

58. ASPECTS OF LUNGFISH DEVELOPMENT

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The first vertebrates recognizable as tetrapods appeared in the mid-Devonian. It is generally agreed that their ancestors were lobe-finned fish. What is not agreed is how close either of the extant groups of lobe-finned fish, lungfish and coelacanths, is to the actual ancestor of the tetrapods. The soft anatomy of living lungfish shares many similarities with that of living amphibians. These similarities are not present in either coelacanths or any members of the other extant bony fish, the ray-finned fishes. Many very well preserved lungfish from the Devonian possess specialized features that would appear to exclude them from being ancestral to the tetrapods. I am hypothesizing that lungfish in the Devonian may have included metamorphosis in their life cycle and that neoteny may have been an early corollary. These reproductively mature larval lungfish would not have had the specialized features of the metamorphosed adults. They may have had a close relationship with the ancestral lobe-finned fish, which is currently believed to be a panderichthiad fish. There are a number of larval features of living lungfish that suggest paedamorphosis. Also of interest is the very large genome of living lungfish, which they share with some families of urodele amphibians and which is highly correlated with neoteny in these groups. I and my students and colleagues are exploring several lines of research to test this hypothesis. First, we are looking for deficiencies in the lungfish thyroid axis that might be comparable to those found in neotenic amphibians. Second, we are probing the lungfish genome for highly repeated transposable elements that might account for its very large size. And third, we are looking at the patterns of gene expression associated with the development of lungfish fins, pectoral girdle, axial skeleton and head that can be compared with living tetrapods and other groups of living fish such as the more primitive ray-finned fish (*Polyodon*, *Polypterus*) and cartilaginous fish (*Heterodontus*). This is a ‘work-in-progress’. Some of our current data will be presented.