

# Towards a better understanding of bird collisions in windfarms using data from ADS

Charlène Gémard<sup>1,2</sup>, Olivier Duriez<sup>1</sup>, Olivier Chappe<sup>2</sup>, Gwénaél Duclos<sup>2</sup>, Aurélien Besnard<sup>1</sup>

1. CEFE, Univ Montpellier, CNRS, EPHE-PSL University, IRD, Montpellier, France

2. WIPSEA, 22770 Lancieux, France

## CONTEXT




The rapid expansion of wind power energy has direct negative impacts on biodiversity, such as birds colliding with turbines. A better understanding of the causes of collision is key to improve mitigation efforts.

However, to date, potential risk factors have mostly been assessed individually, in a few species of interest and/or at small spatiotemporal scales, despite the multifaceted nature of collision risk<sup>1</sup>.





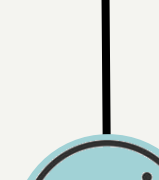
To fill this gap, we here aim at assessing which factors increase collision risk with the endgame of identifying high-risk situations in which mitigation measures must be improved.

## METHODS

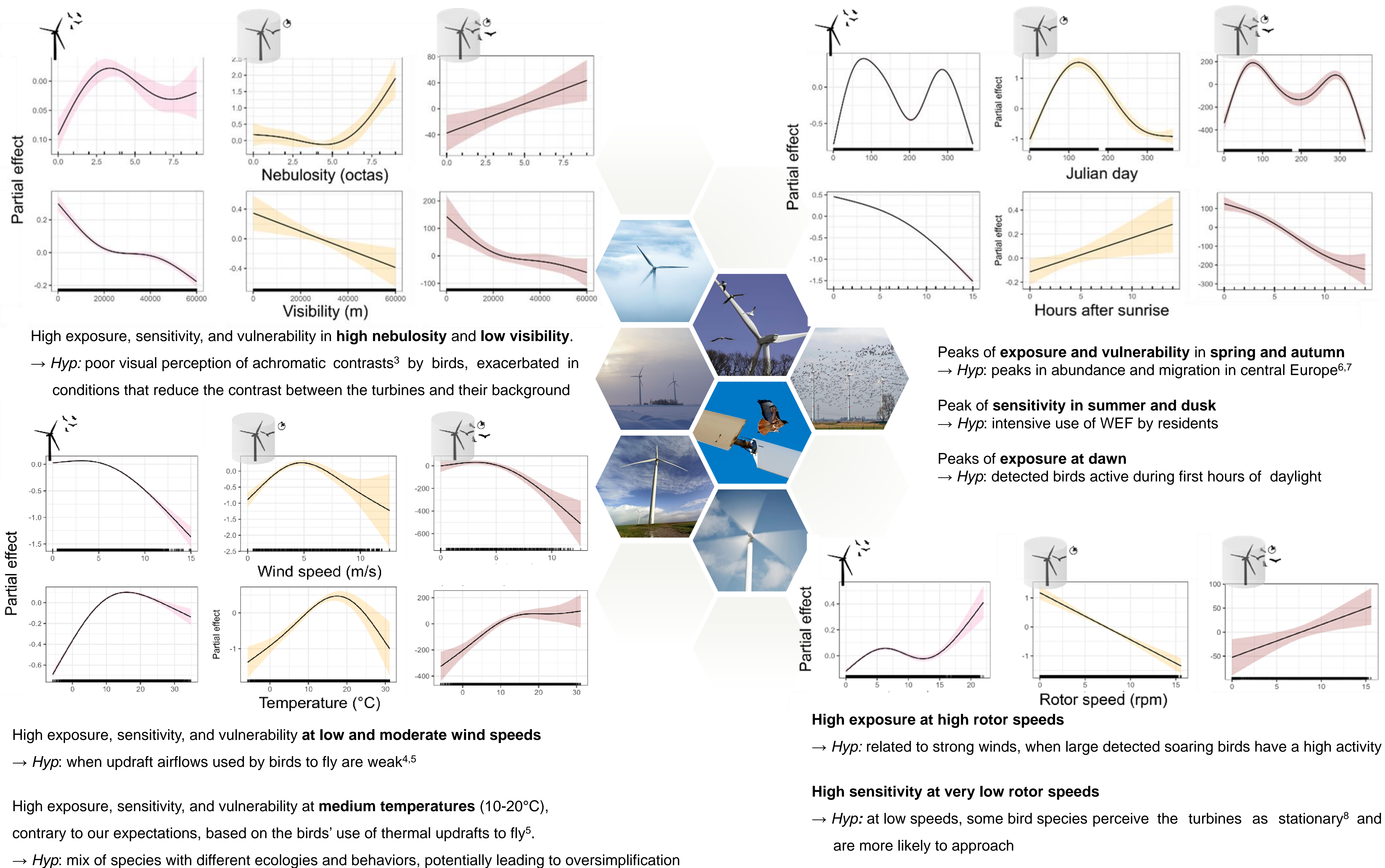
We conducted a global analysis including several bird species, 14 Wind Energy Facilities (WEFs) in Europe, environmental factors and 6 years to simultaneously assess the effects of environmental factors on birds' :

