



REPORT

REGARDING THE MONITORING OF THE AVIFAUNA AND CHIROPTEROFAUNA ON THE LOCATION AND IN THE VICINITY OF THE WIND FARM DOROBANTU-TOPOLOG

PERIOD: MARCH - JUNE 2013

DRAFTER: S.C. AS ORIMEX NEW S.R.L.



2013

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CONTENT

1. INTRODUCTION	2
1.1 Information regarding the drafter of the study	4
2. THE PURPOSE AND OBJECTIVE OF THE STUDY	7
3. GENERAL CHARACTERIZATION OF THE ANALYZED AREA	8
3.1. Geographical position and limits.....	8
3.2. Climate	9
3.3. Hydrologic characteristics	10
3.4. The main types of habitats	11
3.5. The anthropic impact.....	13
4. RESEARCH METHODS	14
4.1. Data collection.....	14
4.1.1. <i>Migratory birds</i>	14
4.1.2. <i>Nesting birds</i>	15
4.1.3. <i>Bats</i>	17
5. RESULTS	21
5.1. The diversity and dynamic of the migratory birds species.....	21
5.1.1. <i>The analysis of the collision risk</i>	38
5.2. The diversity and distribution of the nesting species	46
5.2.1. <i>Diurnal birds</i>	46
5.2.2. <i>Nocturnal birds</i>	80
5.3. The diversity and abundance of the bat species	84
6. DISCUSSIONS	93
7. CONCLUSIONS.....	96
8. BIBLIOGRAPHY	98

1. INTRODUCTION

The developers of wind farms, together with the organizations involved in the environment protection and the scientists have an important role in the creation of the knowledge base regarding their impact over the biodiversity and also regarding the measures for its removal or reduction.

The benefits of such cooperation and information exchange are multiple, not only for the scientists but also for the industry of the wind energy: a better scientific knowledge base will finally lead to a better and faster decisional action.

The monitoring of the areas for the implementation of the projects which purpose is the building of the wind farms and data collection regarding the biodiversity which characterizes these areas, is an absolutely necessary iterative process, which must ensure the foundation of a scientific knowledge base, large enough for the authorities with competence in environment protection and the financial institutions involved in the development of these projects to be able to take motivated decisions and according to the environment community policies.

The monitoring report hereby was performed based on the observations on site registered at the level of the surface related to the object Wind Farm Dorobantu – Topolog, beneficiary S.C. LAND POWER S.R.L. – in the period March – June 2013, being observed the evolution and dynamic of the populations of avifauna and chiropteroфаuna on the location and in its vicinity.

The observations and the investigations on site are completing the vast scientific and informational base already constituted for this project, considering the fact that for the project “BUILDING OF THE WIND FARM DOROBANTU-TOPOLOG outside the built-up area of communes Dorobantu, Topolog, Casimcea, Tulcea County, Romania” there were performed by our team several environment studies necessary for the obtaining of the regulation documents in the environment protection field.

The above mentioned project has as a purpose the development of a wind farm consisting of 42 turbines VESTAS V 90 – 2 MW which produce electric power from non-conventional sources of (wind) power with a total power of 84 MW with the related additional installations. This project is divided in three sub-farms:

- Sub-project Mesteru (ME) – 16 wind power plants;

- Sub-project Luminita (LU) - 11 wind power plants;
- Sub-project Topolog (TO) - 15 wind power plants.

There will be also built underground power grids of 30 kV and 110 kV and a transformer station 30/110 kV Topolog.



Image 1.1. Satellite view of the location of the wind turbines

The land on which the farm is located, is situated:

- outside the built-up area of **Dorobantu commune**, Tulcea County, identified through F12 OUTSIDE THE BUILT-UP AREA: T52, A570, P563, P564, T51, P558, A560, T54, A617;
- outside the built-up area of **Topolog commune**, Tulcea County, identified through F12 OUTSIDE THE BUILT-UP AREA: T40, P252, T41, A263, P264, A266, P262, T43, A276, T61, A384, T62, A390, A388, T82, A489, T83, P500, T85, A498, T84, A495, T₀. DJ 411 (222B), De 490, De 496, DN 701 (22A), De 267, De 273, De 393;
- outside the built-up area of **Casimcea commune**, Tulcea County, identified through F12 OUTSIDE THE BUILT-UP AREA: T16, A173, DN 20 (22°) – related to LES up to the Station 110/400 kV Rahmanu.

The access to the location is performed on the county road 222 B and on the network of communal roads and exploitation roads.

The distance up to the nearest rural living place (Topolog locality) is of about 500 m measured in straight line.

The wind turbines will be located on a land with a total surface of 497 ha.

The affected land surface will consist of:

- 10,08 ha, corresponding to the technologic platforms
- 714 sqm corresponding to the turbines, because the foundations are embedded, and on the surface of the land it remains only the pillar with the diameter of 4,65 m.
- 191,52 sqm the surface affected by the power plants
- 56.895 sqm corresponding to the new access roads to the turbines
- 7.300 sqm the surface of the transformer power plant 30/110 kV Topolog.

1.1 Information regarding the drafter of the study

The drafter of the report hereby is **S.C. AS ORIMEX NEW S.R.L.**, an organization specialized in the offering of complete solutions for environment protection, **especially in the biodiversity field and monitoring of the locations.**

The legal person with experience in the field is accredited by the Ministry of Environment, registered in “*National Register of the Drafters of Studies for Environment Protection*” at position 111, for all types of environment studies, respectively:

- R.M. – Environment Report
- R.I.M. – Report regarding the Impact over the Environment
- B.M. – Environment Balance
- E.A. – Adequate Evaluation Study
- R.A. – Location Report
- R.S. – Security Report

S.C. AS ORIMEX NEW S.R.L. has the biggest team of specialists in the biodiversity field, legal and natural persons certified by the Ministry of Environment:

- 6 environment experts - natural persons certified by the Ministry of Environment
- 9 biologists and ecologists for the performance of the studies regarding the influence of the objectives over the ecosystems inside and in the vicinity of the locations.
- 2 doctors in biology
- 3 Ph. D. students in biology
- the former chief of the department of biodiversity and protected natural areas in the Agency for Environment Protection Constanta;

- ecologist technicians
- engineers of various specializations (constructions, grids, structures, etc)

Besides its specialists, S.C. AS ORIMEX NEW S.R.L. has many external collaborators, specialized also in other fields, collaborates from case to case with Research Institutes, Conservators of Protected Natural Areas, profile NGOs, Environment Associations.

- The National Union of the Practitioners of Environment Protection in Romania – the main office is located in Bucharest, and also branches in most of the counties of the country.
- National Institute of Marine Research – Development "Grigore Antipa"
- The administration of the National Park Macinului Mountains
- ONG ECOWATCH (Constanta) etc.

S.C. AS ORIMEX NEW S.R.L. drafted environment studies for important wind farms in Romania, developed by important international investors as IBERDROLA, VERBUND AUSTRIA, EDP – Energias de Portugal, MARTIFER PORTUGAL, ENEL, ENHOL SPAIN etc.

For some of these investors, our companies performed also studies for the obtaining of funds from Financial Institutions as BERD – European Bank for Reconstruction and Development, for the development of their projects, as EDP – Energias de Portugal – which has already an operational wind farm, and also ENHOL SPAIN for Crucea wind farm.

The projects performed by **S.C. AS ORIMEX NEW S.R.L.** observe the norms of the legislation in force, using modern techniques, softs and last generation equipment, everything being confirmed through the implementation of the quality management systems, labor protection and environment protection.

- ^ Quality Management System – Certificate SR EN ISO 9001:2008
- ^ Environment Management System – Certificate SR EN ISO 14001:2005
- ^ Management System of Health and Occupational Security – Certificate SR OHSAS 18001: 2008.

The coordinator of the work is PETRESCU TRAIAN through CABINET EXPERT MEDIU (ENVIRONMENT EXPERT OFFICE)- PETRESCU TRAIAN, specialized in offering complete solutions for environment protection and who performs this activity since 2005, being certified by the Ministry of Environment.

Certified natural person with experience in the field, accredited by the Ministry of Environment, registered in the “National Register of the Drafters of Studies for Environment Protection” for the following types of studies: R.M., R.I.M., B.M., R.A. and also E.A. and R.S. in collaboration with accredited legal and natural persons:

- R.M. – Environment Report
- R.I.M. – Report regarding the Impact over the Environment
- B.M. – Environment Balance
- E.A. – Adequate Evaluation Study
- R.A. – Location Report
- R.S. – Security Report

Besides its specialists, the Environment Expert Office Petrescu Traian has many external collaborators, specialized also in other fields, the collaboration with these leading to the covering of all activity fields.

Subsequently we present the **list of the collaborators involved in the monitoring process:**

UPPMR - Uniunea Practicienilor de Protectia Mediului din Romania (Union of the Practitioners of Environment Protection in Romania)

Razvan Traian Petrescu - Engineer, Manager of S.C. As orimex New S.R.L., Person accredited by the Ministry of Environment

Marius Skolka - Biologist Dr., Associate Professor, „Ovidius” University, Constanta

Marian Tudor - Biologist Dr., Lecturer (Supl.) „Ovidius” University, Constanta

Anca Dragu – Biologist, C.S. in the framework of the Institute of Speleology "Emil Racovita", Bucharest

Loreley Dana Jianu - Biologist Drd.

Artur Cugut - Ecologist

Elena Buhaciuc - Biologist Drd.

Daniela Vasile - Ecologist Drd.

Anca Mariana Pahon - Biologist, Person accredited by the Ministry of Environment

Daniela Iordache - Biologist

Alina Jornea - Ecologist

Soava Sorin – Engineer

2. PURPOSE AND OBJECTIVE OF THE STUDY

This report is about the monitoring of the species of migratory birds and nesting birds and also the species of Chiroptera in the area of the wind farm and its vicinities, through which there are going to be supplied data from the period March – June 2013, processed according to the international standards, with a structure typical to the one of a scientific work.

The objective of the study is represented by the obtaining of the relevant data regarding the diversity and dynamics of the bird species (in the period of the spring migration and the beginning of the season of nests building) and bats (the finalization of the hibernation period, dispersion in the monitored territory, aggregation in maternity colonies).

The new information brought in this report will complete the *scientific and informational base already constituted for this project*, since 2006. The environment studies drafted by our group of companies in the area Dorobantu – Topolog were directed also to other projects of wind farms, in different implementation stages, the information being vast and with relevance regarding a potential impact of this type of activity in the area.

3. GENERAL CHARACTERIZATION OF THE ANALYZED AREA

3.1. Geographical position and limits

The location of the proposed wind farm is in Dobrogea Region (Romania) at the limit between *North Dobrogea Plateau* (Dorobantu Commune) and *Central Dobrogea Plateau* (Topolog Commune), with the sub-divisions Babadag Plateau and Casimcea Plateau.

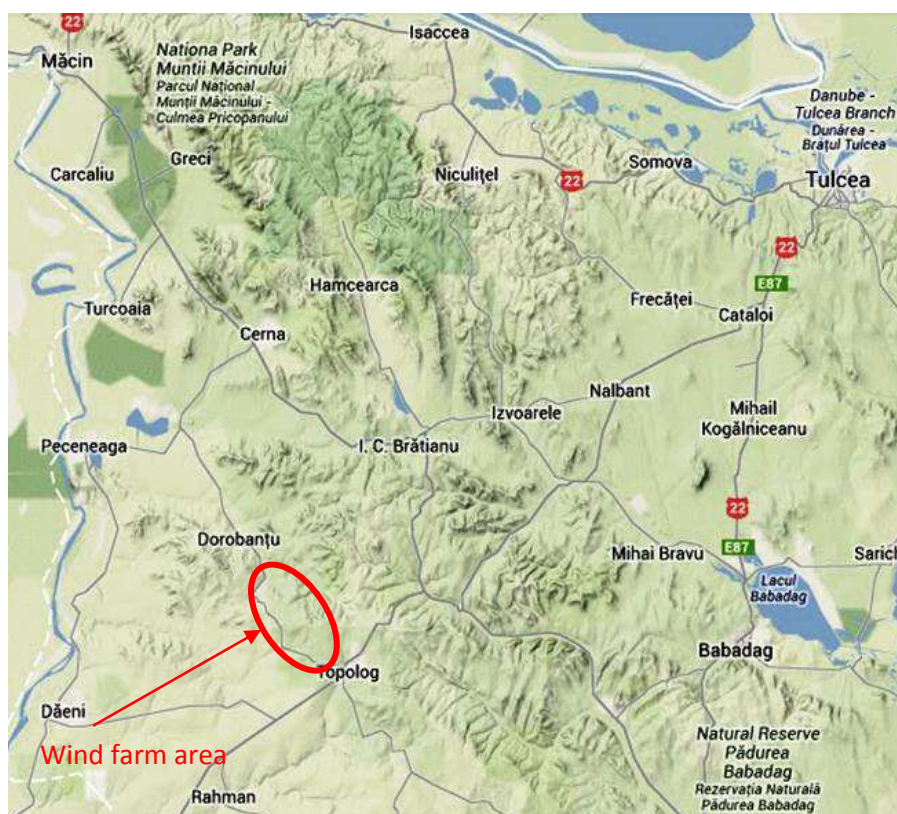


Image 3.1. The location of the wind farm – *geographical map*

Casimcea Plateau includes the crests and plateaus, a little convex, sometimes having the shape of large domes separated by large paths, located in the Northern part, where they form the interfluves towards the hydrographical basins of Aiorman and Slava, and in the central part of the plateau, where they constitute the main interfluves in the hydrographical basins of the rivers Topolog and Casimcea.

On some sectors, the deep valleys in the mass of the green schists have an aspect of canyon, as it is Topologului Valley, between Haidar and Calfa. At the beginning of Topolog, upstream the valley sector in the canyon, it is contoured the Topolog – Sambata Noua Depression, relatively high (200-250 m), reduced from the point of view of the surface, and in which we can find long versants, with reduced slopes, of the type of glacises of erosion.

The base of the Jurassic limestones, present in the South extremity of the plateau, introduces in the geomorphological view a particular note, in contrast with its whole image.

Babadag Plateau is like a massive platform, partially fragmented by not so deep and short valleys, with orientation towards North-East. It is delimited to North by Cernei Depression, then by the Taitei corridor and Babadag Lake, and to South by Pecineaga – Camena fault. To West you can find the high platforms of Danube, and to East the not so high Depression of Jurilovca.

The deposits of Babadag Plateau mostly belong to the Superior Cretaceous period, being represented by sandy limestone, conglomeratic limestone, limy sandstones, lime marl. These formations are covered with a blanket which ends at the surface through a loess layer.

The area Dorobantu – Mesteru – Topolog presents as characteristic relief with the form of some hilly formations, having as characteristic elements a fundament represented by old, weathered Proterozoic deposits and a sedimentary coating consisting of Quaternary blanket deposits, mostly represented by loess from the wind deposit.

The types of soils present on the location are mainly represented by black earths (carbonatic, leached, brown and chocolate)

3.2. Climate

In Dorobantu and Topolog communes, there is a continental climate with hot and dry summers, frosty winters with permanent winds, with big differences of temperature from a day to another. The annual average temperature is of $10^0 - 11^0$, the maximum temperature in the summer is of 37^0C . The average quantity of precipitations is of 400 mm/sqm annually.

The territory is located in an area with strong winds on the direction N-S.

Casimcea Commune is characterized through a continental climate with high temperatures in July and cold winters. The average annual temperature is of 11^0C and an average quantity of precipitations of 480 mm/sqm annually.

The convective movements of the instable air masses produced in the atmospheric storms generate electric phenomena accompanied by lightnings and thunders. The annual average number of days of lightnings and thunders is of about 12. These processes are frequent in months May-June.

In the area of the wind farm, for the studied period (March – June 2013), there were registered the following meteorological parameters:

- average temperatures between 4,6⁰C (in March) and 20,9⁰C (in June);
- average values of the volume of precipitations between 0,18 mm (in March) and 1,91 ml (in June),
- the average wind velocity varied between 3,7 m/s (in June) and 5,4 m/s (in April).

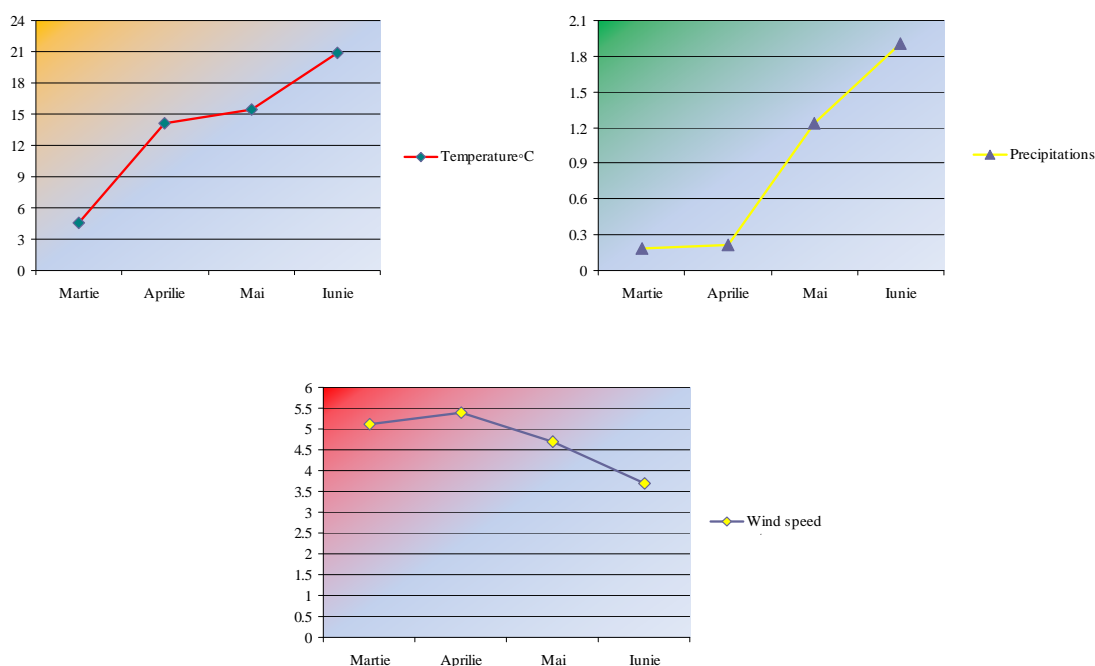


Fig. 3.2. Meteorological parameters in the area, in the period March – June

3.3. Hydrologic characteristics

On the location proposed for the performance of the wind farm, there are no important, permanent or temporary streams

In the vicinity of the wind farm, there are many streams with permanent character: Topolog, Valea Rostilor, Peceneaga and also many streams with intermittent water, conditioned by the volume of the precipitations.

The most important stream is Topolog river, which springs from Casimcea Plateau, near Topolog locality, Tulcea County, with a regimen, generally permanent, but with torrential character.

The course of the river is initially orientated from North-West to South-East, it changes its direction to West, downstream, and has a total length of 38 km, out of which 20 km in Tulcea County, and the rest in Constanta County. The total surface of the

hydrographical basin is of 343 km², out of which 165 km² in Tulcea County, and the rest in Constanta County.

Towards Danube river – the most important stream which delimits Dobrogea region, the location of the analyzed wind farm is situated at a distance of about 13.5 km.

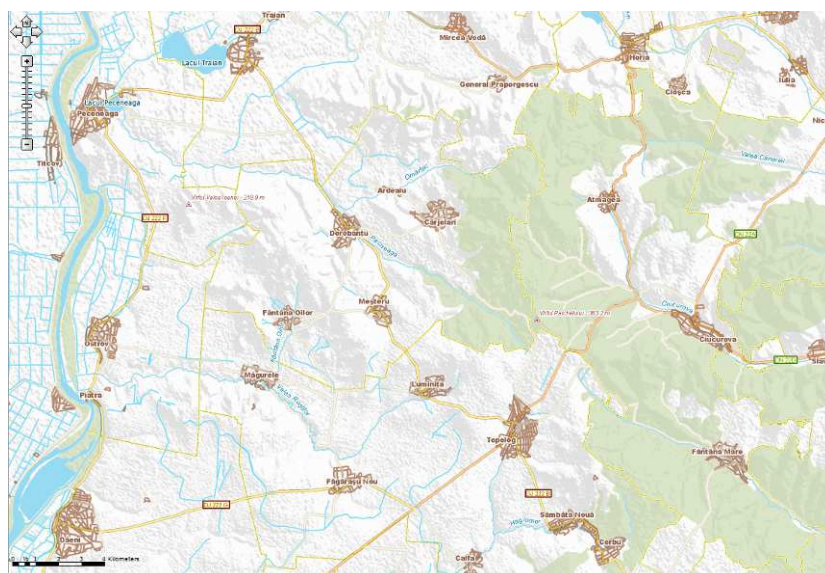


Image 3.3. The hydrographic network from the South West of Tulcea County

3.4. The main types of habitats

The areas for the implementation of the wind farm are represented by ploughland and grazing land, the anthropic habitats (of agroecosystem type) which alternate here and there with semi-natural habitats, respectively secondary steppe grass lands, anthrozoogene, with a floristic structure close to the habitat **R3415 Ponto-Balkan grass lands of *Botriochloa ischaemum* si *Festuca valesiaca***, with a reduced conservative value.



Image 3.4 View of the agroecosystems

In the vicinity of the location, besides the habitats specific to the agroecosystems, we can find a series of semi-natural and natural forestry habitats. From the natural habitats of community importance, we mention the habitat **91M0 Balkan-Pontic woods of oak and holm**, very vast in the area of Babadag Plateau, with the representative associations *Quercopedunculiflorae-Tilietum tomentosae* Donita 1970 and *Nectaroscordo - Tilietum tomentosae* Donita 1970 and also the habitat **91AA*East-European Woods of flaky oak** represented through the association *Galio dasypodi - Quercetum pubescentis* Donita 1970.



Image 3.5 –View of the forestry ecosystem – habitat 91M0

Also, in the vicinity of the wind farm, bordering the already mentioned forestry habitats, there were identified areas of brushwood, representative for them being the association *Pruno spinosae - Crataegetum* Soo (1927) 193, included in the habitat **40C0* Pontic-Sarmatian Deciduous Brushwood**.



Image 3.6 – View of the area with brushwood – habitat 40C0*

Considering the objectives of conservation of the protected natural area of community interest *ROSCI North Dobrogean Plateau*, it must be mentioned the fact that, on the location of the wind farm, there were not identified habitats of conservative interest or primary habitats at community level and also species of plants mentioned in Appendix II to the Council Directive 92/43/CEE, mentioned in the standard form of the site.

3.5. The anthropic impact

The anthropic impact in the analyzed area before the beginning of the construction works of the wind farm is represented by agricultural activities (grazing and agricultural cultures), hunting but also poaching – Babadag forest sheltering a rich fauna of hunting interest, illegal cut down of trees, traffic, human habitation, illegal gathering of the species of flora and fauna of conservative interest in the protected natural areas.

At the level of the location, the anthropic impact was intensified together with the beginning of the construction works of the wind farm Dorobantu – Luminita – Topolog, beginning with March 15, 2013. In this case, the impact over the environment manifested especially through the emissions of the atmospheric pollutants, through fixed, open sources which involve the handling of the construction materials and soil processing and mobile equipment: machinery and motor vehicles. The execution of the uncovering works, respectively recovering (including the ones necessary for the mounting of the underground cables) represent the main types of activities with direct impact over the soil, underground and vegetation, through the temporary removal of the vegetal layer.

4. RESEARCH METHODS

4.1. Data collection

4.1.1. Migratory birds

For the monitoring of the species of migratory birds, it was used the Vantage Point method. So, there were performed observations from three locations, chosen so that to ensure a maximum visibility over the entire surface of interest VP 1 - N44.904903 E28.355363, VP 2 - N44.906667, E28.345457, VP 3 - N44.921708 E28.320626.

The monitoring was performed for a period of 8 hours, in the migration period of the birds and with a frequency of an observation stage / week.

