

2018 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. 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 published field guide which may be tabbed, and written in, **OR** they may make their own field guide binder.

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

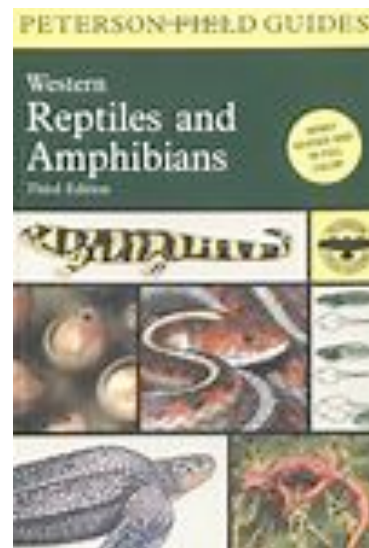
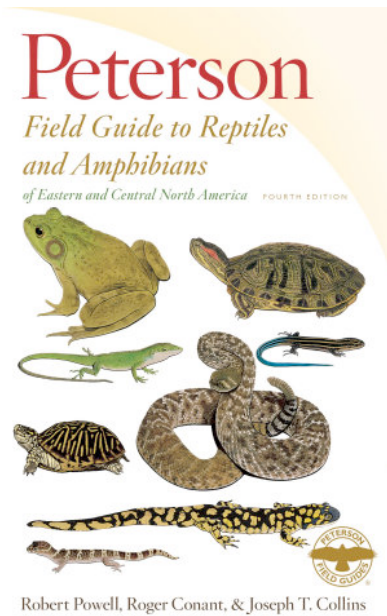
- **Training Power Point** – content overview
- **Training Handouts** - background information
- **Handout** – Guide to making a Field Guide Binder.
- **Sample Tournament** – sample problems with key based upon the National Herpetology List
- **Event Supervisor Guide** – event prep tips, setup needs and scoring tips
- **Posted Training Materials & Internet Resource links**– on the Science Olympiad website at www.soinc.org under Event Information – Herpetology
- A **Biology-Earth Science** (2018) CD, and the **Taxonomy** CD (2016) are available from SO store at www.soinc.org

Field Guide Resources:

- Some of the available field guides for Herpetology are outdated for the updated taxonomy.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 resource 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 – 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 OR TAB THE FIELD GUIDE*** 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 INVITATIONALS*** –to master knowledge, teamwork, and using your binder effectively under timed conditions.

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

General Tips – Field Guides

- Study the information in the front of the field guide
- Become familiar with the organization of the color plates in the field guide
- Notice how the field guide organization is similar to the organization of the Official Herpetology List
- Put the page numbers of Orders and Families Information from the Field Guide on the Official Insect List – it will save you a lot of time
- Tab the field guide with very small useful tabs so it is not cluttered and can be easily used
- Practice using the Field Guide to identify specimens or photos
- Practice under timed conditions to prepare for competition

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 – 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 places on answer sheet
- Print legibly so information is understandable
- Work as a team – 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 – 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, they have smooth skin.	Reptiles are groups of animals that breathe air, have scales on their bodies, and usually lay eggs.
Examples of animals	Frog, toad, and salamanders	Snakes, lizards, crocodilians, turtles
Method of Breathing	Gills, skin and lungs	Lungs
Body Metabolism	Ectothermic (cold-blooded)	Ectothermic (cold-Blooded)
Metamorphosis	Yes. Breathes in water through skin and gills until lungs develops.	No. Looks 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; Gila monster, beaded lizard, and many snakes). Reptiles have scales, which act as a sort of armor to physically protect the body.
Heart structure	3-chambered: one ventricle and two atria	One can say that the reptile heart has three chambers, two atria and one, partially divided, ventricle. Some reptiles have four-chambered hearts with two atria and two ventricles, but the wall between the ventricles is incomplete.
Limbs	Short fore limbs and long hind limbs with five digits (sometimes webbed).	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 glandular skin (laden with mucous glands).	Dry and scaly. Scales are made of keratin. (protein). Skin is found underneath the scales.
Eggs	Have soft, gel surrounding their eggs without any hard covering. Usually, found in water or moist places.	Amniotic egg. Have shelled or leathery eggs laid on land or they keep eggs in the females' bodies until they hatch.
Reproduction	External fertilization	Internal fertilization

