

Moths on farmland: changes in diversity and abundance under Entry Level Stewardship



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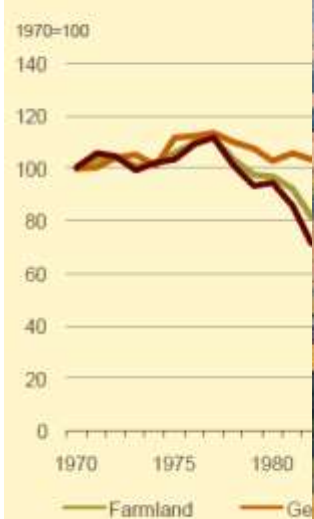
FARMLAND & BIODIVERSITY

- 70%+ UK is agricultural land

- Farm
declin

to be

DE5 Indices of farmland b

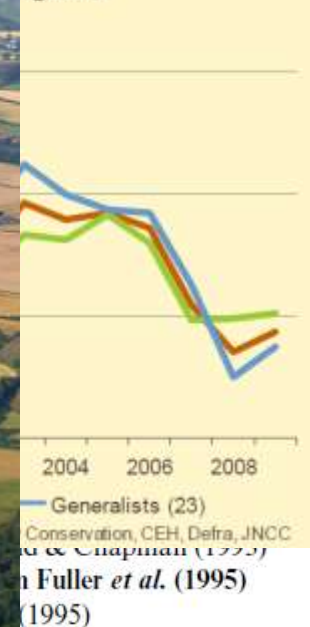


BIGS
Birds 19
Mammals 19



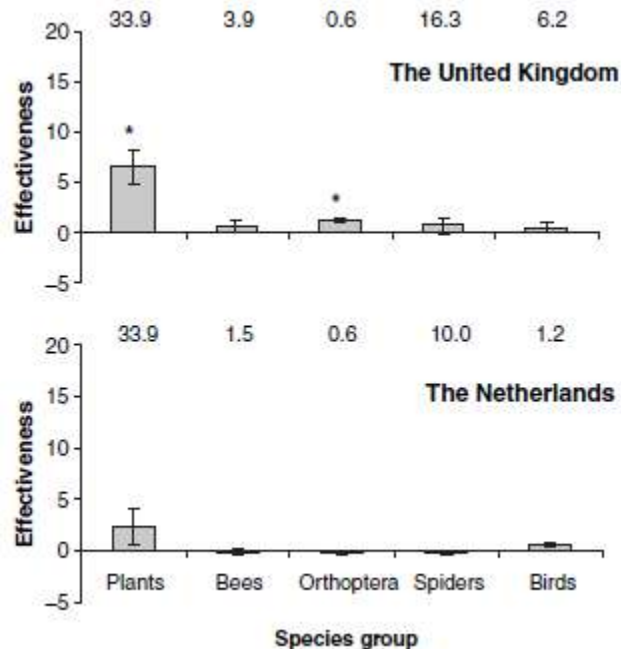
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England



AGRI-ENVIRONMENT SCHEMES

- Major aim of these schemes is to mitigate biodiversity loss
- The effectiveness of these schemes has been mixed and evidence for benefits equivocal
 - Eg Kleijn et al (2006)
- Major reason is the way they have been assessed (Kleijn & Sutherland 2003)
 - Eg No baselines, low replication, poor study design



HILLESDEN FARM EXPERIMENT



1000 ha of lowland arable farmland in central England

Entered ELS in 2005/2006

Defra and CEH led: randomised block experiment to evaluate and demonstrate the cost-effectiveness of Environmental Stewardship options in conserving and enhancing biodiversity at the farm scale

