IG Protocol

GROUND PREDATORS

Aim

To monitor the abundance of ground beetles (Carabidae) and to record features of* Pterostichus madidus *and* Mitopus morio *which may respond to environmental changes

Rationale

In addition to monitoring phytophagous invertebrates such as moths, butterflies and spittle bugs, it has been thought desirable to include a group of predatory species which might amplify changes in their prey or respond in some other, different way to environmental change. The ground beetles (Carabidae) are the obvious choice, being a group which is taxonomically tractable and for which an appreciable body of reliable biological information already exists (eg Thiele 1977). Pitfall trapping has been used extensively and successfully for this group, and a well-developed protocol already exists (M.L. Luff, pers. comm.). Even though it is known that problems exist in interpreting data from such traps, active programmes of standardisation are in progress. Analyses of existing data have already shown that carabids can be sensitive indicators of changes in management (eg Eyre *et al.* 1989). Many beetle species are known to be sensitive to temperature changes (Thiele 1977) and one species, *Pterostichus madidus*, has leg-colour morphs which may be sensitive to climate change (Terrell-Nield 1992); morphs of this species will be recorded separately. The ubiquitous harvestman, *Mitopus morio*, which has features which may respond to environmental change, will also be collected from the pitfall traps.

Method

The method will, in general, conform with that developed by Dr M.L. Luff of the University of Newcastle upon Tyne. At each site, in or adjacent to the TSS, a pitfall trapping system should be instituted to sample Carabidae (ground beetles) and the ubiquitous opilionid (Harvestmen) *Mitopus morio*. Adult crane-flies caught in the traps should also be retained in order to check their identification against the larvae extracted in soil cores (see separate Protocol for Tipulidae). It will be necessary to measure the length of the second femur of *M. morio*; this changes with altitude and latitude and may react to environmental change. **All** carabid beetles (not just *Carabus* spp.) are of interest.

Equipment

The pitfall traps are polypropylene cups, 7.5 cm diameter x 10 cm deep (see Appendix I for supplier). A wire netting cage, made from chicken wire with a mesh size approximately 15 mm x 20 mm and approximately 70 mm high, is clipped to the rim of each trap so as to reduce the number of small mammals inadvertently caught in the traps. Each trap should have a cover which can be made cheaply from 5" diameter plant pot saucers and galvanised wire. This helps to prevent heavy rain from flooding the traps, keeps birds from interfering, and helps in their re-location.

Location

Three transects should be selected, preferably within different vegetation types and including the TSS. Transects should not be placed where cattle have access. Ten pitfall traps should be established in each transect, with 10 m spacing between the traps. If possible, transects should be approached from different directions when attending to traps so as to avoid trampling damage to the vegetation. If trampling is having an obviously deleterious long-term effect on the vegetation, a trapline can be moved each year but returned to the original position every three years. Any movement of traplines should be recorded and information sent to the Central Co-ordination Unit.

Sampling

The traps are set out on the first Wednesday in May and are then emptied and replaced fortnightly for 13 sampling periods, until the end of October. Blue

antifreeze is used as preservative; this can be bought from wholesalers in 25 litre drums at a cost of about £30; it is decanted into 1 or 2 litre bottles for use. The undiluted preservative is poured into each trap to a depth of about 3 cm; if diluted by rain, the catch remains in the heavier, undiluted preservative at the bottom of the trap.

Pre-filled replacement traps with marked lids are taken to the sample site. Each trap to be replaced is removed from the hole and the new trap with its lid is placed in the hole, its seating is checked, and its lid removed and placed on the trap containing the catch. Traps may be stored at 4°C prior to emptying.