CLASS AMPHIBIA - Amphibians



- Up to four limbs without claws on digits (toes)
- **Terrestrial** adults have lungs instead of gills
- Both internal & external nares (nostrils)
- Three chambered heart (two atria and one ventricle)
- Double loop blood circulation to lungs & rest of body cells
- Necks of salamanders help them to more easily, see and feed
- Most with smooth, moist skin to take in dissolved oxygen
- Some with oral glands to moisten food they eat
- 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
- External fertilization with amplexus in frog and toads (male clasps back of female as sperm and eggs deposited into water)
- Eggs coated with sticky, jelly-like material so they attach to objects in water and do not float away
- Male frogs and toads have vocal sacs to produce sounds
- Digestive system adapted to swallow prey whole
- Well-developed muscular system

ORDER ANURA (SALIENTA)

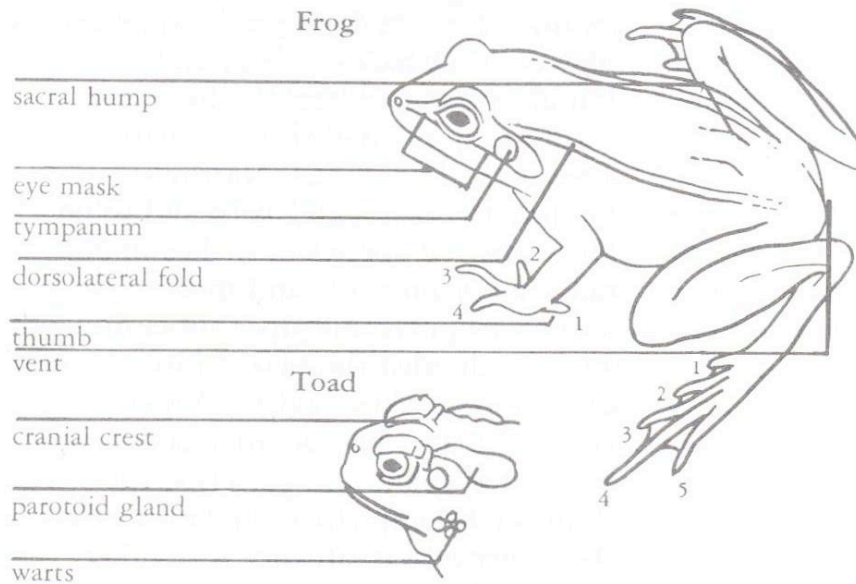
COMPARISON OF FROGS AND TOADS



	Frog	Toad
Hind legs	Long, powerful jumping legs	Shorter legs for walking or hopping
Eggs	Frogs lay eggs in clusters, tadpoles live in water	Toads lay eggs in long chains; tadpoles live in water
Skin	Moist and smooth	Dry and bumpy
Characteristic	Frogs live in or around water	Toads live mostly on land
Habitat	Prefer moist environments	Prefer drier environment but adapt to some moist conditions as well.
Teeth	Frogs have vomerine teeth in their upper jaw.	Toads have no teeth.
Eyes	Eyes bulge out	Eyes do not bulge out, prominent poison gland behind eyes
Food	Insects, snails, spiders, worms and even small fish	Insects, grubs, slugs, worms, and other invertebrates

