

## NESTING PREFERENCES FOR TWO WOODPECKER SPECIES (*DENDROCOPOS MAJOR* AND *DENDROCOPOS MEDIUS*) IN COMANA FOREST, SOUTHERN ROMANIA

IOANA DAMOC, TIBERIU SAHLEAN, ROXANA ION,  
MIHAELA ION, LOTUS ELENA MEȘTER

**Abstract.** The main goal of this study is to get a better insight of the habitat requirements for the Great- and Middle Spotted Woodpeckers. Woodpeckers are forest specialists, threatened all over Europe mainly by the loss of forest habitats and also by the loss in quality of the habitat by reducing the food sources and nesting sites. Both species showed a strong preference for oaks, lime, large trees and dead wood for nesting, but Middle Spotted Woodpecker proved to be more selective in terms of tree species. Nest-height was influenced by tree diameter. Both species have the same nesting preferences for Turkey oak, lime and Pedunculate oak, in a *Quercetum farnetto-cerris* type of forest. The orientation of the nest hole on the tree was mainly NE-E-SE for Middle Spotted Woodpecker and N-NE-E for Great Spotted Woodpecker.

**Résumé.** L'objectif principal de cette étude est de mieux connaître les besoins en matière d'habitat pour le pic épeiche et le pic mar. Les pics sont des spécialistes de la forêt, menacés dans toute l'Europe principalement par la perte d'habitats forestiers et aussi par la perte de la qualité de l'habitat en réduisant les sources de nourriture et les sites de nidification. Les deux espèces ont montré une forte préférence pour les chênes, de chaux, de grands arbres et du bois mort pour la nidification, mais le pic mar s'est avéré être plus sélectif en termes d'espèces d'arbres. Nid-hauteur a été influencé par le diamètre de l'arbre. Les deux espèces ont les mêmes préférences de nidification pour le chêne Turquie, les tilleuls et le chêne pédonculé, dans un *Quercetum farnetto-cerris* type de forêt. L'orientation du trou de nid sur l'arbre était principalement NE-E-SE pour le pic mar et N-NE-E pour le pic épeiche.

**Key words:** nest-site parameters, Middle Spotted Woodpecker, Great Spotted Woodpecker, Comana Forest.

### INTRODUCTION

All over Europe, conservation of forest habitats is of great importance, this biotope being dominant in the continent before massive human intervention; now only one third of the post-glacial forest is still present (Thirgood, 1989; Mikusinski et al., 2001). Regarding the loss of biodiversity, this took place not only by reducing the forest area, but also by reducing the quality of this biotope.

Woodpeckers are a special group among forest birds, with very selective ecological requirements (Angelstam et al., 1994) being regarded as the group with the greatest affinity for forests, also as indicators of forest biodiversity. European woodpeckers are dependent on trees for nesting-sites and they forage for food in old, dying or dead trees. For this reason, woodpeckers are declining in population, especially in the countries with intensive forest management, or where the conversion for agriculture has been massively made (Pettersson, 1985).

Woodpeckers are threatened mainly by the loss of forest habitats and also by the loss in quality of the habitat by reducing the food sources and nesting sites. Cutting the old trees and removing the decaying wood from the forest is the main cause for the declining of those species (Mikusinski, et al., op. cit.; Angelstam et al., op. cit.; Munteanu, 2009).

In Romania, woodpeckers have been studied since the beginning of the 1930 period (Cătuneanu, 1933). Papers dedicated to this group dealt with the distribution, taxonomy, reproduction biology, diet, anatomy, habitat requirements and, within the last years, conservation (Paşcovschi, 1937; Papadopol, 1973, 1974; Papadopol & Mândru, 1977; Popovici, 1971; Korodi Gal, 1970, 1975; Glăvan, 2004; Dorresteijn et al., 2013; Domokos et al., 2014).

Middle spotted woodpecker, *Dendrocopos medius* (Linnaeus, 1758) (MSW), is considered an oak forest specialist (Pasinelli, 2000). Because it prefers mature woods, inhabiting old forests at optimal harvest age, the species decline severely in those regions. Oaks are requiring several decades to become suitable habitats (60-100 years) (Pasinelli, 2003). Losing suitable habitat increases fragmentation and reduces density which in extreme cases can cause extinction, as the southern population from Sweden (Pettersson, op. cit.). Middle spotted woodpecker is listed in Annex I of the Birds Directive of the European Union listing threatened species that require special conservation measures.

