

PROTECTED SAPROXYLIC COLEOPTERA IN "THE FORESTS IN THE SOUTHERN PART OF THE CÂNDE TI PIEDMONT", A ROMANIAN NATURA 2000 PROTECTED AREA

DANIELA BARBUCEANU¹, MARIANA NICULESCU², VIOLETA BORUZ³,
LAURENȚIU NICULESCU², CRISTIAN STOLERIU⁴, ADRIAN URȘU⁴

¹ University of Pitești, Faculty of Sciences, email: daniela_barbuceanu@yahoo.com

² University of Craiova, Faculty of Agriculture

³ Botanical Garden, Craiova

⁴ "Alexandru Ioan Cuza" University of Iași, Faculty of Geography and Geology

*Corresponding author, e-mail: mniculescum@yahoo.com

Keywords: Natura 2000, saproxylic beetles, biology, distribution, conservation.

ABSTRACT

The observations conducted between May and October 2014 in the protected area "The Forests in the Southern part of Cânduța Piedmont" clearly show three species of protected saproxylic beetles: *Lucanus cervus*, *Cerambyx cerdo* and *Morimus asper funereus*. The *Quercus* forests, which are dominant in that area, ensure optimal living conditions for the species *L. cervus* and *M. asper funereus*, which are common species in this site. Several aspects are presented that concern the period of activity of the individuals, sex ratio, the presence of predators and the distribution map of the species. The species *C. cerdo* was only found on *Quercus* sp, and the small number of the individuals counted in the area show that the species does not benefit from favourable development conditions. A number of pressures identified make the rational management of this protected area to be extremely important.

INTRODUCTION

Saproxylic insects have a major role in the degradation of dead wood. Speight (1989) (in Buse et al., 2007) defines saproxylic insects as "invertebrates dependent, in their life cycle, on dead wood or very old trees". The dramatic reduction in the area covered by forests in Europe over the last century has significantly affected the populations of saproxylic insect species, and as a result many of them have acquired the status of protected species being among the most threatened in Europe (Speight (1989) (in Thomaes et al., 2008).

Such insects are *Lucanus cervus* (Linnaeus 1758), *Cerambyx cerdo* Linnaeus 1758 and *Morimus asper funereus* Mulsant 1862. Prior to the present study, mentions about these species were scarce in this area. In the entomological collection of the "Grigore Antipa" Museum of Natural History there are specimens of *L. cervus* collected in the forests from Dâmbovița County (Stan, 2013).

This paper presents data on the biology, ecology, and the distribution map of protected beetle species in the protected area "The Forests in the Southern part of Cânduța Piedmont" ROSCI 0344.

MATERIAL AND METHOD

The area designated by the European Directive 92/43 as a site of Community importance has an area of 4,313 ha, of which 95.3% is a forest ecosystem. The area's coordinates are: N 44° 55' 16" lat and E 25° 15' 9" long. The site is located in the southern part of the Cânduța Piedmont, and its altitude ranges between 201 m in the south area and 485 m in the north area. To identify the three species of invertebrates observations were conducted in the period May to October 2014, in the three parts of the protected area: Ludești (the northern part of the area) Lucieni (the middle part of the area) and Crânguri (the southern part of the area) (Fig. 1 and 2). In the Ludești part, which occupies

most of the SCI, habitats 9170 (Galio-Carpinetum oak-hornbeam forests), 91Y0 (Dacian oak and hornbeam forests), 9130 (Asperulo-Fagetum beech forests) are to be found, and a small area of 91M0 (Pannonian-Balkan turkey oak-sessile oak forests), which are heterogeneous in age. In Lucieni the majority habitat is 91Y0, present and habitat 91M0; these are young forests of trees in the oak group, most of which are 50, 60 years old.