Toads and Frogs

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

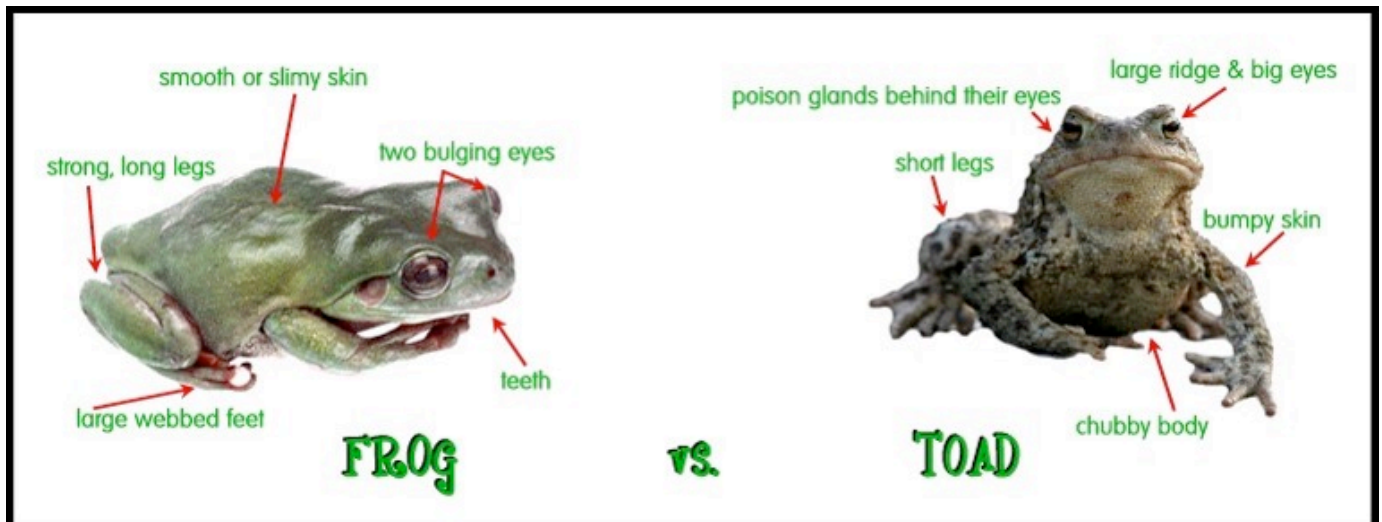


Frog/Toad – Hind Feet

- **True frogs** – webbed toes
- **Tree frogs** – toe pads & webbing
- **Toads** – tubercles & no webbing
- **Spadefoot Toads** – 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
- Prominent tongue attached at front of mouth



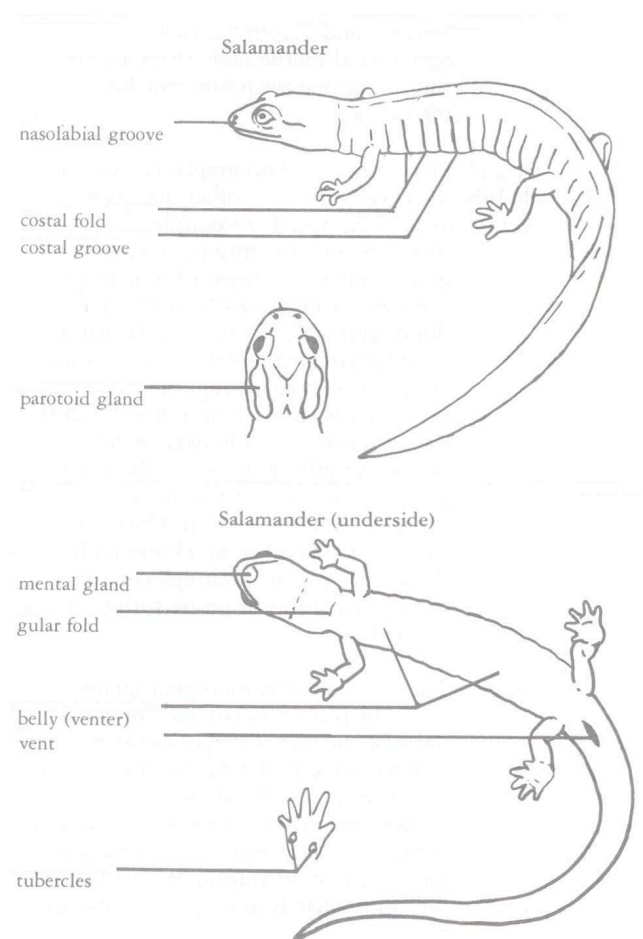
ORDER CAUDATA (URODELA) - Salamanders

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.



- Salamanders may be terrestrial or aquatic; they include mudpuppies, 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 frogs and toads
- Nocturnal when living in drier areas
- Newts usually have a rougher drier skin with warts, but it is always soft in salamanders
- Sirens are aquatic salamanders, which have no hind limbs; amphiumas have reduced limbs
- During the breeding season, the newt develop a flat tail, but salamanders have round tail
- The ability to regenerate missing body parts is greater in newts than in other salamanders.



