakes) have no limbs. Reptiles with limbs vary in their ability to move; some move very slowly and crawl, while others can run, jump, and even climb. One type of lizard can even run on water.
Skin Texture	Smooth, moist and sometimes rather sticky skin. Laden with mucous glands.	Dry and scaly. The dead, outer layer of scales are made of keratin. Living skin is found below .
Eggs	Have soft, gelatinous coatings surrounding their eggs without any hard shells. Usually, found in water or moist habitats.	Amniotic eggs with 3 extra-embryonic membranes. They have hard, calcareous or leathery egg shells laid on land or kept within their bodies until they hatch.
Reproduction	External fertilization	Internal fertilization

CLASS AMPHIBIA - Amphibians



- Up to four limbs without claws on digits (toes)
- **Most** adults have lungs instead of gills
- Three chambered heart (two atria & one ventricle)
- Double loop blood circulation to lungs & rest of body cells
- Most with smooth, moist skin to absorb dissolved oxygen
- Ectothermic - body temperature changes with environment
- Show dormancy or torpor (state of inactivity during unfavorable environmental conditions)
- May hibernate in winter and aestivate in summer
- Aquatic larva called tadpole goes through metamorphosis to adult stage (Delete tadpole here)
- External fertilization with amplexus in frogs and toads and some salamanders (male clasps back of female as sperm & eggs are deposited into water)
- Eggs are coated with a sticky, gelatinous material so that they attach to objects in water and do not float away
- Male frogs and toads have vocal sacs with which to ðsingö
- Digested system adapted to swallow prey whole

ORDER ANURA (SALIENTA)

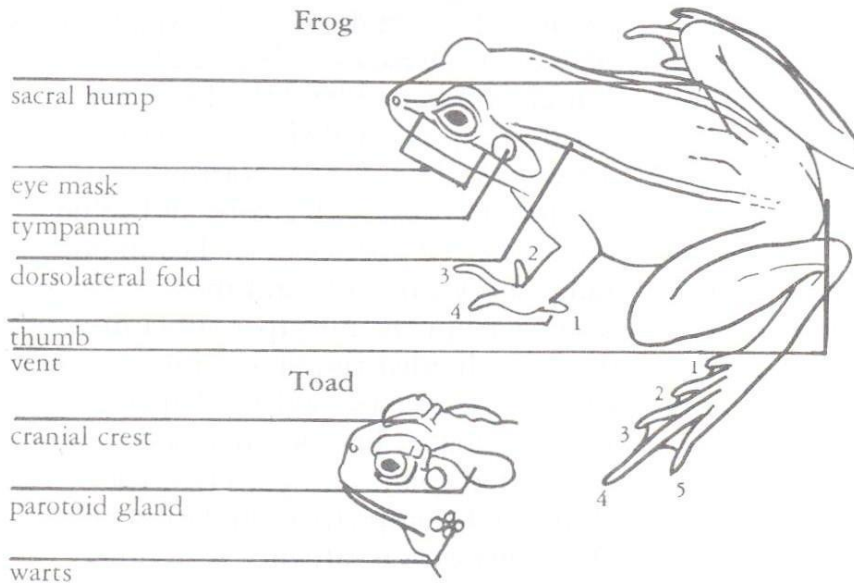
COMPARISON OF FROGS AND TOADS



	Frog	Toad
Hind legs	Long, powerful jumping legs	Shorter legs for walking or hopping
Eggs	Frogs lay eggs in clusters, young typically live in water	Toads lay eggs in long chains=some toads do not lay eggs but give birth to live young, young live in water (Delete high-lighted above)
Skin	Moist and smooth	Dry and bumpy
Characteristic	Amphibians, keeping mostly in water or in moist habitats.	Amphibians, keeping mostly on drier, terrestrial habitats.,
Habitat	Prefer moist or aquatic habitats.	Prefer drier terrestrial habitats. environment but adapt to moist conditions as well. (Delete highlighted)
Teeth	Frogs have vomerine teeth in their upper jaw.	Toads have no teeth.
Eyes	Eyes bulge out	Eyes do not bulge out, poison (parotoid glands) behind eyes.
Food	Insects, snails, spiders, worms and even small fish	Grubs, slugs, worms, insects, and other invertebrates

