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JACQUES BESSON, CAVE EELS AND OTHER ALLEGED EUROPEAN CAVE FISHES

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INTRODUCTION

According to Shaw (1992:227), a standard reference to the history of speleology, in 1569 Jacques Besson was the first to mention in print a reference to a cave fish. This article is aimed to 1) analyze Besson's record of fish; 2) summarize other records for European cave fishes while asserting the validity of those records; and, 3) to establish the true chronology of cave fish records before the first truly confirmed cave fish species, *Amblyopsis spelaea* (De Kay 1842), was described.

JACQUES BESSON AND HIS "LITTLE (CAVE?) EELS"

Despite being considered one of the most important and prolific writers in engineering of the 16th Century, not much is known about Jacques Besson. The following sketch is based on the few biographical sources about him: Arnaud (1894), Droz (1976), Keller (1964, 1973).

It is believed that Besson was born around 1530 near Grenoble, France. He described himself as of Colombieres, near Briancon in the Dauphine, high up in the Alps on the southeastern border of France. There are records indicating that he might have taught mathematics in Paris sometime in the 1550s. By 1557 he was working as an engineer for the city council of Lausanne for whom he designed a water-engine as part of a fountain. In 1559 he was a resident of Geneva and that year he published his first book, *De absoluta ratione extrahendi olea, & aquas e medicamentis simplicibus*, which dealt with chemical analyses and practical distilling. By then he may have been well connected since that book had a praising preface by one of the most noted natural historians of the time: Konrad Gesner (b. Zurich, Switzerland, 26 March 1516; d. Zurich 12 March 1565).

By 1561, when Besson acquired Swiss citizenship, he was going through tough times. He fell seriously ill and was living in poverty. By then he may have been married and had a daughter. In addition to being a teacher, an apothecary, and a mechanical engineer, he became pastor of the Reformed Church. In the town of Villeneuve-de-Berg, in the Vivarais, west of the Rhone Valley, the Protestant community was flourishing and expanding and felt the need for a preacher. Given the serious lack of preachers, almost any educated person qualified for the job. But this position was far from a solution to his problems; when he arrived at his parish, he found that the two religious parties in the town were in a civil war. He and his family were forced to live in another man's house.

In 1563 he left the ministry for Lyons to work distilling oils and waters. In an attempt to avoid angering the church, which punished those who left without permission, he wrote them a letter in which he admitted to inadequacy while claiming, however, that those who appointed him (in essence, the church) were faulty in doing so. In 1565 we found him in Paris and two years later in Orleans where he taught mathematics and demonstrated his inventions to an admiring audience. In 1567 he published his second book, *Le Cosmolabe*, about a versatile and very elaborated mathematical instrument of his own invention, that could be used for almost all the purposes of navigation, surveying, cartography, and astronomy and, when not required for any of them, could double as a reading desk.

In 1569 King Charles IX went to Orleans and Besson entered the King's service as a mathematician and engineer. In that year, he published his most famous book, *Theatrum Instrumentorum et Machinarum* which was the first printed work of mechanical inventions. Between 1578 and 1626 this book was published in four languages and had seven editions. It was also widely plagiarized and pilfered. There he introduced cams and templates (patterns used to guide the form of a piece being made) to the screw-cutting lathe, thus increasing the operator's mechanical control of tool and workpiece and permitting the production of more accurate and intricate work in metal. He also improved the drive and feed mechanisms of the ornamental lathe and described a more efficient form of waterwheel, considered a prototype of the water turbine. In this book he depicts different kinds of machine tools, pumping plants, ploughs, military engines and other machines he had observed in use in different parts of Europe. In reality, it is doubtful that many of these machines were ever in operation, since they are not mechanically viable. Yet, Besson shows great ingenuity in his designs, especially in that of a screw-cutting lathe.

After the Massacre of Saint Bartholomew's Day in 1572 (which actually began on August 24 and ended in October) in which 70,000 French Protestants, or Huguenots, were murdered, he fled France. Besson died in Orleans in 1573.

Besson often used completely new concepts and made major contributions as an inventor. His screw-cutting lathe, which used a cord with an attached weight instead of the earlier springy poles,

L'ART ET SCIENCE

DE TROUVER LES EAUX
ET FONTAINES CACHEES SOVBS
terre, autrement que par les moyens vulgaires
des Agriculteurs & Architectes, par laques Bes-
son Dauphinois, Mathematicien.



Aux Presses

A ORLEANS,

Pour Pierre Trepperel, Libraire, en la rue de l'Escrivainerie,
deuant la porte du cloistre lainté Croix.

M. D. LXIX.

Avec priuilege du Roy pour dix ans.

was a very important invention in the development of the machine-tool industry and of scientific instrumentation. He also invented a practical fire-engine that later became common. His work shows the technological visions of the day while pointing the way to future developments (see also Besson 1571, 1573).

