Is our earliest known ancestor a tiny, gobby blob?

Chinese fossil 1mm long sheds light on evolution Discovery will help fill gap in origins of vertebrates

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You won't find it in your family album, but a tiny prehistoric creature with a baglike body, a huge mouth and no anus has become the best candidate yet for our earliest known ancestor.

Thought to have lived as long as 540m years ago, the creature is the oldest known member of a large group of animals known as deuterostomes, which includes vertebrates – such as humans – as well as starfish, sea urchins and a host of other fauna.

While it is highly unlikely the new species is our direct ancestor, scientists say the discovery of the fossils sheds light on the early stages of our evolution.

"What we are suggesting here is that this is the earliest, oldest, most primitive of the deuterostomes," said Simon Conway Morris, professor of palaeobiology at Cambridge University, and a co-author of the research. "This is, if you like, the starting point of an evolution which led ultimately to things as different as a sea urchin, starfish and rabbit," he said.

Discovered in sedimentary rock in Xixiang county in the Shaanxi province of central China, the species has been dubbed Saccorhytus coronarious for its sac-like, globular body and large mouth. Just one millimetre in length, the tiny animals are believed to have lived on the sea bed, where they would have nestled between grains of sand and moved by wriggling.

"When you look at them under the microscope they look like tiny grains of black rice, frankly – they are pretty uninteresting – but as soon as you put them under the electron microscope, the detail becomes absolutely phenomenal," said Conway Morris who, along with colleagues from China, has published the discovery in the journal Nature.

Among the details revealed by such techniques are a series of folds or wrinkles around the creature's mouth which, the authors argue, could have allowed the animal's mouth to dilate – allowing it to swallow relatively large prey. Like humans, the creature has symmetrical halves.

The large quantities of water the animal would have swallowed while feeding, added Conway Morris, were probably ejected through a number of openings that can be seen on each side of its body.

“These are, we suggest, the precursors of what we call the gill slits, which you see in a fish,” he said. The role of small pores across the body, he adds, are more of a mystery, although he suggests that they might have been involved in securing the animal to sand grains, possible by releasing some sort of adhesive, or may otherwise have played a sensory role.

Perhaps most intriguingly, the animal appears to be lacking an anus. Conway Morris admitted it was possible that the team simply had not spotted it but the worm-like acoels also lack one. “These things are so small, you can envisage something which is basically just a digestive sack with holes on the side,” he said.

Imran Rahman, museum research fellow at the Oxford University Museum of Natural History and an expert in the field, said: “These are really interesting and to my mind surprising fossils. [They have the] potential to greatly improve our understanding of the early evolution of deuterostomes, which is the major group to which vertebrates – including humans – belong, so they are obviously going to be important going forwards for understanding our evolutionary history.”

The tiny size of the fossils, he added, was particularly remarkable, noting that previously discovered fossils of younger deuterostomes were often several centimetres in length.

“That kind of opens up the tantalising prospect that maybe some of these oldest animals were really microscopic as well,” Rahman said.

It’s a point that could shed light on an enduring conundrum, said Conway Morris: why there is an apparent blank in the fossil record from about the time that animals are thought to have emerged based on the so-called “molecular clock” – an approach that estimates the dates of evolutionary splits from the rate at which genetic differences accumulate.

If animals such Saccorhytus were microscopic, they could only be preserved in very exceptional circumstances, said Conway Morris. “They basically slip through the fossilisation net.”

While Conway Morris admits the idea is speculative, he said the latest discovery made it an intriguing possibility. “It is not the only idea in town, but the fact that these very primitive forms seem to be extremely small as well might be a pointer in that direction,” he said.