Iron-Dumping Experiment Is a Bust: It Feeds Crustaceans, Doesn't Trap Carbon

A controversial geoengineering experiment that Greenpeace campaigned against (to little avail) has concluded, and researchers say their findings deal a major blow to the geoengineering technique known as ocean fertilization. As 80beats explained in January, the researchers dumped 20 tons of iron sulfate in the ocean near Antarctica in an effort to spur enormous blooms of phytoplankton, a type of algae; researchers theorized that when that plant life died and sank to the seabed it would lock away the carbon dioxide it had absorbed while growing. They hoped that widespread use of this technique could slow global warming.

While the iron did prove an algae bloom, researchers involved in the Lohafex project found that little biomass sunk down to the sea floor. Their results, announced in a press release, suggest that iron fertilisation could not have a major impact, at least in that region of the oceans. "There's been hope that one could remove some of the excess carbon dioxide – put it back where it came from, in a sense, because the petroleum we're burning was originally made by the algae," said [researcher] Victor Smetacek….

"But our results show this is going to be a small amount, almost negligible" [BBC News]. Researchers also announced the surprising reason for that result: The plankton bloom wasn't a carbon sequestration hot spot, instead it was an all-you-can-eat marine buffet.

Within two weeks of the iron sulfide dump, the algae were being eaten by tiny creatures called copepods, which were then in turn eaten by amphipods, a larger type of crustacean [BBC News]. The researchers say that previous fertilization experiments that showed more sequestration impact generated a different type of algae known as diatoms, which are protected from grazing beasties by hard shells made of silica. But the Southern Ocean has low levels of silicic acid, which is necessary for the growth of diatom shells. "What it means is the Southern Ocean cannot sequester the amount of carbon dioxide that one had hoped," concluded Professor Smetacek [BBC News].

Get the full story in the earlier post: Experiment Trying to Create Algae Bloom Goes Ahead Despite Enviro Fears

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Image: Alfred Wegener Institute

March 24th, 2009 5:09 PM Tags: geoengineering, global warming, ocean, ocean fertilization
by Eliza Strickland in Environment | 5 comments | RSS feed | Trackback >

5 Responses to "Iron-Dumping Experiment Is a Bust: It Feeds Crustaceans, Doesn't Trap Carbon"

1. 1. *Russ* Says:
   March 24th, 2009 at 7:42 pm

   I must disagree with the inference on the tagging of the LohaFex experiment as a bust. What this experiment showed is that iron replenishment and ocean ecorestoration is indeed very possible. That the bloom created was quickly converted from living plant biomass into living animal biomass is the natural scheme of ocean ecology. Especially so under the conditions encountered by the LohaFex team.

   There can be no question that the few tonnes of replenished iron restored ocean plant life at the same levels of efficiency shown by decades of research, that being each tonne of iron yields the plant biomass equivalence of 367,000 tonnes of CO2. Given that this vast amount of biomass is now in the web of ocean life means it is restoring vital ocean fertility.

   Recall that the Southern Ocean has suffered decimating loss of plant life, due to iron depletion effects of high CO2, more than 10% of ocean plants are missng from what was seen less than 30 years ago. So while those few tonnes of iron may not have sent the CO2 to the bottom it has taken that amount of CO2 out of the ocean acidification pathway and repositioned it in the standing living biomass of the Southern Ocean. Had those few millions of tonnes of CO2 not become Southern Ocean plant life it would surely now be Southern Ocean acidifying death.

   This work showed that there is an absolute need to carefully pick the ocean ecosystem that one aims to replenish and restore to achieve the greatest benefit. It also shows that one must design the work to meet minimal ecosystem demands in terms of scale, timing, location, and ecological implications. What LohaFex did was to replenish a very small amount of iron into a very small patch of ocean that was surrounding the new bloom and already enjoying abundant blooming.

   It was surely clear from the first water samples taken that the state of depleted silica meant the ocean had bloomed and consumed other vital mineral nutrients thus limiting or perhaps better put changing anticipated the beneficial effect of the iron replenishment. Thus it was known this would redirect the ecological effect toward species that are less dependent on silica. This led quite predictably to less sinking of large diatoms as carbonate and silicate rocks and instead favoured other species. However it also means that the iron, as clearly observed at the end of the project, remains replenshed in the surface ocean continuing to benefit the ecosystem for months to come. It is the same as what is happening in that same region of ocean as the observed iron rich icebergs melt randomly supporting and sustaining a more robust and varied ecosystem. In fact iron leaves the surface ocean primarily fixed to the biomass it stimulates growth of, as it recycles thus no iron goes to waste.

