

Date: Tue, Jan 19, 2010 at 9:03 PM

Subject: Scholes Cabin 5 (p): Filtering

18 January 2010 16:51 UTM 61.8098 S 11.4219 W

Dear Stirling,

We hit a lot of mushy broken up ice and icebergs yesterday evening and this morning, which prevented a CTD this morning and even UCTDs for several hours. We are in the clear again, and rumbling steadily on towards South Georgia.

Several people saw whales, but I was sleeping.

I haven't told you much about what the other nine members of the oceanography team are doing. I won't do so all at once, because there is quite a lot going on. The main collective activity is analysing the samples we take every four hours from a pipe connected through the keel of the ship into the surface ocean water, and every 12 hours from six depths down to 500 m, when we stop to take a CTD sample with Rose.

In both cases, the water is analysed for most of the important nutrients: ammonia, nitrate urea, phosphates and silicates. Thato takes samples for iron analysis back home, because it is hard to detect changes of a few parts in a billion in the iron content of seawater, when you are surrounded by an iron ship! Sandy analyses for dissolved oxygen on a rather grumpy instrument that you need to treat just right. Then we pass a whole lot of water through filters of different sizes, and keep the filter papers for different analyses.

You already know that a lot of the biological work in the ocean is done by plankton. The problem is that there are tens of thousands - maybe even millions - of species, and only a few specialists know even a fraction of them. Most have probably never even been scientifically described. So what we do is put them into 'functional groups' - in other words, groups of organisms that sort of work the same way. The first step is to sort them by size. That is one of the reasons I asked you to learn about orders of magnitude.

Plankton sizes cover about eight orders of magnitude - from things you can see with your unaided eye, down to picoplankton that you can only see with the most powerful electron microscope.

We also use other clues, such as which pigments they contain. One of the filter papers will be analysed by High Performance Liquid Chromatography (HPLC) in Cape Town. That tells us how much chlorophyll a, xanthophyll, carotene and a dozen other pigments are present. The pigments are like fingerprints of the groups that were present. It is a bit like one of those episodes of CSI, working out who was at the crime scene.

Another filter paper gets analysed for biogenic silica, and a third one for particulate organic carbon. Those tell us how many diatoms and coccolithophores were present. Yet another filter paper is carefully frozen in liquid nitrogen, so that a specialist can look at it later under an electron microscope and identify the actual organisms.

That pretty much keeps a team of five going full time, while the other five sleep. We bump into one another at mealtimes, and when we all help with the CTD.

Love,

Dad