HILLESSEN FARM EXPERIMENT



Legend

Treatment boundary

TREATMENT

Cross compliance

ELS

ELS extra

All_Habitats
habitat

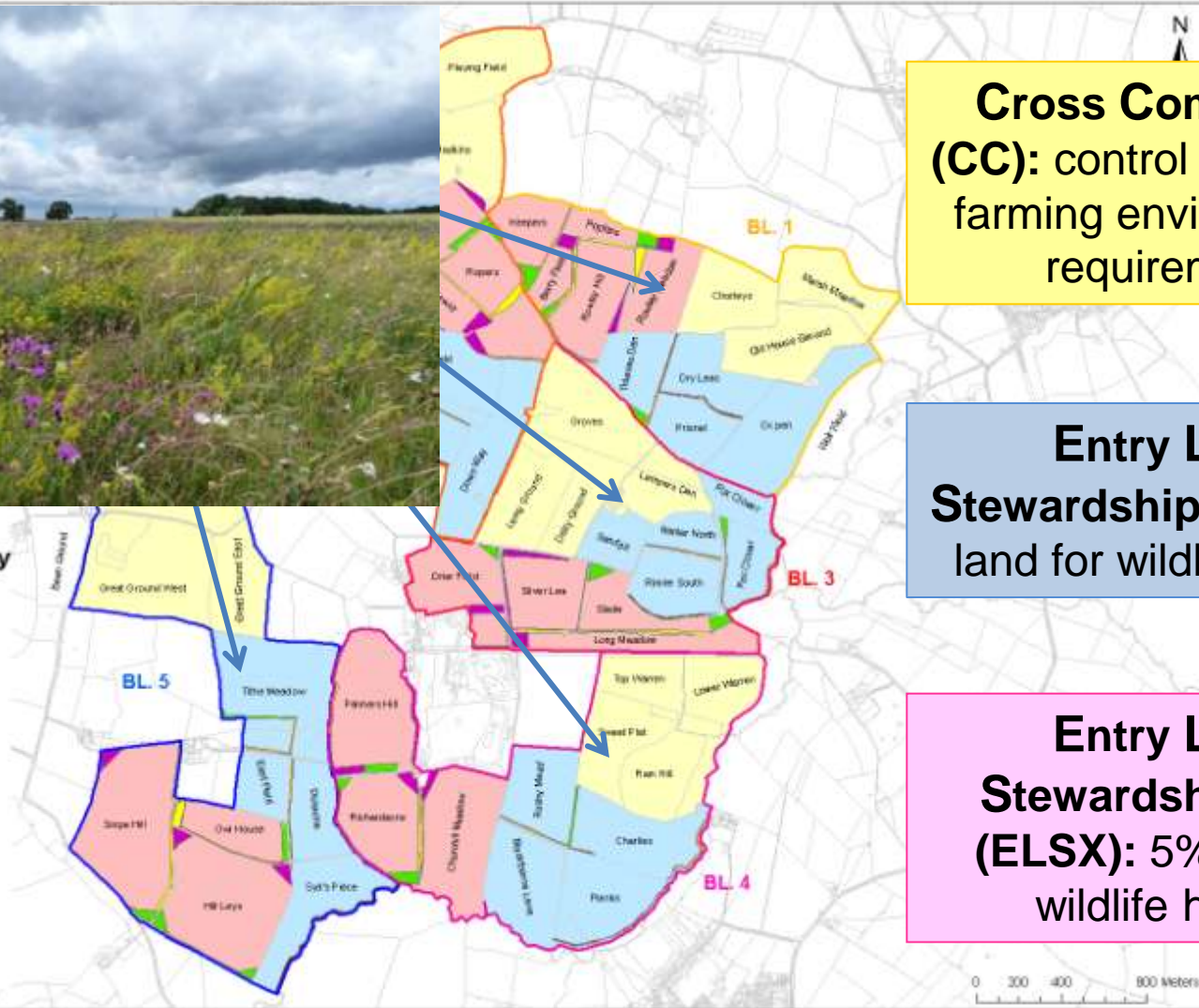
■ Annual cultivation

Bird EF2

Flower EF1

 Natural Regen

Pollen and nectar

 Tussocky

Cross Compliance (CC): control – minimum farming environmental requirements

Entry Level
Stewardship (ELS): 1%
land for wildlife habitat

**Entry Level
Stewardship extra
(ELSX): 5% land for
wildlife habitat**

SURVEYING MOTHS AT HILLESDEN

Three main questions

1. Does moth abundance and diversity differ between the different treatments?
2. What effect is there of ELS on overall moth abundance and diversity at the farm-scale?
3. How does the landscape affect moth abundance and diversity in field margins?