Toads and Frogs

- **Frog skin smooth & moist for cutaneous respiration**
- **Toads is rough & warty with poison glands**

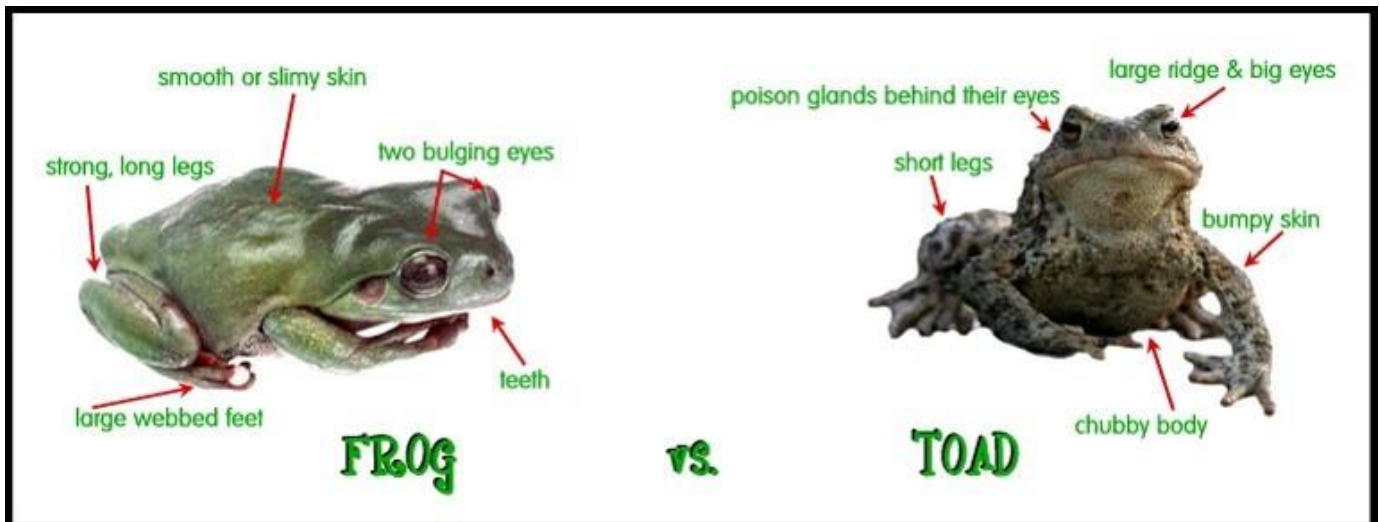


Frog/Toad – Hind Feet

- **True frogs** ó webbed toes
- **Tree frogs** ó toe pads & webbing
- **Toads** ó tubercles & no webbing
- **Spadefoot Toads** ó thorny projections(spade) and reduced webbing

Characteristics of Frogs and Toads

- Tadpole with tail, gills, & two-chambered heart
- Adults without a tail, four limbs, & lungs
- Long, forked tongue hinged at front of mouth