In his 1569 "L'art de science de trouver les eaux et fontaines soubz terre . . .," he reported "little eels" (*petites anguilles*) in a cave stream. Although Shaw (1992:227) claims that such observation took place "in a cave stream in France" the fact of the matter is that Besson did not give the locality of where he made that observation. The passage in reference reads:

Les entrees sont comme portaux voustez & estroits, ainsi que le tout on experimente en entrant en semblages chasteaux natureles soubz terre, la ou lon trouue avec torches de fort grands lacs, & courans d'eaux viues, mesme qui bien souuet produisent des petites anguilles qui n'ont guere affaire de l'air pour leur nourriture. (Besson 1569, 1969:41, notice that we have transcribed it in its original spelling).

[The entries are like narrow arch portals, so all the people coming into these virginal natural subterranean marvels, need to use torches to see big lakes and currents of lively waters, from which one can see small eels for which there is nothing to eat but air.]

There is no indication of either the locality or of the fish itself. He does not describe the fish as being blind and/or depigmented (what would have been extraordinary characteristics to even the casual observer). Thus is it unclear whether he observed a true cave fish, actual eels (*Anguilla anguilla*), or a member of some European freshwater fishes with eel-like bodies that are sympatric with the areas he traveled to (France and Switzerland). Those fish families include Petromizonidae, Cobitidae, Siluridae, and Clariidae (Blanc et al. 1971).

OTHER EARLY REPORTS ON EUROPEAN CAVE FISHES

Besson may have been the first person to report in a publication of what he thought were cave fishes for Europe, but certainly he was not the only one. The second was Athanasius Kircher (b. Geisa, Germany, 2 May 1602; d. Rome, 28 November 1680). He was a prolific Jesuit priest polymath who published 44 books and left more than 2000 manuscripts and letters on varied topics. One of his most famous books was *Mundus subterraneus* (1665), probably the first printed work on speleology. There he wrote about the origin of subterranean water and described all kinds of alleged cave animals (including giants and dragons). On page 85 of part 2, in 'book 8', there is indeed a description of cave fishes.

So I had much to tell about the subterranean animals, that we know. But from these, that can be in the deep and spacious holes in the earth, we can not present much, because we do not know them; from several examples however it appears that there are fishes and other animals, for Plinius writes that in Greece the earth, bursting open due to an earthquake, threw out a river with a large number of fishes, that without doubt had bred in a underground river. [Kircher gives no references to Plinius] There is also in the landscape of Krain close to the town Haubach a field, that every year about the Spring gives much water with fishes, so that in a few days the field changes in a Lake full of fishes. But this subject is sufficiently discussed before. [He probably meant Laibach instead of Haubach, the old name for Ljubljana in Slovenia, with its temporary lakes like Czernica - with springcaves and ponors].

Cysatus confirms the same, saying: in Switzerland rivers rise from the caves of the mountains, that flow from May until September, but stop the rest of the time. He adds to that, that the rivers, as they come out of the mountains, are full of fish, and that it is clear, that they come with the waters from below the earth. [Cysatus is probably the Swiss astronomer Johann Cysat that in 1618 discovered Orion Nebula; Kircher gives no reference].

We think that it is not implausible that, as under the earth all kind of fishes occur and live, also earth animals stay there, that is all kind of Mice, Snakes, Dragons, as well as others, that find their origin in rotten matter.

These references to subterranean fishes, however, are vague, unsubstantiated, and given Kircher's reputation as an uncritical repeater of other people's tales, highly suspect (Romero 2000a). Furthermore, he makes no reference to the features that characterize true hypogean fishes: blindness and depigmentation.

The third reference to subterranean fishes in Europe was by Marc-Rene Marquis de Montalembert (b. Angouleme, France, 16 July 1714; d. Paris, 29 March 1800). He was an aristocrat, military man, and an engineer known for his design of fortifications. Montalembert (1748) reported a blind, subterranean fish in one of his properties in the Southwest of France. His description was as follows:

In a spring at Gabard, Angoumois, near one of (Montalembert's) estates, it is common to fish either blind or one-eyed pike; one-eyed ones always miss the right eye and among the blind ones, the right eye seems further reduced than the left eyes. This spring is a kind of bottomless pit; there are small groups of floating plants at the surface, which impede the use of fishing lines, which makes fishing a long and difficult process; however Montalembert was fortunate enough to capture a young pike with its right eye missing; this spring drains its water into the Lissone river; despite this connection the local people say that one eyed or blind pikes are never fished in the river, while the spring contains one-eyed or blind ones only.

Apparently, Montalembert left no drawings, much less a preserved specimen. He said that what he saw was a pike. That, by itself, is not surprising. The pike (*Esox lucius*) is, by far, the most common freshwater fish of the Northern Hemisphere. The fact that this fish can be identified as a pike despite being blind is not surprising either. Many subterranean fishes are very much identical to their surface ("epigean") forms except for the lack of eyes and pigmentation. But Montalembert never mentioned depigmentation in his description. Furthermore, he says that some of the fish lacked one eye and when that was the case, it was always the one on the right side. True cavernicoles show the same degree of reduction in both eyes. Finally, the location mentioned by Montalembert cannot be found today nor has any true blind cave fish ever been described for Europe (Romero 1999).

Another unproven report of blind cave fish for Europe is that of Scott (1866) who wrote about such a fish in Italy without specifying source or locality. Reports of blind cave fishes for North America, have been analyzed elsewhere and found to be unsubstantiated (Romero 2000b).

