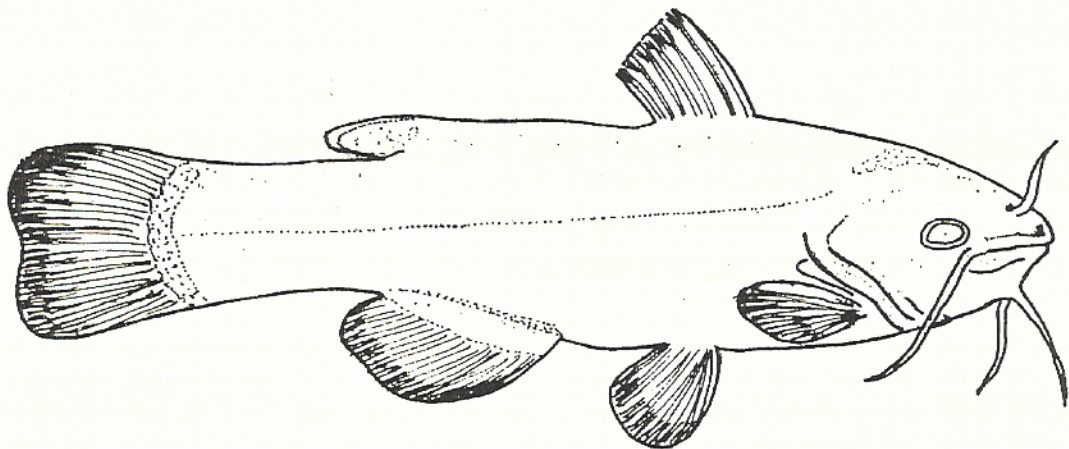
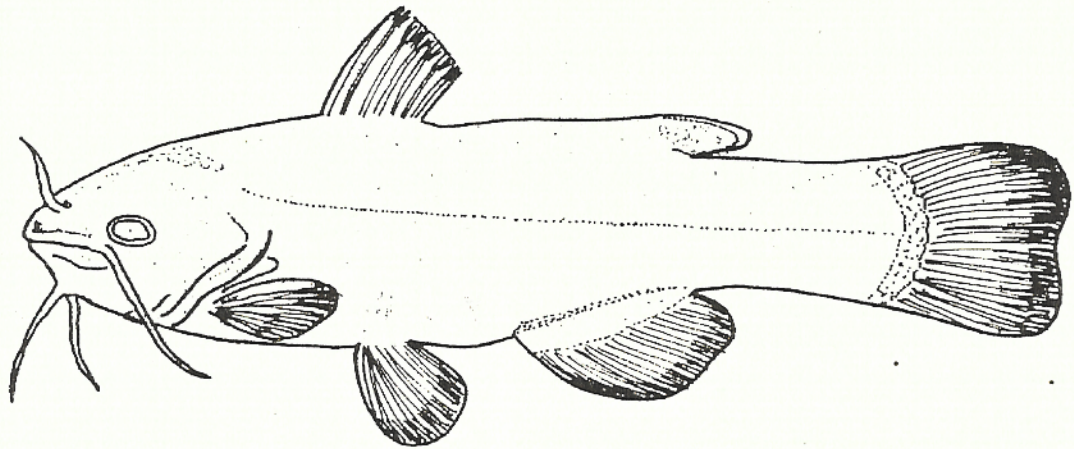


The Journal of

Spelean History

OFFICIAL PUBLICATION OF THE AMERICAN SPELEAN HISTORY ASSOCIATION



Volume 33, No. 4

October - December 1999

MYTH AND REALITY OF THE ALLEGED BLIND CAVE FISH FROM PENNSYLVANIA

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INTRODUCTION

It is not uncommon to find unsubstantiated reports of blind cave fishes in the speleological literature. Examples include accounts of hypogean fishes in France (Montalembert 1752), Italy (Scott 1866), and North Africa (Anonymous 1879) (for analysis of some of those reports, see Romero 1999, 2000). Although several species of cave fishes have been described for the United States (Romero 1998 a,b,c; Romero and Bennis 1998), we have found persistent, but yet unconfirmed, reports of a blind cave fish for Pennsylvania.

Cope (1864) published a paper in which he claimed the discovery of a new species of troglobitic (blind, depigmented, and obligatory cavernicole) fish from Pennsylvania. Despite the fact that the validity of such species is not recognized today, numerous other reports of cave fishes for that state have continued to be published until the present time (e.g., Kranzel 1986).