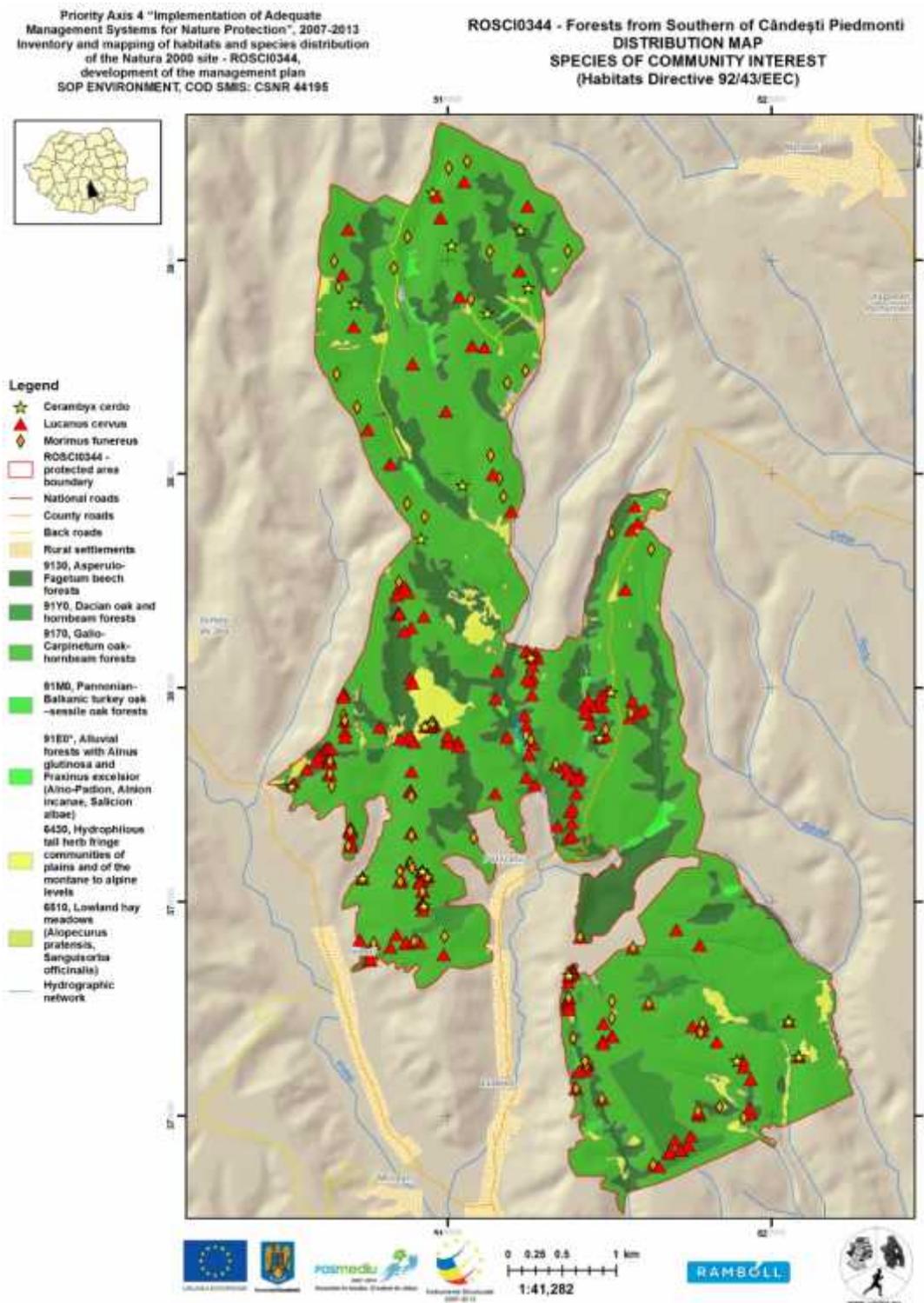


Figure 1. Map of area and protected saproxylic coleoptera distribution, Ludești (the northern part of the area)

