

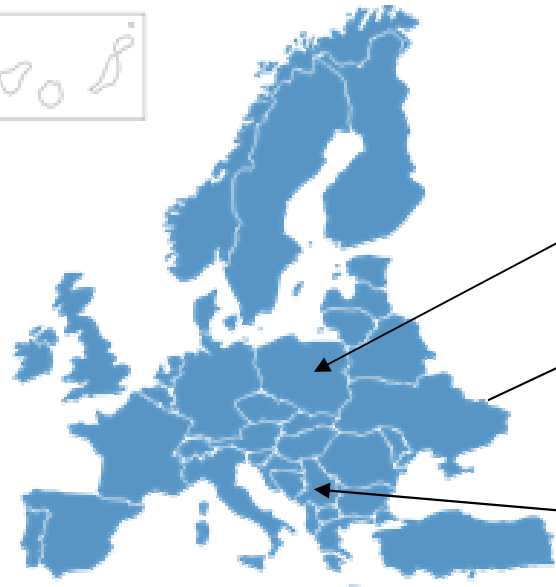
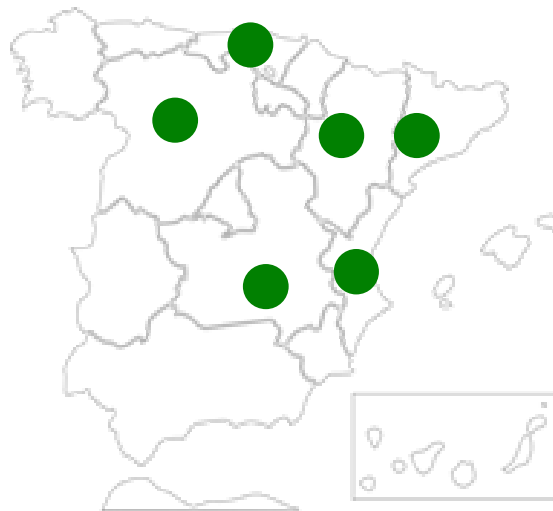
# ***Guidelines for wind farm planning on birds and bats: Lessons learned from operating wind farms***

**Álvaro Camiña**

*Biodiversity & Ecosystem Services in Impact Assessment  
Inter-American Development Bank | Washington, DC, USA  
7-8 February 2013*



