

Effects of ground cover management on ground beetle populations in apple orchards in the UK

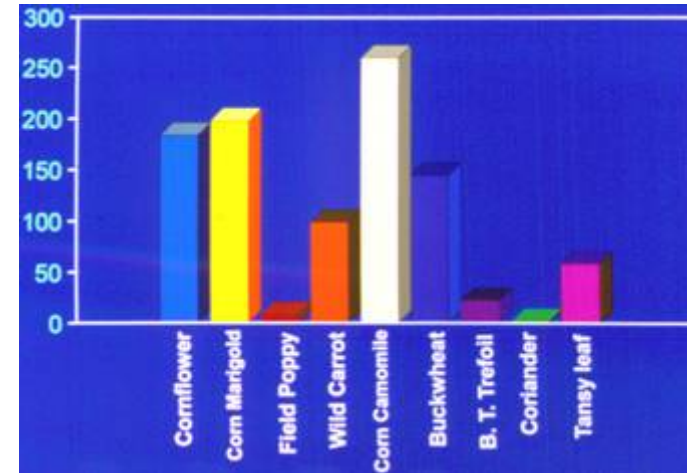
Jean Fitzgerald

Background



- ◆ Cost effective control of pests and pathogens
 - ◆ Reduction of inputs
 - ◆ Use of biological and other control strategies
 - habitat manipulation to increase functional biodiversity
 - refuges
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Habitat manipulation to enhance beneficials



Why are we interested in ground beetles?



- ◆ Potential predators of pests with ground inhabiting life-stage

- *Dasineura mali*
- *Cydia pomonella*
- *Otiorhynchus sulcatus*
- Thrips spp.



Carabids feeding on vine weevil- field study



Species	eggs	larvae	adults
<i>Bembidion lampros</i>	√		
<i>Calathus fuscipes</i>			√
<i>Carabus violaceus</i>			√
<i>Harpalus rufipes</i>		√	√
<i>Notiophilus biguttatus</i>	√	√	
<i>Pterostichus madidus</i>		√	√

Carabids feeding on apple leaf midge-lab study



Species	Mean number consumed in 12 hours
<i>Pterosticus madidus</i>	3
<i>Pterosticus melanarius</i>	2
<i>Carabus violaceus</i>	0.5
<i>Harpalus rufipes</i>	6

9% of *P. madidus* collected from the field had fed on apple leaf midge

Aim of experiment



- ♦ To determine the impact of orchard floor management on ground beetle abundance
 - effect of vegetation structure
 - effect of other soil treatments
 - range of influence of treatment

