SOME OBSERVATIONS REGARDING THE EURASIAN PIGMY OWL (*Glaucidium passerinum* LINNAEUS, 1758) FROM THE FĂGĂRAŞ, IEZER-PĂPUŞA AND LEAOTA MOUNTAINS (SOUTHERN CARPATHIANS, ROMANIA)

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Abstract. Some results of a study on the Eurasian Pygmy Owl (*Glaucidium passerinum* Linnaeus, 1758) performed during 2015-2019 in the Făgăraş, Iezer-Păpuşa and Leaota Mountains from Southern Carpathians (Romania) are presented in the paper. Local particularities of the occurrence and biology of the species in the area were followed and the distribution on habitats and sea level altitude, as well as the influence of the monthly and diurnal periods and of the weather conditions on its vocal activity in the breeding time were analysed. Because it is mentioned in Annex I of the Birds Directive, the species needs protection, in an area affected by intense forestry exploitations.

Keywords: Pigmy Owl, playback, habitats, weather conditions, protection.

Rezumat. Unele observaţii privind ciuvica (*Glaucidium passerinum* Linnaeus, 1758) din Munţii Făgăraş, Iezer-Păpuşa şi Leaota (Carpaţii Meridionali, România). În lucrare sunt prezentate câteva rezultate ale unui studiu referitor la ciuvică (*Glaucidium passerinum* Linnaeus, 1758), realizat în perioada 2015-2019 în munţii Făgăraş, Iezer-Păpuşa şi Leaota din Carpaţii Meridionali (România). Au fost urmărite, îndeosebi, particularităţi locale ale răspândirii şi biologiei speciei în zonă, analizându-se distribuţia sa pe habitate şi altitudine, precum şi influenţa perioadelor lunare şi diurne şi a condiţiilor meteo asupra activităţii sale vocale din perioada de împerechere. Aparţinând Anexei I a Directivei Păsări, specia necesită protecţie, într-o zonă care se confruntă cu intense exploatări forestiere.

Cuvinte cheie: ciuvică, playback, habitate, condiţii meteo, protecţie.

INTRODUCTION

Because of its secretive life and commonly hard conditions of surveillance, caused by weather and relief, the Eurasian Pigmy Owl (*Glaucidium passerinum* Linnaeus, 1758) from Romania was rarely a focus for ornithologists. While the species was monitored on a regular basis in the Eastern Carpathians (https://milvus.ro/), except for a few information (DARÓCZI, 2014), no results were published. Instead, some observations about the species can be found on the on-line ornithological national databases (http://pasaridinromania.sor.ro/ornitodata, http://www.openbirdmaps.ro/, https://rombird.ro/). Also, several issues mention it in the mountains from Romania (PAŞCOVSCHI, 1959; RADU, 1967; VASILIU & ŞOVA, 1968; MĂTIEŞ, 1979; KLEMM & KOHL, 1988; POP et al., 2008; MUNTEANU, 2009, 2012). From Făgăraş - Iezer - Păpuşa - Leaota area, there are some indications on its presence, too (LINŢIA, 1954; BĂCESCU, 1961; CIOCHIA, 1992; GEORGESCU & GEORGESCU, 1996; MUNTEANU et al., 2002).

The main aim of the study was to find some local particularities of its distribution in the area as well as of its biology.

MATERIAL AND METHODS

The Pigmy Owl is the smallest species of owl from Europe. It breeds in coniferous or mixed forests in the boreal zone or in the mountains of the Central Europe, where it prefers the mature spruce or the fir forests. It has a crepuscular activity and it eats birds and voles and nests in a hole in a tree. It is a chiefly resident species (SVENSSON et al., 2009), although, at least in the North of Europe (Central Sweden) some individuals, mostly juveniles, migrate long distances (few hundred of kilometres) mainly between September 15 and October 15 (POLAKOWSKI et al., 2008). Also, it inhabits cultivated forests containing artificial clearings, completely deforested sections and scattered uncut island-stands, but its prime habitat is represented by richly structured, lighter and more open stands of climax coniferous forests dominated by common spruce (MIKKOLA & SAKL, 1997). In Romania, it lives in the huge forests of spruce, up to their upper border, in a cold and wet environment; maybe in mixed forests (MUNTEANU, 2009). It prefers the mountain forests of Norway spruce and fir (DARÓCZI, 2014) and the heterogeneous and tall spruce forests, with fillings. Its presence was noted in a few points, mainly in the Oriental Carpathians and on the Northern slopes of the Southern Carpathians, as well as in the Banat Mountains (MUNTEANU, 2012). During the winter, some specimens execute small altitudinal movements (BIELZ, 1887).

The area of study included the southern versants of the Făgăraş Mountains and the Iezer-Păpuşa and Leaota Mountains (Fig. 1), all placed in the eastern part of the Southern Carpathians (also, know as Transylvanian Alps).