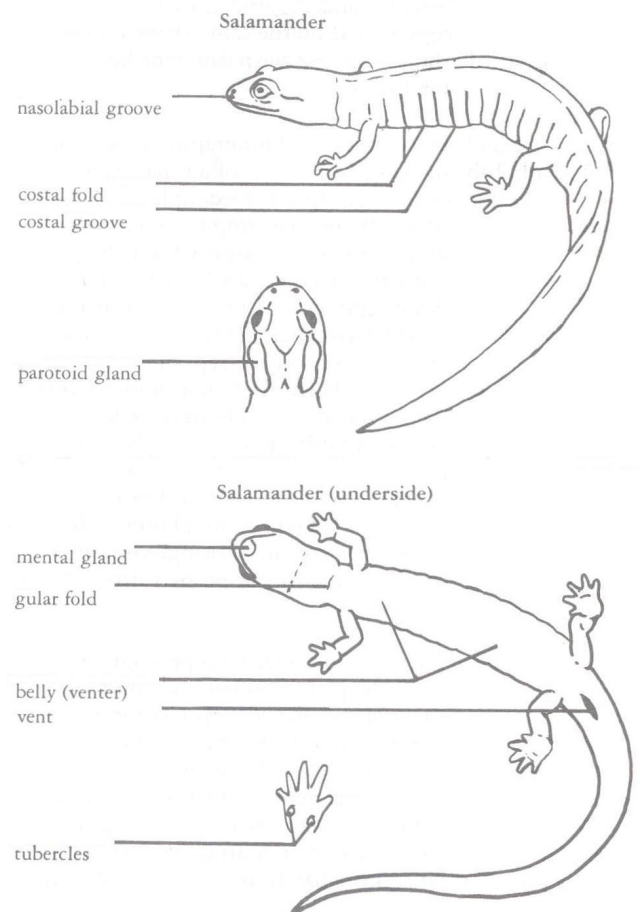
ORDER CAUDATA(Urodela) - Salamanders

Salamander is a common name for the order of Caudata (Urodela)

They are a group of amphibians typically characterized by a lizard-like appearance, with slender bodies, blunt snouts, short limbs projecting at right angles to the body, and the presence of a tail in both larvae and adults.



- Include salamanders, mud puppies, hellbenders, newts, sirens etc.
- Have elongated bodies with a tail & up to 4 limbs
- Smooth, moist skin for cutaneous respiration
- Less able to stay on dry land than frog and toads
- Nocturnal when living in drier areas
- Newts are mostly aquatic salamanders with limbs
- Sirens are slender, aquatic salamanders, which have no hind limbs.
- The ability of regenerating the body parts is remarkably higher in newts than in other salamanders



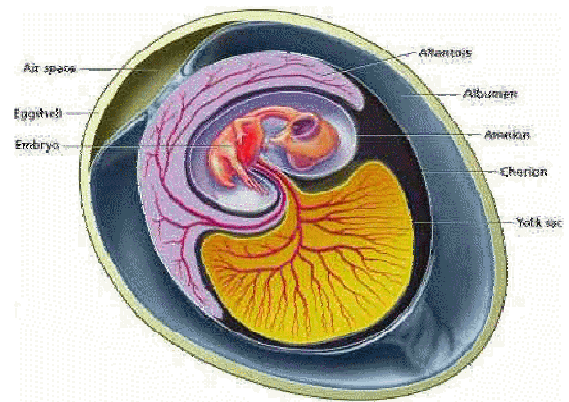
CLASS REPTILIA - Reptiles



- Dry, watertight skin covered by scales covered by a protein called keratin to prevent desiccation (water loss)
- Toes with claws to dig and climb
- Geckos have toes modified with micro hairs on the surface to aid climbing
- Snakes use scales & well developed muscular & skeletal systems to move
- Lungs for respiration. Snakes have one functional lung.
- Double circulation of blood through heart to increase oxygen to cells
- Partial separation in ventricle to separate oxygenated & deoxygenated blood
- Ectothermic - body temperature controlled by environment
- May bask or lie in sun to raise body temperature or seek shade to lower body temperature; known as *thermoregulation*
 - Water conserved as nitrogenous wastes excreted in dry, paste like form of uric acid crystals