- ♦ To assess effects on pest populations



Ground cover management



Centaurea nigra



Organic mulch



Bare soil



Trifolium pratense

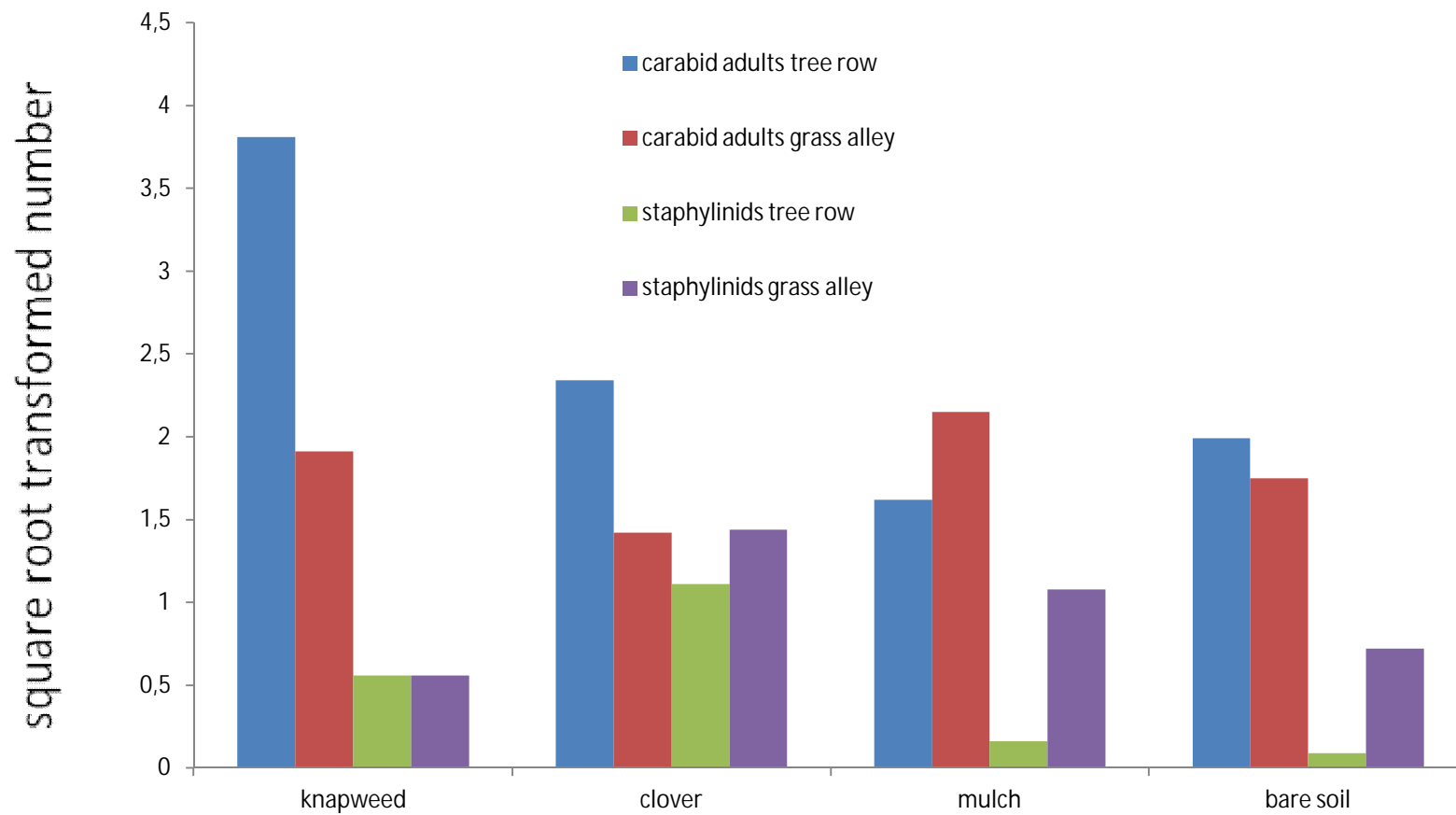
Ground cover management



- ♦ Organic orchard
- ♦ Pitfall traps placed in treated tree rows and in grass alleys
- ♦ Pest damage assessed on trees
- ♦ Fruit damage assessed at harvest



Year 2: August sample-all species



Most abundant carabid species in traps

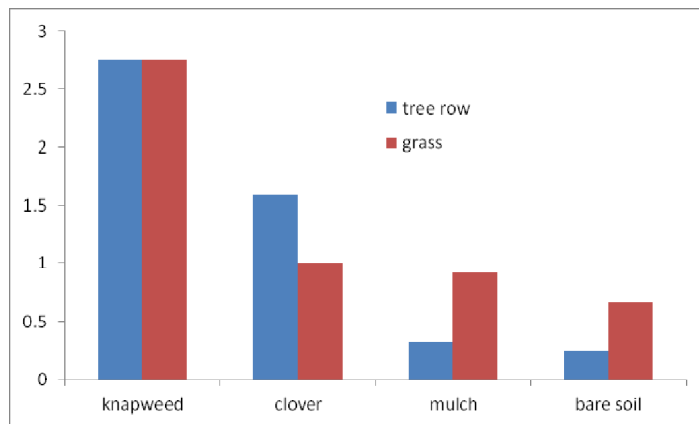


	Species	Total caught (3 trapping occasions in each of 3 years)
1	<i>Pterostichus melanarius</i>	912
2	<i>Nebria brevicollis</i>	857
3	<i>Pterostichus madidus</i>	452
4	<i>Calathus fuscipes</i>	432
5	<i>Harpalus rufipes</i>	274
6	<i>Harpalus aeneus</i>	186
7	<i>Carabus violaceus</i>	185
8	<i>Bembidion lampros</i>	92
9	<i>Loricera pilicornis</i>	78
10	<i>Notiophilus biguttatus</i>	27

