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The Problem of Amphibian Origins

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Abstract

The fossil and other evidence for the evolution of amphibians from non-amphibians is reviewed, concluding that the first known amphibians were very similar to modern amphibians. All of the major groups of amphibians are evaluated, including frogs (Anura), salamanders (Caudata), and caecilians (Gymnophiona). As far as can be determined from the earliest fossil evidence, frogs, salamanders, and caecilians are morphologically *nearly* identical to modern frogs, salamanders, and caecilians. The implications of this finding for the creation model then are discussed.

Introduction

Amphibians are ectothermic (cold-blooded) vertebrates consisting of frogs (Anura), salamanders (Caudata), and wormlike caecilians (Gymnophiona) (Marent, 2008, p. 20). The term "amphibian" means "double life." Amphibians are so named because many spend their entire early life in water. As they mature, most amphibians develop lungs and other structures that allow them to live on land. The classic example is a tadpole's development into a frog (Figures 1 and 2).

This classification is flexible because a few types of animals classified as amphibians develop on land without water, and others live their entire lives in the water. They all lack feathers, hair, and large reptile-like scales, and instead

Figure 1. Frogs in their common habitat. From Brown (1880, p. 146).

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have soft, smooth "skin" that must be kept moist by glands (Noble, 1931). Most adult amphibians have lungs but also can breathe through their skin (e.g. Johnson, 2010, p. 8). As adults, some usually never travel very far from the water; others live their entire life under rocks and logs on high ground or even forests. Aside from these contrasts, the three amphibian groups are very different, despite some similarities.

> Frogs, salamanders, and caecilians are very different from one another in skeletal structure and ways of life, both now and throughout their known fossil [history] … we have found no fossil evidence of any possible antecedents that possessed the specialized features common to all three modern [amphibian] orders…. In the absence of fossil evidence that frogs, salamanders, and caecilians evolved from a close common ancestor, we must consider the possibility that each of the modern orders evolved from a distinct group of Paleozoic amphibians (Carroll, 1988, pp. 181, 182, 184).

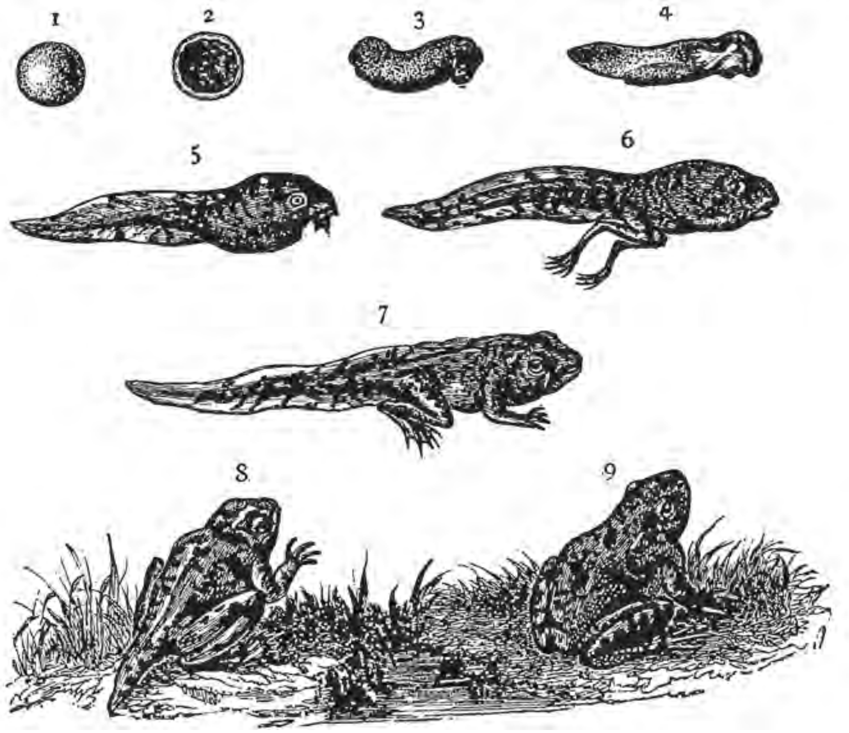


Figure 2. Development of a frog from an egg to a tadpole and finally a frog. From Brown (1880, p. 147).

For this reason, Northeastern Illinois University herpetologist Ellin Beltz claimed that one of the "big scientific issues now is whether the three groups of amphibians—the salamanders, the caecilians, and the frogs and toads—are all descended from one common fish-like ancestor called 'Lissamphibia'" (Beltz, 2005, p. 19) or from some other "more or less aquatic tetrapods," as speculated by Noble (Noble, 1931, p. 2).

Lissamphibia actually is a very unlikely candidate because it is a living fossil that includes all recent amphibians. The problem is the "origin of the Lissamphibia [which] is the subject of continuing debate, and there is no current consensus" (Schoch and Milner, 2004, 345). Darwin speculated that the amphibians descended from a fish "like the Lepidosiren," a South American lungfish (Darwin, 1871, pp. 212–213). Since Darwin, the dominant view has been that amphibians evolved from fish.

A common claim is that some fish species developed the ability to climb out of the water, survive on land, and simultaneously evolve the amphibian reproductive system and other common amphibian features. I will show that many hypothetical ancestors of amphibians have been proposed, but specific evidence for any one ancestor is nonexistent.

The Origin of Amphibians from Fish

Most paleontologists agree that the earliest amphibia must have been fishlike. They assume that "tetrapods evolved from a fish ancestor and that amphibians were the first tetrapods" (Gish, 1995, p. 83). Specifically, most evolutionists believe amphibians evolved from a group of fleshy-finned carnivorous fish about 350 million years ago and they were the first vertebrates to live on land (Johnson, 2010). No fossil fish species yet has been identified as *ancestral* to amphibians; nor has any evidence of an animal "intermediate between the finned and limbed forms" of life been discovered, although many possibilities have been postulated (Stahl, 1974, pp. 194–195).