This paper is aimed to analyze those reports and to establish the facts that may have given credence to the belief of (as yet) the unconfirmed presence of a blind cave fish species for Pennsylvania. This article is part of the Cope Papers Project, an initiative aimed to analyze Cope's contributions to different fields of knowledge.

MATERIALS AND METHODS

I reviewed as much published literature on vertebrate cave fauna for the state of Pennsylvania as I could find. I conducted extensive searches not only in the speleological and ichthyological literature but also all the bibliographic material pertaining to these topics at the library of the Pennsylvania State University, College Park, PA. I also reviewed all the pertinent literature on the people mentioned in this article.

RESULTS

The First Claim

Edward Drinker Cope (b. Philadelphia, PA, July 28, 1840; d. Philadelphia, April 12, 1897) was one of the most prolific American naturalists. He published about 1400 articles and books in many different areas of knowledge. Most of them were on vertebrates, both extinct and living, but his list of publications also includes works on invertebrates, geology, anthropology, evolution, behavior, sociology, education, philosophy, religion, and history, as well as on issues of public interest of his times (Osborn 1931). Cope published 27 papers pertaining to speleology which makes him one of the pioneers of this science in the U.S. (Grady 1987, 1992; Romero & Romero 1999).

In his 1864 paper, Cope described three new species of fish. One of them, according to him, was a blind subterranean fish. In that paper he stated (correctly) that many aquatic

organisms found in subterranean environments are blind and that they belong to diverse taxonomic groups. He briefly reviewed examples of blind, subterranean fishes from around the world. He also explained that among silurid fish, there are many examples with reduced or sunken eyes. Then, he went on to describe a new genus and species of "blind silurid" which he called *Gronias nigrilabris* based on two specimens collected by Jacob Stauffer, Secretary of the Linnean Society of Lancaster, Pennsylvania, which he had received a year earlier.

It is occasionally caught by fishermen, and is supposed to issue from a subterranean stream, said to traverse the Silurian limestone in that part of the Lancaster county, and discharge into the Conestoga.

Two specimens of this fish present an interesting condition of the rudimental eyes. On the left side of both a small perforation exists in the corium, which is closed by the epidermis, representing a rudimental cornea; on the other the corium is complete. Here the eyeball exists as a very small cartilagenous sphere with thick walls, concealed by the muscles and fibers tissue attached, and filled by a minute nucleus of pigment. On the other the sphere is large and thinner walled, the thinnest portion adherent to the corneal spot above mentioned; there is a lining of pigment. It is scarcely collapsed in one, in the other so closely as to give a tripod section. Here we have lapsed an interesting transitional condition in one and the same animal, with regard to a peculiarity which has at the same time physiological and systematic significance, and is one of the comparatively few cases where the physiological appropriateness of a generic modification can be demonstrated. It is therefore not subject to the difficulty under which the advocates of natural selection labor, when necessitated to explain a structure as being a step in the advance towards, or in the recession from, any *unknown* [italics in the original] modification needful to the existence of the species. In the present case observation of the species in a state of nature may furnish interesting results. In no specimen has a trace of representing the lens been found.

The two syntypes described by Cope are deposited today in the Academy of Natural Sciences of Philadelphia and catalogued as ANSP 22082 and ANSP 22083. The label in the jar says: "Pennsylvania: Conestoga Creek, tributary of the Susquehanna; Coll. Jacob Stauffer." Fig. 1 is a drawing of the first of those syntypes.