-  **exposure** (number of birds detected),
-  **sensitivity** (intrusion duration within risk zone),
-  **vulnerability** (sensitivity\*exposure) to collisions.

We analysed 205,879 bird trajectories from 14 WEFs in Europe, recorded by ADS between 2018 and 2023.

-  **ADS data collection**  
Gathering ADS data (videos from 2D ADS + bird 3D positions during the detection from 3D ADS)
-  **Contextual data collection**  
Gathering SCADA data, weather (Météo France), landscape context (CLC), and WEF features
-  **Video analysis**  
Extracting 2D position of birds in each video frame, using a software developed by WIPSEA
-  **Flight behaviour analysis**  
Reconstructing and characterising flight trajectories of birds, then classifying to discriminate two flight types (transit vs foraging flights)<sup>2</sup>
-  **Statistical analysis and modelling**  
Running GAMM to assess the combined effect of environmental factors and bird flight behaviour on sensitivity, exposure, and vulnerability.

## RESULTS & DISCUSSION



## CONCLUSIONS

- Bird sensitivity, exposure and vulnerability were high:
  - during periods of **high bird activity**
  - in conditions **reducing visual perception** of turbines
  - in conditions influencing **flight height**
- Site and inter-specific heterogeneity should be the focus of future research to obtain a deeper understanding of bird collisions.
- The non-synchronicity of exposure and sensitivity peaks highlights the importance of **examining both aspects**<sup>9</sup>.
- Our results plead for a **wider use of ADS** to assess collision risks in anthropogenic facilities.

## REFERENCES

1. Marques *et al.* 2014. *Birds* 2(4): 460–475.
2. Bergen *et al.* 2022. *Ecol Evol* 12(2): e08395.
3. Blary *et al.* 2024. *J Exp Biol* 227(3): jeb246342.
4. Linder *et al.* 2022. *Symmetry* 14(11): 2245.
5. de Lucas *et al.* 2008. *J Appl Ecol* 45(6): 1695–1703.
6. Newton. 2023. *The migration ecology of birds*. Elsevier.
7. Schuster *et al.* 2015. *Environ manag* 56: 300–331.
8. Blary *et al.* 2023. *Conserv Sci Prac* 5(10): e13022.
9. Dickinson *et al.* 2014. *Sci Rep* 4(1): 6898.

This work is part of MAPE, a collaborative research program that aims to produce knowledge to efficiently mitigate bird fatalities at onshore WEFs. We are very grateful to all MAPE participants, especially members of the steering committee for their guidance, windfarm managers who agreed to share data for their contribution, and ADS manufacturers for their support in data collection.



## CONTACT

✉ charlene.gemard@gmail.com  
🌐 <https://mape.cnrs.fr>