The relief is constituted by ridges that leave from the main crest on north-south direction, in the Făgăraş Mountains, on south-east direction, in the Iezer-Păpuşa Mountains, and radial, from the high peaks, in the Leaota Mountains. The main summits are: Moldoveanu (2,544 m), Negoiu (2,535 m), Viştea Mare (2,527 m), Lespezi (2,517 m) from the Făgăraş Mountains, Roşu (2,469 m) from the Iezer-Păpuşa Mountains, and Leaota (2,133 m) from the Leaota Mountains.

The hydrographical system of the investigated area is rich. The Topolog River, tributary of the Olt River and the Argeş River, with its branch – Râul Doamnei, spring from the southern slopes of the Făgăraş Mountains, and Bratia, Râul Târgului, some streams of Râul Doamnei and Argeşel, which flow together toward the Argeş River, spring from the Iezer-Păpuşa Mountains. On the other side, Dâmboviţa River collects most of its water from Leaota Mountains.

The climate is temperate continental with mountain features. The average temperature is -2 ^{0}C on the highest peak of the Făgăraş Mountains, where, in January, the lowest average value (-9 ^{0}C) is recorded. Nebulosity manifests most of the time (over 200 cloudy days/year). The level of precipitations exceeds 1,200 mm/year on the heights and even 1,400 mm/year on the tallest peaks. The snow cover is present on the crests between 150 and 200 days/year and the wind blows strongly mainly at the end of the winter and at the beginning of spring (BARCO & NEDELCU, 1974).

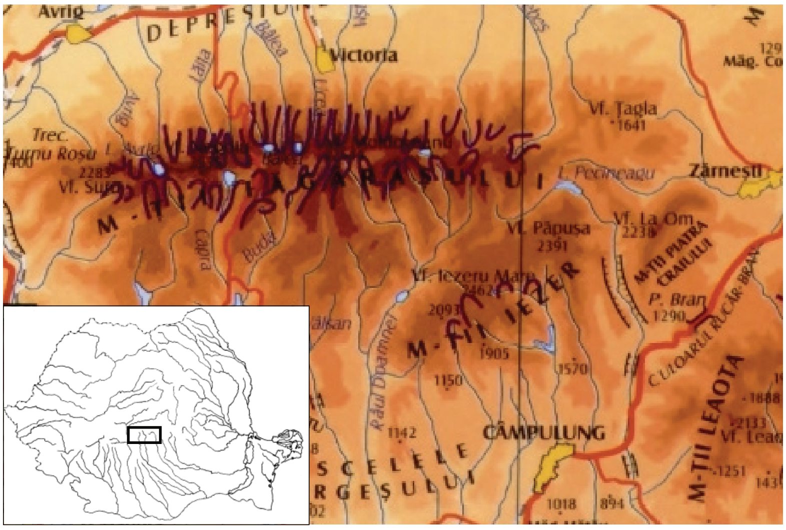

Figure 1. The map of the area (modified, by http://elearning.masterprof.ro/).

The vegetation is diverse, depending on the relief. At the lower level (up to ca. 1,200 m) there are forests of beech (*Fagus sylvatica* L.) and other wood species, at the middle level (up to 1,450 m) there are mixed forests of beech and Norway spruce (*Picea abies* (L.) Karst.) or Silver fir (*Abies alba* Mill.) and at the upper level (up to 1,850 m) there are forests of Norway spruce. The sub-alpine level (up to 2,200 m) is dominated by Dwarf mountain pine (*Pinus mugo* Turra) and Common juniper (*Juniperus communis*) and, in the alpine level (over 2,200 m), *Festuca supina* Schur., *Carex curvula* All., *Agrostis rupestris* All., *Oreochloa disticha* (Wulfen) Link, *Nardus stricta* L. are the most frequent species (DONIŢĂ et al., 2005; ALEXIU, 2008).

As methodology, we used the method of playback (DARÓCZI, 2014, modified). To test the method, the points of playback were randomly chosen in all types of forests from the area and in various weather conditions. Some of them were chosen in places with bad detectability and other in places with good visibility (deforested areas near the woods, exposed ridges or valleys, upper limit of the spruce forest, etc.). So, there were 41 days of field trips and 111 points of observations. 52.25% of the points of observation had adequate conditions for observations (adequate meteorological conditions, without abundant rainfall or snowfall or wind over 3 on the Beaufort scale of intensity, favourable habitat, which means relative or mature mixed or coniferous forests, lack of the stream noise, medium and good position as detectability) and 47.75% of the points of observation had good conditions for observations (the same elements like previously, but only good position as detectability, when the points from the closed forests were eliminated) (Table 1). The distance between the points of playback was more than 700 m. The period of monitoring was October-April, although an intense vocal activity of the birds can occur in September, too, and the points were passed once. The diurnal time of monitoring was between 8:00 and 17:00 (GMT+2). Normally, 5 minutes (alternatively, 1 minute calling, 1 minute listening) were reserved on every point of playback and, to reduce the stress on the birds, the calling generally ceased when the individuals were heard. The alarm behaviour of other birds was observed to find the individuals. In every point of playback, information about the species, the habitat, GPS coordinates, cote, date, hour, weather conditions were noted. As temperature of the air, the interval of monitoring was between -15 and 14 ^{0}C, and the types of clouds were used according to the speciality classification (http://www.cas.manchester.ac.uk/). For nebulosity, the sky was divided in ten parts and the coverage of clouds was visually estimated.

