

Order Anura:

Probably the best known order of Amphibians.

Occur worldwide (except Antarctica); found even on some remote islands.

Only absent from very dry desert areas and extremely cold areas.

Until recently, frog distributions were assumed to result from the breakup of Gondwana (the supercontinent).

Some recent work (based on molecular studies) shows this may not be correct.

However, if the new “timeline” is accepted, then either frogs dispersed across oceans or across land bridges that haven't been identified yet.

There are somewhere between 33 and 45 families, depending on which source you consult.

This is in flux, and unfortunately very confusing:

Note, for example, that the Surinam horned Frog from lab is placed in the Ceratophryinae by your text, but in the Leptodactylidae in your lab handout and on Wikipedia.

As an aside, this gets really silly. We'll stick with Leptodactylidae for now.

We will not discuss all frog families. Instead, we'll concentrate on U.S. groups with a few of the more important groups from the rest of the world included.

This leaves us with 11 families to discuss.

Basic Frog characteristics:

Nine or fewer vertebrae, shorter vertebral column.

Urostyle (single elongated vertebra going through pelvis).

No tail

Generally, large rear legs, shorter front legs (usually for jumping).

Most have prominent vocalizations.

Most have external fertilization (some exceptions).

Some do have parental care.

All carnivorous

Evolution:

Unmistakable frogs can be dated to the early Triassic.

A recent fossil seems to show an animal with intermediate characteristics between salamanders and frogs from about 290 mya (dating back to the Carboniferous).

Bombinatoridae - Fire bellied toads

Found mostly in Europe, with a few getting over to South-east Asia.

Brightly colored ventral area (hence the name).

Mostly in slow moving waters.

Numerous skeletal characteristics that identify the family (see text if you're interested).

Show an arching behavior (unken-reflex) when threatened:

Shows off their bright belly to predators, warning them of toxicity (quite toxic).

Leiopelmatidae - Tailed frogs (and New Zealand Frogs).

Occur in Pacific Northwest, and in New Zealand.

(anyone know the biogeography of this family??)

In North America, the “tail” is an adaptation for internal fertilization.

These frogs live in fast moving streams, and external fertilization would (obviously) not work very well.

Single species was split into two based on mRNA analyses.

Have very quiet vocalization (no vocal sacs).

Nine vertebrae, which is considered primitive (and unique), as well as some remnants of tail muscles.

Pipidae - Surinam Toads, clawed Frogs.

Found in South America and Africa (but see below).

Sometimes called tongueless frogs (have no real tongue).

Aquatic - adults have a lateral line system.

Males use a clicking noise to attract females (using hyoid - lack vocal cords).

Clawed Frogs (*Xenopus laevis*) are very widespread throughout Africa

Now also a major pest species in the U.S. due to the pet trade (illegal to own in Virginia).

Used widely in research

Pipa pipa, Surinam toad is known for reproductive behavior:

Eggs are embedded in the back of the female, develop, and then hatch as fully formed toads.

Scaphiopodidae - Spadefoot toads.

Found in North America.

Identified by a hard protrusion on their foot that helps them dig.

Dig into the soil backwards, and spend much time in burrows.

Emerge to mate, but also to forage on damp days.

Larval development is very rapid (many live in very dry areas).

Hylidae - Tree frogs

Large group of successful frogs, found in most areas except sub-Saharan Africa.

Large range in sizes - from 12mm to 140mm.

Most actually do live in trees (though a few are actually fossorial).

A few have parental care.

Eyes point more forward than in other species (binocular vision).

Adhesive pads.

Many will lay eggs in puddles of water up in trees (or in bromeliads, etc.).

Numerous genera in the U.S. (as is evidenced by your lab handout).

Several interesting animals in the group:

Rocket frogs:

In Australia - can jump large distances.

Waxy monkey frog:

Secretes a waxy substance that helps make it's skin impermeable to water (distributes this with it's legs).

Leptodactylidae - South American Horned Frogs

Status of this family is a bit confused (as noted above).

South America through Central America and Mexico and into the U.S.

Includes South American Horned Toad and Eleutherodactylus (these may be in their own family depending on the reference).

Fairly large, diverse group.

Occupy most habitats; some make foam nests.

Some may make non-fertile eggs as food for growing tadpoles.

Bufonidae - Toads

A very successful and widely spread group (everywhere except Australia).

Most adult males have Bidder's organ (which can become an ovary).

No teeth.

Most are terrestrial.

Often have strongly toxic skin glands (parotoids).

Skin generally has a warty appearance.

Golden Frog is an exception (probably extinct in the wild).

Bufotoxin - general name for toxins produced by toads.

Often lay strings of eggs in the water.

But a few are terrestrial; a few are even viviparous and skip the larval stage.

Dendrobatidae - Poison Arrow frogs

(Apparently they're now called poison dart frogs, even in English - names are confusing enough without changing the English names!!!)

All are to some degree toxic, though this varies widely.

Some of the most toxic varieties are used to coat the tips of darts or arrows (can kill large animals this way).

Most are very colorful, warning predators to stay away.

Many don't taste good in addition to being toxic.

A few predators have evolved resistance to the toxins (*Leimadophis epinephelus*, a snake).

Eggs are laid in terrestrial environments, and the tadpoles than transported to water (often pools in trees, etc.).

Generally, more females than males; Females get to pick males.

Most seem to get some degree of toxicity from their diet (usually ants).

Comment: Malagasy poison frogs (family Mantellidae) are also highly toxic and brightly colored. Have similar toxins in their skin.

Microhylidae - Narrow mouthed frogs/toads

Wide spread, even in Australia (northern part).

Generally small frogs (name suggest that).

Some have “direct” development (skip tadpole stage).

Many have a narrow head, but some have a more typical frog appearance.

Several life styles ranging from arboreal to fossorial and aquatic.

Some specialize on ants and termites (narrow mouthed varieties).

A few have direct development.

Ranidae - Frogs

World wide, with some exceptions (most of Australia, southern South America).

Generally medium to large.

Breed in ponds, lakes, etc. Tadpoles develop within a few months (some, e.g. Bullfrog, may overwinter before developing into the adult form.

Includes the world's largest frog - Goliath Frog (*Conraua goliath*) from west Africa.

Up to 13 inches SV and 3kg (8 lbs.)

Discoglossidae (=Alytidae) - Midwife toads.

Occur in Europe and into Northern Africa.

Frequently dig their own burrows (but dig frontwards).

Called midwife toads because the European genus (*Alytes*) will carry eggs around the hind limbs until they hatch.

Name refers to “disc - tongued” (they do have rounded tongues).