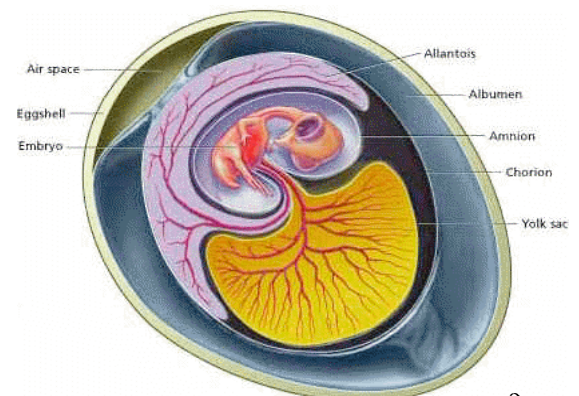
CLASS REPTILIA - Reptiles



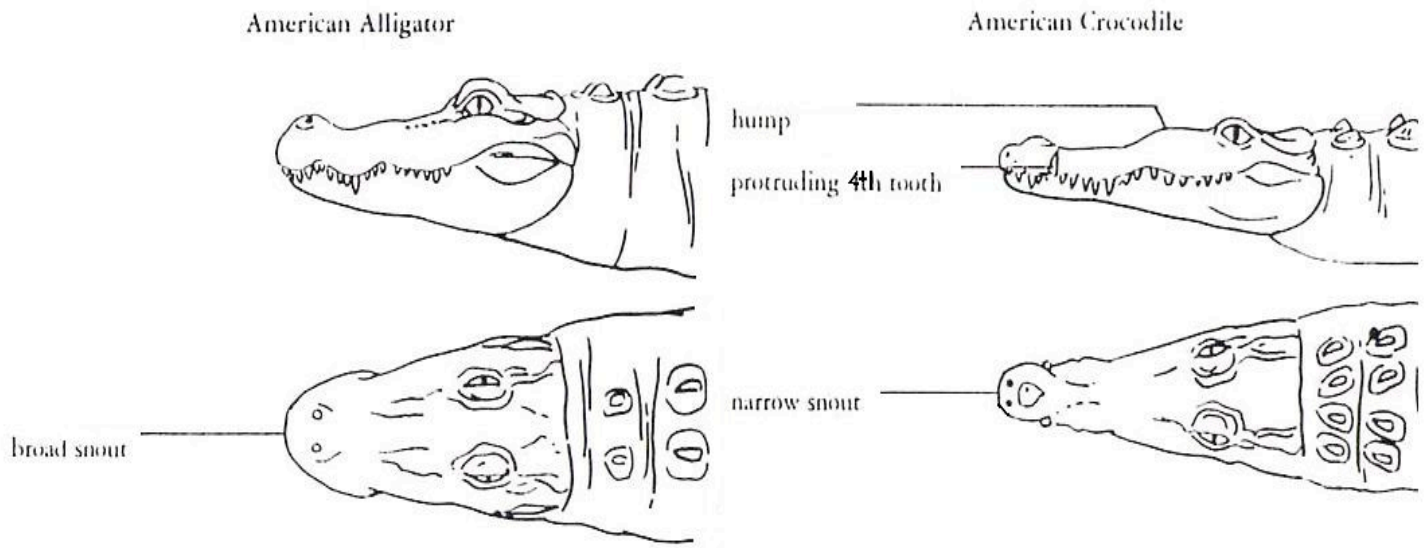
- Dry, watertight skin covered by scales made of a protein called keratin to prevent desiccation (water loss)
- Toes with claws to dig & climb
- Geckos have toes modified with micro hairs on the surface to aid climbing and vertical pupils
- Snakes use scales & well developed muscular & skeletal systems 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 is conserved as nitrogen wastes are excreted in dry, paste like form of uric acid crystals

Reproduction Advance

- Amniotic Egg
- Protective membranes & porous shell around embryo
- Shell may be hard or leathery & waterproof
- Egg is fertilized internally 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
- Crocodiles are tropical or subtropical, occur in salty water, and are usually nocturnal