As tools, we used binoculars, camera, maps, GPS gadget, field journals, calling device, winter equipment (inclusively for deep snow) and a non-lethal kit of protection against aggressive animals.

RESULTS AND DISCUSSIONS

In 58.54% of the days of field trips and in 27.03% of the points of observations, individuals were registered. Among the latest, in 90% one individual was observed and in 10%, 2 individuals (on 28.I.2018, 25.III.2018, 9.XII.2018). On the whole, 33 individuals were registered. They were observed only in 50.00% of the points with adequate conditions for observations and only in 52.83% of the points with good conditions for observations (Table 1). 1 individual (1.89%) was recorded in a point with inadequate conditions for observations (interior of compact mature forest of spruce).

It is interesting to mention that the individuals were not observed in the points of playback situated in young forests and in relative young forests, near the noisy streams, and in the compact forests, because of the bad conditions of sound propagation (exception – 1 individual registered in a mature forest of spruce, as we saw earlier). Also, the individuals were absent from the observations on windy weather (over 3 on Beaufort scale) and in situations of abundant snowfall (Table 2).

Table 1. Some synthetic parameters of the observations of Eurasian Pygmy Owl (*Glaucidium passerinum*).

Parameter	Value	% of total	% of subtotal
No. days of field trips	41	100.00	-
No. days with observed individuals	24	58.54	-
No. days without observed individuals	17	41.46	-
No. points of observations	111	100.00	-
No. points with observed individuals	30	27.03	-
No. points with 1 observed individual	27	24.32	90.00
No. points with 2 observed individuals	3	2.70	10.00
No. points without observed individuals	81	72.97	-
No. individuals	33	100.00	-
No. points with adequate conditions for observations	58	52.25	-
No. points with inadequate conditions for observations	53	47.75	-
No. points with adequate conditions for observations without observations	29	26.13	50.00
No. points with adequate conditions for observations with observations	29	26.13	50.00
No. points with inadequate conditions for observations without observations	52	46.85	98.11
No. points with inadequate conditions for observations with observations	1	0.90	1.89
No. points with good conditions for observations	53	47.75	-

Table 2. The situation of the points with inadequate conditions for the Eurasian Pygmy Owl (*Glaucidium passerinum*) observations.

Inadequate conditions	No. points	% of all points of observations	% of all inadequate points	Remarks
Young forests and relative young forests	19	17.12	35.85	
Wind >I:3	12	10.81	22.64	2 points in young
Abundant snowfall	3	2.70	5.66	1 point in young
Noise of streams	8	7.21	15.09	
Reduced detectability caused by forest	23	20.72	43.40	
Bad conditions caused both weather and unfavourable habitat	31	27.93	58.49	

90.91% of the individuals were observed in the Argeş hydrographical basin and 72.73% in the Făgăraş Mountains, but the distribution does not reflect the preferences of the species for these forms of relief as much as our availability to visit them (Fig. 2, Table 3).

