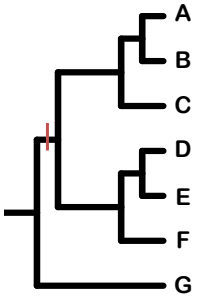


Frog and Salamander Diversity

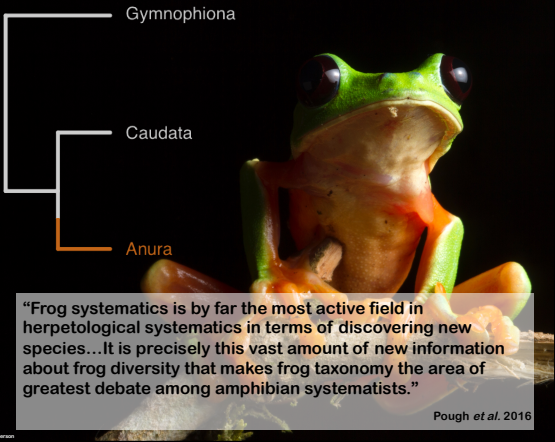
Todd W. Pierson
WFS 433/533
25 January 2018



Source: Todd Pierson



Note: It's wrong to call extant species 'basal' or 'derived'. For more information about this, read the blog post ("The ancestors are not among us") in the supplemental reading.




Gymnophiona
Caudata
Anura

"Frog systematics is by far the most active field in herpetological systematics in terms of discovering new species...It is precisely this vast amount of new information about frog diversity that makes frog taxonomy the area of greatest debate among amphibian systematists."


Source: Todd Pierson
Pough *et al.* 2016

Phylogenetic tree showing relationships between frog families: Heleophrynidae, Sooglossidae, Naskabatrachidea, Myobatrachidae, Calypsocephalellidae, Hyloidea, Ranoidae, Pelobatoidae, Rhinophrynidae, Pipidae, Bombinatoridae, Alytidae, Leioleptidae, and Ascaphidae. A world map highlights the distribution of the Alytidae family in Europe and North Africa. A color scale on the right ranges from 1.0 to 4.0.





Family Alytidae (11 species)

Phylogenetic tree showing relationships between frog families: Heleophrynidae, Sooglossidae, Naskabatrachidea, Myobatrachidae, Calypsocephalellidae, Hyloidea, Ranoidae, Pelobatoidae, Rhinophrynidae, Pipidae, Bombinatoridae, Alytidae, Leioleptidae, and Ascaphidae. A world map highlights the distribution of the Bombinatoridae family in Europe and North Africa. A color scale on the right ranges from 1.0 to 2.0.



Family Bombinatoridae (10 species)

Phylogenetic tree showing relationships between frog families: Heleophrynidae, Sooglossidae, Naskabatrachidea, Myobatrachidae, Calypsocephalellidae, Hyloidea, Ranoidae, Pelobatoidae, Rhinophrynidae, Pipidae, Bombinatoridae, Alytidae, Leioleptidae, and Ascaphidae. A world map highlights the distribution of the Pipidae family in Africa and South America. A color scale on the right ranges from 1 to 7.



Family Pipidae (41 species)

Phylogenetic tree showing relationships among frog families. Rhinophrynidae is highlighted in yellow. A world map shows the distribution of this family in Central America. A color scale on the right indicates genetic distance from 0.9990 to 1.0010.

Family Rhinophrynidae (1 species)

Phylogenetic tree showing relationships among frog families. Pelobatoidea is highlighted in yellow. A world map shows the distribution of this superfamily in South America, Africa, and Asia. A color scale on the right indicates genetic distance from 5 to 20.

Superfamily Pelobatoidea (223 species)



Phylogenetic tree highlighting the Neobatrachia clade in red. The clade includes families: Heleophrynidae, Sooglossidae, Nasikabatrachidea, Myobatrachidae, Calyptocephalellidae, and Hyloidea. A bracket on the right labels this group as **Neobatrachia** with approximately 96% of species.

Phylogenetic tree showing relationships between frog families: Heleophrynidae, Sooglossidae, Nasikabatrachidae, Myobatrachidae, Calyptocephalellidae (highlighted), Hyloidea, Ranoidea, Pelobatoidae, Rhinophrynidae, Pipidae, Bombinatoridae, Alytidae, Leiopelmatidae, and Ascaphidae.