For each observation there were registered: the species, the distance towards the observer, the flying direction and the approximate height where the bird was flying. The identifications were performed directly on site, using specialty devices, or subsequently, using the pictures taken during the monitoring activity. For the observed species, there were performed, within the limit of the possibilities, pictures which allow a subsequent verification of the identifications performed on site. The data were registered on special sheets. On the sheets there were registered also the data related to the meteorological conditions registered on the location. The data on the sheets were centralized in a data base, in electronic format, and were subsequently processed using statistical methods.

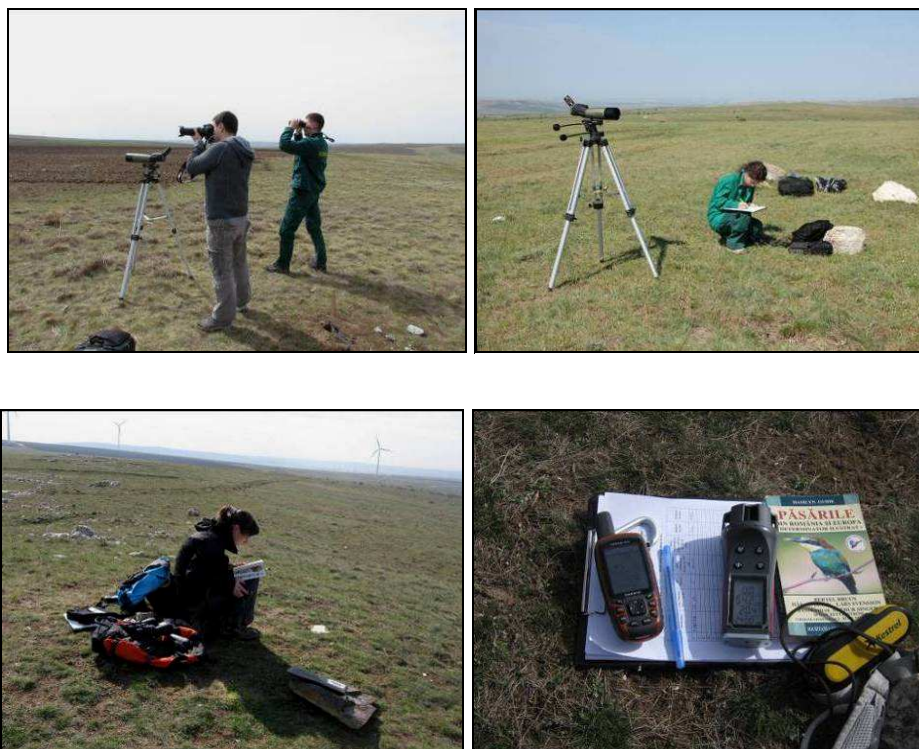


Image 4.1 – The observation of the birds in vantage points

For the performance of the obligations, the following equipment was used:

- **binoculars:** BAIGISH; NIKON; BUSHNELL; MIL-TEC; EAGLE OPTICS RANGER.
- **telescope:** CELESTRON Ultima 80; Baighis 32 M (infrared)
- **still cameras:** NIKON D7000 lens 70-300mm VR II, NIKON D80 lens 70-300 mm VR II, NIKON D3000 lens 70-300 mm VR II; NIKON Coolpix L120 ; CANON Easy Share SX-30; CANON EOS 550 D lens 18-270 mm;
- **GPS:** GARMIN 60CSx; GARMIN 62S;
- **movable meteorological station:** SKYWATCH ATMOS.

4.1.2. Nesting birds

For the monitoring of the avifauna there was used the method of the observations on transects.

According to the monitoring methodology, the observations were performed in April, and May, during the nesting season, in order to be able to observe better the aspects related to the nesting birds. There were chosen five transects, which cover the entire monitoring surface:

- Transect 1. Located on the NE border of the area for the implementation of the project, at the interior limit of ROSCI North Dobrogea Plateau and ROSPA Babadag Forest, on a distance of about 3 km. The observations were performed from South to North.
- Transect 2. Located between Mesteru Locality at West and the South limit of the woody area at East, on a distance of about 3 km. The observations were performed from West to East.
- Transect 3. Located in the central area of the location where the wind farm will be located, between its West extremity and the South limit of the woody area (inside ROSPA Babadag Forest). The distance on which the monitoring was performed – on a distance of about 4,7 km. The observations were performed from West to East.
- Transect 4. Located in the South area of the location where the wind farm will be located, between Luminita locality at West and Topolog locality at East, on a distance of about 3,2 km. The observations were performed from East to West.
- Transect 5. Located in the East area of the location where the wind farm will be located, in the area of the grazing ground from the South of the woody area, on a distance of about 2 km.



Image 4.2 – The inventory of the nesting birds.

The transects were crossed by two persons endowed with observation equipment and still cameras. The observed birds were generally identified on site or, subsequently, based on the pictures taken on site. For each observation, there were registered the species, the area where the bird was noticed – to the left, respectively to the right of the observer, on the movement direction and also the distance at which the observation was performed (and in this case there were used two categories – species noticed at 100 m from the transect and species noticed at over 100 m from the transect), the activity state of the bird (flying, on the ground, eating, etc). Also, on the sheet there were written the data regarding the meteorological conditions registered in the respective day. The observations were centralized in a data base, for the species being written also the coordinates where the observations were performed.



Image 4.3. – Inventory on transects

The monitoring of the species of nocturnal birds was performed through observations with the help of the infrared camera (Pulsar Recon 750 R) and through the registration of their sounds with the help of a directional microphone (Yukon DSAS) connected to a voice recorder Olympus VN-711 PC.



Image.4.4 – The monitoring of the species of nocturnal birds

4.1.3. Bats

The methods used for the inventory of the bats observe the most popular international standards, including the EUROBATS Guide (Rodrigues et al., 2008) and Bat Surveys Good Practice Guidelines al Bat Conservation Trust (Hundt L., 2012).

The estimation of the presence and abundance of the populations of bats at species level was necessary for a correct evaluation of the sensitivity of the studied area at the potential impact of the infrastructure of the wind farm.

The bat detectors are technical instruments which allow the hearing and registration of the ultrasounds emitted by bats during the flight, through the very sensitive microphones.

The inventory of the species of Chiroptera was performed with the help of the ultrasound detectors Pettersson Ultrasound Detector D1000X and BATBOX Duet, the registration of the ultrasounds being performed in fixed points. For the subsequent analysis of the registrations, there was used the program BatSound 4.2.



Image 4.5. Equipment and programs used for the monitoring of the fauna nocturnal species

In the period March – June, the studies of bioacoustics were performed in the two periods: period March – April when the bats migrate from the hibernation place to the summer place of refuge and the period at the end of June, a period of maximum activity of the bats.

The monitoring session was performed through the registration of all sounds of echolocation of the bats in the wind farm and in its vicinity, on a number of 18 points during each period, to which there are added also additional points (5) in the vicinity of the forestry habitats (Babadag Forest) and of the localities. The monitoring points were the followings: N44 52.789 E28 22.405; N44 53.488 E28 22.083; N44 53.826 E28 21.292; N44 54.434 E28 21.697; N44 54.339 E28 20.589; N44 54.382 E28 19.598; N44 54.280 E28 19.147; N44 54.712 E28 19.265; N44 55.046 E28 19.715; N44 55.273 E28 19.349; N44 55.453 E28 19.758; N44 55.669 E28 20.124; N44 55.901 E28 20.189; N44 55.984 E28 19.747; N44 55.521 E28 18.821; N44 55.006 E28 18.942; N44 55.005 E28 18.941. N44 55.009 E28 23.570; N44 54.945 E28 23.721; N44 53.727 E28 19.343; N44 55.155 E28 18.508; N44 55.594 E28 20.339; N44 54.836 E28 21.892.

The duration of each registration period at the level of each point was of 30 minutes. There were avoided the rainy nights or with strong wind for the performance of the registrations.

So, for each point, the following indices were listed:

- the total number of transits of the bats from all species during all registration sessions;
- the diversity index Shannon – Wiener (H') = $-\sum (n_i/N) \log_2 (n_i/N)$ where:

n_i = the sum of the bats in each species during all registration sessions;

N = the sum of the transits of the bats in all species during all registration sessions

In order to avoid any over-estimation of the bats which are searching for food, it was considered “ten transits” as being the maximum value of the contacts for each species, in each point, during each registration session. The same indices were also listed in the wind farm as a whole.

- For the identification of the bats species and the calculation of the index, there were also consulted international experts in this field (see the list of the collaborators).



Image 4.6– Bio-acoustic monitoring of the bats

The supervision of the places of refuge

It was also performed a study for the supervision of the places of refuge in order to evaluate correctly the sensitivity of the studied area regarding the potential impact of the infrastructure. So, it was performed an inspection of all possible places of refuge, sites which can be used by bats as places of refuge, like: caves, barns and other rural constructions, abandoned constructions, historical constructions, attics of the rural buildings, bridges over waters, etc. This inspection was performed on an area of 2 to 5 km around the area proposed for the building of the wind farm. So, there were identified two abandoned mine galleries in the area of the border of Cerna (N44 99990 E28 2813) and Dealul Vararia (N44 96320 E28 30854).

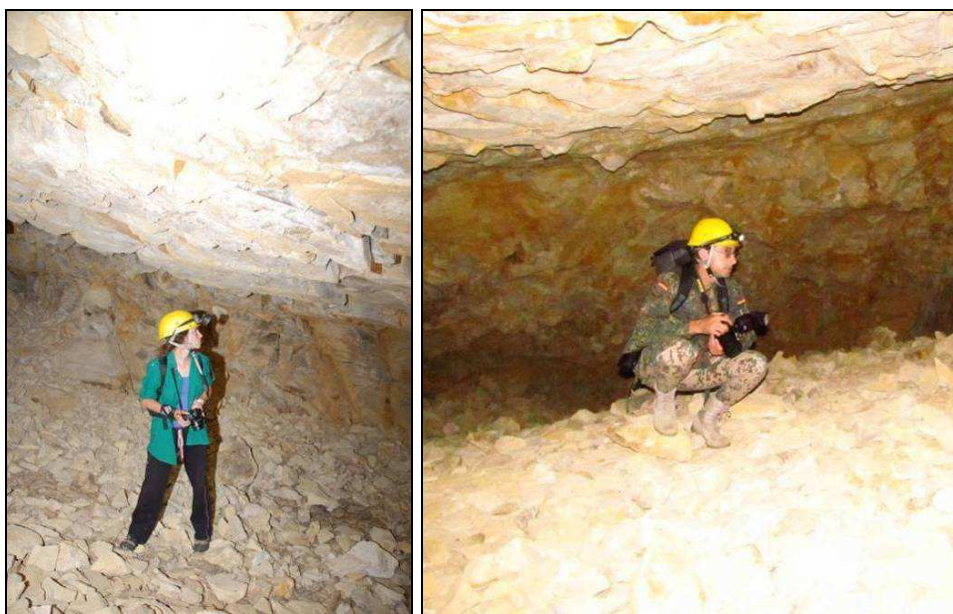


Image 4.7 – Monitoring of the places of refuge

At the end of June, it was performed an inspection for the identification of the potential presence in the places of refuge of the colonies for the breeding of the bat babies. During the inspections, it was registered the ecological use of the places of refuge by bats, as follows: places of refuge for reproduction, hibernation, swarming, taking care not to disturb the activity of the bats present or which could be present in these places of refuge. There were also registered signs of the presence of other species of conservative interest, especially Strigiformes.

5. RESULTS

5.1. The diversity and dynamics of the migratory birds species

For the performance of these analyses, there were considered all data which resulted following the observations in Vantage Points during the entire monitoring program (March – June 2013). The purpose of this undertaking was represented by the discovery of the main characteristics of the migration of the birds in the analyzed area (if, for the monitored area, there is something like this) of the daily activity of the birds in the species of interest (predatory, diurnal birds and aquatic birds), which can be resident in the monitored area or in its vicinity.

The above mentioned observations are used for the establishing of the main flying directions, of the height at which the birds fly, all these in order to establish the possibility for the wind turbines (related to the project for which the monitoring was performed) to intervene in the development of the activities of the species of interest or to endanger the continuance of their existence in the monitored area.

March

March is characterized by the beginning of the migration of the predatory birds and of the aquatic birds species (storks, herons, pelicans, egrets). The observations in the VP, in this period, registered, in most of the cases, diurnal predatory birds species, but also two species of aquatic birds.

The main flight directions of the observed species during the monitoring activity in March are presented synthetically in table 5.1. Here can be noticed also the altitudes at which the birds were flying.

Table 5.1. The flight directions of the birds observed in March 2013

Flight altitude	Direction of flight										total
	stationary over the VP	NNE	N	NE	S	E	SW	W	NNW	SE	
0	1	0	0	0	0	0	0	0	0	0	1
5	0	1	0	0	0	0	0	0	0	0	1
10	0	0	1	0	0	0	0	0	0	0	1
20	0	0	0	1	0	0	0	0	0	0	1
40	0	0	0	0	1	0	0	0	0	0	1
50	0	1	2	1	1	1	1	0	0	0	7
60	0	0	1	0	0	0	0	0	0	0	1
70	0	0	2	2	0	0	0	0	0	0	4

80	0	0	0	1	0	0	0	1	0	0	2
100	0	0	4	5	0	1	0	0	0	0	10
150	0	1	0	7	0	1	0	0	0	0	9
200	0	1	0	2	0	0	0	0	1	0	4
300	0	0	0	1	0	0	0	0	0	1	2
400	0	0	0	0	0	0	0	0	0	0	0
500	0	0	0	1	0	0	0	0	0	0	1
total	1	4	10	21	2	3	1	1	1	1	

It can be noticed the fact that most flights were registered on the direction NE (21 flights) which can suggest that the monitored area is situated (at least at the beginning of the migration season) at the periphery of a route frequented by the migratory or dispersive species. Also, it can be noticed that, from the total of the flights registered in the area (n=45), 33 were performed in the interval 50 – 150 meters (altitudinal interval about which it is considered that it interferes with the area of action of the rotor of the wind turbine)

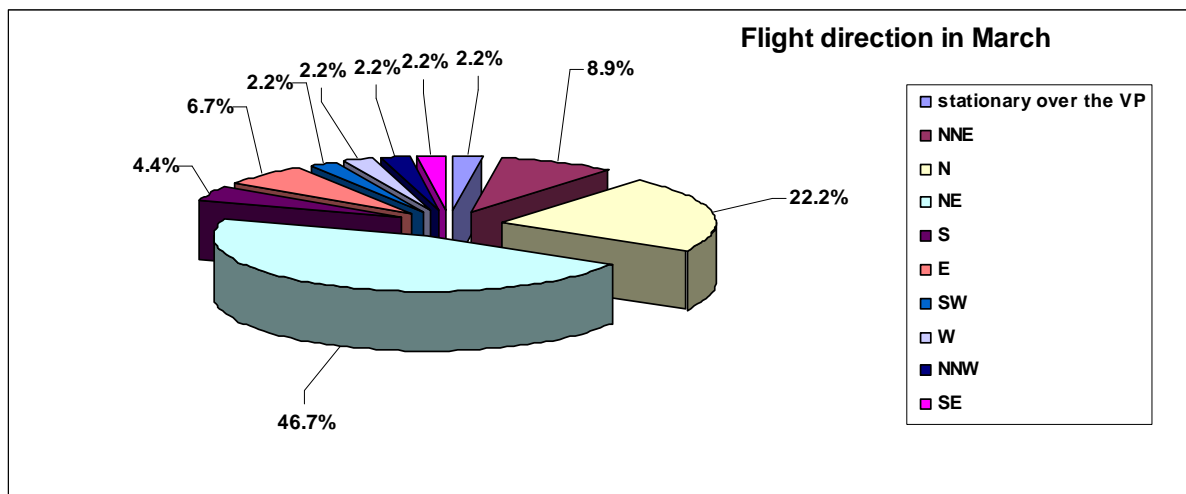


Image 5.1. The percentage analysis of the main directions of flight of the birds observed from VP in March.

From the point of view of the flying direction of the birds registered from VP, it can also be noticed the fact that, in percentages, in March, it dominates the same NE direction (46,7% in the total of the registered flights). On the second place as importance (22,2% from the total of the registered flights) there are situated the flights in the N direction, while for NNE, there were registered only 8.9%, and for NNW direction 2.2%. For all other registered flight directions, the percentages are between 6,7% and 2,2% (image 5.1).

As it can be noticed, cumulatively, the preponderant North direction represents approximately 80%, which also suggests the fact that the monitored area is located at the periphery of one of the routes used by the birds which are in migration or dispersion process.

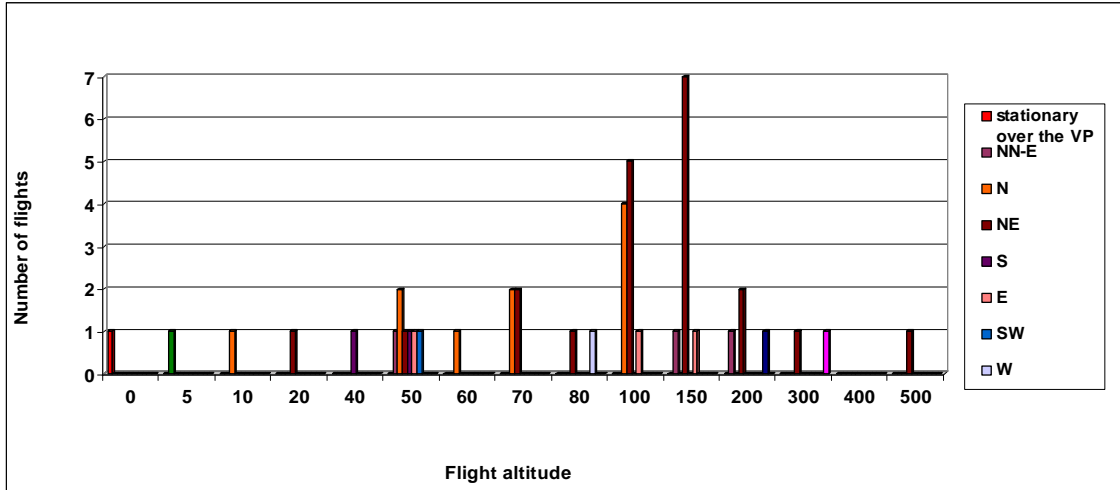


Image 5.2 The analysis of the correlations between the main flight directions of the birds, observed from VP in March, and the altitude where the flights were performed

A graphical analysis of the flight directions in proportion to the altitudes where the flights were registered (image 5.2) shows again the fact that most of the flights were noticed on the NE direction and at an altitude between 0 and 150 meters. So, it is noticed that for the predominant flight direction (NE), for the altitude of 20 meters, it was registered a single flight, for the one of 50 meters, also a single flight, for the altitude of 70 meters, two flights, for the one of 80 meters a single flight, while for the altitude of 100 meters and 150 meters, there are registered five, respectively, seven flights. Two flights were registered for the altitude of 200 meters and only one for the altitude of 500 meters.

April

April is considered to be the month when it is registered the peak of the migration in the case of the predatory birds species and in the case of the aquatic species. The observations from the VP, in this period, registered both diurnal predatory birds and also a small number of aquatic species of birds.

The main flight directions of the birds observed during the monitoring activity in April are presented as such in Table 5.2. Here there can also be noticed the altitudes where the inventoried birds performed their flight.

Table 5.2 The flight directions of the birds observed in April 2013

Flight altitude	Direction of flight										
	W	S	N	E	NE	NNE	NW	SE	SW	SSE	total
10	0	0	1	1	0	0	0	1	0	0	3
20	1	0	1	1	1	1	0	0	1	0	6
30	1	1	1	1	1	0	0	3	0	1	9
40	0	0	1	1	0	0	1	0	0	0	3
50	1	1	3	1	2	0	0	0	1	0	9
60	1	0	1	1	0	1	1	1	0	0	6
70	1	0	0	5	1	0	0	0	0	0	7
80	1	1	1	3	0	0	0	1	3	0	10
100	1	1	2	3	3	0	1	3	0	0	14
150	2	1	4	1	6	0	1	2	0	0	17
200	3	0	3	1	1	1	0	1	2	0	12
250	1	0	1	2	1	0	2	0	0	0	7
300	0	1	1	1		0	1	1	0	0	5
400	0	0	0	0	0	0	0	1	0	0	1
450	0	1	0	0	3	0	0	0	0	0	4
500	0	0	0	1	0	0	0	0	0	0	1
550	0	0	2	0	1	0	0	0	0	0	3
600	1	0	0	0	2	0	0	0	0	0	3
1000	0	0	1	0	0	0	0	0	0	0	1
1500	0	0	0	0	0	0	1	0	0	0	1
total	14	7	23	23	22	3	8	14	7	1	

So, it is noticed that most of the flights were registered on the direction E and N (each of the directions with 23 flights), followed by NE direction with 22 flights. This thing supports the supposition that the monitored area is located at the periphery of a route frequented by the migratory or dispersive species. It is also noticed the fact that, from the total of the flights registered in the area (n=122), 63 were performed in the interval 50-150 meters, being considered the fact that the altitudinal interval interferes with the area of action of the rotor of the wind turbine.

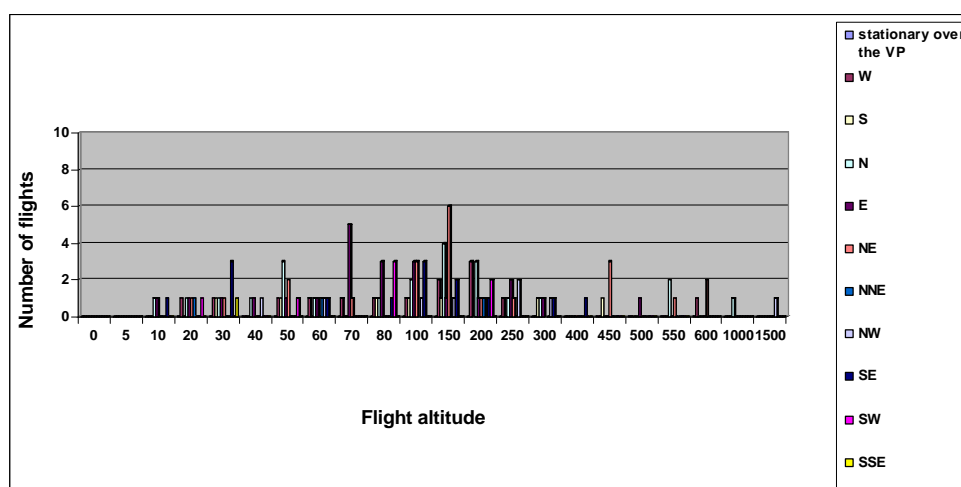


Image 5.3 The analysis of the correlations between the main flight directions of the birds observed from VP in April and the altitude at which the flights were performed

From a graphical point of view, the flight directions of the birds observed from the three VP, in proportion to the altitudes at which the flights were registered (image 5.3) show again the fact that most of the flights were registered on the direction N, E and NE and at an altitude between 10 and 1500 meters. More precisely, it is noticed that for the predominant flight directions (N, E and NE), for the altitude of 10 meters, there were noticed two flights, for the one of 20 meters, it was registered a single flight, for the one of 30 meters three flights, for the one of 40 meters, a single flight, for the altitude of 50 meters, there were observed three flights, for the one of 60 meters three flights, while for the one of 80 meters and 100 meters there are registered four, respectively two flights. Also, for the altitude of 150 meters, there were registered six flights, for the one of 250 meters three flights and a single flight for the altitude of 300 meters, while at the altitude of 550, there were noticed two flights.