CONCLUSIONS

All reports of European blind cave fishes are unsupported by scientific evidence. Two of them (Besson and Kircher) do not even describe them with the features typical of hypogean fishes while the third (Montalembert) is suspect. Furthermore, no true cave fish is known for Europe at the present time.

From the chronological viewpoint, although all three records precede the description of the first blind cave fish described in the Western Hemisphere (*Amblyopsis spelaea* by De Kay in 1842) (Romero & Bennis 1998) and are thus pre-Linnean, there is an even earlier reference to a blind cave fish that, in this case, was probably true. That is of a cavernicole fish from China (*Sinocyclocheilus hyalinus*), first reported in 1541 (Chen et al. 1994).

LITERATURE CITED

Arnaud, E., 1894, Note sur Jacques Besson, Bulletin de la Societe d'Etudes des Hautes Alps, 13:218-219.

Besson, J., 1559, De absoluta ratione extrahendi olea & aquas e medicamentis simplicibus: accepta olim a quodam empirico, postea vero ab eodem Bessono locupletata, & rationibus experimentisque confirmata, liber. Tiguri, Apud Andream Gesnerum juniorem, 42 p. illus. 17 cm.

Besson, J., 1567, Le cosmolabe; ou, Instrument universel: concernant toutes obseruations qui se peuuent faire par les sciences mathematiques, tant au ciel, en la terre, comme en la mer, Paris, Par Ph.G. de Roville.

Besson, J., 1569, L'art et science de trouver les eaux et fontaines cachees sous terre: autrement que par les moyens vulgaires des agriculteurs et architectes, Orleans: E. Gibier, [6] leaves, 83 p. [We used the reprinted version by Editions Coral, Columbus, Ohio, published in 1969].

Besson, J., 1569, Theatrvm instrvmentorvm et machinarum, Cum Franc. Beroaldi figurarum declaratione demonstratiua, Lvgdvni: Apud B. Vincentium, [22] p., 60 plates, 40 cm., Plates engr. by Jacques Androuet du Cerceau and Rene Byvin.

Besson, J., 1571, Description et vsaige du compas euclidien: contenant la plus part des obseruations qui se sont en la geometrie perspectiue, astronomie, & corographie, Paris: Galiot du Pre, en la rue Saint Iaques, a l'enseigne de la Galere D'Or, et au premier pillier de la grand salle du Pallays, 5 leaves; 20 cm., (4to).

Besson, J., 1573, Art et moyen parfaict de tirer huyles et eaux, de tous Premierement receu d'un certain empirique confirme par raisons & experiences, Nouuellement corrige & augmente d'un second livre . . . Paris: Galiot du Pre, 31 [i.e. 32] ll. illus., 16 cm.

Blanc, M., P. Banarescu, J.-L. Gaudet & J. C. Hureau, 1971, European Inland Water Fish, A multilingual catalogue, London, Fishing News (Book) Ltd.

Chen, Y.-R., J.-X Yang and Z.-G. Zhu, 1994, A new fish of the genus *Sinocyclocheilus* from Yunnan with comments on its characteristic adaptation (Cypriniformes: Cyprinidae), Acta Zootaxonomia Sinica 19 (2):246-253.

De Kay, J. E., 1842, Zoology of New York or the New-York Fauna, Part IV Fishes, Albany, W. & A. White & J. Visscher.

Droz, E., 1976, Chemins de L'Heresie, Testes et Documents, Geneve, Slatkine.

Keller, A., 1964, Theatre of Machines, London, Chapman & Hall.

Keller, A., 1973, The Missing Years of Jacques Besson, Inventor of Machines, Teacher of Mathematics, Distiller of Oils, and Huguenot Pastor, Technol. Culture 14: 28-39.

Kircher, A., 1665, *Mundus subterraneus*, in XII libros digestus; quo divinum subterrestris mundi opificium, mira ergasteriorum naturae in eo distributio, verbo pantamorphou Protei regnum, universae denique naturae majestas & divitiae summa rerum varietate exponuntur, Amsterdam, J. Janssonium & E. Weyerstraten, 2 vols.

Montalembert, M.-R., 1748, *Observations de Physique Generale*, I, Histoire de L'Academie Royale des Sciences, Annee M. DCCXLVIII, Avec les Memoires de Mathematique & de Physique, pour la meme Anne, pp. 27-28.

Romero, A., 1999, The Blind Cave Fish That Never Was, *N. S. S. News*, 57(6):180-181.

Romero, A., 2000a, The Speleologist Who Wrote Too Much, *N. S. S. News*, 58(1):4-5.

Romero, A., 2000b, Myth and Reality of the Alleged Blind Cave Fish from Pennsylvania, *Journal of Spelean History*, 33(4):67-75.

Romero, A., & L. Bennis, 1998, Threatened Fishes of The World: *Amblyopsis spelaea* De Kay, 1842 (Amblyopsidae), *Environmental Biology of Fishes* 51(4):420.

Scott, W., 1866, Probable Existence of a Great Cavern Under Lancaster, Pa., *Scientific American*, (April 7, 1866),14:228.