World map showing the distribution of Family Calyptocephalellidae in South America, marked with a yellow dot.

Family Calyptocephalellidae (5 species)

Phylogenetic tree showing relationships between frog families: Heleophrynidae, Sooglossidae, Nasikabatrachidae, Myobatrachidae (highlighted), Calyptocephalellidae, Hyloidea, Ranoidea, Pelobatoidae, Rhinophrynidae, Pipidae, Bombinatoridae, Alytidae, Leiopelmatidae, and Ascaphidae.

World map showing the distribution of Family Myobatrachidae in South America, marked with a blue dot.

Family Myobatrachidae (134 species)

Phylogenetic tree showing relationships between frog families: Heleophrynidae, Sooglossidae, Nasikabatrachidae (highlighted), Myobatrachidae, Calyptocephalellidae, Hyloidea, Ranoidea, Pelobatoidae, Rhinophrynidae, Pipidae, Bombinatoridae, Alytidae, Leiopelmatidae, and Ascaphidae.

World map showing the distribution of Family Nasikabatrachidae in South America, marked with a yellow dot.

Family Nasikabatrachidae (2 species)

A phylogenetic tree on the left lists amphibian families: Heleophrynidae, Sooglossidae (highlighted with a yellow dot), Naskabatrachidea, Myobatrachidae, Calyptrorhynchidae, Hyloidea, Ranoidea, Pelobatidae, Rhinophrynidae, Pipidae, Bombinatoridae, Alytidae, Leioleptidae, and Ascaphidae. To the right is a world map with a color scale from 3.9990 to 4.0010. A yellow dot on the map indicates the distribution of Sooglossidae in South America. Below the map are two photographs of frogs: one is a brown frog on a rock, and the other is a brown frog on a green leaf.

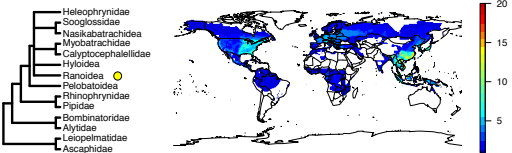
Family Sooglossidae (4 species)

A phylogenetic tree on the left lists amphibian families: Heleophrynidae (highlighted with a yellow dot), Sooglossidae, Naskabatrachidea, Myobatrachidae, Calyptrorhynchidae, Hyloidea, Ranoidea, Pelobatidae, Rhinophrynidae, Pipidae, Bombinatoridae, Alytidae, Leioleptidae, and Ascaphidae. To the right is a world map with a color scale from 1.0 to 2.0. A yellow dot on the map indicates the distribution of Heleophrynidae in South America. Below the map is a photograph of a brown frog on a green leaf.


Family Heleophrynidae (6 species)

A phylogenetic tree on the left lists amphibian families: Heleophrynidae, Sooglossidae, Naskabatrachidea, Myobatrachidae, Calyptrorhynchidae, Hyloidea, Ranoidea (highlighted with a yellow dot), Pelobatidae, Rhinophrynidae, Pipidae, Bombinatoridae, Alytidae, Leioleptidae, and Ascaphidae. To the right is a world map with a color scale from 20 to 100. A large blue area on the map indicates the distribution of the superfamily Ranoidea across South America, Africa, and Europe. Below the map are two photographs: one of a brown frog on a black background, and another of frog eggs (small black dots on a yellow background).

Superfamily Ranoidea (2626 species)

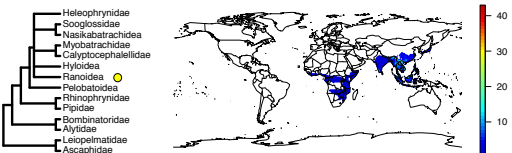


A phylogenetic tree on the left lists amphibian families: Heleophrynidae, Sooglossidae, Naskabatrachidea, Myobatrachidae, Calyptrorhachidae, Hyloidea, Ranidae (highlighted with a yellow circle), Pelobatidae, Rhinophrynidae, Pipidae, Bombinatoridae, Alytidae, Leiopternidae, and Ascaphidae. To the right is a world map with a color scale from 0 to 20, showing the distribution of the Ranidae family across North and South America, Europe, and Africa.