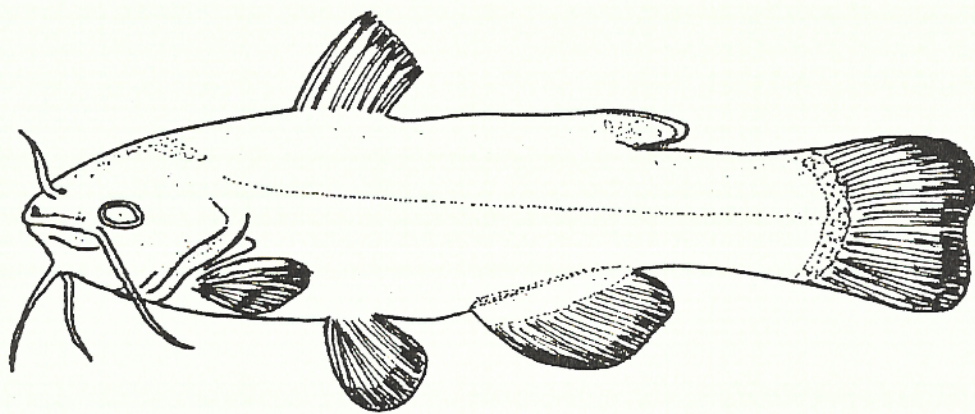


Fig. 1. Specimen of "*Gronias Nigrilabris*" (Cope 1864).

There are two issues here. The first one is the true location where these fish were found. The second is if the fish he examined were true blind cave fish or the result of a biological phenomenon.

For the first one, Cope provides no evidence whatsoever that the fish was of underground origin. Furthermore, his appreciation that the specimens that he had examined really represented individuals not only of a new species but even a new genus of true blind cave fish, has been countered by those who have examined them.

THE COUNTER CLAIMS

Henry Weed Fowler (b. Holmesburg, PA, March 23, 1878; d. Philadelphia, June 21, 1965), was the first curator of "cold-blooded" vertebrates at the Academy of Natural Sciences of Philadelphia, where the above-mentioned specimens were deposited (Conant 1966, Phillips 1964). Cope had donated most of his ichthyological collection (specimens of 341 out of the 424 nominal species) to the Academy (Smith-Vaniz & Peck 1991). Fowler, who had met Cope in 1894 (Fowler 1963), oversaw the transfer of Cope's entire alcoholic collection to the museum in 1898 and spent the next several years deciphering Cope's notes and organizing the collection (Smith-Vaniz & Peck 1991).

As early as 1915, Fowler challenged the validity of Cope's original interpretation of classifying these specimens as a new genus. In his paper on the nematognathous fishes contained in the collections of the Academy of Natural Sciences in Philadelphia, he named Cope's specimens as *Ameiurus nigrilabris* and placed this species next to *A. nebulosus* as indicating the close relationship between the two nominal species (Fowler 1915).

By 1945, Fowler was fully convinced that Cope's specimens are nothing more than unusual individuals of *Ameiurus nebulosus nebulosus*, the Brown Bullhead, as noted in his study of the fishes of the southern Piedmont and coastal plain of the United States (Fowler 1945:55). Unfortunately, Fowler never left any published rationale for dismissing Cope's original description as just a synonym of a fish that had been originally described by French ichthyologist Charles Alexandre LeSeur (b. Le Havre, France, January 1, 1778; d. Le Havre, December 12, 1846) (Hamy 1968) in 1819, based on a specimen collected also in Pennsylvania.

Fowler's initial reinterpretation has been confirmed by other ichthyologists who have examined Cope's specimens. Thus, Hubbs and Bailey (1947), in their analysis of the blind catfishes from the artesian waters of Texas, wrote:

Gronias nigrilabris Cope (1864:231-232) has also been regarded as a blind cave catfish related to *Ameiurus*. The specimens, however, were caught in Conestoga Creek, Pennsylvania, and were assumed to have issued from limestone caves merely because the specimens had defective eyes. They were well pigmented and had an air bladder. We see no reason for thinking that the types of *Gronias nigrilabris* were other than specimens of *Ameiurus nebulosus nebulosus* (LeSeur) with eyes defective due to injury or some other cause. Such fish are not infrequently encountered. The serrated pectoral spine as well as the locality precludes the relationship with *Ameiurus melas* postulated by Jordan and Evermann (1896:142). A figure of the type of *Gronias nigrilabris*, recently published by Fowler (1945:55, Fig. 160), confirms our reference of *Gronias nigrilabris* to the synonymy of *Ameiurus nebulosus nebulosus*.

Later, Taylor (1969), in his monograph of the catfish genus *Noturus* wrote:

The two syntypes (ANSP 22082-3) of *Gronias nigrilabris* Cope (1864) were examined in the course of this study. They do not represent a distinct genus, but are specimens of *Ictalurus nebulosus* (LeSeur) as maintained by Hubbs and Bailey (1947, p. 12). Fowler (1915a, p. 208) regarded them as a distinct species of *Ameiurus* [= *Ictalurus*]. Both have eight rays in each pelvic fin; the anal fins have 19 and 20 rays; the pectoral spines are long and serrated posteriorly. Contrary to report the eyes are present, but are asymmetrically developed - undoubtedly a teratological condition.

