

Housing to protect cattle from bluetongue – an update

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Background

Historically horses in South Africa were protected from AHS by stabling. More recently, Meiswinkel *et al* (2000) showed that the major AHSV vector, *Culicoides imicola*, is exophilic.

For *Culicoides obsoletus* in Europe, the evidence is mixed:

- Meiswinkel *et al* (2008) report that 2x midges were caught outside animal housing as inside;
- Zimmer *et al* (2008) report 15-22 more inside than outside.

BUT

In both of these studies effects of site/night were not controlled for, and animals were housed at night, and hence nearer to one trap than another.

Our Aims

- To use a strong experimental design;
- To investigate the entry behaviour of British species of *Culicoides* into cattle housing:
 - Total numbers of *Culicoides* inside relative to outside
 - Effect of presence of cattle on numbers of *Culicoides* caught inside & outside;
- To assess the effectiveness of housing as a strategy to protect cattle from the bites of *Culicoides* midges during an BTV outbreak situation.

Bala, north Wales



52°55'04.20" N

3°35'22.08" W

elev 175 m

2006

Eye alt 8.11 km

Experimental design

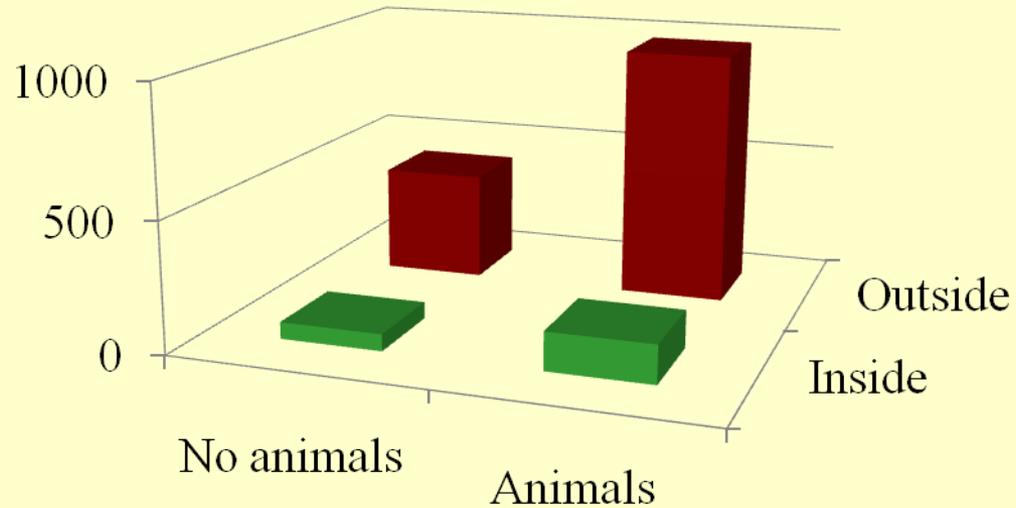
- Three-times-replicated 4x4 latin square design
- 4 treatments, 4 farms, 4 nights
 - Trap outside/cattle absent
 - Trap outside/cattle present
 - Trap inside/cattle absent
 - Trap inside/cattle present
- Confounding effects controlled
 - difference between farms
 - difference between nights
- 2 trials
 - Summer
 - Autumn

