Ocean fertilisation by buoyant flakes

A presentation by Bru Pearce of Envisionation on behalf of Sev Clarke

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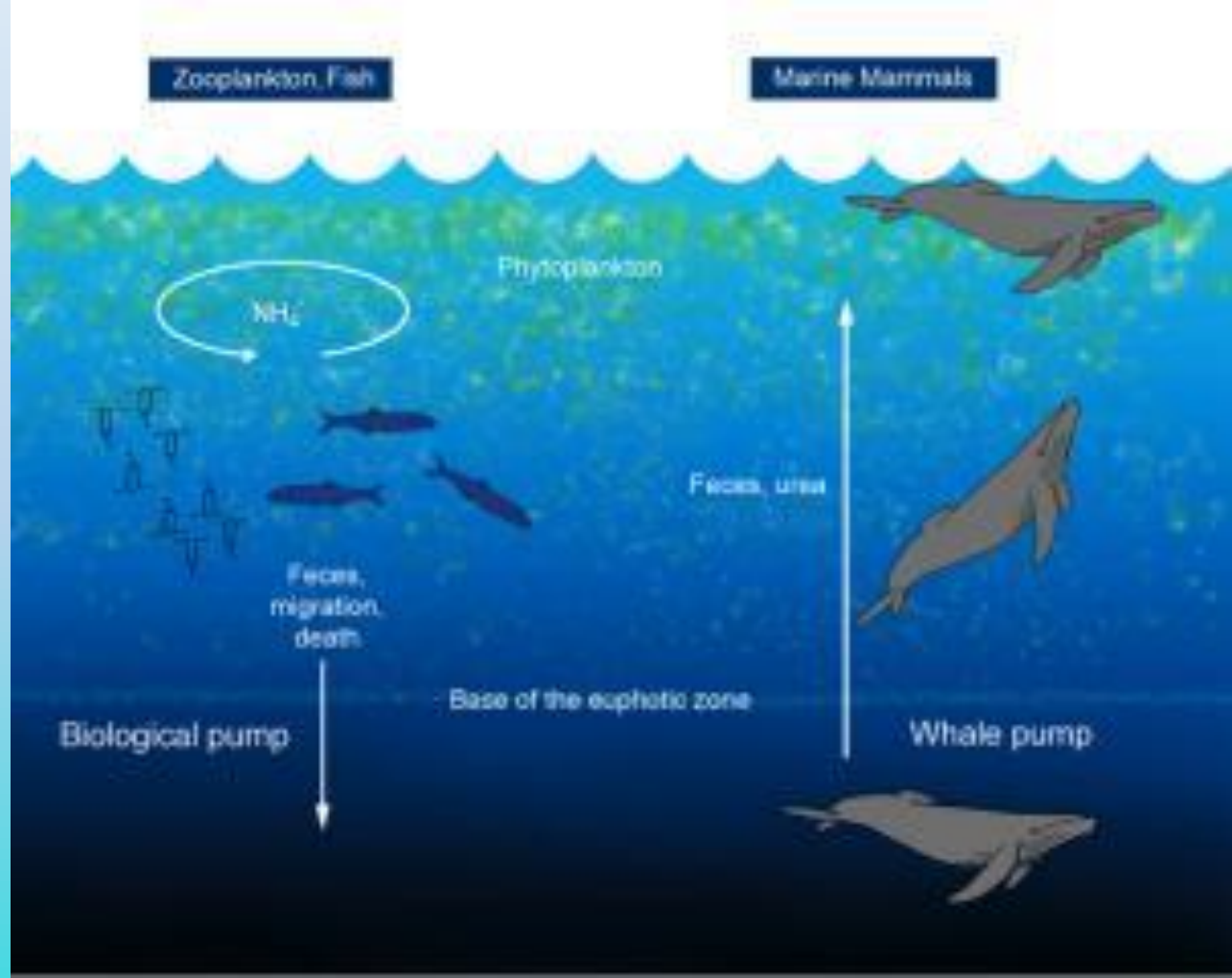
The Blue Planet.
In the last 50 years it has lost 40% of its phytoplankton which leads us to ask should it really be this colour?