These analyses seem to have settled the issue. As a matter of fact, in modern ichthyological literature, Cope's specimens are no longer considered a distinct species (e.g. Eschmeyer 1998). That, together with the fact that Cope never provided any hard evidence that these specimens originated from hypogean (subterranean) environment, should have been sufficient as to dismiss any evidence of blind, subterranean fishes for Pennsylvania.

Yet, numerous authors have continued to publish accounts of an alleged blind cave fish for Pennsylvania.

THE PERSISTENCE OF THE MYTH

Walter Scott wrote on March 20, 1866 (two years after Cope's original description) an article published on April 7, 1866, in *Scientific American*, which reads as follows:

MESSRS. EDITORS. - It is well settled belief among many of our most intelligent residents, that underneath the city of Lancaster and vicinity there exists a vast cavern. Many facts are recited giving extreme plausibility of this theory, the most important of which may be briefly stated, as follows: -

The city is located within the great limestone belt extending across the south-eastern part of the State, and of all the geological formations limestone the most abounds in caverns, many of which are known to be of vast extent. In sinking wells in certain parts of the city, the bottom crust breaks through before reaching water, and the pump is suspended from above by chains.

There have been several well authenticated cases in the vicinity of the city, of the crust of the earth breaking and engulfing farm animals. In two instances men engaged in plowing, saw their teams disappear beneath the surface and only a funnel-shaped cavity remained to mark the spot.

The earthquake of Sept. 29, as well as several lighter shocks, may be very reasonably accounted for this theory. Huge masses of rock breaking from the roof of the cavern and falling into the depths beneath may cause such a quaking of the upper crust and dull rumbling noise as that which astonished the inhabitants on that day.

One of the most convincing proofs of the existence of this subterranean cavity is the discovery of an eyeless catfish in the waters of the Conestoga, a stream flowing past the city and supposed to connect with the hidden

waters beneath. This fish is entirely destitute of organs of sight, having only small spots in place thereof.

In a celebrated grotto of Italy eyeless fish have been found, and it is inferred that the eyeless catfish of the Conestoga must originate in a similar underground locality and escape through the fissures of the rocks. I have endeavored to present as concisely as possible the principal facts bearing on the theory, and leave it for others to elaborate.

Walter Scott. Columbia, Pa. March 20, 1866

Note that the penultimate paragraph very likely makes reference to Cope's specimens since it refers to the same locality. The last paragraph is, however, even more surprising because there are no records whatsoever of blind cave fishes in Italy. Scott (on whom I have not been able to find any information) may have been referring to a citation by Athanasius Kircher (b. Geisa, Germany, May 2, 1602; d. Rome, Italy, November 28, 1680), a polymath, notorious for his unsubstantiated assertions about underground creatures that included dragons and other mythical animals (Romero 2000). Kircher (1665) writes about cave fishes and cites a couple of localities in Italy, as well as others in Greece and Switzerland. However, there is no evidence whatsoever of blind cave fishes for Europe.

Thus, Scott seems to be referring to Cope's specimens and offers no evidence that those fishes are actually hypogean but that they "must originate in a similar underground locality and escape through the fissures of the rocks."

Five years later we find another article, also in *Scientific American* that, again, refers to blind cave fishes in Pennsylvania (Anonymous 1871).

It is well known that great trouble and expence [sic] have been caused by the sinking of a portion of the track of the new Jefferson Railroad, where it crosses a swamp in Ararat township, Pa. It has been found, say the Montrose Republican, that under the swamp is a subterranean pond of several acres in extent and of considerable depth. This pond, of several acres in extent and of considerable depth. This pond is covered by about six feet in depth of black earth, which supports a heavy growth of woods. The trees are mostly soft maple, pine, hemlock and birch, many of them ranging from six inches to three feet in diameter. Last fall it was discovered that the subterranean pond contained many fish, of the kind usually found in ponds in this part of the country - pickerel and "shiners" among others - but all without eyes! In the darkness of their subterranean abode, they have no use for the organ of vision. The Ball Pond, about a mile and a half distant, is now "growing over." A considerable part of it has become subterranean within the last twenty years, and, probably, before many years it will be entirely covered like the other. This pond is about twenty acres in extent. For some distance from the shore, it is filled with a dense growth of water-lilies, and these, no doubt, furnish the foundation on which the superstructure of earth is commenced.

