

ASPECTS CONCERNING REPRODUCTIVE BEHAVIOUR OF EUROPEAN MOUFLON (*Ovis ammon mussimon*) INTO ENCLOSURES FROM ROMANIA

ANTONE Veronica, URSU Nicoleta

Abstract. This paper presents the results obtained in 3 years of field research on mouflon nucleus* from folds, hunting complexes and zoological gardens across the country. Two conducted studies in controlled conditions - the separation of ewes from rams in mating season and the introduction of two new mouflon specimens from other geographical areas, have confirmed the field results and showed the importance of socio-signals, sexual glands maturity and season climatic conditions. The study shows behavioural differences between the European and Canadian mouflon and underlines changes of the reproductive behaviour and the breeding period for the colonized mouflon in Romania.

Keywords: mouflon, reproductive behaviour, breeding season, mating, Romania.

Rezumat. Aspecte privind comportamentul de reproducere al muflonului european (*Ovis ammon mussimon*) în împrejurimi din România. Lucrarea de față prezintă rezultatele a 3 ani de cercetare pe nuclee de mufloni din țarcuri, complexuri de vânătoare și grădini zoologice din țară. Două studii realizate în condiții controlate - separarea femelelor de masculi în perioada de rut și introducerea în țarc de noi exemplare de mufloni din alte zone geografice, au confirmat datele obținute din teren și au evidențiat importanța sociosemnalelor, a maturității glandelor sexuale și a condițiilor sezoniere specifice. Studiul arată diferențe de comportament între muflonul european și cel canadian, evidențiază modificări ale comportamentului și a perioadei de reproducere la muflonul colonizat în România.

Cuvinte cheie: muflon, comportament de reproducere, sezon de rut, împerechere, România.

INTRODUCTION

In Romania, the mouflon - *Ovis ammon mussimon* (PALLAS 1811) is found only in confined areas such as hunting complexes, folds or zoological gardens, all these areas being located at small altitudes - under 700 m. The locations, with history on trophy quality and/or the size of population, are Negureni, Șarlota, Scroviștea and among the zoological gardens - CMSN Constanța.

The settled relations between individuals belonging to the same group govern the characteristic behaviours, which favours the development of the population, even if certain individuals are underprivileged or eliminated. Several behaviours could be discerned: social, territorial, feeding, reproductive and defence (MICU, 1999).

The mouflon has a group behaviour, including flocking. Both genders reached sexual maturity in the second year of life. The gestation period is about 22 weeks (MICU, 2004). Field observations point to major variations of mouflon behaviour in the period of reproduction, which is October - December.

MATERIAL AND METHODS

The field research was made in 3 years (2009 - 2011) and covered 80% of mouflon locations across the country, meaning 4 folds out of 5 with permanent population and 10 zoological gardens out of 13 with mouflon populations in patrimony - representing more than 300 specimens. Detailed studies were made on mouflon nucleus from Negureni - where the population have had between 45 and 75 individuals in last three 3 years, and CMSN - where the population was between 25 and 15 individuals in last three 3 years (ANTONE & VICOVAN, 2009; ANTONE & UNICI, 2011).

Field observations were made from fixed points (scouting pickets) and itinerantly.

For remote observations it has been used a Bresser 7x21x40 binocular and a Fuji Finexpix S1000FD digital camera.

The observations have been recorded on typical observations' forms - data concerning number of individuals, gender, location, altitude, age, weather conditions, time-stamp or time interval etc., and on an observations' notebook in which there were recorded the behavioural manifestations or any other relevant data. Most of the enclosures from Romania have mouflon specimens identified by ear tags or by RFID tags, including CMSN. Thus, it was possible to create a database, register cards and individual observations' forms.

According to TIMBERGEN (1951), the breeding implies the synchronization of sexual activities of two partners, and the synchronization is mainly based on three factors: specific season conditions such as length of day and temperature; the maturity and the activity of sexual glands plus the presence of the adult opposite gender; the presence of certain socio-signals in mating behaviour. For underlining the importance of these three factors, two studies in controlled conditions have been conducted:

1. The isolation of the rams, starting in August until December - which represents the ending of mating period. The groups of ewes and rams had no visual contact (Figs. 1A, 1B). In December, a single ram, 2 years old, was put inside the ewes' enclosure.
2. A pair of mouflon was brought from Dobrick (Bulgaria) zoological garden, and the estrous cycle was put under observation in the following year.

RESULTS AND DISCUSSIONS

Although a wild animal, the mouflon has a specific social behaviour determined by the isolation of groups into enclosures/folds and by the human presence.

The majority of mouflon lives in groups with variable sizes depending on the density of population and season. The living area and food availability - both being controlled by people, have no major influence on group.

