SLIPPERY PHYLOGENIES: EVOLUTIONARY SPECULATIONS ON THE ORIGIN OF FROGS

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Abstract

The fossil record is examined for evidence for the origin of frogs. While much diversity is found, little is discovered which would indicate that skeletal and muscular features of frogs were derived from other types of organisms. The anuran mode of locomotion and the molecular evidence for frog phylogeny is also reviewed. The apparent meaning of the Genesis "kind' is examined in relation to frogs, toads and other amphibians.

Introduction

The alleged evolution of frogs has not been addressed adequately by creationist writers, with the notable exception of Gerald Duffett's (1984) excellent discussion of the anatomy and physiology of a common species in the extant genus *Rana.* Unfortunately the article's lack of emphasis on the paleobiological aspect of the controversy tends to aggravate this pronounced gap in creation-related literature. We believe, therefore, it is time to examine the claims of herpetologists for the origin of this interesting group of amphibians. All frogs (and toads) belong to the superorder Salientia, order Anura (meaning the "tailless ones"), comprising some 23 families.

True frogs belong to the family Ranidae, and are classified into 30 genera with about 700 species, most of which live on the African continent and in the Orient. Adults may range in size from shorter than 2.5 cm. up to the 30 cm. giants of Africa. The genus *Rana* is by far the largest and most widely distributed, with about 200 species, and is the only genus of the family in North America.

Modern adult frogs adhere to a singular skeletal pattern: hindlimbs are greatly elongated relative to the forelimbs; the vertebral column consists of eight to 10 vertebrae; the skull is open and flat; a tail is lacking; the ribs are suppressed; the bones tailing the pelvis are fused to form the urostyle. Apparently in defiance of evolution, this same basic pattern, considered by zoologists to be among the most specialized of a vertebrate order, has remained unchanged through geologic time.

Although most frogs display rather drab coloration with greens and browns predominating, some exotic species are quite colorful with bright blue, yellow, and red hues. A few even have the ability to change color! Like the toads, some frogs possess poison glands, but unlike the warty-skinned Bufonidae (true toads), most frogs sport smooth, slippery skin. Aquatic habitats predominate among frogs, but a few are quite at home in the trees (arboreal) and some types are even fossorial (burrowing). Perhaps the most remarkable group of frogs, all belonging to the genus *Rhacophorus* of southeast Asia, have been observed gliding from trees by spreading out the thin webbing between their toes.

Frogs are overwhelmingly nocturnal and pass through a complicated life-cycle which begins as a gelatinous egg deposited in water, from which a tadpole or "pollywog" hatches a few days later. Within months, the tadpole-stage undergoes a process of metamorphosis, at which time the animal is transformed from a fish-like form into a juvenile frog. Lungs develop where gills once provided a supply of oxygen. Then the limbs appear, the tail is absorbed and the mouth becomes typically frog-like.

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Evolutionists' Comments on the Fossil Record of Salientia

Can we find from the fossils, the amphibian-type ancestor of frogs and their cousins the toads? Although much has been written by transformist authorities on this subject, the answer appears to be a firm "NO." To confirm this we present the following candid admissions from leading evolutionists in the field: ". . . interpretations of frog phylogeny are unavoidably conjectural" (Orton, 1957, p. 79).

"The fossil record for anurans is so incomplete that it has not been possible to establish with certainty the area of origin of the major taxa" (Blair, 1973, p. 4).

"It is thus apparent that the early evolution of frogs is not yet represented in the fossil record" (Estes and Reig, 1973, p. 11).

"Numerous fossil frogs have been recovered and described, but they contribute relatively little to our understanding of the phylogeny of frogs" (Inger, 1966, p. 369).

"The fossil record of frogs prior to the Cretaceous is poor. The single specimen of *Triadobatrachus* from the Lower Triassic of Madagascar demonstrates that stem-anurans with just a few anuran skeletal characteristics had evolved by the beginning of the Mesozoic . . . However, no other Triassic anurans are known and few frogs have been described from Jurassic rocks, . . ." (Evans, Milner, and Mussett, 1990).

In the same vein Romer (1966, p. 100), concluded that little is known of the evolutionary history, and wrote further that ". . . even the 'primitive' frog families differ only in *relatively minor* features from the more 'advanced' ones" (emphasis added). The earliest-known fossil frog (genus *Vieraella)* has a generally modern appearance, despite its great age-allegedly 180 million years.

