Pygmy owl *Glaucidium passerinum* and Tengmalm's owl *Aegolius funereus* in Kampinos Forest: an analysis of factors which condition the occurrence of both species

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ABSTRACT

The occurrence of the pygmy owl *Glaucidium passerinum* and Tengmalm's owl *Aegolius funereus* in Kampinos Forest has not so far been described in literature. The Kampinos Forest and at the same time Kampinos National Park is situated apart from typical ranges of both these species in Poland. The area also lacks the Norway spruce *Picea abies*, which according to many authors is an important factor for both owl species to occur. Nevertheless, for several years now both of them have been reported from Kampinos Forest and their abundance has been growing. In 2009-2018 five Tengmalm’s owl’s territories were found, while in 2016-2018 six pygmy owl’s territories were reported. This paper analysis the distribution and habitat preferences of these owls in Kampinoska Forest both in terms of types of forest stands and the threat from the tawny owl *Strix aluco* and northern goshawk *Accipiter gentilis*. Tengmalms’ owl’s habitats were rather homogenous and they were always pine coniferous forests of various types, over 140 years old on average and with poor understorey. Pygmy owl chose forest parts rich in species, with a high share of deciduous trees and bushes, of varied age structure, with the dominant pine trees over 110 years old on average.

Keywords: Pygmy owl, *Glaucidium passerinum*, Tengmalm's owl, *Aegolius funereus*, owls, Kampinoska Forest
1. INTRODUCTION

National papers on pygmy owl *Glaucidium passerinum* and Tengmalm’s owl *Aegolius funereus* distribution in Poland, Kampinos Forest and Kampinoski National Park on its area are not reported at all (Domaszniewicz *et al.* 2007; Stawarczyk *et al.* 2007). The resources on Strigiformes of Kampinoski National Park (Kowalski *et al.* 1991; Źmichorski *et al.* 2005; Olszewski *et al.* 2010; Génot *et al.* 2014) also lack data on pygmy owl and Tengmalm’s owl. It is a vast forest area of about 26,000 ha in the patch of habitats both dry and wet. Ancient forest fragments over 120 years old take up about 6,000 ha. The creation of a national park on its area ensured the limiting of forest management works, availability of dead and dying trees, the occurrence of mid-forest clearings and parts felled by gales, left for natural succession. Such an area should at least seem a potential place to look for both pygmy owl and Tengmalm’s owl. However, reference data do not indicate that this is the case, which probably results from the location of Kampinoska Forest beyond the known, most important ranges for both species in Poland (Domaszewicz *et al.* 2007; Sikora & Mikusek 2015). Some years ago a group of owl researchers in the area (Kowalski *et al.* 1991) virtually claimed that while studying the abundance of owls in Kampinoska Forest they did not search for pygmy owl, assuming it was highly unlikely to find it due to the species connection with spruce forests.

First significant information of pigmy owls in Kampinoska Forest was gathered by the author in the years 2010-2014, however, they were usually single reports by naturalists who were in the forest, own observations or single hearing, usually in autumn, which were not confirmed in subsequent years. In October 2015 the author several times spotted a pigmy owl entering a woodpecker hole in common aspen *Populus tremula*. The bird was no more reported in spring or in next years.

While analysing the current knowledge of the occurrence of the other owl species, namely Tengmalm’s owl, it is surprising that ornithologists studying the area in the years 1990s did not intensively look for it, even though its feathers were found in the feeding place of northern goshawk *Accipiter gentilis* (Olech 1997). The first report of territorial Tengmalm’s owl in Kampinoski National Park came in 2009 (Pepłowska-Marczak 2009). It concerned a territorially pair recorded many times, at the same place for several years. This confirmed report of a territorial couple of Tengmalm’s owl and its further yearly observations and single reports of pygmy owls hoots motivated the author to start a planned, methodical search for both species. In next years the monitoring of both owls started. Both observations and monitoring were conducted by the author in Kampinoski National Park every year since 2011. Although the work seemed pointless, this article certainly proves that methodical search can contribute to the knowledge of distribution of small owls in Poland, particularly in the areas traditionally assumed to be geographically unsuitable, especially because an increase in both species’ abundance has been recorded in many parts of Poland (Ciach & Czyżowicz 2014).

