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Detection of wind turbines' rotary motion by birds: A matter of speed and contrast



Constance Blary^{1,2}, Francesco Bonadonna¹, Élise Dussauze¹, Simon Potier^{3,4}, Aurélien Besnard⁵ and Olivier Duriez¹

Context:

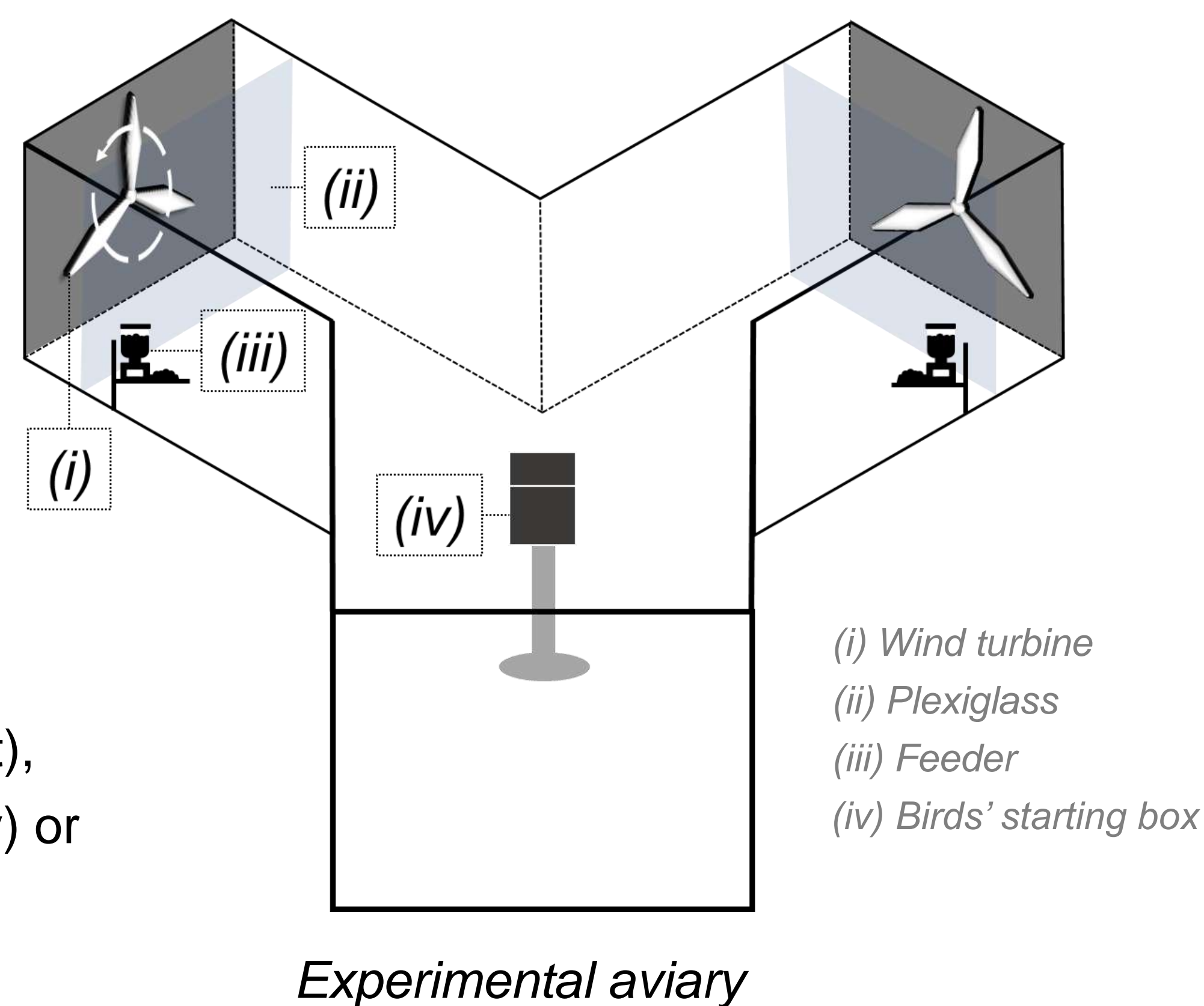
To reduce bird collisions on wind turbines, Automatic Detection Systems (ADS) have been developed to detect approaching birds and trigger turbines to slow down blades to 3-5 rotations per minute (rpm). However, it is not known whether birds can detect this reduced speed and avoid the turbine. In this study, we evaluated the detection of rotary motion by birds.