Culicoides catch data

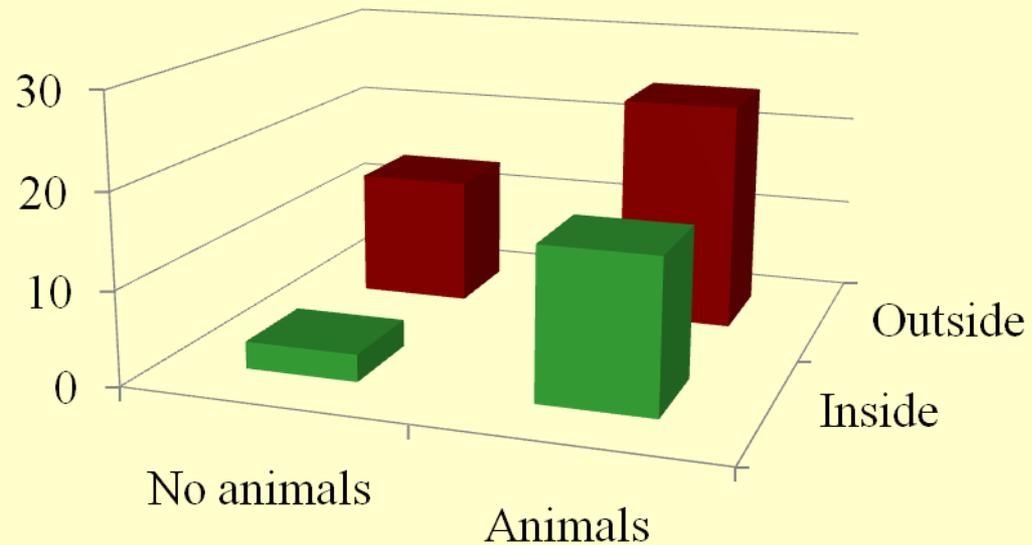
	SUMMER		AUTUMN	
Total <i>Culicoides</i>	71,729		4,690	
Female <i>C. obsoletus</i>	66,159		3,961	
(of above) % nullipar	76%		46%	
(of above) % par	13%		33%	
SPECIES BREAKDOWN	MALE	FEMALE	MALE	FEMALE
% <i>C. obsoletus</i>	89	73	12	47
% <i>C. scoticus</i>	5	23	53	37
% <i>C. dewulfi</i>	6	1	22	8
% <i>C. chiopterus</i>	0	2	13	7