# Where we work



**POLAND**

Bat monitoring

EIA's

**BOSNIA HERZEGOVINA**

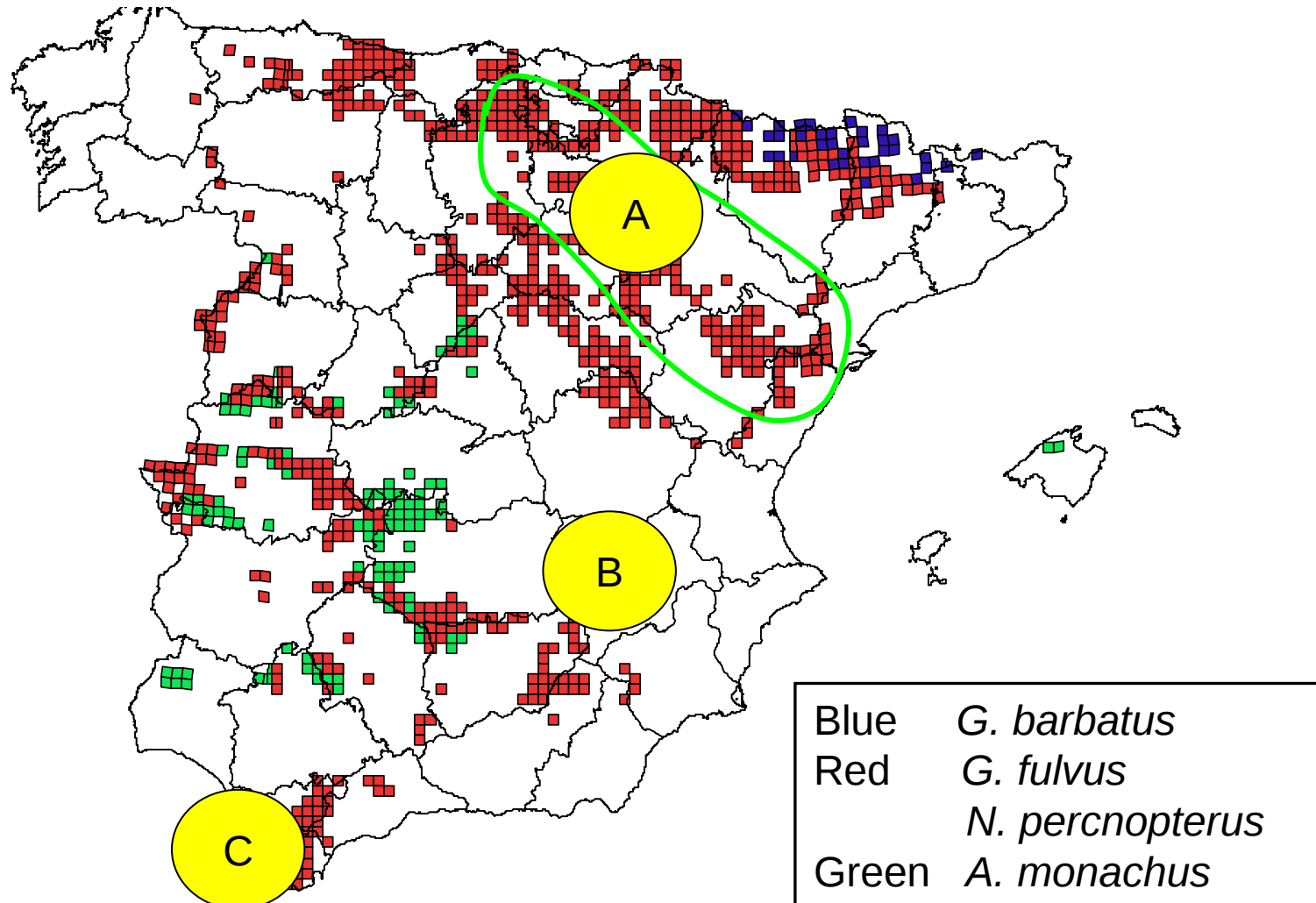
**MONTENEGRO**

Mozura Wf

Krnovo Wf



# Mortality rates, species affected(case of vulture species)



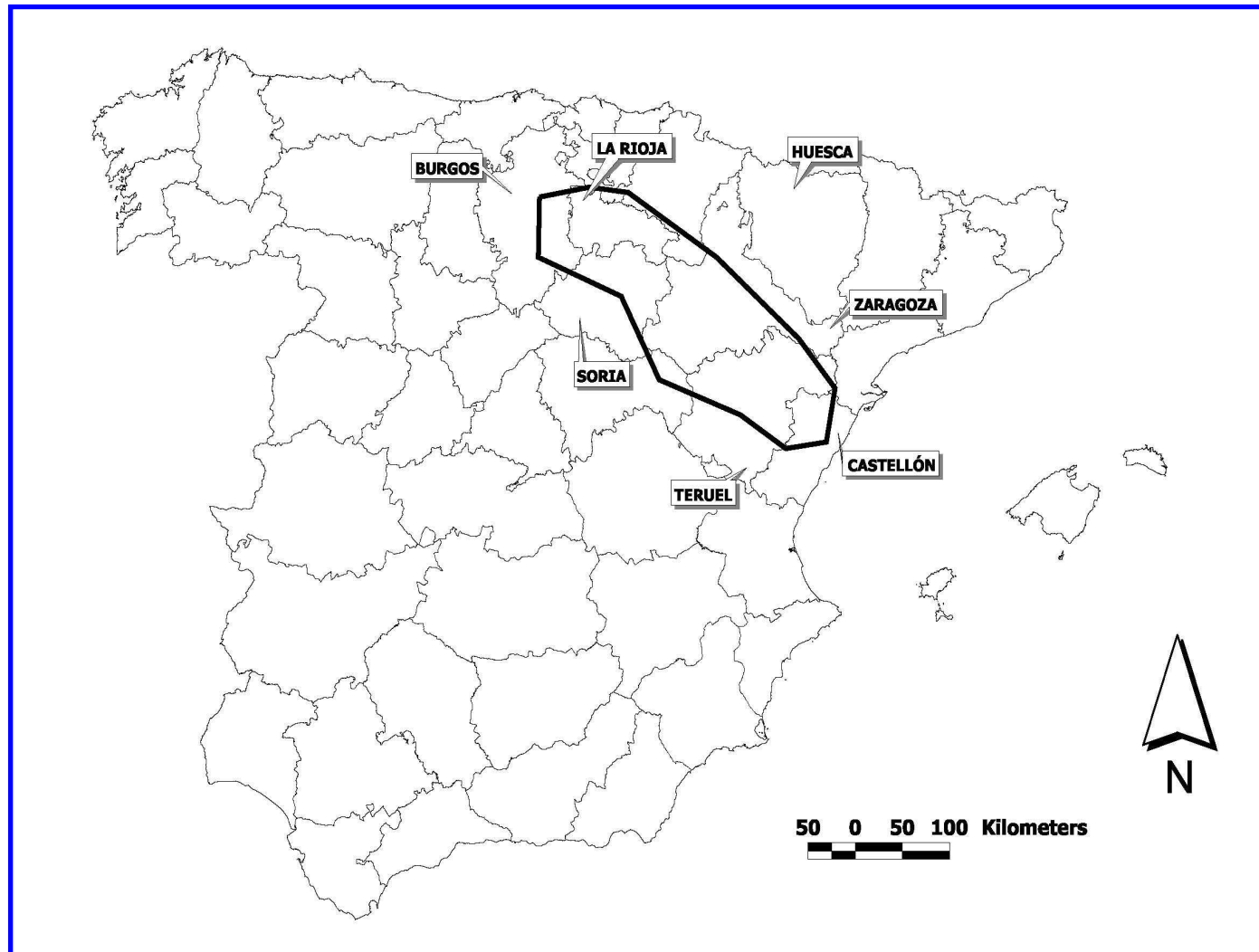
# Mortality rates, species affected

| AREA             | A      | B      | C      |
|------------------|--------|--------|--------|
| Windfarms        | 125    | 64     | 62     |
| Turbines         | 3305   | 1879   | 908    |
| Turbines sampled | 57.45% | 49.39% | 69.49% |

| Mortality rates       |       |       |       |
|-----------------------|-------|-------|-------|
| Vultures/turbine/year | 0.184 | 0.002 | 0.420 |

| COLLISIONS                   |      |   |     |
|------------------------------|------|---|-----|
| <i>Gyps fulvus</i>           | 2035 | 4 | 527 |
| <i>Neophron percnopterus</i> | 3    | - | 5   |
| <i>Aegypius monachus</i>     | 3    | - | -   |
| <i>Gypaetus barbatus</i>     | -    | - | -   |
| <i>Gyps rueppellii</i>       | -    | - | 1   |
| <i>Gyps africanus</i>        | -    | - | 1   |

# ***Review of monitoring reports 2000-2011***



# *Public bodies-Governments*

*Around 900 post-construction monitoring reports*

- Only account for fatalities
- Usually they do not react
- Bureaucracy
- Lack of a prompt answer for solving problems—mitigation and/or correction.
- Transparency

# ***Environmental consultancies***

- Just account for number of fatalities
- No further data analysis (reasons of collision)
- Lack of searcher detection bias or carcass removal
- Very poor related with bats
- Lack of management conclusions (i.e. retrofitting turbines)
- Saving money/subcontracting
- Lack of know-how
- Each one their own - not adequate- methodology.

# *Developers*

- *“I do not want any problem”*
- Just or fill for the requirements of the EIS
- The cheaper, the better.
- Environmental monitoring is mandatory
- Fear : Wildlife is a problem even on already operating wind farms
- Despite proper environmental monitoring is an added service, it is true Biodiversity protection.

## ***Impact on biodiversity***

Birds and bats collide with blades

Barrier effect

Habitat loss



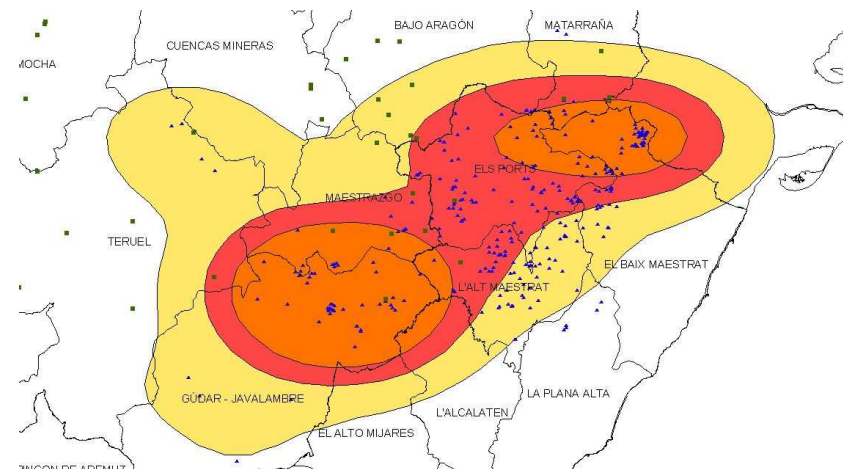
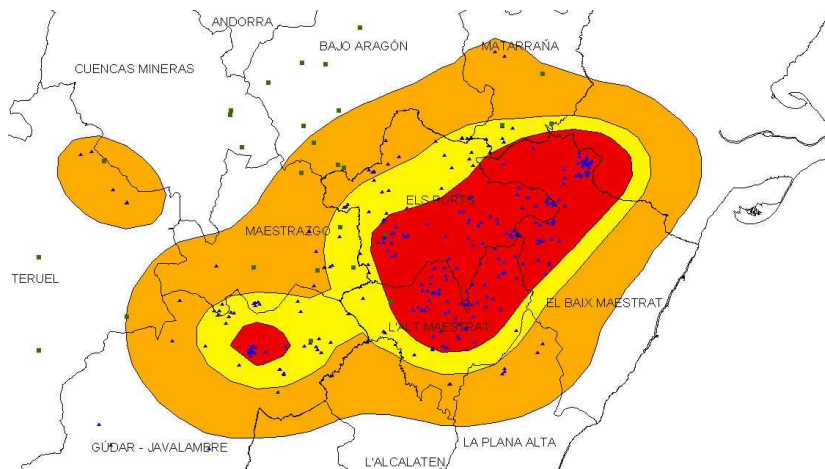
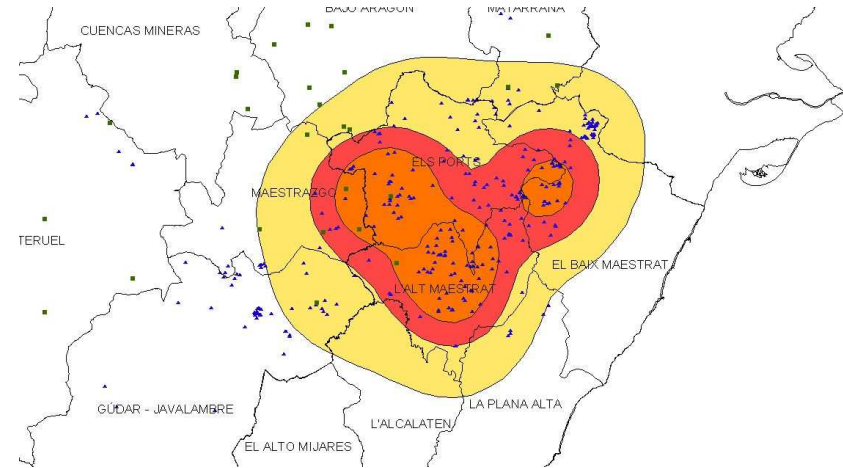
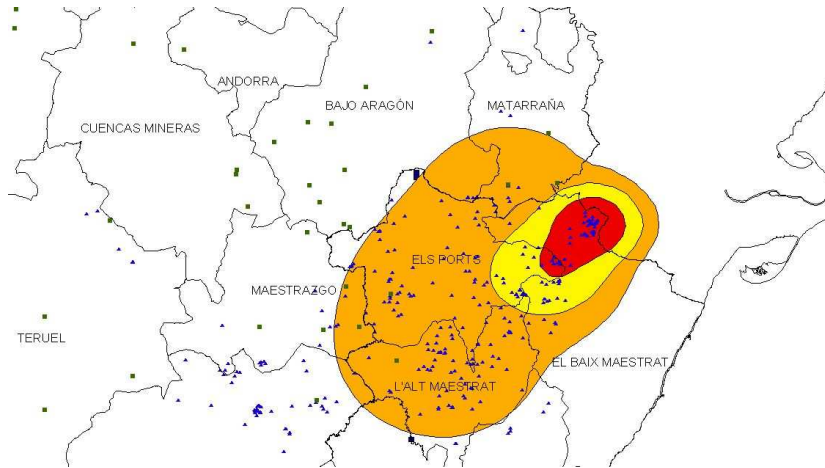
# ***Reasons of mortality***