Great Spotted Woodpecker, *Dendrocopos major* (Linnaeus, 1758) (GSW), is regarded as the most numerous and widespread European woodpecker and is not listed as threatened. Being primary cavity excavators, woodpeckers are considered as 'key species', producing nest sites and roosting places for other animals (Kosiński & Winiecki, 2004; Kosiński et al., 2006; Wesółowski, 1989), especially Great Spotted Woodpecker which builds more than one cavity in search for the final nesting place, offering more opportunities for the secondary nesters (Cramp, 1985).

It has been reported that although Great- and Middle Spotted Woodpecker are taxonomically related species, coexisting in deciduous forests (del Hoyo et al., 2002; Kosiński et al., op. cit.), both species differ with respect to nest-tree selection, nest height and orientation of the hole entrance (Kosiński & Winiecki, op. cit.; Kosiński et al., op. cit.).

The main goal of this study is to get a better insight of the habitat requirements for the two species, by characterising the nest sites used by Great and Middle Spotted Woodpeckers and to compare the nest sites between species in a lowland forest, a remaining fragment of the secular forest that dominated in the past the southern part of Romania.

#### MATERIALS AND METHODS

*Study area.* The study was conducted in Comana Forest, Southern Romania (44°09'N, 26°07'E), 30 km south of the capital of Bucharest. This woodland is a remnant of an ancient vast forest which dominated this part of the country, being in time fragmented and cleared for agriculture and human settlements. Now, the forest (8000 ha) is included together with a mosaic of habitats: wetlands, agriculture fields and atrophic areas in Comana Natural Park and is part of the Special Protection Area Comana (ROSPA0022) and the Community Importance Site Comana (ROSCI0043). Since 2012 the area is a RAMSAR site. The deciduous forest is situated on the right bank of the Neajlov River and Lake Comana and it belongs to several plant associations: *Quercetum cerris* Georgescu, 1941, *Quercetum farnetto-cerris* (Georgescu, 1945) Rudski, 1949, *Melico uniflorae-Tilietum tomentosae* (Sanda et Popescu, 1971), corr Popescu et Sanda, 1992, *Ornithogalo-Tilio-Quercetum* A. Dihoru, 1976, *Fraxino pallisae-angustifoliae-Quercetum roboris* Popescu et al., 1979 (Paucă-Comănescu et al., 2000; Paucă-Comănescu et al., 2001). The area is

known as an important *hot spot* for the biodiversity of this part of the country, here being mentioned over 240 bird species (Petrescu et al., 2009).

*Data collection and analysis.* Data were collected during the pre-breeding and breeding season of 2013. From March to the end of April, the number and distribution of territorial birds was established by responses to the play-back of taped calls (Kosiński et al., 2004). After the bird's response, the territories were checked for occupied nest-holes. Searches continued especially in May and June, identifying the nest by the calls of the nestlings. The position of the nests was recorded with a GPS and revisited after fledging for recording nest-site parameters. The following parameters were recorded to describe the nest site: tree species, diameter of the tree at breast height (Dbh), health of the tree on a scale from 1 to 5 describing the decaying state (1-dead, 5-alive), exact position of the tree, nest and tree height, orientation of the nest, vegetation on a 10 m radius around the nest tree.

Statistical analyses were performed at a confidence level  $\alpha = 0.05$ , using PAST software (Hammer et al., 2001). Where data did not fit a normal distribution, normalization was carried out by means of Box-Cox transformation and tested again for normality. If normalization was not successful, non-parametric tests were used to test data for statistical significance.

Statistical procedures included Kruskal-Wallis non-parametric ANOVA with Tukey post-hoc analysis to test woodpecker-tree species association, one-way ANOVA for species-tree circumference relationship and  $\chi^2$  test for independence to test any existing relationship between tree circumference and height at which the nest was built.