2. STUDY AREA

The study was conducted in the forests of Kampinos National Park, of total area 38,544 ha, located in central Poland. The forests of Kampinos National Park, which includes Kampinoska Forest, take up nearly 26,000 ha. Kampinoska Forest consists of about 23.8% old-growth forest, 54.9% mature forest. Second-growth forest are almost non-existent, forest stands
aged 25-80 take up 19.01% (KNP’s own data). The main forest types are pine forests, which account for 62.86% of forest areas. Scots pine *Pinus sylvestris* as a dominant species is 66.35% of all tree species (KNP’s own data). Norway spruce *Picea abies* occurs sporadically in the form of small clumps of various ages. Kampinos National Park includes a number of nature reserves, where any human activity is banned apart from non-invasive scientific research. The reserves take up slightly more than 4,600 ha area. A characteristic element of Kampinos National Park, which results in high landscape variety, are dunes which form hills divided by marsh belts.

In the article the name Kampinoska Forest is used alternately with Kampinos National Park (hereinafter: KNP).

3. METHODS

The search for Tengmalm’s owl was conducted from 2011 according to the guidelines by Sikora & Mikusek (2015). It consisted in listening for territorial males with vocal stimulation from mid-February to the end of May. Male owl voices were played from points set along 4 ten-kilometre routes leading through various forest types, usually with older trees, and additionally from selected points in potential habitats and from open mid-forest points (shelterbelts, fragments of bare dunes). The listening started after dusk and continued for 5-6 hours. Search with luring and listening was repeated twice a season. During the day the habitats and spots from which male Tengmalm’s owls cried were described; e.g. holes made by black woodpecker *Dryocopus martius* were noted. The listening was conducted on clear and windless nights.

The search for pygmy owl was conducted from 2011 according to guidelines by Mikusek (2015). It included listening for territorial males, vocal stimulation, most intensive from March to the end of May, in selected routes of various length, in the patchwork of habitats were owl voices were played. The routes were 40 km long in total. The search with luring and listening was repeated twice a season. Pygmy owl was also searched for all year, if other studies were conducte, and in some points in Norway spruce forest fragments. Also the response of small forest birds to recorded pygmy owl’s voice was checked and traces of its hunt were searched. The search was conducted in the morning, afternoon and soon before dusk, on sunny and windless days. Habitats and places from which male pygmy owl were heard were described, e.g. woodpeckers’ holes were noted.

The analysis considered only males or territorial couples of Tengmalm’s owl and pygmy owl, observed by the author in the nesting season. The paper does not take into consideration reports by other people if they were not confirmed by the author or reports which only concern autumn. In one case of Tengmalm’s owls (territories 3a and 3b, Table 1) we did not know for sure they were separate pairs, but due to the occurrence of two territories next to each other at different times we decided to analyse each of them separately.

Data analysis also used the results of independent monitoring of tawny owl *Strix aluco* pair distribution (KNP’s own data) as well as search results for a tawny owl in the vicinity of recognised stands of pygmy owl and Tengmalm’s owl.

The analysis of Norway spruce was only limited to ensuring its occurrence, because as a species introduced in Kampinoska Forest it is not included in forest descriptions and lacks data.
The habitat features were analysed in a circle of 300 m radius, assuming a territorial male owl’s stand as its centre. The data was analysed in ArcGIS with Spatial Data System of Kampinoski National Park.

Habitat preferences were defined with Jacob’s selectivity index \( D \) (Jacobs 1974): \( D = \frac{(r - p)}{(r + p - 2rp)} \), where \( r \) means the component’s share in an area 300 m radius around the owl’s reported stand, \( p \) means the same component’s share in all the study area (KNP forests).

4. RESULTS
4. 1. Tengmalm's owl
4. 1. 1. Abundance

In 2009-2018 five Tengmalm's owl’s territories were found in KNP. The first spotting of a territorial pair in Kampinoska Forest was in 2009 (Peplowska-Marczak 2009). Before that nobody reported that species, it could not be found during night listening for other owl species (Zmichorski et al. 2005; Olszewski et al. 2010; Génot et al. 2014). The listening for Tengmalm’s owl was conducted in January 2009; they were spontaneous voices, without stimulation. In subsequent weeks a territorial male and female were seen and heard in the same place. The pair was reported from the same spot in 2010, 2011, 2012 and 2014. After a year-long break the pair of Tengmalm’s owls appeared about 300 metres further. It is not certain if this was the same pair, or whether it was a new territory found by another pair of birds. For the sake of the analysis it was assumed that the other territory was equal to another pair (3a and 3b, Table 1). The pair stayed there both in 2017 and in 2018; it was seen or heard several times every spring. Another Tengmalm’s owl’s territory was found in 2015, a dozen kilometres from the previous one. A territorial male was also heard there in 2016 and 2018. In 2010 unsuccessful attempts to hear Tengmalm’s owl without stimulation were made (Génot et al. 2014). The birds might not have been there yet. Other two territories of this owl were found in another part of the forest in 2018. Besides two reports of a male owl’s voice were made, but they have not been confirmed so far.

