

## A multi-year survey of the Black Grouse *Tetrao tetrix* in the Mont Avic Natural Park (Aosta Valley, Italy)

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### Abstract

Censuses of males of the Black Grouse *Tetrao tetrix* on spring display were regularly carried out in a study area of about 20 km<sup>2</sup> within the Mount Avic Natural Park (north-western Italian Alps) from 1986 to 2008. Every year, all the sites where at least one bird had been detected (seen or heard) were monitored at dawn from 25 April to 20 May to geo-reference displaying males. This method is the most precise and accurate possible because both multiple cocks at the arena and soloists are actually detected. Hence, underestimates that are typically associated with censuses focused on lekking sites may be avoided, and this is particularly relevant in the Alps, where densities of solitary displaying cocks are usually high.

The analysis of the entire data set provided information on local spatial ecology (distribution of males in the different sectors of the area) and population dynamics (numerical fluctuations, changes in the proportions of soloists and in the dimension of lekking groups).

To assess the reliability of censuses based on less extensive sampling efforts, results obtained using the entire data sets were compared with those obtained using data from single, sample areas (300 ha) and from the largest local arena.

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### Keywords

Black Grouse, census methods, soloist, lekking group

### Aims

Black Grouse monitoring started in Chalamy Valley in 1986 (Western Italian Alps) within the researches to institute Mont Avic Natural Park. The Natural Park continued the monitoring of displaying Black Grouse males each year on the entire area used by this Tetraonid.

One of the main objectives for the management of a protected area is to obtain reliable data sets, compatibly with the available number of observers involved into censuses.

Censuses concentrated in leks could underestimate the real population size and dynamics, not considering the number of soloist cocks and ignoring disturbances and modifications on a portion of the species habitat.

In this paper we compare the entire data set with data obtained by randomly selecting a portion of the suitable territory and by selecting the greater lek known in the area respectively.

Furthermore we discuss the spatial distribution of displaying males on the entire study area.

### Study Area

The study area has an extension of 2000 ha, including forests dominated by mountain pine *Pinus montana*, some subalpine pastures, peat-bogs, small lakes and scree slopes. Larch *Larix decidua* and Scots pine *Pinus sylvestris* are also present. Ericaceae (mostly *Rhododendron ferrugineum*, *Vaccinium myrtillus*, *V. vitis-idaea*, *V. gaultherioides*), junipers and scattered grassy spots constitute the main bushes and grass cover. The study area includes all suitable Black Grouse habitats in the Chalamy stream basin (1400-2250 m a.s.l.).

### Methods

Every year all the sites where at least one bird had been detected (seen or heard throughout the year) were monitored at dawn from 25 April to 20 May from fixed observation points.

This method is the most precise and accurate possible because both multiple cocks at the arena and soloists are actually detected. Hence, underestimates that are typically associated with censuses focused on lekking sites could be avoided, and this is particularly relevant in the Alps, where percentages of solitary displaying cocks are usually high.

Every male detected has been geo-referenced and a half km grid has been drawn with ARCGIS 9.1; every group consisting of 2 or more displaying cocks ( $< 100$  m far off) was processed as a lek.

We considered a subset from 1996 to 2008 to analyze population dynamics and the ratio between grouped and soloists males comparing the performance of three different sampling methods, i.e. considering: 1. the entire dataset, 2. a portion of 300 ha mainly utilized by soloists and 3. the main lek in the study area.

We also analyzed the spatial fluctuation of areas occupied by displaying males.

## Results

Overall we censused 1025 displaying males ranging from a minimum of 62 (1996) to a maximum of 92 cocks (2007) (mean =  $78.85 \pm 9.90$ ). The number of soloists was 407 varying from a minimum of 33 (2001) to a maximum of 60 (2005) (mean =  $47.54 \pm 8.46$ ) while the number of grouped males was 814 varying from 23 to 37 (mean =  $31.31 \pm 5.39$ ). The number of leks varied from 8 to 13 (mean =  $10.38 \pm 1.85$ ) in which displayed from 2 to 11 individuals (mean =  $3.01 \pm 1.92$ ).

The results of pairwise correlation between yearly fluctuation in total number of individuals in the study area, in the 300 ha sample area and in the main lek we found that the only significant correlation was between the numbers of individuals in the full study area and in the 300 ha sample area ( $r = 0.734$ ,  $P = 0.04$ ).

The pairwise correlation between the total number of displaying males, the number of soloists in the full study area and those displaying in leks showed a significant correlation between the number of soloists and the total number of individuals ( $r = 0.78$ ,  $P = 0.001$ ), between the number of individuals in leks and the total number of individuals ( $r = 0.61$ ,  $P = 0.028$ ), while no correlation was found between the number of soloists and the number of individuals displaying in leks. Furthermore, the number of leks found in the area did not varied significantly with the total number of individuals ( $r = 0.44$ ,  $p = 0.13$ ).

The total number of 25 ha cells in which was found at least one displaying male in 13 years was 78, which varied yearly from a minimum of 27 (2001) to a maximum of 36 (2008). The number of cells occupied by at least one displaying male showed a significant correlation with the total number of individuals ( $r = 0.56$ ,  $p = 0.04$ ).

In our study area the cells occupied by leks varied from a minimum of 10 (1997) to a maximum of 21 (2006) and only one cell hosted leks occupied every year.

## Discussion

The results obtained in Mont Avic Natural Park point out the presence of a high percentage of soloists (higher than 50 % of the displaying males), although annual density exceeds 4 males in 100 ha. In the study area annual fluctuations of the entire population are not correlated with the number of cocks in the main lek. For management purposes, when limitations of resources could not allow to study the entire area, an appropriate alternative could be to monitor a sample area of at least 300-400 ha of suitable habitat, instead of monitoring only one lek.

The correlation between density and the number of grid cells occupied by displaying males is probably due to the inconstant use of sites that are not optimal for the species, while there is no evidence of an higher aggregation of males with the increasing of males density.

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