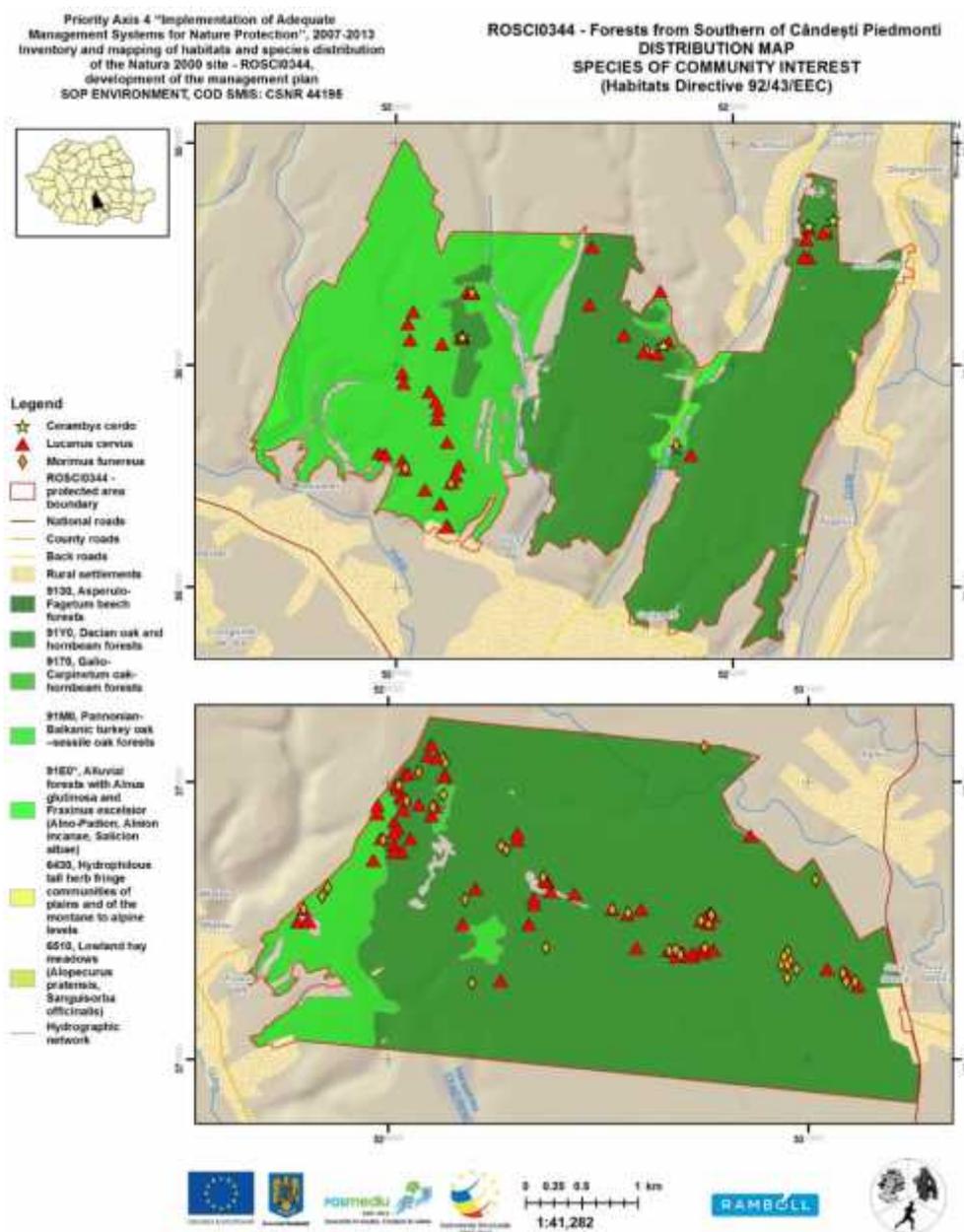


Figure 2. Map of area and protected saproxylic coleoptera distribution, Crânguri (the southern part of the area - above) and Lucieni (the middle part of the area - below)

In Crânguri, where the majority is habitat 91M0, in the median area, there is underbrush of oaks about 15 years old, of high density, which are not fit for the insect species monitored in this study. Also, in this part of area, was observed timber theft.

Old *Quercus* sp., *Fagus sylvatica*, *Carpinus betulus*, etc. trees inspected: old trunks, cracked century-old trees, fallen trees, etc., stacks of wood from logged trees, paths, forest roads. In suitable areas transects were defined, whose length was 100 m and width 20 m – $S = 2000 \text{ m}^2$, over which the individuals observed were counted, on trunks and litter, and after the end of the flight period, the exoskeletons of *Lucanus cervus* and *Cerambyx cerdo*.

Observations were conducted concerning the sex of the individuals, the insect behaviour, and the habitat type. The sex ratio was calculated (Simionescu, 1984).

The mapping was done simultaneously with the inventory of the species. Based on the presence of adults, larvae or their exoskeletons, and the characteristic habitats of

those species, the coordinates were recorded of the reporting areas needed for the mapping of the distribution.