Due to a very low density of Tengmalm’s owl for 100 ha of forest, which is equal to third decimal place, it was deemed to be insignificant for all the forest area of Kampinoska Forest. The density of this owl in old forest over 120 in 2018 was 0.15 terit./10 km².

4. 1. 2. Habitat preferences

All the reports of territorial Tengmalm’s owls concerned the reserves in Kampinoski National Park. Tengmalm’s owl’s habitat was very homogenous, with the prevailing pine coniferous forest. The dominant species was Scots pine (Table 1).

In the immediate vicinity of Tengmalm’s owls (up to 300 m) 4 forest types were found: moist coniferous forest, fresh coniferous forest, moist mixed coniferous forest and fresh mixed coniferous forest. Individual preferences were as follows: fresh coniferous forest and moist coniferous forest to the same degree: \( D = + 0.8 \) and \( + 0.79 \); moist coniferous forest, \( D = + 0.93 \); moist mixed coniferous forest, \( D = + 0.94 \); moist mixed coniferous forest, \( D = + 0.72 \); moist mixed coniferous forest, \( D = + 0.9 \).

Fresh coniferous forest prevails in Kampinoski NP with a share in forest types at 38% (KNP’s own data), however, it was preferred only on one Tengmalm’s owl’s territory. On the other hand, the remaining preferred forest types, i.e. moist coniferous forest and moist mixed
coniferous forest take up a share of 2% and 3% respectively. In practice in Tengmalm’s owls’ immediate vicinity almost in all the cases the dominant forest was fresh coniferous forest, with a share of 48% to 85% of a 300 m – diameter circle.

In one case the dominant type was moist mixed coniferous forest, which took up 51% are. The spruce was not significant in the habitat, only two territories of Tengmalm’s owl were in the coniferous forest with a share of young spruce trees (Table 1). However, it was noted that Tengmalm’s owl’s habitats in coniferous forest were characterised by a poor understorey.

In some spots the understorey contained young common oak *Quercus robur*.

**Table 1.** Selected characteristics of the area 300m from Tengmalm’s owl’s finding.

<table>
<thead>
<tr>
<th>Diameter circle No.</th>
<th>Various share (%) of tree species in canopy</th>
<th>The distances from tawny owl’s holes in 1 km circle</th>
<th>Presence of spruce</th>
<th>Various share (%) of open space</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>pine (100)</td>
<td>170, 650</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>pine (100)</td>
<td>no ones</td>
<td>+</td>
<td>4</td>
</tr>
<tr>
<td>3a</td>
<td>pine (100)</td>
<td>260, 300</td>
<td>-</td>
<td>27</td>
</tr>
<tr>
<td>3b</td>
<td>pine (100)</td>
<td>130, 440</td>
<td>-</td>
<td>26</td>
</tr>
<tr>
<td>4</td>
<td>pine (100)</td>
<td>420, 580</td>
<td>+</td>
<td>13</td>
</tr>
</tbody>
</table>

The average age of forest stands where Tengmalm’s owls were found fluctuated between 148 and 174, with a standard deviation on a similar level (Table 2). The oldest, pine forest stand, was 190 years old.

**Table 2.** Average age of forest stands in the area of 300 m from Tengmalm’s owl’s finding.

<table>
<thead>
<tr>
<th>Diameter circle No.</th>
<th>The average age of trees</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>155</td>
<td>29,15</td>
</tr>
<tr>
<td>2</td>
<td>148</td>
<td>20,59</td>
</tr>
<tr>
<td>3a</td>
<td>174</td>
<td>19,44</td>
</tr>
<tr>
<td>3b</td>
<td>169</td>
<td>22,19</td>
</tr>
<tr>
<td>4</td>
<td>155</td>
<td>21,05</td>
</tr>
</tbody>
</table>
In Tengmalm’s owls’ immediate vicinity, 4 out of 5 cases were open spaces: mid-forest meadows or shelterbelts with fallen trees (Table 1). Their share in the area up to 300 m from the Tengmalm’s owl’s spot was from 4% to 27% (Table 1). Real values of all open spaces were from 1.8 to 3.2 ha.

4. 1.3. Threat and competition

Out of 5 reported sightings of Tengmalm’s owl, four were placed near an occupied hole by tawny owl. The distances between the places Tengmalm’s owl was sighted and tawny owl’s holes are presented in Table 1, and their distance was 130 m to 650 m. In all cases two breeding territories of tawny owl were situated up to 1 km away in each place.

The shortest distance between two territorial males of Tengmalm’s owl, found at the same time, was about 1,500 m. The shortest distance between the territorial pygmy owl and Tengmalm’s owl was about 400 m.

