

Bats and Windfarms

Radar as a method of mitigation ?

*P.A. Racey & B. Nicholls

*School of Biological Sciences, University of Aberdeen, U.K.

Bats and Radar

Mitigation:

Birds: visual deterrents

Bats: Acoustic deterrents ???

Radar ?

- 1. Anecdote:** No bats in vicinity of Aberdeen airport radar.
- 2. Pilot Project:** Significantly fewer bats in vicinity of two Scottish airport radars compared with sites matched for altitude and land use.
- 3. 2006 Project:** To test hypothesis that bats avoid electromagnetic radiation associated with radar installations.

Biological Effects of Electromagnetic Fields (EMF)

1MHz – 300GHz: Thermal burden

Perception → Aversion → Thermal insult → Death

Auditory microwave hypothesis: Thermal expansion

Thermoelastic wave → sound pressure wave → excitation of auditory neurones

Auditory response:

Humans: 13kHz

Cats: 38kHz

Rodents: 45kHz

10 Radars: 300MHz – 15GHz



**Civil Air Traffic Control
(n=4)**



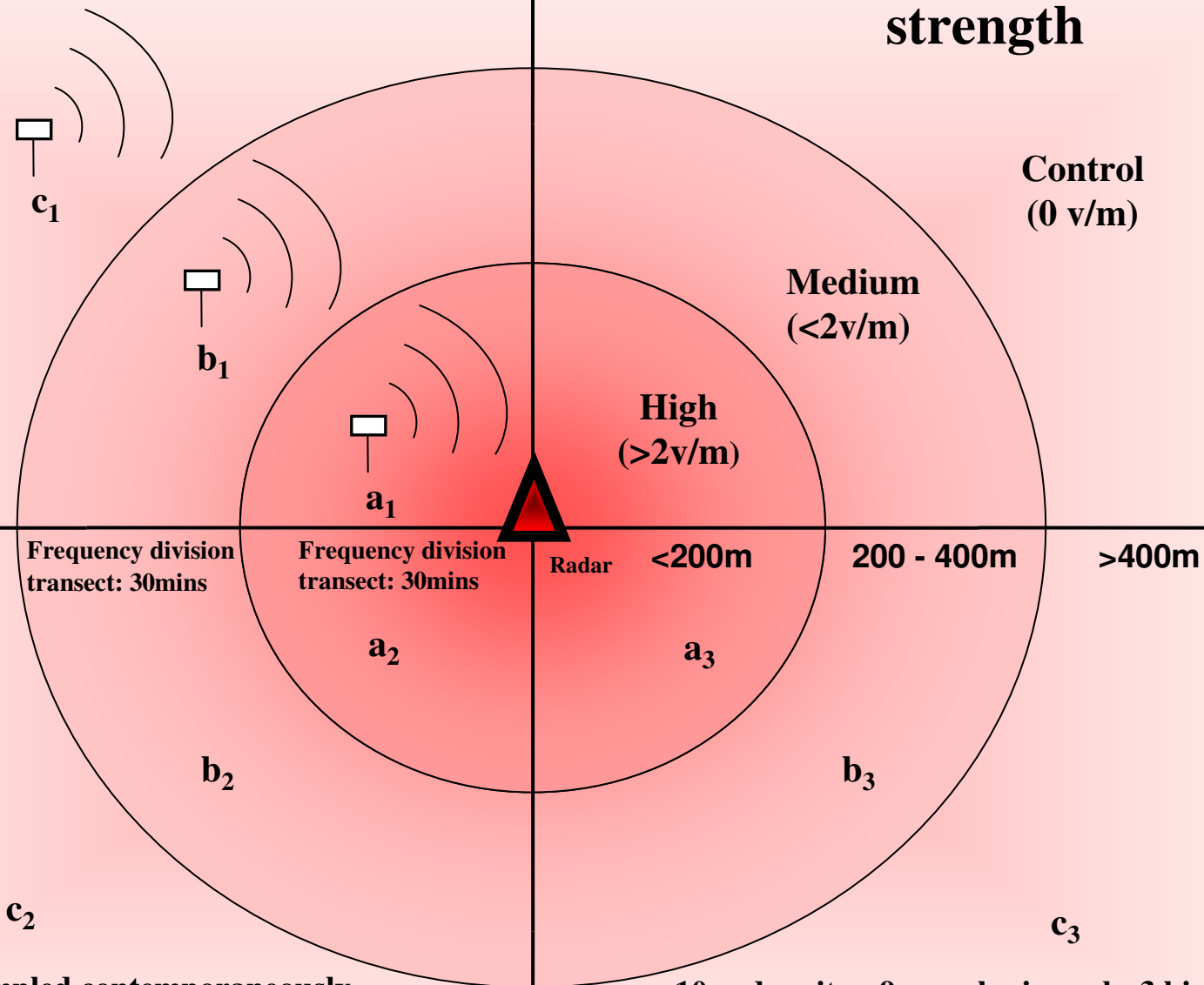
**Military Air Traffic Control
(n=3)**



**Weather
(n=3)**

Sampling protocol

Electromagnetic field strength



Frequency division
transect: 30mins

Frequency division
transect: 30mins

Frequency division
transect: 30mins

Radar <200m

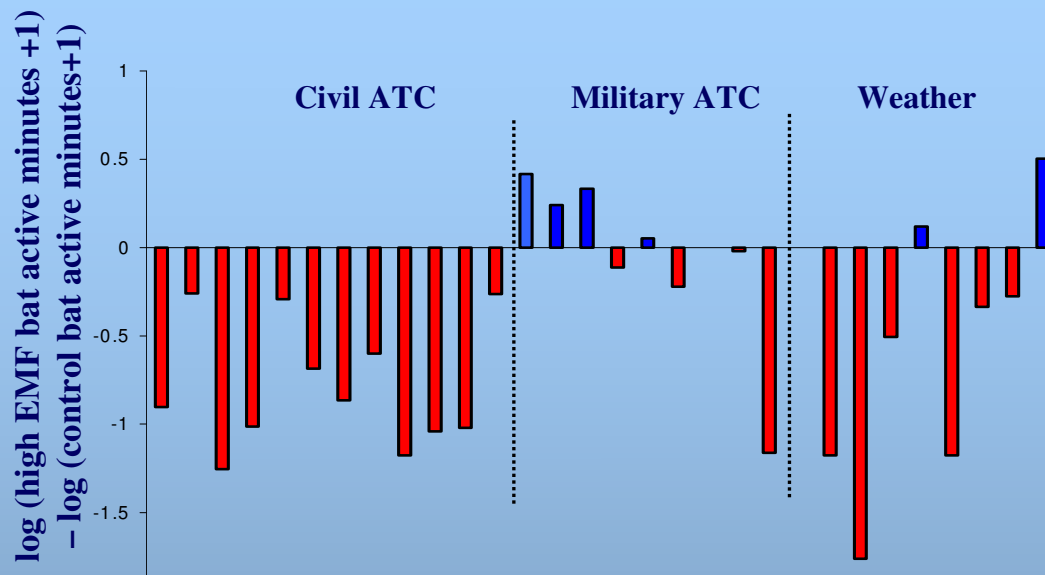
200 - 400m

>400m

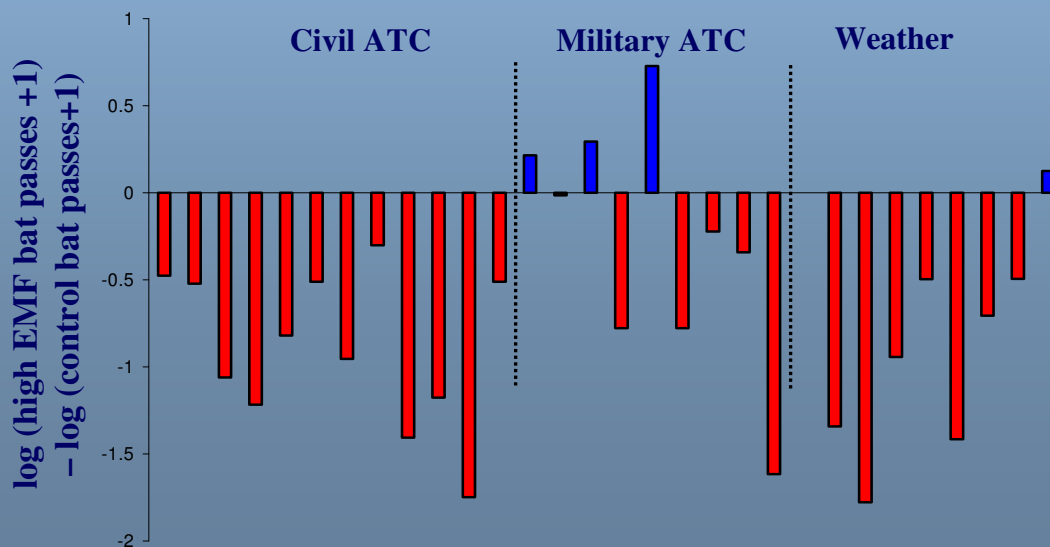
Three sites sampled contemporaneously each night. Sites paired for: altitude, latitude, landclass, habitat type, connectivity and habitat structure.

10 radar sites, 9 samples in each: 3 high, 3 med, 3 low. Total = 90 samples, 30 in each group. Sampled for bat activity, species and feeding buzzes.