- **Biology of the species.**
- **Environmental variables.**
- **Wind famr Characteristics.**
- **External factors**

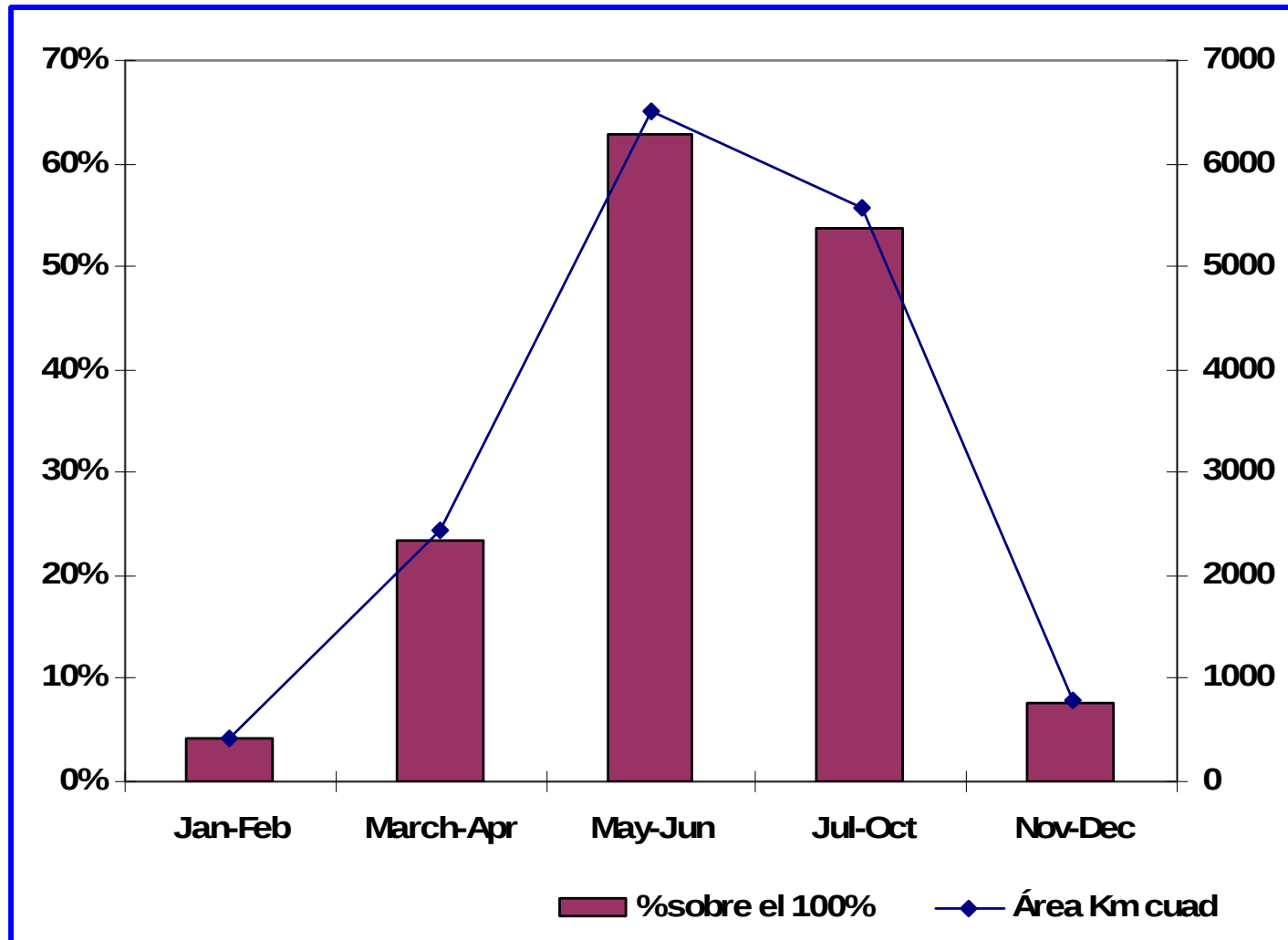
# ***Reasons of mortality***

**Biology of the species**

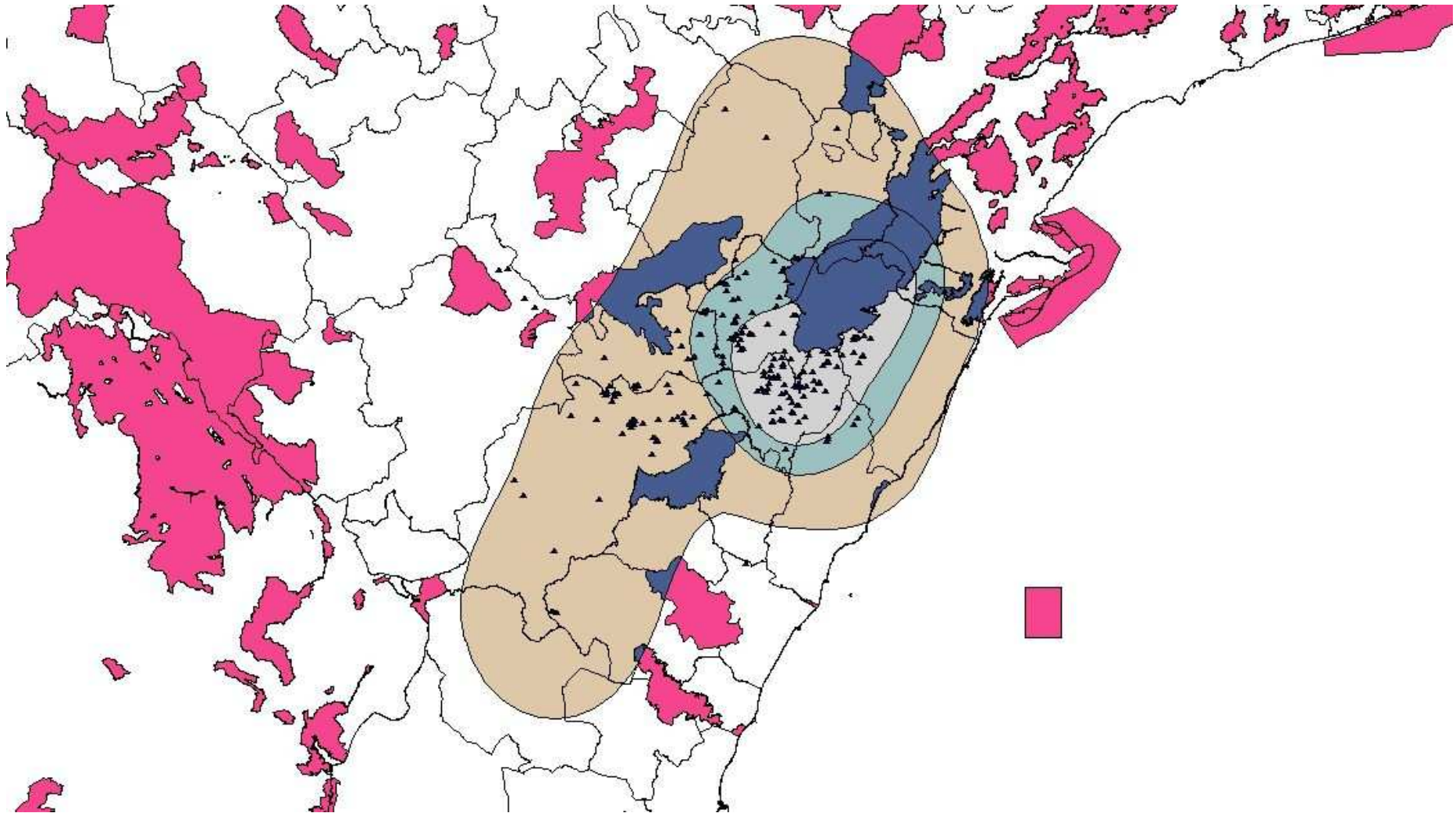