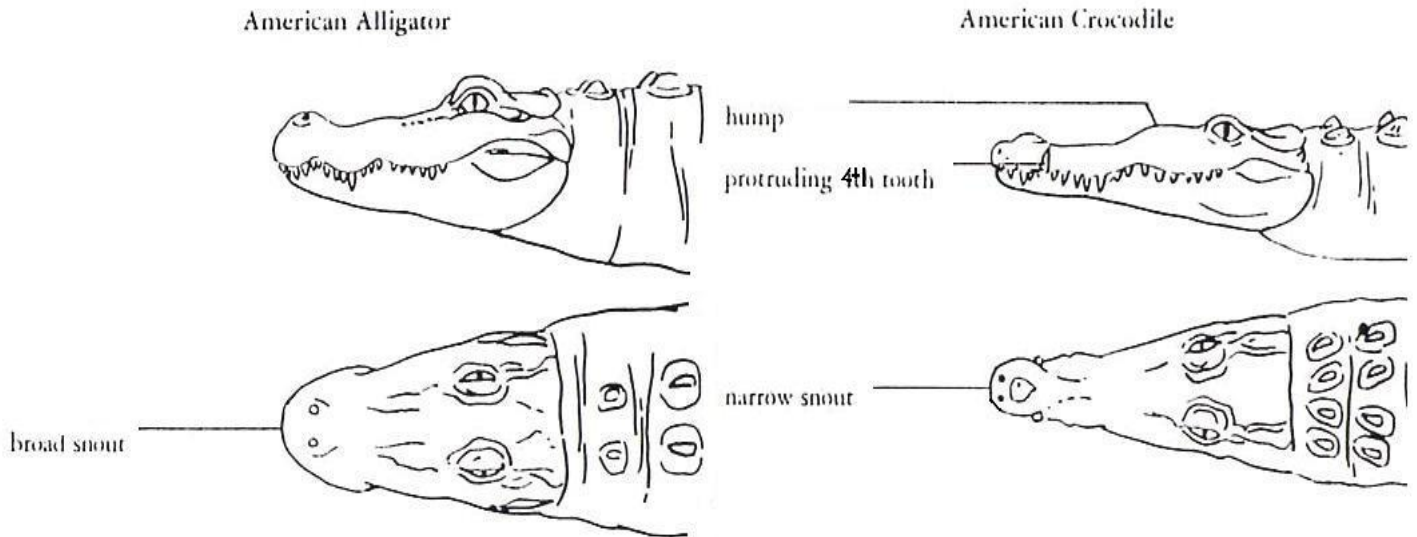
Reproduction Advance

- Amniotic Egg
- Protective membranes & porous shell around embryo
- Shell may be hard (calcareous) or leathery
- Internal fertilization before shell is formed



ORDER CROCODYLIA – Crocodiles and Alligators

- Carnivorous (wait for prey to come near & then aggressively attack)
- Eyes located on top of head so they can see when submerged
- Nostrils on top of snout to breathe in water
- Valve in back of mouth prevents water from entering airway when feeding underwater
- Both American Alligator and American Crocodile guard the nest and watch over young, and the males are vocal
- Crocodiles are tropical or subtropical, usually nocturnal



ORDER TESTUDINES (CHELONIA) – Turtles

- Water-dwelling turtles have streamline, disk shaped shell to rapidly move in water.
- All species (marine, aquatic, and terrestrial) lay eggs on land
- Body covered with shell composed of hard plates and tough, leathery skin
- Carapace or dorsal surface of shell fused with vertebrae and ribs
- Plastron is ventral shell surface
- Shape of shell modified for habitat
- Dome shaped shell helps to retract head & limbs in tortoises
- Tortoises are terrestrial, herbaceous turtles



Galapagos Tortoise



Spotted Turtle



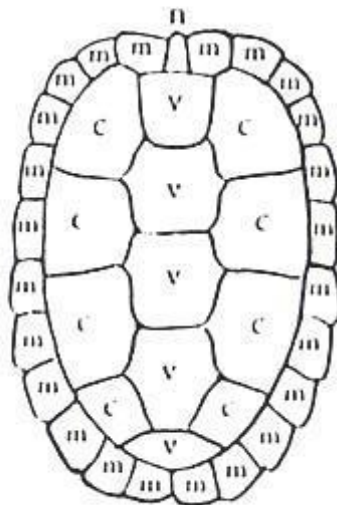
Marine Turtle

Turtle

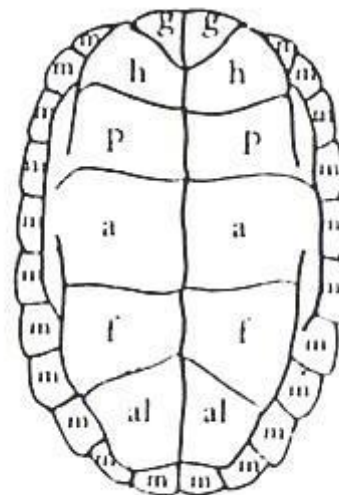
Scutes

a-abdominal
al-anal
c-costal
f-femoral
g-gular
h-humeral
m-marginal
n-nuchal
p-pectoral
v-vertebral

carapace (upper shell)