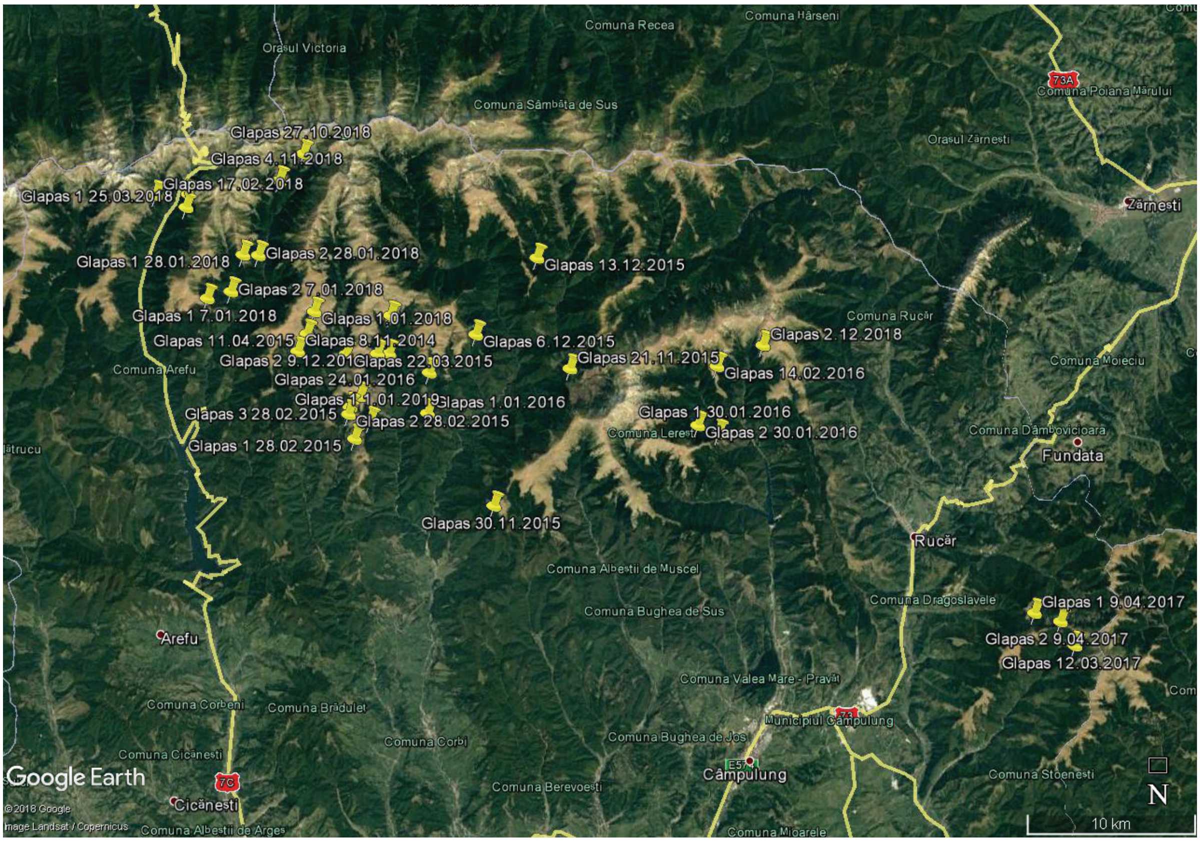

Figure 2. The map of distribution of the registered individuals of Eurasian Pygmy Owl (*Glaucidium passerinum*) (original).

Table 3. The distribution of the individuals of Eurasian Pygmy Owl (*Glaucidium passerinum*) by the main forms of relief.

The main forms of relief		No. individuals	%
Hydrographical basins	Olt Basin	0	0.00
	Argeş Basin	30	90.91
	Dâmboviţa Basin	3	9.09
Groups of mountains	Făgăraş	24	72.73
	Iezer-Păpuşa	6	18.18
	Leaota	3	9.09

From the point of view of the habitats occupied by individuals at the initial place of observation, the majority (33.39%) preferred the mature spruce forests and, a good part, the mature mixed forests with clearings (24.24%) or the mature spruce forests with clearings (24.24%). The fewest of them (3.03%) were registered in the mature mixed forests and in the relative mature spruce forests with clearings (Table 4). According to other authors, the species favours richly structured habitats with mature trees, clearings, dense groups of young spruce, etc., the nest being often placed in coniferous trees, especially in spruces, but also in birch and beech (KÖNIG & WEICK, 2008). In Western Rhodope Mountains (Southern Bulgaria), the species prefers old Spruce and Spruce - Scots Pine (*Pinus sylvestris* L.) forests and much more rarely, the mixed ones. It was found in few cases in much younger forests, between 50 and 80 years (SHURULINKOV et al., 2012). In the Swiss Jura Mountains, the Pygmy Owl was found in spruce as well as fir (50%) forests, and the most of the occupied cavities were in trees surrounded by natural regeneration (HENRIOUX et al., 2003). In old-growth forests of the southern French Prealps, optimal habitats were old-growth fir-dominated mixed forests including patches of dead spruces and edges with open habitat gaps (BARBARO et al., 2016). In Norway, the studies indicate an affinity for mature forests (STRØM & SONERUD, 2001) and in Greece, the habitat of the species was dominated by Norwegian Spruce forests (GASTERATOS et al., 2015). In Slovakia, the highest frequency of nests was found in spruce forests, in fir-beech forests and in beech-spruce-fir forests (PAČENOVSKÝ & ŠOTNÁR, 2010).

Table 4. The distribution of the individuals of Eurasian Pygmy Owl (*Glaucidium passerinum*) at the initial place of observation by the occupied habitats (n=33).

Occupied habitats by individuals	No. individuals	%
Mature mixed forests	1	3.03
Mature mixed forests with clearings	8	24.24
Relative mature spruce forests with clearings	1	3.03
Mature spruce forests	13	39.39
Mature spruce forests with clearings	8	24.24
Relative mature spruce forests	2	6.06

As it was expected, due to the placement of the playback points, most of the individuals (42.42%) were moved during the observations at the border of the spruce forest with the alpine level. A significant part remained in the mature spruce forest, while others appeared at the margin of the mature spruce forest with the clearing (Table 5).

Table 5. The distribution of the individuals of Eurasian Pygmy Owl (*Glaucidium passerinum*) at the final place of observation by the used habitat (n=33).

