Proceedings of the International Conference on Creationism

Volume 9
Print Reference: 686

Article 75

2023

Unresolved Issues in Hypothetical Fish-to-Amphibian Evolution

David Prentice
Retired - Louisiana public schools

Recommended Citation
Prentice, David (2023) "Unresolved Issues in Hypothetical Fish-to-Amphibian Evolution," *Proceedings of the International Conference on Creationism*: Vol. 9, Article 75.
DOI: 10.15385/jpicc.2023.9.1.77
Available at: https://digitalcommons.cedarville.edu/icc_proceedings/vol9/iss1/75

Prentice, D. 2023. Unresolved issues in hypothetical fish-to-amphibian evolution [poster]. In J.H. Whitmore (editor), *Proceedings of the Ninth International Conference on Creationism*, pp. 686-687. Cedarville, Ohio: Cedarville University International Conference on Creationism.

UNRESOLVED ISSUES IN HYPOTHETICAL FISH-TO-AMPHIBIAN EVOLUTION

David Prentice, Kenner, Louisianna prentice@instruction.com

ABSTRACT

Most biology textbooks present as fact the idea that ancient fish came out of the water and evolved into amphibians. The most common scenario is that droughts dried up the bodies of water they lived in. Those with stronger fins slithered across the land to other ponds and lakes, acquiring stronger fins with each generation. These fins gradually evolved into legs while all of the other structures of amphibians evolved as well.

Such a scenario is contrary to the available evidence. Some of the changes that would have had to happen:

- Amphibian spines become segmented and bony. However, fish proposed as ancestors (coelacanths or lungfish) have a flexible notochord that never develops into a segmented spine.
- Two types of vertebrae, rhachitomous and lepospondylous, would have had to evolve independently.
- Amphibians would have to develop a pelvic girdle.
- Fins would have to develop into legs attached to the new pelvic girdle.
- Since the body weight would no longer be supported by water, both the bones and muscles would have to become much stronger.
- Swim bladders would have to develop into functional lungs.
- Eyes would have to change from focusing in water to focusing in air.
- Living crossopterygian fish and lungfish reproduce by internal fertilization. Every type of amphibians except the snakelike caecilians reproduces by EXTERNAL fertilization.
- All amphibians except newts undergo metamorphosis; coelacanths and lungfish do not.

The Lamarckian idea that new structures can be created by use and disuse of body parts (e.g., stronger fins) has been thoroughly falsified. The only way such changes could occur would be by a lengthy series of beneficial mutations.

There are six Paleozoic orders of amphibians and three modern ones. The only fish that had an overall shape similar to amphibians were crossopterygians, which were shaped somewhat like ichthyostegids. No proposed common ancestor has the features that would be necessary to give rise to more than one or two of the amphibian orders.

Even according to standard geologic dating, the supposed ancestral, transitional, and terminal fossils are in the wrong sequence.

KEYWORDS

Amphibian evolution

THE AUTHOR

David Prentice has a B.S. in Physics, an M.Ed. Curriculum & Instruction, and an M.A. Science Teaching. He has a Louisianna lifetime secondary certification in Physics, Chemistry, Biology, General Science, Mathematics. He has taught on creation and apologetics in 13 countries.

Unresolved Issues In Hypothetical Fish-to-Amphibian Evolution

by David A. Prentice, M.Ed., M.A.S.T.

2023 International Conference on Creationism

ABSTRACT

Most biology textbooks present as fact the idea that ancient fish came out of the water and evolved into amphibians. The most common scenario is that droughts dried up the bodies of water they lived in. Those with stronger fins slithered across the land to other ponds and lakes, acquiring stronger fins with each generation. These fins gradually evolved into legs while all of the other structures of amphibians evolved as well.

Such a scenario is contrary to the available evidence. Even according to standard geologic dating, the supposed ancestral, transitional, and terminal fossils are in the wrong sequence. In addition, many structural changes would have had to happen:

- Swim bladders would have to develop into functional lungs.
- Amphibian spines become segmented and bony. However, fish proposed as ancestors (coelacanths or lungfish) have a flexible notochord that never develops into a segmented spine.
- Two types of vertebrae, rhachitomous and lepospondylous, would have had to evolve independently.
- Amphibians would have to develop pelvic and thoracic girdles.
- Fins would have to develop into legs attached to the new pelvic girdle.
- Since the body weight would no longer be supported by water, both the bones and muscles would have to become much stronger.
- Eyes would have to change from focusing in water to focusing in air as eyelids developed.
- Living crossopterygian fish and lungfish reproduce by internal fertilization. Every type of amphibians except the snakelike caecilians reproduces by EXTERNAL fertilization.
- All amphibians except newts undergo metamorphosis; coelacanths and lungfish do not.