The year 2014 was characterized by a regime of excessive rainfall.

RESULTS AND DISCUSSIONS

In the ROSCI0344 protected area three invertebrates species of Community interest were identified: *Lucanus cervus*, *Cerambyx cerdo* and *Morimus asper funereus*.

I. *Lucanus cervus* (Linnaeus 1758)

Lucanidae Family, Coleoptera Order

Status: Habitats Directive 92/43/CEE, Annex II; in Romania - OUG 57/2007 Annex 3.

Biology and ecology

In Europe, the interest taken by specialists over the last few years has supplemented the gaps regarding the biology and ecology of this species (Hawes, 2008; Thomaes et al., 2008; Harvey et al., 2011).

According to the data in the literature, males appear about a week before females, usually in late May. In southern areas of Europe, they were reported in early April, while in northern areas, their emergence is delayed (Harvey et al., 2011).

In the special conditions in the year 2014, in the protected area, according to our observations, adult activity lasts from early May until the latter half of August.

While last active males are shown on 12 July, females are also shown in the subsequent observation trips, including that on 9 August. The trips made in late August confirmed that the species completed its active period.

The literature mentions intense flight in June and the former half of July, but the numerous couples in their mating period observed during the 23 to 25 May mark the intense activity of the species as early as the end of May (Fig. 3). Individuals that are in the process of mating are observed at different times of the day: 11 o'clock, 14 o'clock, 16 o'clock. If at the beginning of the flight period it is males that dominate, towards the end of the flight only females are present.

Our observations showed immature and late-age larvae in rotting trunks of oak tree and hornbeam; the larvae in one trunk were the same age. Among the predators, the most outstanding are the badger (*Meles meles*), the wild boar (*Sus scrofa*) and the fox (*Vulpes vulpes*), which are mentioned in the literature (Harvey, 2011).

The data recorded in situ reveal the dominance of males, with a percentage of 68.5%, with an above-par sex-ratio (Fig. 4). However, these values deviate from the normal because the small number of live specimens did not allow a statistical calculation based on them.

The distribution

The species was observed in habitats where species of *Quercus* (91Y0, 91M0, 9170) grow, and rarely in habitats with *Fagus sylvatica* (9130), in the entire area (Fig. 1 and 2). The suitable habitat has been provided by the forests of various oak species for over 45 years, which ensure optimal conditions for their development and flight. The presence of rotten logs and trunks, dried trees, woody debris left after logging, provides the best conditions for the development of this species. Our observations confirm the high density of *L. cervus* individuals in the edges of forests. Thus, during the 28 August observations in the northern area, near the village of Lude ti, in a forest corresponding to the 9170 habitat, very good conditions are met for *L. cervus*, which reaches a density of 23 individuals /2,000 square meters in the edge of forest. Such abundant areas are only found in isolation. During the observations in the entire area, from May to October 2014, 517 individuals were identified, both males and females, many of which were in the form of whole or fragmented exoskeleton. We consider the species as being common in the area.

Compared to the national level, the population size is between 2-15%. We consider that the species falls in class 6 (5,000 – 10, 000 i).