Habitat	No. individuals	%
Margin of mixed forest with clearing	1	3.03
Margin of spruce forest with alpine level	14	42.42
Margin of mature spruce forest with clearing	7	21.21
Mature spruce forest	9	27.27
Relative mature spruce forest	2	6.06

About the initial sea level altitude of the observed individuals (Table 6), most of them (45.45%) were recorded between 1,500 and 1,599 m, which correspond to the inferior floor of the Norway spruce forests. Only a few individuals were observed between 1,300-1,399 m and between 1,700-1,799 m. The mean was 1,567.48 m (Table 7). In the Western Rhodope Mountains, situated ca. 450 km to the South (in Bulgaria), the altitudes of the localities varied between 1,412 m and 1,930 m, on average 1,712 m (n=34), with the most between 1,700 and 1,800 m and between 1,800 and 1,900 m (SHURULINKOV et al., 2012). In Slovakia, in the High Tatra Mountains, the species bred from 420 m up to 1,600 m (where is the tree line) and occupied not only coniferous forests in high mountains, but also coniferous and broad-leaved forests (PAČENOVSKÝ & SHURULINKOV, 2008). In Greece, the altitude ranged from 1,200 to 1,600 m (GASTERATOS et al., 2015) while, in Slovakia, high prevalence of nests (72.5%) has been situated in elevations of 600-1,100 m, with an average of 840 m a. s. l. (PAČENOVSKÝ & ŠOTNÁR, 2010).

The maximum sea level altitude reached by individuals during the observations was another envisaged aspect. Most of the individuals were recorded between 1,700 and 1,799 m and only 2 (6.06%) ascended between 1,800-1,899 m (Table 8). The mean is 1,615.36 m and the maximum of 1,858 m coincides with the upper border of the Norway spruce forest (Table 9).

For comparison, the parameters of the playback points were presented in the same table. In other parts of the territory, the Pygmy Owl was occurred above 200 m, in Germany (MIKKOLA, 2012), and up to 2,150 m, in Alps (KÖNIG & WEICK, 2008).

Table 6. The distribution on intervals of altitude (m) of the recorded individuals of Eurasian Pygmy Owl (*Glaucidium passerinum*) (n=33).

Initial sea level altitude of the observed individuals	**1,300-1,399**	**1,400-1,499**	**1,500-1,599**	**1,600-1,699**	**1,700-1,799**	**1,800-1,899**
No. individuals	1	7	15	8	2	0
Weight (%)	3.03	21.21	45.45	24.24	6.06	0.00

Table 7. The main parameters of the initial sea level altitude (m) of the observed individuals of Eurasian Pygmy Owl (*Glaucidium passerinum*).

Parameter	**Value**
Mean	1,567.48
Standard Deviation	95.15
Minimum	1,313
Maximum	1,732
Confidence Level (95.0%)	33.74

Table 8. The distribution on intervals of altitude (m) of the maximum cote attained by the recorded individuals of Eurasian Pygmy Owl (*Glaucidium passerinum*) during the observations and of the sea level altitude of the playback points for the observed individuals, in brackets (n=33).

Intervals of sea level altitude	**1,300-1,399**	**1,400-1,499**	**1,500-1,599**	**1,600-1,699**	**1,700-1,799**	**1,800-1,899**
No. individuals (playback points)	1 (1)	6 (7)	7 (4)	11 (8)	5 (11)	2 (2)
Weight (%)	3.03 (3.03)	18.18 (21.21)	21.21 (12.12)	33.33 (24.24)	18.18 (33.33)	6.06 (6.06)

Table 9. The main parameters of the maximum sea level altitude (m) of the observed individuals of Eurasian Pygmy Owl (*Glaucidium passerinum*) and of the sea level altitude of the playback points for the observed individuals, in brackets.

Parameter	**Value**
Mean	1,615.36 (1,631.69)
Standard Deviation	123.81 (133.16)
Minimum	1,313 (1,390)
Maximum	1,858 (1,870)
Confidence Level (95.0%)	43.90 (47.21)

While most of the field days were in March (21.95%), the majority of the days with observations were recorded in January (29.17%) that means a rate of success of 87.50%. Surprisingly, in March the rate was the lowest (33.33%), while, in October and March, this seems to be medium (50.00%). February (with 75.00%) was also a good month in this respect and April (with 66.67%), a relatively good month. If we consider the field days with adequate conditions for observations, the distribution shows the month of January as having the biggest weight (24.24%), it being followed by March (with 21.21%). Instead, the rate of success of the observations was maximum (100.00%) in October and February, but the result must see under reserve because of the low number of sample (1, respectively 3). The following month is January (with 87.50%) and again March has the lowest percent (42.86%), (Table 10). It should be kept in mind that, in Romania, the eggs are laid at the end of March, up to the second decade of April (CIOCHIA, 1992). Also, the males start to call sometimes from September, depending on the weather, and, after the pair formation, the intensity of the calling can slowly decrease. Therefore, two periods of intense vocalizations were recognized: September-November and February-April (DARÓCZI, 2014).