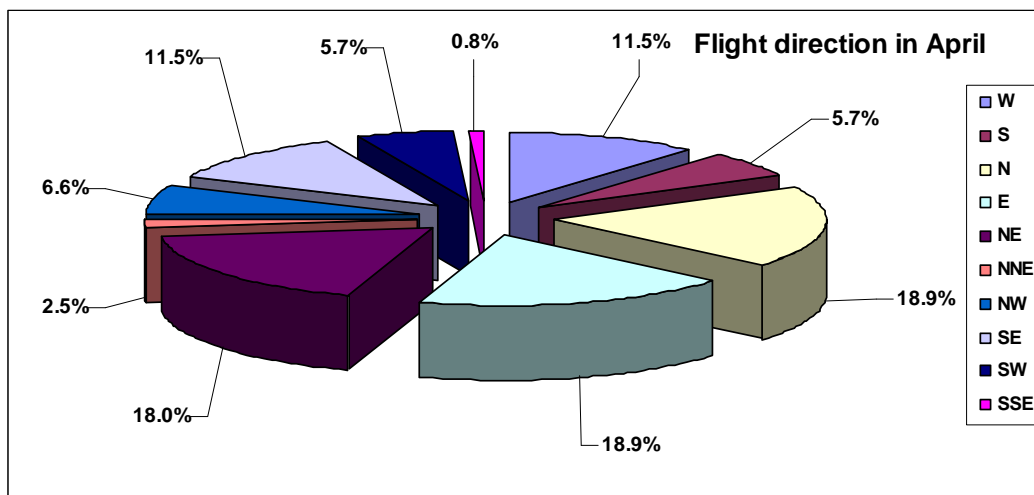


Image 5.4 The percentage analysis of the main flight directions of the birds observed from VP in April

From the point of view of the flight direction of the birds registered from VP, the percentage graphical analysis shows that the directions which dominate in April are a little different from the ones registered in the previous month. More precisely, there dominate the directions E, N and NE with 18,9% from the total of the registered flights (E and N) and 18% NE). Totally, the three main flight directions totalize 55,8% from the total of the observed flights. On the second place as importance (11,5% from the total of the flights) there are situated the flights on the directions W and SE, while for NW there were registered only 6.6 percentages, and for the direction SW and S, 5,7%. For all the other registered flight directions, the percentages are between 0.8% and 52% (image 5.4).

As it can be noticed, cumulatively, the preponderant North direction represents approximately 72%, a fact which also suggests that the monitored area is located at the periphery of one of the routes used by the birds which are in migration or dispersion process.

May

May marks in its first half the end of the migration and dispersion in the case of the species of interest, targeted by the monitoring program. In this period we may notice less directional flights specific to the migration and more multidirectional overfly flights.

The observations from VP in this period registered diurnal predatory birds species but also a very small number of aquatic birds.

The main flight directions of the birds observed in the monitoring activity in May, are presented in table 5.3. Here we may also see the altitudes at which the inventoried species performed their flight.

Table 5.3. The flight directions of the birds observed in May 2013

Flight altitude	Direction of flight									
	W	S	N	E	NE	NNE	NW	SE	SW	total
10	0	0	0	1	0	0	0	0	0	1
20	0	0	1	0	0	0	0	0	0	1
30	0	1	1	0	0	0	0	0	0	2
40	0	0	0	1	0	0	0	0	1	2
50	0	0	1	2	1	0	0	0	0	4
60	0	0	1	2	3	0	0	2	2	10
70	0	1	0	2	3	0	1	0	0	7
80	1	1	0	0	2	0	1	0	0	5
100	0	1	3	2	2	0	2	1	0	11
150	1	3	3	3	6	1	0	3	1	21
200	3	0	6	1	0	0	1	2	0	13
250	4	2	0	0	2	0	3	0	2	13
300	2	0	2	0	1	0	0	3	1	9
350	0	1	0	0	0	0	0	0	0	1
800	0	0	0	0	0	0	1	0	0	1
total	11	10	18	14	20	1	9	11	7	

From the data inserted in the above table, it can be noticed that most of the flights were registered on the NE direction (20 specimens) which, again, confirms the hypothesis that the monitored area is located at the periphery of a route frequented by the migratory or dispersive species or is part of a migration way which is crossed by a small part of the populations of diurnal predatory birds and aquatic birds which place of reproduction is the North of Dobrogea and Danube Delta. Also, it can be noticed the fact that, from the total of

the flights registered in the area (n=101), 58 were performed in the interval 50-150 meters (an altitudinal interval about which it is considered that it interferes with the area of action of the rotor of the wind turbines).

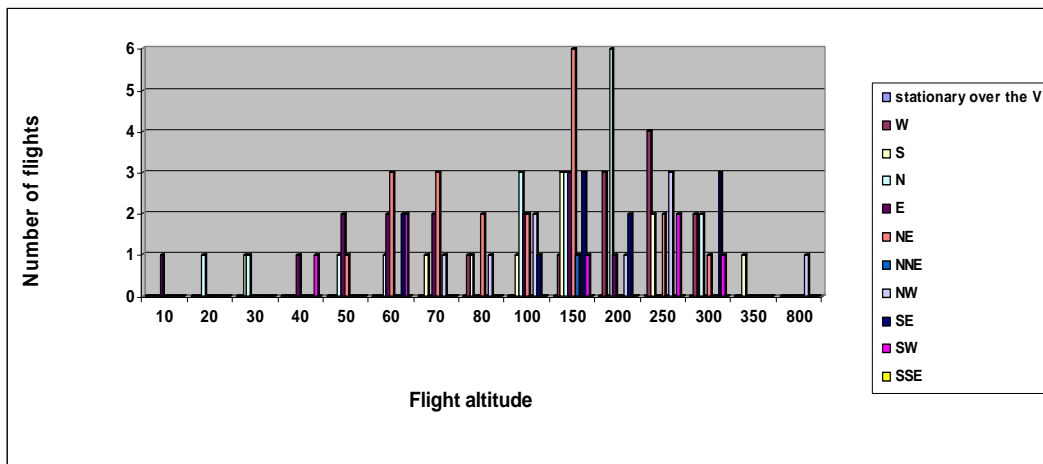


Image 5.5. The analysis of the correlations between the main flight directions of the birds observed from VP in May and the altitude at which the flights were performed

The analysis of the existing correlations between the flight direction and the altitudes at which the flights were registered (image 5.5) shows the fact that most of the flights were registered on NE direction and at an altitude between 60 and 300 meters. In order to clarify this situation, we mention the fact that, on the predominant flight direction (NE), for the altitude of 60 meters, there were registered three flights, for the one of 70 meters, also three flights, for the altitude of 80 meters two flights, for the one of 100 meters, also two flights, while for the altitude of 150 meters and the one of 250 meters, there are registered six, respectively two flights. Only a single flight was registered for the altitude of 300.

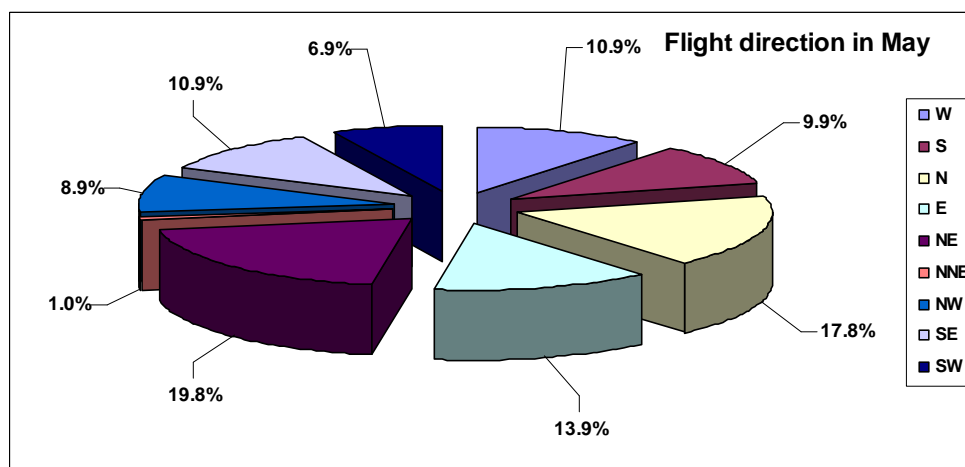


Image 5.6 The percentage analysis of the main flight directions of the birds observed from VP in May

From the point of view of the incidence of the flight directions, expressed in percentages this time, it is noticed that all the flights registered in May from the three VP observe approximately the same pattern noticed also in the previous months. Practically, from all the registered flights, dominant as proportion, there are the ones in which the birds were moving on the NE direction (19,8 % from the total of the registered flights), followed by the ones which were moving on the North direction (N, 17,8%) and East (E, 13,9%). On the following positions as importance, we can find the directions W and SE (each direction registers 10,9% from the total of the flights). On the South direction (S), there were registered 9,9% from the total of the flights, on North-West direction (NW) 8,9% of them, and on South-West direction (SW), 6,9% from the total of the flights. The NNE flight direction registered a single percentage from the total of the observed flights (image 5.6).

And for May it is noticed that the preponderant North direction has the biggest percentage (46,5%).

June

June marks the full nesting season for the majority of the species which are going to build nests in the monitored area or in its vicinity. Following this phenomenon, the observations from the three Vantage Points, registered a pronounced downfall. Practically, the observers noticed the disappearance of the preponderant directional flights and the installation of a flying pattern characterized through random changes of direction in the case of the observed species. Also, in this month, there were no longer observed birds in the species of aquatic birds. The specimens of big birds observed in this period belong, without exception, to the predatory diurnal birds species.

Table 5.4. The flight directions of the birds observed in June 2013

Flight altitude	Direction of flight									
	W	S	N	E	NE	NW	SW	NNE	SE	total
30	0	0	0	0	1	0	0	0	0	1
50	0	1	0	0	0	0	0	0	0	1
70	0	1	0	0	0	0	0	0	0	1
80	0	1	0	1	0	0	0	0	0	2
100	0	0	0	0	0	0	0	2	0	2
150	1	0	1	0	1	0	0	0	1	4

200	0	0	0	2	0	0	0	0	0	2
250	1	2	2	0	1	2	0	0	0	8
300	0	0	0	1	2	0	1	0	0	4
350	0	0	0	0	0	0	1	0	0	1
500	0	0	0	0	0	0	1	0	0	1
Total	2	5	3	4	5	2	3	2	1	

The analysis of the data presented in table 5.4 shows that most of the flights were registered again on the direction NE (5 specimens), despite the fact that the season of the migrations ended, but the same number (n=5) was observed also on the South direction (S). This aspect may suggest the presence in the area, in the first decade of June, of some late specimens which, only now, reached the reproduction places. The same aspect, corroborated with the flights to South can also lead to the conclusion that, in the case of the predatory birds (which represent the entire observations registered in this month), they hunt on the North and South direction, because the border of the forest is located in proportion to these cardinal points, and the fields where they hunt are also located parallel with the forest and on the same North-South direction. Also, it can be noticed that, from the total of the flights registered in the area (n=27), 10 were performed in the interval 50-150 meters (the altitudinal interval about which it is considered that it interferes with the area of action of the rotor of the wind turbine).

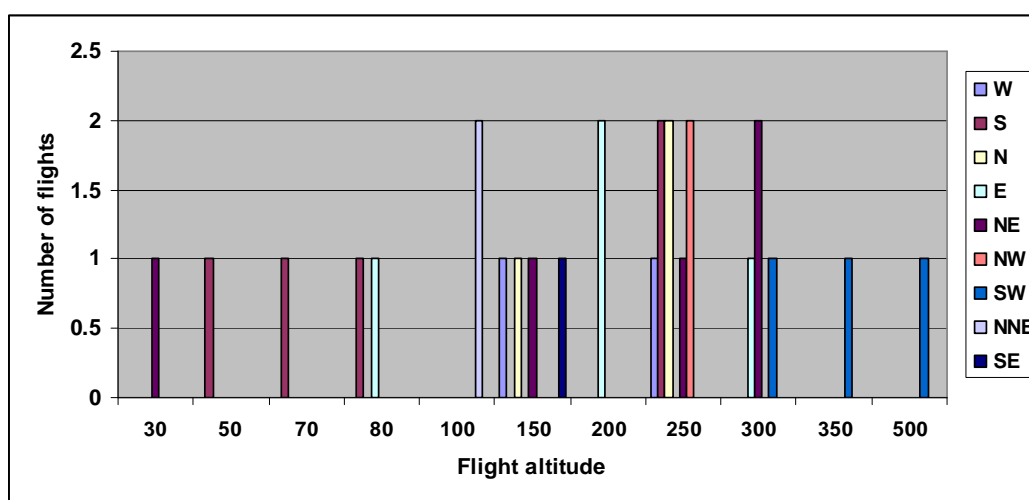


Image 5.7 The analysis of the correlations between the main flight directions of the birds observed from VP in June and the altitude at which the flights were performed.

The graphical analysis of the flight directions correlated with the altitudes at which the flights were registered (image 5.7) show the fact that the directional flights are no longer

so important in this month and are replaced with territorial flights which suggest hunting and mating rituals in the case of the predatory birds. Most of the flights registered in June were included in the altitudinal range between 30 and 150 meters (11 flights). From the flights registered on the dominant directions (NE and S), only four are included in the altitudinal interval 50-150 meters (the critical interval of action of the rotating elements of the wind turbine). Three of the flights on the dominant directions were registered at the altitude of 250 meters, and three flights, at the altitude of 300 meters.

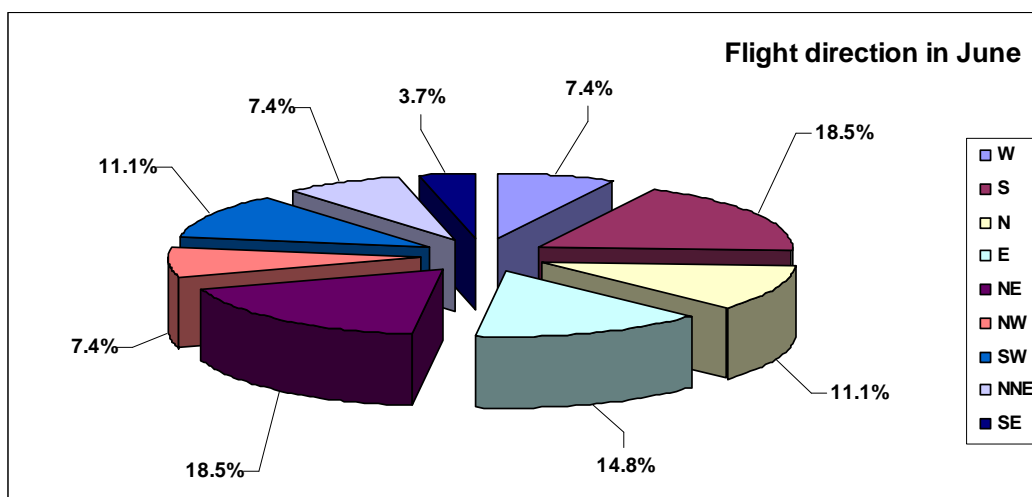


Image 5.8 The percentage analysis of the main flight directions of the birds observed from VP in June

From the point of view of the percentage comparative analysis of the flight direction of the birds registered from VP in June (image 5.8), it is noticed the fact that, in this period, it dominates the same direction NE (18.5% from the total of the registered flights) to which there is added in this month the South direction (S) with the same number of percentages (18.5%). The following flight directions as percentage registered in June are the East direction (E) with 14,8 percentages, followed by the North direction (N) and South-West (SW) with 11 percentages. The last as importance are the flights on the West direction (W) and North-West (NW) with 7,4% from the total of the flights. Only 3.7% from the birds observed in VP in June flew on the SE direction.

Table 5.5. – The flight direction in June – centralization

Flight direction	Percentage
W	7,4%
S	18,5%
N	11,1%

E	14,8%
NE	18,5%
NW	7,4%
SW	11,1%
NNE	7,4%
SE	3,7%

The spring months

From the point of view of the dynamics of the flights of the birds, the spring months are considered to be critical. In this period of the year, the agglomerations which result as an effect of the phenomena of migration, dispersion and beginning of nesting, may determine the appearance of certain undesired effects regarding the interactions between the birds which cross or frequent a certain area and the wind turbines present on them.

Even if above it was presented the situation on each spring month, it was considered advisable to construe the data in the context of the entire spring season, for a better understanding of the situation on the whole.

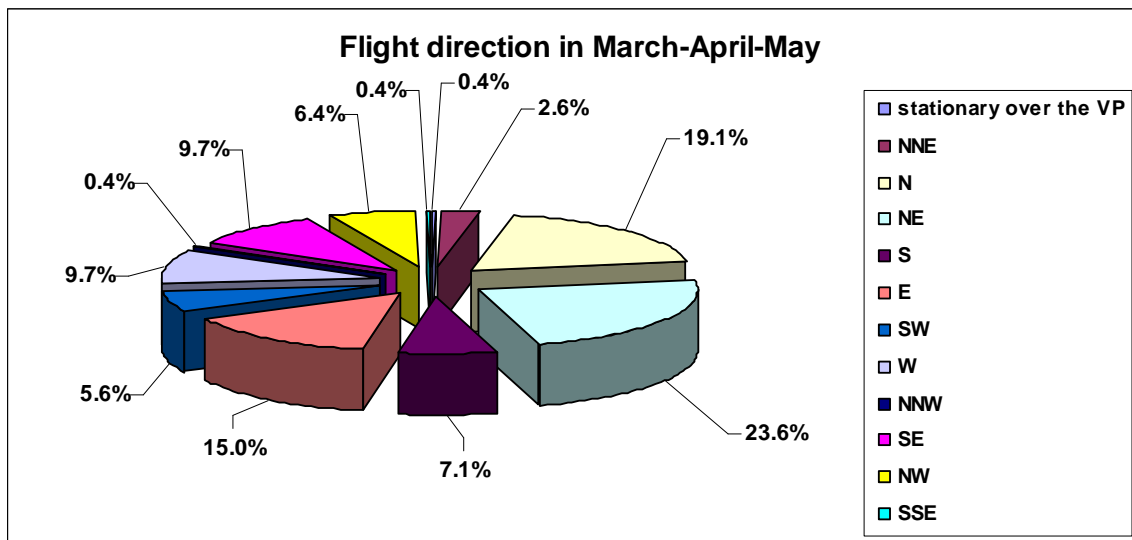


Image 5.9 The percentage analysis of the main flight directions of the birds observed from VP in the spring months

As it can be seen in image 5.9, during the spring months, the main flight direction was mainly the North-East one (NE) with 23% from the flights registered in the monitored area. To this percentage there are added the percentages related to the flights on the North direction

(N) with 19.1%, North-West (6.4%), North-East (2.6%) and North – North-West (NNW) which leads to the total value of 45.6% from the total of the flights which were observed in the analyzed area.

Table 5.6. – The flight direction in the spring months – centralization

Flight direction	Percentage
stationary over the VP	0.40%
NNE	2.60%
N	19%
NE	23.60%
S	7.10%
E	15.00%
SW	5.60%
W	9.70%
NNW	0.40%
SE	9.70%
NW	6.40%
SSE	0.40%

April-May months

The months April and May are generally considered to correspond to the peak of the migration of the birds which arrive from Europe, for reproduction.

Because of this aspect, it was considered advisable to perform a synecological analysis of the meaning of the data registered in Vantage Points, in the two mentioned calendar months.

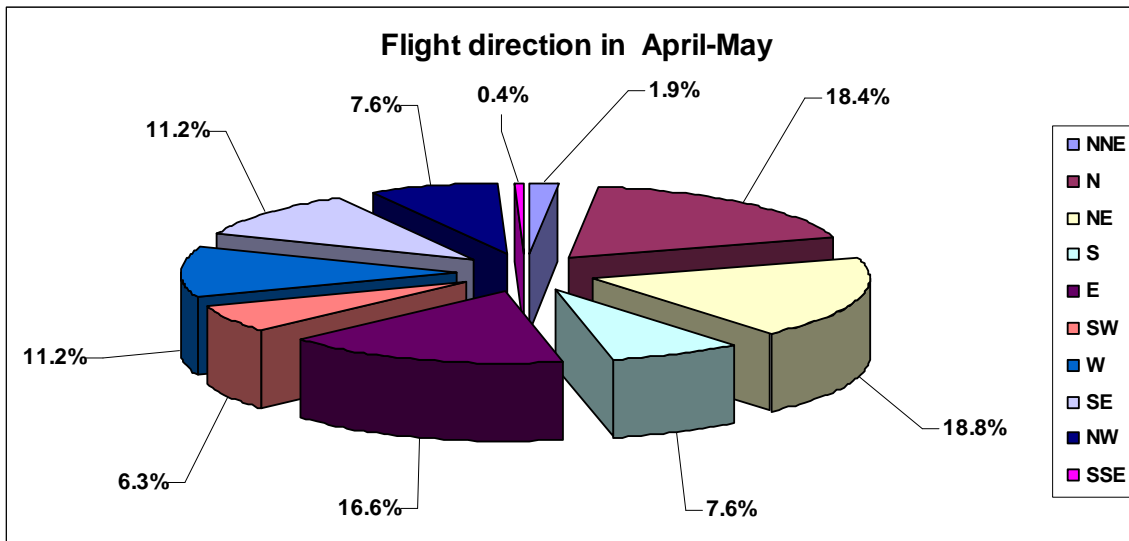


Image 5.10 The percentage analysis of the main flight directions of the birds observed from VP in the months considered to be a migration peak.

In the case of the data added up for this analysis, it resulted the fact that in April and May, the main flight direction was North and North-East (N and NE), each with 18% from the flights registered in the monitored area. To this percentage there are added the percentages related to the flights on the direction North – North-East (NNE) with 1.9% and North-West (NW) with 7.6% which leads to the value of 45.5% from the total of the flights which were observed in the analyzed area. The obtained result differs with only 0.1% from the one calculated for all three spring months, and confirms the previous observations.

In April and May, the other flight directions represent 54.5%. Divided on directions, it is noticed that on the East direction (E) there flew 16% from the birds identified following the observations from VP in April and May, and to South-East (SE) and West (V) there were registered 11.2% from the total of the flights, while to South-West (SW) and South – South-West (SSW) flew only 6.3%, respectively 0.4% from all birds noticed in this calendar interval.

Table 5.7. – The flight direction in April and May – centralization

Flight direction	Percentage
NNE	1.90%
N	18.40%

NE	18.80%
S	7.60%
E	16.60%
SW	6.30%
W	11.20%
SE	11.20%
NW	7.60%
SSE	0.40%

The dynamics of the observations from VP

From the point of view of the intensity of the flying activity of the specimens of the species of interest (diurnal predatory birds and aquatic birds) it is noticed that the period of maximum intensity is the one between the last decade of April and the first decade of May (image 5.11).

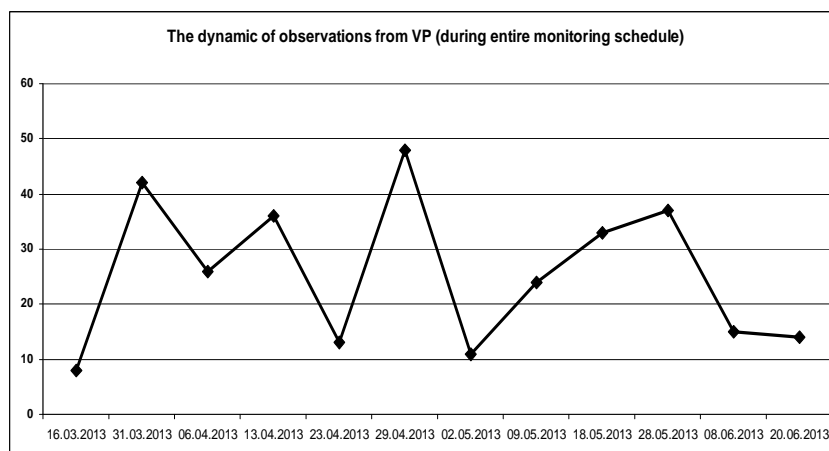


Image 5.11. The analysis of the flight activity of the birds based on the calendar intervals during the monitoring program

So, in the previously mentioned period, the number of registered flights is of about 50. Other two peaks of activity (but significantly lower) are registered at the end of March and between May 18-28, 2013, with a maximum number of observed flights of about 40.