Effect of treatment

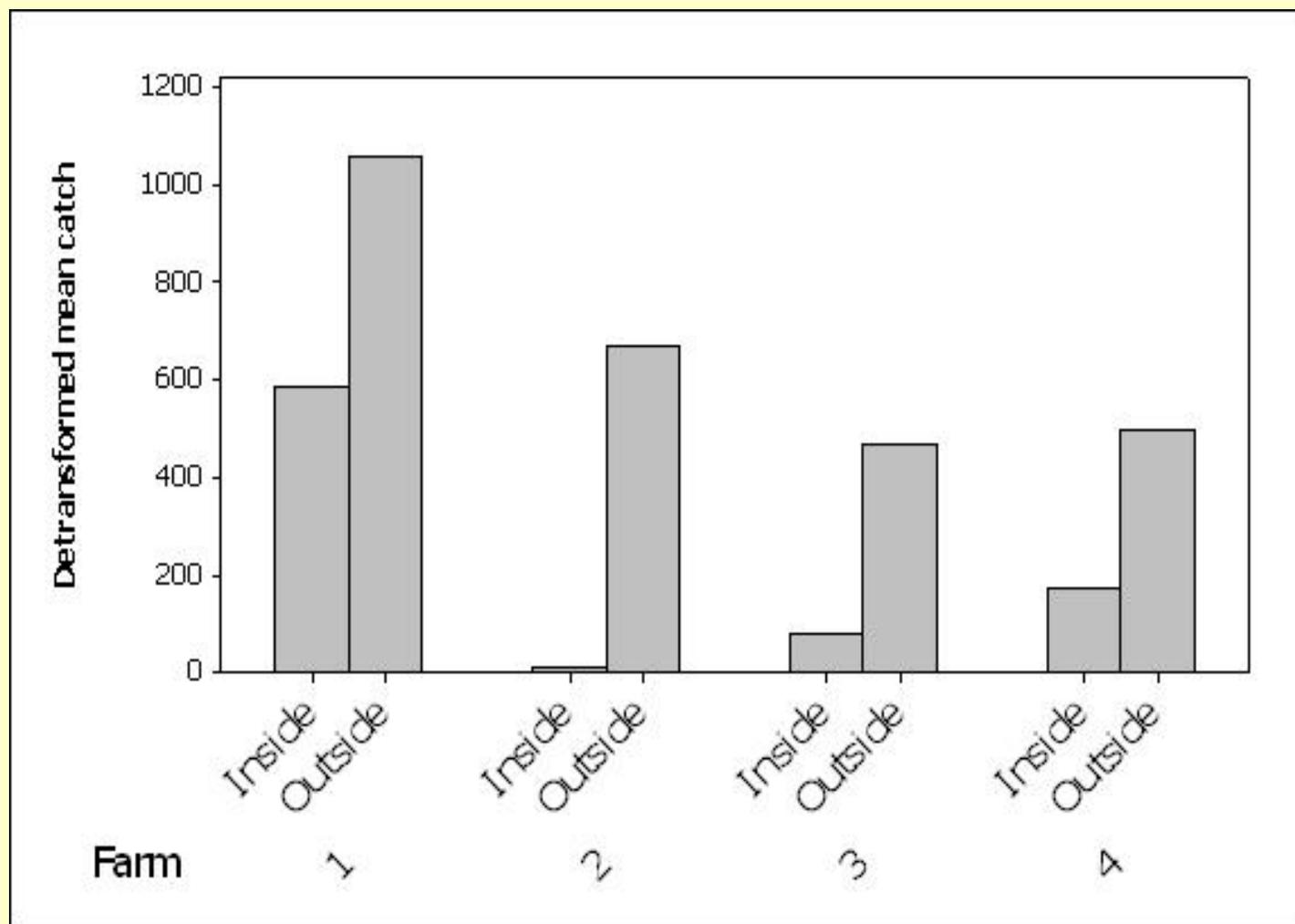
SUMMER



AUTUMN



Interaction of Farm x Treatment

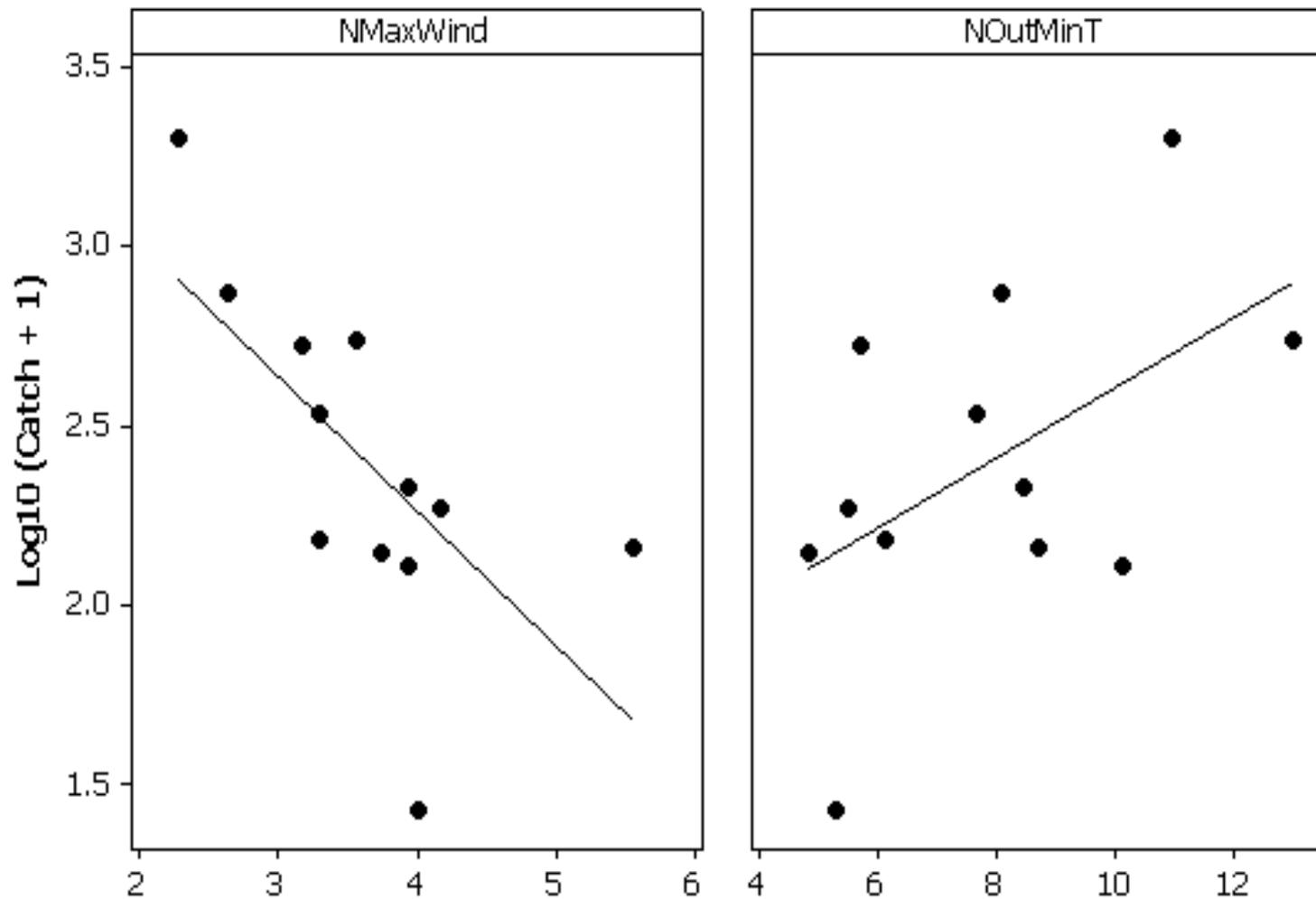


The delightful (British) weather

Weather variable	May/June		October	
	Inside	Outside	Inside	Outside
Max temp(°C)	21.1	21.7	12.3	13.8
Min temp (°C)	9.5	7.8	6.2	5.5
Min RH (%)	56	44	78	64
Max wind (m/s)	n/a	3.6	n/a	4.5
Total rain (mm)	n/a	1.4	n/a	37.5

Catches and weather

SUMMER



Inside v Outside

SUMMER

INSIDE catches only: these increase with minimum temperature inside ($P = 0.02$), but there is no effect of wind speed (measured outside).

OUTSIDE catches only: increase with minimum temperature ($P = 0.01$) and decrease with wind speed ($P = 0.01$).

A 3-variable model of ANIMAL (present/absent), minTemp and maxWind has $R^2 = 73\%$ for OUTSIDE *C. obsoletus* (ie, not considering night or farm!).

INSIDE AND OUTSIDE TOGETHER: a model of Farm, Animals, In/Out, Farm*In/Out, minTemp and maxWind has $R^2 = 83\%$

(no consideration of night !)

Catches and weather

AUTUMN

INSIDE catches only: these increase with minTemp ($P < 0.05$)

OUTSIDE catches only: these increase with minTemp ($P < 0.01$) and decrease with maxWind ($P < 0.05$)

Model fit was poor compared to summer. The inclusion of ANIMAL did not improve the models.

As for Summer, weather affected outside catches more strongly than inside catches.

Conclusions

1. Strong evidence that catches are higher outside than inside in both seasons;
2. The difference is greater in summer than autumn;
3. Changes to the population structure (species composition or age) could play a role BUT
4. We present strong evidence for effects of weather.
 1. Colder and windier weather reduces OUTSIDE catches more than INSIDE catches
 2. In autumn the OUTSIDE catches are more suppressed than those INSIDE, and the difference between them is reduced.
5. Min. Temperature & max. Wind speed – TOGETHER - largely account for the effects of Farm and Night.
6. **When trapping midges, we should attempt to record both of these weather variables as standard.**