### RESULTS AND DISCUSSIONS

In 2013, we found 20 nests for Middle Spotted Woodpecker and 29 nests for Great Spotted Woodpecker (Figs 1, 2). Both species prefers oaks as nesting tree

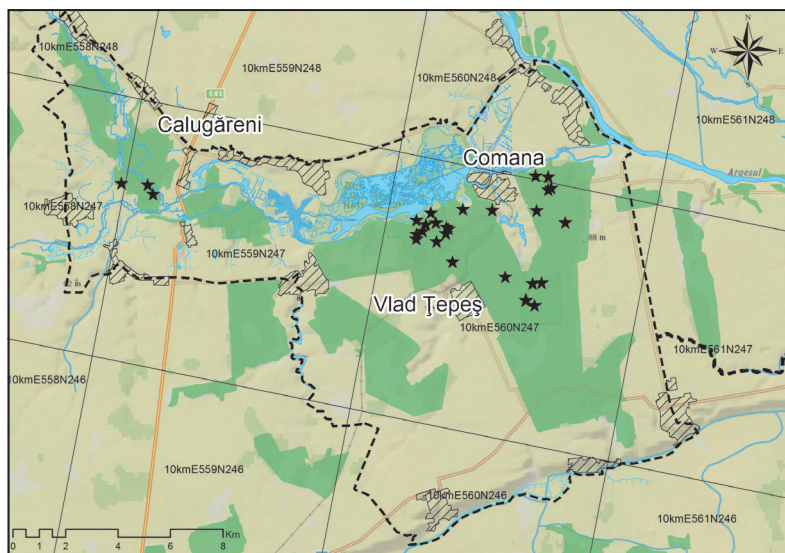


Fig. 1 - Distribution of the nest sites for Great Spotted Woodpecker in Comana Forest (★) - GSW nests, (- -) - limit of Comana Natural Park.

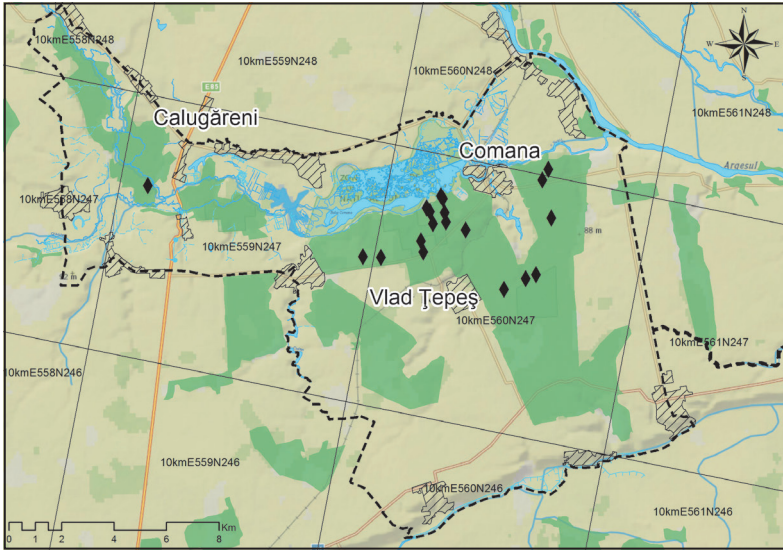


Fig. 2 - Distribution of the nest sites for Middle Spotted Woodpecker in Comana Forest (◆) - nests, (- -) - limit of Comana Natural Park.

(Tab. 1, fig. 3), Turkey oak *Quercus cerris* was the most commonly used tree by *Dendrocopos major* and *D. medius*, followed by Pedunculate oak *Q. robur* and Silver lime *Tilia tomentosa*. For *D. medius*, the differences between selected trees are not significant, although there can be observed a preference for Turkey oak and Silver lime (binomial exact test,  $p=0.07$ ,  $\alpha=0.05$ ). Same for *D. major* (binomial exact test,  $p=0.012$ ,  $\alpha=0.05$ ), it can be observed a preference for Turkey oak and Pedunculate oak. There was also a highly positive selection for dead trees (Fig. 4).

The average breast height diameter (Dbh) of the nesting tree was  $33\pm 13.7$  cm ( $n=20$ ) in Middle Spotted Woodpecker and  $36\pm 12.8$  cm ( $n=29$ ) in Great Spotted Woodpecker. Median nest tree Dbh differed significantly between the two species

Table 1  
Trees used by Great- and Middle Spotted Woodpecker (N-sample size, dbh-diameter at breast height, \*-mean±standard deviation).