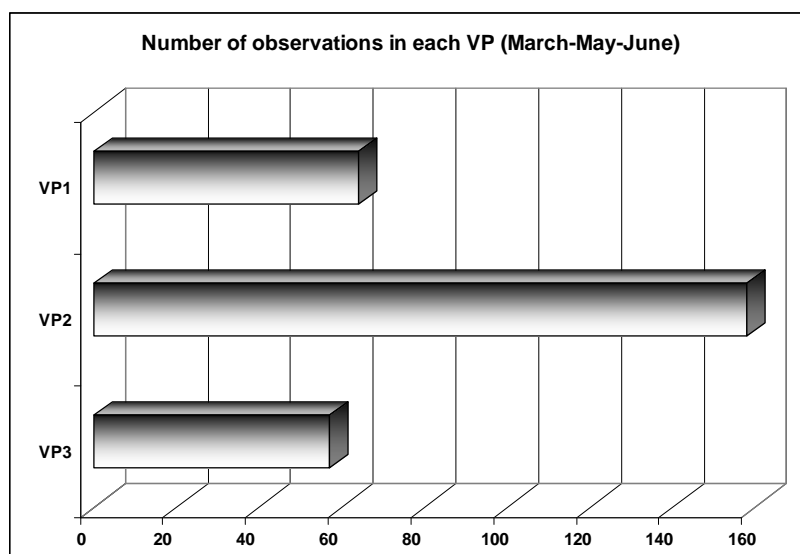


Image 5.12. The analysis of the activity of the birds, from the point of view of the number of flights observed from each VP.

From the point of view of the dynamics of the observations from the Vantage Points (number of observations / VP), we may notice that most of the flights were observed from VP2 (N44 54.400 E28 20.727) (image 5.12). This aspect is independent from the observers and is especially related to the special position of this point.

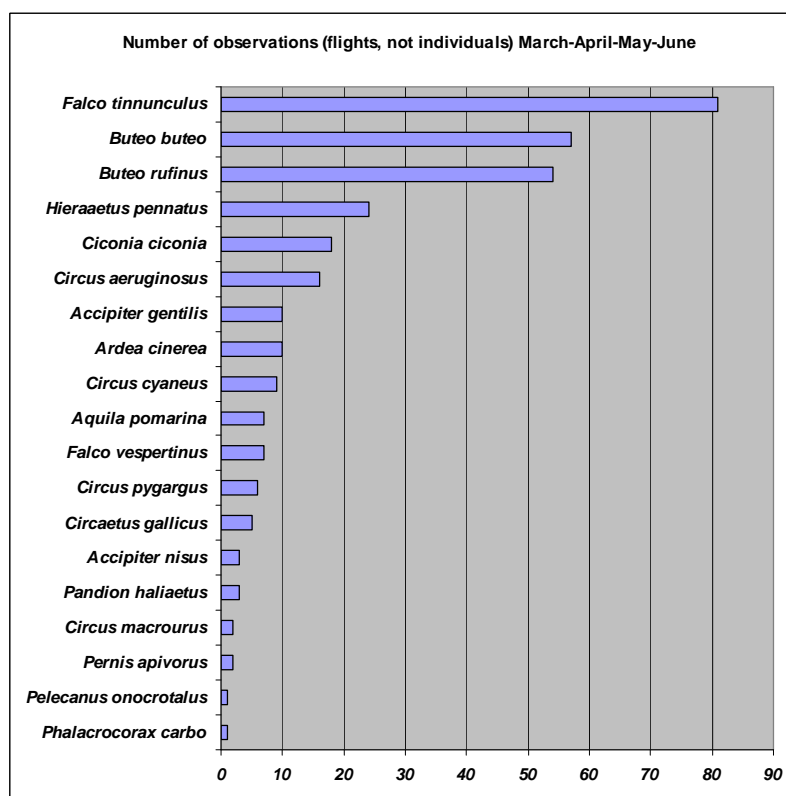


Image 5.13. The analysis of the activity of the birds from a qualitative and quantitative point of view (number of flights registered for each of the identified species).

From the point of view of the specific composition of the avifauna in the monitoring period, we may notice the fact that most of the flights (over 80) were registered in the case of the species *Falco tinnunculus*, followed by *Buteo buteo*, with almost 60 flights and *Buteo rufinus* with 55 flights. In the middle register (from the point of view of the number of observations) we may find *Hieraaetus pennatus* with about 25 flights, *Ciconia ciconia* with about 18 flights and *Circus aeruginosus* with about 16 flights. All other observed species (see image 5.13) registered between one and 10 flights.

Subsequently, it was analyzed the dynamics of the flights for the entire period (March-June 2013), from the point of view of the time intervals (image 5.14) in which there were registered the flights. The purpose of this type of analysis was the one to identify the time segment with most flights, in order to establish the daily interval in which the birds are most vulnerable to a potential impact resulted following the interaction with the wind turbines.

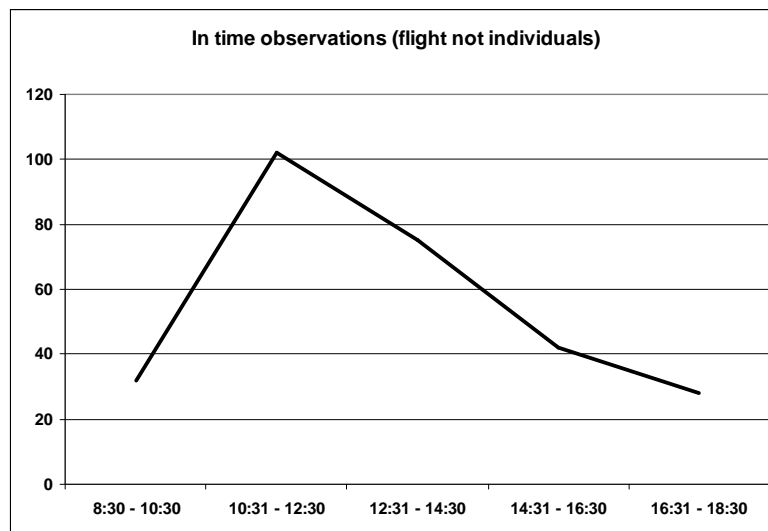


Image 5.14. The analysis on time segments of the activity of the birds observed during the monitoring from the Vantage Points

So, it is noticed the fact that, for the entire analyzed period, the time interval with the most intense activity is the one between 10:30 and 12:30, an interval which usually corresponds with the start of the ascendant thermal currents, following the heating of the soil. Practically, beginning with 08:00 in the morning, the activity of the birds registers a constant increase, with the activity peak between 11:00 – 11:30. Following this time interval, the activity of the birds decreases constantly until 18:30.

Table 5.8. The conservation status of the birds species according to the European legislation, national legislation and IUCN.

Species	The conservation status according to the Birds Directive (147/2009/EC.)	The conservation status according to the Governmental Emergency Ordinance 57/2007	IUCN	The phenological category	The standard form of the protected area ROSPA0091 Babadag Forest
<i>Phalacrocorax carbo</i>	-	-	LC	OV/OI	-
<i>Pelecanus onocrotalus</i>	Appendix I	Appendix 3	LC	OV	✓
<i>Pernis apivorus</i>	Appendix I	Appendix 3	LC	OV	✓
<i>Circus macrourus</i>	Appendix I	Appendix 3	NT	OV/OI?/P	✓
<i>Pandion haliaetus</i>	Appendix I	Appendix 3	LC	P	-
<i>Accipiter nisus</i>	-	-	LC	S/OI	✓
<i>Circus gallicus</i>	Appendix I	Appendix 3	LC	OV	✓
<i>Circus pygargus</i>	Appendix I	Appendix 3	LC	OV	✓
<i>Falco vespertinus</i>	Appendix I	Appendix 4B	LC	OV/OI	✓
<i>Aquila pomarina</i>	Appendix I	Appendix 3	LC	OV	✓
<i>Circus cyaneus</i>	Appendix I	Appendix 3	LC	OI	✓
<i>Ardea cinerea</i>	-	-	LC	OV/RI	-
<i>Accipiter gentilis</i>	-	-	LC	S	-
<i>Circus aeruginosus</i>	Appendix I	Appendix 3	LC	OV/RI	✓
<i>Ciconia ciconia</i>	Appendix I	Appendix 3	LC	OV	✓
<i>Hieraaetus pennatus</i>	Appendix I	Appendix 3	LC	OV	✓
<i>Buteo rufinus</i>	Appendix I	Appendix 3	LC	OV/P	✓
<i>Buteo buteo</i>	-	-	LC	OI/S/P	✓
<i>Falco tinnunculus</i>	-	Appendix 4B	LC	OV/OI	-

LEGEND

Governmental Emergency Ordinance 57/2007:

- **APPENDIX 3 SPECIES** – of plants and animals which conservation needs the designation of the special areas for conservation and the avifaunistic special protection areas

- **APPENDIX 4 B** – SPECIES OF NATIONAL INTEREST - Species of animals and plants which need a strict protection

Phenology category

OV – summer guest (they arrive on the territory of our country for reproduction)

OI – winter guest (they arrive on the territory of our country for wintering)

RI – rarely in winter

PM - partial migratory

Ac - accidental (species which can be observed in an exceptional manner, most of them being located very far and their appearance is accidental)

P - passage (species which can be observed only during their migration to the nesting places – spring or wintering places – autumn, without having nesting representatives)

E - erratic (species observed outside the nesting period, searching for food, or with the occasion of travels outside their usual limits)

S - sedentary (species which presence is signalized in all months of the year)

IUCN Category:

A little threatened (NT)

With low risk (LC)

The conservation status according to the Birds Directive (147/2009/EC.)

- **Appendix 1**- species of birds which represent the object of the special conservation measures regarding the habitat, in order to ensure their surviving and reproduction in their distribution area.

5.1.1. The analysis of the collision risk

The calculation methodology used for the establishing of the theoretical risk of collision of the birds with the wind turbines, is based on the guide drafted by Scottish Natural Heritage (SNH).

The calculations used in the methodology (detailed in the SNH guide) have the purpose to establish the number of the collisions of the birds in a certain period of time, for a quantification of the potential impact of the wind farms over the avifauna and the drafting of early measures in order to reduce the impact.

The calculations are divided in 2 different stages:

1. In the first stage, it is calculated the number of the birds which fly in the area of action of the blades of the wind turbines.
2. In the second stage, it is calculated the possibility for the birds which fly in the area of action of the blades to be hit.

Also, the first stage involves two different approaches which differ based on the analyzed species and flying behavior they manifested in the time interval when the observations were performed:

- Approach 1: it is applied to the species / populations of birds which are crossing the studied area of the wind farm;

- Approach 2: it is applied to the species / populations of birds which frequently use the airspace of the wind farm. This approach is applied especially in the case of the predatory birds which occupy an established territory.

The results obtained in the 2 stages are finally used for the theoretical calculation of the number of birds which may collide with the mobile elements of the wind turbines, the following calculation formula being used:

The number of birds which collide with the wind turbines per period = the number of the birds which fly in the area of action of the blades (stage 1) * the probability for the birds which fly in the area of action of the blades to be hit (stage 2).

In this case, the time interval in which the observations were performed was March 16, 2013 – June 20, 2013, which corresponds to the period of the spring migration and the beginning of the nesting period.

APPROACH 1

For this approach, there were considered the observed species which were crossing the location of the wind farm, species which can arrive in the area of action of the blades of the wind turbines.

According to the SNH methodology, it was calculated a “risk window” which first side represents the imaginary line which connects the farthest two points (wind turbines) in the area of the wind farm and which are located on the flying predominant direction of the birds (here SV_NE). The second side is represented by the maximum height of the turbines (150 m) in the wind farm (figura 5.15).

So being obtained the values for the sides of the “risk window”, it is subsequently calculated its surface using the following calculation formula: Surface (W) = the length of the imaginary line * the maximum height of the turbines.

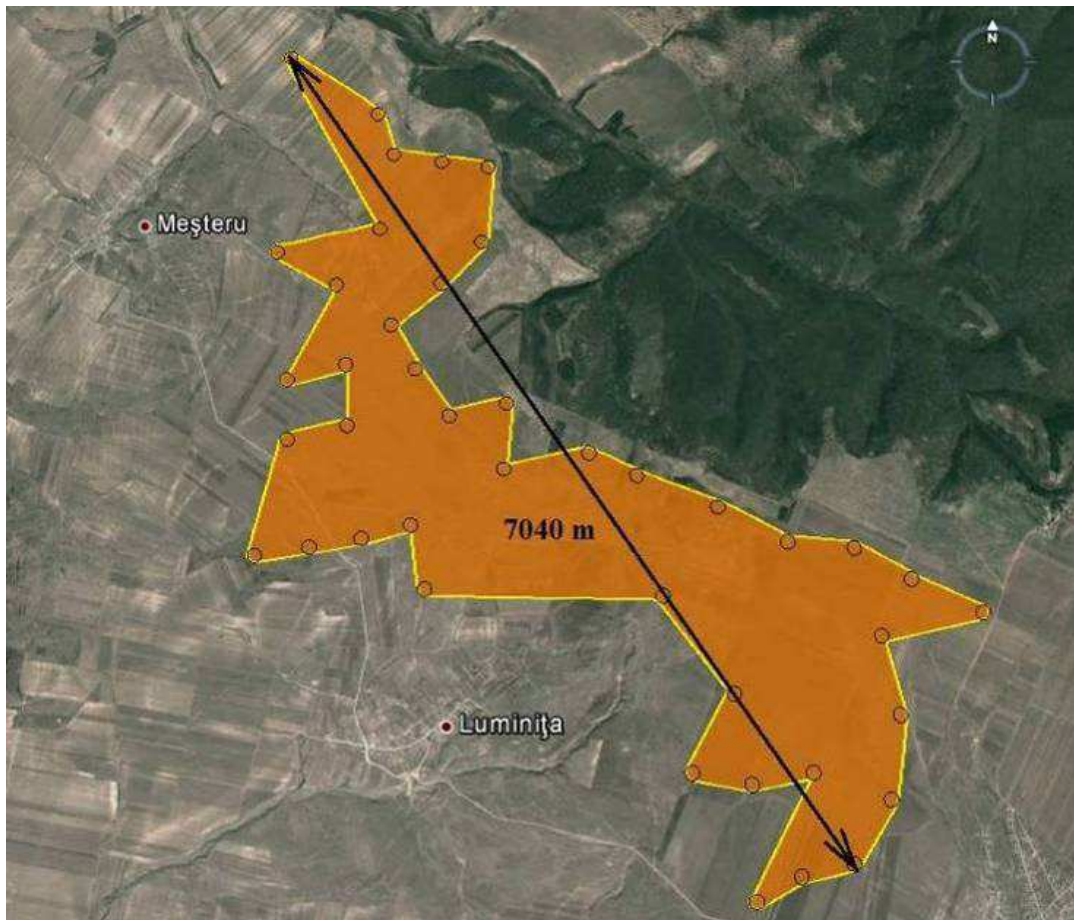


Image 5.15 Risk window

The estimation of the number of birds (n) which fly through the risk window, is calculated based on the formula: the number of birds observed during the monitoring period * the flying frequency. In this case, because of a single monitoring season, respectively the spring migration, the flying frequency was considered to be equal with 1, which means the fact that the species of birds which are in migration over the location crossed only once the considered risk window.

We mention that the target species which were considered for this method are the Falconiformes and the aquatic birds which cross the airspace of the wind farm in the migration period and which present, because their dimensions and flying heights, an increased risk of collision.

Subsequently, it was calculated the action surface of the rotors of the wind farm. $A = N \times \pi R^2$ where N represents the number of the turbines and R the radius of the rotor, this leading to the finding of the report between the action surface of the rotors and the surface of the risk window.

The dimension of the side of the risk window, perpendicular on the predominant flying direction	l	7040 m
The surface of the risk window	$W=l * H$	$W=1.056.000 \text{ m}^2$
The action surface of the rotors of the wind farm	$A= N * \pi R^2$	$A=267057 \text{ m}^2$
The report between the action surface of the rotors and the surface of the risk window	$A/W= 0.25$	

The number of the birds which fly in the action area of the blades is equal to the number of the birds which cross the risk window x the report between the action surface of the rotors and the surface of the risk window = $n * (A/W)$

Technical characteristics of the turbines

The height of the turbines	H	150 m
The number of the turbines	N	42
The radius of the rotor of the turbine	R	45 m

Table 5.9a.The results regarding the collision risk of the birds which are in migration with the wind turbines.

Specie	No. of specimens	Number of the birds through the risk window	Length (m)	Wing span (m)	Flying speed (m/s)	Collision probability %	No. of the birds with collision risk without avoiding activities	Avoidance rate %	No. of the birds with real collision risk / season
	n	nx A/W							
<i>Accipiter nisus</i>	3	0.75	0.31	0.61	11	9.4	0.0705	98	0.00141
<i>Ardea cinerea</i>	3	0.75	0.93	1.65	12	12.8	0.0960	98	0.00192
<i>Buteo buteo</i>	45	11.25	0.52	1.20	12	10.3	1.1587	98	0.02317
<i>Buteo rufinus</i>	41	10.25	0.54	1.42	10	12.2	1.2505	98	0.02501
<i>Circus aeruginosus</i>	15	3.75	0.49	1.27	11	10.9	0.4087	98	0.00817
<i>Circus macrourus</i>	2	0.5	0.45	1.07	10	11.4	0.0570	98	0.00114
<i>Circus cyaneus</i>	9	2.25	0.50	1.07	9	12.8	0.2880	99	0.00288
<i>Circus pygargus</i>	5	1.25	0.44	1.06	8	13.8	0.1725	98	0.00345
<i>Circaetus gallicus</i>	5	1.25	0.65	1.70	11	12.1	0.1512	98	0.00302
<i>Ciconia ciconia</i>	102	25.5	1.02	2.00	16	10.9	2.7795	98	0.05559
<i>Hieraaetus pennatus</i>	3	0.75	0.46	1.22	11	10.7	0.0802	98	0.00160
<i>Pandion haliaetus</i>	4	1	0.56	1.59	13	10.2	0.1020	98	0.00204
<i>Phalacrocorax carbo</i>	11	2.75	0.85	1.35	15	10.2	0.2805	98	0.00561
<i>Pelecanus onocrotalus</i>	15	3.75	1.57	2.70	16	13.6	0.5100	98	0.01020
<i>Pernis apivorus</i>	1	0.25	0.55	1.24	12	10.5	0.0262	98	0.00052

APPROACH 2

For the calculation of the collisions risk, according to approach 2, there were considered only those species which frequently use the airspace of the wind farm. The target species for this approach were considered the ones belonging to the order Falconiformes (resident), considered to be an increased risk category because of the flying height, dimensions and also their flying behavior.

According to the SNH guide, the method is used for the species of predatory birds which occupy an established territory.

For the calculation of the collision, the following parameters were considered:

The surface of the wind farm	A	8.220.130 m ²
The height of the wind turbine	H	150 m
Number of turbines	N	42
Radius of the rotor of the turbine	R	45 m
The length of the rotor	d	4.4 m

The surface of the wind farm (A) is delimited by the wind turbines, plus the surface in the immediate vicinity, with a length of 50 m, representing the action radius of the blades. Then, it was identified a flight risk volume (V_w), calculated as the surface of the wind farm multiplied with the height of the wind turbines.

„The risk volume”	$V_w = A * H$	$V_w = 1.233.019.500 \text{ m}^3$
The swept volume by the rotors of the wind farm	$V_r = N * \pi R^2 * (d+l)$	See the below table

The estimation of the volume swept by the rotors of the wind farm was performed through the formula $V_r = N * \pi R^2 * (d+l)$, where N represents the number of turbines, d = the length of the rotor and l = the length of the bird.

The number of birds (n) which occupy the “risk volume” (V_w) represent the number of observed birds, multiplied with the time spent in the “risk volume”, in the period for which the estimation of the collision was performed, respectively the period March – June (96 days). For the estimation of the number of days in which the target species used the airspace of the wind farm, it was considered the interval from the first reporting of the presence of the species in the analyzed area until the last date of the monitoring (June 20). We mention that it was used the scenario in which these birds fly daily, no matter the meteorological conditions and only in the area of the location, with a flying average of 5 hours per day.

The estimation of the number of birds which occupy the volume swept by the rotors of the wind farm, is calculated according to the formula: $n * (V_r/V_w)$.

The time necessary for a bird to pass through the rotor was determined as follows: $t = (d+l)/v$ where d = length of the rotor, l =length of the bird and v =the speed with which the bird passes through the volume swept by the rotor.

The number of birds which pass through the volume swept by the rotors per time unit is calculated through the following report: $n * (V_r/V_w)/t$. (Table 5.9b).

Table 5.9b. The results regarding the collision risk of the birds which frequently use the airspace of the wind farm

Species	No. ind.	Lengt h. (m)	Wing span (m)	Flying speed (m/s)	Volume swept by the rotors of the turbines	No days/season	No. of birds on V_w	V_r/V_w	The estimation of the number of birds which occupy the swept volume	The time necessary for as transit through the action area of the blades	No. of birds which pass through the volume swept per time unit	*Prob. Collision %	No. of birds with collision risk without avoiding activities	Avoidance rate %	No. of birds with real risk of collision / season
					$V_r = N * \pi R^2 * (d + l)$				$n * (V_r/V_w)$	$t = (d + l) / v$					
<i>Accipiter gentilis</i>	2	0.52	0.97	11	1313920.44	96	960	0.001065	1.0224	0.4472	2.28	10.9	0.2485	98	0.0049
<i>Aquila pomarina</i>	4	0.60	1.55	12	1335285.00	68	1360	0.001082	1.4715	0.4166	3.53	11.0	0.3883	98	0.0077
<i>Buteo buteo</i>	2	0.52	1.20	12	1313920.44	96	960	0.001065	1.0224	0.4100	2.49	10.3	0.2564	98	0.0051
<i>Buteo rufinus</i>	4	0.54	1.42	10	1319261.58	96	1920	0.001069	2.0524	0.4940	4.15	12.2	0.5063	98	0.0101
<i>Circus aeruginosus</i>	1	0.49	1.27	11	1305908.73	82	410	0.001059	0.4341	0.4445	0.97	10.9	0.1057	98	0.0021
<i>Circus pygargus</i>	1	0.44	1.06	8	1292555.88	75	375	0.001048	0.3930	0.6050	0.64	13.8	0.0883	98	0.0017
<i>Falco tinnunculus</i>	8	0.34	0.73	13	1265850.18	96	3840	0.001026	3.9398	0.3646	10.80	8.5	0.9180	95	0.0459
<i>Falco vespertinus</i>	4	0.31	0.70	13	1257838.47	58	1160	0.001020	1.1832	0.3623	3.26	8.3	0.2705	95	0.0135
<i>Hieraaetus pennatus</i>	4	0.46	1.22	11	1297897.02	82	1640	0.001052	1.7252	0.4418	3.90	10.7	0.4173	98	0.0083

*According to the SNH methodology

5.2. The diversity and distribution of the nesting birds

5.2.1. Diurnal birds

For the estimation of the effect of the implementation of the project over the avifauna in Topolog area, there were performed several transects in the area of installation of the wind turbines and laying out of the exploitation roads. The such analyzed area is represented by agricultural lands and also by the splay crests of some deforested hills, covered by herbaceous vegetation (grazing ground), with some rocks and brushwood of *Crataegus monogyna* and *Rosa canina*.

The wind farm consisting of 42 turbines is located partially inside the Protected Area of Community Interest, as follows:

- 11 turbines inside **ROSCI0201 North Dobrogea Plateau** (LU-03, LU-04, LU-05, LU-06, LU-07, LU-08, LU-09, LU-10, LU-11, TO 01, ME – 08);
- one turbine inside **ROSPA0091 Babadag Forest** (ME – 08).

We mention that the transects 1, 3 and 4 are partially overlapped with *ROSCI0201 North Dobrogea Plateau*, and transect 1 with *ROSPA0091 Babadag Forest* (image 5.16).

