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INSTITUTE OF TERRESTRIAL ECOLOGY

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MASQ: MONITORING AND ASSESSING SOIL QUALITY

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Module 6: Soils and Pollution

Progress Report 4 to The Environment Agency

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1. Work Programme

- Development and population of the database for soil acidity and loss-on-ignition, and associated supporting data.
- Laboratory examination of soil fauna and microbiology
- Analysis of heavy metals and organic compounds

A timetable for the work programme of this project is presented in Table 1.

2. Progress

2.1 Development and population of the databases

Soil acidity and loss-on-ignition, and associated supporting data: Measurements of soil pH have been completed on all soil samples collected this year. Loss-on-ignitions have been carried out on 75% of all samples. The deadline for LOI analyses was extended to 31.01.2000 to provide time for a validation exercise on the analyses of heavy metals including an ICP-OES / ICP-MS comparison between ITE Merlewood and The Environment Agency laboratory at Llanelli.

2.2 Laboratory examination of soil fauna and microbiology

Soil faunal diversity:

Taxonomy training

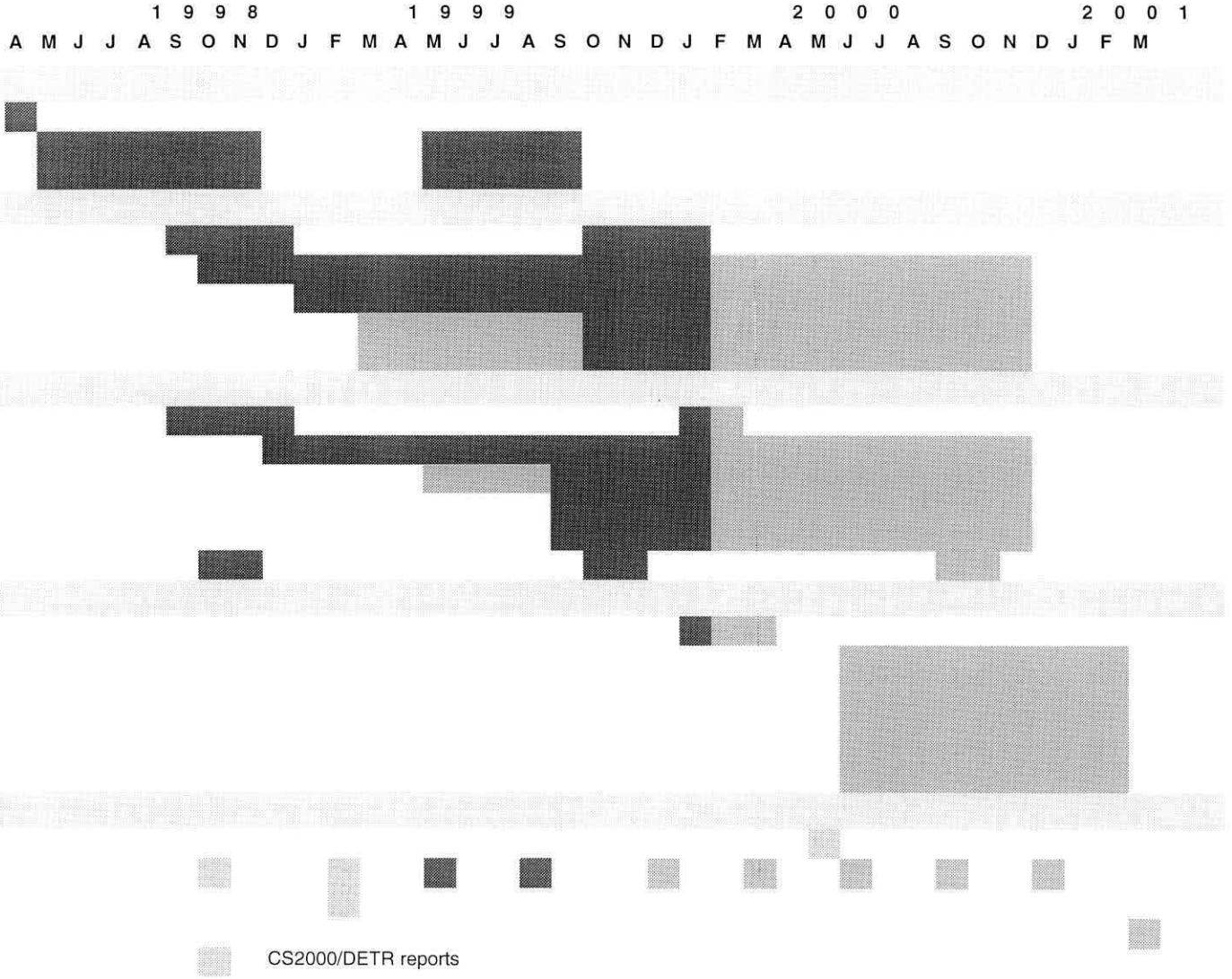
Considerable time has been spent by A. Rollett and P. Self in developing their taxonimic skills to the necessary level. A short course has been organised for January 2000 with Prof. N. Webb at ITE Furzebrook to train staff to identify soil acari (mites) to a higher taxonomic level. This group is notoriously difficult to identify.