Species	<i>Dendrocopos medius</i>				<i>Dendrocopos major</i>			
	N	%	dbh*	nest height*	N	%	dbh*	nest height*
<i>Quercus robur</i>	4	20	51±18.2	9±1.41	8	28	49±13.5	11±3.1
<i>Quercus cerris</i>	7	35	27±6.2	7.2±5.11	10	34	27±3	5.4±1.8
<i>Tilia tomentosa</i>	6	30	34±5.2	8.66±4.71	5	17	30±2.2	6.7±3.2
<i>Carpinus betulus</i>	1	5	25	9	1	3	29	4.5
<i>Fraxinus excelsior</i>	0	0	0	0	3	10	37±3	5.2±2.4
<i>Quercus frainetto</i>	0	0	0	0	1	3	27	5
<i>Salix alba</i>	0	0	0	0	1	3	65	5
<i>Robinia pseudoacacia</i>	2	10	15	3	0	0	0	0
Total	20	100			29	100		

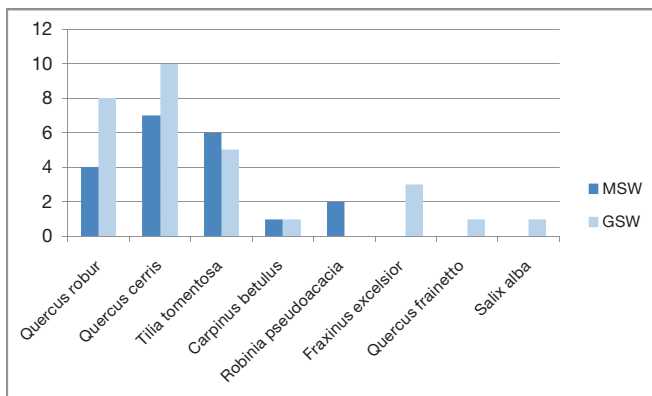


Fig. 3 - Trees used by Great- (GSW) and Middle Spotted Woodpecker (MSW).

( $t = 67.464$ ,  $p = 4.3282 \cdot 10^{-24}$ ) (Fig. 5). The average height of the nest hole from the ground was  $7.7 \pm 3.6$  cm ( $n=20$ ) for Middle Spotted Woodpecker and  $7.1 \pm 3.4$  cm ( $n=29$ ) for Great Spotted Woodpecker. For *Dendrocopos medius* it was found that there is a positive association between tree circumference and nest height  $\chi^2=386.84$ ;  $df=19$ ;  $p=2.378 \cdot 10^{-70}$ ) (Fig. 6). Also, the association was positive for Great Spotted Woodpecker ( $\chi^2=779.33$ ;  $df=28$ ;  $p=4.684 \cdot 10^{-146}$ ) (Fig. 7).

Comparing preferences of woodpeckers for specific trees species as nesting places (seven tree species for *Dendrocopos major* and five for *D. medius*), applying Kruskal-Wallis non-parametric ANOVA, it showed a significant difference between species ( $p=1.01 \cdot 10^{-8}$ ). Applying Tukey post-hoc test we found that there is a significant difference about the selection preferences for nesting regarding tree species. Hereby, for Great Spotted Woodpecker, there are significant differences between the preference for hornbeam *Carpinus betulus* and Turkey oak *Quercus cerris* (Tukey post-hoc,  $p=0.00014$ ), the woodpecker strongly preferring the Turkey oak. The same, regarding Turkey oak and other tree species, ash *Fraxinus excelsior* ( $p=0.00049$ ), Hungarian oak *Q. frainetto* ( $p=3.36 \cdot 10^{-05}$ ) and White willow *Salix alba* ( $p=3.36 \cdot 10^{-05}$ ). Also, between selection of Turkey oak, Pedunculate oak and

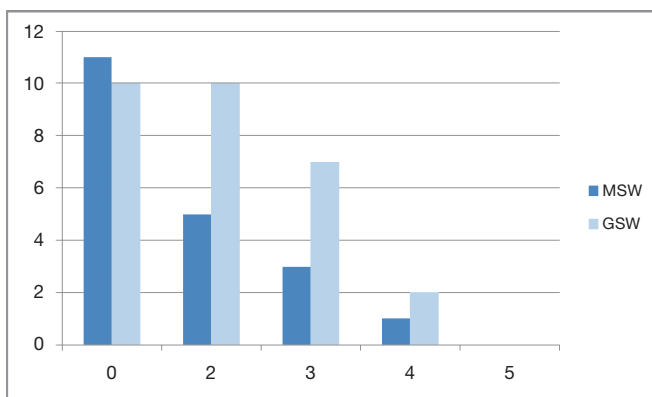


Fig. 4 - Decaying state of trees used by Great- (GSW) and Middle Spotted Woodpecker (MSW), on a 1 to 5 scale: 1- dead, 5-alive.