SURVEYS:

Trapped each year in May and again in July 2006-2010 (5yrs).

- one block per night trapped
- 125w MV Robinson traps placed in the margin of each treatment

All moths recorded (macros and micros)



MOTHS AND AES

- Merckx et al (2009-2010): AES benefit moths
 - wide margins and hedgerow trees*
 - significant on targeted farms
 - Hedgerow trees especially important for less mobile species
- Fuentes-Montemayor et al (2011): AES benefit macro- and micro-moths compared to conventional farms
 - Especially micro moths

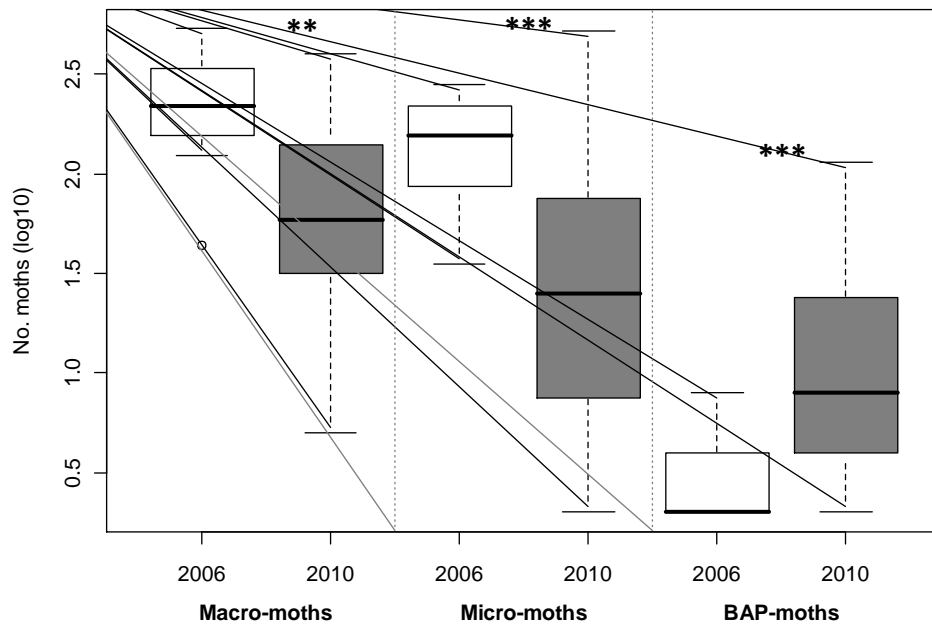


Farm-scale changes

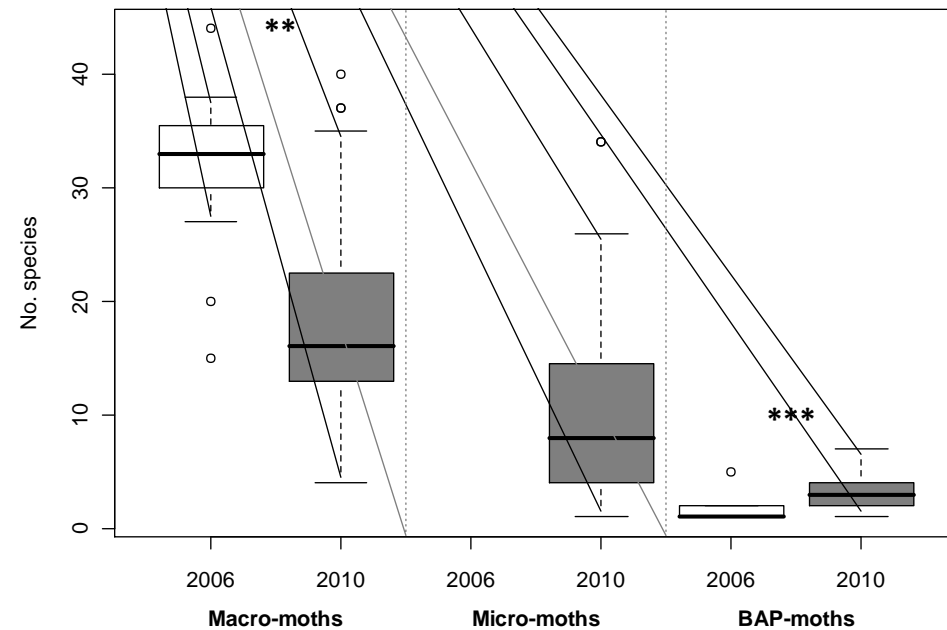
Counted over 30,000 moths of over 600 species