4. 2. Pygmy owl

4. 2.1. Abundance

Despite searching no pygmy owl was found in KNP in 2011-2015. In 2016-2018 six territorial Pygmy owl stands were recorded, out of which three were still there in 2017 - 2018. The first pygmy owl in Kampinoski National Park, the bird which in next years turned out to be territorial, was reported in autumn 2016. Then the owl responded with an alarmed cry to a recorded voice of hazel grouse *Tetrastes bonasia*. In spring 2017 a pygmy territorial male was confirmed in the same spot, about 100 metres from the very place it had been heard the previous autumn. In spring 2018 the presence of this male was confirmed again in the permanent territory. The breakthrough was in 2017, when the total of three pygmy owl territories were found in spring, also one territorial male was reported (R. Lasecki). In 2018 the total of five spring territories of this owl were found in KNP, two of them with a pair of birds. One stand was a confirmed report (M. Rycak). The finding of two territorial males close to each other enough to arrive and respond to vocal stimulation from one recording came as a biggest surprise. After the recording was stopped the birds still behaved aggressively towards each other. Then a female appeared, too. Due to a very low density per 10 km² of forest it was considered pointless to provide the figure for all the Kampinoska Forest area. The density of pygmy owl occurrence in old-growth forest aged over 120 was 0.19 territory /10 km² in 2018. The totalled territories of 2017-2018 (N=6) yield the density at 0.23 territory/100 ha of old-growth forest.

4. 2.2. Habitat preferences

All the reports of territorial pygmy owls considered the reserves of Kampinoski National Park. The forests where the owls occurred were varied, with the pine tree, common oak, alder as dominant species with various share (Table 3).

The immediate vicinity (300 m) of pygmy owls 10 forest habitats were found, namely: fresh mixed broadleaved forest, moist mixed broadleaved forest, moist broadleaved forest, fresh coniferous forest, alder forest, alder-ash forest, fresh mixed coniferous forest, fresh coniferous forest, moist mixed coniferous forest, and moist coniferous forest. Particular individuals preferred: fresh coniferous forest, D = + 0.86; moist mixed broadleaved forest, D = + 0.9; fresh coniferous forest, D = + 0.79; moist mixed broadleaved forest, D = + 0.9; moist mixed
maximal D = +0.97 and fresh coniferous forest, D = + 0.96. Although the share of fresh coniferous forest in all forest types of KNP is only 2%, and the share of moist mixed broadleaved forest is 2%, pygmy owl showed preference for these forest types. In one case the avoidance of alder-ash forest was shown with D = - 0.47, in another it was fresh mixed broadleaved forest, D = - 0.22, however, without significant impact. In one case fresh broadleaved forest was used in line with habitat availability, D = 0. Practically pygmy owls’ immediate surroundings were dominated by fresh mixed coniferous forest, fresh coniferous forest, moist mixed broadleaved forest and moist broadleaved forest. It was noted that the habitat was characterised by well developed, dense understorey. Most pygmy owls stayed in forests with a high share of the common hazel *Corylus avellana* and common oak in understorey (5 cases), Norway spruce was noted in three cases (Table 3).

**Table 3. Characteristics of the area 300 m from pygmy owl’s finding**

<table>
<thead>
<tr>
<th>Diameter circle No.</th>
<th>Various share (%) of tree species in canopy</th>
<th>The distances from tawny owl’s holes in 1 km circle</th>
<th>Presence of spruce</th>
<th>Common hazel and common oak</th>
<th>Various share (%) of open space</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>pine (30), oak (30), alder (30)</td>
<td>400</td>
<td>yes</td>
<td>+</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>pine (80), birch (20)</td>
<td>600, 620, 720</td>
<td>no</td>
<td>+</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>pine (80), birch (20)</td>
<td>410, 600, 640</td>
<td>no</td>
<td>+</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>pine (100)</td>
<td>960</td>
<td>yes</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>pine (50), alder (30), birch (20)</td>
<td>no ones</td>
<td>yes</td>
<td>+</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>alder (58), pine (25), birch (16), oak (1)</td>
<td>505, 460</td>
<td>no</td>
<td>+</td>
<td>0</td>
</tr>
</tbody>
</table>

**Table 4. The average age of trees in a 300 m radius from pygmy owl’s finding**

<table>
<thead>
<tr>
<th>Diameter circle No.</th>
<th>The average age of trees</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>115</td>
<td>27,65</td>
</tr>
<tr>
<td>2</td>
<td>116</td>
<td>42,15</td>
</tr>
<tr>
<td>3</td>
<td>114</td>
<td>36,6</td>
</tr>
<tr>
<td>4</td>
<td>127</td>
<td>20,22</td>
</tr>
<tr>
<td>5</td>
<td>113</td>
<td>11,23</td>
</tr>
<tr>
<td>6</td>
<td>117</td>
<td>10,2</td>
</tr>
</tbody>
</table>
The average age of the forest stand was between 113 and 127, a standard deviation fluctuated (Table 4). The oldest forest stand, i.e. the pine forest stand, was 155 years old. No open areas were found in pygmy owls’ immediate vicinity (Table 3).