One suggested possible ancestor is a crossopterygian fish, a conclusion that relies on bone homology based on the fact that the crossopterygian fish pectoral fin bones "are similar to, or homologous with, the humerus, radius, and ulna of the forelimb of amphibians" (Gish, 1995, p. 87). The problem is this:

> There the similarity of either the pectoral or pelvic fins of these fishes to the forelimbs and hind limbs of amphibians ceases. There is nothing in any of these fish to equate to

> or homologize with hand and feet of amphibians (Gish, 1995, p. 87).

The proposed rhipidistian ancestor, claimed to have skeletal features resembling amphibians, also is problematic. For example, the function of the thick, lobate-paired extinct rhipidistian fin

> was very different from the function of the feet and legs of the amphibians. In the rhipidistian fish the humerus (of the front paired fins) and the femur (of the rear paired fins) were held close to the body, which restricted lateral or rotational movement. Thus their fins point in a posterior direction. In the "primitive" tetrapods, however, the limbs are extended forward and away from the trunk during locomotion. The mode of locomotion of amphibians, including the "earliest" or most "primitive" amphibians, was thus drastically different from that of any fish (Carroll, 1988, p. 145).

To evolve from a fish that spends most of its time in the water to a tetrapod that spends most of its time as an adult on land required a radical new respiration system, from a gill system to an air-breathing lung system, and from a finned fish to a four-legged tetrapod that effectively could walk on land. Even the lungless salamanders required an entirely new respiratory system that effectively could take in enough oxygen through their skin to allow the animal to live (Johnson, 2010, p. 39).

Yet another set of radical changes include maintaining proper internal water balance. As the proto-amphibian moved from water to dry land, it would suffer serious water loss through the mouth, lungs, and body surfaces. Significant changes were required in these and other organs and structures to minimize these losses. Furthermore,

> curiously, tetrapods and fish move in exactly opposite ways. In fish, locomotion is provided by the body, with the tail propelling the fish through the water. In tetrapods, the legs are used for propulsion; the longer tetrapod tail is only for balance (Beltz, 2005, p. 20).

The major evolutionary gap between fish and both frogs and salamanders has long been recognized. In comparing

> a frog sitting on the edge of a pond with the perches, catfish, or eels in the water, the difference between a tetrapod and a fish seems tremendous. A scrutiny of their detailed structure brings forth such a series of differences in skull, appendages, and breathing apparatus that the change from fish to frog would seem to be one of the most radical steps in the evolution of the vertebrates. This step does not seem less tremendous when we compare the aquatic newt with the fish, for the former is a typical tetrapod which has secondarily taken up a life in the water. It is no wonder that anatomists were puzzled for many years as to how the first tetrapod arose, and even today there is no agreement between those who study only the recent forms (Noble, 1931, p. 2).

The same problem is still with us today. Benton notes that the "major problems" that exist "in moving from water onto the land" include "weight and structural support … new ways of feeding, of sensing prey and predators, of water balance and of reproduction" (Benton, 2005, p. 75). He then documents in detail each of these problems. Nonetheless, in spite of these problems, paleoanthropologists continue to speculate on the identity of the possible ancestors of amphibians.

Darwinists often describe the extinct fish order *Rhipidistian* as an "ancestral group" to amphibians. Rhipidistians have some skeletal features resembling early amphibians, including those that appear to have evolved into legs. The rhipidistians are known by only a "relatively small number of fossils, many of which show little more than dermal bones and scales" (Stahl, 1974, p. 146). Stahl added that

> none of the known fishes is thought to be directly ancestral to the earliest land vertebrates. Most of them lived after the first amphibians appeared, and those that came before show no evidence of developing the stout limbs and ribs that characterized the primitive tetrapods (Stahl, 1974, p. 148).

Many paleontologists considered the coelacanth to be closely related to the rhipidistians until a living specimen was discovered in 1938. It was expected to shed light on the soft body parts of the putative immediate ancestors of amphibians.

> [When] dissected, however, its internal organs showed no signs of being preadapted for a land environment and gave no indication of how it might be possible for a fish to become an amphibian. The experience suggests that a rhipidistian fish might be equally disappointing to Darwinists if its soft body parts could be examined (Johnson, 1993, p. 77).

Other amphibian ancestor candidates include certain Ganoidei fish, a group of mostly extinct, bony fishes characterized by armor-like bony scales, or dipnoan fish, various fish that can respire by lungs as well as gills (Dziewa, 1980), and Labyrinthodontia. All of these claims are so problematic that Benton (2205, p. 79) only briefly covers the problems of amphibian evolution without speculating on any resolution. Order Ganoidei is named after their scale type. Ganoid scales are thick, nonoverlapping, and composed of bone overlaid with an enamel-like substance called *ganoin*. This scale type is most commonly seen in the lobed-finned coelacanth.

All of these proposals are based on certain specific similarities of fish with reptiles or mammals. As Gish notes, all it requires to document amphibian evolution is a few transitional forms to "reveal what was ancestral to amphibians and what the evolutionary pathway was. Lacking that, all suggestions are mere scenarios and empty rhetoric" (Gish, 1995, p. 85). Thus he concludes that when one critically reads

> the massive amount of literature on the origin of major groups, such as the origin of tetrapods … one soon becomes overwhelmed and confused by the many controversial and contradictory notions of evolutionists. Each espouses his supposedly logical argument based on a comparison of the many characteristics that the theorist assumes to be the most important in selecting the creature believed to be the probable ancestor (Gish, 1995, p. 84).

The same problem still exists today. While Carroll argues for a rhipidistian fish ancestor, other experts advocate for a much earlier ancestor such as a coelacanth-like animal, and still others for some lungfish, as Darwin did. Of all of the known extinct amphibians, all clearly are amphibians, although some are much larger than their modern amphibian relatives; a few as long as 1.5 meters.

