

World Birdstrike Association Conference Bangkok, November 29th – 1st December 2022

Modelling weather effects on bird strike ratio. A case study



Albert Cama Ferran Navàs Xavier Ferrer Carme Rosell



Intense wildlife management on airfields















But bird strikes still do occur



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Even with hard work, some reasons are unknown



But bird strikes still do occur

Even with hard work, some reasons are unknown

Others are known, but managers can not influence on them



Weather is out of managers control

And can show a strong effect on hazard!!!





But weather can be predicted!



But weather can be predicted!

At least until a certain point...



Prediction allows mangers to:

Organize, prioritize and optimize resources

Establish protocols





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Maximize safety!!





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Establish protocols

Maximize safety!!

Proactive instead of reactive!!!



• Josep Tarradellas Barcelona – El Prat Airport



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5 example species

- Common kestrel
 (Falco tinnunculus)
- Yellow-legged gull (Larus michahellis)
- Common wood pigeon (Columba palumbus)
- Barn swallow (*Hirundo rustica*)
- Common swift (*Apus apus*)



- Weather variables
- For previous days also
- Daily and weekly models



Also a large scale indicator used

North Atlantic Oscillation



Also large scale indicator used

North Atlantic Oscillation



Also a large scale indicator used

North Atlantic Oscillation



Also a large scale indicator used

North Atlantic Oscillation

Avge. winter (december-february) NAO Weekly average Also for previous weeks



- Daily weather modelling (40 variables)
- Weekly weather modelling (15 variables)
- NAO based weekly modelling (9 variables)

3 models





• MARS multivariate adaptable regression analysis

MARS in R (Multivariate Adaptive Regression Splines)



Using the "earth" and "caret" packages With cross-validation and grid search

• MARS multivariate adaptable regression analysis



• MARS multivariate adaptable regression analysis



Results

Some models with many variables.

Just major findings are shown



Main results. Common kestrel

Collisions concentrated:

- Days after high humidity rates
- After soft winters (high positive NAO)









Deviance explained by predictive models

Daily meteo model	Weekly meteo model	Weekly NAO model
10%	24%	16%

Main results. Yellow-legged gull

Collisions concentrated on:

- Bad weather after a few days of stability
- After soft winters (positive NAO)







Atmospheric pressure previous days

Deviance explained by predictive models

Daily meteo model	Weekly meteo model	Weekly NAO model
20%	42%	42%

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Relative humidity



Previous winter NAO

Main results. Common Wood pigeon

Solar radiatior

Collisions concentrated:

- Sunny days after high humidity
- After soft winters (positive NAO)
- High annual variability

Deviance explained by predictive models

Daily meteo model	Weekly meteo model	Weekly NAO model
9%	36%	44%



Relative humidity previous days





Main results. Barn swallow

Collisions concentrated:

- With maintained bad weather for a few days
- Strong phenological influence



Atmospheric pressure previous days



NAO previous weeks



Deviance explained by predictive models

Daily meteo model	Weekly meteo model	Weekly NAO model
14%	32%	35%

Main results. Common swift

Collisions concentrated:

- Dry sunny days after instability the few previous days
- At longer term, under stability scenarios

Deviance explained by predictive models

Weekly meteo model

24%

Daily meteo model

10%



Previous week NAO

Conclusions

- Increased **factual** knowledge on the local conditions of Bird strikes
- Allowing anticipation on measures to be applied
- Other unknown factors out of weather have a relevant influence on Bird strike rates
- Prospective analyses may show results with unknown mechanisms behind them
- But can give unexpected, innovative results.

Next steps

• Seasonal predictions

Better predictive management performance

Most next steps use to be unknown until walking for a while



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