4. 2. 3. Threats and competition

Out of 6 reports of territorial pygmy owls in five cases there was a tawny owl’s breeding territory with a tree hole nearby. The distances between the spot where territorial pygmy owls were found and tawny owl’s holes were between 400 and 720 m (Table 3). In two cases as many as three tawny owl’s territories were located up to 1 km away, in one case there were two of them. The shortest distance between territorial males of pygmy owl found at the same time (except when two excited males were attracted to the same place by vocal stimulation): about 100 m.

5. DISCUSSION

5. 1. Tengmalm’s owl

Tengmalm’s owl is still very scarce in Kampinoska Forest, and its density is much lower than the one indicated for other parts of the country or Europe, where it occurs in its typical habitats (Domaszewicz et al. 2007; Rajkovic et al. 2010; Sikora & Mikusek 2015). We do not know whether Tengmalm’s owl recently appeared in Kampinoska Forest due to fluctuating population abundance in various parts of the country and migration related to the abundance of food or climatic conditions (Ciach & Czyżowicz 2014; Sikora & Mikusek 2015). The study covered only the reports of territorial males, without checking their breeding categories or intensive searching for the holes taken. This results from the fact the Tengmalm’s owl only recently appeared in Kampinoska Forest and currently the most important task is to find the species and define its optimal stands. The next stage of the search can focus on finding the tree holes taken by the owls. Due to this it cannot be ascertained whether it is a permanent population of Tengmalm’s owl in Kampinoski National Park and which direction its abundance and distribution will take. The fact that territorial Tengmalm’s owls did appear confirms the assumption that the owl is worth seeking in Kampinoska Forest. As proven by studies (Rajković et al. 2013) not all the habitat factors and features deemed to be decisive for Tengmalm’s owl’s appearance are really such in each case.

An analysis of the immediate surroundings of territorial Tengmalm’s owls shows that they chose quite homogenous habitats, always pine forests of various types, on average aged more than 140 years. However, when taking a closer look at habitat preferences, it can be seen that Tengmalm’s owl preferred moist coniferous forest and moist mixed coniferous forest in its vicinity, and they are marginal in the park. Choosing such a forest type, which is very rare in Kampinoska forest, for its vicinity may show its great role for this owl. This might be one of factors limiting its occurrence in KNP. Similar results were obtained by Stachyra et al. (2005) in Solska Forest, where Tengmalm’s owl preferred e.g. moist coniferous forest of 100 years old. Tengmalm’s owl’s territories in Kampinoska Forest always contained large, old pine trees, Norway spruce was not always present. According to many authors Norway spruce (apart from the regions with European beech *Fagus sylvatica*) is essential in Tengmalm’s owl’s habitat (Rajković et al. 2010; Sikora & Mikusek 2015; Basile et al. 2016), however, this is not the case...
in Kampinoska forest. The spruce is scarce, it occurs in small stands, planted by man, and usually creates a lower forest layer. Only rarely can single adult spruce trees be found.

An important component com near Tengmalm’s owl’s stands were small open spaces. Many authors emphasize the importance of such places in this owl’s habitat (Osojca 2004; Stachyra 2005; Domaszewicz et al. 2007). Mid-forest clearings in KNP are gaps always resulting from natural phenomena; they include shelterbelts or small mid-forest meadows and marshes. Even the oldest vast parts of Kampinoska Forest do not lack such areas. Some authors indicate a higher abundance of food in places where trees were cut down (Basile et al. 2016). Natural clearings in Kampinoski NP meet these requirements, as there is no cutting typical of managed forest.

It is certainly worth noting that Tengmalm’s owls were only found in old-growth forest with a high share of dead, fallen and crooked trees (Photo 1). In such places many trees are ill and dying, and there are many woodpecker tree holes, which condition small owls’ breeding, including Tengmalm’s owl.