Species studied:

- 5 domestic doves (*Streptopelia roseogrisea risoria*)
- 3 Harris's hawks (*Parabuteo unicinctus*)

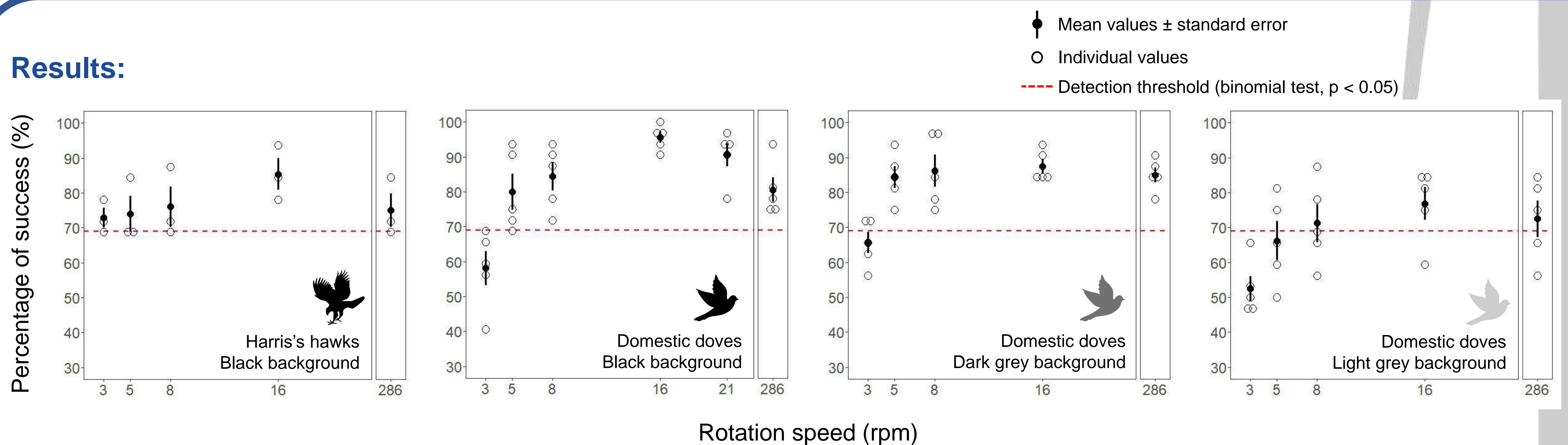
Method:

- Operant conditioning with miniatures wind turbines (2m diameter)
- Positive stimulus (rewarded): stationary wind turbine
- Negative stimulus (unrewarded): wind turbine in rotation
- 6 rotation speeds tested: 3, 5, 8, 16, 21 and 286 rpm
- White wind turbine on a black background (high achromatic contrast), dark-grey background (mid-range achromatic contrast, for dove only) or light-grey background (low achromatic contrast, for dove only)
- 32 trials per speed and bird – binomial tests



Sites: Centre for Functional and Evolutionary Ecology and Les Ailes de l'Urga (France)