Two photographs of frogs. The left one shows a brown frog with dark spots and a white stripe. The right one shows a brown frog with a white stripe and dark spots.

Family Ranidae (391 species)

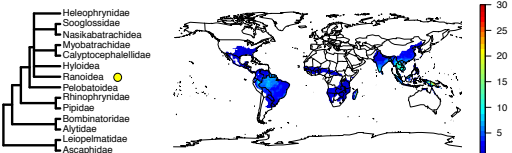


A phylogenetic tree on the left lists amphibian families: Heleophrynidae, Sooglossidae, Naskabatrachidea, Myobatrachidae, Calyptrorhachidae, Hyloidea, Ranidae (highlighted with a yellow circle), Pelobatidae, Rhinophrynidae, Pipidae, Bombinatoridae, Alytidae, Leiopternidae, and Ascaphidae. To the right is a world map with a color scale from 0 to 40, showing the distribution of the Rhacophoridae family primarily in Asia and Australia.




Two photographs of frogs. The left one shows a brown frog with a white stripe. The right one shows a green frog with a white stripe and dark spots.

Family Rhacophoridae (415 species)



A phylogenetic tree on the left lists amphibian families: Heleophrynidae, Sooglossidae, Naskabatrachidea, Myobatrachidae, Calyptrorhachidae, Hyloidea, Ranidae (highlighted with a yellow circle), Pelobatidae, Rhinophrynidae, Pipidae, Bombinatoridae, Alytidae, Leiopternidae, and Ascaphidae. To the right is a world map with a color scale from 0 to 30, showing the distribution of the Microhylidae family across Africa, Europe, and Asia.



Two photographs of frogs. The left one shows a brown frog with a white stripe. The right one shows a brown frog with a white stripe and dark spots.

Family Microhylidae (636 species)

A phylogenetic tree on the left lists frog families: Heleophrynidae, Sooglossidae, Naskabatrachidea, Myobatrachidae, Calyptocephalellidae, Hyloidea (highlighted with a yellow circle), Ranoidea, Pelobatoidae, Rhinophrynidae, Pipidae, Bombinatoridae, Alytidae, Leioptelmatidae, and Ascaphidae. To the right is a world map with a color scale from 5 to 30, showing distribution in Africa and South America. Below are two photos of frogs: a translucent green one and a yellow one with dark spots.

Family Hyperoliidae (231 species)

A phylogenetic tree on the left lists frog families: Heleophrynidae, Sooglossidae, Naskabatrachidea, Myobatrachidae, Calyptocephalellidae, Hyloidea (highlighted with a yellow circle), Ranoidea, Pelobatoidae, Rhinophrynidae, Pipidae, Bombinatoridae, Alytidae, Leioptelmatidae, and Ascaphidae. To the right is a world map with a color scale from 50 to 150, showing widespread distribution. Below are two photos of frogs: a brown one and a bright green one with red eyes.

Superfamily Hyloidea (3757 species)

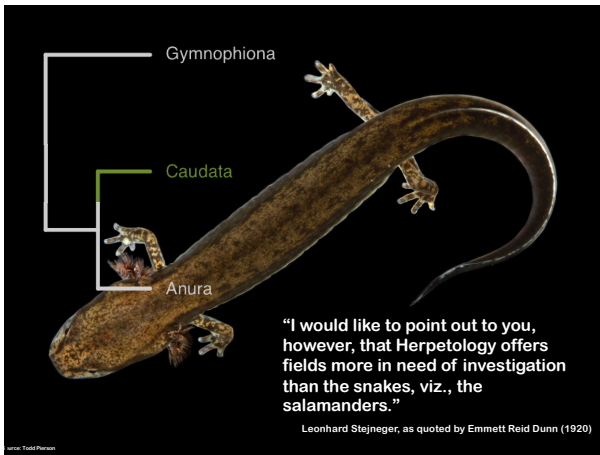
A phylogenetic tree on the left lists frog families: Heleophrynidae, Sooglossidae, Naskabatrachidea, Myobatrachidae, Calyptocephalellidae, Hyloidea, Ranoidea, Pelobatoidae, Rhinophrynidae, Pipidae, Bombinatoridae, Alytidae, Leioptelmatidae, and Ascaphidae. To the right is a world map with a color scale from 5 to 15, showing distribution in North America, Europe, and Asia. Below are two photos of frogs: a large, mottled brown one and a bright green one with red and black markings.

