

Insular population of mouflon (*Ovis aries*): an experimental census method

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Introduction

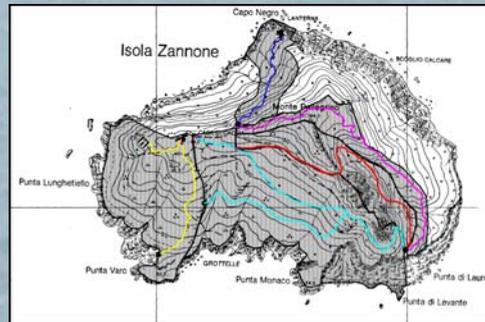
The mouflon (*Ovis aries*), was introduced in Zannone Isle from 1922 up to 1971. The consistence of the population fluctuated from a maximum number of 200 individuals, in the mid of 50's, to a minimum of 20 individuals; at present, in the isle, there seem to be near 40-50 heads. The rough morphology and the dense vegetation makes the direct quantitative sight, of this ungulate, difficult. The present research, started with two experimental sessions using the "block count census" (October 2006 - July 2007), has the aim of finding the possibility to apply the count technique by direct observation (generally used in the Alps) in small islands such as Zannone, which presents objective difficulties during the sightings sessions but, on the other hand, we find it possible to "cover" the whole experimental area with a few operators.

Study Area

Zannone Isle is a part of the Pontine Archipelago and was included in the Circeo National Park since 1979. The distance from the coast of Italy is 15 miles, the surface is about 102.88 hectares with a coastal total length of 6 Km. The main altitude has reached by Monte Pellegrino (194 m). The weather is mild and scarcely rainy; perennial sources aren't present but watershed and small artificial basins are a good reserve of water for three seasons a year. Years and years of agricultural and shepherd's exploitation, brought the landscape to the actual situation. Three distinct phytocenosis are present in the isle: chaparral (Fig. 1) in the SW of the isle; oak's forest (*Quercus ilex* - Fig. 2) in the N-NE, with a structure near the high forest; Mediterranean woodlands (Fig. 3) in the S of the isle. Besides the mouflon, the fauna is composed of a large number of birds, during the period of the migrations, and by a very important endemic species: *Lacerta sicula patrizii*.



Fig. 1 – Chaparral



Map 1 – Zannone Isle with block counts areas and sample roads



Fig. 2 – Oak's forest (*Quercus ilex*)



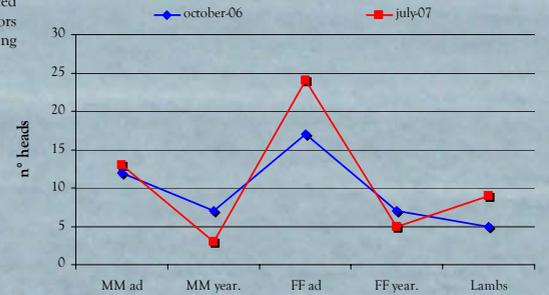
Fig. 3 – Mediterranean woodland

Materials and methods

Five non - linear transects, for a total length of 6.38 Km, has been made, using the internal network of roads, to allow the quantitative monitoring of the mouflon's population in 65.63 hectares (equal to 64% of the total surface - Map 1) and that to consider the different degree of visibility presented by the two sides of the transect. During the sessions, in October 2006 and July 2007, every transect was repeated 8 times by using 4 - 6 operators (minimum and maximum number) who were experts of the isle environment. The transects were chosen to cover adjacent surfaces; the "double sightings" were suddenly noticed via-portable radio between the operators present at the same time during sunrise/sunset.

| SESSIONS | MM ad | MM year. | FF ad | FF year. | Lam. | TOTAL | TOTAL DRAWED |
|------------|-------|----------|-------|----------|------|-------|--------------|
| october-06 | 12 | 7 | 17 | 7 | 5 | 48 | 49 |
| july-07 | 13 | 3 | 24 | 5 | 9 | 54 | 53 |

Tab. 1 – Consistencies of mouflons recorded during two sessions of block count



Graph. 1 – Different consistencies in sexual/age classes during two sessions of block count



Results

Tab. 1 shows the obtained results *Minimum Checked Consistence* of the mouflon's population in Zannone Isle during the experimental sessions of block count. The elaboration of the data, having checked all the heads of the isle in the research period, was carried out considering the *Minimum Checked Consistencies* for each sex/age class (after the redistribution of the indeterminate individuals for every sex/age class) so obtaining the totals simply with a summation (penultimate column of Tab. 1). Comparing this data with the *Minimum Net Checked Consistence*, the largest number checked at the same time in the sessions, (last column in Tab. 1), we can note the almost perfect coincidence. In Graph. 1 it should be noted how we can appreciate, with this census method, even in a short period of time, the "passage" between the classes of age and the increase after the births.

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Discussion and Conclusions

The most suitable method to check quantitatively the population of Bovides, used in the Alps, particularly for the alpine ibex (*Capra ibex*), the chamois (*Rupicapra rupicapra*) and the mouflon (*Ovis aries*) too, is the *block count* (Murayama and Nakama, 1983). This method consists in the direct observation from dominant points and fixed transects, after dividing the study area in plots and sectors. "Checking Units" of 40 - 50 hectares in the woody areas, up to 100 hectares and more, where possible, in open areas. This census method can be, by using a group of expert observers, repeated every seasons so as to collect important information about the distribution and the movement of the considered species; which is very important to avoid the double counting is the connection via-radio between the observers and the critical analysis of the results at the end of the watching sessions. This type of census is suitable in mountainous areas, but in forested areas having a complex morphology the method could be hard to apply both, because of the objective difficulties in easily determining the border of the Checking Units, and the difficulties to move in the same unit (Pedrotti and Tosi, 1998).

The environment of Zannone Isle presents both disadvantages and advantages in applying the block-count method in its entirety. The disadvantages are: 1. the green coverage, Mediterranean woodlands and ilex grove is about 84% of the area and creates situations of poor visibility; 2. the morphology of the N and E face is very complex. The advantages: 1. limited extension of the study area together with the absolute isolation of the mouflon's population. 2. the internal network of roads that allow the operators to reach every places of the isle.

In spite of the poor visibility conditions presented in some sectors of the transects due to the thick vegetation, 64% of the study area was checked with the help of a small number of operators in a very short time.

The extremely limited discrepancy between the recorded values of *Minimum Consistence* and the values obtained from the summation of the consistencies divided between sex/age classes, make us sure that the block-count method could be considered suitable for a seasonal/annual monitoring of a species such as the mouflon, even in an insular area having a size not higher than 500 - 1000 hectares. Another method was experimented in the past: the "pellets count group" (Gusella, 1994) and, in our opinion it could be considered a good way to verify the obtained data with the block-count.