Photo 1. The fragment of territory Tengmalm’s owl (Photo by Danuta Pełowska-Marczak)
Old, weak trees, attacked by insects, attract woodpeckers. The abundance of black woodpecker in the park is estimated at 100 - 140 pairs and the yearly monitoring results indicate its density at about 1.0 – 1.5 pairs/ 100 ha in optimal habitats, i.e. old forests (KNP’s own data) (Photo 2). Homogenous aged forests are indicated as the most important factor of Tengmalm’s owl occurrence in Serbia, and creating reserves was considered the best protection for this owl (Rajković et al. 2010). The oldest forests are necessary in this species’ habitat, and their number correlates with the owl’s reproduction (Basile et al. 2016). Lower forest age and intensification of forest management are some of more important factors resulting in the disappearance of Tengmalm’s owl’s habitats (Stachyra et al. 2005). The reserves in Kampinoska Forest were created already in 1820s, 1830s, and 1840s, before the national park was established. Their aim was to protect old forests of unique character, which now result in the occurrence of relict insects of primeval forests (Marczak & Masiarz 2013; Marczak & Królik 2015; Marczak et al. 2018). Rajković et al. (2010) indicate that in some regions of Serbia Tengmalm’s owl occurs mainly in nature reserves or on their edges in old forest stands. The average age of Scots pine is over 140 years and reserves may be an important factor of this owl’s appearing in these studies. Also in studies by Mikusek & Sikora (2013) all Tengmalm’s owl stands in coniferous forest were in forest stands older than 120, in Romincka Forest in forest stands older than 110 (Osojca 2004).

Photo 2. Young Tengmalm’s owls in a hollow (Photo by Adam Kwiatkowski).
The occurrence of the tawny owl is considered to be an important factor controlling the abundance of Tengmalm’s owl, as it preys on the smaller species (Vrezec & Tome 2004; Rajković et al. 2013). A close proximity and locally quite high density of tawny owls in Kampinoska Forest do not rule out the occurrence of Tengmalm’s owl in the area. Nevertheless, as was indicated by detailed observations of the pair found in 2009, the male hooted rarely and for a short time, as it was haunted by tawny owls (Peplowska-Marczak 2009). In other cases Tengmalm’s owls were not vocally active, they usually gave short territorial and contact voices, and the prolonged “ppopopopopopo…” voice of a mating male is rarely heard in KNP. It is certainly the reason for a poorer traceability of Tengmalm’s owls in the area.

Tawny owls’ aggression has been repeatedly reported from Tengmalm’s owl’s luring points. Nevertheless Tengmalm’s owls’ territories in KNP are situated quite near tawny owls’ territories, sometimes in the immediate vicinity of one, even two pairs. The distance of 130 or 170 m from a tawny owl’s tree hole basically means sharing a territory, which is in contrast to literature data, according to which these two species clearly avoid each other (Vrezec & Tome 2004). The distribution of Tengmalm’s owls and tawny owls indicates that Tengmalm’s owl does not or is not able to avoid close proximity of tawny owls in Kampinoska Forest. And although the tawny owl may prey on Tengmalm’s owl, the latter’s appearance might indicate that the threat is not so serious.

It was also noted that Tengmalm’s owl might not have cried at all and it might have not responded to vocal stimulation, which is definitely related to tawny owl’s proximity. In 2019, which is not analysed herein, the person playing the recording of Tengmalm’s owl’s voice was attacked by this owl, although Tengmalm’s owl did not hoot at all at the spot the recording was played. After the attack the owl sat on a branch, and after a while it flew to its lookout branch and started monitoring the area.

There was a tawny owl nearby, and it was active that night. This clearly indicates that even if Tengmalm’s owls in Kampinoska Forest do not hoot, this does not mean they are not there and standard searching methods do not suffice in this case. An investigation of tawny owl’s food in Kampinoski National Park (Lesiński et al. 2013) and at their plucking site near tawny owl’s permanent stands never revealed the remains of Tengmalm’s owls. According to resources Northern goshawk does not prey on Tengmalm’s owl, apart from one case in Przemyskie Foothills (Bylicka 2011). However, on the edges of Kampinoska Forest one case of Northern goshawk preying on this small owl was recorded (Olech 1997). Thus it can be inferred that the abundance of Tengmalm’s owl might be controlled by the goshawk much more often than it is thought.

A factor controlling the abundance of Tengmalm’s owl might be also food competition by tawny owl and Tengmalm’s owl. The tawny owl is abundant in KNP, locally very numerous, with density reaching 5.3 territory/10 km² (Génot et al. 2014), according to other research 6.8 territory/10 km²; its density increases with forest age (Olszewski et al. 2010). Tawny owl’s food sources, as inferred from an analysis of owl pellets collected in Kampinoski National Park (Lesiński et al. 2013), include 25 % of bank vole Myodes glareolus, nearly 24 % of rainer hutterer Sorex araneus.