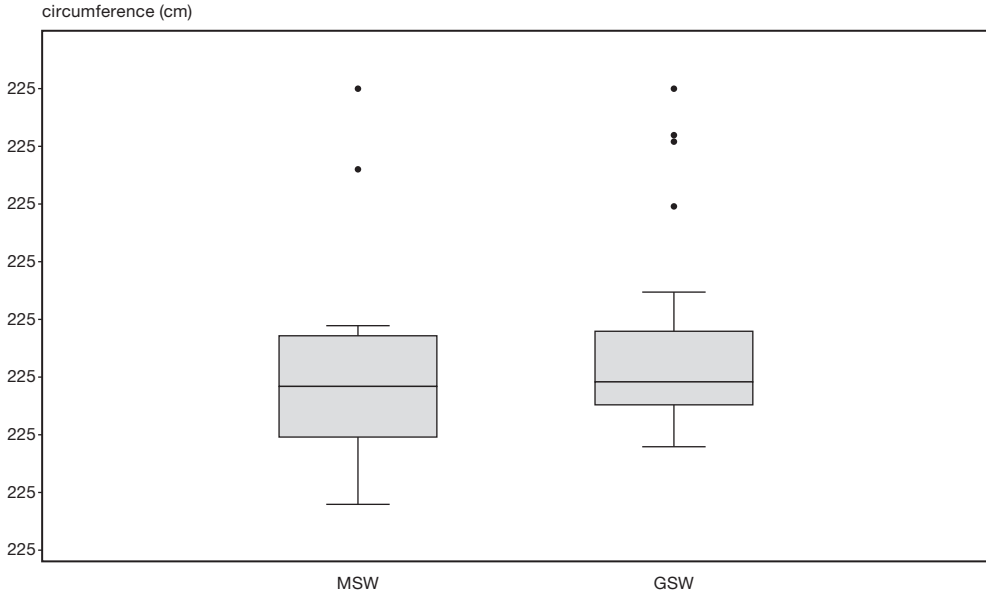


Fig. 5 - Differences of nest-trees circumference between *Dendrocopos medius* (MSW) and *D. major* (GSW).

lime, there are no differences regarding the nesting preferences, Great Spotted Woodpecker nesting often in those trees.

Middle Spotted Woodpecker has the same nesting preferences for Turkey oak, lime and Pedunculate oak, but it can choose also hornbeam *C. betulus* and

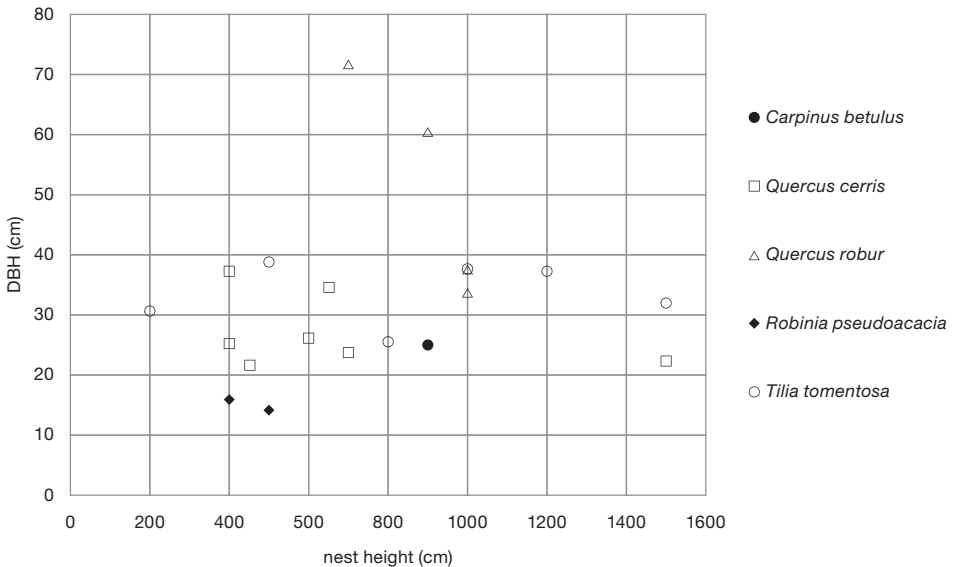


Fig. 6 - Relation between tree diameter (DBH) and nest height in Middle Spotted Woodpecker.