ORDER TESTUDINES (CHELONIA) - Turtles

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



Galapagos Tortoise



Spotted Turtle



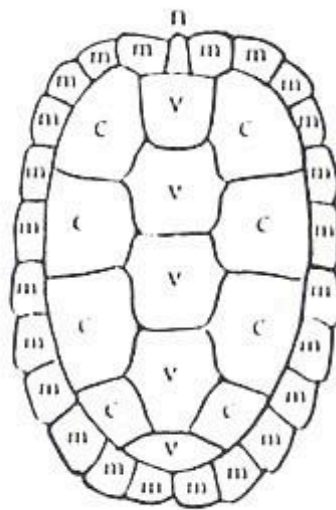
Sea Turtle

Turtle

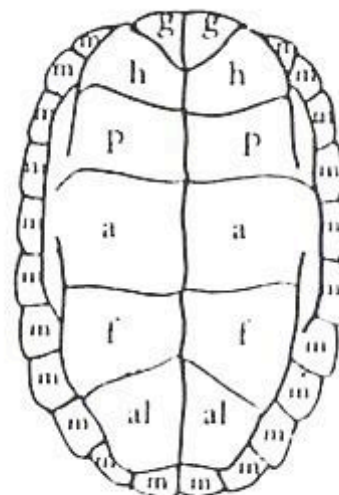
Scutes

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

carapace (upper shell)

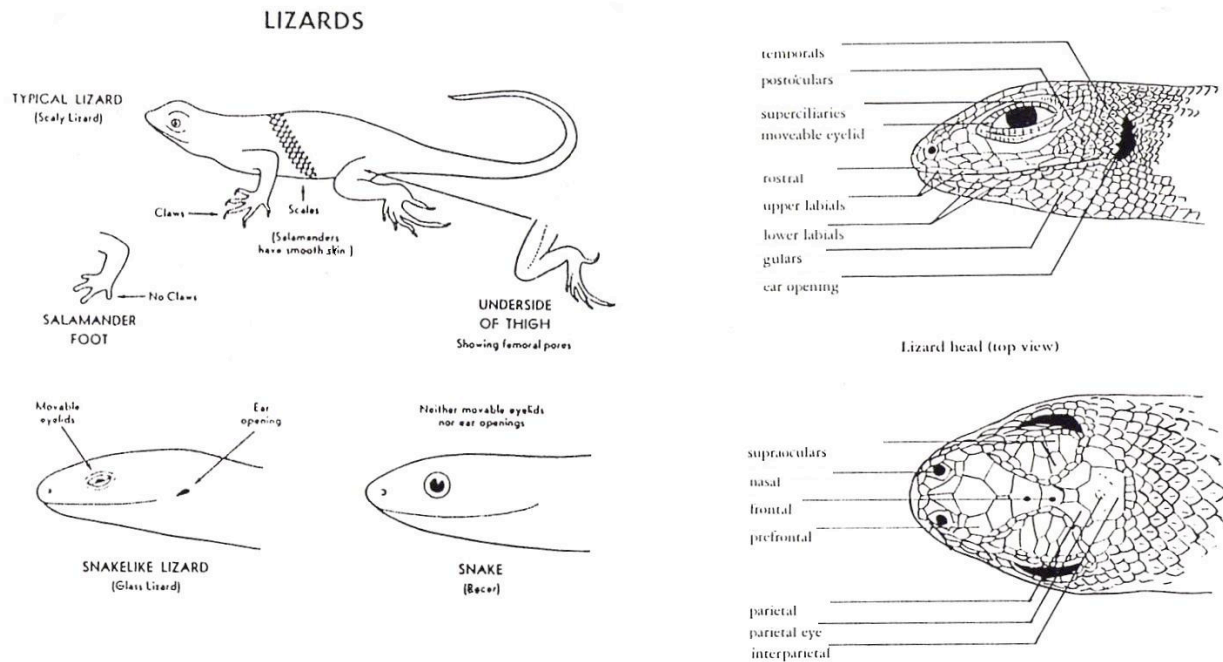


plastron (lower shell)