The performance of transects on the location of the future wind farm allows the identification of the resident and/or nesting species in the area, allowing the estimation of the number of those species in the area of interest. Because of the fact that the observations were performed in the period of the months April and May (on April 20 and respectively May 23), in which the species of birds in the area are nesting, their results are conclusive for the analyzed aspect. So, it could be observed the beginning period in which it takes place the delimitation of the nesting territory through specific activities and also the nesting period. The manner of the performance of the transects, allowed the identification both of the nesting species in the open areas and also of the ones which prefer the brushwood areas or the forest borders. Also, there could be noticed species of diurnal predatory birds which are nesting in the wooded habitats located at North from the location of the future wind farm.

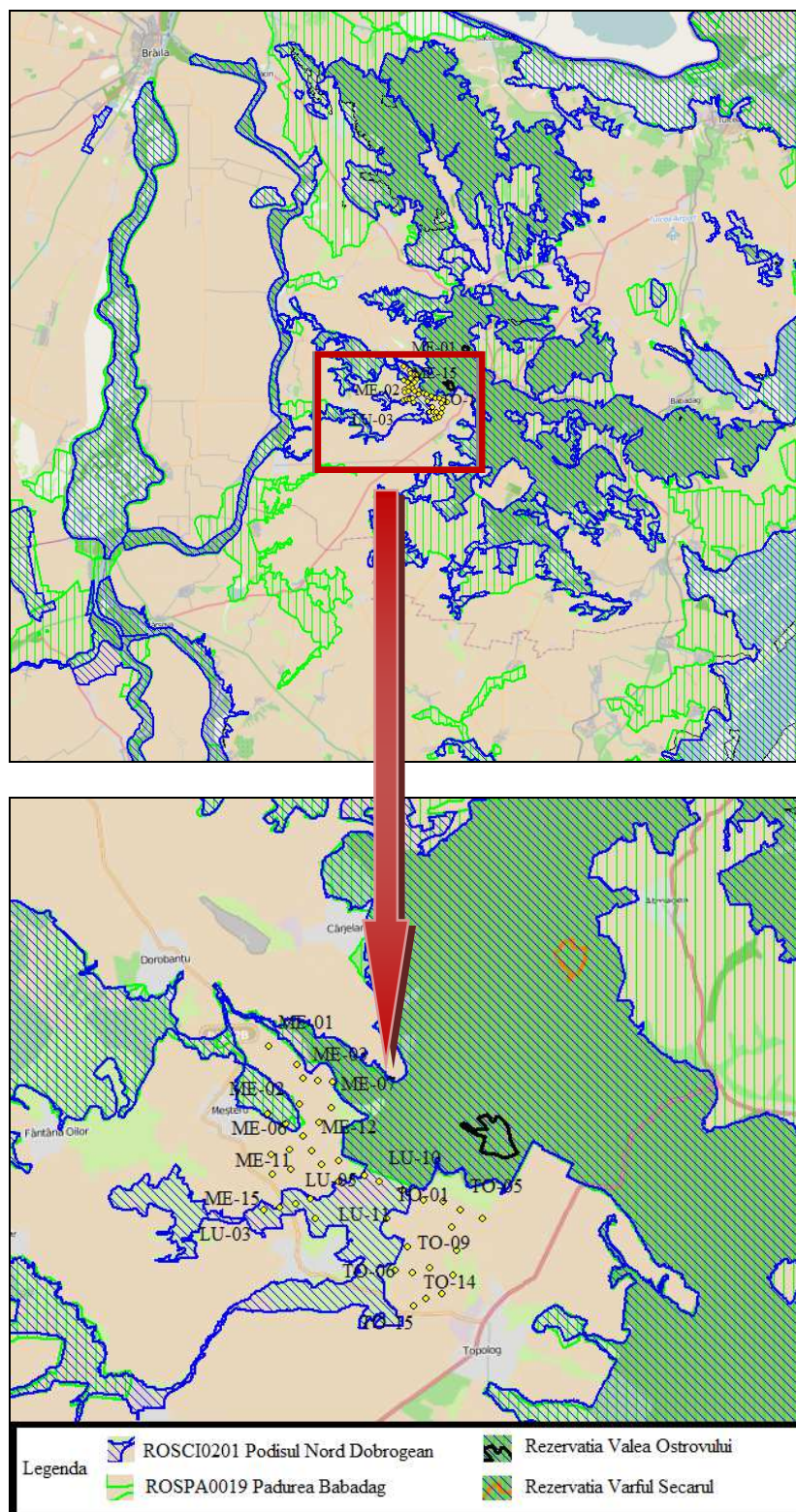


Image 5.16 Protected Areas Natura 2000 in the area of the wind farm

We subsequently present the results obtained following the performance of the transects for the monitoring of the species of nesting, diurnal birds.

Table 5.10. Species observed on transect and their conservation status according to the national and international legislation

Species	Total observations	GEO 57/2007	Conservation status according to Birds Directive (147/2009/CE.)	IUCN Category	Standard form of the protected area ROSPA0091	Bird Phenological Category
<i>Miliaria calandra</i>	113	Appendix 4B	-	LC	-	PM
<i>Calandrella brachydactyla</i>	50	Appendix 3	Appendix 1	LC	✓	OV
<i>Melanocorypha calandra</i>	24	Appendix 3	Appendix 1	LC	✓	PM
<i>Oenanthe oenanthe</i>	11	-	-	LC	✓	OV
<i>Falco tinnunculus</i>	9	Appendix 4B	-	LC	-	OV
<i>Sturnus vulgaris</i>	8	Appendix 5C	Appendix 2B	LC	✓	PM
<i>Merops apiaster</i>	7	Appendix 4B	-	LC	-	OV
<i>Corvus frugilegus</i>	6	Appendix 5C	Appendix 2B	LC	-	S
<i>Oenanthe isabellina</i>	5	-	-	LC	✓	OV
<i>Lanius collurio</i>	6	Appendix 3	Appendix 1	LC	✓	OV
<i>Fringilla coelebs</i>	4	-	-	LC	-	PM
<i>Corvus cornix</i>	4	Appendix 5C	Appendix 2B	LC	-	S

REPORT REGARDING THE MONITORING OF THE AVIFAUNA AND CHIROPTEROFAUNA ON THE LOCATION AND IN
THE VICINITY OF THE WIND FARM DOROBANTU-TOPOLOG, period March-June 2013

<i>Alauda arvensis</i>	4	Appendix 5C	Appendix 2B	LC	-	PM
<i>Hirundo rustica</i>	4	-	-	LC	✓	OV
<i>Streptopelia turtur</i>	4	Appendix 5C	Appendix 2B	LC	✓	OV
<i>Phasianus colchicus</i>	3	Appendix 5C,5D	Appendix 2A,3A	LC	-	S
<i>Riparia riparia</i>	3	-	-	LC	-	OV
<i>Erithacus rubecula</i>	2	Appendix 4 B	-	LC	-	OV, RI
<i>Circus aeruginosus</i>	2	Appendix 3	Appendix 1	LC	✓	OV
<i>Buteo buteo</i>	2	-	-	LC	✓	S
<i>Aquila pomarina</i>	2	Appendix 3	Appendix 1	LC	✓	OV
<i>Upupa epops</i>	2	Appendix 4B	-	LC	✓	OV
<i>Turdus merula</i>	2	-	Appendix 2B	LC	-	PM
<i>Motacilla flava</i>	2	Appendix 4B	-	LC	✓	OV
<i>Buteo rufinus</i>	2	Appendix 3	Appendix 1	LC	✓	P, OV
<i>Anthus campestris</i>	2	Appendix 3	Appendix 1	LC	✓	OV
<i>Passer domesticus</i>	2	-	-	LC	-	S
<i>Turdus philomelos</i>	1	Appendix 5C	Appendix 2B	LC	-	OV
<i>Sylvia atricapilla</i>	1	-	-	LC	✓	OV
<i>Streptopelia</i>	1	Appendix	Appendix 2B	LC	-	S

<i>decaocto</i>		5C				
<i>Sitta europaea</i>	1	Appendix 4B	-	LC	-	S
<i>Saxicola torquata</i>	1	-	-	LC	✓	OV
<i>Motacilla alba</i>	1	Appendix 4B	-	LC	✓	OV
<i>Hieraaetus pennatus</i>	1	Appendix 3	Appendix 1	LC	✓	OV
<i>Galerida cristata</i>	1	-	-	LC	-	S
<i>Dendrocopos major</i>	1	-	-	LC	-	S
<i>Cuculus canorus</i>	1	-	-	LC	✓	OV
<i>Circus pygargus</i>	1	Appendix 3	Appendix 1	LC	✓	OV
<i>Circus cyaneus</i>	1	Appendix 3	Appendix 1	LC	✓	OI
<i>Asio flammeus</i>	1	Appendix 3	Appendix 1	LC	-	OI
<i>Lanius minor</i>	1	Appendix 3	Appendix 1	LC	✓	OV

LEGEND

GEO 57/2007:

- **APPENDIX 3 SPECIES** – of plants and animals the conservation of which needs designing of the special conservation areas and birds and animals special protection areas
- **APPENDIX 4 B** – SPECIES OF NATIONAL INTEREST – Species of animals and plants requiring a strict protection
- **APPENDIX 5 C** – SPECIES OF COMMUNITY INTEREST the hunting of which is allowed
- **APPENDIX 5 D** – BIRDS SPECIES OF COMMUNITY INTEREST – the trading of which is allowed

Bird Category

OV – summer guest (they arrive on the territory of our country for breeding)

OI – winter guest (they arrive on the territory of our country for wintering)

RI – rarely in the winter

PM – partially migratory

Ac - occasionally (species which can be observed exceptionally, the majority having faraway the spreading area, and their apparition is more randomly)

P - passage (species which can be observed only during their migration to the nesting sites – in the spring, or to the wintering territories – in the autumn, without nesting representatives)

E - erratic (species observed outside of nesting period, either searching feed or with occasion of certain travels outside of their usual spreading borders)

S - sedentary (species the presence of which is evidenced during all months of the year)

IUCN Category:

With low risk (LC)

Conservation status according to Birds Directive (147/2009/CE.)

- **Appendix 1**- species of birds being the object of special conservation measures regarding the habitat, in order to ensure their surviving and breeding in their distribution area.

- **Appendix 2A, 2B** – species of protected birds, but which may be the object of hunting acts within national legislation, depending on their population level, geographic distribution and breeding coefficient in assembly of the Community (Appendix 2A- they may be hunted in the maritime and terrestrial geographic area of application of this directive and Appendix 2B- they may be hunted only within Member States for which they are specified)

- **Appendix 3A** – species of birds for which the trading may be regulated by the Member State after previously consultation of the Commission, together with which it studies if the trading of the specimens of respective species should not lead or risk to lead, according to any reasonable forecast, to endanger their population level, the geographical distribution or breeding coefficient in the assembly of the Community.

20 April 2013

5 transects were performed, covering the future site of the wind farm. The following situations resulted after analysis of the data obtained from observations on site.

Transect 1

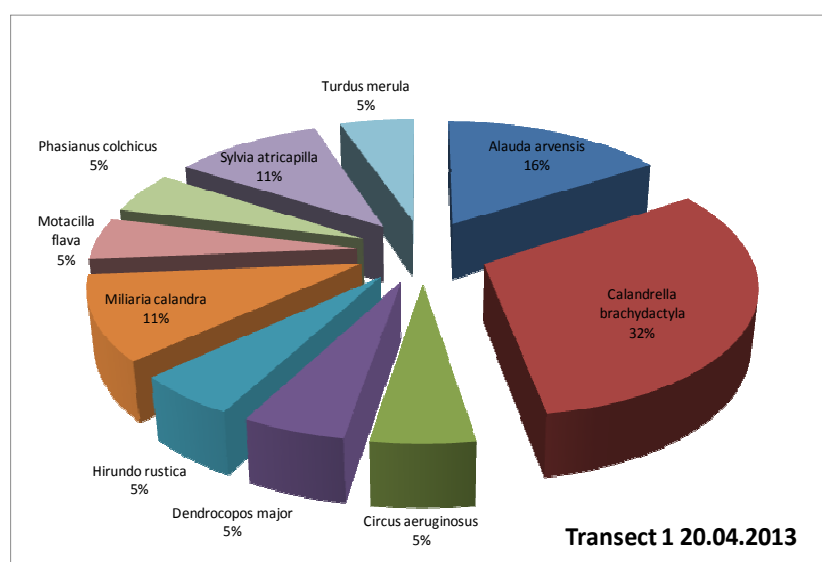


Figure 5.17– Composition of birds species – transect 1/20.04.2013

11 birds species were identified, the dominant species being *Calandrella brachydactyla* (32%) and *Alauda arvensis* (16%). The other species represented reduced numbers. Also the presence of the species *Circus aeruginosus* and *Dendrocopos major* is noted in the wooded area.

Transect 2

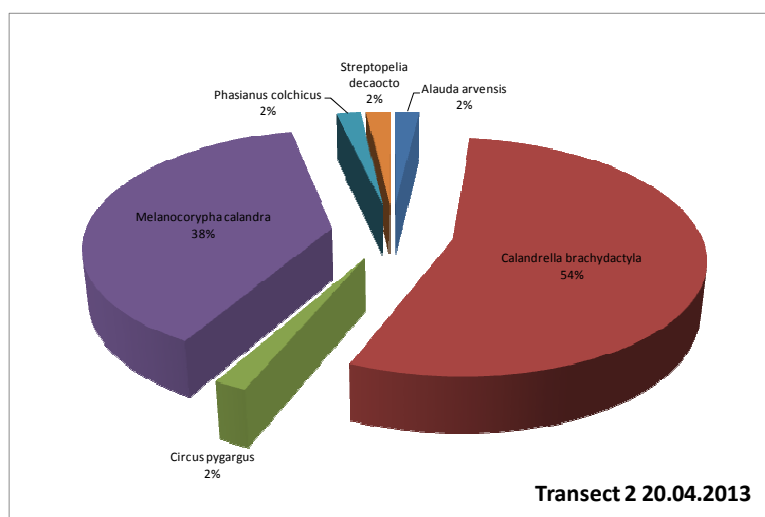


Figure 5.18– Composition of birds species – transect 2/20.04.2013

Only 6 species were identified, being a transect performed in areas of agro-ecosystems. It is observed the dominance of the species *Calandrella brachydactyla* and *Melanocorypha calandra* with 54% respective 38%. Also in this transect a predatory species appears – *Circus pygargus*.

Transect 3

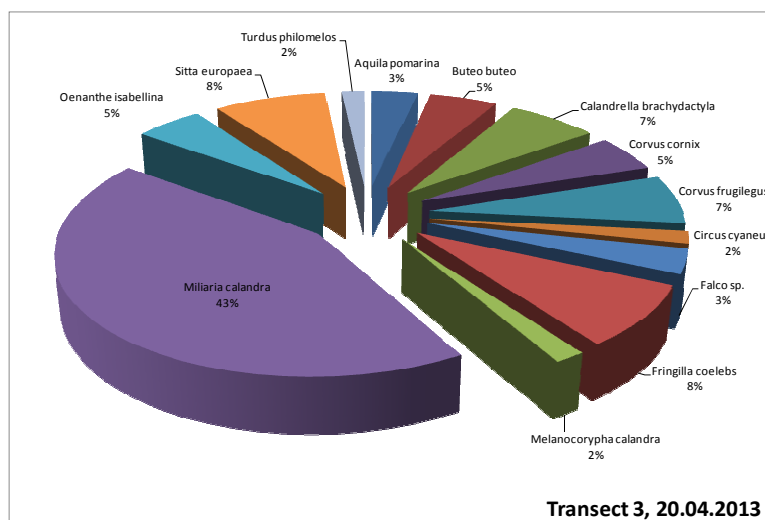


Figure 5.19. Composition of birds species – transect 3/20.04.2013

The transect being more complex regarding the composition of the covered habitats – pasture areas, agro-ecosystems (plowland) and respectively the margin of the wooden area included in ROSPA Babadag Forest, the number of species is higher – 13 species – the clear dominance of the species *Miliaria calandra* (43%) being observed also in this case. Important effectives appear also to *Fringilla coelebs*, due to the presence in the transect area of the margin of above mentioned protected area. From the birds of prey, *Aquila pomarina* (2 ex), *Circus cyaneus* (1 ex), *Buteo buteo* (2 ex) and more probable 2 exemplars of *Falco tinnunculus* were identified on the transect (considering also the hour to which the observations were performed). The total percents of the birds of prey reach to 13%, the covered area being used as feeding niche.

Transect 4

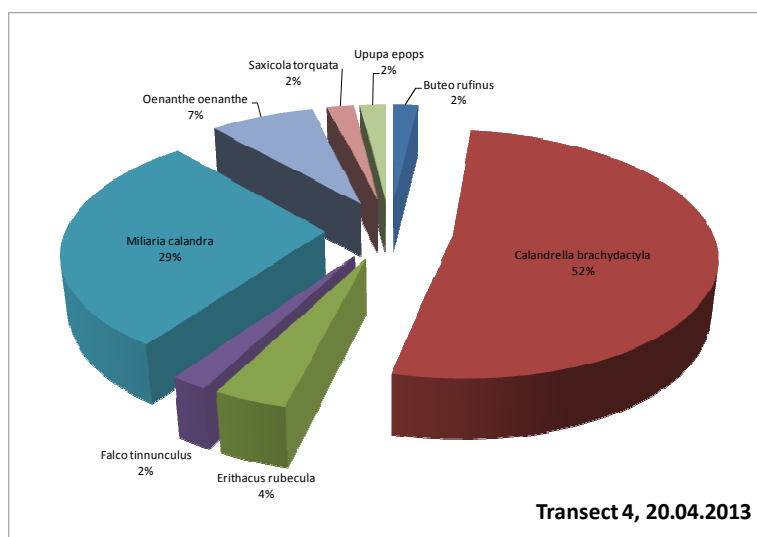


Figure 5.20. Composition of birds species – transect 4/20.04.2013

Over the transect – which covered in particular agro-ecosystems and pastures – 8 species of birds were identified. Considering the habitat type, *Calandrella brachydactyla* (52%) and *Miliaria calandra* (29%) were dominant. Two species were identified between birds of prey – *Buteo rufinus* and *Falco tinnunculus*, and due to the presence of characteristic habitat – rockery at day – also *Oenanthe oenanthe* (7%) was observed.

Transect 5

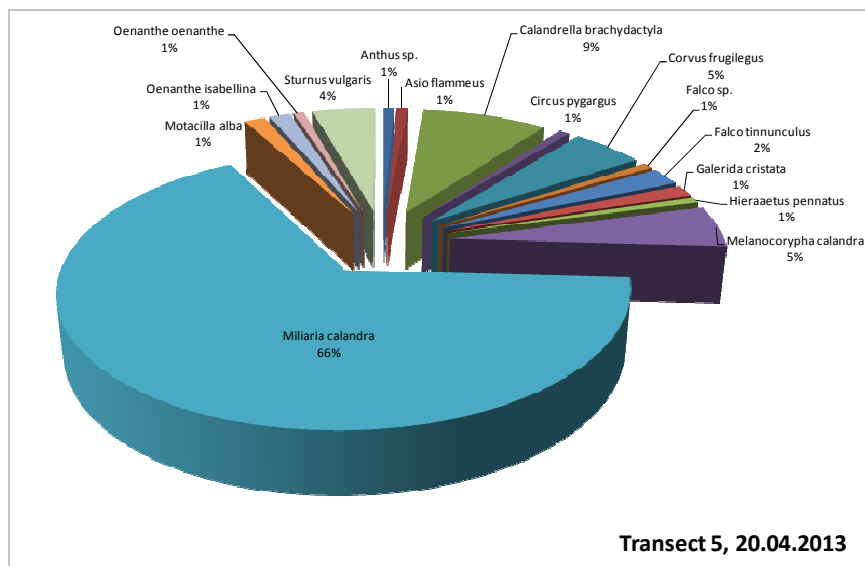


Figure 5.21. Composition of birds species – transect 5/20.04.2013

The transect covered in particular the pasture area adjacent to Babadag Forest. The most numerous in the area were the exemplars of *Miliaria calandra* (66%), followed by other two species characteristic for these types of habitat – *Melanocorypha calandra* (5%) and *Calandrella brachydactyla* (9%). Between birds of prey, *Asio flammeus* (1%), *Falco tinnunculus* (2%), *Hieraaetus pennatus* (1%) were identified. Two species of *Oenanthe* : *Oenanthe oenanthe* (1%) and *Oenanthe isabellina* (1%) were identified within the areas with abruptions.

23 May 2013

In May, the transects were retaken in the area of installation of the wind farm, in order to highlight the differences occurred within birds life and for precise identification of the nestling species in area.

Transect 1

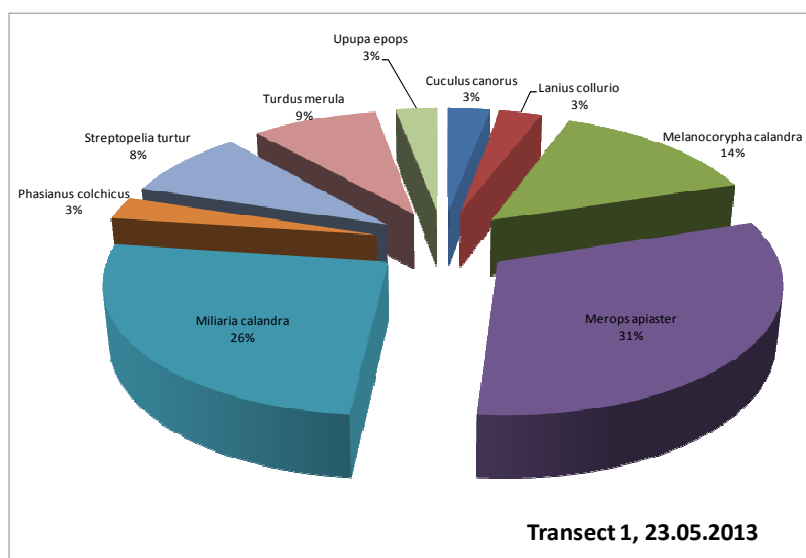


Figure 5.22. Composition of birds species – transect 1/23.05.2013

9 species were identified on the transect. In this case it is observed the dominance of the species preferring for resting, shelter and observation point the shrub vegetation, *Merops apiaster* (31%), *Miliaria calandra* (26%), *Turdus merula* (9%), *Lanius collurio* (3%). Considering the particular manner of feeding of the European bee-eaters and the fact that in area there were still plants with flowers attracting hymenoptera and diptera – we consider that the basic feed of these birds is on the pasture surfaces from the *area of transect 1* representing the feeding niche for the given species. High percent (14%) of the exemplars from the species *Melanocorypha callandra* is explained by the fact that the covered transect crosses both agricultural lands and areas with secondary steppe vegetation, both types of habitats being preferred by this species.

Transect 2

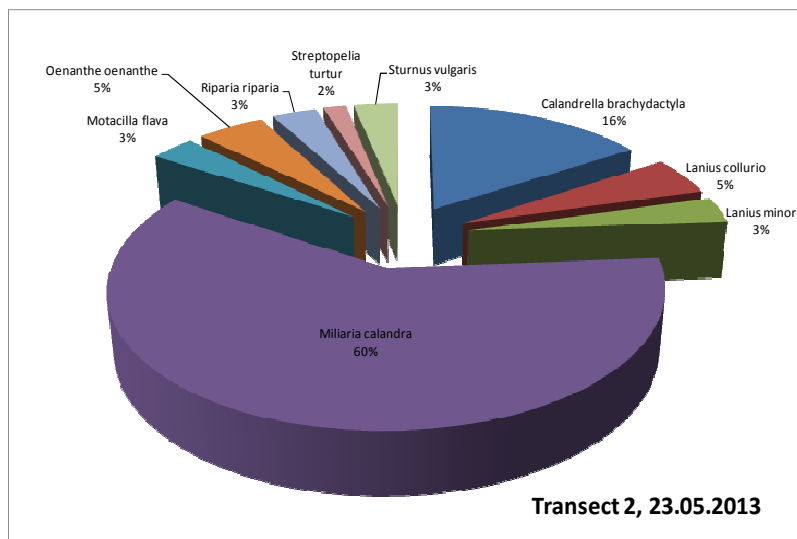


Figure 5.23. Composition of birds species – transect 2/23.05.2013

On the transect 2, the most numerous exemplars were those of the species *Miliaria calandra* (60%), followed by *Calandrella brachydactyla* (16%). In the area it is observed the presence of red backed shrike – *Lanius collurio* (5%), as well as of the species *Lanius minor* (3%).