Just 400 years ago had the same picture been taken from space we might well have christened it the Turquoise Planet

This planet had a far greater biosphere totalling possibly 2 to 6 times the current amount of organic carbon

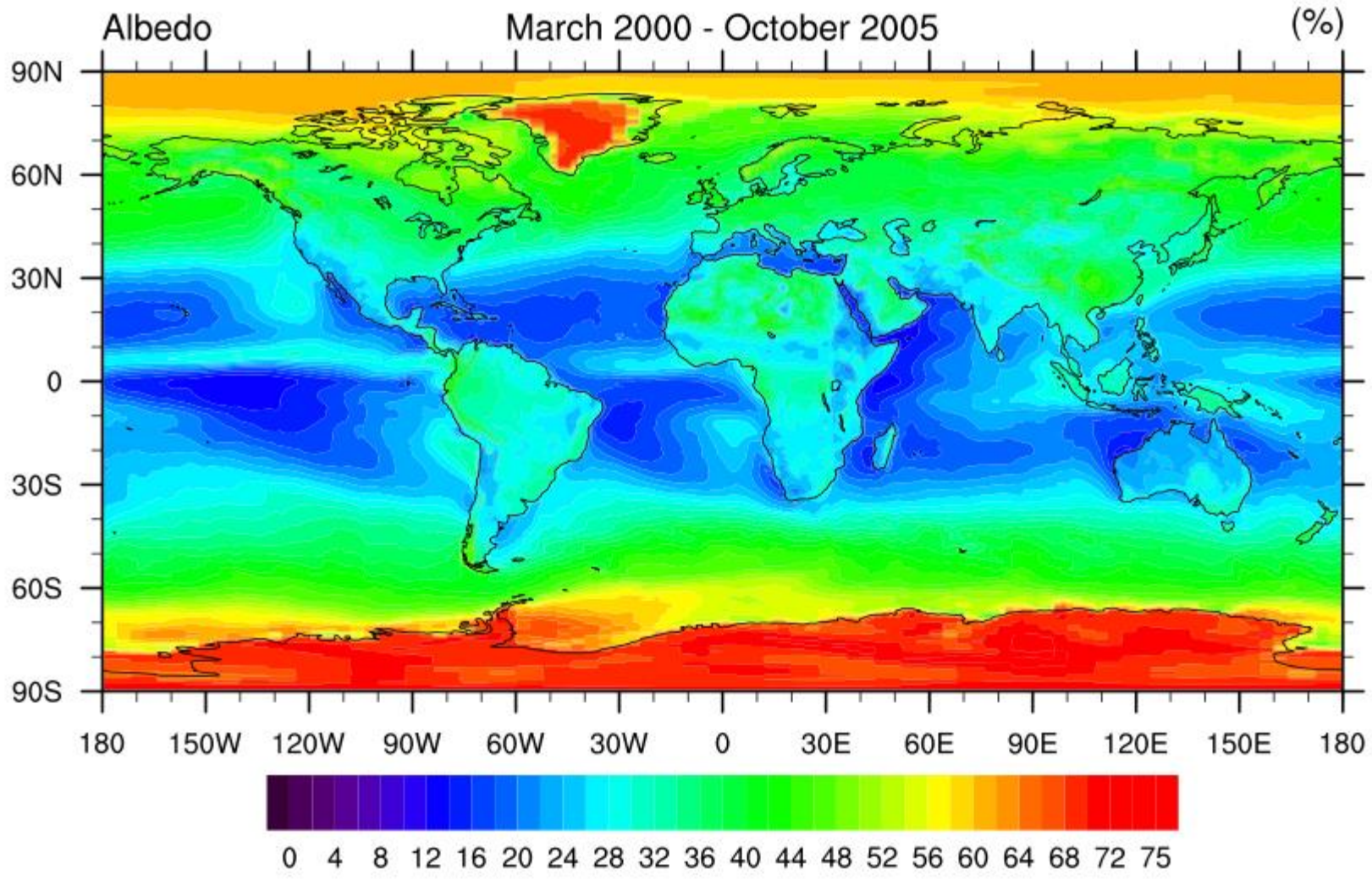
As a consequence it was far more resilient than it is now