Abundance



Species richness

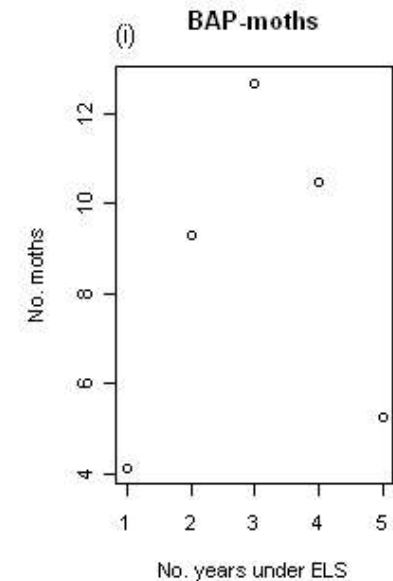
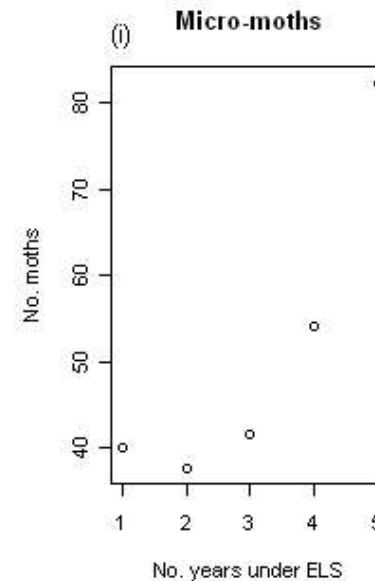
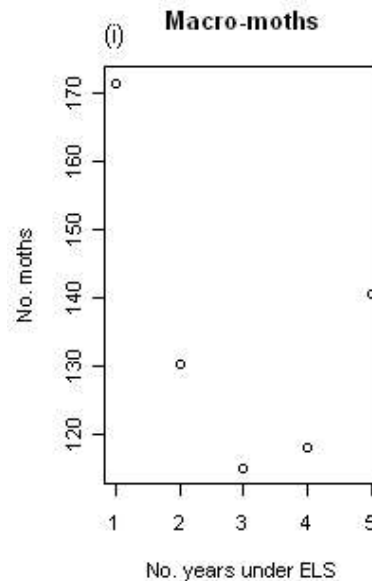