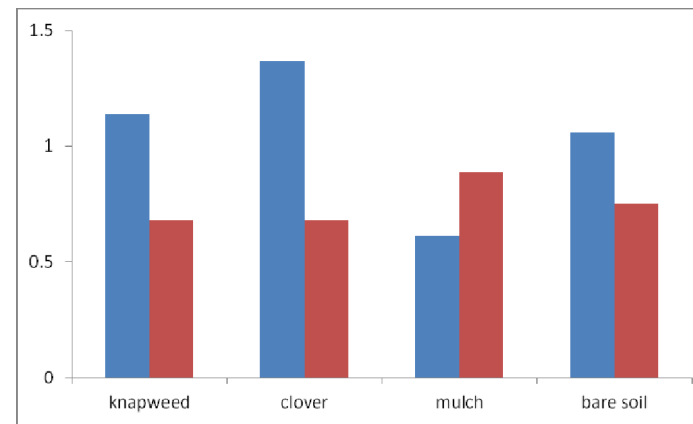
Habitats in which species caught



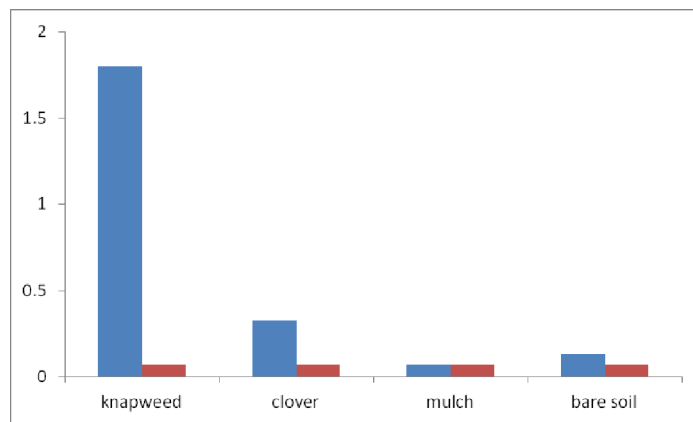
P. melanarius



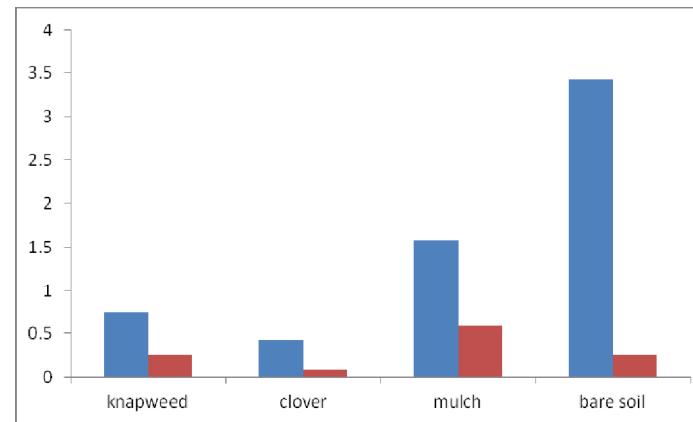
P. madidus



N. brevicollis



C. fuscipes



Damage on trees



	% damage on angular scale		
	Apple leaf midge	aphids	leafminer
Knapweed	10.7	1.23	12.4
Clover	32.7	1.58	29.2
Mulch	50.5	0.64	51.3
Bare soil	41.5	2.09	39.1
P	<0.001	0.48	<0.001
lsd	11.7	2.0	10.7

Fruit damage at harvest



	% damage on angular scale		
	Aphid	Tortrix	Other caterpillar
Knapweed	8.2	6.2	10
Clover	4.0	12.0	10.2
Mulch	3.2	16.6	6.7
Bare soil	5.8	14.6	10.2
P	0.26	0.05	0.6
Isd	5.56	7.54	6.49

Conclusions



- Habitat manipulation affected the numbers and species of ground beetle trapped
 - Some evidence that pest damage was lower where ground beetle populations were enhanced
 - Effect of different habitats was seen only locally
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Thank you for your attention

