

Rock pools that take us back 3.7bn years

■ Scientists very excited
■ Medicinal substances

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A LONG a stretch of South African coastline are some special rock pools that have become windows into what our world looked like 3.7 billion years ago.

In the rock pools are green mats of what appear to be algae, but they are actually living fossils that date back to when the Earth was young. Their discovery has scientists excited. The green mats are stromatolites, layer upon layer of cyanobacteria and diatoms, that live in water with high concentrations of calcium carbonate, and undertake photosynthesis.

The diversity of bacteria in each of these pools is so great that researchers even believe there are new pharmaceutical substances to be discovered, including possible anti-cancer drugs.

Stromatolites were considered rare, that was until they were spotted in abundance along the Eastern Cape coast, south of Port Elizabeth.

According to Professor Renzo Perissinotto, who holds a research chair in shallow-water ecosystems at the Nelson Mandela Metropolitan University (NMMU), he and his team have so far identified 540 rock pools that hold stromatolites.

These pools, he believes, might explain how the Earth evolved its oxygen-rich atmosphere and provide the reason why our earliest ancestors learnt to move.

The earliest stromatolite fossils have been dated to 3.7 billion years and were around at a time when the Earth was a very different place to what it is today.

"It would have been hellish back then," explains Perissinotto. "The sky would have been a red or orange, with no oxygen, and seas would have been green because of the high iron content. There was lots of volcanic activity."

However for the stromatolites, this was a happy time that lasted more than 2 billion years, when conditions were perfect for them and they faced no competition.

But the theory is that their success ultimately led to their downfall.

Vast mats of photosynthesising stromatolites filled the atmosphere with oxygen which in turn allowed metazoa (more complex and multicellular organisms) to evolve.

These metazoa, the theory goes, burrowed into the



RARE FIND: Green mats are stromatolites, layer on layer of cyanobacteria and diatoms, that live in water with high concentrations of calcium carbonate. Usually rare, they are in abundance along a 200km stretch of the Eastern Cape.

mats and fed on them.

"They would have grazed on them, like cows grazing on a field," says Perissinotto.

Stromatolite formations declined sharply, but some survived and have clung on up until the present.

Prominent living communities have been found in Western Australia, Ireland

and the Bahamas.

But the South African stromatolites are the most extensive.

"Why it is so exciting is that the structures of the South African stromatolites are very similar to those found in the fossil record," Perissinotto says.

In South Africa, stromatolites occur where freshwater mixes with seawater in the



STORY TO TELL: Professor Renzo Perissinotto and his team collect stromatolites from a rock pool close to Port Elizabeth in the Eastern Cape.

intertidal area.

But while multicellular organisms have been fingered as being responsible for the downfall of stromatolites, researcher Dr Gavin Rishworth, also of NMMU, has seen behaviour that suggests that it is more complicated than that.

He has been investigating rock pools along the Eastern

Cape coast and has noticed multicellular organisms living in harmony with stromatolites.

"It didn't make sense, as it was thought that they would destroy them. We needed to find out why they were coexisting."

He came to the conclusion that these organisms were using these green mats to hide from predators and to take

advantage of the oxygen-rich environment.

It may be a relationship that goes back hundreds of millions of years and multicellular organisms might be partly off the hook in causing the great stromatolite die-off of 500 million years ago.

Perissinotto believes this offers a glimpse into what

was happening all that long time ago.

"What might have happened is that during the day the metazoa took comfort from the stromatolites, with their increased oxygen levels, then at night they would go out to feed. And this required them to develop mobility."

The stromatolite downfall,

says Perissinotto, might have come instead from the changing chemistry of the oceans.

But in the future, Perissinotto, his team and five international universities will be delving deeper into the secrets hidden in these rock pools hoping to obtain a better understanding of that time when life had just begun.