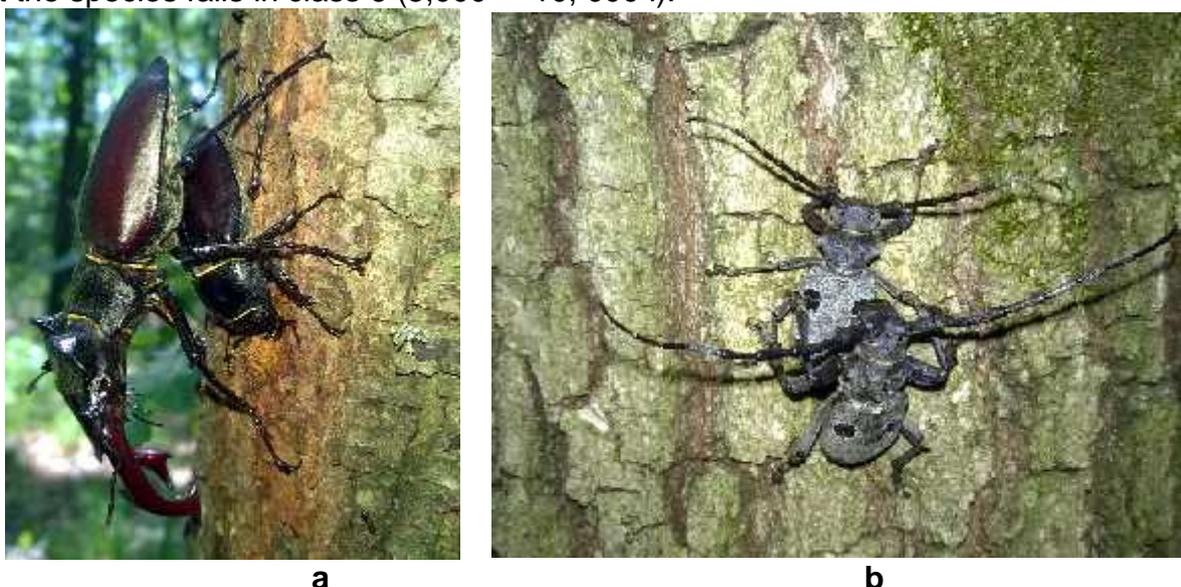


Figure 3. The mating: a. *Lucanus cervus*; b. *Morimus funereus* (25.05.2014, Lucieni Forest)

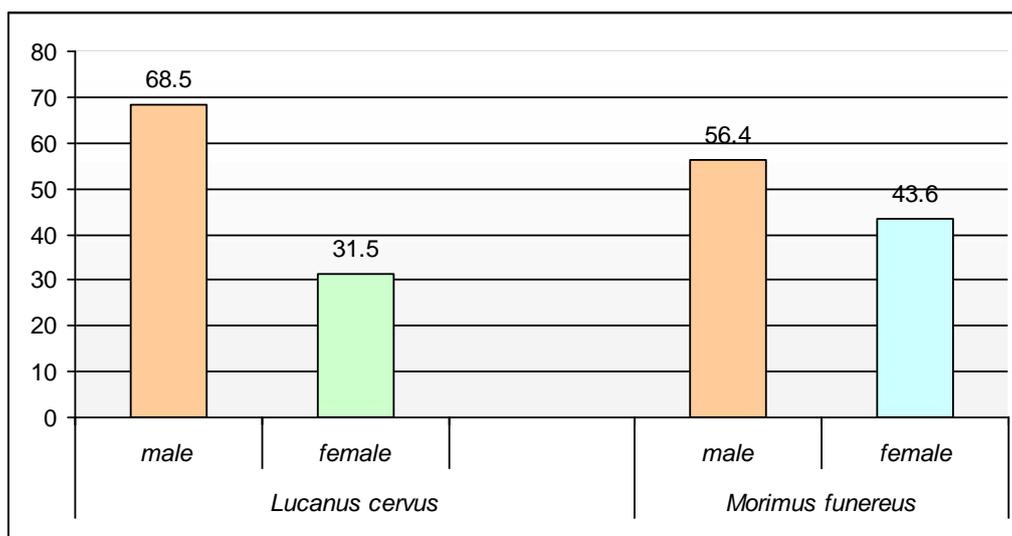


Figure 4. Sex-ratio in saproxylic Coleoptera

II. *Cerambyx cerdo* Linnaeus 1758

Cerambycidae Family, Coleoptera Order

Status: Habitats Directive 92/43/EEC, Annex II and IV; in Romania - OUG 57/2007 Annex 3 and 4A.

Biology and ecology

This species prefers old forests of oaks, but such forests are very rare in this protected area. In the conditions specific to the year 2014, the field data, though scarce due to the small population of the species in the area and the bad weather conditions, confirm the period of activity for adults: from May until the end of August. On the favourable plateaus covered in oak trees, the species is observed in association with *L. cervus*, which confirms the data from the literature (Panin and S vulescu, 1961). The observation on 29 August highlights an association of the three insect species protected: *C. cerdo*, *L. cervus* and *M. asper funereus*, in the northern area, in a 91Y0 habitat, aged

about 70 years. Our observations revealed that species only in the wood of the *Quercus* species, and the exploration of the zone indicates a very small area of the preferred habitats, i.e. oak forests made up of trees over 70 years of age.