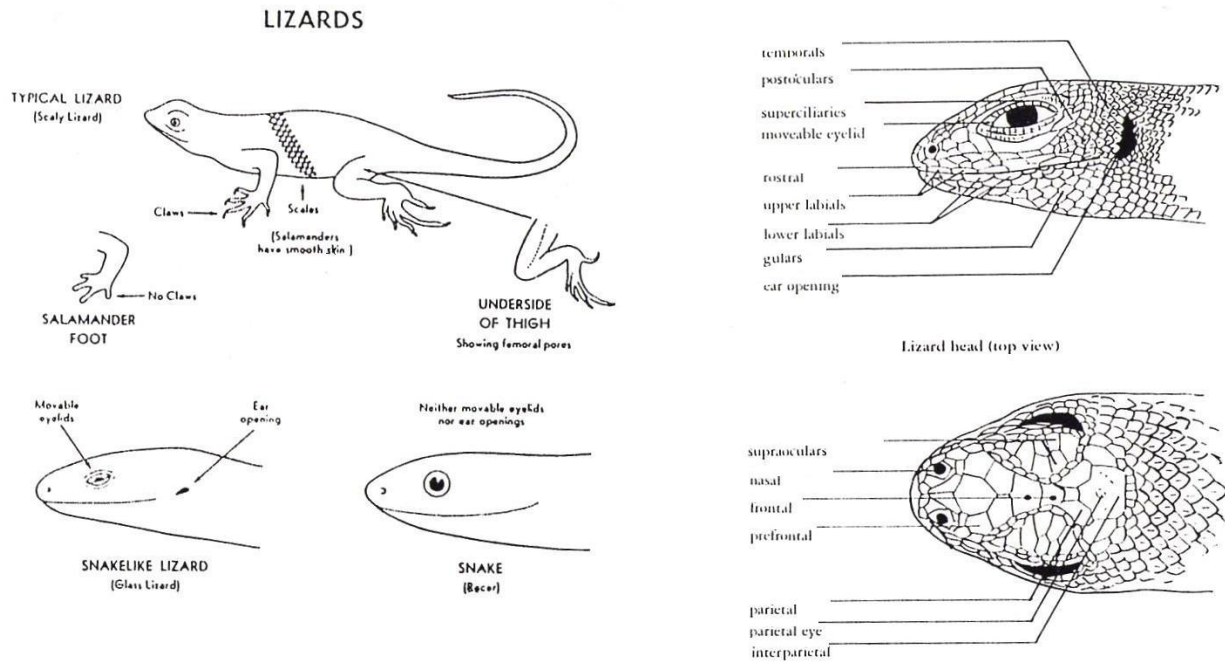


plastron (lower shell)