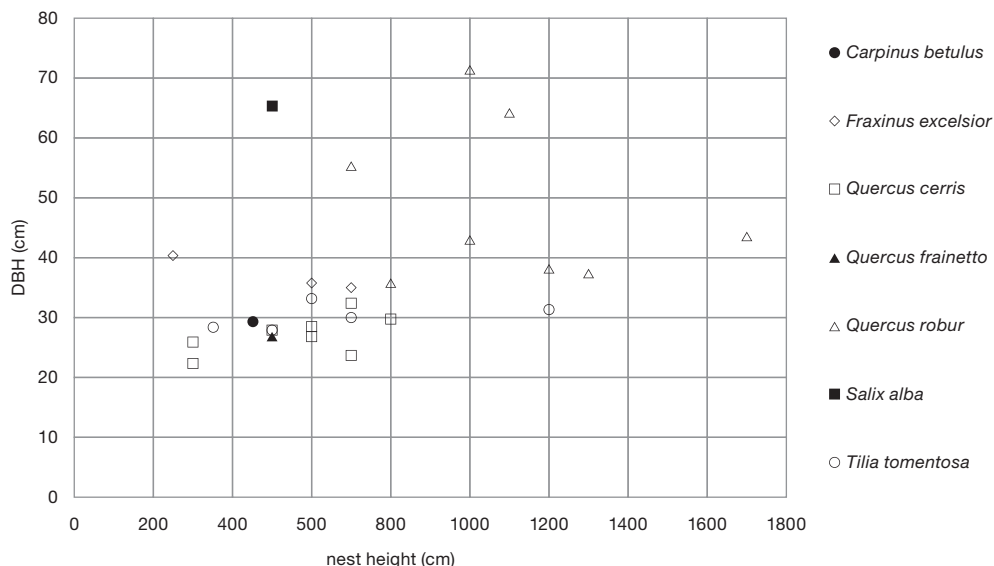


Fig. 7 - Relation between tree diameter (DBH) and nest height in Great Spotted Woodpecker.

even black locust *Robinia pseudoacacia*. Choosing between Turkey oak and hornbeam there are statistic significant differences ( $p=0.00014$ ), *Dendrocopos medius* preferring the Turkey oak for nesting, but between Turkey oak and lime ( $p=0.1834$ ) or Pedunculate oak ( $p=0.2729$ ), data do not differ significantly. Hereby, Middle Spotted Woodpecker is more selective in terms of tree species than the Great Spotted Woodpecker, choosing only five species of trees for nesting.

The orientation of the nest hole on the tree was mainly NE-E-SE for Middle Spotted Woodpecker (Fig. 8) and N-NE-E for Great Spotted Woodpecker (Fig. 9). In other studies, the orientation of the nest hole was SE and NE for *D. medius* and S, NE and NW for *D. major*, but the orientation is believed to be related with the slope (Glăvan, 2004). In our case, the slope was not a criteria factor.

Vegetation around the nest tree was recorded on 10 m radius from the tree and identified according to Habitats of Romania (Doniță et al., 2005). We recorded 5 plant association for nesting habitat of Middle Spotted Woodpecker, 50% of the nest being placed in *Quercetum farnetto-cerris* (Georgescu, 1945) Rudski type of association, followed by *Melico uniflorae-Tilietum tomentosae* (Sanda et Popescu 1971), corr Popescu et Sanda, 1992 and *Lychnio coronariae-Quercetum cerris* Sanda et Popescu, 2003 (Tab. 2). Also, 45% of Great Spotted Woodpecker nests were identified in *Quercetum farnetto-cerris* (Georgescu, 1945) Rudski, 1949 type of forest, followed by *Melico uniflorae-Tilietum tomentosae* (Sanda et Popescu, 1971), corr Popescu et Sanda, 1992 (Tab. 3).