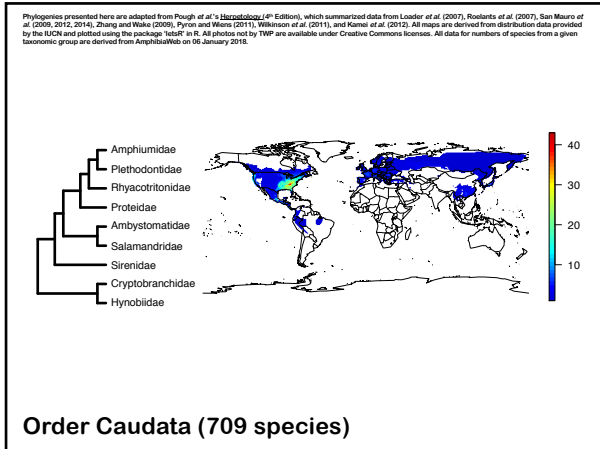
Family Bufonidae (607 species)

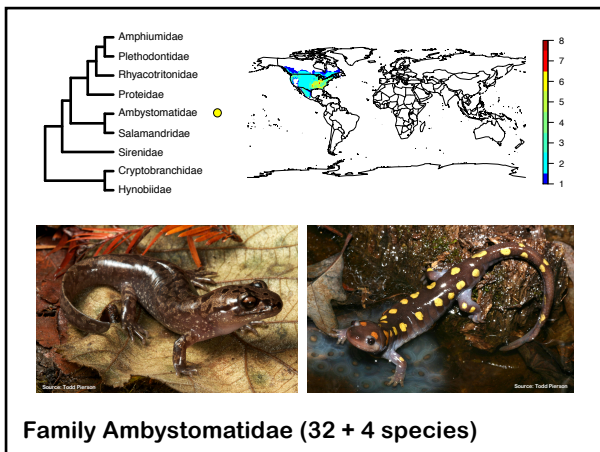
Family Dendrobatidae (310 species)

Family Hylidae (978 species)


Family Craugastoridae (808 species)








Phylogenetic tree showing relationships between Amphiumidae (highlighted with a yellow dot), Plethodontidae, Rhyacotritonidae, Proteidae, Ambystomatidae, Salamandridae, Sirenidae, Cryptobranchidae, and Hynobiidae. A world map shows the distribution of Amphiumidae in North America. A color scale ranges from 1.0 to 3.0.




Family Amphiumidae (3 species)

Phylogenetic tree showing relationships between Amphiumidae, Plethodontidae, Rhyacotritonidae, Proteidae, Ambystomatidae, Salamandridae, Sirenidae, Cryptobranchidae (highlighted with a yellow dot), and Hynobiidae. A world map shows the distribution of Cryptobranchidae in Africa. A color scale ranges from 0.9990 to 1.0010.




Family Cryptobranchidae (3 species)

Phylogenetic tree showing relationships between Amphiumidae, Plethodontidae, Rhyacotritonidae, Proteidae, Ambystomatidae, Salamandridae, Sirenidae, Cryptobranchidae, and Hynobiidae (highlighted with a yellow dot). A world map shows the distribution of Hynobiidae in East Asia. A color scale ranges from 1 to 6.