The genus Microtus takes up about 17% of pellet composition. The other genera and species were found individually in food. The species and genera listed in numbers are also quoted as a dominant or significant component of Tengmalm’s owl’s food (Zarybnicka 2009; Rajković et al. 2013). Although it has been commonly assumed that Tengmalm’s owl and tawny owl are not food competitors, this possibility should be taken into consideration.
5.2. Pygmy owl

The pygmy owl is very scarce in Kampinoska Forest and its abundance is far from the numbers provided for other parts of Poland or Europe, where it occurs in its typical habitats (Stawarczyk et al. 2007; Pačenovský & Shurulinkov 2008; Mikusek 2015). The species is regarded as a non-mobile, travelling only short distances (Cząstkiewicz & Sereda-Cząstkiewicz 2015), however, its recent reports from Kampinoski National Park might force us to verify this opinion.

The pygmy owl has been searched for in Kampinoska Forest for years. The area is also frequently penetrated by bird watchers and photographers, due to which at least some birds would have been spotted earlier. This research has only concerned the records of territorial males, without checking their breeding categories or intensive search for taken tree holes. This results from the fact that pygmy owl appeared in Kampinoska Forest quite recently and right now it is most important to find the species and define its optimum habitats. Consequently it cannot be estimated if it is a permanent population of pygmy owl in Kampinoski National Park and what direction its abundance and distribution will take. The fact that territorial pygmy owls appeared in the area certainly confirms the assumption that it is worth searching for it in Kampinoska Forest.

An analysis of pygmy owl’s immediate vicinity in Kampinoska Forest indicates that the species has chosen the forest very rich in species, of varied spatial, storey and age structures, with a high share of deciduous trees and bushes (Photo 3).

Photo 3. The fragment of territory Pygmy owl (Photo by Danuta Pepłowska-Marczak)
It is characteristic for pygmy owls of Poland to choose different habitats, from fresh coniferous forest to fresh broadleaved forest of various age structure (Mikusek 2015). Individual territorial pygmy owls in KNP chose the spots different in terms of habitat, however, they had one thing in common: they were all situated next to highly varied forests with pines of average age over 110. A detailed analysis of habitat preferences indicates that pygmy owls chose the pine, common oak, birch and alder trees in different proportions in their immediate vicinity (in a diameter of 300 m) and always fresh broadleaved forest and moist mixed broadleaved forest, although these two forest types are very rare in Kampinoski National Park (KNP’s own data). This might prove a high significance of such habitats for pygmy owl, although taking into consideration a wide range of habitats chosen in other parts of the country, it seems that pygmy owl can appear in many surprising spots.

In the immediate vicinity of territorial pygmy owls in Kampinoska Forest an important habitat component was the young Norway spruce in the understorey. And although this spruce is really scarce in Kampinoska Forest, it forms small clusters, is was found in half pygmy owl’s known territories. The spruce is considered to be a species the pygmy owl is usually connected to (Cząstkiewicz & Sereda-Cząstkiewicz 2015; Mikusek 2015). In half of the cases there were no spruces or other coniferous trees in pygmy owl’s immediate vicinity, so the owl took up territories with abundant young common oak and hazel tree. If we took spruce occurrence as an indication of pygmy owl’s occurrence, we would not have started looking for it in Kampinoska Forest. Most probably pygmy owl finds more food in the parts of Kampinoska Forest with a high share of deciduous trees and bushes. In Kampinoski National Park such forest fragments are noted for a higher diversity of birds and their higher abundance (KNP’s own data). This particularly concerns small insectivorous birds, which form part of pygmy owl’s diet (Šotnár & Pacenovský 2015). Older forests are also preferred by small resident birds (Helle 1985), which are particularly pygmy owl’s winter prey.

Pygmy owl was found in older, but not the oldest parts of Kampinoska Forest. In Poland the species prefers the forests over 80 years of age (Mikusek 2015). A high diversity of pygmy owl habitats and the places with dense understorey were also reported from studies by Strøm & Sonerud (2001) as well as Heinrioux et al. (2003). An open space was not reported next to pygmy owl’s territories in Kampinos Forests, which may result from the fact that these owls prefer the middle of the forest (Heinrioux et al. 2003), although Strøm & Sonerud (2001) proved it also hunts on a forest edge, but it does not usually leave it.

It is certainly worth noting that pygmy owls were always reported from strictly protected areas, with ill and dying trees, which provide a number of holes, the factor that is a prerequisite for small owls breeding, which includes both Tengmalm’s owl and pygmy owl. The great spotted woodpecker Dendrocopos major, which makes holes suitable for pygmy owl (Henrioux et al. 2003), is numerous and evenly distributed in the park (Pełowska-Marczak 2015, 2018). The areas of strict protection are those where small birds, particularly hole-nesters, are more abundant, and these birds constitute pygmy owl’s food, apart from small mammals or reptiles (Šotnár et al. 2015).