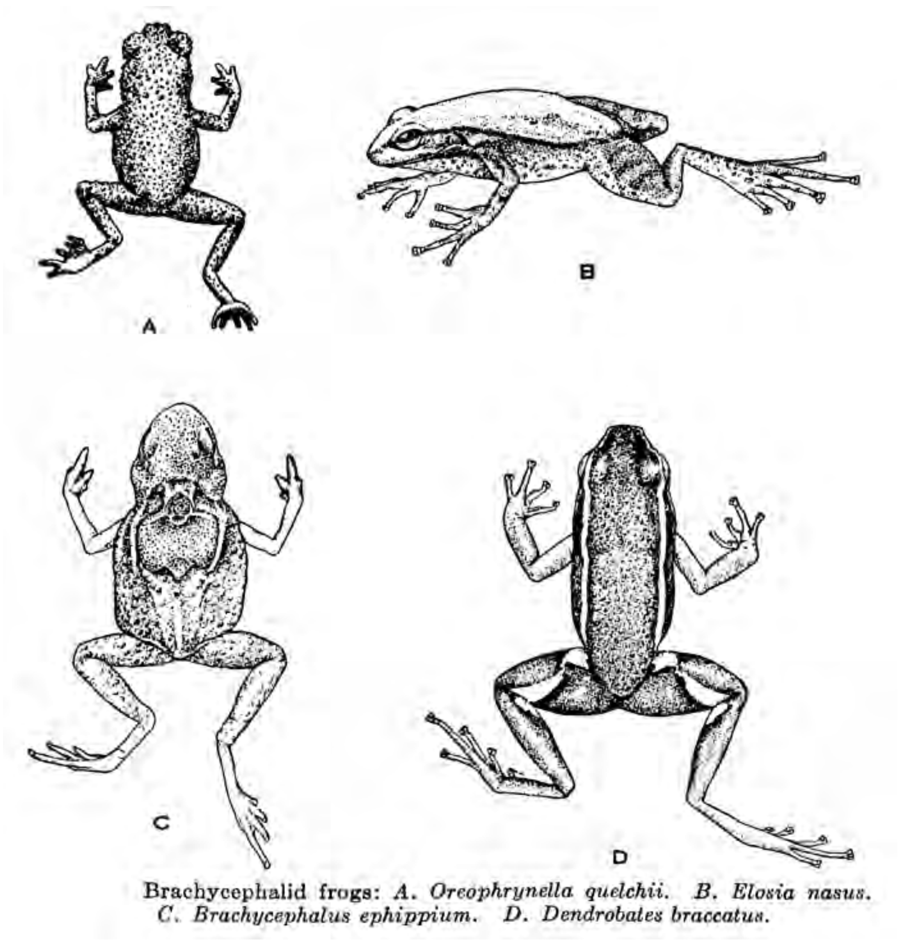


Figure 3. Examples of four of the almost 4,000 species of frogs. From Noble (1931, p. 506).

Frogs and Toads

Frogs and toads are amphibians in the order Anura (meaning "tailless": Greek *an-* meaning "without," plus *-oura*, meaning "tail"). Over 6,000 amphibian species have been identified, and Anurans make up about 90% of the class Amphibia. Most frogs are designed to be able to jump long distances, a movement mode called saltatorial locomotion. This design includes long, powerful hind legs, a short body, webbed fingers and toes, and the absence of a tail—which would interfere with how it jumps (Figure 3). Large, protruding eyes allow them to accurately land on designated targets. Many other frog anatomical characteristics, such as their nervous system and brain, specifically were designed to improve their jumping ability, both their length and their accuracy.

Frog habitats range from tropic to subarctic regions, but most species are found in tropical rainforests. Some frog species synthesize an antifreeze substance that gives them the "amazing ability to freeze solidly in the winter and thaw out in the spring with no harm done" (Holman, 2003, p. 206). Because of their permeable skin, most frogs are semiaquatic or inhabit humid regions, but they can easily move about on land.

Toads are Anurans that have wart-like dry skin, short legs, parotid glands, and other features enabling them to be well adapted to dry environments. The only family exclusively referred to by the common name "toad" is the genus *Anaxyrus*, North American Toads classified as *Bufonidae*, or *Bufo* in Europe, but spade-foot frogs are also classified as toads.

Frogs typically lay their eggs in mud puddles, ponds, or lakes. Their larvae, called *tadpoles*, are tailed, have gills, and mature in water. The adults lose their tail and gills, and develop lungs needed for living on land. Frogs tend to be carnivorous, consuming mostly arthropods, annelids, and gastropods (see Table I). These small creatures are distinguished by their calls at night during the mating season.

Table I. General Differences Between Frogs and Toads[a]

Frogs	Toads
long and skinny	short and stubby
long legs and arms	short legs and arms
long faces	blunt faces
eyes that see up and over to their butts	eyes that see mainly forward with a little periphery
smooth skin	warty skin
not too many wrinkles at joints	sometimes very saggy, baggy skin
not as successful at tongue hunting	extremely successful at tongue hunting—implies better brain power and better resolution on eyesight
"dignified" mating, lay mostly egg masses	massive frothy free-for-alls ending in amplexed pairs stuck for days laying eggs in strings
slower-developing tadpoles	very fast-developing tadpoles
live in lower temperatures and moister places	live in higher temperatures and drier places
most frog species have five toes, jointed 2-2-3-4-3	some true toads (and a few frogs) have only four toes on their hind feet

[a] From Beltz, 2005, p. 41

Frogs are among the most diverse groups of vertebrates known, and the approximately 6,000 known species are arranged into 30 families (Marent, 2008, p. 20). Unfortunately, populations of certain frog species are declining significantly. The North American green frog is the most familiar type, but frogs come in an amazing variety of vibrant colors, from bright blue to red and even dark or solid black coloration. Many are multicolored, such as black and orange, red and blue, or yellow and red.

Evidence of Frog Evolution

Frog fossils have been found on all continents except Antarctica. Biogeographic data indicates that they once inhabited Antarctica when it had a *warmer* climate. Extinct frog species exist in the fossil record, but the first frog clearly was a frog. Modern frogs actually are in two major ways less complex than so-called primitive frogs—"primitive frogs had up to eight rib bones; modern frogs have few or none" and modern frogs have lost their once-short tails (Beltz, 2005, p. 20). They were called primitive because they possessed character traits found in presumed ancestors and not necessarily because these traits were "simple" or "inferior."