Hecht in 1963 (p. 20), stated

> The earliest-known true frog is *Vieraella herbstii* . . . from the Lower Jurassic of Argentina." Hecht wrote that *Vieraella* "did *not* have the primitive forearm, but a true *modern* radio-ulna of the typical Anura, and that furthermore there is little evidence in this fossil to indicate greater primitiveness than is *already known* in living and fossil frogs [p. 27, emphasis added].

Another remarkably well-preserved anuran genus is the genus *Eodiscoglossus* from the Jurassic of Spain and England (Hecht, 1970; Evans, Milner and Mussett, 1990; Evans and Milner, 1993). Hecht notes that these types actually retain a keratinized integument-the nuptial pad on the enlarged pollex. This *is identical* to the condition found on breeding males of extant species, and provides conclusive evidence that amplexial behavior was already established in some of the earliest frogs. Based on the available fossil evidence, frogs appear in the middle Mesozoic, not only morphologically similar to modern forms, but also apparently with similar behavioral patterns as well.

Anuran Origins-Drowning in Evolutionary Speculation-The Triassic Period

Are there any suitable amphibian candidates for frog ancestry in the preceding Triassic or even in earlier Permian or Carboniferous times? The fossil record has so far provided only one dubious candidate called *Triadobatrachus* (Rage and Rocek, 1989). Coleman and Olive Goin (1962, pp. 66, 68), tell us that

> For a time it was thought that *Protobatrachus* [now referred to as *Triadobatrachus]* of the Lower Triassic represented an intermediate stage in the evolution of the frogs . . . It is highly probable that the single known specimen of *Protobatrachus* [*Triadobatrachus]* was ***not*** a true evolutionary intermediate, but a metamorphosing tadpole . . . [The frogs] *cannot* be traced back to any known group of Paleozoic amphibians . . . they *may* be related to the anthracosaurs [emphasis added].

Hecht (1962, p. 39), confirms the lack of evolutionary development implied by the Goin statements: "The first tree frogs appear in the Jurassic already bearing the major characteristics of the group." After examining the features of *Triadobatrachus,* Hecht again agrees with the Goins by stating (p. 41) that "Various characteristics, if present, are faint indeed. They can only be interpreted as such (frog-like) impressions *if one knows that Triadobatrachus* is a frog . . ." [emphasis added]. Hecht (p. 43) states that it is impossible to determine what relationship, if any, that *Triadobatrachus* has to frogs, and that to present it as an intermediate form between modern frogs and ancestral amphibians is no longer a certainty. On page 31 of Part Two of his work, Hecht clearly exclaims that *Triadobatrachus* is *not* on the phylogenetic line of the frogs and concludes that there are *no* clear ancestral groups known.

Orton (1957, p. 80), goes further and writes-"All of the known recent frogs have essentially the same peculiar structural plan." She could have gone a little further and come to the same conclusion with respect to the more ancient forms! She expresses a conviction which is, that if *Triadobatrachus* is only a metamorphosing tadpole, then the tadpole-frog structural plan was *already* in existence by Late Triassic times. She writes that ". . . it is difficult to find anything of clearly primitive nature in any of the frogs" (p. 81).

A Later View

Thus far we have cited a number of authorities from the past, but has the position changed in recent years? Unfortunately for evolutionists, the answer is "no." A current authority on amphibians, Dr. G. Minelli, Professor of Comparative Anatomy at the University of Bologna, Italy states that (1987, p. 26):

> The problem of linking present-day amphibians to those which ruled during the Carboniferous Period has not been satisfactorily solved yet. We can only make hypotheses . . . Maybe their evolutionary line started when all the old amphibians disappeared.

He says:

> In the Triassic Period, 200 million years ago, we meet *Triadobatrachus,* with a frog-like skull, pelvis and short tail, and with conventional, not specialized legs. This is still an anuran, not yet specialized for jumping, but it soon will be . . . Looking at amphibian skeletons for the Carboniferous period, we do *not* see any typical frog feature [emphasis added] (p. 27).

No connecting links are known to any earlier amphibian.

He (p. 27) writes that the 150 million year old (Jurassic) skeleton of *Neobatrachus* has all the features of a frog or a toad, and that there can be no doubt that it is an anuran. It thus seems that if the time-scales are valid, the frog has undergone hardly any change.

One might object that being a soft-bodied creature, there are not enough fossil anurans available to trace their ancestry, but this is not true. Many fossils have been recovered from the Recent back to the Mesozoic, but the biggest gap remains where it always is-between the first true frog and whatever is supposed to have given rise to it. Once again we have the all too familiar major missing link.