ORDER SQUAMATA – Lizards and Snakes

SUBORDER LACERTILA OR SAURIA – Lizards

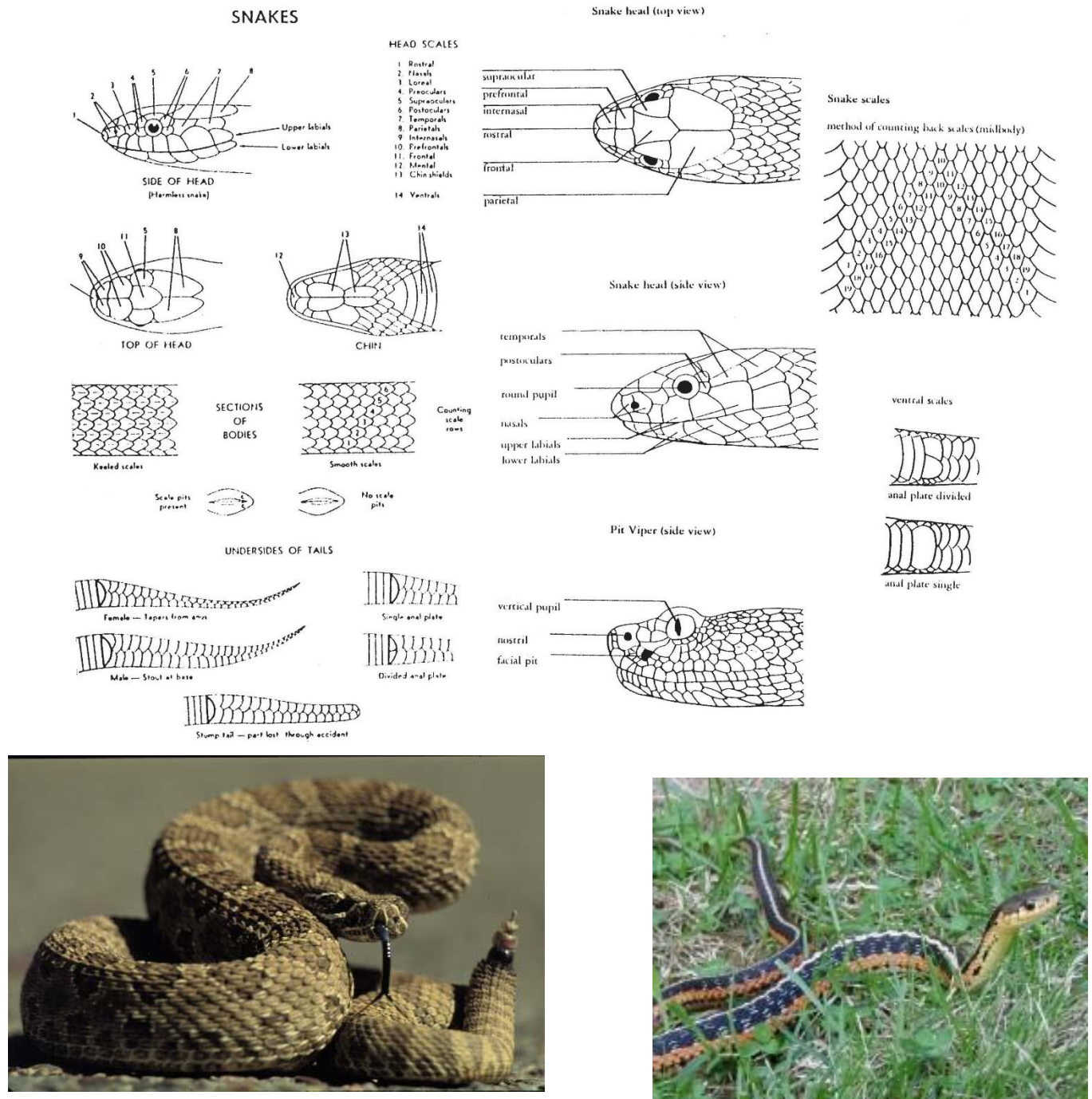


Lizards: Includes iguanas, geckos, skinks, chameleons, etc

- Most have four limbs, may have none
- Rely on speed, agility, & camouflage to catch prey
- Feed on small animals (insects, worms, etc.)
- Some, such as anole & chameleon, can change colors for protection
- May use active displays such as squirting blood, hissing, or inflating bodies
- Some show autotomy (breaking off tail to escape predators)
- One venomous U.S. species - Gila Monster



SUBORDER SERPENTES - Snakes:



- 100 ó 40 vertebrae each with a pair of ribs & attached muscles for movement
- Move in 3 ways ó lateral, rectilinear, & side winding
- Lateral undulations most common
- Hearing is poor-they locate prey by sight or with chemical scents (using forked tongue)
- May inject venom or poison ó Hemotoxin (rattle snake & water moccasin) or neurotoxin (coral snake)
- Constrictors wrap body around prey and squeeze to death
- Swallow prey whole ó jaws unhinge from mouth to stretch

Ecological Impacts

- Importance of ectothermy
- Economic value
- Bio-indicators
- Functional role in ecosystems
- Longevity of some species ó 50 yrs
- Status and conservation
- Habitat destruction

Decline of Amphibians

- Their highly permeable skin is more immediately sensitive to changes in the environment, including changes to freshwater and air quality
- Air and water pollution
- Habitat are being destroyed for human development
- Consumer demand in pet trade

Decline of Reptiles

- Habitat loss & degradation
- Invasive Species
- Environmental Pollution
- Unsustainable use
- Global climate change
- Life history ó some do not reproduce until later in life ó some turtles 18 yrs.
- Top of food pyramid ó indicators of environmental health.