Table 10. The monthly distribution of the days of observations for Eurasian Pygmy Owl (*Glaucidium passerinum*).

Month	**X**	**XI**	**XII**	**I**	**II**	**III**	**IV**
Field days	2	8	7	8	4	9	3
Weight (%)	4.88	19.51	17.07	19.51	9.76	21.95	7.32
Field days with observations	1	4	4	7	3	3	2
Weight (%)	4.17	16.67	16.67	29.17	12.50	12.50	8.33
Rate of success of the observations (%)	50.00	50.00	57.14	87.50	75.00	33.33	66.67
Field days with adequate conditions for observations	1	5	6	8	3	7	3
Weight (%)	3.03	15.15	18.18	24.24	9.09	21.21	9.09
Field days with observations	1	3	4	7	3	3	2
Weight (%)	4.35	13.04	17.39	30.43	13.04	13.04	8.70
Rate of success of the observations (%)	100.00	60.00	66.67	87.50	100.00	42.86	66.67

Regarding the monthly sharing of the points of observations, we see a different situation from that of the days of observation (Table 11). While most of the points of playback were disposed in March (25.23%), December (20.72%) and November (19.82%), the rate of success of observations was the biggest in January (58.82%) and October (50.00%). Taking into account only the points of playback with adequate conditions for observations, the rate of success of the observations changes again: it is maximal (100%) in October, but the value must be seen with circumspection because of the insufficient number of points of playback; it has important weights in January and February (76.92%, respectively 71.43%), before the eggs laying period. In March, at the beginning of the breeding period, the rate was the lowest (25.00%) and in April it became relatively high (60.00%). According to other authors, as we previously mentioned, the most vocal activity of the birds is between February and April, as well as in September-October, daytime singing decreases rather abruptly when the female starts laying and the pair formation have a break in midwinter (KÖNIG & WEICK, 2008).

Table 11. The monthly distribution of the points of observations for Eurasian Pygmy Owl (*Glaucidium passerinum*).

Month	**X**	**XI**	**XII**	**I**	**II**	**III**	**IV**	**The earliest data**	**The latest data**
Points of playback	2	22	23	17	12	28	7	4.X.2015	11.IV.2015
Weight (%)	1.80	19.82	20.72	15.32	10.81	25.23	6.31		
Points of playback with observed individuals	1	4	4	10	5	3	3	27.X.2018	11.IV.2015
Weight (%)	3.33	13.33	13.33	33.33	16.67	10	10		
Points of playback without observed individuals	1	18	19	7	7	25	4	4.X.2015	11.IV.2015
Weight (%)	1.23	22.22	23.46	8.64	8.64	30.86	4.94		
Rate of success of the observations (%)	50	18.18	17.39	58.82	41.67	10.71	42.86		
Points of playback with adequate conditions for observations (PPACO)	1	7	13	13	7	12	5	27.X.2018	11.IV.2015
Weight (%)	1.72	12.07	22.41	22.41	12.07	20.69	8.62		
PPACO with observed individuals	1	3	4	10	5	3	3	27.X.2018	11.IV.2015
Weight (%)	3.45	10.34	13.79	34.48	17.24	10.34	10.34		
PPACO without observed individuals	0	4	9	3	2	9	2	20.XI.2016	11.IV.2015
Weight (%)	0	13.79	31.03	10.34	6.90	31.03	6.90		
Rate of success of the observations (%)	100	42.86	30.77	76.92	71.43	25	60		

The earliest calling individual was registered at 9:50 and the latest one at 15:15 (GMT+2). On intervals of time of 2 hours, the majority of individuals (51.52%) and most of the points of playback with observed individuals (46.67%) were registered between 10:00 and 11:59, when 3 points of playback had 2 individuals each. The rate of success of the observations in the points with adequate conditions for observations was the highest (65.00%) between 10:00 and 11:59, too (Table 12). It is known that the birds are very active at dusk and dawn (KÖNIG & WEICK, 2008), or, more exactly, starting 20 minutes before the sunrise and ending 30 minute after the setting (DARÓCZI, 2014), but few of our observations from the beginning and the ending of the diurnal period do not confirm this; perhaps, these episodes there were before 8:00 and after 18:00. In the Rhodope Mountains, vocalization was detected during the entire day from 30 minutes before sunrise until 22:00 (SHURULINKOV, 2007). Also, it was stated that on calm evenings between February and early May, depending on climatic conditions, the male sings at different places in the territory (KÖNIG & WEICK, 2008).

Table 12. The hourly distribution of the observations of Eurasian Pygmy Owl (*Glaucidium passerinum*).