Farm-scale changes – weather effects

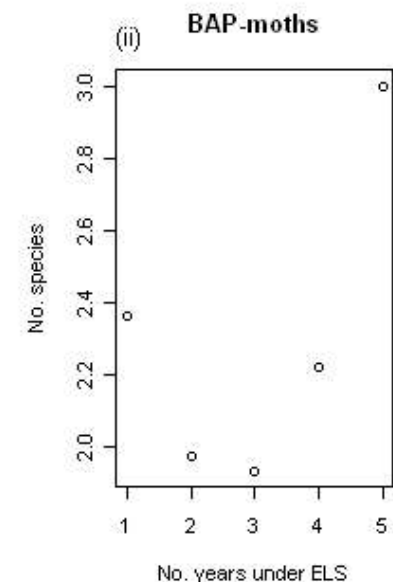
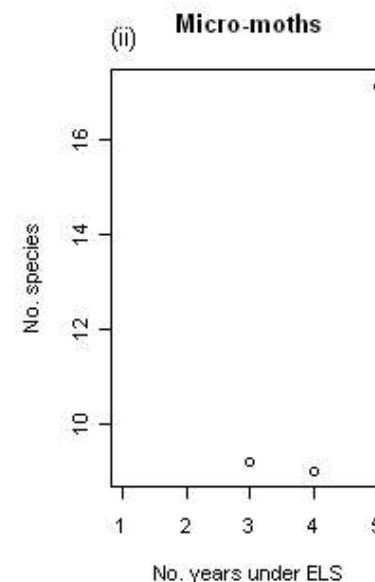
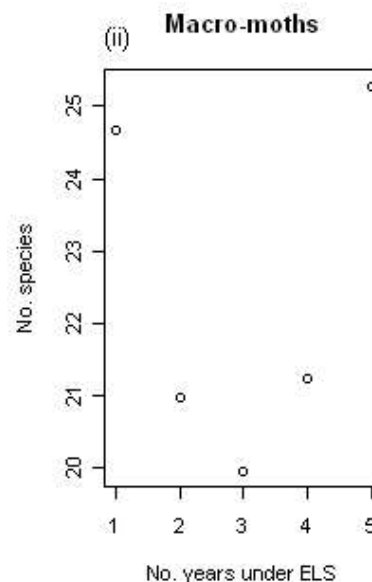
Accounting for
temperature and
rainfall:



Small Square-spot *Diarsia rubi*



Large Nutmeg *Apamea anceps*



Treatment effects?

Treatment	Response	Macro-moths	Micro-moths	BAP-moths
ELS vs CC	Abundance	ELS>CC	ELS>CC	ELS<CC
	α -diversity	ELS>CC	ELS>CC	ELS<CC
ELSX vs CC	Abundance	ELSX>CC	ELSX>CC***	ELSX>CC
	α -diversity	ELSX>CC	ELSX>CC*	ELSX>CC
ELSX vs ELS	Abundance	ELSX>ELS	ELSX>ELS**	ELSX>ELS
	α -diversity	ELSX>ELS	ELSX>ELS	ELSX>ELS

Large numbers of specialist micros that feed in seed heads eg. *Cochylimorpha straminea* & *Aethes smeathmaniana*