That was before we are killed more than 90% of the whales and massively reduced the numbers of large fish in the sea.

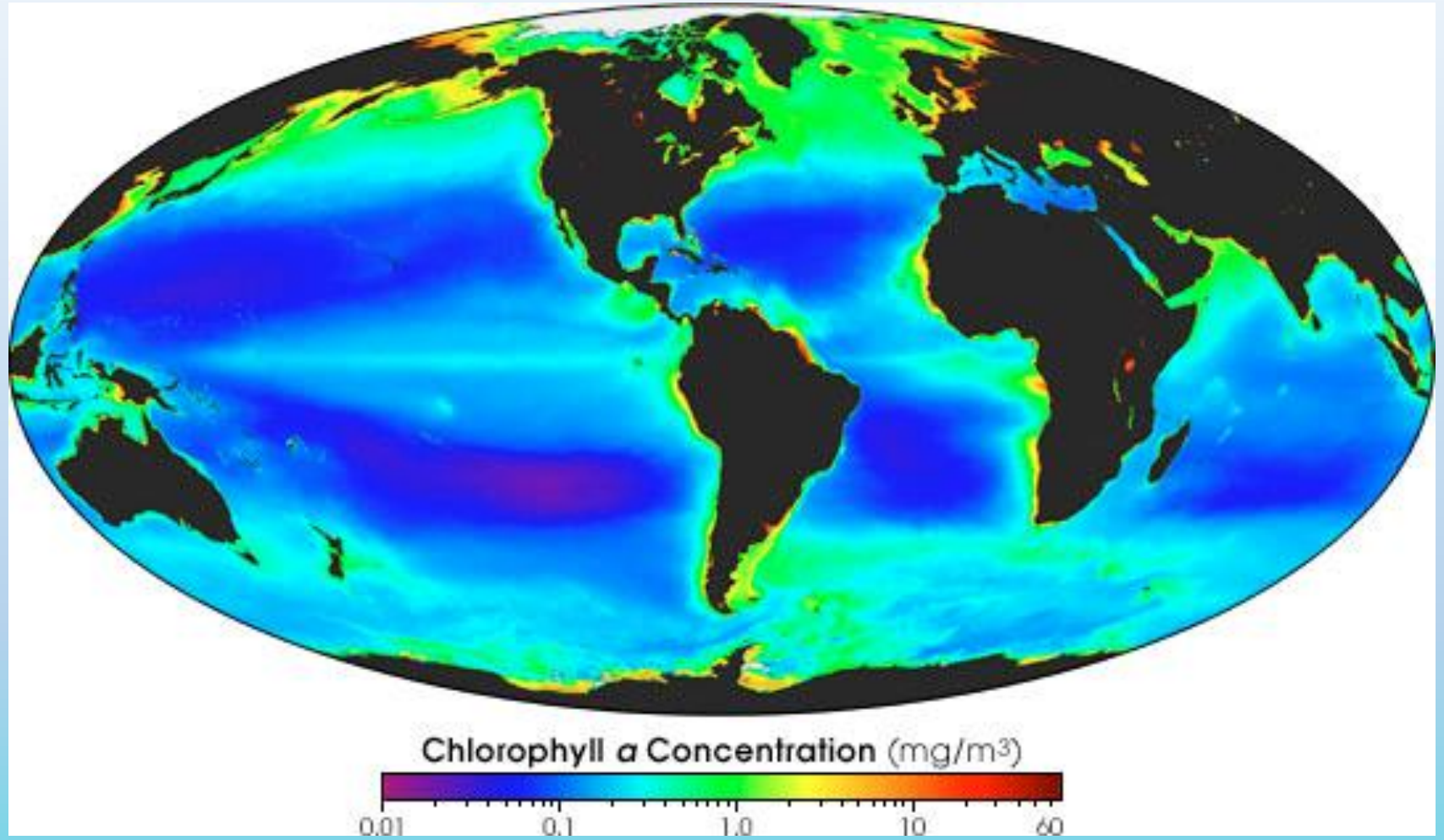


Along with them we have lost a huge amount of the circulation of key marine nutrients such as iron and phosphate

The loss of phytoplankton has to have affected the planets albedo



For the biosphere to recapture atmospheric carbon we require a growth medium with sunlight and nutrients



The oceans provide this but we need to put back some nutrients

Plankton blooms provide much the fastest creation of biomass on the planet, but typically stimulated by nutrients from volcanic or desert dust which sinks quickly through the water column they bloom and die before stable ecosystems can form