Expert Identification for Species Identification and Quality Control

Taxonomic experts for the major faunal groups have been contacted to establish who would be available for these tasks. A contact list has been compiled on EXCEL with details of those willing to participate.

TABLE 1

TIMETABLE FOR MASQ: CS2000 MODULE 6 SOILS & POLLUTION



Progress with faunal identification

A decision was made (using previous experience of identifying a large number of samples from diverse sources) to identify samples in soil type order to aid the task of identification and facilitate databasing and intitial analyses. Soil type data is available from the 1978 survey data and a full list of all CS2000 faunal samples by 1978 soil type was extracted from the MASQ Access database where the 1978 is held. The first identifications were started on the brown earth soil type as it consists of more than a third of the total zoology samples. Over three hundred and fifty samples were identified as belonging to this category and identification of the fauna from these samples is now 2/3rd completed and is on target for completion by the end of Feb. 2000.

Soil Microbial Diversity:

A total of 998 soil samples were returned to Merlewood from the 1998 CS200 survey, ten of these were not frozen due to there being insufficient material to do all of the analyses. Of the remaining 988 samples, the number of samples processed (thawed, sieved and determination of moisture content), analysed for microbial activity and functional diversity (BIOLOG) and re-frozen for analysis of organic chemicals to date are detailed in Table 2.

Table 2: Progress on microbial analyses

Samples	Processed	Analysed	Re-frozen
Batch F (Sept.-Oct. 1999)	60	51	59
Batch F (Nov.-Dec. 1999)	42	38	39

2.3 Laboratory evaluation of chemical properties

Heavy Metals

Protocols have been agreed with the Environment Agency laboratory (Llanelli) for sample preparation, method validation, analysis of samples at Merlewood by ICP-OES, and a ICP-OES / ICP-MS comparison exercise. The proposed work timetable is outlined below.

Timetable

Completion of sample preparation (ball milling) 31/03/00.
Validation analysis - 29/11/99 to 3/12/99.
Evaluation of validation data 14/12/99 to 18/12/99.
Digestion of statistically representative sub-set 10/01/00 to 14/01/00.
Dispatch of aliquot of digest solution to Llanelli 17/01/00.
Analysis of sub-set by ICP-OES w/c 17/01/00.
Evaluation of data and protocols w/c 24/01/00.
Completion of the analysis of 300 samples 31/03/00.
Completion of the analysis of 600 samples 30/06/00.
Completion of the analysis of 800 samples 31/08/00.

Organic Pollutants

The outline of the analytical method has been chosen : analytes will be extracted by microwave assisted extraction. The extract will then be cleaned up in two stages, the first stage to remove the gross contaminants and the second stage to separate the different classes of analytes. The final analysis will be by gas chromatography- mass spectrometry (GC-MS). Carbon-13 labelled PCBs and PAHs will be used to improve analyte identification and the measurement of recovery for each sample. Certified reference materials for quality assurance have been investigated. As no suitable commercial material has been found, an in-house reference material will be prepared and validated.

Work has been completed on the optimisation of the gas chromatographic separation of PCBs, OCs and PAHs to enable the largest number of separate analytes to be quantified. Dialysis, gel permeation chromatography and silica gel/alumina chromatography are currently being tested for the first stage of the cleanup. The initial work is being carried out on extracts derived from the most difficult to analyse of the soil types (i.e. those with high levels of organic matter such as peat). This will help to ensure that the analytical method will be suitable for all soil types. For the separation of the sample extracts into PAH and PCB fractions an automated HPLC method is being set-up. This method will be independent of sample type and therefore have a wide application.

The tendering process for the acquisition of a new GC-MS complete. It is expected that the new instrument will be ordered in January 2000 and installed by March 2000.