

Diversity of Anura

WFS 433/533

1/24/2013

Lecture goal

To familiarize students with the different families of the order anura.

To familiarize students with aspects of natural history and world distribution of anurans

Required readings:
Wells: pp. 15-41

<http://amphibiaweb.org/aw/index.html>

Lecture roadmap

Characteristics of Anurans

Anuran Diversity

Anuran families, natural history and world distribution

What are amphibians?

These foul and loathsome animals are abhorrent because of their cold body, pale color, cartilaginous skeleton, filthy skin, fierce aspect, calculating eye, offensive smell, harsh voice, squalid habitation, and terrible venom; and so their Creator has not exerted his powers to make many of them.



Carl von Linne (Linnaeus)
Systema Naturae (1758)

What are frogs?

A thousand splendid suns, a million moons, a billion twinkle stars are nothing compared to the eyes of a frog in the swamp



—Miss Piggy about Kermit, in Larry King live, 1993

Diversity of anurans

30 Families
4963 species

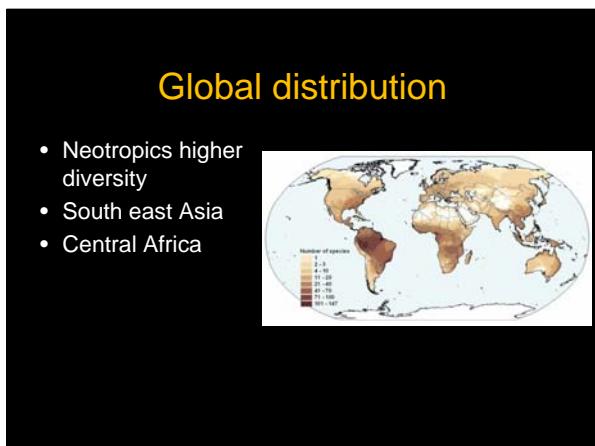
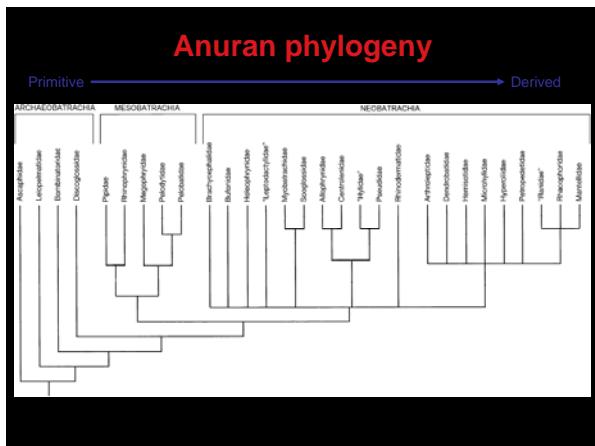
Groups:

- Archaeobatrachia (4 families)
- Mesobatrachia (5 families)
- Neobatrachia (all other families)



30 families

Family	No. of Known Species in World	Number of Species in the United States?	Number of Species in Tennessee?
Aleurophytidae	1	0	0
Anthroleptidae	78	0	0
Ceratophryidae	2	2	0
Bombinatoridae	11	0	0
Brachycephalidae	6	0	0
Bufoidae	457	23	2
Ceropeltidae	139	0	0
Dermophytidae	239	1	0
Dipsosauridae	11	0	0
Hemisphaeridae	6	0	0
Hemirhagididae	9	0	0
Hydridae	851	29*	10
Hylidae	423	0	0
Leptopelidae	4	0	0
Lepidodactylidae	1130	7*	0
Mantellidae	151	0	0
Megophryidae	126	0	0
Mertensidae	244	3	1
Myobatrachidae	124	0	0
Neobatrachidae	1	0	0
Pelobatidae	11	7	1
Pseudophryidae	3	0	0
Ranidae	30	1	0
Psilodontidae	9	0	0
Ranidae	732	29*	7
Rhinopelidae	220	0	0
Rhinodermatidae	2	0	0
Rhinellidae	1	1	0
Sclerophryidae	9	0	0
Sounguinae	4	0	0
TOTALS	4563	103	21



1) Leptodactylidae

(Southern Frogs)