The Lamarckian idea that new structures can be created by use and disuse of body parts (e.g., stronger fins) has been thoroughly falsified. The only way such changes could occur would be by a lengthy series of beneficial mutations.

There are six Paleozoic orders of amphibians and three modern ones. The only fish that had an overall shape similar to amphibians were crossopterygians, which were shaped somewhat like ichthyostegids. No proposed common ancestor has the features that would be necessary to give rise to more than one or two of the amphibian orders.

MATERIALS and METHODS

Searches of scientific journals were performed using multiple sites including aaas.org, academia.edu, journals.plos.org/ plosone/, pnas.org, pubmed.ncbi.nlm.nih.gov, phys.org, researchgate.net, sciencedirect.com, and others. In addition, books on vertebrate paleontology were used as resources. Searches dealt with anatomical features of living and extinct fish and amphibians as well as stratigraphic positions of important fossil discoveries.

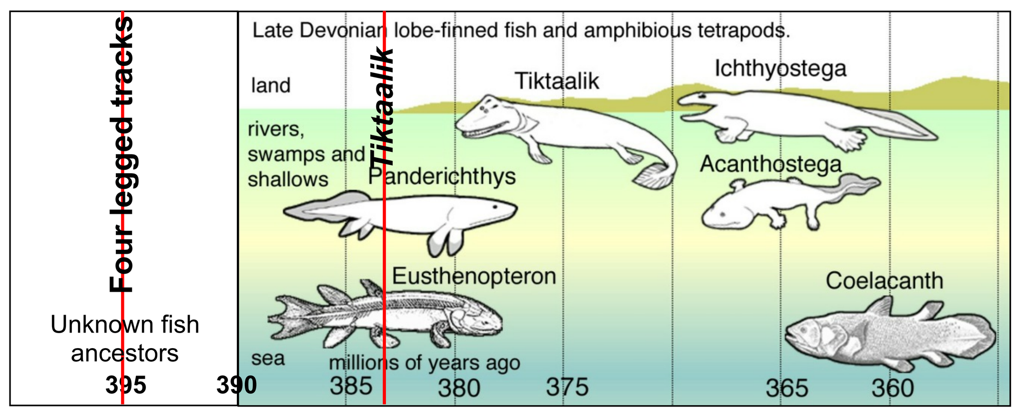
BACKGROUND

Most high school biology textbooks in current use tell students that millions of years ago some ancient fish such as *Eusthenopteron* crawled out of the water as a result of periodic droughts and gradually evolved into amphibians such as *Ichthyostega*.

The Lamarckian idea that use and disuse of body parts can cause the development of new body structures has been thoroughly falsified by experimentation. Living organisms do not acquire the features they need; they only develop the features coded for in their DNA. In addition, problems with the scenario of fish evolving as they slither from one body of water to another are seldom if ever mentioned.

1. FOSSILS OUT OF SEQUENCE.

(Note: Reference to evolutionary ages does not indicate agreement with those ages.)



https://commons.wikimedia.org/wiki/File:Fishapods.png. dave souza, CC BY-SA 3.0 <http://creativecommons.org/licenses/by-sa/3.0/>, via Wikimedia Commons

Tracks of four-limbed creatures have been found in at least four locations around the world (Niedzwiedzki et al., 2010; Ahlberg, 2018). They are dated 395 MYA. The commonly accepted "transition" from water to land, *Tiktaalik*, is dated after 383 MYA (million years ago). On the evolutionary time scale, this is 12 million years too late.

2. COELACANTHS AND LUNGFISH.

The Devonian fish *Eusthenopteron* (Order Crossopterygii) is considered an early form of the modern fish known as a coelacanth. It is often shown in museums and textbooks along with *Ichthyostega* or *Acanthostega* (Order Ichthyostegalia), the two amphibians believed to have looked most like it.

