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Opportunities and limitations using Remotely Piloted Aircraft Systems (RPAS) for the study of wild ungulates: a first experimental approach for estimating roe deer (*Capreolus capreolus*) populations

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One of the methods used in medium-low forest cover areas for estimating roe deer (*Capreolus capreolus*) populations is represented by observations from vantage point. This method can give useful information, but it is subject to some limitations, such as the risk of double counting and the necessity of a high number of operators due to the small size of the observable areas. A contribution to the reduction of these limitations could be offered by the integration of the method with measurements made by Remotely Piloted Aircraft Systems (RPAS).

To examine the suitability for RPAS use in the specific case of roe deer, some experiments were carried out, mainly to check:

- the possibility of identifying animals in open areas in relation to the type of camera, the flight altitude and the type of vegetation cover,
- the possible disturbance caused to animals by the aircraft in relation to the noise emitted by the rotors and by the flight altitude,
- the extension of the analyzed surface in detection time attributable to the dusk.

The tests were conducted in a protected area with a high density of roe deer (Parco Mediceo di Pratolino - Florence) and in absence of disturbing elements. The aircraft used (Yuneec Q500+) has four propellers, it is equipped with Gimbal camera (CGO2+) and it is characterized by a flying time of about 20 minutes.

The first experimental phase concerned the definition of the technical parameters useful to characterize the research system. To do this, the values of the noise emitted by the aircraft and the breadth of the ground surface shot with RPAS have been detected at intervals going from 10 m up to 70 m above the ground.

In the second phase, operating flights were carried out on an area of around 90,000 m² consisting of seven contiguous open areas separated by hedges and woody plants.

The analysis of the videos has allowed to verify that the shooting field amplitude grows about 2.000 m² by the ground to the increase of each portion of 10 m: from 50 m to the soil the area covered by each frame is about 9.000 m², while from 60 m is around 11.000 m².

The size of the locations and the ability to fly over the natural visual barriers (land

ography, presence of hedges, etc.) have allowed to conduct a census in the whole area of study, although fractionated, by two operators in an average time of about 10-15 minutes with an aircraft speed of approximately 3 m/s. The surface scanned with this method is considerably wider than the one scanned from the ground with the same number of operators.

The analysis of the aerial shots taken at dusk with shares between 50 and 60 m has identified many roe deer grazing in different open areas and has verified the absence of any alarm reactions to the passage of the aircraft.

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