Credit to Dr Richard Kirby

Phytoplankton produce 50% of our oxygen but reduce in numbers and biodiversity as the sea becomes more acidic

What is required is long term availability of nutrients so that more complex ecosystems can survive.

The solution is buoyant fertiliser flakes made from waste products

Rice husks include silica

Mineral tailings rich in iron, silica, phosphorus and trace elements.

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Hot-melt LIQUID LIGNIN

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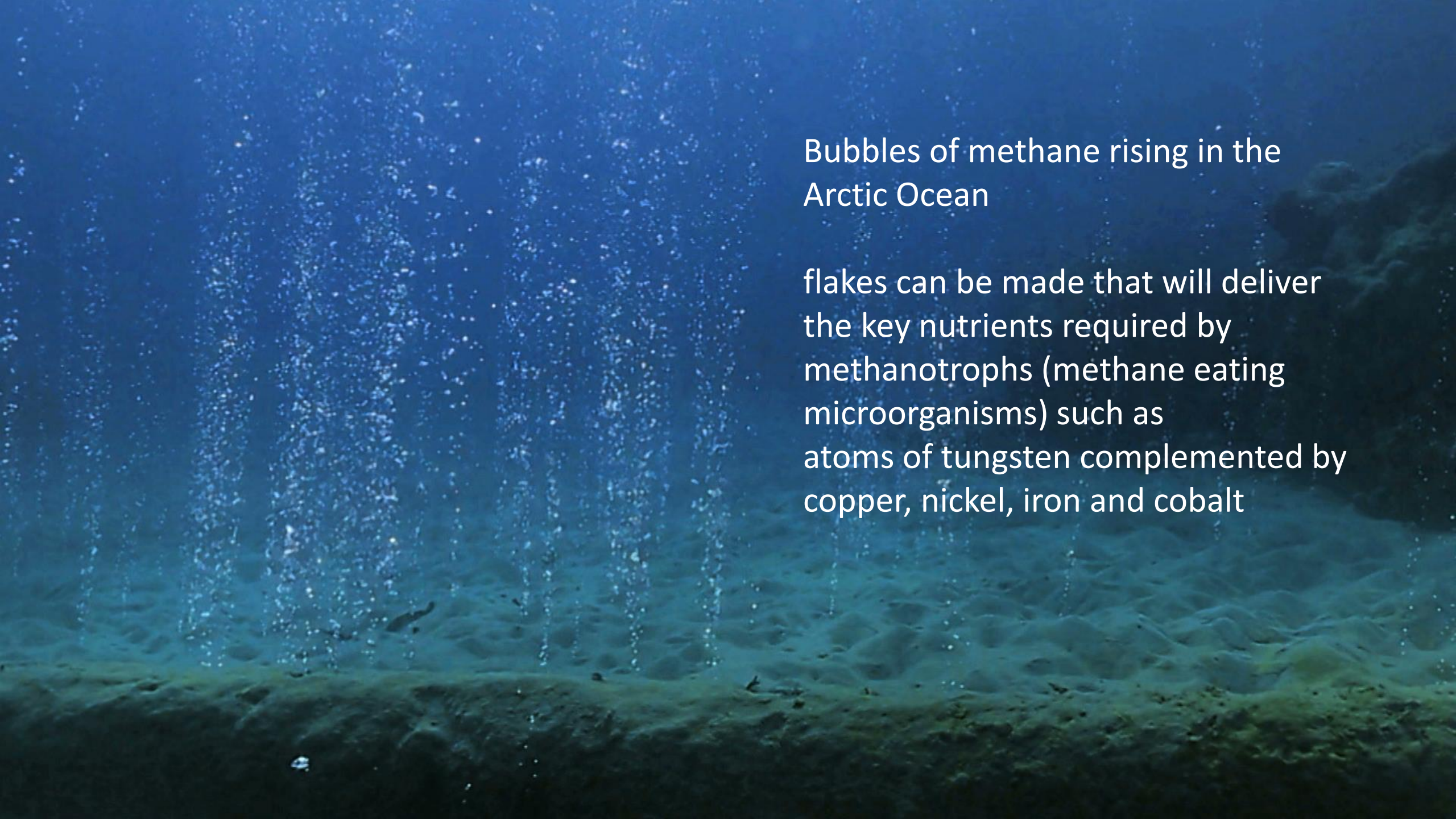
Flakes approx. 0.3-0.5cm2 in area at 10 to 100 per m2 of ocean