Eusthenopteron - Denver Museum (author photo)

Artist's conception of *Ichthyostega*- https://commons.wikimedia.org/wiki/File:Ichthyostega_BW.jpg Nobu Tamura (http://spinops.blogspot.com), CC BY-SA 3.0 <http://creativecommons.org/licenses/by-sa/3.0/>, via Wikimedia

PROBLEMS WITH COELACANTHS:

1. Modern coelacanths do not use their "lungs" to breathe. They use them as swim bladders to control their buoyancy.
2. They never use their fins for anything like walking.
3. They live in the deep ocean rather than in shallow lakes or ponds.

As a result, many paleontologists reject coelacanths as the ancestor of amphibians. They consider a different category of fish, the lungfishes (dipnoids), as a better candidate for the ancestors of amphibians.

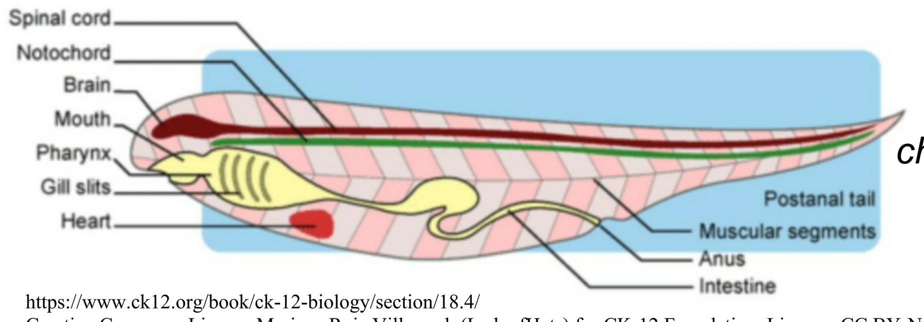
The Devonian lungfish *Uranolophus* - Author photo, Denver Museum.

1. In addition to using their lungs as swim bladders, some modern lungfish are able to use their lungs to breathe as well.
2. Many lungfish live in shallow lakes or ponds.
3. Some push themselves with their fins to slither across short distances on land or arch their backs to move along like inchworms. However, none of them actually walk in the same way that tetrapods do.

In addition, there are many difficulties that render lungfish unlikely ancestors.

3. FLEXIBLE NOTOCHORD VS. SEGMENTED BACKBONE.

Both coelacanths and lungfish have anatomical features that render either type unlikely ancestors for amphibians.



Typical chordate body plan

https://www.ck12.org/book/ck-12-biology/section/18.4/ Creative Commons License Mariana Ruiz Villarreal (LadyofHats) for CK-12 Foundation. License: CC BY-NC 3.0

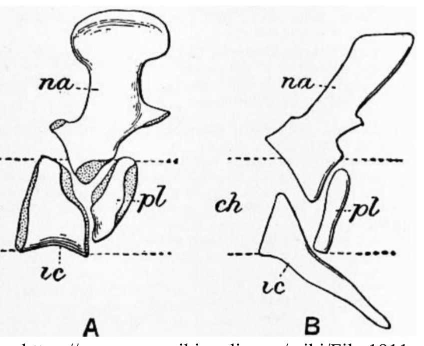
Every member of Phylum Chordata starts with a flexible rod of cells called a notochord. In almost all vertebrates, including amphibians, the notochord later develops into a segmented spine. However, the two types of fish proposed as possible ancestors of amphibians, coelacanths and lungfish, never develop a segmented spine. They maintain an uninterrupted notochord throughout their lives. (Annona et al., 2015; Reynolds, 1897; Bates, 2015; Redmer, 2020; Schmitz, 1998)

The DNA of the line evolving into amphibians would have to experience a great many mutations to cause them to develop segmented spines even though their ancestors did not have such structures.

4. RADICALLY DIFFERENT TYPES OF VERTEBRAE.

Rhachitomous. Three extinct orders of amphibians (Ichthyostegalia, Temnospondyli, and Anthracosauria) as well as reptiles and crossopterygian fish have rhachitomous type vertebrae. There are variations, but all are composed of:

- A more or less semicircular horseshoe-shaped piece (the *intercentrum*) that goes across the bottom of the notochord,
- Two wedge shaped pieces (*pleurocentra*), one on each side, and a neural arch on top through which the nerves run.



https://commons.wikimedia.org/wiki/File:1911_Britannica_-_Batrachia_-_Archegosaurus.png. *Encyclopædia Britannica*, 1911, Public domain, via Wikimedia Commons

The pieces start as part of the notochord, then ossify (turn into bone) and then fuse into a single unit.