Transect 3

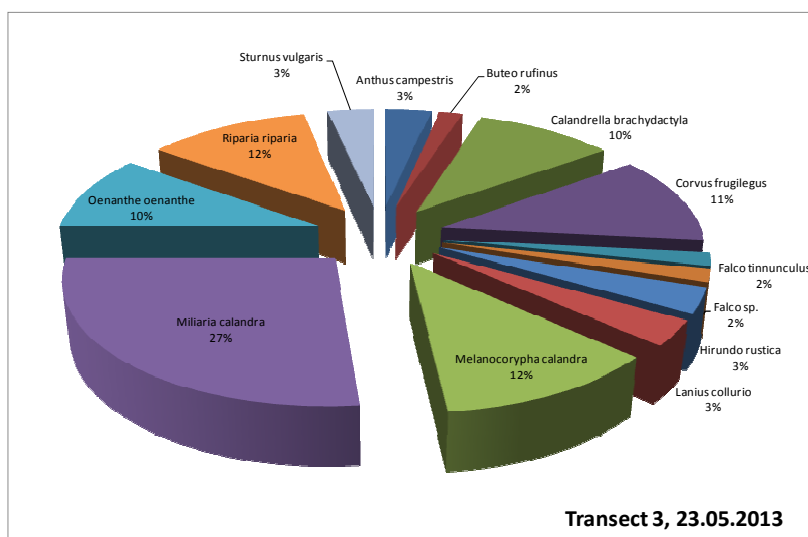


Figure 5.24. Composition of birds species – transect 3/23.05.2013

On the track of transect 3, the dominant species remain *Miliaria calandra* and *Melanocorypha calandra*, with 27% and 12% respectively. *Calandrella brachydactyla* appears present with 10%, being also a dominant species. *Buteo rufinus* (2%) and *Falco tinnunculus* (approx. 4%) were identified among birds of prey, both feeding in the area. Also *Oenanthe oenanthe* appears with numbers relatively important (10%).

Transect 4

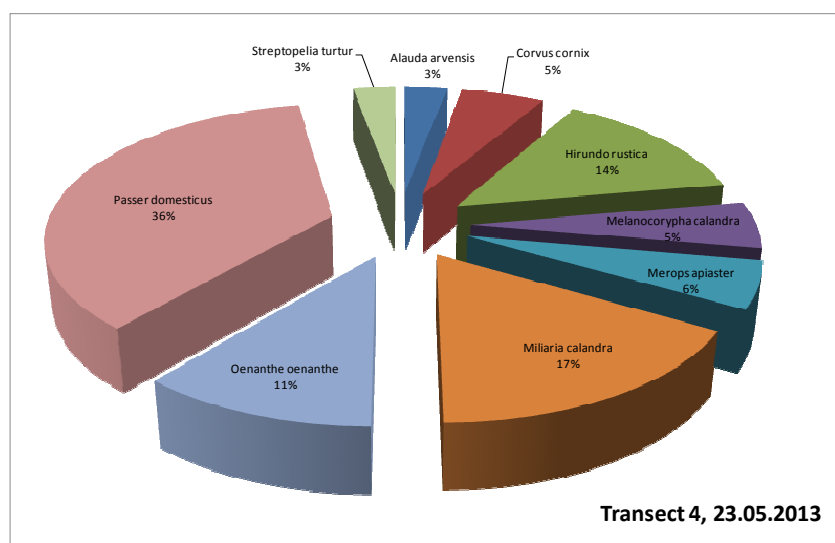


Figure 5.25. Composition of birds species – transect 4/23.05.2013

The transect 4 is characterized by presence of the following dominant species: *Miliaria calandra* (17%), *Oenanthe oenanthe* (11%) and *Passer domesticus* (36%). Presence of a significant percent of dwelling sparrows is due to approach of anthropic areas. Also European bee-eaters – *Merops apiaster* (6%) were identified within area of transect, during feeding.

Transect 5

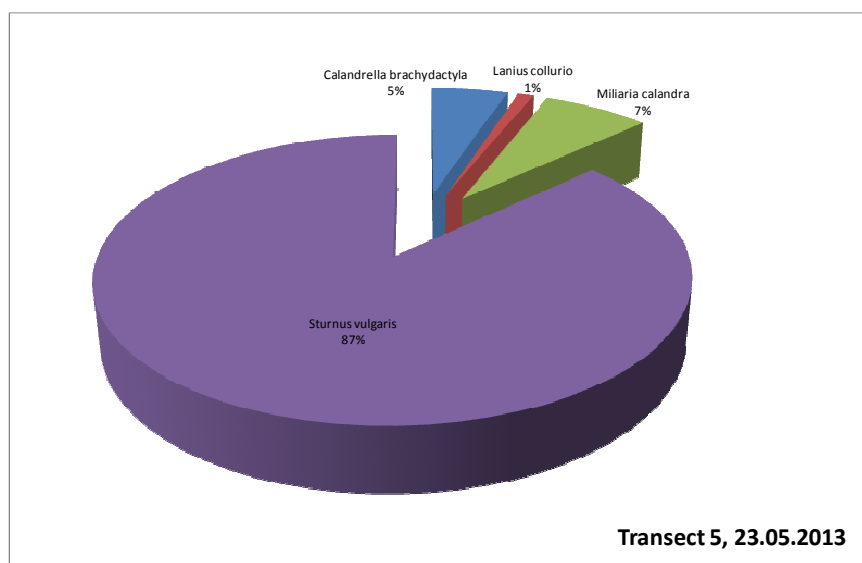


Figure 5.26. Composition of birds species – transect 5/23.05.2013

On the track of transect 5, the most exemplars belonged to the species *Sturnus vulgaris* (starling), found in transit over the analyzed pasture area. Both *Miliaria calandra* and *Calandrella brachydactyla* recorded low percents - 7% respectively 5%. Also *Lanius collurio* 1% was identified on the track of transect, within area of margin.

Analyzing in assembly both series of transects, it is observed that the dominant species were those characteristic to the habitat areas of secondary steppe or pasture or agricultural lands (agro-ecosystems) – *Miliaria calandra* – with percents between 7 and 66%, *Calandrella brachydactyla* – with percents between 5 and 52% and *Melanocorypha calandra* – with percents between 2 and 38%. These species use the analyzed area as area for nesting and feeding.

As birds of prey, *Buteo rufinus* and *Falco tinnunculus* appear constantly in the analyzed area, both species nesting within wooded area included in ROSCI Babadag Forest. Also *Aquila pomarina*, *Hieraaetus pennatus*, *Buteo buteo*, *Circus aeruginosus*, *Asio flammeus* are observed being present within area as birds of prey, these species using the respective habitats as feeding area.



Figure 5.27b Representative habitats in the area of transect 1

The only nests observed as a result of covering of the transects within area of wind farm are located on transect 1, having the following coordinates:

Nest 1: N44 55.987 E28 20.033

Nest 2: N44 56.093 E28 19.844

Nest 3 N44 56.102 E28 19.810



Location of nests towards the wind farm

The nests 2 and 3 are old nests of birds, without eggs or broods in them, visibly altered by the meteorological conditions, observed in the pasture area, in the shrub vegetation.



Figure 5.28b Old nests of birds (Nest 2 and Nest 3)

The nest 1 is of lark, placed directly on soil and marked with dry herbaceous vegetation.



Figure 5.28c Lark nest (Nest 1)

The approximate distances from nests to the nearest wind turbines are:

- approx. 286 m from Nest 1 to ME05
- approx. 404 m from Nest 2 to ME04
- approx. 395 m from Nest 3 to ME02

Transect 2

Majority of the observed species and exemplars are grouped on the left side of the track towards travel direction, at less of 100 m towards observers. Type of lands – agro-ecosystems (arable land) and pasture.

The most observations were performed in the middle area and in the end third of the transect, within agricultural habitats (arable land).

The most observations were performed on flying birds (19) comparing with 11 standing birds.

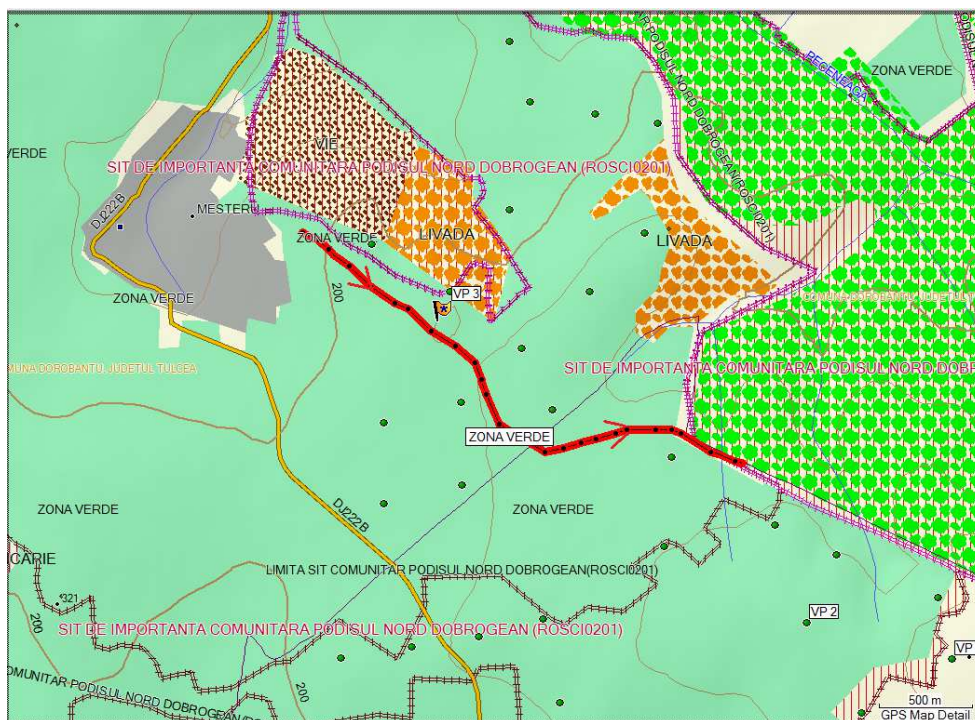


Fig. 5.29a Track and direction of crossing of transect 2



Fig. 5.29b Representative habitats within area of transect 2

Transect 3

The most observed species and exemplars were located on the left side of the track towards travel direction, at a distance of less of 100 m towards observers, in different habitats – arable land, pastures, wooded areas.

The most observations were performed on the last part of the transect, in agricultural habitats, pasture or forest habitats.

As of the observations, 25 concerned flying birds and 16 birds found on soil or standing on bushes or in trees.

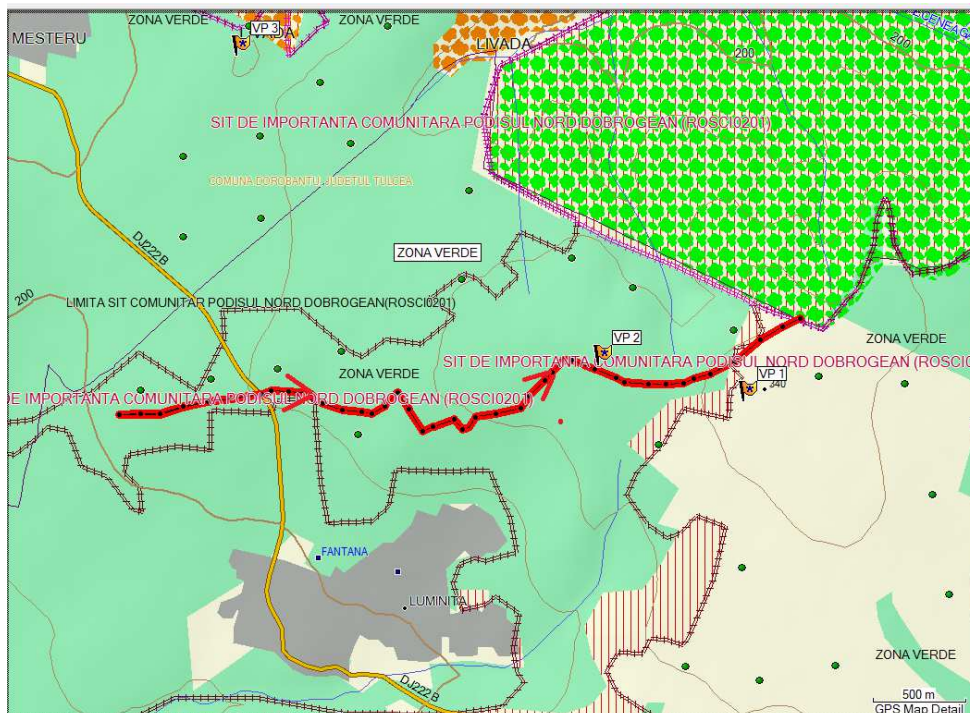


Figure 5.30a Track and direction of crossing of transect 3



Figure 5.30b Representative habitats within area of transect 3

Transect 4

Distribution of the species and exemplars is balanced; on the left side of the transect, the most observations were performed within limit of less of 100 m towards observers, while on the right side, the observations performed at distance higher than 100 m are more numerous.

The most numerous observations were performed in first third of the monitoring transect, in habitats of pasture and arable land.

As regards the activity status, it were observed both flying birds, singing or not, birds standing on soil, feeding or fighting with other exemplars for nesting territory.

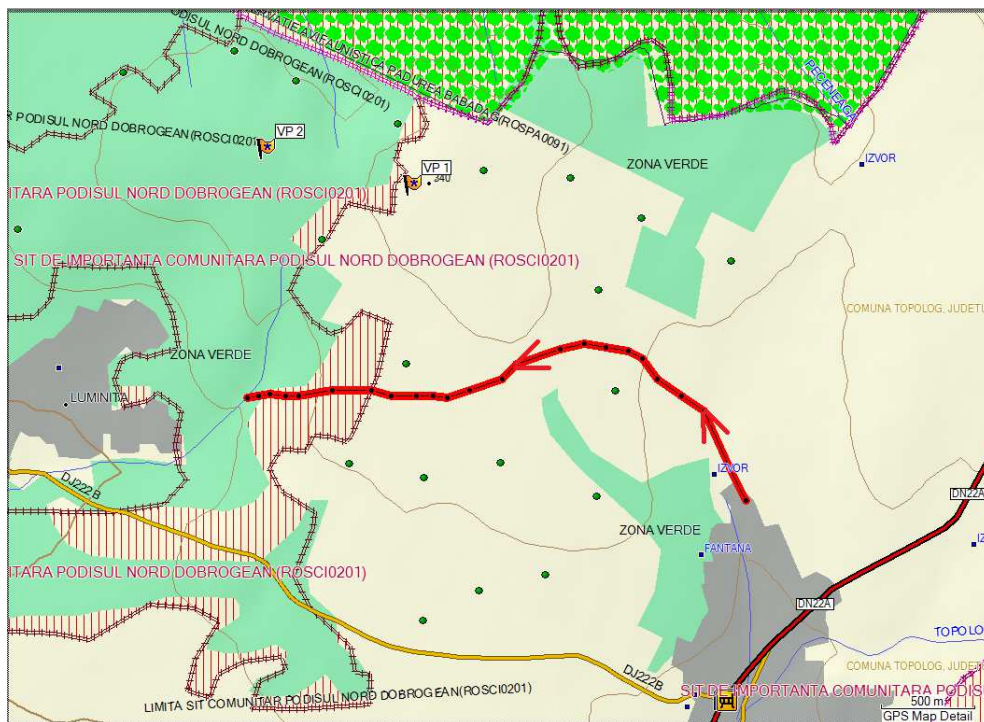


Figure 5.31a Track and direction of crossing of transect 4



Figure 5.31b Representative habitats within area of transect 4

Transect 5

Distribution of the observed species and exemplars is balanced, within limits of up to 100 m towards observers being identified in fact the majority of birds, both on right side and left side of the transect.

Distribution of the observations on length of the transect was balanced. The most part of the observations concerned flying birds, in case of species *Melanocorypha calandra* and *Miliaria calandra* these being singing males.



Figure 5.32a Track and direction of crossing of transect 5



Figure 5.32b Representative habitats within area of transect 5

May 2013

Transect 1

The most numerous observations were performed on left side of the transect, within limits of up to 100 m distance from observers.

As regards the distribution of observations towards total length of the transect, it is found a balanced distribution of them.

As regards the activity status, flying birds, birds singing in trees (marking of nesting territory) or singing in fly birds were observed.



Figure 5.33 *Alauda arvensis*

Transect 2

The most observations were performed within limit of 100 m towards observers, both on right side and left side of the transect. The number of observations performed at a distance higher of 100 m is very low.

The distribution of the observations towards total length of the transect is balanced.

As regards the activity of the observed birds, the most were flying, others being in rest on soil or in the shrub vegetation.



Figure 5.34 *Lanius collurio*

Transect 3

Both on right side and on left side of the track, the higher number of identified birds was observed, within limit of up to 100 m towards observers. On the right side of the transect it appears also a relatively important number of birds, at a distance over 100 m towards observers.

In case of this transect, the most observations were performed in the end third of it, in habitats of pasture.

The most birds observed on this transect were in fly, a low number being on soil or in trees.



Figure 5.35 *Miliaria calandra*

Transect 4

The observations were performed within limits of up to 100 m towards observers, both on right side and left side of the transect. No birds were identified at a distance higher than 100 m from observers.

The most observations were performed in first third of the track, in pasture habitats

Majority of the observations concerned flying birds, singing in order to mark their territory. Less exemplars were observed resting on soil.



Figure 5.36 *Erithacus rubecula*

Transect 5

The higher number of observations was performed in this case at a distance of over 100 m towards observer, on right side of the transect. But if it is considered the fact that in the respective case the birds were a starlings flight crossing the pasture, the most numerous observations are located also within limit of up to 100 m towards observer, both on right side and left side of the transect.

The most observations were performed on first third of the track, in pasture habitats.

The most observations concerned flying birds.



Figure 5.37 *Galerida cristata*

Numerical analysis of the species observed on transects

Analysis of the number of observations performed during performance of the transects showed that within two periods of observations – in April and respective May – there are differences, due to the activity status of the birds during the two months.

Thus, 192 observations were recorded in April on transects, while 107 were recorded in May (Table 5.11a). Comparing the transects between them depending on the number of performed observations, it is found that differences appear from case to case, depending on activity status of the birds. Within period of the nuptial parade, the activity of males is more intense and this was the reason for which more observations were recorded on certain transects in April. In May, during the nesting season, the adults were less visible.

Table 5.11a Number of observations on transects

Transect	No. of observations in April	No. of observations in May
Transect 1	16	17
Transect 2	31	33
Transect 3	41	28
Transect 4	17	18
Transect 5	87	11
Total observations = 299	192	107

As regards the number of observations related to number of species (Table 5.11b), it may be found that the most observations are connected in both periods of analysis with three species – *Miliaria calandra*, *Calandrella brachydactyla* and *Melanocorypha calandra*, all the three being characteristic to the types of habitats existent in the area.

In April, 69% from observations were for the three mentioned species (*Miliaria calandra* with 78 observations, *Calandrella brachydactyla* with 38 and *Melanocorypha calandra* with 18). In the same month, species with 7 observations (one species), with 5 observations (one species), with 4 observations and 3 observations (2 species), with 2 observations (7 species) and with one observation (20 species) were recorded on transects. The birds of prey appear with fewer observations: *Falco tinnunculus* with 7, *Buteo buteo* with 2, *Aquila pomarina*, *Hieraaetus pennatus*, *Circus pygargus*, *Circus cyaneus*, *Buteo rufinus* and *Asio flammeus* with one observation each.

Table 5.11b Number of observations on transects related to number of species

Species	Total Transects/ April	Total Transects/ May	Total
<i>Miliaria calandra</i>	78	35	113
<i>Calandrella brachydactyla</i>	38	12	50
<i>Melanocorypha calandra</i>	18	6	24
<i>Oenanthe oenanthe</i>	2	9	11
<i>Falco tinnunculus</i>	7	2	9
<i>Sturnus vulgaris</i>	2	6	8

<i>Merops apiaster</i>	-	7	7
<i>Corvus frugilegus</i>	4	2	6
<i>Oenanthe isabellina</i>	5	-	5
<i>Lanius collurio</i>	-	6	6
<i>Fringilla coelebs</i>	4	-	4
<i>Corvus cornix</i>	3	1	4
<i>Alauda arvensis</i>	3	1	4
<i>Hirundo rustica</i>	1	3	4
<i>Streptopelia turtur</i>	-	4	4
<i>Phasianus colchicus</i>	2	1	3
<i>Riparia riparia</i>	-	3	3
<i>Erithacus rubecula</i>	2	-	2
<i>Circus aeruginosus</i>	2	-	2
<i>Buteo buteo</i>	2	-	2
<i>Aquila pomarina</i>	2	-	2
<i>Upupa epops</i>	1	1	2
<i>Turdus merula</i>	1	1	2
<i>Motacilla flava</i>	1	1	2
<i>Buteo rufinus</i>	1	1	2
<i>Anthus campestris</i>	1	1	2
<i>Passer domesticus</i>	-	2	2
<i>Turdus philomelos</i>	1	-	1
<i>Sylvia atricapilla</i>	1	-	1
<i>Streptopelia decaocto</i>	1	-	1
<i>Sitta europaea</i>	1	-	1
<i>Saxicola torquata</i>	1	-	1
<i>Motacilla alba</i>	1	-	1
<i>Hieraaetus pennatus</i>	1	-	1
<i>Galerida cristata</i>	1	-	1
<i>Dendrocopos major</i>	1	-	1
<i>Cuculus canorus</i>	-	1	1
<i>Circus pygargus</i>	1		1
<i>Circus cyaneus</i>	1	-	1
<i>Asio flammeus</i>	1	-	1
<i>Lanius minor</i>	-	1	1

For May, the data are a little different. Only *Miliaria calandra* and *Calandrella brachydactyla* record 45% from observations, 6 species record between 8 and 4 observations, 3

species two observations each and 9 species one observation each. The observed predatory species have a low number of observations each – *Lanius collurio* – 5 observations, *Falco tinnunculus* 2 observations, *Buteo rufinus* – one observation and *Lanius minor* – also one observation.

If the data are analyzed in total, the same three dominant species - *Miliaria calandra*, *Calandrella brachydactyla* and *Melanocorypha calandra* – record near 63% of observations. One species – *Oenanthe oenanthe* – records 10 observations, *Falco tinnunculus* – 9, *Sturnus vulgaris* – 8, *Merops apiaster* – 7, *Corvus frugilegus* – 6, *Oenanthe isabellina* and *Lanius collurio* 5 observations each. Five species record 4 observations each, three observations – 2 species, 2 observations - 10 species and one observation – 14 species. Excepting *Falco tinnunculus*, the other species of birds of prey presented in total 2 observations each – *Circus aeruginosus*, *Buteo rufinus*, *Buteo buteo*, *Aquila pomarina* – respectively one observation each – *Circus pygargus*, *Circus cyaneus*, *Buteo rufinus*, *Asio flammeus* and *Lanius minor*.

Identification of nests in wooded area

Additional to the transects performed on the site of wind farm, 3 transects (A,B,C) were performed (Fig. 5.39), in April, in the area of Babadag Forest, in order to identify some potential nests or birds of prey. The results of the monitoring on transects of the wooded area adjacent to the wind farm were materialized in identification of 7 nests of birds of prey and more nests which may belong to the birds species having the preferential habitat represented by old forests: *Dendrocopus major*, *Dryocopus martius*, *Picus canus*, *Sitta europea*, *Parus major*, *Parus lugubris*, *Parus caeruleus*, but which may be used also by owls and species of forestry chiropters (Fig. 5.38).