In conclusion, Great Spotted Woodpecker and Middle Spotted Woodpecker in Comana forest do not differ very much in terms of nesting preferences, with the difference that *D. medius* is more selective about tree species. The woodpeckers nesting preferences depends on the forest composition. In a mosaic of forest plant associations, the two woodpecker species choose to nest more frequently in *Quercetum farnetto-cerris* (Georgescu, 1945) Rudski, 1949 and *Melico uniflorae-Tilietum tomentosae* (Sanda et Popescu, 1971), corr Popescu et Sanda, 1992. In

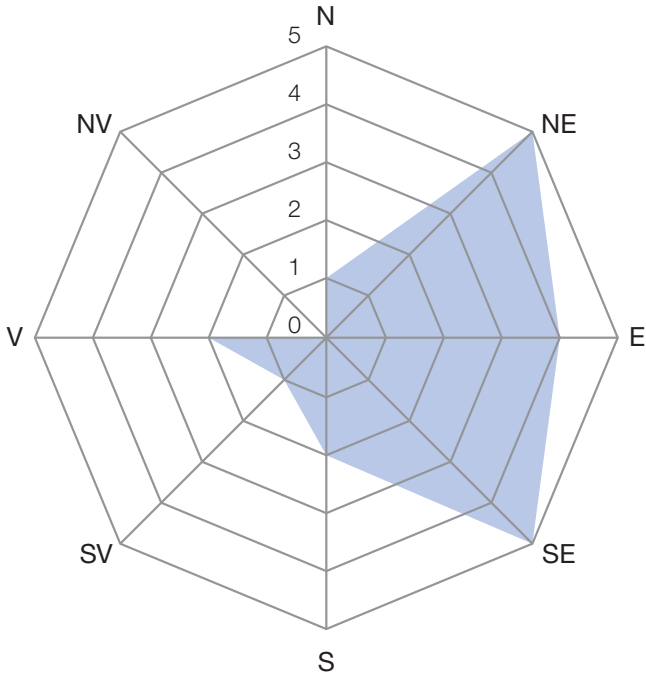


Fig. 8 - Nest hole orientation for *Dendrocopos medius*.

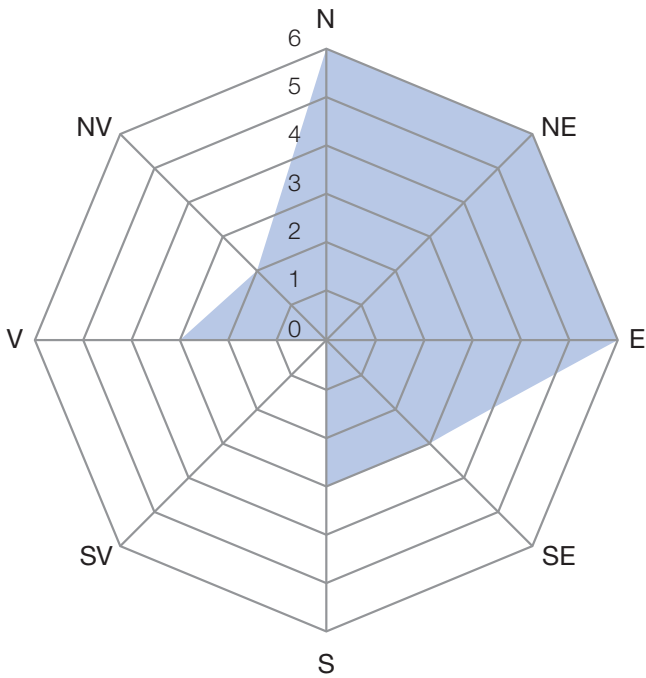


Fig. 9 - Nest hole orientation for *Dendrocopos major*.



Table 2

Plant associations selected by *Dendrocopos medius* as nesting habitat (N - sample size, \* - mean±standard deviation).