In the beginning of the mating period (September), the food is abundant and the spring lambs become fully independent. At this time, the behaviours of threat and fight, hierarchical and sexual behaviours emerge. Now it begins the fight between rams for the participation in the reproductive act. The vigorous adult males have precedence, they are the winners. More often, the hierarchy between rams suffers modifications.



Figure. 1. European mouflon in C.M.S.N. - Constanța: A - Ewes' enclosure; B - Rams' enclosure.
 Figura 1. Muflonul european la CMSN – Constanța: A - incinta femele, B - incinta masculi (original).

The state of sexual motivation is hormonally determined and is under the influence of key stimulus triggers. (ACATINCĂI, 2003).

The ram acquires the relevant information by smelling, meaning the detection of female proestrus. The rams smell the anal zone of the ewes (Fig. 2); they scent by uplifting their neck and by increasing the contact surface area of their upper lip with the air (Fig. 3).



Figure 2. Detection by smelling.
 Figura 2. Detecție prin mirosire (original).



Figure 3. Ram, scenting specific posture.
 Figura 3. Berbec, postură specifică de adulmecare (original).

Outside the estrus period the females do not accept mating, they adopt a surviving behaviour - they simply run.

Inside the mouflon groups under study, although the youth rams stay along the ewes, it was not observed a sexual ambivalent behaviour such as that described by the M. Cociu at the Canadian mouflon (*Ovis canadensis*) (see pages 749-750, COCIU, 1999). He points out that the Canadian mouflon behaviour regarding congeners is not dependent on gender, but only on size and rank among the group; females behave such as being underdeveloped rams. Also native from Corsica and Sardinia, the mouflon sheep brought into the west-central Texas, U.S.A., show a more aggressive behaviour (MCCLELLAND, 1991).

However, as in the case of the Canadian mouflon, the strong rams, which participate in the reproductive act, are those with ages between 5 and 7 years old. This fact was underlined by the experiment no.1, because all the isolated females gave birth in May – June of the following year, meaning that their ovules were fecundated after December 1, when a ram ageing 5 or 6 years old was put in their enclosure.

Comparing the sexual behaviour of the European mouflon, described in literature (GAREL *et al.*, 2005; STEKLENEV, 2006) with data collected from the field, it was found that in Romania the mouflon females reach the puberty in the second year of life, and thus at the age of three they are already ewes. That fact could argue that in Romania there are good conditions, which leads to a good development of the females, although slightly accelerated, but in spite all these, the reproductive capacity does not exceed the age of 12.

The first experiment has also put in evidence the Whitten effect: the estrous cycle is adjusted by the presence of the male inside the group; the females living in a group mate quicker when are presented to a male than the solitary ones.

The significance of season changes and the presence of the socio-signals were clearly showed in the second experiment. The ewe brought from Bulgaria gave birth in December, so she was mated in July. In the next year, the first proestrus period was in August, but mating was barely in November – the same period with the other females from group.

If the ram finds an ewe in estrus period, he begins the courting by slow approach and then by touching or stroking her in an affectionate manner (Fig. 4). If the ewe is detected in the same time by two or more rams, it will start the fight between the rams. The ewe will couple with the strongest one, the winner, while the other rams will run.



Figure 4. Courting the female. / Figura 4. Curtarea femelei (original).

The mouflon coupling has the following stages:

- The ram stalks the ewe (Fig. 5);
- Parallel running, the ram guides the ewe (by gentle kicks with his head) to a certain place and to prevent the getting away of the ewe (Fig. 6);
- Lateral gentle (foot) kicks;
- Dorsoventral coupling position, with ram having its neck uplifted and minimal body contact with the female.



Figure 5. Stalking the ewe. / Figura 5. Urmărire femelă (original).



Figure 6. Parallel running. / Figura 6. Fuga în paralel (original).

CONCLUSIONS

The mouflon mating behaviour includes three stages: searching, courting and mating.

The mating behaviour of the European mouflon is different from the behaviour of the Canadian mouflon. In the case of the European mouflon, it was not observed an ambivalent sexual behaviour, or any deviant one.

The mouflon females reach the puberty in the second year of life, and at the age of three, they are already ewes.

The Whitten effect was also highlighted in the case of the European mouflon.

It is necessary that older rams have to be removed from folds or enclosures, because there is a risk to be accidentally killed by the 5 to 7 years old rams (younger and stronger).

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Antone Veronica, Ursu Nicoleta
Museum Complex of Natural Sciences of Constanța,
255, Mamaia Blvd., Constanța, Romania
E-mail: veronica.antone@gmail.com
E-mail: constanta_mai@yahoo.com

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