# ARGOS-GPS Monitoring



# Home range



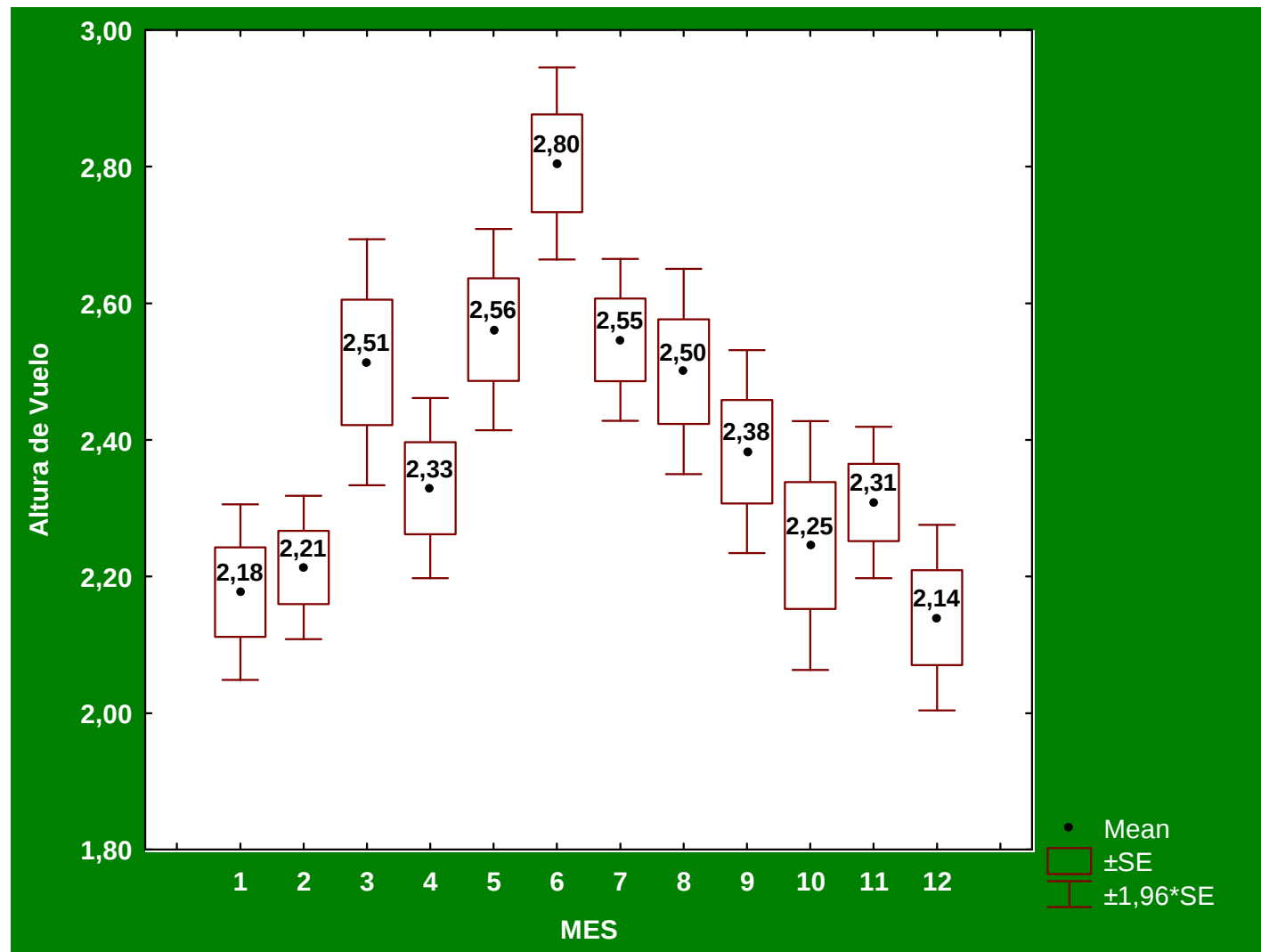
# How much of the home range is protected



# ***Reasons of mortality***

- **Environmental variables**

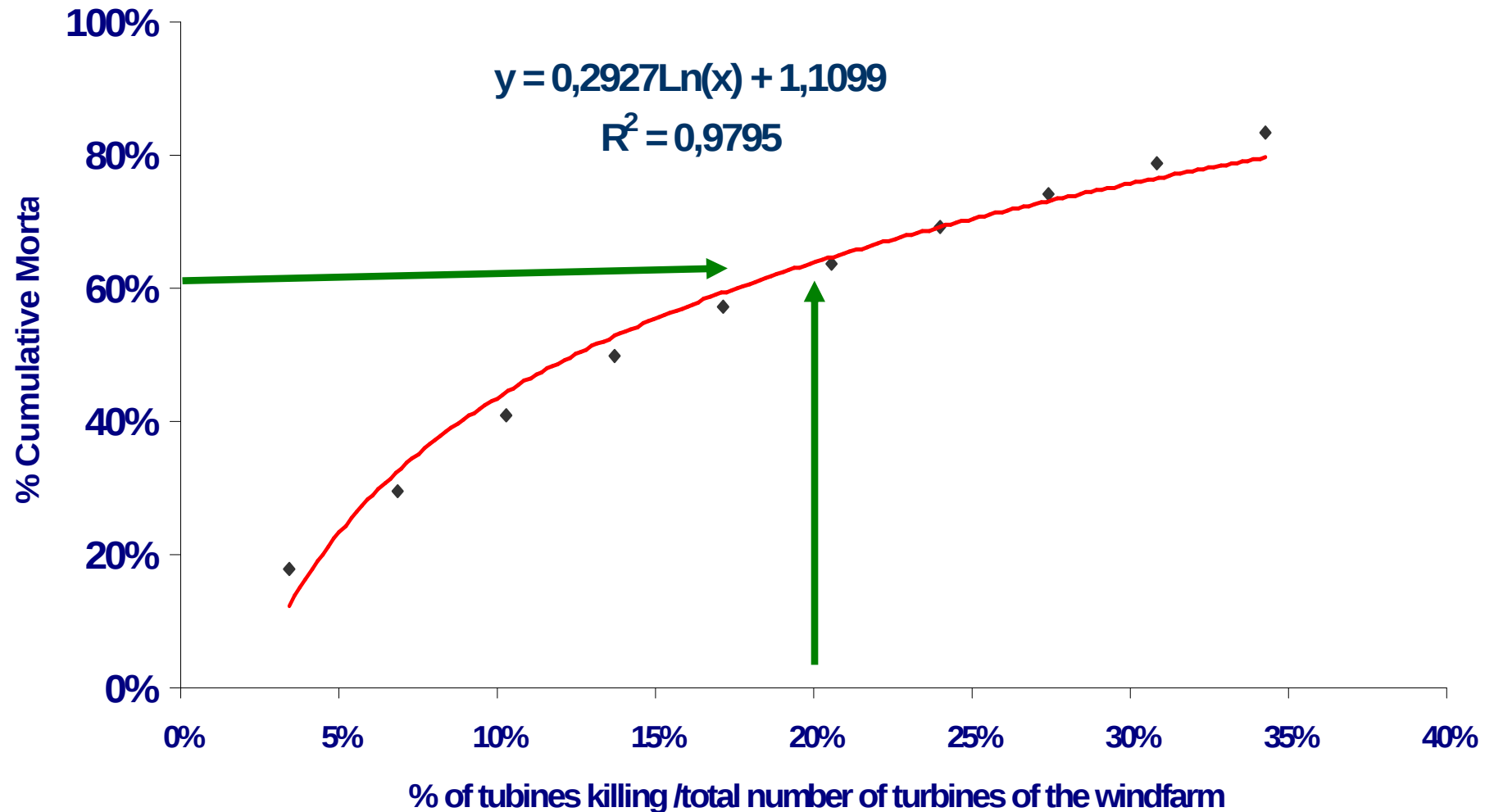
# *Effect of temperature on flying vultures*