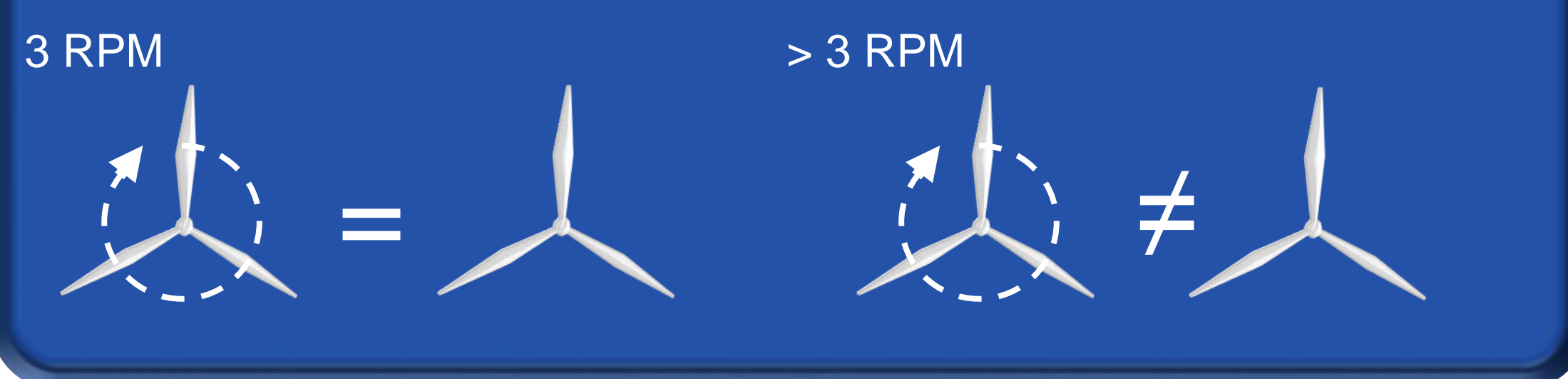
Results:



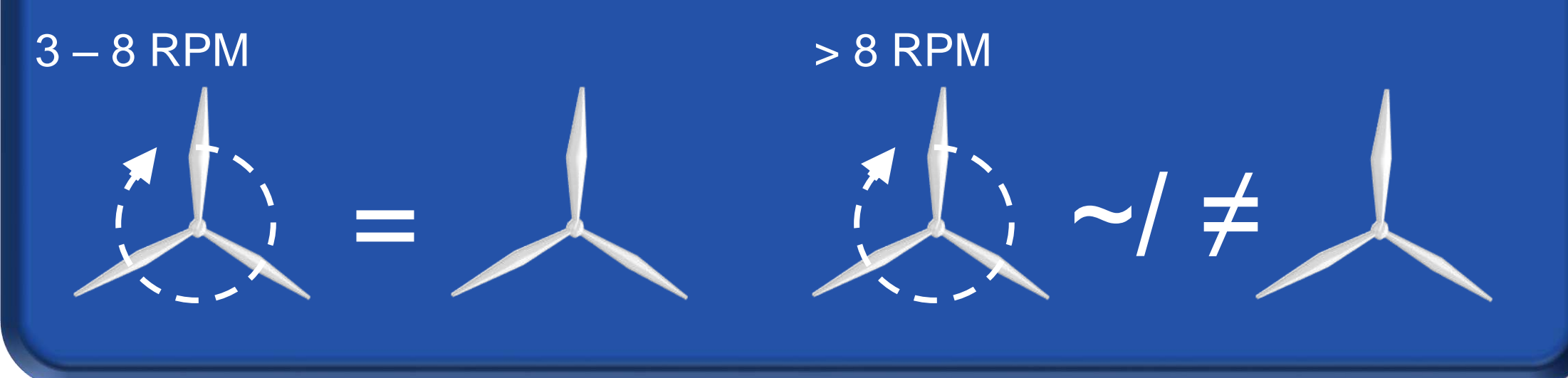
Harris's hawks



Domestic doves – High and mid-range contrasts



Domestic doves – Low contrast



Conclusion:

Doves perceive blades as stationary at low rotation speeds and low contrast conditions, which could influence their decision to enter the rotor-swept zone. The action to slow down the blade speed might encourage the bird to fly through the rotor-swept zone despite the risk. The speed reduction to 3-5 rpm triggered by ADS may be counterproductive for some bird species.

➔ As a precaution, to limit avian mortality ADS should trigger a true stop of the blades.