Modern frogs are speculated to have evolved from early temnospondyls, such as an *Eryops*, an animal similar to an overweight alligator and very unlike a frog (Colbert and Minkoff, 2001, p. 96). *Eryops* was as long as almost two meters, as large as many reptiles of the time, and was well adapted to land (Colbert and Minkoff, 2001, p. 108). It had a "large" bony head, strong limbs, a long tail, and rows of sharp teeth in a large mouth. The frog-amander fossil is speculated be an amphibian missing link but lived a life very much like modern-day alligators, which it strongly resembled (Beltz, 2005, p. 21).

Marjanovic and Laurin (2007, p. 369) concluded: "Review of the paleontological literature shows that the early dates of appearance of Lissamphibia recently inferred from molecular data do not favor an origin of extant amphibians from temnospondyls, contrary to recent claims." The choice of this unlikely animal as the frog ancestor was partly because a more plausible frog ancestor does not exist. The problem is the first putative frog ancestors left no trace that has yet been found "in spite of paleontologists searching the globe" looking for fossil frogs in ancient rocks likely to preserve animals and plants contemporary to when frog ancestors were theorized to have first evolved (Beltz, 2005, pp. 24–25). The first frog in the fossil record clearly was a frog.

Paleontologists have found a few extinct froglike animals, such as the Early Permian *Gerobatrachus hottoni* (meaning Hotton's elder frog), a frog with salamander-like traits discovered in Texas in 1995 by a Smithsonian field researcher. Only one known specimen of the 12 cm-long animal exists, and this example is very incomplete.

One of the earliest known froglike animals was *Triadobatrachus massinoti*, an early Triassic animal that evolutionists conclude lived in Madagascar 250 million years ago. Its broad skull with large eye sockets and "a nearly modern configuration of the jumping apparatus" are all very froglike (Carroll, 1998, p. 284). The fossils possess several features that are different from most modern amphibians, including their ileum, a longer body with more vertebrae, and separate tail vertebra (modern frogs have fused tail vertebrae). The tibia and fibula bones are also unfused and separate, thus *Triadobatrachus* probably was not an efficient leaper.

Evaluation of its restored skeleton reveals that many "characters (e.g., orbit size, fusion of frontoparietals, morphology of pterygoids and squamosals, etc.) are developed to the same degree as in modern anurans, but other features, mainly in its postcranial skeleton, are very different than modern frogs" (Rage and Rocek, 1989, p. 15). It was likely merely an extinct frog because its restored skeleton looks almost identical to a modern frog skeleton (Rage and Rocek, 1989).

Of the two anuran families known to have lived during the Paleocene (dated by evolutionists 2.3 to 1.64 million years ago), one is extinct and the other is a "modern type" still alive today (Holman, 1998, p. 12). Another example is the "frog-amander" fossil that some claim to be the fish-to-amphibian missing link (Casselman, 2008).

Another fossil frog, *Prosalirus bitis*, called the earliest known anuran, was discovered in 1995 in Arizona's Kayenta Formation (Jenkins and Shubin, 1998, p. 495). It was dated by evolutionists as the Early Jurassic epoch (190 million years ago). This is somewhat younger than *Triadobatrachus*, documenting that *Triadobatrachus* could not be a transitional form but merely an extinct frog. Like *Triadobatrachus*, *Prosalirus* effectively used saltatorial locomotion but had the typical three-pronged pelvic structure. *Prosalirus bitis* was so modern that Jenkins and Shubin (1998, p. 505) concluded that it "demonstrates that many of the distinctive anatomical features of modern anurans were established by Early Jurassic time."

Unlike *Triadobatrachus*, *Prosalirus* had a small, stub-like tail and was well adapted for jumping. Likely it was an extinct frog. Artists' drawings show that it was unmistakably a frog, as does an evaluation of the skeleton (Jenkins and Shubin, 1998). All fossil frogs dated after this example are recognized by paleontologists as fully modern frogs. One paleoherpetologist pointed to the problem that these frogs are only extinct varieties of frogs and, as has been argued

> before and will be again, you need a comparative anuran skeleton collection to be able to make reliable identifications of fossil frogs because of the osteological variations that occur within species. But limitations exist, as seldom do you get an adequate sample of fossil amphibian species (Holman, 2003, p. 207).

The earliest well-documented fully modern frog, *Vieraella herbsti*, has been dated by evolutionists back to the early Jurassic (188–213 million years ago), when dinosaurs were believed to have populated vast land regions. It is known only from the dorsal and ventral impressions of a single animal estimated to be only 33 mm (1.3 in) from snout to vent.

Another modern frog, *Notobatrachus degiustoi*, was dated from the Middle Jurassic, about 155–170 million years ago. Compared to early extinct frogs, the only morphological differences seen in modern frogs are a slightly shorter body and total loss of the tail. The earliest complete fossil of a fully modern frog is the *Sanyanlichan*, which evolutionists claim lived 125 million years ago and had all modern frog features. Thus, the fossil evidence has documented that the first modern frog, dated by evolutionists as living about 190 million years ago, was fully a frog.

The most accurate method of determining frog evolution is to evaluate the frogs entombed in amber. One example is a frog and a mushroom that were found in Dominican Republic amber dated at 40 million years (Poinar and Poinar, 1994, p. 178). This excellently preserved frog looks identical to a modern frog (Poinar, 1992, p. 216). Also, what looks like a modern tadpole was discovered entombed in amber (see Poinar and Poinar, 1999, p. 155).

The conclusion of these many fossil studies is that frog fauna in North America, the British Isles, and Europe "existed in a state of evolutionary stasis during the entire Pleistocene epoch" (Holman, 2003, p. 206). Furthermore, the evidence reveals that, "other then large tortoises or unique island taxa … all Pleistocene amphibian and reptile species … belong to modern species" (Holman, 2003, p. 207). This conclusion is based on the fact that all of the "Pleistocene herpetofaunas that have been documented at numerous sites in continental North America have been strikingly more stable than the mammalian and avian faunas" (Holman, 2003, pp. 208).