An Abandoned Ancestor

Another anuran ancestor which ran into troubled waters was a small labyrinthodont- *Amphibanus grandiscene.* It was found encased in shale nodules in the Mazon Creek region of Illinois and is probably less known among professional paleontologists. The fossils were first described in 1940 by Watson, who believed it to be a primitive "proto-frog" and assigned it to the suborder Phyllospondyli. Gregory in 1950 and Carroll in 1964 reasoned that Watson's frog-like features perceived in *Amphibanus* were based on shoddy misinterpretations, and that his new suborder created for this fossil should be abolished. Furthermore, Bolt (1979, p. 535) found that Gregory's redescription of *A. grandiceps* eliminated most of the detailed resemblances to frogs. He concluded that there is no special relationship to frogs, and argued instead that *A. grandiceps* was most closely related to the rhachitome family Dissorophidae. Thus another speculative phylogeny was quietly eliminated from the literature.

Barbara Stahl (1974, p. 246) frankly states that ". . . forms transitional between primitive types and more advanced ones are *not* available," and that therefore the investigators have difficulty in constructing a phylogenetic scheme to underpin the classification of frogs. She further states that "No one believes that any frog or toad now living can be likened to the ancestor of any other" (p. 248). This is a reasonable admission.

We hardly need to document any further the total inadequacy of the fossil record to supply even a carica-

ture of frog evolution, but to re-emphasize the point once more, we quote from Joseph Tihen, who served in the Department of Biology at Notre Dame University. In a 1965 paper (pp. 309-310) he said:

> At present one can only say realistically that the ancestor of the Anura (frogs) remains virtually unknown . . . About six anuran genera are known from the Jurassic . . . all are *true* Anura, with the specializations that characterize the order as a whole . . . *none* exhibit any recognizable primitive characteristics that *are not retained* by at least some living forms . . . our interpretation of the fossils is effectively based on evolutionary *inferences* drawn from comparative studies of modern Anura, rather than the fossils . . . [emphasis added].

Primitive or Advanced?

Creationists often refer to the question of subjectivism in relation to evolutionary theory. It is important to note what Tihen also wrote (p. 310) regarding the early candidates for anuran ancestry. Referring to the highly-fancied fossil frogs *Vieraella* and *Notobatrachus* as having free ribs, the author said

> We can say that they are primitive in this respect, not because these early fossils have them, but because *we are already convinced* that primitive types had free ribs [emphasis added].

After reviewing the three major criteria established for the identification of "primitive" characters in fossil organisms, Trueb (1973, p. 66) notes that since

> . . . the fossil record of anurans is so poor that for most characters, it is of little use in determining primitive states . . . we (evolutionists) are left little choice but to reason inductively on the basis of these (three) hypothetical criteria for primitiveness. The potential fallibility of the reasoning employed is obvious.

We see therefore that the term "primitive" is highly questionable when dealing with frogs. There is only variety and diversification. Many of the experts simply "see" what they want or expect to see, in accordance with the presuppositions they carry over from evolutionary theory.

Tihen provides an excellent example of this pervasive attitude:

> Interpretation of many myological (muscular) characteristics may involve a sort of circular reasoning. A certain condition exists in some group or groups that we believe to be primitive, and then use the condition as evidence of the primitive station of frogs that possess it (p. 313).

The simple fact remains that when undue speculation is dispensed with, a proper assessment of the anuran fossil record reveals the existence of basically modern-looking frogs at the earliest stages of their assumed evolution. Members of the order suggest no real evidence of evolutionary ancestry. It is probably for this very reason that "Current work on frog phylogeny has made little use of the existing fossil record" (Estes and Reig, 1973, p. 11).

Locomotion: Did Frogs Evolve by Quantum Leaps?

If evolutionists seem confused and puzzled over the assumed phylogeny of the anurans, similar problems arise when attempts are made to explain the processes which supposedly led to their rather unique mode of locomotion.

Most students have assumed that the frogs and their immediate ancestors were aquatic, because the origin of frog locomotion is only explicable in terms of evolution in water where the swimming-leaping motion had the function of pushing the "pre-frogs" into aquatic vegetation or into muddy substrates. According to this view the swimming-leaping movement in water was primary; whereas terrestrial leaping was secondary. Other views suggest that the adult "ancestors" of frogs were terrestrial animals using the saltatory locomotion as an escape mechanism.

