STRETCHING THE DEFINITION OF 'PAST' TO ITS LIMITS

*With this contribution from Professor **Daniel Pauly** of the **Institute for the Oceans and Fisheries** at the **University of British Columbia** which stretches our definition of the past much deeper in time, we simultaneously are presented with his challenge, and I quote, of looking so far back into the past "to a limit that no one will be able to stretch further." (To see Prof. Pauly's prior look in OPN into deeper time, see the 25th edition). ~RMW*

The most ancient growth curve

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As a student, I learned that the Cambrian (539 – 487 million years ago) was the earliest period with abundant and varied metazoan life. However, this 'sudden' appearance of a wide range of fossils was hard to explain, not least to Charles Darwin, whose conception of evolution was slow and gradual.

Then, a book appeared that suggested the invention of eyes facilitated predation, which led to the need for armor and consequently, to bodies that left easily recoverable fossils[1]. Voilà, the Cambrian explosion was explained.

Except for sponges, whose chemical traces appear in the fossil record over 600 million years ago, the first metazoans seem to have appeared at the end of the period now known as the Ediacaran, which lasted 96 million years, and ended with the Cambrian. These metazoans had no head, no mouth, no appendages to grasp things with, and therefore no way to prey on their neighbors.

But they had to eat, and they did – at least in the small Ediacarans of the genus *Parvancorina* – by orienting themselves against water currents near the sea floor, which were rendered turbulent by a ridge in front of their bodies. This turbulence then caused food particles (bacteria, phytoplankton) to be deposited on their back (see Figure 1), where they were consumed by phagocytic dorsal cells[2]. Thus, they had the energy required for growth, but how did they grow?

Fortunately, various sites have been identified, starting in the Ediacaran Hills of South Australia, where large numbers of these animals were in underwater avalanches. Some of the sites have yielded hundreds of specimens of different sizes, all entombed at the same time.

When dug up and studied, neat length-frequency (L/F) data sets can thus be produced which can be analyzed using methods used for studying the growth of tropical fish and invertebrates, both of which lack the annual 'rings' that make it easy to 'age' them.

As I earlier did for Ordovician trilobites[3], I applied the Electronic Length-Frequency Analysis (ELEFAN) software I developed in the early 1980s to study the growth of tropical fishes to the L/F data of 221 *Parvancorina minchami* collected by paleontologists from rocks around the White Sea, in Northwestern Russia, and estimated the growth parameters of the standard von Bertalanffy growth equation from these data[4].

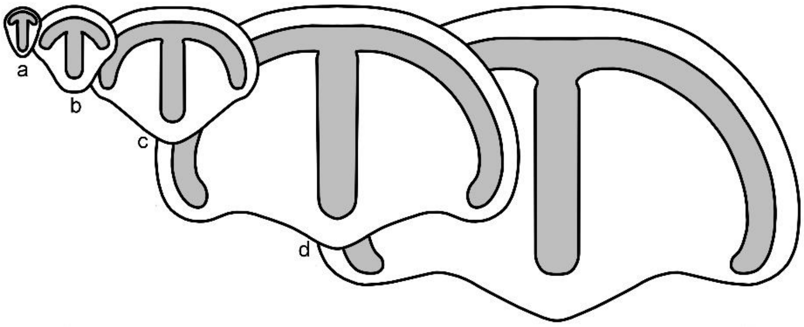

Figure 1. Body shape changes with growth in the Ediacaran *Parvancorinal minchami*. Left: 'Juvenile' stages (a – c); d: 'pre-adult' stage. Right: 'adult' stage.

So, now we know how Ediacaran animals around what is now the White Sea grew: it took them 3–4 years to reach lengths of approximately 2 cm. Paleontologists can now use this growth curve to draw various inferences about the ecology of these weird animals.

As for me, I might have traced the growth curve for the most ancient animal so far, i.e., based on fossils at least 550 million years old. Will I make it into the *Guinness Book of World Records*?

References

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Growth of the enigmatic Ediacaran *Parvancorina minchami*

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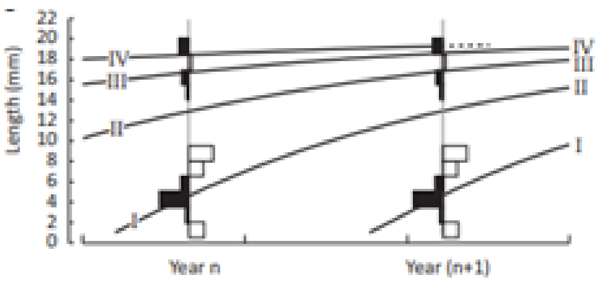

Figure 6. Growth and mortality of the Ediacaran *Parvancorina minchami* Glaessner.