A significant factor which controls pygmy owl’s abundance in Kampinoski National Park may be the northern goshawk and to some extent (as it is scarce) Eurasian sparrowhawk Accipiter nisus. While luring pygmy owls it was observed that the goshawk and sparrowhawk responded to recorded pygmy owl’s voice – they came to the spot and carefully checked the trees. So the researchers stopped playing pygmy owl’s voice near goshawk’s nests, but this did not matter, as birds came anyway from further away.
The goshawk is highly abundant in Kampinoska Forest, in recent years about 60 nests of this species have been found yearly (KNP’s own data). Some authors believe that the pygmy owl can be controlled by the northern goshawk and Eurasian sparrowhawk (Strøm & Sonerud 2001). Moreover, the goshawk is a food competitor to the pygmy owl (Strøm & Sonerud 2001). Also the distances between tawny owl’s territories and pygmy owl’s locations up to 1 km were checked. In several cases the distances between the found pygmy owls and tawny owl’s nests were several hundred metres. This indicates a possibility of sharing habitat between the pygmy owl and tawny owl. Tawny owl’s preying on pygmy owl cannot be ruled out in Kampinoski NP, but higher and higher abundance of pygmy owls indicates that this is not a factor which excludes it altogether. An analysis of tawny owl’s food (Lesiński et al. 2013) and searching for plucking sites near tawny owl’s permanent localities the remains of pygmy owl have never been found.

5.3. Comments to field works

A significant impairment while listening for both owl species is the noise created by planes taking off or touching down. There are two airports near Kampinoski National Park: the Frederic Chopin Airport in Warsaw, 16 km away from the park border, and Warszawa-Modlin airport near Nowy Dwór Mazowiecki, 5 km away from the border of Kampinoski NP. The planes fly over the forest every few minutes, often very low. Due to this both the process of playing the recordings and listening take longer, as the noise of a plane forces a break in the work.

A potential problem are owl searches conducted by bird lovers in Kampinoski National Park without park director’s consent or knowledge. While conducting official scientific search for owls we might hear an owl’s voice played by somebody else without due authorisation. There is also a risk that small owls will not hoot during scientific works or monitoring, because in their immediate vicinity somebody without director’s permit played a voice of e.g. Ural owl Strix uralensis, which could scare away small owls. Such a risk is of course potential, but highly possible. From our own data we know that there are unregistered bird watchers and photographers in Kampinoski National Park who wander off the trails. We can only hope that they abide by nature researcher’s code of ethics and do not vocally stimulate the birds for their own needs.

The author holds a relevant decision by the Ministry of the Environment to deviate from the bans concerning species under strict protection.

6. CONCLUSIONS

6.1. Tengmalm’s owl

1) Tengmalm’s owl occurs in Kampinoska Forest only in pine coniferous forests, with particular preference for moist coniferous forest.

2) Spruce was not an important tree in Tengmalm’s owl’s immediate vicinity.

3) Searching for Tengmalm’s owl only in forests with spruce diminishes the chances of finding this owl in all the studied area.

4) Forest stands where Tengmalm’s owl was found always incorporated old pine trees of average age over 140.
5) Tawny owl’s presence does not exclude the possibility of finding Tengmalm’s owl in Kampinoska Forest.
6) Finding Tengmalm’s owl only in strictly protected areas indicates an insufficient quality of natural habitats in the remaining areas of Kampinoski NP.
7) Tengmalm’s owl often does not hoot at all in its territory nor does it respond to vocal stimulation due to close proximity of tawny owls.

6. 2. Pygmy owl

1) In Kampinoska Forest the pygmy owl prefers forest stands of diverse storey structure, with a high share of deciduous trees and bushes.
2) The spruce in pygmy owl’s immediate vicinity was an important, but not the most important tree species. In half the findings the understorey included common oak and hazel tree instead of spruce.
3) Searching for pygmy owl only in forest stands with spruce diminishes the chances to find this owl in all the studied area.
4) Forest stands where pygmy owl was found always incorporated old pine trees of average age 110 to 130.
5) The tawny owl does not completely exclude pygmy owl’s occurrence in Kampinoska Forest.
6) Finding pygmy owls only in strictly protected areas indicates insufficient quality of natural habitats in the remaining areas of Kampinoski NP.

Acknowledgement

I would like to express my sincere thanks to Mr Robert Lasecki and Mr Michał Rycak for providing me with information about small owls they heard in Kampinoski NP.

References


[19] Pačenovský S., Shurulinkov P. 2008. Latest data on distribution of the Pygmy Owl (Glaucidium passerinum) in Bulgaria and Slovakia including population density comparison. Slovak Raptor Journal, 2: 91-106