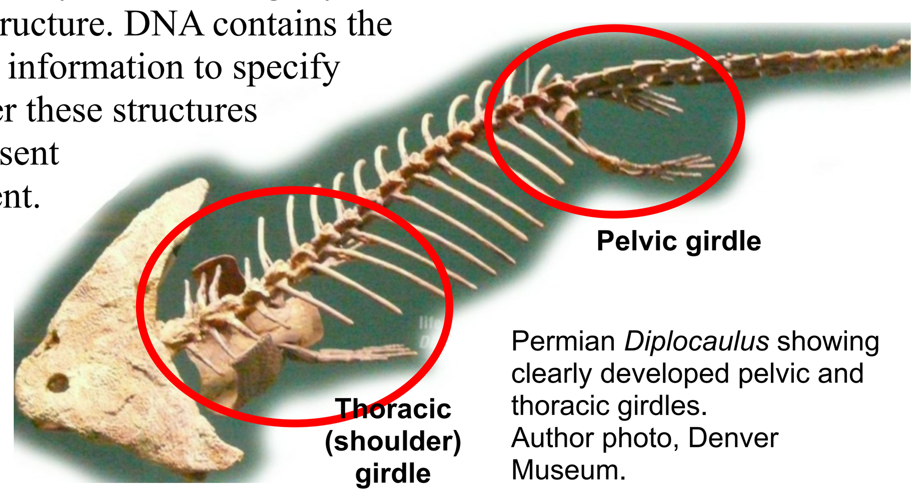
Lepospondylous. Three extinct and three living orders of amphibians have *lepospondylous* vertebrae that start as a single spool-shaped *centrum* that ossifies from surrounding tissue rather than the notochord, plus a neural arch on top.

This type is considered more primitive than the rhachitomous, though it appears later in the fossil record. There are no known common ancestors for the two different types of vertebrae. (Reynolds, 1897; Clack, 2012; Romer, 1996; Carroll, 2005)

https://commons.wikimedia.org/wiki/File:Tetrapod_vertebrae.svg. Smokeybjb, CC BY-SA 3.0 <https://creativecommons.org/licenses/by-sa/3.0>, via Wikimedia Commons

5. PELVIC GIRDLE AND ATTACHED STRUCTURES.

Fish fins are loosely embedded in muscle. In amphibians that have legs (all but some extinct aistopodans and nectrideans and living caecilians) the legs are firmly attached to a pelvic girdle and a thoracic girdle, bony structures rigidly attached to the backbone. Fish have no such structure. DNA contains the coding information to specify whether these structures are present or absent.



Permian *Diplocaulus* showing clearly developed pelvic and thoracic girdles. Author photo, Denver Museum.

6. PROPULSION.

Fish propel themselves by motion of the body and tail. Fins are used mainly for balance and steering.

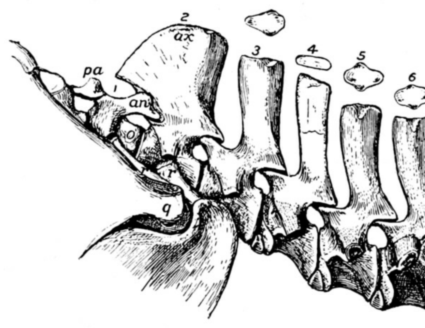
Amphibians propel themselves mainly with their legs, supposed to be derived from fins. (Clack, 2012)

7. INCREASED MUSCLE STRENGTH.

Since most of a fish's weight is supported by water, the fins do not experience much stress when it rests on the bottom. However, a fish out of water would be subject to much greater forces. The fins, supporting muscles, and backbone would all have to be strong enough to support the full body weight.

Land animals whose backbones must support their weight have reinforcing structures called zygapophyses between the vertebrae. The supposed ancestral fish did not have these processes. This would have made their backs rather weak. Ichthyostegalia, the only one of the extinct amphibian orders that resembled fish, had vertebrae more or less similar to the rhachitomous ones of its alleged fish ancestors except that zygapophyses were definitely present. This would have made their backs much better able to support their weight.

(Ahlberg & Clack, 1998; Ahlberg et al., 2005; Carroll et al., 2005).