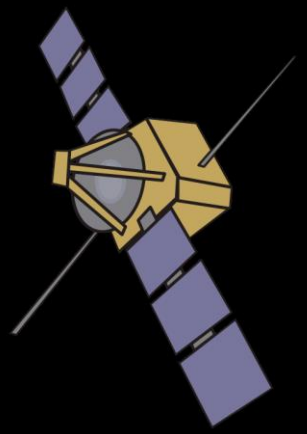
These float on the surface for 6 -12 months providing nutrients and a habitat for micro organisms



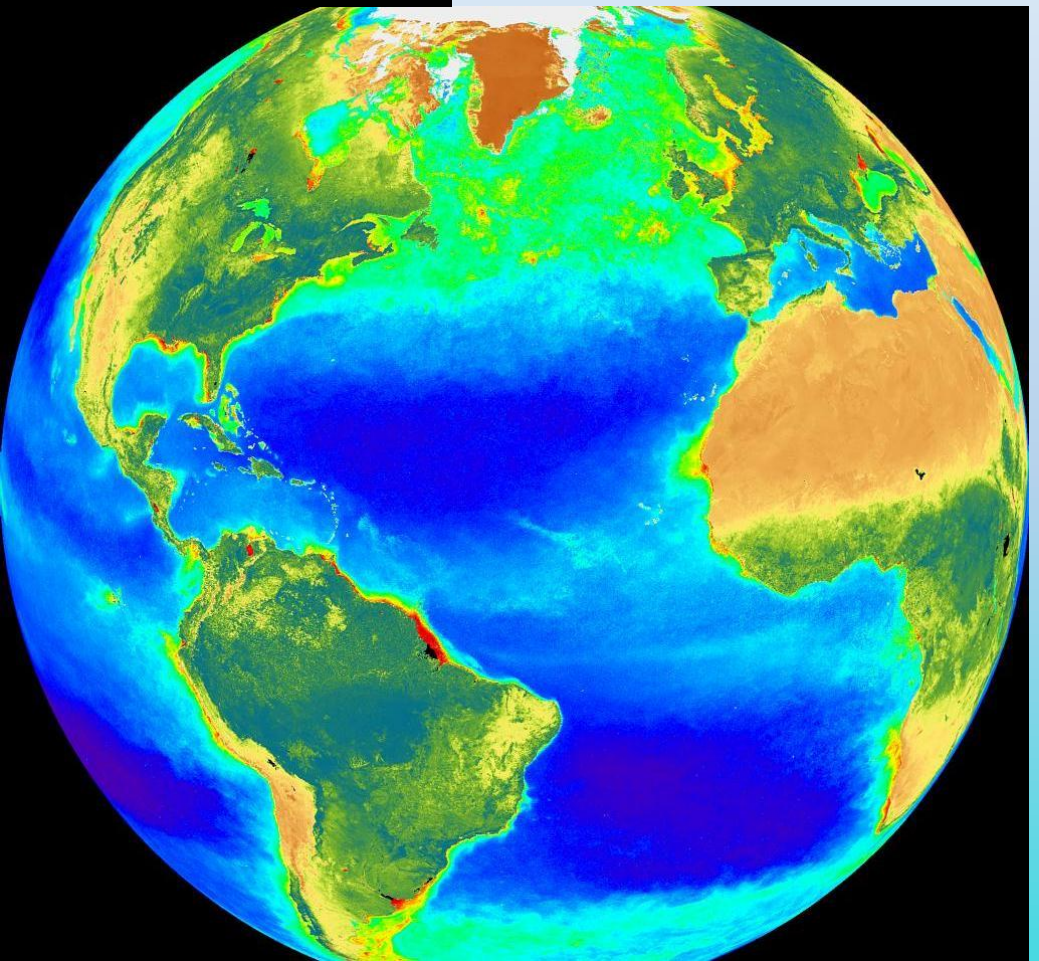
Bubbles of methane rising in the Arctic Ocean

flakes can be made that will deliver the key nutrients required by methanotrophs (methane eating microorganisms) such as
atoms of tungsten complemented by copper, nickel, iron and cobalt

Flakes will be disseminated
pneumatically and by the wind
from bulk vessels



Commercial Viability



- The waste materials used in making the flakes will themselves take on value
- By monitoring the development of phytoplankton blooms from space it may be possible to set up fishing licensing agreements
- Fortunately there is a new NASA mission to study ocean colour and airborne particles
- A tonne of iron in buoyant flake fertiliser (allowing 80% losses) should produce some 6,000 tonnes of dry-weight fish
- Flakes might be produced and disseminated for as little as USD$84 /tonne
- This could be the world's single largest generator of carbon credits
- Conservative estimate is around $10/tonne for carbon drawn down

Major beneficial impacts are:

1. Progressive ocean de-acidification, commencing with a reduction in the rate of business-as-usual acidification
2. Rapid reductions in overall atmospheric greenhouse gas pollution and a progressive return to a more favourable atmospheric make-up.
3. Increase in the carbon flux to the middle and deep ocean depths, with consequential carbon sequestration of 6-13Gt C per year
4. A sustained increase in the overall ocean biomass an initial carbon draw down of 50 Gt plus C during early years of establishment
5. Net increases in fish catch providing protein for a large portion of the world's population
6. Increase in the albedo of fertilized oceanic plumes
7. Increase in phytoplanktonic dimethyl sulfide (DMS) production leading to increases in ice particle and rain nucleation, marine clouds

Call to action

- These ideas now need to be researched and developed further Envisionation is seeking partners to take on this work
- Initial proof of concept
- Conducting approved small scale ocean trials and earth systems modelling
- Progressively larger trials in different oceans locations

Thank you

- Detailed papers relating to this presentation can be found on the Envisionation web site www.Envisionation.co.uk
- Contact
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  - Sev Clarke on sevclarke@me.com
- Envisionation is also engaged in projects to deliver sustainable environmental and economic solutions to Small Island Developing States
- Member of the Unity Group