- 1283 species (24%)
- Found in the New World Tropics
- Males brood eggs
- Foam nests
- Varied life history (tadpoles, direct dev., viviparous)
- Eggs usually guarded



Ceratophrys ornata

2) Hylidae

(Tree Frogs)

- 835 species (15%)
- Global distribution
- Toe discs
- Good climbers and jumpers
- Free swimming tadpoles (most)

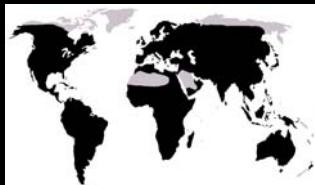


Cruziohyla calcarifer

3) Ranidae

(True Frogs)

- 799 species (14.7%)
- Global distribution (Africa and Asia most)
- Well-developed legs and webbed feet
- Free swimming tadpoles (most)



Tomopterna tuberculosa

4) Bufonidae

(True Toads)

- 493 species (9%)
- Global distribution (Genus *Bufo* for most)
- Cutaneous glands
- Teeth nearly absent
- Bidder's organ (rudimentary ovary on testes)



5) Microhylidae

(Narrow-mouthed Frogs)

- 449 species (8%)
- Mostly tropical and subtropical
- 2-3 palatal folds
- Stout hind legs, short snouts, and globose bodies
- Breviceps - males produce secretions to stick to females



6) Rhacophoridae

(Asian Tree Frogs)

- 288 species (5%)
- Africa, India, SE Asia
- Hanging foam nests
- "Flying Frogs" (excessive webbing)
- Flash coloration on inner thigh
- Convergent with hylids



7) Hyperoliidae

(African Tree Frogs)

- 261 species (4.8%)
- Africa, Madagascar, Seychelles
- Pupil vertically elliptical
- Toe discs
- Brightly colored
- Some fold leaves over eggs



Afrrixalus tornasini

8) Dendrobatidae

(Poison Arrow Frogs)

- 252 species (4.7%)
- Found in Central and South America
- Brightly colored and toxic skin
- Most very small (<1 inch)
- Males wrestle for dominance
- Tadpole ride on males back



Dendrobates azureus

[Video](#)



9) Mantellidae

(Mantellas)

- 164 species (3%)
- Madagascar only
- Brightly colored and toxic skin
- Most very small (<1 inch)
- Some convergent with Dendrobatidae



Tsingymani tsingymani antitra



10) Centrolenidae

(Glass Frogs)

- 143 species (2.3%)
- Central and South America
- Transparent skin, no ribs
- Most very small (<1 inch)
- Males guard eggs



Centrolene buckleyi

11) Megophryidae

(Cryptic Frogs)

- 138 species (2.5%)
- Asia & Indonesia (streams)
- Leaf-like appearance
- Nocturnal and poor jumpers
- Tadpoles feed at surface



12) Myobatrachidae

(Water Frogs)

- 126 species (2.3%)
- New Guinea, Australia, & Tasmania
- Foam nests in water
- Unique egg brooding (pouch, mouth)
- Lack toe discs
- *Rheobatrachus* (extinct)



Lechniodus fletcheri



Limnodynastes dumerilli

13) Arthroleptidae

(Squeakers)

- 51 species (0.9%)
- Sub-Saharan Africa (forests)
- Direct development (some tadpoles)



Leptopelis uluguruensis



Trichobatrachus robustus

14) Pipidae

(Tongueless Frogs)

- 31 species (0.6%)
- Africa & South America
- Fully aquatic (webbed feet, lateral line system)
- *Pipa* (eggs embedded on female)
- *Xenopus* (tadpoles with barbs)
- Eyes dorsal and no tongue



Xenopus laevis



Pipa parva



15) Astylosternidae

(Astylosternids)

- 29 species (0.5%)
- Sub-Saharan Africa (forests)
- Often grouped with Arthrolepididae
- Toe discs



Leptopelis kivuensis



Astylosternus laurenti

16) Discoglossidae

(Disc-tongued Frogs)

- 12 species (0.2%)
 - SW Europe; Northern Africa
 - Females vocalize some
 - Toad-like
 - Terrestrial and life in burrows



Discoglossus sardus



Alytes cisternasii



17) Pelobatidae

(Spadefoots)

