John Samuel Budgett (1872–1904): In Pursuit of Polypterus

What drove scientists in the 19th and early 20th centuries to return again and again to the tropics, where the climate was appalling, risk of life-threatening illness a daily prospect, and the political situation fraught with danger? What possible questions could engender such stoic persistence? The goal of two turn-of-the-century biologists—John Samuel Budgett and Nathan Russell Harrington, both of whom died in the attempt—was to document the embryonic development of Polypterus, a fish found in the lakes, river margins, swamps, and floodplains of tropical central and western Africa and the Nile River system. Budgett, the more successful of the two, undertook four long, arduous expeditions between 1898 and 1903. The embryos he collected provided the basis for our understanding of Polypterus development for almost 100 years. This is the story of the pursuit of Polypterus and of the importance assigned to missing links between fishes and tetrapods.

Polypterus

Discovered, described, and named in 1802 by Geoffroy St. Hilaire, Polypterus—a genus of 10 green-to-yellow-brown species, the largest of which can reach a meter in length (Figure 1)—posed a real conundrum for Victorian naturalists. What was one to make of an animal with

- a pair of lungs opening to the ventral wall of the pharynx, as seen in tetrapods and lungfishes and distinct from the single dorsal air bladder of teleost fishes
- pectoral and pelvic fins with fleshy basal lobes superficially resembling lungfish fins but with a fringe of numerous fin rays (lepidotrichia) not seen in lungfishes
- a subdivided, sail-like dorsal fin unlike that of any other fish
- a spiracle (persistent gill cleft), as seen in sharks and other cartilaginous fishes

Was Polypterus then a bony fish, a cartilaginous fish, or a lungfish? Or was it perhaps even a primitive amphibian, in which case it would be a tetrapod and not a fish at all? In 1861 Thomas Henry Huxley created an order, Crossopterygii, to house those extinct and extant animals that possessed lungs and fleshy pectoral fins with lepidotrichia. Recognizing the specialized features of the two modern genera, Polypterus and Calamoichthys (Erpetichthys calabaricus (the rope fish, which is longer and more slender than Polypterus)), Huxley established a separate group (the tribe Polypterini) within the order Crossopterygii for them, noting

Thus both ends of the Crossopterygian series appear, if I may use the expression, to be cut off from the modern representatives of the suborder; Polypterus being separated from those members of its suborder with which it has the closest zoological relations, by a prodigious gulf of time, and from the fossil allies which are nearest to it in time, by deficient zoological affinities. (Huxley 1861, pp. 445–446)

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