Duffett concluded from a detailed study that "fossils of allegedly ancient frogs show that adult frogs have always resembled frogs" (Duffett, 1984, p. 199). Romer's 1966 conclusion is still valid today despite the subsequent discovery of numerous new well-preserved fossil frogs.

> Records of late Cretaceous and Tertiary frogs are not uncommon; most are fragmentary and poorly

> preserved, and hence often difficult to assign to their proper position in the system of classification. It seems clear, however, that most of the modern families have been in existence since the early part of the Cretaceous. In recent years several good specimens of frogs have been found in the Jurassic of South America and Europe … Although these finds carry the frog story far back in time, they do not tell us much of frog evolutionary history, for even the "primitive" frog families differ only in relatively minor features from the more "advanced" ones. The basic pattern of anuran structure was already established by the early Jurassic and exemplified by the South American *Vieraella*—essentially a modern frog in its general adaptation, despite its great age (Romer, 1966, p. 100).

He adds that the history of frogs goes back as far as the

> Triassic, overlapping the history of the older groups in time, but without closing the morphological gap. In the early Triassic of Madagascar has been found the skeleton of a small animal, *Triadobatrachus* [*Protobatrachus*]. The specimen displays a skull which, although incomplete, appears to be basically similar to that of modern frogs and toads (Romer, 1966, p. 100).

Furthermore, although enormous variety of color, body size, and other features exist, "the adult frog shows remarkable constancy of body plan and general morphology, indicating they all belong to one baramin" (Duffett, 1984, p. 199).

Salamanders and Newts

Salamanders and newts (both family Salamandridae order Urodela) are the second largest group of amphibians (Johnson, 2010). Salamander is the common name for more than 535 amphibian species that are characterized by long slender bodies, short noses, and long tails (Min et al., 2005) (Figures 4 and 5). Most salamanders have four toes on their front feet and five on their back feet. Some have large feet, others, such as the Olm, have thin, short feet. More than 70 percent are classified in a single family, the *Plethodontidae*, or lungless salamanders (Min, et al., 2005, p. 87). All known fossils and extinct

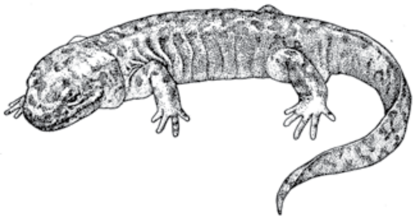
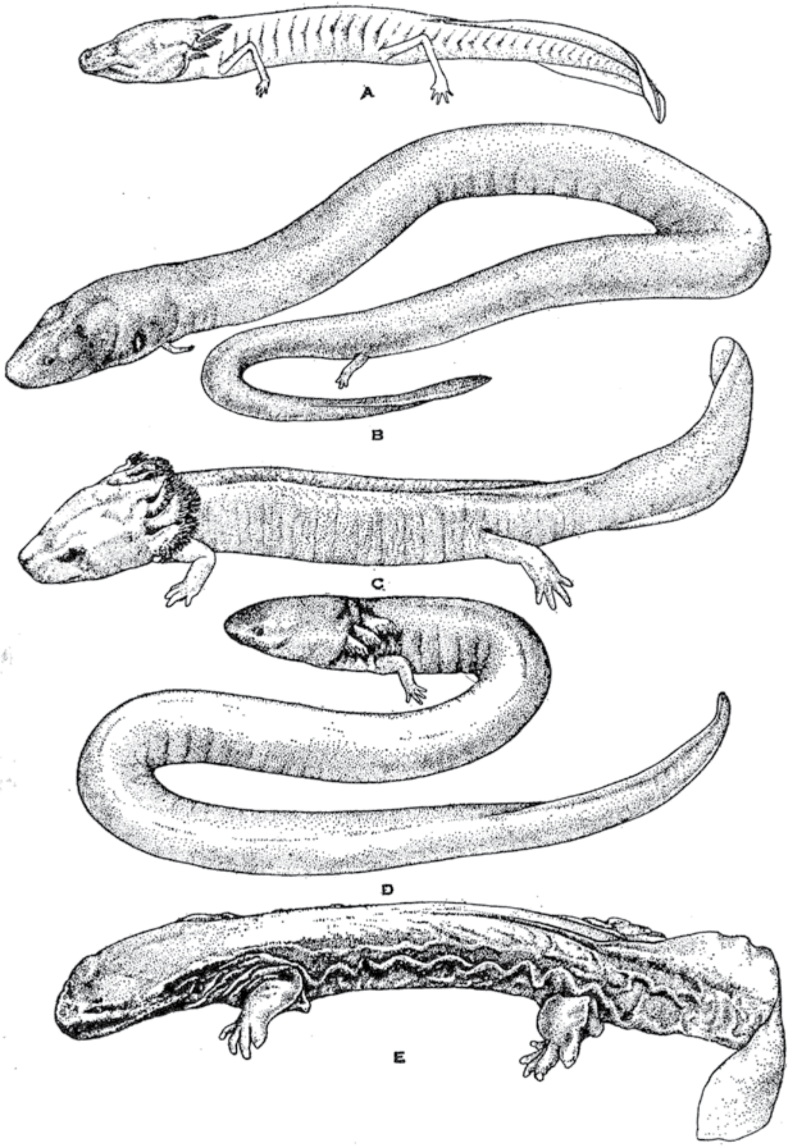
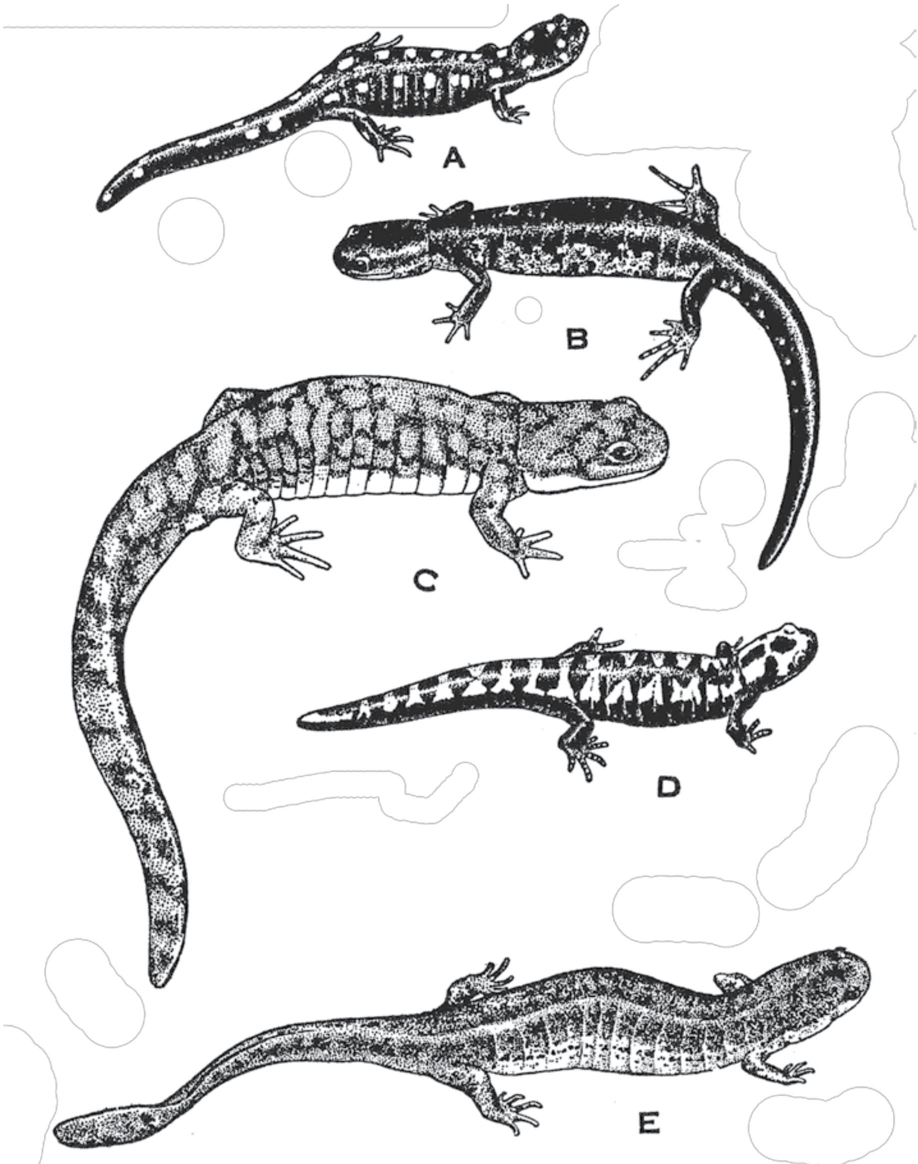