Figure 5.38. Nests observed in the forest

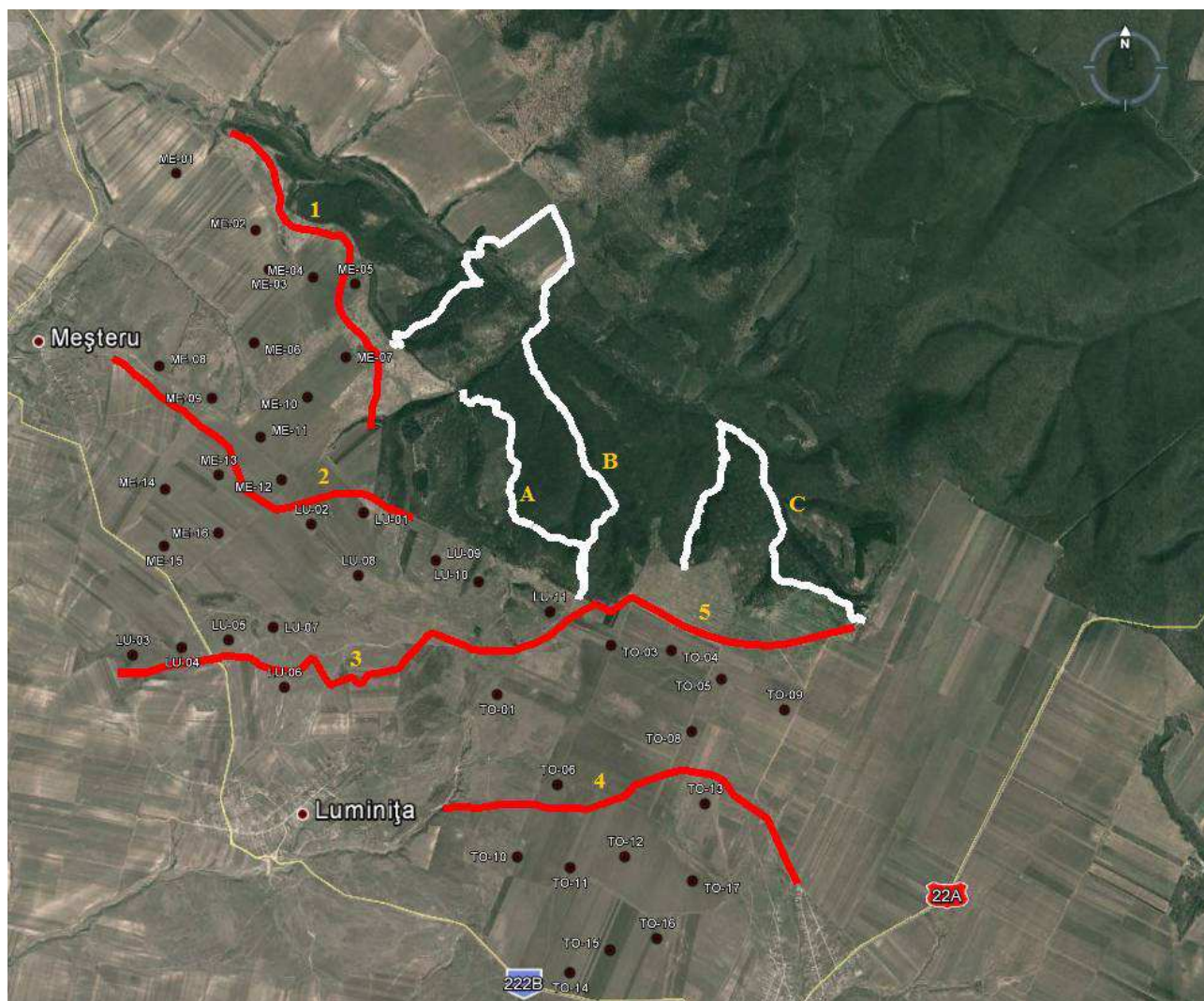





Figure 5.39. Transects crossed within period March - June 2013

Table 5.12 Coordinates of the nests on transect A

Transect A		
Coordinates of initial point: N44 54.533 E28 21.424		
Coordinates of final point: N44 55.596 E28 20.340		
No. of the nest	Coordinates of the nest	Foto
Nest 1	N44 55.072 E28 21.489	
Nest 2	N44 55.119 E28 21.465	
Nest 3	N44 55.232 E28 21.411	



Nest 4	N44 55.475 E28 21.186	
Nest 5	N44 55.649 E28 21.174	



Figure 5.40. Transect A

Table 5.13 Coordinates of the nests on transect B



*Transect B		
Coordinates of initial point: N44 54.529 E28 21.418		
Coordinates of final point: N44 55.398 E28 20.710		
No. of the nest	Coordinates of the nest	Foto
-	-	-

- **No nest of predatory species was observed on transect B**



Figure 5.41. Transect B

Table 5.14 Coordinates of the nests on transect C

Transect C		
Coordinates of initial point: N44 54.655 E28 22.028		
Coordinates of final point: N44 54.448 E28 23.068		
No. of the nest	Coordinates of the nest	Foto
Nest 6	N44 54.826 E28 22.128	
Nest 7	N44 55.125 E28 22.534	

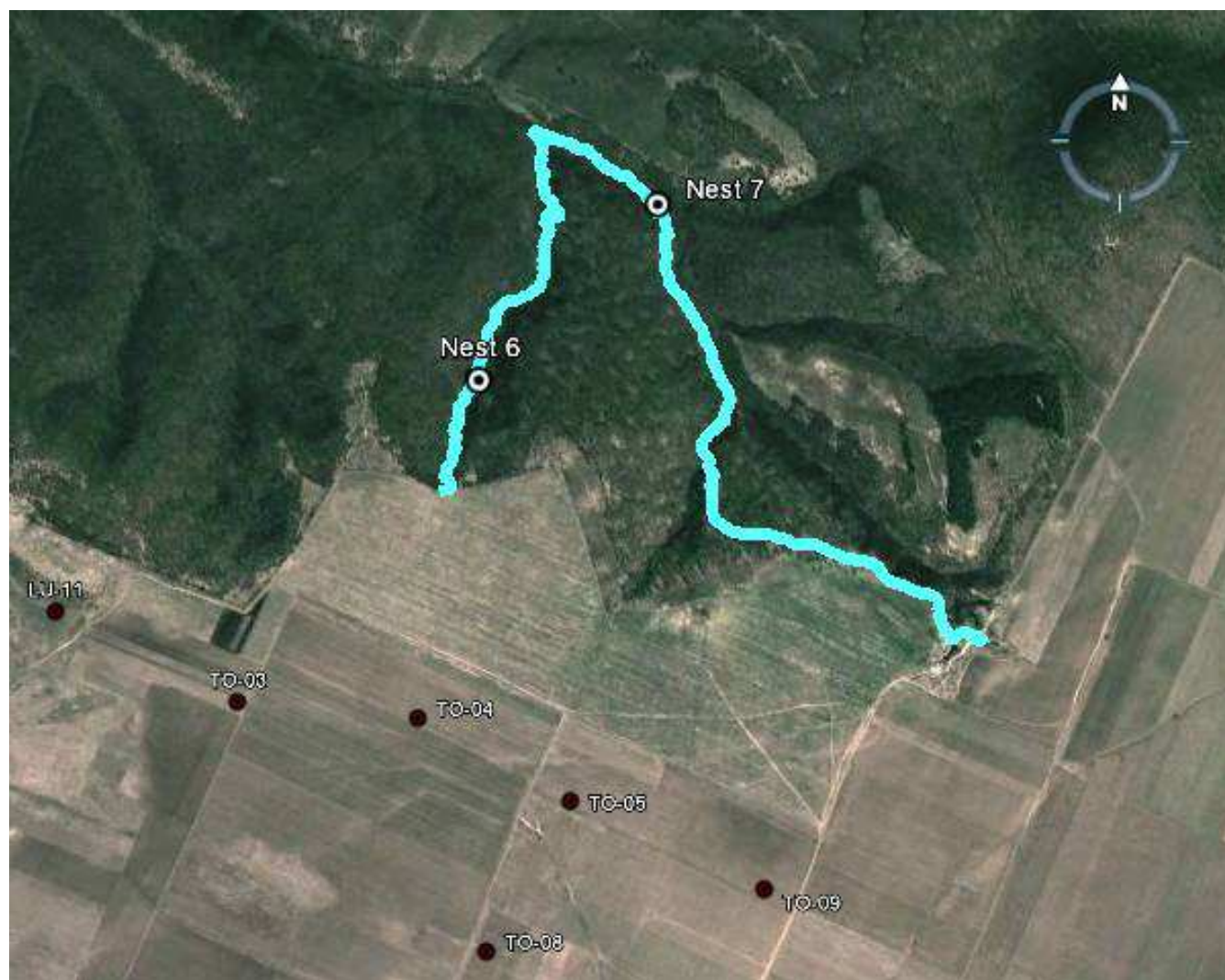


Figure 5.42. Transect C

It must be noted the fact that all the 7 nests of birds of prey were observed in the wooden valleys of some temporary water courses, where the trees, due to the climatic and soil conditions and competition for the trophic resources, are higher (as it may be seen in the below figure). Another aspect to be noted is the fact that valley areas present a specific micro-climate, and the wooded coasts delimiting the mentioned valleys attenuate the winds power.

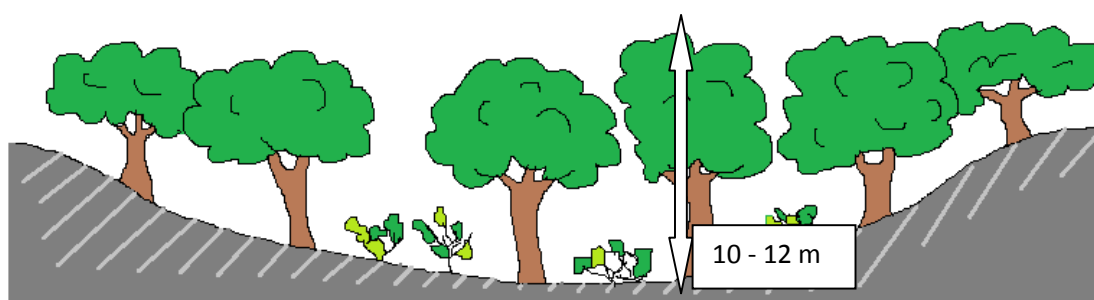


Figure 5.43. Structure of the forest in analyzed area

Further we present the approximate distances from birds of prey nests to the nearest constructed elements of the wind farm (wind turbines):

- approx. 1149 m from Nest 1 to turbine LU 11
- approx. 1240 m from Nest 2 to turbine LU 10
- approx. 1386 m from Nest 3 to turbine LU 10
- approx. 1651 m from Nest 4 to turbine LU 9
- approx. 1435 m from Nest 5 to turbine ME 5
- approx. 965 m from Nest 6 to turbine TO 4
- approx. 1670 m from Nest 7 to turbine TO 4

5.2.2. Nocturnal birds

As a result of travels on the site performed for the purpose of monitoring of presence/absence and activity of nocturnal birds activity, a set of data was collected, expressed in the following table.

Table 5.15 Species of nocturnal birds identified during the monitoring

Species	No. of individuals	G.E.O. 57/2007	Red List IUCN	ROSPA 0091 Babdag Forest	Bird Phenological Category
<i>Athene noctua</i>	1	Appendix 4B	LC	-	S
<i>Lullula arborea</i>	25-30	Appendix 3	-	✓	OV
<i>Strix aluco</i>	2	-	LC	-	S
<i>Otus scops</i>	1	Appendix 4B	LC	-	OV
<i>Asio flammeus</i>	1	Appendix 3	LC	-	OI

LEGEND

GEO 57/2007:

- **APPENDIX 3 SPECIES** - of plants and animals the conservation of which needs designing of the special conservation areas and birds and animals special protection areas

- **APPENDIX 4 B** – SPECIES OF NATIONAL INTEREST – Species of animals and plants requiring a strict protection

Bird Category

OV – summer guest (they arrive on the territory of our country for breeding)

OI – winter guest (they arrive on the territory of our country for wintering)

S - sedentary (species the presence of which is evidenced during all months of the year)

IUCN Category:

- With low risk (LC)

Observation points were selected within monitoring of nocturnal birds, coinciding with points of bio-acoustic monitoring of the bats. Thus, 3 species were recorded and identified: *Athene noctua*, *Strix aluco* (nocturnal birds of prey) and *Lullula arborea* (forest lark), known also for its singing in the night or crepuscule period.

The species *Athene noctua* (owlet) was identified within recording of station 1, found in the immediate adjacency of Topolog Locality. This fact is correlated with preference of this species for sheltering in barns, house lofts, etc., feeding also with rodents.

On the majority of recordings performed in the studied area, the species *Lullula arborea* (forest lark), is heard, but in particular within stations located in the margin of the forest, the location of the records being in accordance with the preferences of the species for breeding and nesting – wooded areas.

Tawny owl (*Strix aluco*) prefers the areas wooded with old and hollow trees, where it may be sheltered with facility and finds enough feed in the margin of the forests or in openings.

It is a territorial species, and within its trophic preferences there are different species of bats, which it can catch even flying. Within records performed by our team in order to monitor the nocturnal birds, this species was identified only one time (2 exemplars) in point 1 near Babadag Forest, fact correlated with habitat preferences of the species.

Over the transects performed in order to monitor the nocturnal birds, other two species of nocturnal birds of prey were observed, and namely: *Otus scops* (Scops owl) and *Asio flammeus* (short-eared owl). We specify the fact that both species were observed and photographed within crepuscule period.

Otus scops is a species of night bird of prey having the maximum of activity from sunset until middle of the night. During the day it stays sheltered in hollows of the trees or on branches with dense leaves, and in the evening it goes in open areas adjacent to the forests. It was observed by our team after performance of transects in March in the margin of the forest, at beginning of the night monitoring activity. We specify that this species was identified during the period of spring migration, being summer guest in our country.

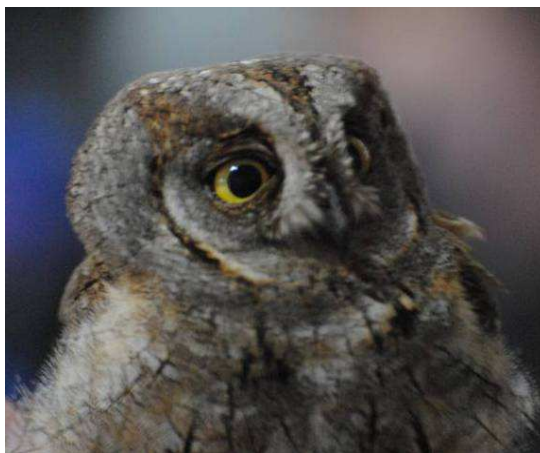


Figure 5.44. *Otus scops*

Asio flammeus (short-eared owl) is a species of bird of prey from order Strigiformes, but in contrast with other species of this order, its maximum period of activity is in the early morning, sometimes in the day also. Rarely, it may extend its activity to the evening, but in the night they go to the shelter. They prefer the open areas with very little trees, nesting on soil in high grass. It migrates from North, being winter guest in our country.

This species was identified by our team after performance of transects of nocturnal birds monitoring, in April, upon beginning of the monitoring activity during the evening.



Figure 5.45. *Asio flammeus*

The map with locations where the migratory or sedentary nocturnal birds of prey were recorded or observed is presented in the following figure.



Figure 5.46. The map with stations for monitoring of nocturnal birds

5.3. Diversity and abundance of bats species

Considering the potential negative impacts both on bats populations and on their habitats, as follows:

- Affecting, perturbing or destroying of habitats of feeding and destroying of shelters;
- Increasing of the risk of collision of flying bats;
- Disorientation of flying bats by emission of ultrasound noises.

Careful monitoring of the locations of future wind farms is needed in order to obtain as complete as possible data about diversity and abundance of the representatives of this important group of mammals. For this purpose, travels were performed within March – June 2013, both during the night – for bio-acoustic monitoring, and during the day in order to identify the shelters (caverns, caves, hollows).

The followings were identified after site monitoring

Table 5.16 Fauna of chiropters identified after monitoring

Species	Identification method	Red List IUCN	GEO 57/2007	*Presence in the standard form of SCI North Dobrogean Plateau
<i>Eptesicus serotinus</i>	ultrasounds	LC	Appendix 4A	-
<i>Myotis daubentonii</i>	ultrasounds	LC	Appendix 4A	-
<i>Nyctalus noctula</i>	ultrasounds	LC	Appendix 4A	-
<i>Nyctalus leisleri</i>	ultrasounds	LC	Appendix 4A	-
<i>Pipistrellus pipistrellus</i>	ultrasounds	LC	Appendix 4A	-
<i>Barbastella barbastellus</i>	ultrasounds	NT	Appendix 3, 4A	-
<i>Plecotus auritus</i>	direct observations	LC	Appendix 4A	-
<i>Rhinolophus ferrumequinum</i>	direct observations	LC	Appendix 3, 4A	✓

LEGEND

GEO 57/2007:

- **APPENDIX 3 SPECIES** – of plants and animals the conservation of which needs designing of the special conservation areas and birds and animals special protection areas
- **APPENDIX 4 A - SPECIES OF COMMUNITY INTEREST** – Species of animals and plants requiring a strict protection

IUCN Category:

- Low threatened (NT)
- With low risk (LC)

* The only species of bat representing conservation objective of the protected natural area of community interest **ROSCIO201 North-Dobrogean Plateau** is *Rhinolophus ferrumequinum* – species identified by direct observations of the monitoring team at a distance of over 2.7 km within travels for identification of certain potential sheltering areas.

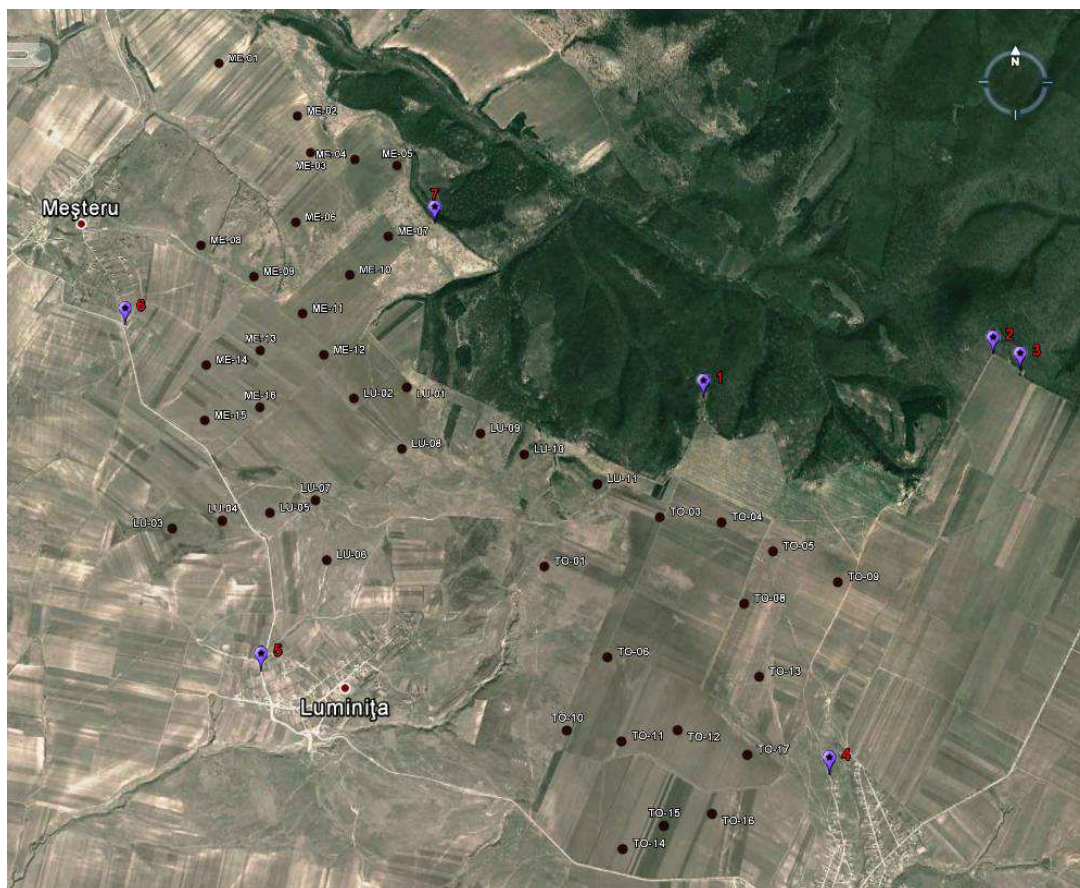


Figure 5.47. Observation points outside of the site

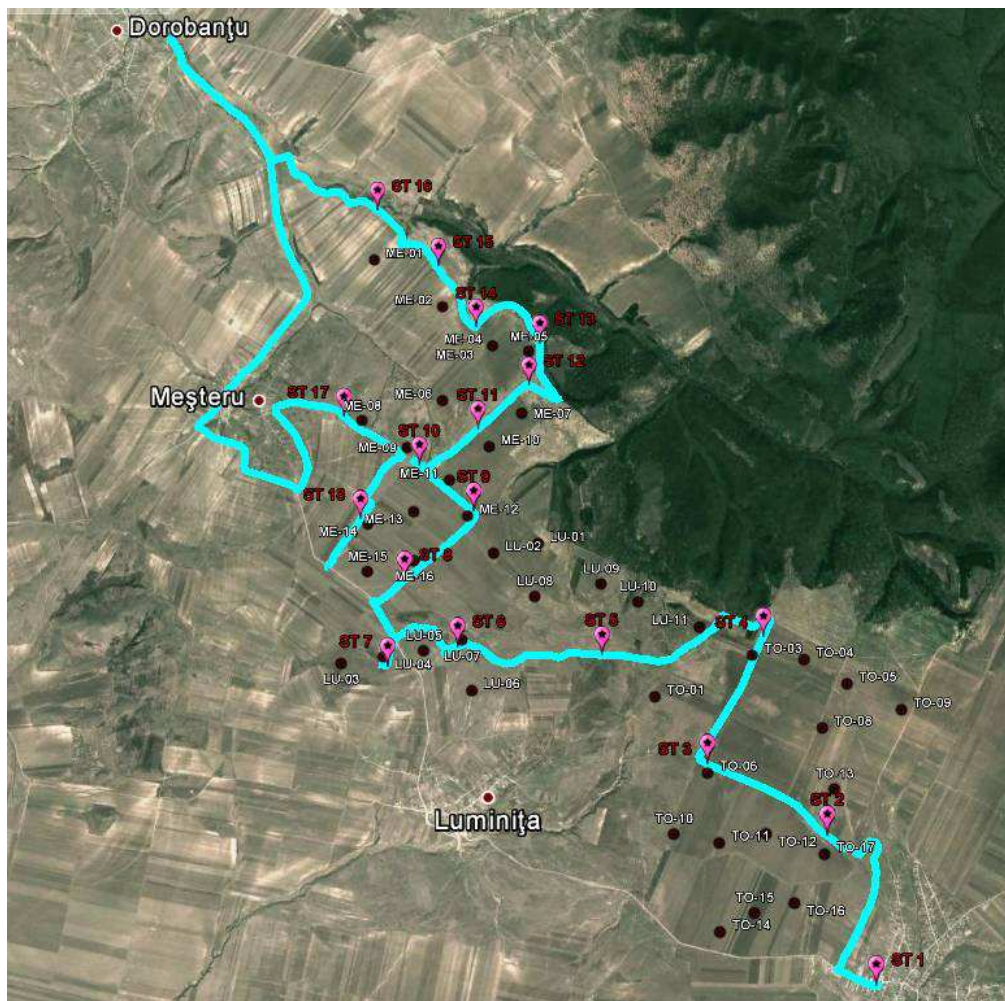


Figure 5.48. Observation points and the transect crossed on the site

The areas with the higher abundance of species are points 1, 2 and 3 near Babadag Forest, where the majority of recordings with ultrasounds were performed. The presence of bats, but with a much lower abundance (1-2 exemplars/ hour) was recorded in the points ST 13 and ST 14 near location of the turbines ME 02, ME 03, ME 04 and ME 05. In case of points 1, 2 and 3, the abundant presence of the bats is explained by specific conditions provided by the openings of Babadag Forest and namely the attenuation of the powerful air currents by the forestry vegetation and due to the abundant trophic resources in ecotone area.