- 11 species (0.2%)
 - US, Mexico, Europe, Eastern Asia
 - Xeric environments
 - Explosive breeders
 - Fast developing larvae
(cannibalistic larvae)



Spea intermontana



10 of 10



18) Brachycephalidae

(Pumpkin Toads)

- 11 species (0.2%)
 - SE Brazil
 - All direct development
 - Reduced digits
 - Bright orange (tetrodotoxin)
 - *B. didactylus*: smallest tetrapod in southern hemisphere (3/8")



Brachycephalus nodoterga



Brachycephalus ephippium

19) Bombinatoridae

(Fire-bellied Toads & Barbourulas)

- 10 species (0.2%)
- Europe, East Asia
- Toxic Skin (unken reflex)
- Barbourulas: Rocky streams



Bombina orientalis

20) Hemisotidae

(Shovel-nosed Frogs)

- 9 species (0.17%)
- Sub-Saharan Africa
- Burrows head first
- Lay eggs in burrow
- Females dig ditch or transport tadpoles



Hemisus guttatus



Hemisus marmoratus

21) Heleophrynidæ

(Ghost Frogs)

- 6 species (0.1%)
- Southern Africa
- Well-developed toe discs, spines, sucker-like oral disc (tadpoles)
- Fast-flowing streams



Heleophryne regis



Heleophryne hewitti

22) Sooglossidae

(Seychelles Frogs)

- 29 species (0.5%)
- Madagascar
- Inguinal amplexus (only Neobatrachid)
- Secretive; litter and rocks
- Direct development & tadpoles on back



Sooglossus pipiodryas



Nasikabatrachus sahyadrensis

23) Leiopelmatidae

(Leiopelmatids)

- 4 species (0.1%)
- New Zealand
- Primitive group
- Do not call (no T, ME, VS)
- Inscriptional ribs



Leiopelma hochstetteri



24) Pelodytidae

(Parsley Frogs)

- 3 species (0.1%)
- Black & Caspian Seas, S. Europe
- Bulging Eyes; Parsley Color
- Females reported vocalizing when amplexed



Pelodytes punctatus



Pelodytes punctatus

25) Ascaphidae

e (Tailed frogs)

- 2 species (<0.1%)
- NW US, British Columbia
- Fast moving streams
- Tail: Cloacal Extension
- Internal fertilization
- Most primitive extant family
(don't call, 7 yrs to maturation)



Ascaphus montanus



Ascaphus truei

26) Rhinodermatidae

(Mouth-brooding frogs)

- 2 species (<0.1%)
- Southern South America (Chile)
- Tadpoles Develop in Vocal Sac (male)
“Rhinoceros nosed”



Rhinoderma darwinii



27) Allophrynidae

(Ruthven's Frog)

- 1 species (<0.1%)
- NE South America
- Centrolenidae (related?; foot muscle morphology)
- Little known about its ecology

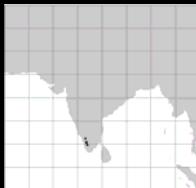


Allophryne ruthveni



28) Nasikabatrachidae

- (Purple Frog)
• 1 species (<0.1%)
• India (discovered 2003)
• Fossorial
• Explosive breeders
• Little known



Nasikabatrachus sahyadrensis



Nasikabatrachus sahyadrensis

29) Rhinophryidae

- Drunken toad
• 1 species (<0.1%)
• Costa Rica to Rio Grande
• Fossorial
• Explosive breeders
• Termite and ant specialists
• No teeth



Rhinophryne dorsalis



30) Pseudidae

- 2 genera
- aquatic frogs
- South America
- *Pseudis paradoxa*
- tadpoles (250-300 mm)
- Adult quarter the size of tadpole
- float among vegetation in shallow ponds and roadside ditches
- There are no fossils.



Pseudis paradoxa



Anuran morphology and ecology

Some other topics to explore on your own

1. Habitat associations of adult anurans

- Are most frogs strongly associated with water?

2. Body size and ecology of adult anurans

- How does body size impact habitat associations?
- What traits are associated with miniaturization of frogs?

3. Adaptations for different life styles

- What adaptations are associated with different life styles?

Lecture summary

Evolutionary history of amphibians

Characteristics of anuran families

Anuran families world distribution