Distribution

In the area, the species was observed in the following types of habitat: 91Y0, 91M0 and 9170. The entire area were inventoried, and it was found only in Lude ti and Cr nguri (Fig. 1 and 2). In the Lucieni forest, only a part of the area have trees of about 80-100 years, but the species was not found. In Lude ti forests, which are made of oak trees, and heterogeneous in age, 100-130 year old trees of the oak group are only to be met in isolation, so the insect species is rare.

C. cerdo larvae inhabit century-old trees in clearings or edges of forests, being a thermophilous species. Exploiting secular trees has led to a drastic reduction in the populations of the species in the area.

The small number of individuals counted (11 individuals) suggests that, in the area, the species does not benefit from favourable conditions for development. Compared to the national level, the population size is below 2%. We consider that the species falls in class 2 (50-100 i). The conservation status of the species was assessed as unfavourable-inadequate. Through proper management the needed habitat requirements can be assured, and thus provide the viability of the species over time.

III. *Morimus asper funereus* Mulsant 1862

Cerambycidae Family, Coleoptera Order

Status: Habitats Directive 92/43/CEE, Annex II; in Romania – OUG 57/2007 Annex 3.

Biology and ecology

The literature mentions that adult activity begins fairly early, in April, and continues until September (Vrezec et al., 2010; Dojnov et al., 2012). In the conditions of the year 2014, the activity of the adults takes place from the latter half of April until the first half of August. Occasionally, individuals are observed as late as October. Thus, on 1 and 2 May already shows mating in this species. It is a species of nocturnal, and also daytime activity (Fig. 3). Individuals were observed in both sunny and cloudy days.

The recorded data show male dominance, with a 56.4% share, the sex ratio value being above par: 1.3 (Fig. 4). The adults were found near the trunks and stumps, on recently felled trees and logs, on the stem of old trees, or on dried branches in the lower level, or else on completely dry trees belonging to different kinds of timber: species of *Quercus*, *Fagus sylvatica*, *Robinia pseudacacia*, *Prunus avium*. Quite frequently, females were observed on *Quercus petraea* – 59.6%, followed by *Quercus robur* with a percentage of 13.46% (Fig. 5). Although it appears that beech is the preferred wood species in this site, with its predominance of oak species in the habitat, the species is commonly encountered on species of *Quercus*.

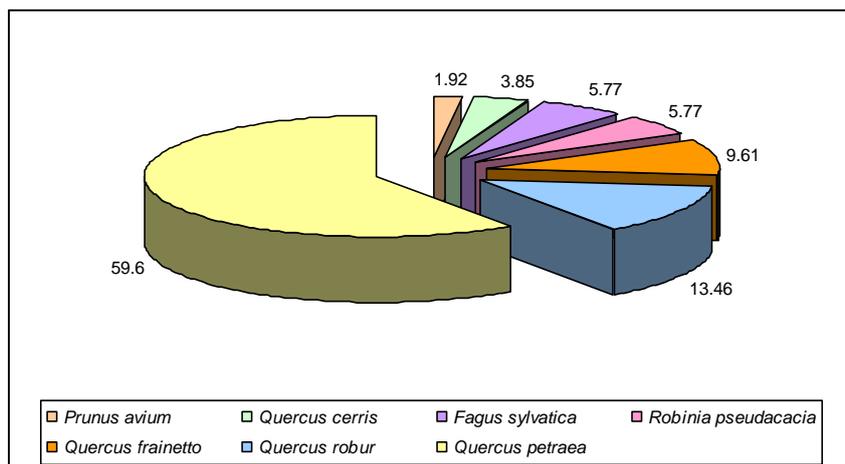


Figure 5. Location of *Morimus funereus* females on woody species (%)

Distribution

Adults were observed in all the area, where they found conditions that could ensure their long-term viability (Fig. 1 and 2). Unlike *L. cervus*, which prefers sunny forests with a rare tree stratum, this species was equally found in forests with higher density of trees and shrubs, but in the fringe areas. However, the species was not found in habitats that seemed favourable during the adult activity period. This is due to habitat fragmentation caused by the low dispersion capacity of individuals incapable of flight, and also by anthropogenic factors. As many as 59 active individuals were identified, both males and females, during the activity period of the species, namely from 1 May until 9 August, after which field observations no longer record this species, although the habitats inventoried are favourable. However, during the 17 October a live male was observed, which can be attributed to the very hot weather in the autumn.