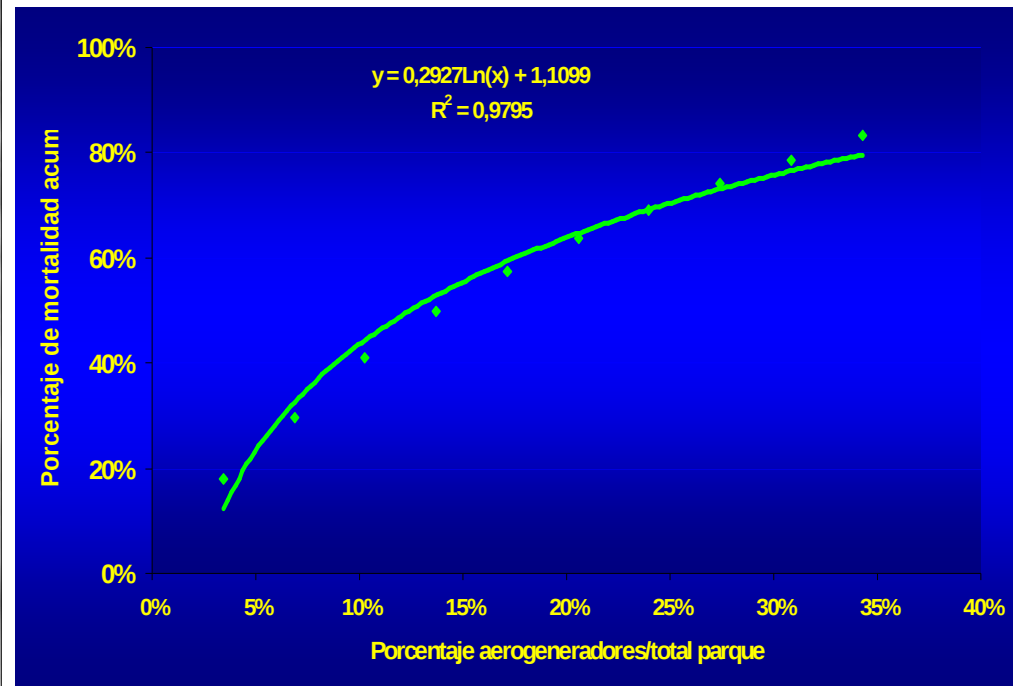
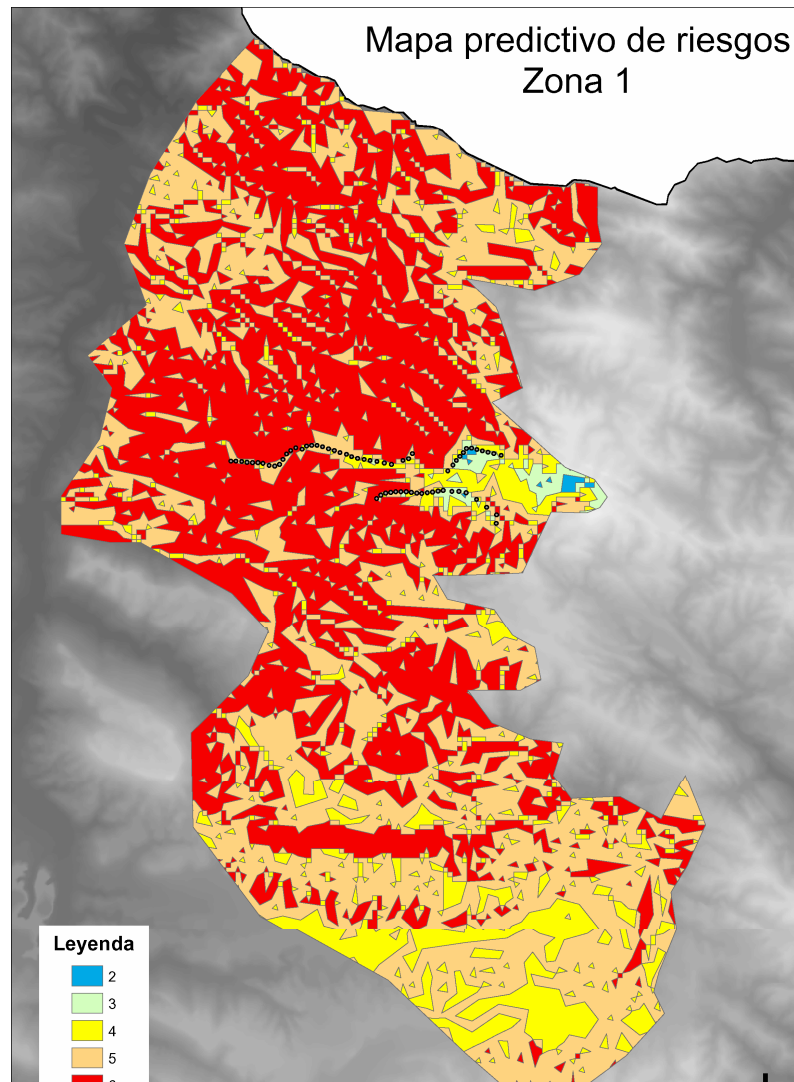
# ***Reasons of mortality***