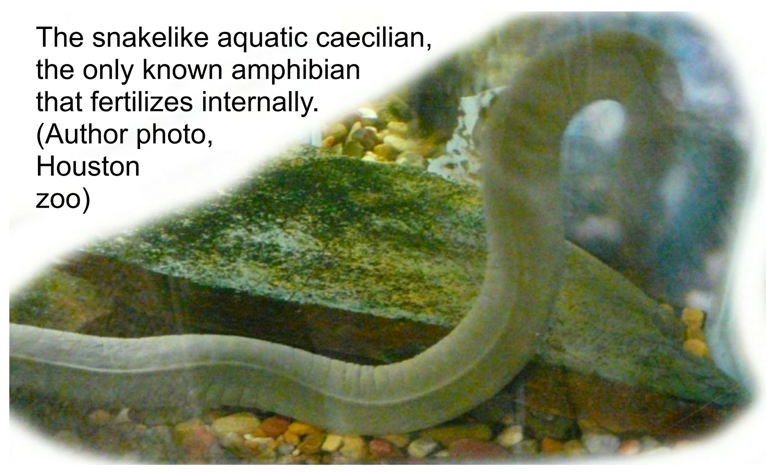


Typical land vertebrate backbone segment from *Ophiacodon* showing reinforcing zygapophyses. https://commons.wikimedia.org/wiki/File:The_Osteology_of_the_Reptiles_p100.png Samuel Wendell Williston, 1925, Public domain, via Wikimedia Commons

8. EXTERNAL VS. INTERNAL FERTILIZATION.

Some animals rely on internal fertilization, in which the male deposits sperm inside the female's body. Others use external fertilization, where the female ejects her eggs then the male deposits his sperm on them.

- The living fish supposed to be related to the ancestors of amphibians (coelacanths and lungfish) fertilize internally. (Anthony & Millot, 2017)
- However, all but one type of known amphibians (caecilians) fertilize externally.



The snakelike aquatic caecilian, the only known amphibian that fertilizes internally. (Author photo, Houston zoo)

In order for each new type of amphibian to develop, there would have had to be many types of ancient fish where many males and females living at the same time and in the same place experienced matching complementary mutations in their reproductive systems so that the male and female systems would continue to work together. .

9. METAMORPHOSIS.

All living amphibians except newts go through the process of metamorphosis to a greater or lesser extent. The development of frog larvae into tadpoles and then mature adults is an obvious example.

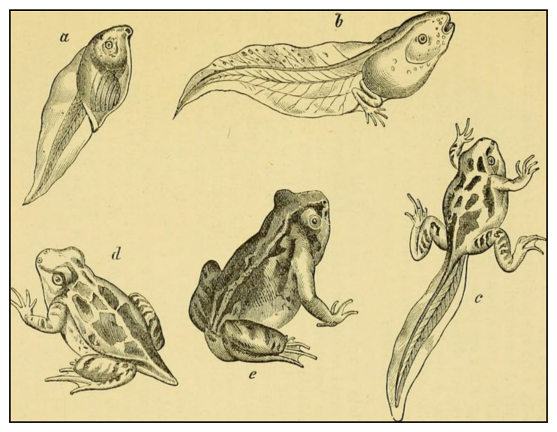
If the first amphibians evolved through mutations in the DNA of fish, it stands to reason that they would have inherited the feature of metamorphosis from the DNA of their crossopterygian or dipnoid ancestors. However, living crossopterygian fish and lungfish do NOT undergo this process. The only fish known to go through any sort of metamorphosis are:

Subclass Actinopterygii (ray-finned fish) –
- Some Eels go through five stages over several years (complete metamorphosis)
- Flatfish go through partial metamorphosis in which their skulls reform to place both eyes on the same side
- Salmon undergo partial metamorphosis from fresh to salt water.

Class Agnatha – lampreys (complete metamorphosis)

(Romer, 1966; Case, 1946; Colbert, 1980; O'Gogain, 2017)

None of these are considered relatives or ancestors of amphibians.



https://commons.wikimedia.org/wiki/File:British_reptiles_and_batrachians_(1888)_(14781336724).jpg Internet Archive Book Images, No restrictions, via Wikimedia Commons

10. MISSING TRANSITIONAL FORMS WITHIN AMPHIBIANS.

There are SIX EXTINCT ORDERS of amphibians:

SUBCLASS LABYRINTHODONTIA - all had "arch-type" rhachitomous vertebrae.
- Order Ichthyostegalia, the only order that looked like any of the fishes.
- Order Temnospondyli – water-dwellers with flat bodies and small limbs.
- Order Anthracosauria, supposed to be the ancestor of reptiles.