Figure 4. *Dicamptodon* ensatus, the largest living terrestrial salamander, reaching up to 35.1 cm long. It lives in California. From Noble (1931, p. 472).



Permanent larvae: the perennibranch and derotreme salamanders. *A. Typhlomolge rathbuni. B. Amphiuma means. C. Necturus maculosus. D. Siren lacertina. E. Cryptobranchus alleganiensis.*

Figure 5. Various types of extant salamanders showing the variety. Note example B *(Amphiuma means)* has very small legs, and example D *(Sirena lacertian)* has front legs only. From Noble (1931, p. 470).



Some common species of Ambystoma: *A. Ambystoma maculatum. B. Ambystoma jeffersonianum. C. Ambystoma tigrinum. D. Ambystoma opacum. E. Ambystoma texanum.*

Figure 6. Several common species of *Ambystoma* salamanders, showing the variety of pattern variations in the integument. From Noble (1931, p. 471).

salamander species are grouped in the order Caudata.

Most salamanders lay their eggs in water. When their eggs hatch, they look more like tadpoles than salamanders, and are referred to as "salamander nymphs." The nymphs have feathery gills that extend outward from the sides of their necks to help the young salamanders absorb oxygen from the water. Their moist skin requirement forces them to live in habitats in or near water, or in wetlands. Some have lungs, others feathery gills; yet others, such as the mudpuppy, have larger external bushy gills (Johnson, 2010, p. 43).

Some salamander species are fully aquatic throughout their life; other types take to the water intermittently, and many are entirely terrestrial. Salamanders are unique among all vertebrates because many species can regenerate lost limbs and some other body parts. The strange-looking Axolotl has a long dorsal and ventral fin like a tadpole, and is a popular animal used to research limb regeneration.

