The world's oceans are anaemic and this scientist is trying to find out why

RN By Ann Jones for Off Track

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PHOTO: Andrew Bowie and PhD candidate Morgane Perron aboard the RV Investigator. (ABC RN: Ann Jones)

The world's oceans depend on iron for growth but a third of all oceans are said to have become anaemic — essentially creating a vast blue barren desert.

Iron is one of the essential trace elements of life on earth. It is formed deep within stars then scattered across the universe by collapsing supernovas, it is then secreted in our soils, hiding in our glaciers, floating in our oceans and carried in our blood.

"Iron is everywhere: it's on human skin, it's in dust," says Associate Professor Andrew Bowie, a chemical oceanographer, as he stands next to a rain sampler on board the RV Investigator.

"We're on a ship right now, made of metal, largely made of components including iron."

But ironically — pun intended — much of the world's oceans don't have much iron in them at all.

"Almost one third of the world's oceans are anaemic — they are limited by the amount of iron that is available," says Associate Professor Bowie.

"The amount of iron in the ocean is like looking for a pinhead in about 200,000 Olympic-sized swimming pools. That sort of gives you an idea on the concentration range: it's vanishingly small.

"Having said that, if you had maybe three of those pinheads, that would change the ocean from being iron limited to being iron sufficient."

It's hard to believe that such a small ratio of a mineral could make a difference in the ocean, but Associate Professor Bowie explains that a tiny amount of iron is incredibly important.

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Listen as Off Track's Ann Jones goes on board the RV Investigator to learn how iron enters the ocean.

"Iron is used in a number of different processes, both in humans, both in plants, in order to stimulate growth," he says.

PHOTO: The equipment on the mast includes a clean air intake system. (ABC RN: Ann Jones)

It is used by tiny organisms called phytoplankton which float in the water and photosynthesise for energy. Just like a land-based plant, in the process of its photosynthesis, phytoplankton absorbs carbon dioxide and produces oxygen.

"Approximately every second breath we take as humans is supplied by the marine plants in the ocean," says Associate Professor Bowie.

"It's doing humans a service, this phytoplankton growth, putting oxygen out for us to breathe but also pulling carbon dioxide out of the atmosphere, and this carbon dioxide is currently warming the planet."

Associate Professor Bowie, along with colleagues and post graduate students are on the RV Investigator, trying to capture evidence as to how micronutrient trace elements like iron, but also copper, cobalt, nickel and manganese among others, enter the ocean.

"All these elements are essential for growth; of plants, of humans, of animals, they're all needed for growth in different ways, and they're all different concentrations and different ratios to each other.

"When we make our measurements in the ocean, we don't only look at iron, we look at all these elements together, because they will have a subtle effect on the function of the ocean.

Sampling such minute amounts — remember, one pinhead or so of iron particles — in the vast space of the ocean is a delicate business.

PHOTO: Scientists change filters within a special hood to ensure the samples are not contaminated. (ABC RN: Ann Jones)

As the ship motors on, they harvest the trace elements from the air above the ocean, and from rainfall before it joins the watery mass.

The samples taken are handled with extreme care, in clean suits, in laminar airflow booths and even clean rooms to ensure that the samples are not contaminated. Filters and bottles are cleaned with acid before they are used to ensure that not a stray particle could remain.

The air-intake for the system is on a mast at the front of the ship and turns on and off automatically to ensure that the system does not take in air from the ship's own stacks.

Researchers led by Associate Professor Bowie are attempting to map how these elements enter the ocean naturally, and next to the large contingent of Australia, this could be through bushfire smoke, dust storms or other emissions.

Associate Professor Bowie also contributes his work to a global consortium of researchers called Geotraces who gather data to try to more accurately predict the role the ocean will play in the future of the world's climate.

The RV Investigator will run long transects around Australia's coast over the next year or so, sampling the air everywhere she goes.

PHOTO: At the front of the Investigator is a tall mast with scientific equipment. (ABC RN: Ann Jones)