Time of observation of individuals (GMT+2)	**8:00-9:59**	**10:00-11:59**	**12:00-13:59**	**14:00-15:59**	**16:00-17:59**
No. individuals	1	17	9	6	0
Weight (%)	3.03	51.52	27.27	18.18	0.00
Points with observed individuals	1	14	9	6	0
Weight (%)	3.33	46.67	30.00	20.00	0.00
No. points with adequate conditions for observations	3	20	21	13	1
No. points with adequate conditions for observations with observed individuals	1	13	9	6	0
Rate of success of the observations (%)	33.33	65.00	42.86	46.15	0.00

As for the air temperature at the moment of observations, the interval of temperature when was recorded individuals were between -15 and 10 ^{0}C. Most of the individuals (75.76%) and of the points with observed individuals (73.33%) were registered between -5 and 4 ^{0}C. The highest rate of success in the points with adequate conditions for observations was between -15 and -6 ^{0}C, but the number of samples was relatively low. If we split the intervals of temperature at below and above 0 ^{0}C, we see an almost similar situation in the two cases, this time with a better rate of success of the observations between 0 and 14 ^{0}C, actually between 0 and 10 ^{0}C (Table 13). 2 points of playback each with 2 individuals were registered between - 5 and -1 ^{0}C and 1 point of playback with 2 observed individuals, between 0 and 4 ^{0}C.

Table 13. The distribution of the observations of Eurasian Pygmy Owl (*Glaucidium passerinum*) on intervals of temperature.

Temperature (^{0}C)	**-15 to -6**	**-5 to 4**	**5 to 14**	**-15 to -1**	**0 to 14**
No. individuals	3	25	5	15	18
Weight (%)	9.09	75.76	15.15	45.45	54.55
Points with observed individuals	3	22	5	13	17
Weight (%)	10.00	73.33	16.67	43.33	56.67
No. points with adequate conditions for observations	5	44	9	25	33
No. points with adequate conditions for observations with observed individuals	3	21	5	12	17
Rate of success of the observations (%)	60.00	47.73	55.56	48.00	51.52

In terms of nebulosity, an influence was also seen on the vocal activity of the birds (Table 14). So, the most individuals (39.39%) and most points with observed individuals (40.00%) were registered on the 7-10 interval of nebulosity, the rate of success of the observations was the highest (57.14%) for the 0-2 interval of nebulosity. The lowest one (42.86%) was noticed in circumstances with medium covered sky with clouds. However, two points each with 2 individuals were registered on 3-6 nebulosity and 1 point with 2 individuals was registered on 7-10 nebulosity.

Table 14. The distribution of the observations of Eurasian Pygmy Owl (*Glaucidium passerinum*) on intervals of nebulosity.

Nebulosity	**0-2**	**3-6**	**7-10**
No. individuals	8	12	13
Weight (%)	24.24	36.36	39.39
Points with observed individuals	8	10	12
Weight (%)	26.67	33.33	40.00
No. points with adequate conditions for observations	14	21	23
No. points with adequate conditions for observations with observed individuals	8	9	12
Rate of success of the observations (%)	57.14	42.86	52.17

Related to the type of clouds, most of the individuals (57.58%) and most of the points with registered individuals (56.67%) were observed in the presence of exclusive or predominant lower clouds. The rate of success of the observations in the points with adequate conditions for observations was the highest (64.00%) for similar clouds, too (Table 15). The lower clouds can be met on any type of weather, both fair weather (i. e. *Cumulus*) and bad weather (i. e. *Stratus*) and therefore the type of clouds has to be seen in link with the rank of sky covering. It is worth to mention that 2 points of playback each with 2 individuals were registered on lower clouds and 1 point with 2 individuals was registered on higher clouds.

Table 15. The distribution of the observations of Eurasian Pygmy Owl (*Glaucidium passerinum*) by the type of clouds.

Type of clouds	**Clear sky**	**Lower clouds**	**Medium clouds**	**Higher clouds**
No. individuals	4	19	1	9
Weight (%)	12.12	57.58	3.03	27.27
Points with observed individuals	4	17	1	8
Weight (%)	13.33	56.67	3.33	26.67
No. points with adequate conditions for observations	10	25	3	20
No. points with adequate conditions for observations with observed individuals	4	16	1	8
Rate of success of the observations (%)	40.00	64.00	33.33	40.00

Wind intensity plays an important role on the calling because it obstructs the detectability of the singing male if it blows strongly (Table 16). Most of the individuals (36.36%) and the most of the points with observed individuals (40.00%) were registered on intensity of 2. The highest rate of success of the observations (73.33%) was also recorded on 2 wind intensity, but an important value (56.25%) was obtained for fully calm weather. In wind of intensity of 3, this decreased up to 25.00% and in wind stronger than that, individuals were not recorded. Two points of playback each with 2 recorded individuals were registered on 0 intensity of wind and 1 point with 2 individuals was registered on 3 intensity of wind.