Salamander Evolution

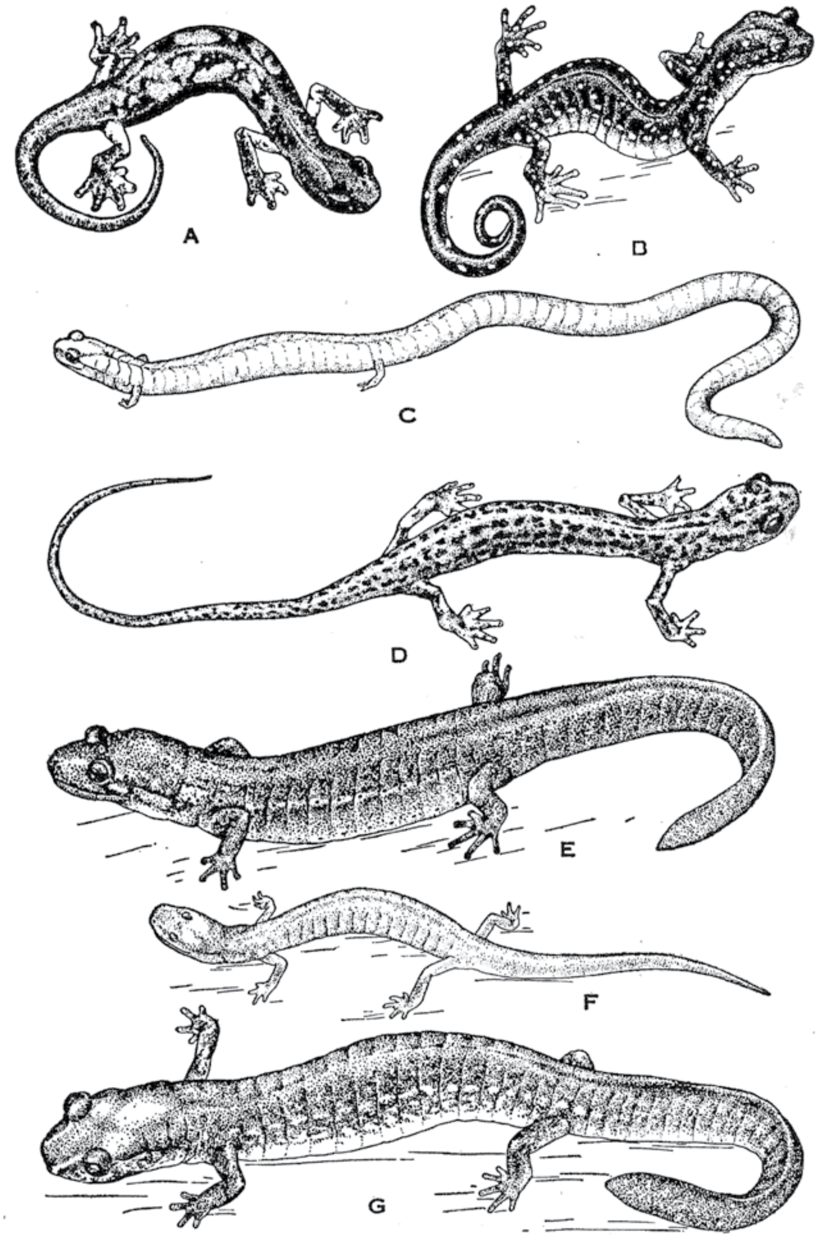
Researchers seldom have "an adequate sample of fossil amphibian species—an obvious exception being the hundreds of specimens of *Ambystoma tigrinum* that J. A. Tihen was able to study in Kansas," and from these "hundreds of specimens" some conclusions about evolution can be made (Holman, 2003, p. 204). Since Holman's work, many more discoveries have been made (Figures 6 and 7).

Evolutionists have traced the salamander's genetic lineage back to more than 110 million years. A team led by David Wake of UC Berkeley's Department of Integrative Biology (a specialist on the diversity of amphibians who has studied salamander species for nearly 50 years) found that no significant changes have occurred in this 110 million years (Wake and Vredenburg, 2008). Another unsolved puzzle is Asian species of salamanders, which

> have only four toes on their feet, while the salamanders of Europe and the Americas all have five. And none of us can think of any reason why four toes would make a salamander species better adapted for survival than five (Perlman, 2006).

To make things more complex, the *Hemidactylium scutatum* salamander has four toes on both its front and hind feet.

Neil Shubin and his colleagues have been collecting thousands of salamander fossils from seven excavation sites in



Plethodontid salamanders: *A. Hydromantes italicus. B. Aneides lugubris. C. Batrachoseps attenuatus. D. Eurycea lucifuga. E. Desmognathus quadra-maculatus. F. Typhlotriton spelaeus. G. Gyrinophilus porphyriticus.*

Figure 7. Plethodontid salamanders, which illustrate the enormous variety, from snakelike salamanders (example C *Batrachoseps attenuaatus*) to lizard-like salamanders (example E *Desmoggnathus quadra-maculatus*). From Noble (1931, p. 478).

China that evolutionists date back to 161 million years, many of which have preserved the entire skeleton and even impressions of soft tissues. The fossils closely resemble the North American hellbender, a common salamander found in Asia as well as in the Allegheny Mountains (Gianaro, 2003, p. 2).

Most of the changes in modern salamanders, as compared to fossil salamanders, involve minor differences in the shape of their front skull bones and minor finger, toe, and rib variations. One unique feature is that its "unicapitate" ribs have only one facet or head where they connect to the vertebra—most modern salamanders have two-headed ribs—otherwise they were identical to modern salamanders. Because scientists claim that salamanders have had the same body morphology for millions of years, they are called living fossils.

> Despite its Bathonian age, the new cryptobranchid shows extraordinary morphological similarity to its living relatives. This similarity underscores the stasis within salamander anatomical evolution. Indeed, extant cryptobranchid salamanders can be regarded as living fossils whose structures have remained little changed for over 160 million years (Gao and Shubin, 2003, p. 428).

These research conclusions were based on "200 specimens … many of which preserve evidence of soft tissues" (Gao and Shubin, 2003, p. 426). Shubin adds,

> Whether you look at a salamander you find under a rock in the local forest preserve or in a rock in China dating back 165 million years, they look alike. In fact, they look alike in great detail—the bones in their wrists are the same, the way their skulls are formed—intricate details are the same (Shubin, quoted in Gianaro, 2003, p. 3).

This finding is based on "thousands of salamander fossils—many of which preserve the entire skeleton and impressions of soft tissues" (Gianaro, 2003, p. 1). One reason for the

> apparent stasis of Pleistocene amphibians may be gleaned from additional studies of modern as well as fossil amphibians. It appears obvious

> that ectothermic (cold-blooded) animals, such as amphibians, that have very low metabolic rates and are able to hibernate (in winter) or estivate (in summer) during inclement conditions would have many advantages over endothermic (warm-blooded) birds and mammals during intervals of climatic fluctuations. The ability of many amphibians to freeze solid in the winter, sometimes several times, without dying … certainly must have been adaptive during the glacial periods of the Pleistocene. In some species of amphibians glycogen from the liver is converted to glucose, which acts as an antifreeze. In others, such as the Old World salamander *Salamandrella keyserlingii*, converted glycerol is used (Holman, 2006, p. 204).