This flightless species has a low dispersion of its populations, namely a major fragmentation of its habitat. Although it has the same living area as *L. cervus*, the population size is smaller. We consider the species as being common in the area. Compared to the national level, the population size is between 2-15%. We consider that the species falls in Class 5 (1,000 – 5,000 i).

CONCLUSIONS

In the protected area ROSCI0344 the protected saproxylic beetles *Lucanus cervus*, *Cerambyx cerdo* and *Morimus asper funereus* were identified.

We consider the species *L. cervus* and *M. asper funereus* to be common in the area, as optimal living conditions are ensured.

The species *Cerambyx cerdo* fails to have the needed habitat requirements, and restoring habitat and its population is a long process. The species was shown to live in forests older than 70 years, but it takes time for trees to reach the appropriate age range and be inhabited by the species. By means of a firm management of the site the suitable habitat can be provided, and thus the viability of the species in time.

ACKNOWLEDGEMENTS

This study has been conducted by the financial support of the European Regional Development Fund (ERDF) under the Operational Programme Environment, Priority Axis 4, the project “The inventory and mapping the distribution of the habitats and species in the site Natura 2000 – ROSCI0344, The forests in the Southern part of the Cârdești Piedmont”, beneficiary: ARCES (Romanian Association for Culture, Education, and Sport).

BIBLIOGRAPHY

1. **Buse, J., Schroder, B., Assmann, T., 2007** - *Modelling habitat and spatial distribution of an endangered longhorn beetle – A case study for saproxylic insect conservation*, Biological Conservation, 137: 372-381.
2. **Dojnov, B., Vujcic, Z., Bozic, N., Margetic, A., Vujcic, M., Nenadovic, V., Ivanovic, J., 2012** - *Adaptations to captive breeding of the longhorn beetle *Morimus funereus* (Coleoptera: Cerambycidae); application on amylase study*, J Insect Conserv, 16: 239–247. doi: 10.1007/s10841-011-9411-x.
3. **Harvey, Deborah, Gange, A., Hawes, C. Markus, Rink, 2011** - *Bionomics and distribution of the stag beetle, *Lucanus cervus* (L.) across Europe*, Insect Conservation and Diversity, 4: 23–38.
4. **Hawes C., 2008** - *The stag beetle *Lucanus cervus* (Linnaeus, 1758) (Coleoptera: Lucanidae): a mark-release-recapture study undertaken in one United Kingdom residential garden*, Rev. Écol. (Terre Vie), vol. 63: 131-138.
5. **Niculescu, Mariana, Iulian Bercea, Gerald Matei, Silvestru Ilie Nuta, Ion Iovu, Stefan Aurelian Ciupitu, Calin Salceanu, 2009**: *Researches about *Quercus cerris* forests situated in the North-East of Dolj County*, Analele Universitatii din Craiova, Agricultura, Montanologie/ Annals of the University of Craiova, Agriculture, Montanology, Cadastre series, <http://old.agro-craiova.ro/index.php/aamc/article/view/322/300> , vol. XXXIX/B
6. **Panin, S., S vulescu, N., 1961** - *Insecta, Coleoptera, Fam. Cerambycidae*, vol. X, fasc. 3, Ed. Academiei R.P.R., 523 pp.
7. **Simionescu, V., 1984** - *Lucr ri practice de ecologie*, Litogr. Universitatea „Alexandru Ioan Cuza”, Ia i, 193 pp.
8. **Stan, Melania, 2013** - *Romanian species of lucanids (Coleoptera: Scarabaeoidea: Lucanidae) in the collections of “Grigore Antipa” National Museum of Natural History*, Travaux du Muséum National d’Histoire Naturelle «Grigore Antipa», Vol. LVI (2): pp. 173–184.
9. **Thomaes, A., Kervyn, T., Maes, D., 2008** - *Applying species distribution modelling for the conservation of the threatened saproxylic Stag Beetle (*Lucanus cervus*)*, Biological Conservation, vol.141: 1400-1410.
10. **Vrezec, A., Ambrozic, S., Kapla, A., 2010** - *Biology and ecology of flightless cerambycid *Morimus funereus* (Muslant, 1862) as a background for monitoring application: laboratory and largescale field study*, Book of abstracts, 6th European Symposium on the conservation of saproxylic beetles, Ljubljana, pp. 20.