   A key feature of the LohaFex blooms is that the very small size of the patch, and the fact that the region was blooming and preloaded with grazers. This led to those grazers enjoying the free lunch and dispatching the much of new bloom in relatively short order. It is as if you decided to plant a tiny patch of lettuce in a vast field of rabbits, the rabbits would

graze the emerging lettuce in a flash leaving little to grow to maturity. If one had planted a large patch of lettuce some considerable distance from any large populations of rabbits before the rabbits discovered and populated the rich territory the lettuce patch would have grown to maturity and be sustaining itself. Lettuce and rabbits would fall into synch along with the rest of the ecosystem and all would flourish.

However even so the LohaFex rabbits(copepods, amphipods, and whales)continue to recycle the iron and other nutrients as they eat and defecate and are eaten and converted into all manner of marine life.

What LohaFex does NOT show is that the replenishment of iron to achieve ocean restoration does not work as your report tends to suggest. This politically charged sentiment is nonsense that panders to the distortions of those who would make the guise of science into an excuse for non-critical thinking?

How is it that a forest on land, which never leaves the living biosphere to be buried in abysmal sediments, is recognized as being of enormous value to the environment and society and its standing biomass carbon content is allowed to be monetized in emerging carbon markets to provided an economic stimulus to the planting, restoration, and protection of forest ecosystems.

So most certainly LohaFex is another, albeit small, step along the path to understanding how we must proceed to becoming active stewards of our oceans. Those oceans are by all accounts in the most dire of straits as reports are showing. Only this year the Southern Ocean was reported to be doomed to tip over the proverbial deadly tipping point of ocean CO2 acidification by 2030, a mere 21 years away. That tipping point is certain based on the preloaded carbon bomb of hundreds of gigatonnes of CO2 already in the air and destined to dissolve into the surface ocean. It will occur regardless of whether we slow additional emissions, as the first carbon bomb is more than sufficient to produce the deadly acidification. The only means to counter that first carbon bomb is by replenishing the oceans mineral micronutrients and accomplishing ocean ecorestoration. The restored ocean plants will fix and convert deadly CO2 into ocean life, the phyto-plankton, copepods, amphipods and whales of PolarStern's voyage.

My own company Planktos Science is well known in this field and in fact we worked hard some few years ago to convince the German Institute and Prof. Smetacek to engage in a much larger more ideally situated, longer term, and better suited iron replenishment experiment. Sadly the attacks on this topic by means of lies and subterfuge of the likes of Greenpeace and other nare-do-wells scared the Germans and their Indian partners into this minimalist effort which is now most useful in proving How Not To engage in meaningful ocean restoration.

Your casting this important work into the mere context of the fight story over potential CO2 sequestration results does a grave disservice to this important field of ecorestoration science and to the planet.

For more info read http://www.planktos-science.com

2. 2. *Nick* Says:
March 25th, 2009 at 1:38 am

More pollution is not going to solve pollution.

3. 3. *Jumblepudding* Says:
March 25th, 2009 at 10:51 am

so we need to dump silicon as well to feed the diatoms. Now we have a use for all those obsolete electronics.

4. 4. *Eliza Strickland* Says:
March 25th, 2009 at 1:08 pm

@ Jumblepudding: heh!

@ Russ: I hadn't considered iron fertilization's effects on ocean acidification, thanks for making that point.

But I'm still not at all sold on the merits of ocean fertilization. And neither is our new NOAA head, Jane Lubchenco. In an interview with Nature News, she said large-scale fertilization experiments could do significant damage. Her quote:

"Many of the experiments that have been done to date are relatively small-scale and short-term. Those experiments can tell us how a few species will respond over the short term to the addition of iron. They do not and cannot tell us the larger ecosystem-scale responses over a longer period of time. Therein lie the risks of serious disruption. We know from many studies done in lake ecosystems that changing nutrients have surprising and completely unintended consequences at higher trophic levels and can result in a significant shift of an ecosystem from one state to another. It's difficult to evaluate the likelihood of that [sort of thing] with small-scale, short-term experiments."

5. 5. *Tedd* Says:
April 20th, 2009 at 12:44 am

Why is it that fishing the oceans is accepted, but replentishing those same waters is not? For the megatons of fish removed, all of the chemicals contained therein are removed from the food chain of the ocean and released into the food chain of people. Cod, tuna, salmon (and many more) are all depleated. Could this be from having no lower food chain to feed from? So if the addition of iron doesn't remove carbon from the atmosphere, that's no reason to stop considering the addition to bolster the biomass of a major source of food for the people of this planet.

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