Of course, this only explains how they survived so well in extreme conditions, not how they evolved from non-salamanders by descent with modification as a result of the accumulation of mutations. The problem of "evolutionary stasis in North American Pleistocene Amphibians" also applies to salamanders: "Despite all the Pleistocene stresses that had to be coped with, North American salamanders appeared to exist in a state of evolutionary stasis during the epoch" (Holman, 2006, p. 203). The first salamanders were modern salamanders.

Caecilians

Caecilians (order *Gymnophiona*) are tropical amphibians that have been less studied than other amphibians. They are snakelike organisms with long, legless, and tailless bodies. Externally they strongly resemble earthworms, but they have several clear vertebrate characteristics, including teeth and a unique jaw-closing system (Mauro, et al., 2004). Caecilians commonly are found around swampy locations in most tropical regions, but seldom are seen because of their underground habitat. Their compact skulls contain recessed mouths and small eyes (Measey and Herrel, 2006). A few species remain aquatic as adults and resemble eels. The approximately 50 known species range in size from 18 cm – 140 cm long and most are about 30 cm long.

Their bodies are ringed with grooves, and some species have small, thin scales embedded in their skin; a feature evolutionists label as a primitive amphibian trait. Grooves on both sides of their head contain a retractable sensory tentacle. Their eyes are nearly functionless, and some species even lack eyes. Caecilians live in the ground and consume small invertebrates such as termites and earthworms.

The phylogeny of the Gymnophiona is poorly understood and until recently received little attention (Nussbaum and Wilkinson, 1989, p. 1). The prevailing theory is that they evolved from a four-legged animal "in response to their specialized head-first burrowing lifestyle" (Measey and Herrel, 2006, p. 485). No fossil or other evidence exists for this view, but it is accepted because it is the most plausible theory of the many unlikely evolutionary scenarios (Measey and Herrel, 2006, p. 485). Nussbaum and Wilkinson (1989, p. 1) concluded that "present knowledge does not allow establishment of a robust, phylogenetic classification of Caecilians."

The first caecilians in the fossil record are found in the Lower Jurassic, and they are very similar to modern forms that have not changed since this time (Beltz, 2005). Savage and Wake (2001, p. 60) noted several theories about their origin, at least the origins of certain species, which they admitted were not based on the relevant empirical evidence.

Hybridization Research

Many new hybridization studies are required to determine monobaramins (Hennigan, 2010). One hybridization study established that Linguaelapsus, Ambystoma-2 and Mexican ambystomatids are all part of a Salamander Monobaramin (Brophy and Kramer, 2007).

Conclusions

As predicted by creationists, when amphibians first appeared in the fossil record, they were modern and very diverse in structure, just as is true today (Caldwell, 2003; Channing, 2001). This is true of frogs, Family salamandidae, newts, and caecilians. Carroll (1988, p. 180) says that when they first appeared

> in the fossil record, [during the Jurassic] both frogs and salamanders appear essentially modern in their skeletal anatomy. The described fossil record of Gymnophionans (caecilians) is limited to isolated vertebrae from the Upper Cretaceous and Paleocene that are very similar to those of modern genera.

According to Colbert, although logical scenarios for frog evolution exist, due to total lack of empirical evidence for their evolution, scientists "can only speculate about" amphibians' putative "change from an aquatic to a terrestrial mode of life" (Colbert and Morales, 2001, pp. 84–85). The evolutionary origins of frogs lack any clear support in the fossil record, and because "the fossil material provides no evidence of … the transformation from fish to tetrapod, paleontologists have had to speculate how legs and aerial breathing evolved" (Stahl, 1974, p. 195). Enormous gaps exist in the Amphibia fossil record, and the largest gap is the origin of amphibians (Benton, 2005). Furthermore, most of the amphibians identified in the ancient fossil record are based on a few isolated bones, and thus are subject to revision as more fossils are discovered (e.g., Carroll, 1998, p. 116).

Because the first known frogs are extinct but clearly frogs, evolutionists conclude that the evolution of modern

Anura had ceased during the Jurassic period of history. All frogs dated after this time are clearly modern frogs. In other words, the evidence shows that frogs have not changed during what evolutionists claim was over 200 million years! In conclusion, Colbert and Morales (1991, p. 99) stated,

> There is no evidence of any Paleozoic amphibians combining the characteristics that would be expected in a single common ancestor. The oldest known frogs, salamanders, and caecilians are very similar to their living descendants.

The most recent careful evaluation of amphibians has determined that

> herptofauna appears to have been in remarkable stasis since the onset of the Pleistocene, in other words, virtually unchanged for the last 1.64 million years. [Thus], there is no doubt that the herpetofaunas of the British Islands, the European continent, and North America have been strikingly more stable since the beginning of the Pleistocene than the endothermic faunas there. Moreover, this has been documented by hundreds of Pleistocene sites (Holman, 1998, pp. 221–222).

Why "Pleistocene herpetofaunal stasis" exists has not been explained by evolutionists, but they hope that additional fossil studies may hold the answer (Holman, 1998, p. 222). In view of the existing large herpetofaunal fossil record, though, this appears very unlikely. A more recent study concluded,

> The relationships of the three extant groups of amphibians (Anura, Urodela, Apoda) to each other, and the identification of their closest Palaeozoic relatives, have been subjects of controversy over the last century. The interrelationship of the modern groups continues to be controversial because neither morphological nor molecular cladistic analyses give a consistent pattern of relationships between the frogs, salamanders, and caecilians (Schoch and Milner, 2004, pp. 345–346).

This is true in spite of the wealth of evidence obtained (including new fossils and new nucleotide sequences), allowing for a revision of the current evolutionary theories (Kupriyanova, 2009, p. 819).

Creation science, in general, predicts variation within the created kinds but stasis of the created kinds. Further research is required to better document the discontinuity between amphibians and their putative ancestors and the continuity within the amphibian kinds, which likely involves the frog kind, the salamander kind, and the caecilian kind. The discontinuity in the amphibian fossil record is consistent with the creationary predictions of the creation of separate Genesis kinds.

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