Family Hynobiidae (67 species)

Amphiumidae
Plethodontidae
Rhyacotritonidae
Proteidae
Ambystomatidae
Salamandridae
Sirenidae
Cryptobranchidae
Hynobiidae




3.0
2.5
2.0
1.5
1.0





Source: Mattal/Wikipedia
Source: Todd Pearson

Family Proteidae (6 species)

Amphiumidae
Plethodontidae
Rhyacotritonidae
Proteidae
Ambystomatidae
Salamandridae
Sirenidae
Cryptobranchidae
Hynobiidae



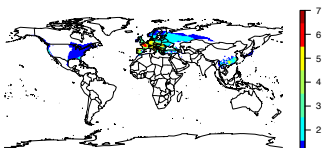
3.0
2.5
2.0
1.5
1.0





Source: Todd Pearson
Source: Todd Pearson

Family Rhyacotritonidae (4 species)

Amphiumidae
Plethodontidae
Rhyacotritonidae
Proteidae
Ambystomatidae
Salamandridae
Sirenidae
Cryptobranchidae
Hynobiidae

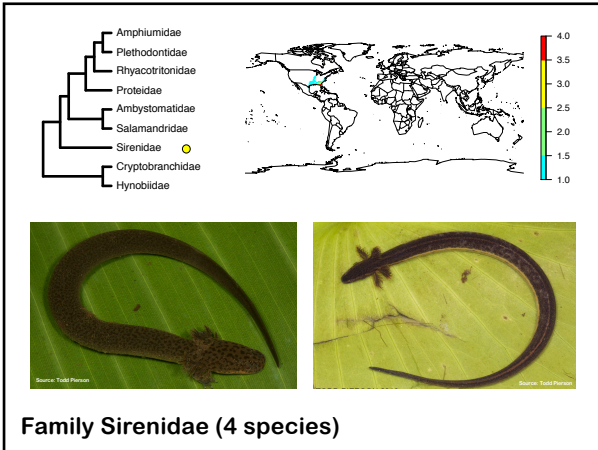


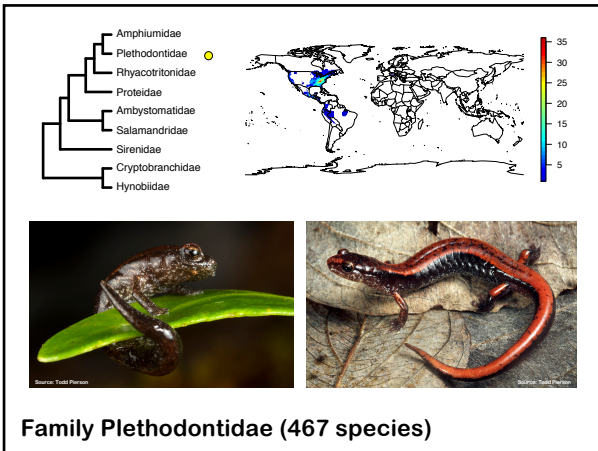
7
6
5
4
3
2
1

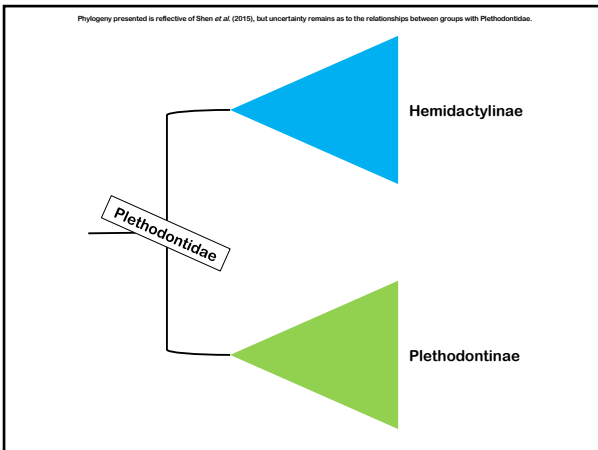


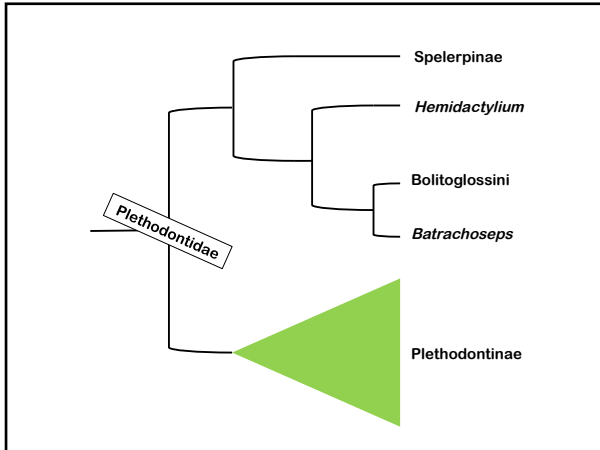
Source: Todd Pearson
Source: Todd Pearson