By the presence/absence of the snow cover of the soil, most of the individuals (78.79%) and most of the points with observed individuals (76.67%) were registered in the first situation. The rate of success in the points with adequate conditions for observations was higher for the soil covered with snow (57.89%), too (Table 17). We must remember that the period of observations was October – April, but birds can be vocally active also in other months of the year, when the soil is normally without the snow cover. All 3 points, every with 2 observed individuals, were recorded in conditions with snow cover.

Table 16. The distribution of the observations of Eurasian Pygmy Owl (*Glaucidium passerinum*) by the wind intensity (Beaufort scale).

Wind intensity	**0**	**1**	**2**	**3**
No. individuals	11	8	12	2
Weight (%)	33.33	24.24	36.36	6.06
Points with observed individuals	9	8	12	1
Weight (%)	30.00	26.67	40.00	3.33
No. points with adequate conditions for observations	16	23	15	4
No. points with adequate conditions for observations with observed individuals	9	8	11	1
Rate of success of the observations (%)	56.25	34.78	73.33	25.00

Table 17. The distribution of the observations of Eurasian Pygmy Owl (*Glaucidium passerinum*) by the presence/absence of the snow cover on the soil.

Snow cover	**No**	**Yes**
No. individuals	7	26
Weight (%)	21.21	78.79
Points with observed individuals	7	23
Weight (%)	23.33	76.67
No. points with adequate conditions for observations	20	38
No. points with adequate conditions for observations with observed individuals	7	22
Rate of success of the observations (%)	35.00	57.89

About the precipitations registered at the moment of the observations, only one individual (3.03% of all) was observed on November 21, 2015 (at 12:10), in circumstances with weak rainfall. The rest of the observations (96.97% of the individuals and 96.67% of the points with observed individuals) were recorded at time without precipitations, when the rate of success of the observations in the points with adequate conditions for observations was of 49.12%.

CONCLUSIONS

Some major findings can be extracted:

1. In the Făgăraş, Iezer-Păpuşa and Leaota Mountains, most of the individuals of Pygmy Owl preferred the mature spruce forests and, a good part, the mature spruce or mixed forests with clearings, while the fewest of them were registered in the mature mixed forests and in the relative mature spruce forests with clearings. During the observations, most of the individuals moved to the border of the spruce forest with the alpine level, a significant part remained in the mature spruce forest, while others appeared at the margin of the mature spruce forest with the clearing;
2. Most individuals were initially recorded between 1,500 and 1,599 m (the mean –1,567.48 m), which correspond to the inferior floor of the Norway spruce forests and only a few of them were observed between 1,300-1,399 m and between 1,700-1,799 m. At the end of the observations, most of the individuals moved between 1,700 and 1,799 m (the mean – 1,615.36 m; the maximum – 1,858 m, which represent the upper border of the Norway spruce forest);
3. For the October-April period, the rate of success of the field days with observations turned out to be the highest in October and February, high in January and the lowest in March, while the rate of success of the observations in the points of playback with adequate conditions for observations was the highest in October, high in January and February, and the lowest in March, which partially contradicts, at least for the heights of the Southern Carpathians, the periods of monitoring recommended by the Romanian manuals;
4. Between 8:00 and 17:00 (GMT+2), the diurnal period when monitoring was performed, the rate of success of the observations at points with adequate conditions for observations was the highest between 10:00 and 11:59, low between 8:00 and 9:59, and 0 between 16:00 and 17:59;
5. Depending on weather elements, the rate of success in points with adequate conditions for observations was: the highest between -15 and -6 ^{0}C temperature of the air and the lowest between -5 and 4 ^{0}C (however, for positive temperatures, the rate of success was bigger than for the negative temperatures, for -15 to 10 ^{0}C, the interval of air temperature when the individuals were recorded); the highest for the 0-2 interval of nebulosity and the lowest for medium covered sky with clouds; the highest in the presence of exclusive or predominant lower clouds and the lowest on sky covered with clouds at medium level; the highest for wind of 2 intensity and relatively high for the complete calm weather (on wind higher of 3, there were not observed individuals). Also, the rate of success in the points with adequate conditions for observations was higher for the soil covered with snow than for the snow-free soil. Very rarely, males were active during the weak rainfall and, during periods without precipitations, the rate of success of the observations in the points with adequate conditions for observations was almost 50%.

We hope the results will help the managers of the area to protect this species, currently included in the Annex I of the Birds Directive, and also the habitats occupied by it, because, like other species of owls, the Pygmy Owl can be considered a good indicator of the biodiversity and ecosystem health and used to identify the areas of conservation or at-risk (ROMULO, 2012). This is all the more necessary as presently the area faces with intense forestry exploitations.

The large body of forests, preferred by the species, should be excluded from logging and a suitable strategy should be elaborated at national level by the Forestry Department and the interested organisations.

Also, we express our belief that the results can be helpful to improve and adapt monitoring methods to local conditions.

Finally, we think that this work will be a preliminary study about the Pygmy Owls from the Făgăraş, Iezer-Păpuşa and Leaota Mountains and the researches will continue to confirm or infirm the results and to provide other on-site information on the species.

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