

## Salamanders - Caudata (= Urodela).

This group is much better known than the Caecilians, and occurs world wide except in sub-Saharan Africa and Australia.

Your text, strangely, says very little about the biogeography of Salamanders (it devotes a small but significant section to Caecilians!).

One of the most diverse areas in the world for salamanders is the Appalachian region (it's estimated that about 1/3 of the 560 or so salamanders occur in this area).

Avoid extreme cold areas (or extreme dry areas).

Some characteristics include:

Well developed tails

Most have good limbs as well (though some have lost some limbs)

Many have internal fertilization, though males don't have any type of copulatory organ.

Some terrestrial species also forgo the metamorphosis stage

Most have four toes front, five toes back

No scales, skin usually moist to the touch.

Range in size from 2.7cm (some tropical Plethodontids) to 1.8m (Chinese giant salamander, *Andrias davidianus*) (the largest amphibian, weighs up to 65kg (= 140 lbs)).

Color varies from drab to very colorful.

Some will change color during the breeding season.

Depending on your source, there are between 9 and 10 families. We'll actually go through most of them this time (most of the occur in the U.S., or are "reasonably" well known).

(Don't worry - we won't go through all 33 - 44 families of frogs!).

Earliest fossils date back to the Jurassic

Something called *Beiyanerpeton jianpingensis*, recently found in China

## Cryptobranchidae:

Think giant salamanders. Includes three species, including our native hellbender.

All quite large (hellbender gets to 75 cm).

Well developed limbs, compressed tail.

Large folds of skin help increase oxygen uptake.

Prefer faster moving streams

Have external fertilization (female releases eggs, male releases sperm on top of eggs).

Males may attract several females to their “nest”.

Chinese giant salamander is seriously endangered (“critically endangered”) due to the usual problems of habitat destruction, pollution, and use in traditional Chinese medicine (also eaten a lot).

Hellbenders (*Cryptobranchus alleganiensis*) have also declined in numbers (quite seriously).

Occur in Eastern U.S., somehow avoiding most of Virginia except the southwest corner.

Adults have gill slits (not functional).

Do have lungs, but get most of their oxygen through their skin.

Generally nocturnal. Feed on pretty much anything they want (carnivorous).

#### Hynobiidae:

Asiatic (giant) salamanders.

Group that is closely related to Cryptobranchidae.

Occur in Asia (considerably far north).

No gills slits, lungs well developed (one species w/o lungs).

Both this group and Cryptobranchidae have aquatic larval stages.

Not well known (with a few exceptions).

#### Ambystomatidae:

Mole salamanders. Endemic to North America.

“Thick” heavy bodies salamanders; 80 - 550mm.

Costal grooves (along ribs).

Well developed lungs (usually).

Aquatic larvae (oviparous), larva metamorphose. A few may get to adult size before metamorphosis. Fertilization is internal.

Some Ambystomids are among the first amphibians to become active and will come out on “warm” days in early winter to start mating.

Can sometimes find egg masses from Ambystomids in January.

## Eyelids

Axolotl - keeps gills as adult (larva do not metamorphose).

Wild forms are almost extinct due to pollution and introduced species

Used a lot to study limb regeneration (captive populations are okay).

Includes lots of familiar species such as:

*Ambystoma maculatum* (spotted salamander) and *Ambystoma tigrinum* (tiger salamander)

The genus *Dicamptodon* from the coastal forests of the Pacific Northwest is often considered a separate family (Wikipedia shows them as a separate family, your text does not, though your text is older).

## Salamandridae:

Newts and European salamanders - related to the mole salamanders

Europe, southeast Asia, North America (only a few species).

Generally smaller; most are less than 200mm, though a few get bigger.

Gills absent in adults (some populations of *Notophtalmus* and *Triturus* don't metamorphose)

Internal fertilization.

Rough skin with numerous poison glands (more toxic than other salamanders)

Some remain aquatic as adults.

Some (*Notophtalmus*) have a three part life cycle:

Larva --> terrestrial eft stage --> Adult aquatic stage.

Fire salamander (*Salamandra salamandra*)

It is thought the name might have derived from the fact that they like to hide in damp wood and or tree trunks.

When humans put these into a fire (for heating), they'd come crawling out.

## Amphiumidae:

Amphiumas. Found only in the southeast U.S.

Small, short limbs.

Can get large (up to 1m).

Internal fertilization.

Internal gills, but lungs are present.

Three species, identified (literally) by the number of toes:

*Amphiuma tridactylum*, *A. means*, *A. pholeter* have three, two and 1 toe on each foot respectively (scientific names refer to this as well).

Females may stay with eggs and protect them until hatching.

Mostly nocturnal and aquatic; rarely seen on land.

#### Sirenidae:

Restricted to southeast U.S. and Mexico.

Not closely related to other salamanders (some suggest putting them in as a separate order).

Two tiny forelimbs (but fully developed), no hindlimbs.

Adults have fully developed external gills.

Surprisingly, for a U.S. species, we don't even know how they reproduce, though we guess it's external (no spermatheca in females).

Live in marshes, swamps, etc. and eat mostly invertebrates.

Very few teeth - but have developed a strong “beak” arrangement on the premaxilla

No pelvic girdle

Text also mentions an intraventricular septum (though it's not clear how this would function since they rely primarily on gills to breathe).

#### Proteidae:

Mudpuppies/waterdogs.

Wikipedia mentions they were named that way because they were thought to make a barking sound (which turns out to be wrong).

Essentially totally aquatic. Adults never lose gills.

Do have a lung which doesn't seem to be used much.

Live in slow moving waters, carnivorous (mostly invertebrates).

European species (called the “Olm”, *Proteus anguinus*, is a cave dwelling species).

Unlike many other aquatic forms, have well developed limbs.

Usually around 200mm, but some get close to 1/2 meter.

Internal fertilization. Often reach sexual maturity in their larval stage.

#### Rhyacotritonidae:

Small family with four species, found in the Pacific Northwest.

Originally placed within the Ambystomatidae, in 1992 it was designated it's own family.

The single species was split into four species (genetic analysis) at the same time.

Did anyone bother to check for hybridization??

Overall, similar to the Ambystomatidae.

Are more aquatic, and live in aerated waters. Sometimes found on land after heavy rains.

In coniferous forests.

Fertilization is internal.

Thick body, strong limbs, generally on the small side (90 - 120mm).

#### Plethodontidae

Lungless salamanders

Large diverse group.

Guess what - no lungs!

No gills either, in the adults.

Breathe entirely through their skin.

Sizes range from 2.5cm up to 32cm.

Fertilization is internal; some do not have a larval stage.

North and South America, with a few in the Mediterranean area and in Korea.

This is the group that shows such a high diversity in the Appalachians.

Also found all over campus, if you know where to look.

Quite numerous in some locations

Many prey on collembolans, which are generally too small for most other vertebrates.

Allows them to increase in number as other vertebrates aren't really taking advantage of this.