**Supplementary Material**

**Effects of free-flight activities on wildlife: a poorly understood issue in conservation**

Jorge Tobajasa\*, Francisco Guilb, Antoni Margalidaa

aInstituto de Investigación en Recursos Cinegéticos (IREC), CSIC-UCLM-JCCM, Ronda de Toledo No.12, 13005 Ciudad Real, Spain.

bMinisterio para la Transición Ecológica y el Reto Demográfico. Pza. San Juan de la Cruz s/n, 28071 Madrid, Spain.

\*Corresponding author: Jorge Tobajas ([jtobajas47@gmail.com](mailto:jtobajas47@gmail.com))

**Table S1.** Web of Science search string, resulting in 41 direct hits†

TS=(( "free-flight\* activit\*" OR "free-flight\* sport\*" OR paragliding OR para-gliding OR "para gliding" OR hangliding OR hang-gliding OR "hang gliding" OR hang-glider\* OR "hang glider\*" OR hanglider\* OR paramotor\* OR para-motor\* OR "para motor\* "OR sailplane\* OR "sailplane\* glider\*" OR parachuting OR para-chuting OR “para chuting” OR deltagliding OR delta-gliding OR “delta gliding” OR deltaglider\* OR delta-glider\* OR “delta glider\*” OR “base jumping” OR base-jumping OR basejumping) AND (wildlife OR disturb\* OR effect OR mammal\* OR bird\* OR reptile\* OR raptor\* OR cetacean\* OR vulture\* OR ungulate\*))

AND SU=("Ecology" OR "Ornithology" OR "Biodiversity Conservation" OR "Biology" OR "Environmental Science" OR "Forestry" OR "Marine Freshwater Biology" OR “Plant Science” OR “Veterinary Science” OR "Zoology")

†Last searched on 02/08/2021.

**Appendix S1.** Summary: Recommendations to improve coexistence between free-flight and wildlife

Considering the existing data on the effects of recreational free-flight activities and their peculiarities in air navigation and impacts on wildlife, the following recommendations are proposed to reduce the possible effects of free-flying on wildlife in natural areas:

1) The pilots performing the flights must be experienced and trained in the effects of free-flight on wildlife when they make flights in sensitive areas where threatened species are present.

2) Before flying, the species present in the flight area must be evaluated and the flight parameters (jump/takeoff areas, routes, flight height) must be adapted in relation to the species present and the foreseeable effect that they may have.

3) Zoning: the different areas of permitted use must be defined and, based on the possible expected effects on wildlife, specific restrictions must be applied to flight height and minimum approach distances. Flight restriction zones must be applied to avoid flights in the more sensitive areas far as possible.

4) Restrict flights to common and established jump/takeoff areas, avoiding flights in new areas and those where historically flights have been infrequent to reduce the effects on non-habituated wildlife.

5) Establish a procedure in which a study of the impact on wildlife is a mandatory requirement for the establishment of any new jump/takeoff zone. This report should be presented by the club(s) interested in managing these new flight spaces and then be approved by a competent authority. Fliers should only use established routes and in the case of flights outside the established routes, request authorization from the competent administration in order to assess the possible effects on sensitive species in those areas.

6) Avoid direct and close-range approaches, giving species time to detect the presence of the aircraft so that it can move away. Avoid high-speed movements towards animals. As soon as an animal or possible nest is detected nearby, it is necessary to make avoidance maneuvers and move away as soon as possible. Do not jump or fly within 1000 m of nests of raptors or of known bird breeding areas.

7) Minimize or avoid flights near to sensitive species or during the reproductive period, or breeding and molting periods in the case of birds. In the case of raptors this is generally between January and June but will depend on the specific regulations in each area and the phenology of the species concerned.

8) In areas where sensitive animal species are probably present, make the shortest possible flights and leave the area as soon as possible.

9) Avoid maneuvering over animals whenever possible and, if not possible, maintain the maximum height possible. Never fly over them at less than 300 m.

10) Fly at the highest possible altitude and always fly over 500 m above the ground when ungulate species are detected, and the trajectory cannot be changed. In the breeding and special protection areas for birds, this height should be increased to 1000 m; maintain a minimum distance of 1000 m in the horizontal when passing cliff nesting areas.

11) It is proposed that paragliders and hang-gliders carry unique registration numbers in the special protection zones. This could reduce the number of disturbance incidents and make it possible to identify and deal with those responsible for (repeated) irresponsible flights.

12) Identify problem areas and find solutions acceptable to the various stakeholders. Distribute information regarding the effects of free-flying on wildlife, the measures that be taken to mitigate them, and information on restrictions to free-flight clubs in the vicinity of jump areas, in leaflet form and on easily accessible online platforms.

13) Create informative guides, specialized websites, or brochures containing legislative information and recommendations to minimize the impact of flights on animal species, and include them in the learning packages of free-flight schools.