- **Wind farm Characteristics**

# How many turbines are really dangerous ?



# Wind farm location



# ***Reasons of mortality***

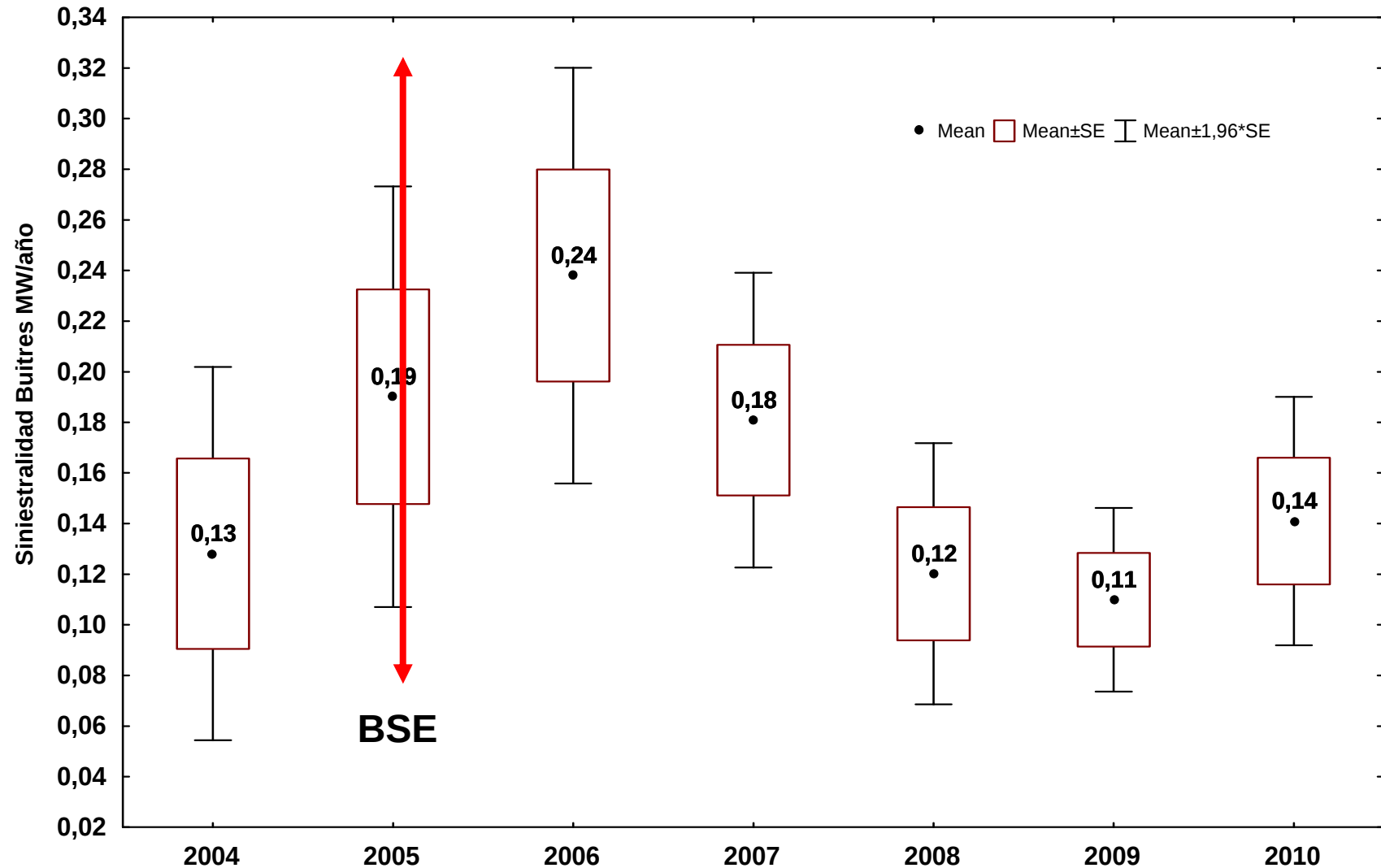
- **External factors**

*In 2000 cattle  
becomes “crazy”*

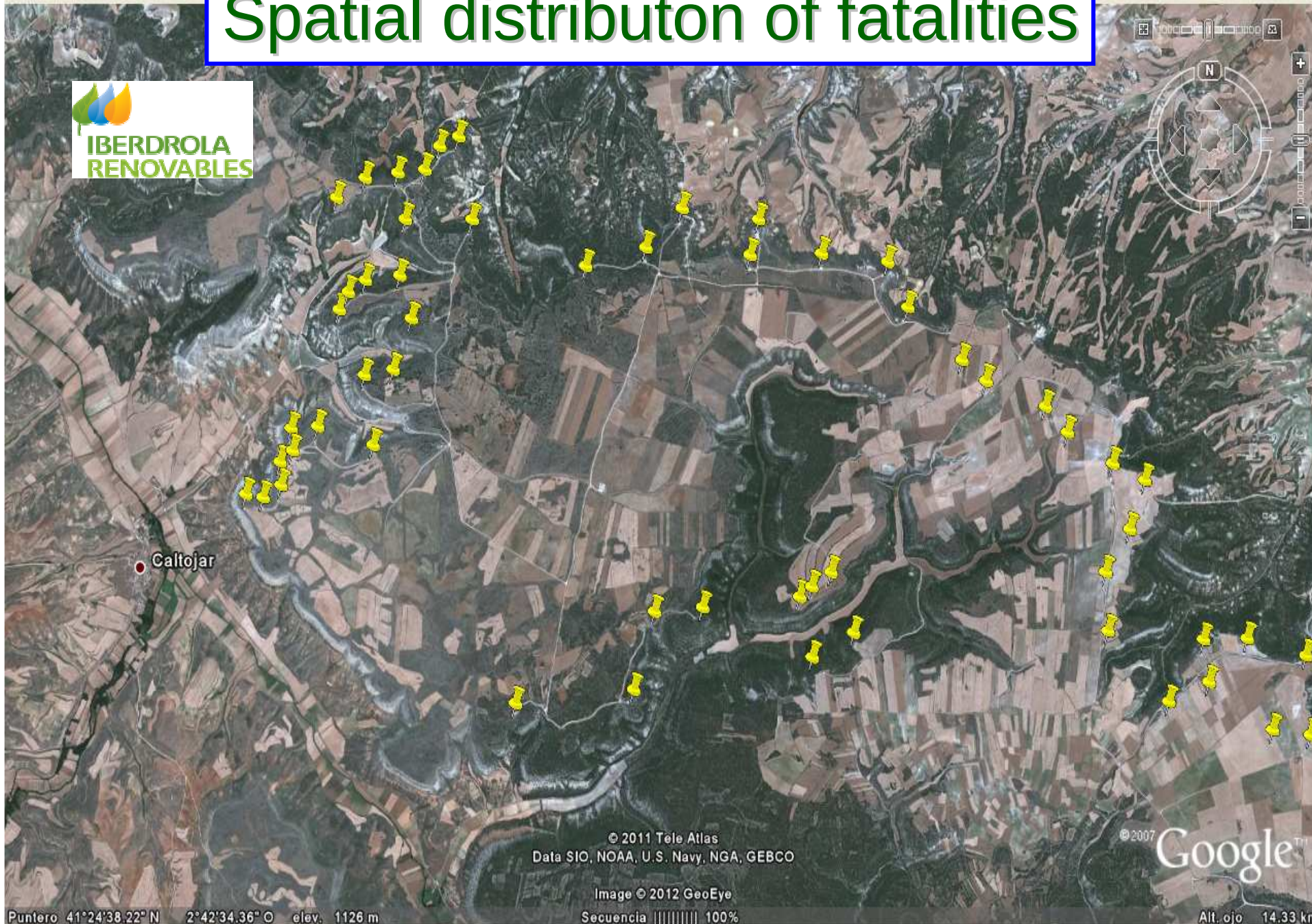
*Because the  
Mad-cow disease*



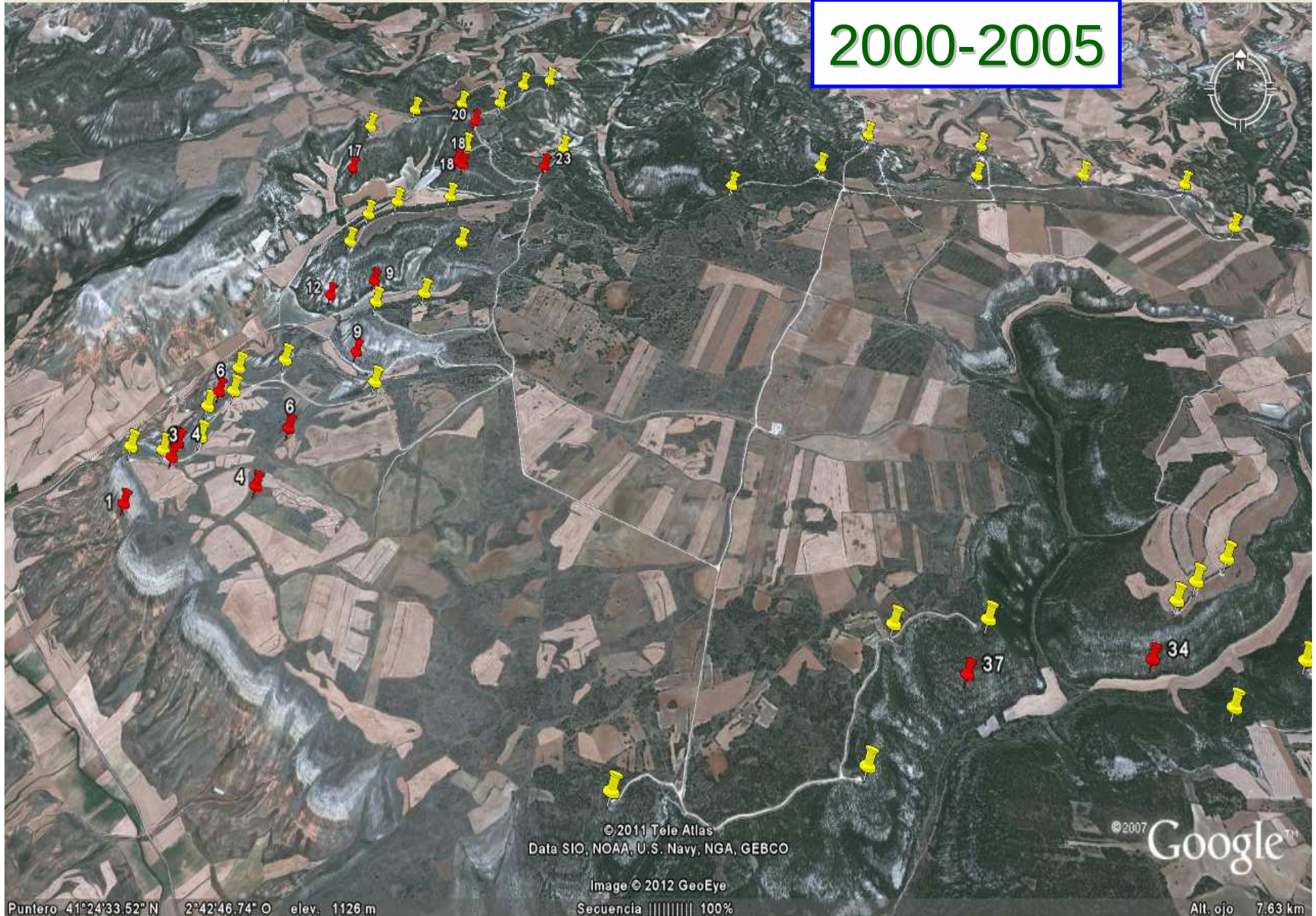
# Variations in mortality (Same species over time)