Among the reasons given in favor of an aquatic genesis is that the demands on the swimming apparatus provided the basic requisite for jumping. Actually the swimming and leaping movements of adult frogs are very much alike, with the hind limbs acting in unison, thus giving the forward thrust in water and the leaping ability on land. If frogs were descended from an aquatic amphibian ancestor, it is logical to believe that this ancestor possessed the long tail common to all the supposedly early amphibians, allegedly derived ultimately from a rhipidistian fish. Therefore the frog group anurans had to lose their tails while still aquatic, which would mean the loss of a very efficient form of guidance while moving in water. To suggest that early frogs did this while *gradually* acquiring a new and less efficient means of aquatic propulsion, i.e. the rearward thrusting of the hind limbs, is asking a great deal and places much strain on one's credulity. Two biologists, from the University of Pennsylvania, and the Marine Biological Laboratory (Woods Hole), who studied and experimented with frog locomotion, concluded their study by postulating that "many different parameters must have evolved *in concert to produce a system capable of this explosive movement* [emphasis added]" (Lutz and Rome, 1994, p. 370).

Some authorities have argued forcefully for a terrestrial origin for anuran locomotion. Two such are Carl Gans and T. S. Parsons, (1966, pp. 92-99). Before presenting their case, the authors state that it is "dangerous to speculate about the origin of a particular adaptation in a group of essentially unknown ancestry." Referring to the assumed pre-frogs, the authors (p. 92) say that in many of these amphibian groups, the adult stages ". . . showed trends toward a relatively short-coupled body-form with sizable legs that extend laterally and cantilever the trunk between them." With splayed legs in much same way as modern crocodiles, forward locomotion is relatively awkward because the animal has to sway itself each time it takes a step. Gans and Parsons go on to say (p. 92): "It is not clear what produced the adaptive trends that led to the shortening of the trunk . . ." We agree that it is difficult to visualize such a large transformation which allowed the animal to remain viable at all stages.

Minelli, speaking of "adaptations" (p. 55), points out that if a certain feature is not continuously favored (by selection), it will disappear. This makes both preadaptation and "ordinary" adaptation difficult to accept as

viable evolutionary mechanisms. For example, some cave fish have lost their sight, and some reptiles, including snakes, have lost their legs. Minelli states that according to the "old" theory,

> reptilian features began to occur accidentally (mutational) but progressively among the amphibians. These features did them no good, but they did not harm them either. They were neutral as it were. When the environment changed, the animals endowed with these new characteristics were favored, and they asserted themselves. But this theory is *in contrast* with the banal statement that if a certain feature is not continuously favored, it soon disappears, as was the case with the eyes in cave-dwelling animals and the legs in crawling animals [emphasis added].

Obviously this would apply to all organisms including amphibians. It would seem to us that the only way adaptations would be useful would be if they evolved very rapidly to "fit" the new environment and the chances of this happening frequently are zero. Slow and gradual evolution would be out of the question. The only answer appears to be that the organisms possessed the genetic variability *right from the start.*

More Difficulties

In common with other major groups of plants and animals, the postulated evolution of the anurans from as yet undiscovered amphibian ancestors still poses mostly unresolved problems.

Writing in the massive treatise, *Evolutionary Biology of the Anurans,* W. Frank Blair (1973) examined a host of such difficulties. Besides the problem of the missing fossil evidence, the questions raised by Blair include problems relating to probable parallel/convergent evolution, how certain specializations arose and became "perfected," the mechanism of speciation, diversification, and relationships between various species. The obvious shortcoming of Blair's review is that while he succeeds masterfully in presenting all of these problems, he fails miserably, as do the other contributors to the volume, in arriving at feasible solutions. Estes and Reig (1973, p. 11) candidly declare:

> Although it is frequently expected that paleontological evidence may afford sound conclusions for various unsettled questions about the evolutionary biology of a given taxon, such an expectation will not necessarily be satisfied in the present paper.

Blair inquires as to "How much has our understanding of phylogenetic relations been clouded by convergent evolution?" As creationists, we should understand that many phylogenies are plagued by this very problem. It arises because evolutionists often have great difficulty in arranging the "lineages" by mistaking simple lateral variation within a type or kind for vertical (mega)-evolution. This holds true whether the morphological variability is among contemporaneous forms, or over vertical (different) time-periods.

Again Blair asks: "Why are some genera monotypic and seemingly have been monotypic or nearly so throughout their histories, while others split into many species?" For creationists, it presents no particular problem if one accepts the original and potentially variable created Biblical "kind" or "Baramin" as being roughly equivalent to the modern "family" taxon; although this would not be true for all types such as humans where there really is only one species, or at the most, one genus. It should, however, be apparent that the Creator did not endow every kind with the same range of genetic variability-some "families" are comprised of many more genera and species than others.

