

Amphibian Diversity



M. Kevin Hamed
Professor of Biology



Lecture Goals

To familiarize students with characteristics and diversity of the Class Amphibia

Reading Assignments:

Wells 2007

Chpt. 1: 12-48 (Anurans)

56-70 (Caudates)

74-80 (Caecilians)

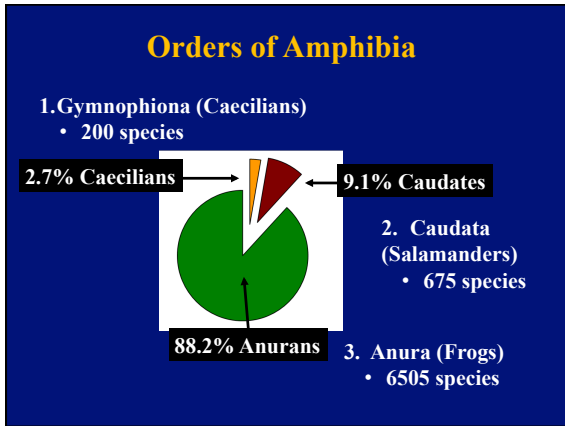
www.Amphibiaweb.org

Daily taxonomic updates

Lecture Structure

1. Salamander Diversity
2. Anuran Diversity
3. Caecilian Diversity





Salamanders

Caudata (Urodela)

Characteristics:

- Tails
- Most have internal fertilization
- Pheromones


Benefits

“Progress on the road to regenerating major body parts, salamander-style, could transform the treatment of amputations and major wounds”


Scientific American – March 17, 2008

Plethodontidae


- 446 species (66%)
- Mostly New World
- Lungless
- Direct development (nonaquatic eggs)
- Eggs often guarded




Aneides aeneus



Plethodon yonahlossee

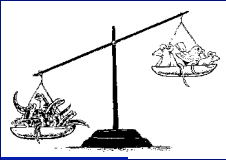


Plethodon glutinosus





Bolitoglossa rostrata

Plethodontidae





(Hairston 1987)





Plethodon welleri

Plethodontidae

First new genus in 50 years



Urspelerpes brucei



Salamandridae

- 109 Species (16.1%)
- Mostly in Europe & Asia
- Adult aquatic stage
- Develop dorsal fins
- Toxic
- *B. salamandrivorans*



Lissotriton vulgaris

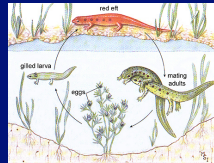


Ichthyosaura alpestris



Notophthalmus viridescens

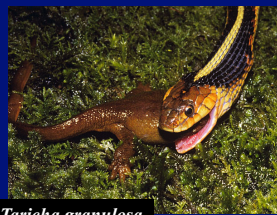
Salamandridae



- Tetrodotoxin (TTX)
- “corks” sodium channels
 - Blowfish toxin

Could kill 10-20 humans

“Arms race with garter snakes”



Taricha granulosa

Ambystomatidae

- 32 Species (4.7%)
- North America
- Mole salamanders
- Fossorial adults
- Breeding migrations
- Vernal pools (fishless)



A. barbouri



Ambystoma maculatum




A. opacum




A. tigrinum

Proteidae


- 6 Species (0.8%)
- Eastern US & Europe
- Reduced toes
- Fully aquatic
- External gills



Proteus anguinus




Necturus maculosus



Necturus punctatus

Sirenidae


- 4 Species (0.6%)
- Southeastern & Central US
- External gills
- Lack rear limbs
- Vegetation & Low DO
- External fertilization



Siren lacertina




Siren intermedia




Pseudobranchius axanthus

Dicamptodontidae


- 4 species (0.6%)
- ≤ 35 cm
- Larval period ≤ 4.5 years
- Pacific NW & Idaho
- Adults "bark"



Dicamptodon ensatus




Dicamptodon copei




Dicamptodon tenebrosus

Amphiumidae "Conger eel"


- 3 Species (0.4%)
- Southeastern US
- Single pair gill slits & lungs
- Swamps and ponds (Low DO)
- Larvae very developed
- Aestivate in burrows



Amphiuma pholeter



Amphiuma means



Amphiuma tridactylum

Cryptobranchidae

- 3 Species (0.4%)
- US, China, & Japan
- No external gills
- Suction feeders



Andrias japonicus



Cryptobranchus alleganiensis

Frogs

Anurans

Characteristics:

- Most adults are tailless
- Shortened bodies
- Large hind legs, head, and eyes
- Reduced vertebrae
- Urostyle
- Fused tibia & fibula
- External fertilization (most)


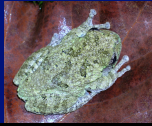



Conraua goliath

[Video](#)

Hylidae




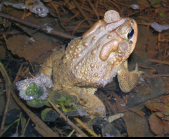
- 951 species (14.6%)
- Tree Frogs
- Enlarged toe pads
- Most free swimming tadpoles
- Most adapted to life in tree canopy



Litoria nigrofrenata *Tripion petasatus* *Hyla chrysoscelis* *Pseudacris crucifer*

Bufoidea



- 591 (9.1%)
- Worldwide
- Cutaneous glands (Parotoid) bufotoxin
- Most have rough skin



Anaxyrus americanus *Incilius periglenes* *Atelopus zeteki* *Atelopus varius*

Microhylidae

- 567 species (8.7%)
- Mostly tropical and subtropical
- Mostly fossorial & terrestrial
- Asia & New World – narrow-mouthed



Gastrophryne carolinensis *Dyscophus antongilii*

Ranidae

- 379 Species (5.8%)
- True Frogs
- Worldwide except southern South America
- Aquatic tadpoles
- Generalized frog body plan
- Most semiaquatic



Amphlops hainanensis




Rana (Lithobates) catesbiana




Rana (Lithobates) sylvatica

Dendrobatidae


- 301 species (4.6%)
- Central & South America
- Diurnal
- Toxic
- Complex courtship
- Parental care/egg obligate feeders



Dendrobates tinctorius




Dendrobates leucomelas



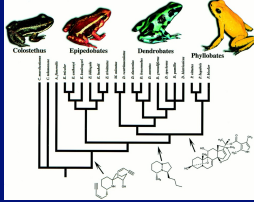
Ranitomeya imitator

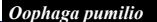
Dendrobatidae

Bocas del Toro




(Maan & Cummings 2012)






Oophaga pumilio

Dendrobatidae

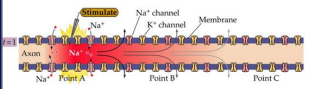


Phyllobates terribilis

Batrachotoxins


CN1[C@H]2[C@@H](O)C[C@H]3[C@@H](O)C[C@H](O)C[C@H]3N2C1=O

1 µg/kg

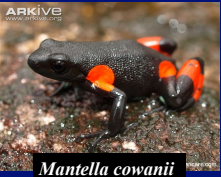


Mantellidae


- 207 (3.2%)
- Madagascar
- Convergent with dendrobatids
- Diurnal
- Pumilotoxin



Mantella madagascariensis




Mantella cowanii




Mantella aurantiaca

Leptodactylidae


- 201 species (3%)
- New World Distribution
- Most pond breeders
- Foam nests (most)
- Pond type tadpoles



Leptodactylus bolivianus



Leptodactylus mystacinus



Leptodactylus sp.

Centrolenidae

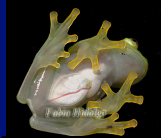
- 152 species (2.3%)
- Glass frogs
- Most have transparent venter
- Central & South America
- Eggs often laid over water



Hyalinobatrachium lemur



Hyalinobatrachium fleischmanni



Myobatrachidae

- 133 species (2%)
- Australia, New Guinea
- Brood eggs & tadpoles in pouches at hip regions
- 2 extinct gastric brooders
- Many species endangered



Assa darlingtoni



Limnodynastes peronii



Rheobatrachus silus

Scaphiopodidae

- 7 species (>0.1 %)
- Spadefoots
- Burrow backwards
- Long periods of dormancy
- Rapid tadpole development
- Often deserts and dry areas



Scaphiopus holbrooki



Spea bombifrons



Scaphiopus couchii

Caecilians

- Elongated & legless
- Fossorial or aquatic
- Degenerated eyes (covered with skin or bone)
- Internal fertilization (phalloseum)
- 75% viviparous (fed cell lining oviducts)
- Most natural history is unknown



Ichthyophiidae

- 55 species (27.5%)
- Southeast Asia & Indian subcontinent
- Stegokrotaphic skull (solid)
- Eggs laid near water & female guards
- Aquatic larvae
- True tail with caudal vertebrae



Ichthyophis glutinosus



Ichthyophis pauli

Caeciliidae

- 42 species (21.0%)
- Lack true tails
- Up to 1.5 m
- Typically fossorial
- Stegokrotaphic skull



Caecilia attenuata



Osaecilia osae



Caecilia thompsoni

Questions