This article is unsigned, but given the nature of the topic, the locality (Pennsylvania), and the publication (*Scientific American*), we can not rule out that Walter Scott was its author.

Since then reports of blind cave fishes for Pennsylvania have been dismissed. Mohr (1953), for example, writes that:

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There are no blind salamanders or eyeless fish in Pennsylvania caves, no white crayfish or blind beetles (p. 15).

Blind, white fishes have been reported at intervals but always have proved to be half-starved, pale, eyed fishes, often washed into caves during floods and trapped there as the waters subsided.

A single blind fish is known from Pennsylvania. It was a blind Catfish sent to Edward Drinker Cope in 1864, from the Conestoga Creek, Lancaster County. While some thought that the fish came from a subterranean stream feeding into the Conestoga, ichthyologists say that blindness is by no means extraordinary in this group of fishes (p.18).

Holsinger (1976), in his extensive monograph on the cave fauna of Pennsylvania, wrote:

There are apparently no established records for fishes from Pennsylvania caves. True cave fishes (troglonites) are unknown from the Appalachian Valley and most of the Appalachian Plateau, although accidentals are sometimes observed in cave systems of Virginia, West Virginia, and eastern Tennessee. The northern muddler, *Cottus b. bairdii* Girard (sculpin family Cottidae) is reported from a few caves in the central and southern Appalachians but has not been found in caves as far north as Pennsylvania (p. 87).

Despite this lack of evidence supporting the true blind cave fishes for Pennsylvania, Kranzel (1986) thinks blind cave fish for that state are real. After summarizing the Scott (1866) paper, he wrote:

Troglonitic species are scarce; in fact, troglonitic vertebrates are unknown in PA. There are apparently no established record for fishes from PA caves, yet this single 1864 specimen exists. Believing that the blind catfish came from a subterranean stream feeding the Conestoga, the discoverer sent it to the cave exploring naturalist, Edward Drinker Cope in 1864. Cope was engaged in the world-wide examination and reclassification of fishes. Ultimately, he published 125 papers on fishes, describing over 220 new species.

The fact that no other eyeless catfish specimens have been observed either in the creek or in local caves would not totally confirm the fishes nonexistence. Perhaps it inhabits inaccessible crevices and fissures in the limestone or caves that have no entrances. The author was not trying to defend the blind species existence, but merely using the specimen to substantiate his theory of a vast underground cavern in the vicinity of Lancaster.

Note that Kranzel, 1) does not provide any hard or new evidence for the existence of blind cave fish species for PA; 2) his speculations are the same in kind as Cope's conjecture for the existence of this type of creature; and, 3) he ignores all other sources that, based on the examination of specimens, are not consistent with his explanation (Fowler 1945, Hubbs and Bailey 1947, Taylor 1969). However, part of his reasoning is that "The fact that no other eyeless catfish specimens have been observed either in the creek or in local caves would not totally confirm the fishes nonexistence." In other words, based on the fact that

nobody can prove a negative (e.g., to prove that "Santa Claus does not exist"), Kranzel perpetuates this myth.

CONCLUSIONS

There is no evidence supporting the reports of blind cave fishes for Pennsylvania. The original description of alleged troglobitic fishes for that state was based on an erroneous identification. It has been well documented that because of his constant rush to publish, many of Cope's writings were either superficial or contained numerous errors, a fault that was even recognized by his most ardent supporters which gave him a reputation for sloppiness (Davidson 1997, Romero & Romero 1999). Later accounts of troglobitic fishes for Pennsylvania are little more than repetitions of Cope's early assertions not substantiated by either the examination of the fish he described nor by extensive cave explorations.

Unless an actual troglobitic fish is captured in Pennsylvania, we must assume that such fish do not exist and attempts to challenge this assertion by asking to prove a negative should be dismissed as incongruent thinking.

ACKNOWLEDGMENTS

William G. Saul of the Academy of Natural Sciences provided useful information on the specimens originally classified as "Gronias nigrilabris" and deposited at the Academy's collection. Olga Mayayo drew Fig. 1. Andy Miller read the manuscript and made valuable suggestions. This is contribution no. 1 of the Cope's Papers Project.

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