The catch should be stored at 4°C prior to sorting, but if sorting cannot be undertaken in less than three days after collection the catch should be transferred to 75% alcohol to avoid deterioration of the sample material. To sort, the contents of the trap are poured through a 1 mm mesh, 10 cm diameter test sieve (see Appendix I for supplier). The antifreeze is collected in a beaker placed beneath the sieve and is then poured back into a 5 litre aspirator for future use. The traps are rinsed with water to ensure that any adhering dirt which may contain beetles is washed through the sieve. The sieve is then inverted over a 10 cm diameter crystallising dish and the contents are washed into the dish with water. The taxa of interest are extracted carefully on a large white plastic tray under good light and adequate ventilation into individually labelled vials containing a mixture of 70% alcohol, 5% glycerol and 25% water. Particular care must be taken not to damage or remove legs of *Mitopus morio* specimens which are needed for measurement. The catch is labelled by writing the ECN site identification number, trap number and collection date on a piece of paper which is then placed in an empty, plastic-stoppered 5 cm x 1.2 cm specimen tube which is dropped into the storage bottle. The catch can now be stored for subsequent identification. Records of the catch from each trap should be kept separate until after identification, when the catch from ten traps can be bulked and stored.

Time

Emptying traps	1 h/month
Identification (for an experienced identifier)	10 h/month

Author

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References

Eyre, M.D., Luff, M.L. Rushton, S.P. & Topping, C.J. 1989. Ground beetles and weevils (Carabidae and Circulionidae) as indicators of grassland management practice. *Journal of Applied Entomology,* **107**, 508-517.

Terrell-Nield, C.E. 1992. Distribution of leg-colour morphs of *Pterostichus madidus* (F.) in relation to climate. In: *The role of ground beetles in ecological and environmental studies,* edited by N. Stork, 39-51. Andover, Hampshire: Intercept Ltd.

Thiele, H-U. 1977. *Carabid beetles in their environments.* Berlin: Springer-Verlag.

Appendix I. Equipment details

Supplier

Pitfall traps can be obtained from:

A W Gregory & Co Ltd
Glynde House
Glynde Street *Tel: 0181 690 3437*
London SE4 1RY, UK *Fax: 0181 690 0155*

Test sieves are obtainable from:

Endecotts Ltd
9 Lombard Road
London SW19 3TZ, UK

Specification of results and recording conventions

The measurement variables listed below are those required for each IG sampling location at an ECN Site. Sites submitting data to the ECNCCU should refer to the accompanying Data Transfer documentation for the specification of ECN dataset formats, available on the restricted access Site Managers' extranet. Contact ecnccu@ceh.ac.uk if you need access to this documentation.

The first 4 key parameters uniquely identify a sample or recording occasion in space and time, and must be included within all datasets:

• Site Identification Code (e.g. T05)	Unique code for each ECN Site
• Core Measurement Code (e.g. PC)	Unique code for each ECN 'core measurement'
• Location Code (e.g. 01)	Each ECN Site allocates its own code to replicate sampling locations for each core measurement (e.g. for different surface water collection points)
• Sampling Date (/time)	Date on which sample was collected or data recorded. This will include a time element where sampling is more frequent than daily

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Core measurement: invertebrates – ground predators (IG Protocol)

The following variables are recorded fortnightly from May until the end of October (13 trapping periods) for each transect of ten traps. Each transect of ten traps is regarded as a single sampling location.

Variable	Units	Precision of recording
Site Identification Code		
Core Measurement Code		
Location Code		
Date traps set		
Collection (Sampling) date		
For all ground predator species		
Trap ID	character code (Tn)[1]	
Species code	BRC code[2]	
Species name	genus species	
Number caught	count	1
In addition, for harvestmen		
Species code of individual	BRC code[2]	
Species name of individual	genus species	
Gender of individual	M or F	
Femur length of individual	mm	0.1

Recording forms

Three types of form are available from the CCU:

1. Species recording form: one for each of the three transects (an example is provided in Appendix II)
2. Pitfall trap dates and quality information form (an example is provided in Appendix II)
3. Form for recording femur lengths for harvestmen.

Notes

1. Trap ID numbers should be unique within each ECN site, eg traps T1-T10 for transect 01, T11-T20 for transect 02, and T21-T30 for transect 03. For species recording (Form 1 above), separate rows of the Table should be used to record the different leg

colour morphs and also gender of *Pterostichus madidus,* using the following codes after the species name:

FR	female red legs	MR	male red legs
FB	female black legs	MB	male black legs

2. The coding system should follow the standard currently used by the Biological Records Centre, ITE Monks Wood, Abbots Ripton, Huntingdon, Cambs PE17 2LS, UK.