# Spatial distributon of fatalities



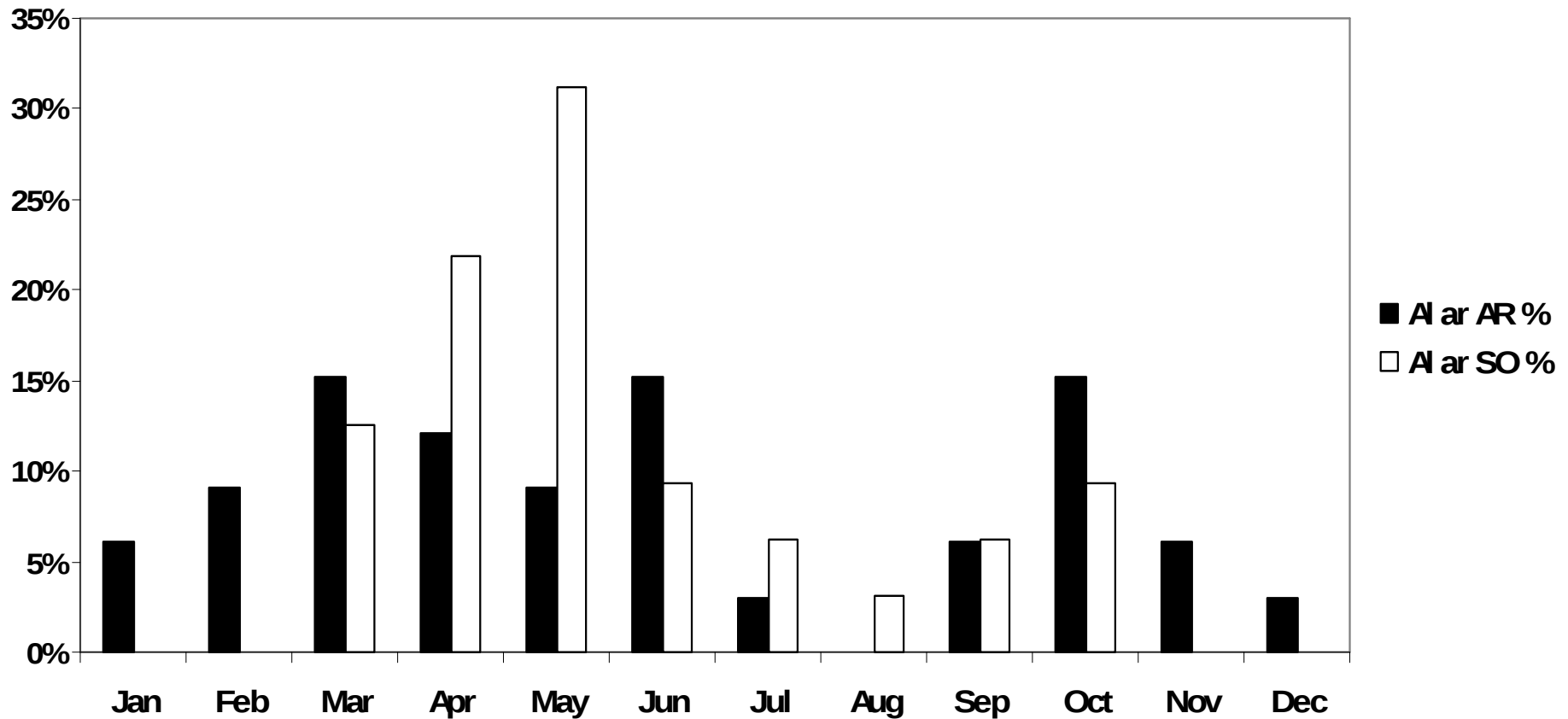
2000-2005



2006-2010

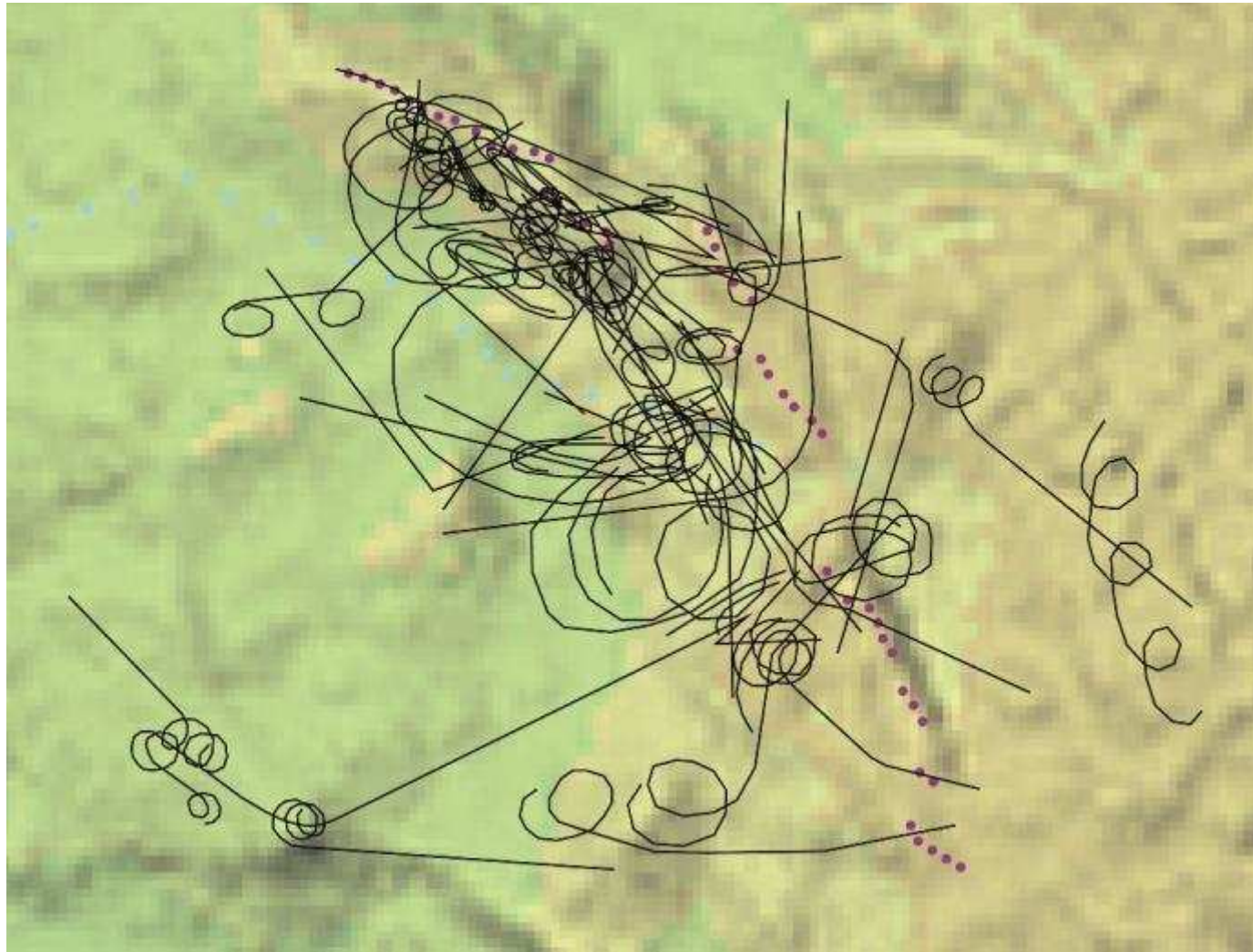
**Turbines with one collision increase from 32% to 58%  
(Wilcoxon  $Z = 2,02$   $p < 0,05$ )**