ORDER SQUAMATA – Lizards and Snakes

SUBORDER LACERTILA OR SAURIA – Lizards

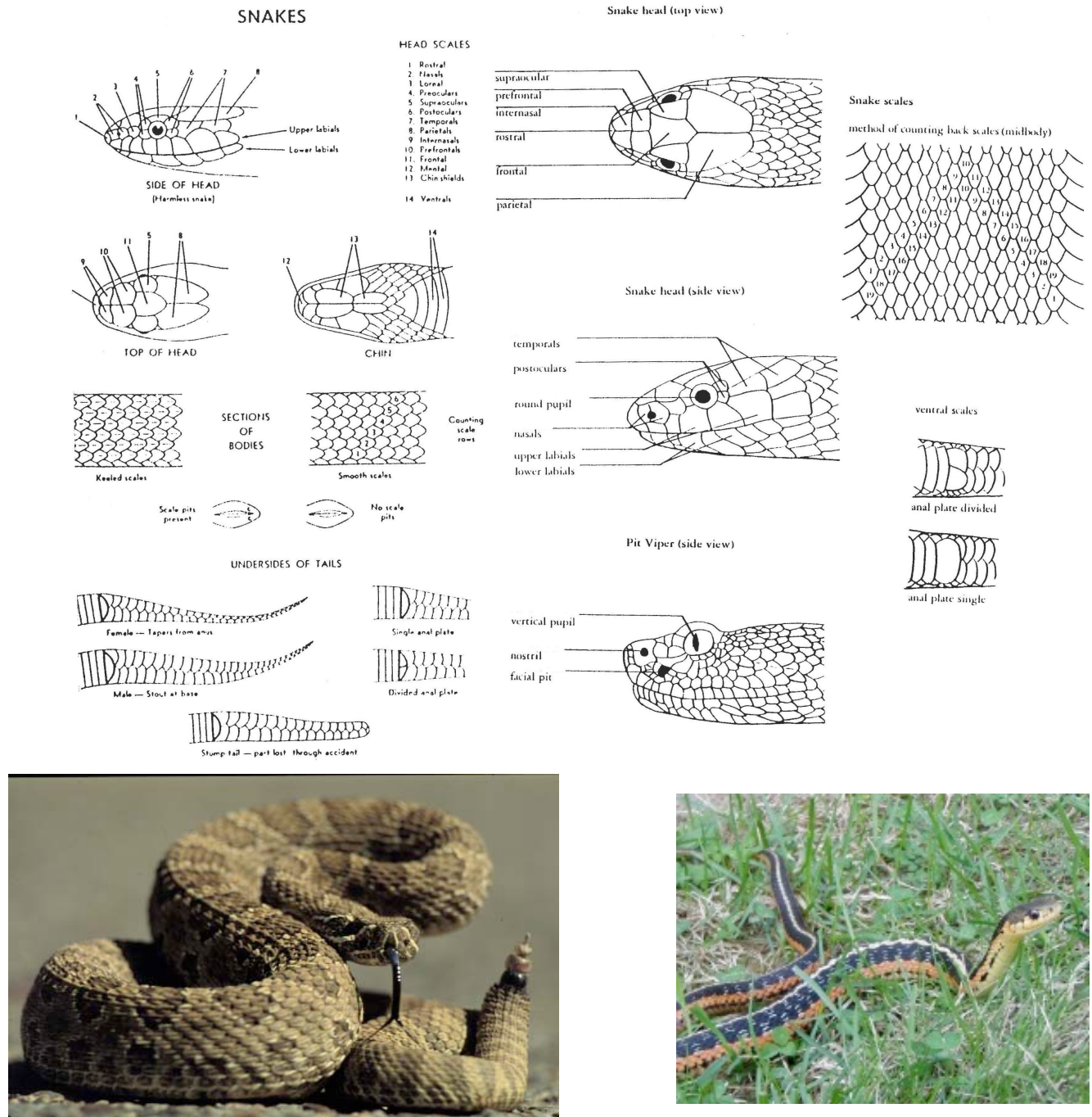


Lizards: Includes iguanas, geckos, skinks, chameleons, etc.

- Most have four limbs, may have none
- Rely on speed, agility, and camouflage to catch prey
- Feed on insects and other small animals (including worms)
- 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 – 40 vertebrae each with a pair of ribs & attached muscles for movement
- Move in 3 ways – lateral undulations, rectilinear, and side winding
- Lateral undulations most common
- Hearing is poor-locate, snakes locate prey by sight and by chemical scents using forked tongue
- May inject venom or poison – Hemotoxin (pit vipers) or neurotoxin (coral snakes)
- Constrictors wrap body around prey and squeeze to suffocate them
- Snakes swallow prey whole – jaws may unhinge to swallow largest prey items

Ecological Impacts

- Importance of ectothermy
- Economic value
- Bio-indicators
- Functional role in ecosystems
- Longevity of some species – 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
- Habitats are being destroyed for human development
- Consumer demand

Decline of Reptiles

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