%	N	Plant association	Cover (%)*
5	1	<i>Bromo sterilis-Robinetum pseodacaciae</i> (Pócs, 1954) Soó, 1964	75
20	4	<i>Lychnio coronariae-Quercetum cerris</i> Sanda et Popescu, 2003	80±9.1
20	4	<i>Melico uniflorae-Tilietum tomentosae</i> (Sanda et Popescu, 1971), corr Popescu et Sanda, 1992	80±7.1
5	1	<i>Ornithogalo-Tilio-Quercetum</i> A. Dihoru, 1976	90
50	10	<i>Quercetum farnetto-cerris</i> (Georgescu, 1945) Rudski, 1949	75.5±10.9
100	20	Total	

Table 3

Plant associations selected by *Dendrocopos major* as nesting habitat (N - sample size, \* - mean±standard deviation).

%	N	Plant association	Cover (%)*
3	1	<i>Fraxino pallisae-angustifoliae-Quercetum roboris</i> Popescu et al., 1979	80
14	4	<i>Lychnio coronariae-Quercetum cerris</i> Sanda et Popescu, 2003	76.3±7.5
28	8	<i>Melico uniflorae-Tilietum tomentosae</i> (Sanda et Popescu, 1971), corr Popescu et Sanda, 1992	83.7±5.2
7	2	<i>Ornithogalo-Tilio-Quercetum</i> A. Dihoru, 1976	82.5
3	1	<i>Polygonato latifolio - Quercetum roboris</i> (Hargitai, 1940) Borhidi, 1966 in Borhidi et Kevey, 1996	70
45	13	<i>Quercetum farnetto -cerris</i> (Georgescu, 1945) Rudski, 1949	80±9.1
100	29	Total	

related literature, it was found that *D. major* prefers living trees from species like *Populus tremula*, *Fagus sylvatica*, *Quercus petraea*, *Quercus robur*, *Tilia cordata* and *D. medius* nests mostly in dead wood, preferring *Fagus sylvatica*, *Tilia cordata*, *Fraxinus excelsior* as nesting trees (Glăvan, 2004).

We found that *D. medius* can choose as nesting site Black locust *Robinia pseudoacacia*, a tree with extremely hard wood, resistant to rot and toxic when is alive, woodpeckers avoiding it as nesting place, except for Great Spotted Woodpecker. The nests were found in decaying snags, probably old nests of Great Spotted Woodpecker, which proofs again the importance of old and decaying trees for woodpeckers, especially when other tree species are not available. In literature, we found only one case of nesting in Black locust for *D. medius* (Mazgajski, 1997 in Pasinelli, 2003). This aspect, together with the results related to the preference for large oaks and lime and decaying wood bring the base information for a specific management action plan for the conservation of the species and the forest in this protected area.

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PREFERINȚELE DE CUIBĂRIT LA DOUĂ SPECII DE CIOCĂNITORI  
(*DENDROCOPOS MAJOR* ȘI *DENDROCOPOS MEDIUS*), ÎN PĂDUREA COMANA,  
SUDUL ROMÂNIEI

REZUMAT

Scopul principal al acestui studiu este de a obține o mai bună înțelegere a nevoilor pe care ciocănitoarea pestră mare și ciocănitoarea de stejar le au pentru habitatul în care trăiesc. Ciocănitorele sunt specialiștii pădurii, fiind amenințate cu dispariția în întreaga Europă, mai ales prin distrugerea habitatelor forestiere precum și prin pierderea calității habitatului, prin reducerea surselor de hrană și a locurilor de cuibărit. Ambele specii au aratat o preferință puternică pentru stejari, tei, arbori mari și lemn mort pentru cuiburi, dar Ciocănitoarea de stejar s-a dovedit a fi mai selectivă în ceea ce privește speciile de arbori. Înălțimea cuibului a fost influențată de diametrul copacului. Ambele specii au aceleași preferințe de cuibărit pentru cer, tei și stejarul pedunculat, într-o pădure de tipul *Quercetum farnetto-cerris*. Orientarea intrării în cuibul din arbore a fost în principal NE-E-SE pentru ciocănitoarea de stejar și N-NE-E pentru ciocănitoarea pestră mare.

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Ioana Damoc, Roxana Ion, Mihaela Ion  
Institutul de Biologie București  
Splaiul Independenței, 296  
e-mail: ioana.cobzaru@ibiol.ro

Lotus Elena Meșter, Tiberiu Sahlean  
Facultatea de Biologie, Universitatea București  
Splaiul Independenței, 91-95  
e-mail: tiberiu.sahlean@gmail.com