# Variations in mortality (same species-diferent places) Lark's



# **Bird and bat monitoring**

# Bird monitoring

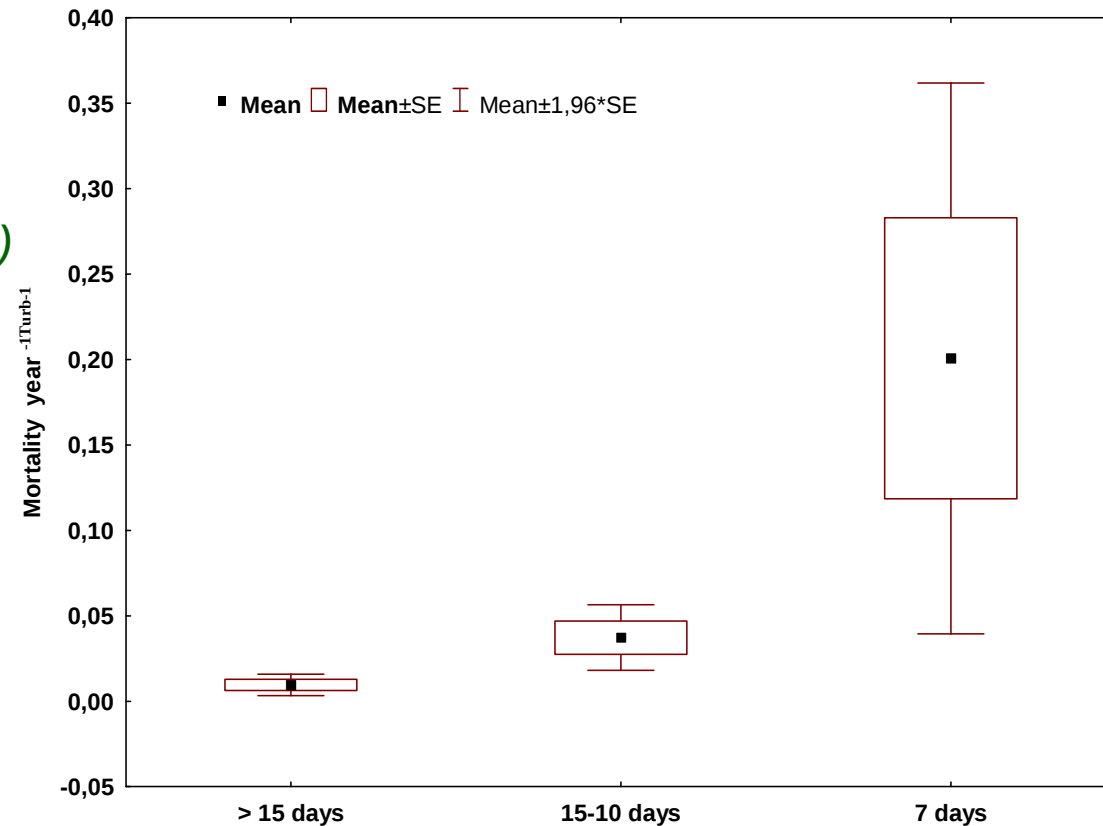


# Bat fatalities

Camiña, A. (2012) Bat mortality at wind farms in Northern Spain. *Acta Chiropterologica* 14(1):205-212.

1662 fatalities

Only 147 bats (8.84%)



## ***Related issues***

**Mitigation measures : there are already tested measures i.e. curtailment of turbines for bats, temporary shutt down.**

**Measuring carcass removal and observer detecton bias**

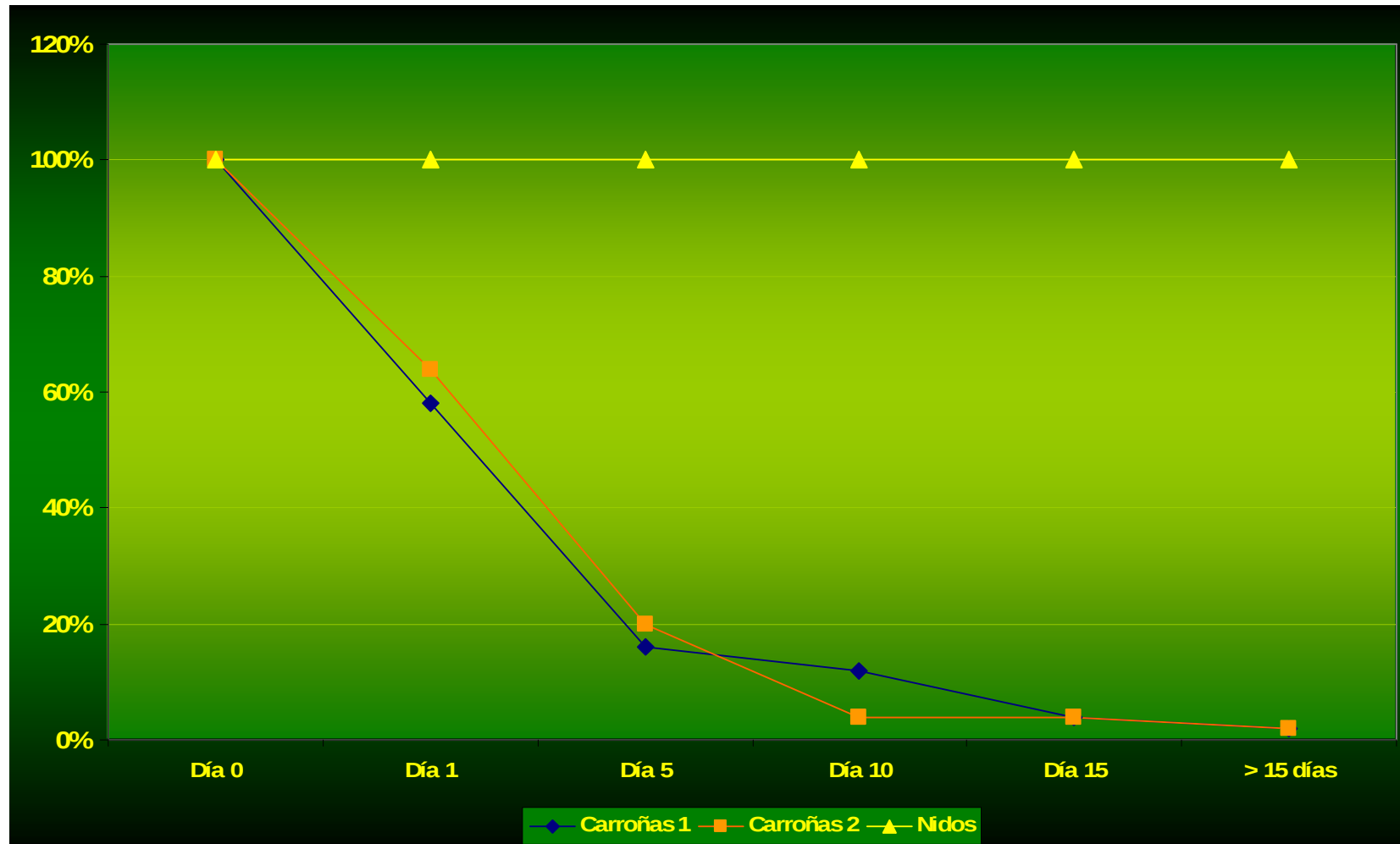


# **Carcass removal**

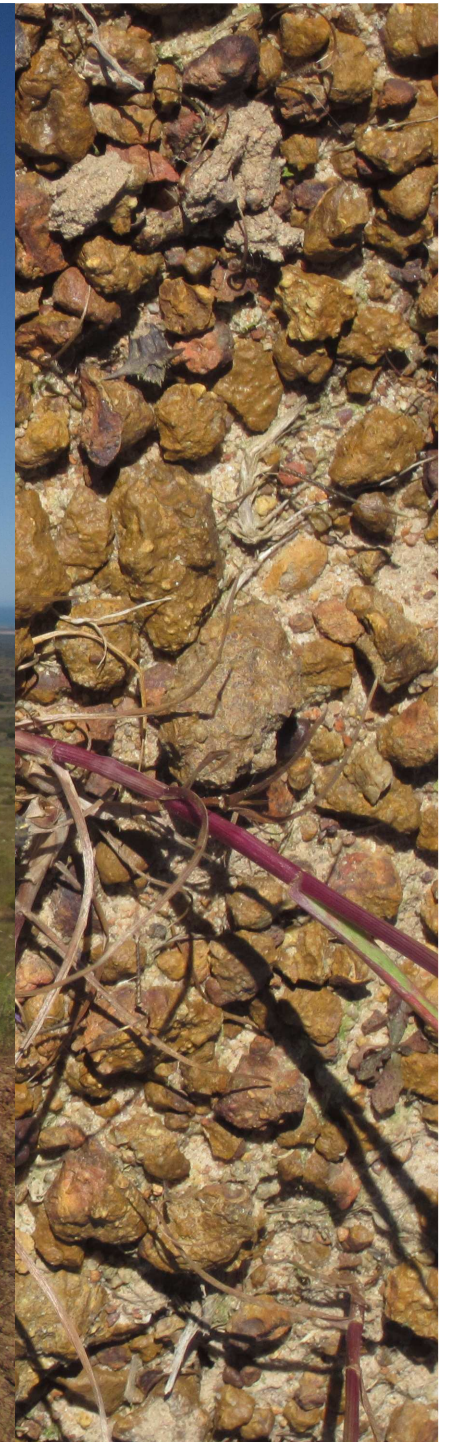
## **Searcher detection bias**



# Carcass removal and detection







# ***Conclusions-Priorities***

- Develop one and unique methodology in all aspects; space use of the wind farm, abundance.
- Formation for consultancies: data collection, data analysis...
- Estimate searcher detection bias or carcass removal, estimation of fatalities.
- Species-specific and site-specific studies (micrositing).
- DATA ANALYSIS!!!

*Thank you!*

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