

# Approaching birds with drones: first experiments and ethical guidelines

**Elisabeth Vas, Amélie Lescroël, Olivier Duriez, Guillaume Boguszewski & David Grémillet**

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## **Abstract**

Unmanned aerial vehicles, commonly called drones, are being increasingly used in ecological research, in particular to approach sensitive wildlife in inaccessible areas. Impact studies leading to recommendations for best practices are urgently needed. We tested the impact of drone colour, speed and flight angle on the behavioural responses of mallards *Anas platyrhynchos* in a semi-captive situation, and of wild flamingos (*Phoenicopterus roseus*) and common greenshanks (*Tringa nebularia*) in a wetland area. We performed 204 approach flights with a quadricopter drone, and during 80% of those we could approach unaffected birds to within 4 m. Approach speed, drone colour and repeated flights had no measurable impact on bird behaviour, yet they reacted more to drones approaching vertically. We recommend launching drones farther than 100 m from the birds and adjusting approach distance according to species. Our study is a first step towards a sound use of drones for wildlife research. Further studies should assess the impacts of different drones on other taxa, and monitor physiological indicators of stress in animals exposed to drones according to group sizes and reproductive status.