SUBCLASS LEPOSPONDYLI – All had "husk-type" lepospondylous vertebrae considered to be more primitive even though they are dated millions of years later.
- Order Aistopoda – long snakelike forms with up to 250 vertebrae. Most had no limbs and no pelvic girdle.
- Order Nectridea also included some forms with no legs.
- Order Microsauria – small amphibians.

There are THREE LIVING ORDERS:

SUBCLASS LISSAMPHIBIA – Though dated much later than the alleged first amphibians with rhachitomous vertebrae, they all have the "more primitive" lepospondylous type.
- Order Urodela or Caudata (salamanders and newts),
- Order Apoda or Caecilia (worm-like with no limbs),
- Order Anura or Salientia (frogs and toads).

There are no known fossil or living forms claimed to represent transitions from one type to another. (Romer, 1971; O'Gogain, 2017; Colbert, 1980)

CONCLUSIONS

Though the idea that fish might have evolved into amphibians might seem to be a minor point, it should be examined carefully. If it had happened, this would be a major step in the evolution of life However, the evidence does not support such a process and in fact argues strongly against it.

REFERENCES

Ahlberg, P. (2018). Follow the footprints and mind the gaps: a new look at the origin of tetrapods. *Earth and Environmental Science Transactions of the Royal Society of Edinburgh*. 109. 1-23. 10.1017/S1755691018000695.

Ahlberg P., & Clack, J, (1998). Lower jaws, lower tetrapods - A review based on the Devonian genus Acanthostega, Transactions of the Royal Society of Edinburgh, Earth Sciences. 89: 11-46.

Ahlberg, P., Clack, J., Blom, H. (2005). The axial skeleton of the Devonian tetrapod Ichthyostega. Nature 2005;437:137-40. Nature. 437. 137-40. 10.1038/nature03893.

Annona, G., Holland, N.D. & D'Aniello, S. (2015). Evolution of the notochord. *EvoDevo* 6, 30. https://doi.org/10.1186/s13227-015-0025-3

Anthony, J.D. & Millot, J. (2017). Crossopterygian. *Encyclopedia Britannica*. https://www.britannica.com/animal/crossopterygian, accessed 01/11/21.

Bates, M. (2015). The creature feature: 10 fun facts about the coelacanth. *Wired.* https://www.wired.com/2015/03/creature-feature-10-fun-facts-coelacanth/. Accessed 02/04/2021.

Carroll, R., Irwin, J., & Green, J. (2005). Thermal physiology and the origin of terrestriality in vertebrates. Zoological Journal of the Linnaean Society 143. pp. 345 - 358.

Case, E.C. (1946): A Census of the determinable Genera of Stegocephalia. *Transactions of the American Philosophical Society*, vol. 35, Part 4, pp 325-420 Phyllospondyli section of article

Clack, J. (2012). *Gaining Ground: The Origin and Evolution of Tetrapods*. Bloomingtom, IN: Indiana Univ. Press.

Colbert, E. H. (1980). *Evolution of the Vertebrates*, 3rd Edition. New York: John Wiley & Sons.

Niedźwiedzki, G. et al. (2010). "Tetrapod Trackways from the Early Middle Devonian Period of Poland." *Nature News*, Nature Publishing Group, 7 Jan. www.nature.com/articles/nature08623.

O'Gogain, A. (2017). Fossil Focus — The ecology and evolution of the Lepospondyli. *Palaeontology Online*, Volume 7, Article 11, 1-7.

Redmer, S. (2020, May 29). 10 Interesting Facts About Coelacanths. *WorldAtlas*. https://www.worldatlas.com/articles/10-interesting-facts-about-coelacanths.html.

Reynolds, S. H. (1897). *The Vertebrate Skeleton.* Cambridge Biological Series. London: C.J. Clay & Sons. 66, 70.

Romer, A. S. (1966). *Vertebrate Paleontology*, 3rd Edition. Chicago: Univ. of Chicago Press.

Schmitz, Robert. (1998). Comparative ultrastructure of the cellular components of the unconstricted notochord in the sturgeon and the lungfish. *Journal of Morphology.* 236. 75-104. 10.1002/(SICI)1097-4687(199805)236:23.3.CO;2-D.