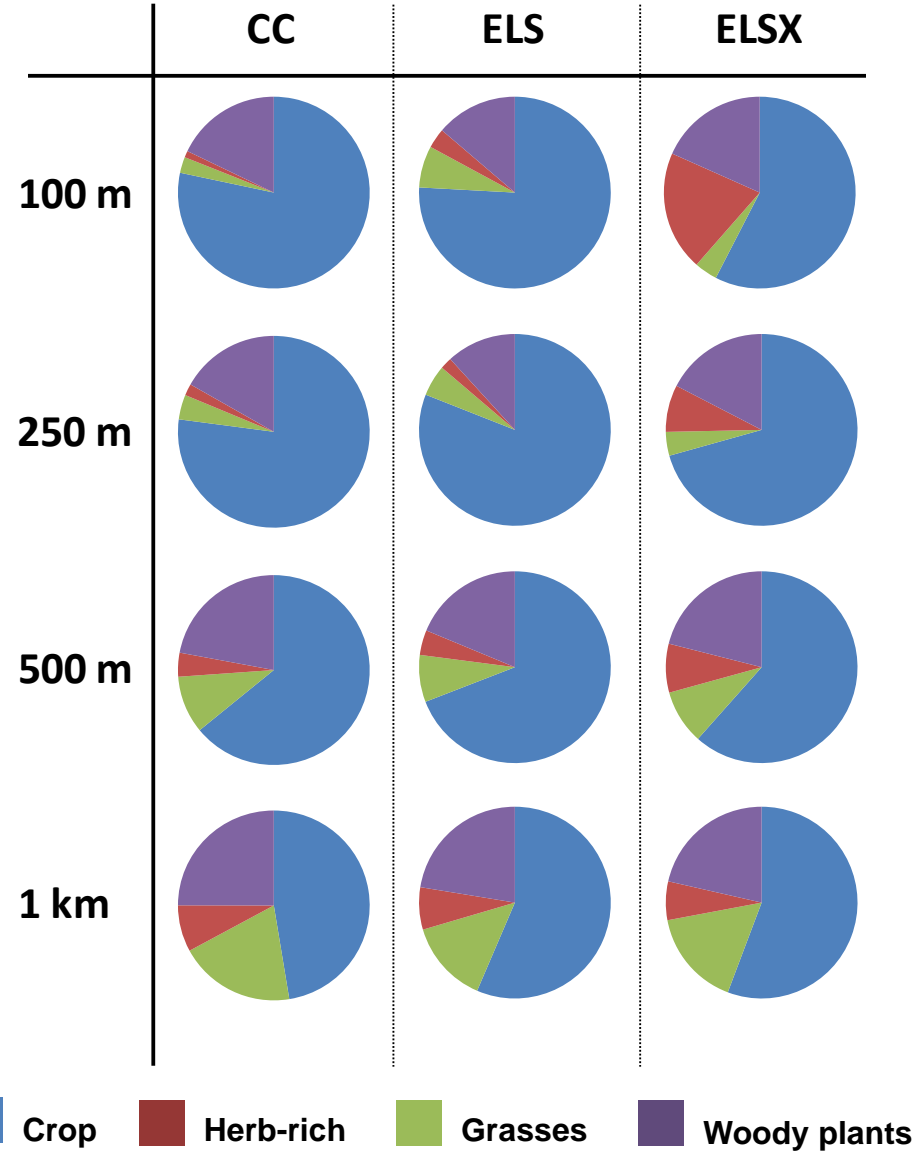
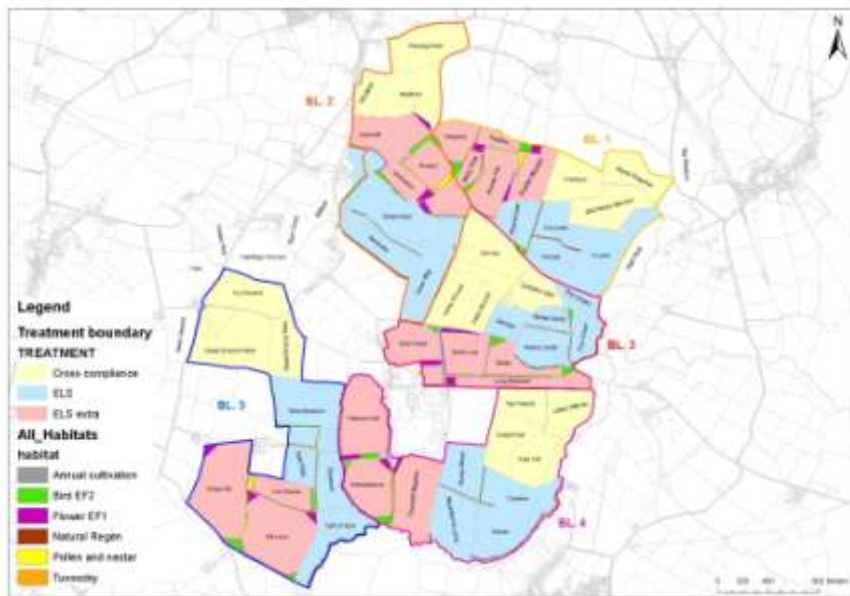


Scale: landscape?

Mobile species attracted from nearby habitats

Treatments too close together

Ubiquitous presence of hedgerows and hedgerow trees



SUMMARY & CONCLUSIONS

- ELS is likely to benefit moths
 - UK BAP species have increased
 - After poor years nationally moth numbers are increasing at farm-scale
 - Both ES margin types increased abundance and diversity of moths compared to cross compliance
- Type of margins are important
 - ELSX increases abundance and diversity of all moths and significantly micro-moths compared to ELS standard
- Highlights need for longer-term monitoring and consideration of landscape

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