Results: high EMF vs control

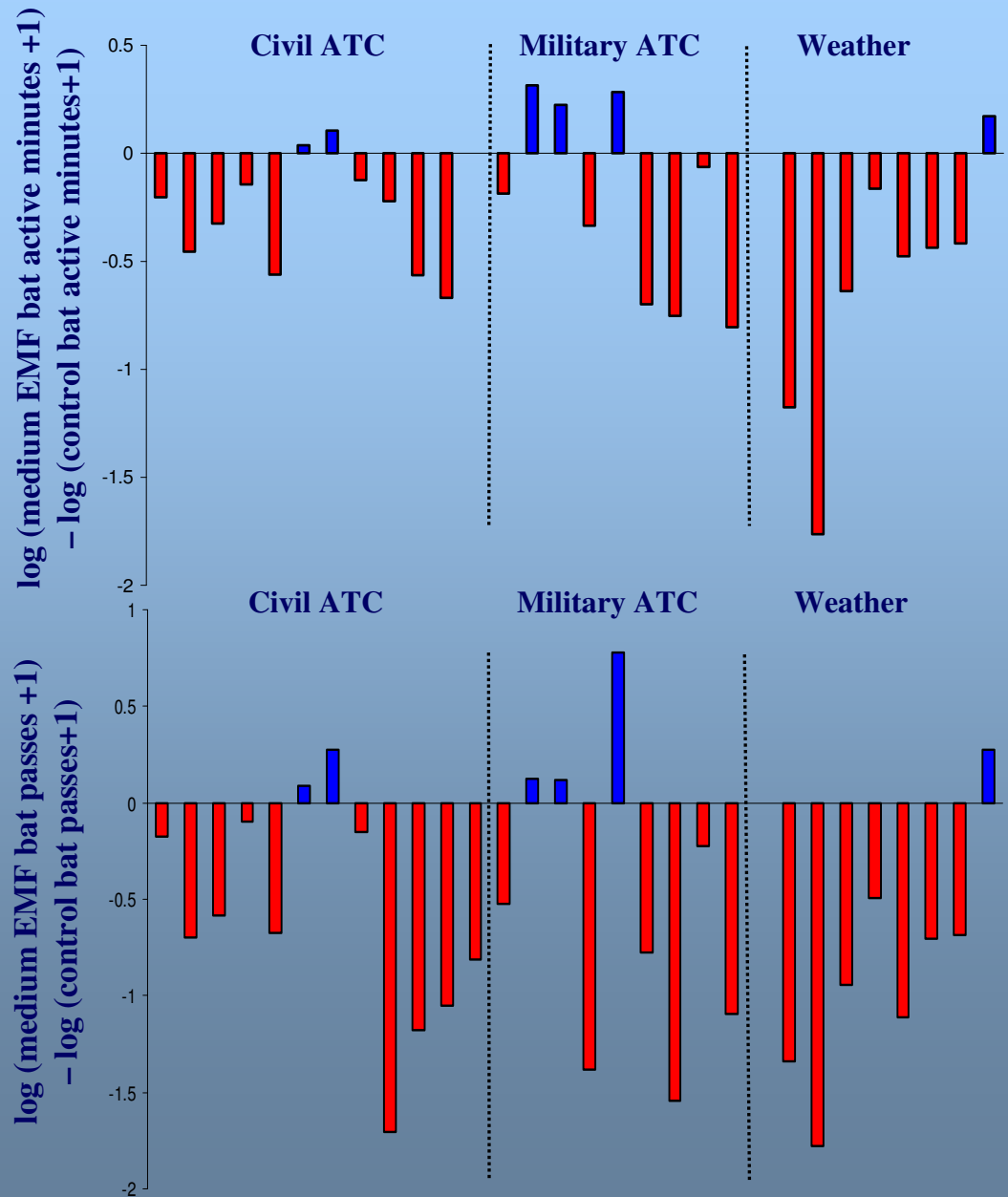


Bat active minutes
(paired t test, $n = 30$, $p < 0.001$)



Bat passes
(paired t test, $n = 30$, $p < 0.001$)

Results: Intermediate EMF vs control



Bat active minutes
(paired t test, n = 30, p=0.004)

Bat passes
(paired t test, n = 30, p<0.001)

Conclusions

- Bat activity was reduced in habitats exposed to electromagnetic radiation.
- However without access to detailed specifications of individual radar units (including operational times and operating frequency) it is difficult to quantify this relationship further.

Way Forward

- To more fully define the impact of radar on foraging bats, and ascertain its value as a potential source of mitigation, field trials involving a mobile radar that can be introduced into areas of known bat activity are now required. If the parameters of an RF signal capable of inducing an aversive response in foraging bats could be characterised then this may offer a method of mitigating bat collisions with wind turbines.

ACKNOWLEDGEMENTS

*PEOPLE'S TRUST
FOR ENDANGERED SPECIES*

