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FeeP – A dual release, dual ship experiment to investigate nutrient limitation of biological activity in the north-east Atlantic

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Phytoplankton productivity appears to be limited by nutrients in nearly two-thirds of the global ocean, with nitrogen availability generally thought to be the most likely candidate. However, it is now apparent that other elements, such as iron and phosphorus, may well be important.

Plymouth Marine Laboratory have been involved previously in a number of highly publicised and successful experiments (eg IRONEX, SOIREE, EISENEX) in which small patches of the ocean have been deliberately seeded with iron, and one experiment in the eastern Mediterranean (CYCLOPS) where the effects of phosphorus fertilisation were examined. This work provided the background to a major two-ship experiment that we carried out in 2004. Involving 24 PML scientists in collaboration with visitors from the National Institute of Water and Atmospheric Research, New Zealand; Laboratoire d'Oceanographie Biologique, Banyuls sur Mer, France and the universities of Plymouth and East Anglia on the *RRS Charles Darwin* and the German *RV Poseidon*, this pioneering experiment was the first to examine the possible interaction of iron and phosphorus in controlling phytoplankton growth in an *in-situ* experiment.

This technically challenging experiment involved the use of SF_6 as a tracer and the "seeding" of two 25km^2 patch of ocean, the first with 20 tonnes of phosphate, and the second with phosphate and 5 tonnes of iron (ferrous sulphate), .

Initial results suggest there was little impact on phytoplankton photosynthesis in re-

sponse to the phosphate alone, whereas bacterial productivity appeared to be enhanced by up to three-fold for a short period after the phosphate addition. On the other-hand, when iron and phosphate were added together we saw significant changes in the phytoplankton community composition. Much work remains to be done on sample analysis but it is clear that this experiment will reveal hitherto unknown insights into marine nutrient cycling.