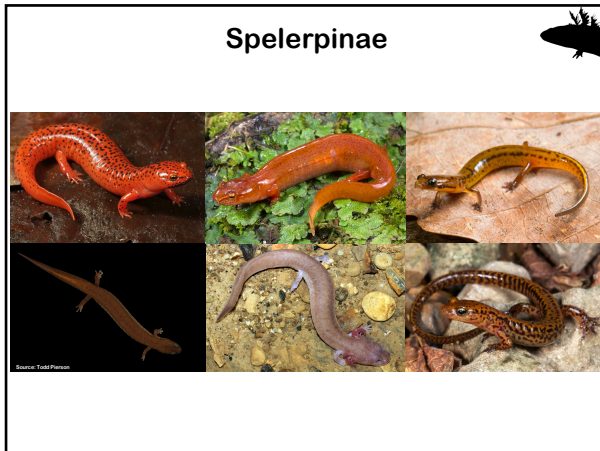
Family Salamandridae (119 species)

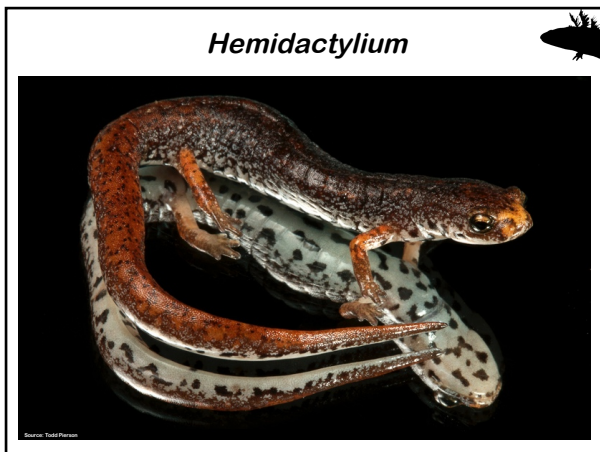












Bolitoglossini



Nyctanolis pernix, A New Genus and Species of Plethodontid Salamander from Northwestern Guatemala and Chiapas, Mexico

PAUL ELIAS!
DAVID B. WAKE!

ABSTRACT. A new bolitoglossine salamander, *Nyctanolis pernix*, from the Cordillera de Chuacuzamá of Guatemala and neighboring Chiapas, Mexico has been discovered. It differs from all other neotropical plethodontids in its spotted color pattern, long legs, and divided premaxilla. The osteology of *Nyctanolis* is the most plesiomorphic of any member of the supergenus *Bolitoglossa*. Ex-

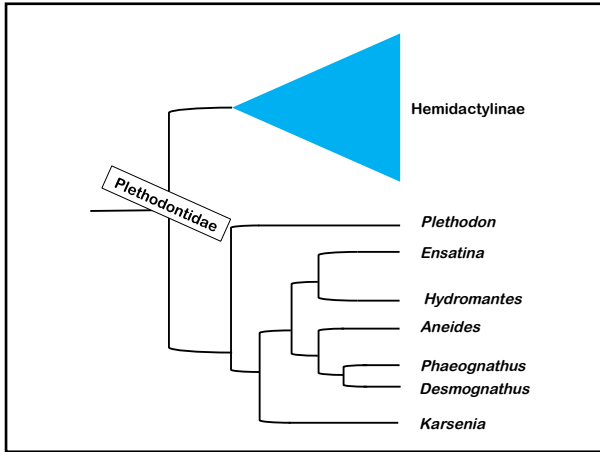
its infancy, and undescribed species are found with regularity. No new genera have been described for thirty years (Tanner, 1959), but despite this seeming stability several of the presumed lineages are poorly defined (Wake and Lynch, 1976). In the summer of 1974 the senior author visited a remote area on the east-

Source: Todd Patten



Batrachoseps









Hydromantes



Aneides



Phaeognathus



Desmognathus



Karsenia



questions?
tpierso1@vols.utk.edu