A comparison between anurans and mammals clearly illustrates this "disparity" in morphological variability. Structural (protein-producing) genes in frogs are much more divergent than in modern mammals, but in anatomy they are much less divergent. While frogs are now classified as a single order, mammals fall into 16 different orders!

> They (frogs and toads) have not been exempt from mutations but have varied in regulatory genes much less than mammals. Consequently, frog species are much more hybridizable than mammals (R. Wesson, 1991, p. 202).

While creationists accept speciation, they view the process of natural selection as a strictly limiting factor, capable of producing only changes on a small scale by acting on traits already present in the genetic population. Evolutionists argue that there is a certain amount of inconsistency in this view and continue to imagine unlimited changes among organisms over time, despite the lack of hard evidence in both genetic research and the historical (fossil) record (Newman, 1992; Goin and Goin, 1971, pp. 68-71).

Molecular Arguments

Because of the disappointing results obtained from fossils in their attempts to construct a viable anuran phylogeny, evolutionists have turned to biochemical studies of modern frogs and other amphibians. These, not surprisingly, have proven frustratingly contradictory (see Estes and Reig, 1973, p. 43). One series of DNA tests indicated both apodans (limbless amphibians) and urodelans (tail-bearing amphibians) were most likely derived from a common ancestral stock, while frogs probably originated from labyrinthodonts that were closely related to the ancestry of reptiles. Similar work by another group of specialists, however, supports totally different conclusions.

Karyological studies performed with selected vertebrates indicate that the so-called "primitive" frogs and salamanders, as well as some apodans, possess similar karyotypes, leading some authorities to suspect ancestral relationships between the Lissamphibians (a collective term denoting the three living amphibian orders). Hillis (1991, p. 26) states:

> Data from morphological and molecular studies strongly support the monophyly of the living amphibians and place the Lissamphibia as the sister group to the amniotes [reptiles, birds and mammals: those animals which have an amnion-a membrane enclosing the embryo].

However, Estes and Reig observe (p. 44), "The fossil record of modern amphibians does not shed light on the question of the reality of the Lissamphibia," and they further express caution in using this chromosomal data to verify the Lissamphibia hypothesis.

They also point out that the Triassic form *Triadobatrachus,* previously described in this paper, is ". . . well advanced in the direction of anurans . . .," and neither this fossil nor the other early anurans divulge any clues which point to relationships with any other group of amphibians.

Another Dead End

Apparently undeterred by this scientific revelation, some evolutionists such as Parsons and Williams (1963), prefer to imagine the existence of a "protolissamphibian" faithfully predicting its future discovery somewhere in the fossil record. In fact, the labyrinthodont *Doloserpeton annectens,* from the lower Permian of Oklahoma, has been cited as a possible "proto-lissamphibian," seemingly fulfilling some of the evolutionary requirements of such a transitional form. Yet upon closer scrutiny, *Doloserpeton* proved to be no closer to a "protolissamphibian" than other dissorophoids.

Although much has been made of the fact that *Doloserpeton* possessed pedicellate (bicuspid-like) teeth, its value as an indication of phylogenetic relationships is highly questionable, because analogous structures occur in the Teleostei, the bony fishes. Estes and Reig conclude their discussion of *Doloserpeton* with the following cautionary note:

> It is clear that additional work is necessary before pedicellate teeth are considered as a necessary protolissamphibian character state, or (perhaps more important) that the presence of such teeth in a labyrinthodont is unequivocal evidence of ancestry for any of the modern orders. Besides this, it is also clear that *Doloserpeton* has *no* features that specifically suggest relationships with frogs [emphasis added] (p. 45).

Conclusion

Our review of the claims for anuran evolution, as perceived by Darwinists, shows that these claims are simply not substantiated by fossil or molecular evidence. The extensive fossil record has not yielded any convincing discoveries which would support the idea that frogs and toads evolved from other orders of amphibians. "At present," said Tihen (p. 309), "one can only say realistically that the ancestry of the order Anura remains virtually unknown." Tihen's statement remains just as true to this day as we have seen with the comments of Minelli in 1987.

Even with the amphibians as a class, there is little compelling evidence of their alleged origin from crossopterygian fish of the Devonian. Many now share the opinion expressed by Parsons and Williams that the evidence is still insufficient for a decision on the question of amphibian ancestry (Wever, 1985, p. 9; Minelli, 1987, p. 20).

Finally we quote from two other modern authorities,

> The higher taxonomy of anurans is NOT well established. Present knowledge of many characters and the direction of their (alleged) evolutionary change *does not permit their utilization in the reconstruction of a phylogeny* (Duellman and Trueb, 1986, p. 515-emphasis added).

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