We specify that in the other observation points, after bio-acoustic monitoring, no chiropters were recorded. This fact is due to location of the site in an open area, characterized by air currents with increased intensity and low trophic resources.

Below we present spectrograms with species identified under analysis of ultrasounds:

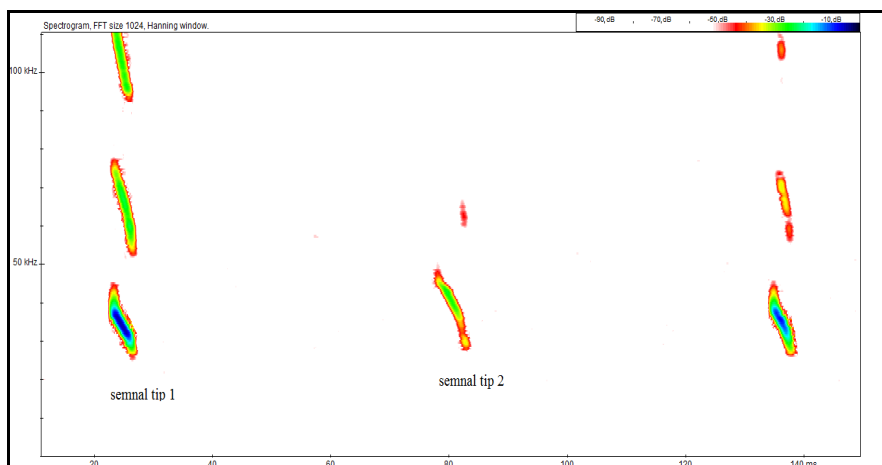


Figure 5.49. *Barbastella barbastellus*, signal of type 1 and signal of type 2

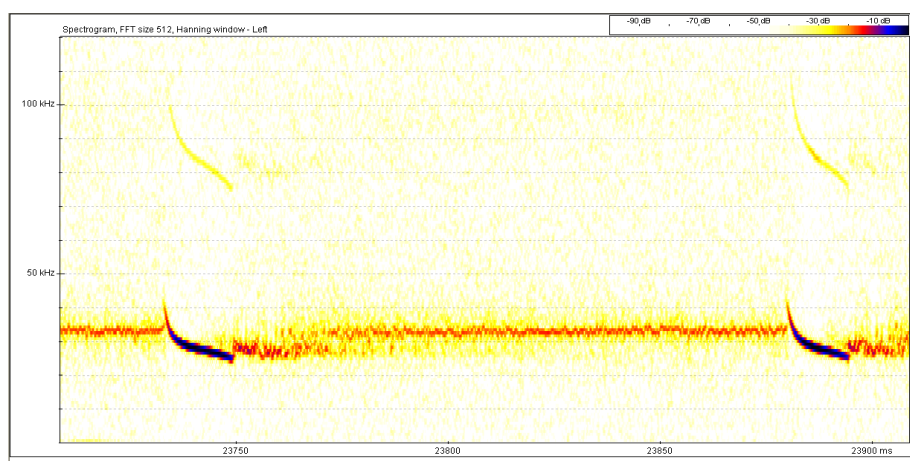


Figure 5.50. Signals emitted by *Eptesicus serotinus*

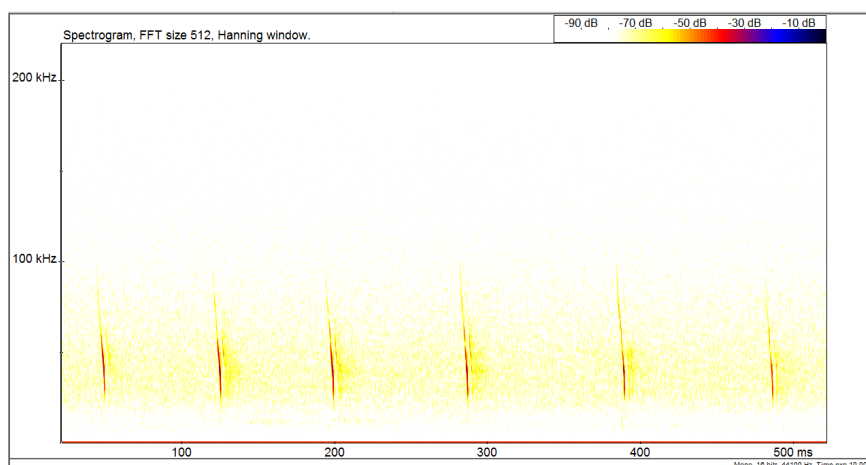


Figure 5.51. Signals emitted by *Myotis daubentonii* near Babadag Forest

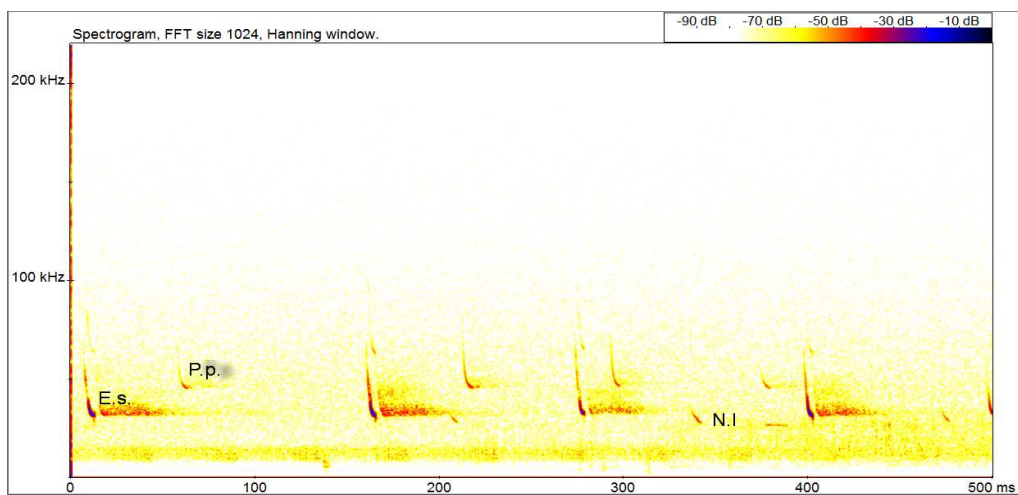


Figure 5.52. *Eptesicus serotinus*, *Pipistrellus pipistrellus* and *Nyctalus leisleri* near Babadag Forest

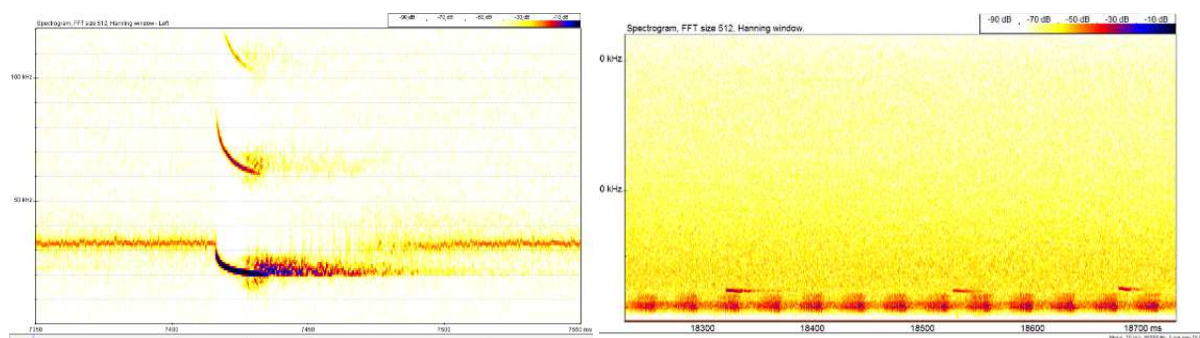


Figure 5.53. *Nyctalus noctula* near Babadag Forest

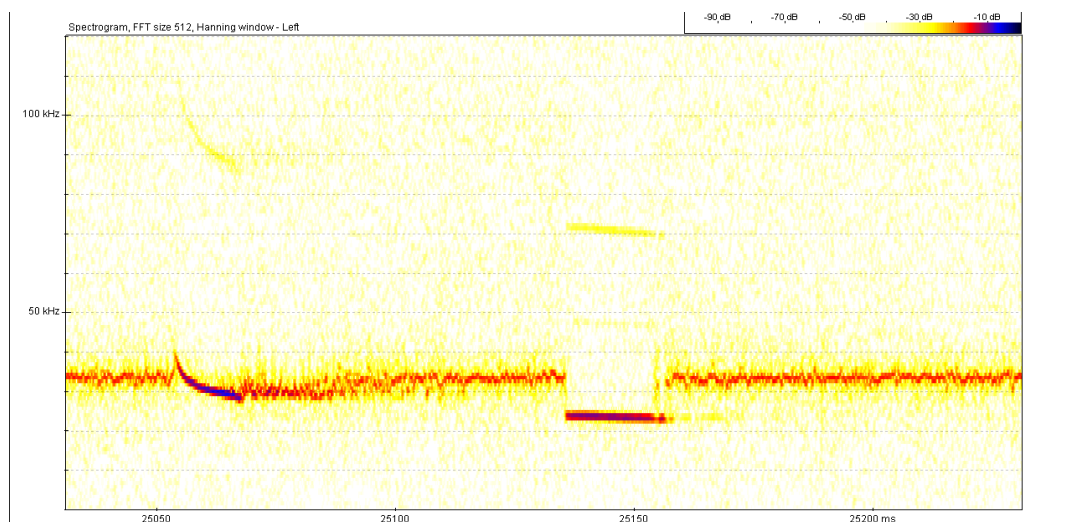


Figure 5.54. *Eptesicus serotinus* and *Nyctalus noctula*

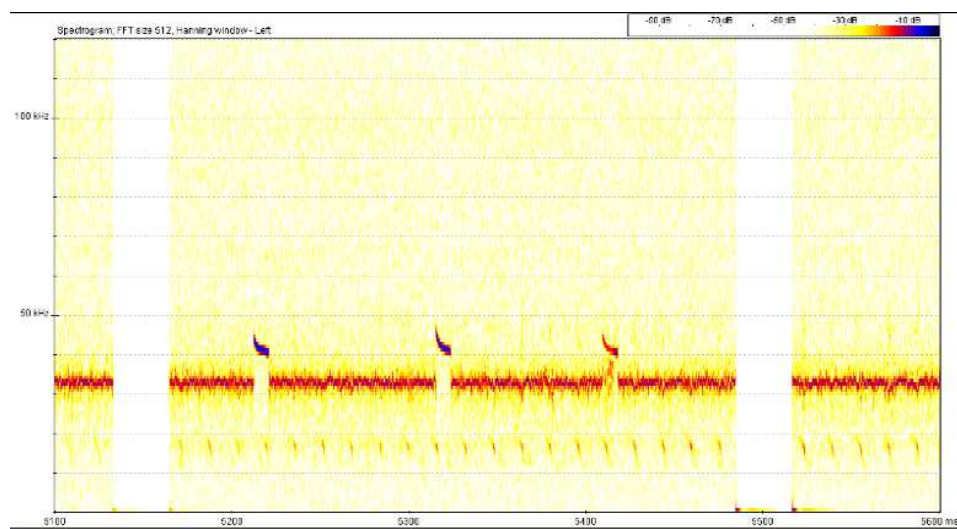


Figure 5.55. Signals emitted by *Pipistrellus pipistrellus*

The alpha Shannon Wiener diversity index for chiropters

According to the provisions of the monitoring protocol, the diversity of chiropters fauna was analyzed in area of the site, forest margin areas (included in ROSPA Babadag forest) and in localities adjacent to the site. The concerned area is used as shelter niche during the day by the bat species hunting in the site area.

Totally, relative less species of chiropters were identified, the concerned species being characteristic to the area of Central Dobrogea.

In order to analyze the specific diversity of the chiropters fauna, the alpha Shannon – Wiener diversity index was used, both for the chiropters observed on the site and for those observed at the limit of the site.

The calculation formula which was used is the following *:

$$H_{(S)} = - \sum_{i=1}^S p_i \log p_i$$

where

- $H_{(S)}$ represents the Shannon-Wiener diversity index (informational contents of the sample);
- S is the number of species from analyzed area;
- the product $p_i \log p_i$ represents the degree of uncertainty of each event associated to the finite field of probabilities (probability of apparition of the individuals belonging to each species from area).

* (Gomoiu M.-T., Skolka M., 2001 – Ecology – Methodologies for ecological studies, Ovidius University Press, 175 pp. ISBN 973-614-001-6.)

Analyzing the Shannon-Wiener diversity for the concerned area, it was found that for the site area, the index calculated for the studied period is 0.30, while the index calculated near Babadag Forest is 0.70.

The higher value of the index in the area located outside of the site is connected with higher number of observed species and trophic offer of the ecotonal area from forest margin, the favorable micro-climate and habitat conditions. The number of identified species and implicitly of observations is lower inside of the perimeter of the future wind farm, the trophic offer being more reduced and distance towards day shelters being relatively high.

In June, travels were performed in order to identify some potential shelters of the chiropters. Thus, in collaboration with the representatives of forest district Cerna (Carjelari Canton), travels were performed in the locations of two galleries of mine prospection located at 2.8 km respective 7.2 km.

In the gallery number 1 the presence of chiropters was not evidenced, but a nest of *Hirundo rustica* was observed.



Figure 5.56. *Hirundo rustica* nest

In the gallery number 2 two exemplars of *Rhynolophus ferrumequinum* were observed, and on the floor of the gallery no representative quantities of guano that might indicate the presence of a high number of individuals were observed.



Figure 5.57. *Rhinolophus ferrumequinum*



Entrance in the gallery number 2

Entrance in the gallery number 1

Figure 5.59. Mine galleries

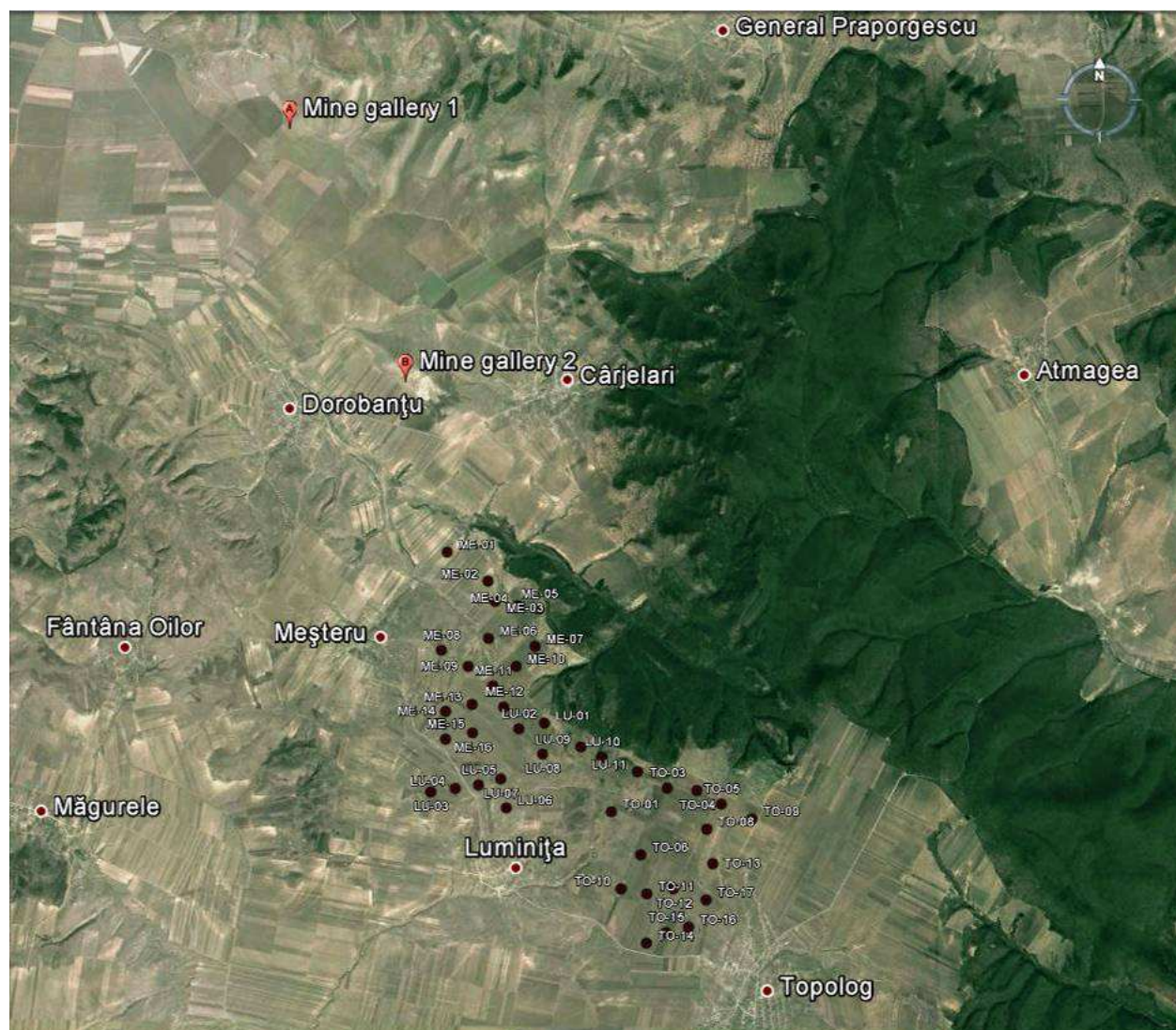


Figure 5.58. *Locations of the two prospecting galleries*

6. DISCUSSIONS

From observations performed during the transects in April and May, certain conclusions may result regarding the birds species on the site of wind farm.

The number of observed species is not too high, the observed species being component of the fauna specific to the agricultural areas, pastures and slopes covered with shrub vegetation of Dobrogea.

Considering the habitat type found on site location, the presence of species *Miliaria calandra*, *Melanocorypha calandra* and *Calandrella brachydactyla* is normal. Within period of beginning of nesting, during the nuptial parade, it was observed a high number of singing males, and in May, full period of nesting, the birds were much less visible.

In the areas with rockery at day on slope of the hill, some pairs of *Oenanthe oenanthe* and *Oenanthe isabellina* were observed, their number being reduced due to the support capacity of the habitat.

The birds of prey observed were relatively fewer. In the area, due to the reduced area and habitat type, only a limited number of birds of prey of high size can exist. Thus, exemplars of *Buteo rufinus* and *Buteo buteo* were regularly observed during all the travels performed. Also *Aquila pomarina* and *Hieraaetus pennatus* were observed, all the four species using the site area as hunting ground (the population of ground squirrels and rodents of area being able to offer the feed of a reduced number of birds of prey pairs).

Also within category of birds of prey is the short-eared owl *Asio flammeus*, observed on one from the pastures covering the slopes of the hills. The area of the site allows existence of at least one pair of *Asio flammeus*, species of high size, characteristic to open areas, with vegetation of shrubs.

During performance of the transects, other species were also observed, the presence of which is common in forest margins or in vegetation with bushes of *Crataegus* or *Rosa canina*. Within this category species as *Lanius collurio*, *Lanius minor*, *Fringilla coelebs*, *Sitta europaea*, *Dendrocopos major* and others are framed, the last three species being found exclusively within the forest during the nesting period.

The site area is transited also by anthropophilic species, appearing in a higher number in any type of agro-ecosystems – *Corvus cornix*, *Corvus frugilegus*, *Sturnus vulgaris*, *Passer domesticus*, *Streptopelia decaocto*.

In case of observations in Vantage Points, the analysis of the results suggests that the area could be located at the boundary of a track followed by the birds species found in migration. This affirmation is based on the fact that a high number of observations was registered on mainly Northern direction (N, NE, NNE, NW). During the entire monitoring program (March - June 2013), the number of observed species was relatively low. Also, for each separate species, the number of exemplars is low. On the other hand, the low number of species and constant presence of some from them in the studied area may suggest also the fact that they are resident and/or nesting exemplars.

Thus, the species *Accipiter nisus* is considered by us being migratory in the area, but in number of maximum three exemplars; *Accipiter gentilis* is considered as being resident, with a number of 4 exemplars; *Aquila pomarina* is present as resident species with a number of four exemplars (most probably two pairs); *Ardea cinerea* is migratory and we considered the number of exemplars transiting the area being only three; *Buteo buteo* was considered both migratory (45 exemplars) and resident (one pair); *Buteo rufinus* was also considered both migratory (41 exemplars) and resident (two pairs); *Circus aeruginosus* migrates in number of maximum 16 exemplars, out of which one could be resident in the area (it was observed more times). In case of *Circus macrourus*, we consider that the number of migratory exemplars is two, and in case of *Circus cyaneus* - nine. The following species were considered being only in passage through monitored area: *Circus pygargus* (five exemplars), *Circaetus gallicus* (five exemplars), *Ciconia ciconia* (102 exemplars), *Pernis apivorus* (one exemplar), *Pelecanus onocrotalus* (15 exemplars), *Phalacrocorax carbo* (11 exemplars), *Pandion haliaetus* (four exemplars). Also, under the same observations, it may be considered that the following species have resident exemplars in the monitored area: *Falco tinnunculus* (eight exemplars), *Falco vespertinus* (four exemplars) and *Hieraaetus pennatus* (four exemplars)

Many from the exemplars observed in the monitored area fly within range 50-150 meters, the altitude range considered as being at risk, due to the potential interactions with the moving elements of the wind turbines.

In case of the species of nocturnal birds, it must be noted the fact that the heard/recorded exemplars have as preferential habitat the forest areas. There were identified based on recordings: one species from Passeriformes order - *Lullula arborea* and 2 species from Strigiformes order - *Athene noctua* and *Strix aluco*, out of which only *Lullula arborea* is mentioned in ROSPA0091 Babadag Forest, and by direct observations, the species *Otus scops* of Strigiformes order was observed.

Using the calculation method for determination of the theoretical risk of collision of the birds with wind turbines (according to SNH guide), there were calculated for the species found in passage (migratory): number of birds passing through risk window, probability of collision and actual collision risk, and for the resident species, the followings were calculated: the number of birds occupying the volume swept by rotors of wind turbines and also the collision probability and actual collision risk in case of these species. Although the recommended method is applied on one year, there are specifications indicating the possibility of use of a lower observations period (e.g.: one migration season).

The results of the synecological analysis in case of data concerning the chiropters (in particular the values of Shannon-Wiener index) suggest a higher trophic offer of the ecotonal area from margin of the forest. Also, we consider that the ecotonal area presents micro-climate and habitat conditions favorable to the bats. Inside of the perimeter of the future wind farm, the trophic offer for chiropters is lower, and the distance towards day shelters is relatively high. This fact is correlated with a low number of species recorded and subsequently identified.

7. CONCLUSIONS

- 56 species of birds were identified in the area of location of the wind farm, being species of birds characteristic to the habitats with herbaceous vegetation, agro-ecosystems, diurnal and night predatory species, aquatic species, forest species.
- The birds in the area of location of the wind farm is specific to the areas dominated by agro-ecosystems and pastures. The characteristic species are *Miliaria calandra*, *Calandrella brachydactyla* and *Melanocorypha calandra*. Also, the area is used as feeding area for a series of birds of prey – *Falco tinnunculus*, *Buteo rufinus*, *Buteo buteo*, *Asio flammeus* and others – nesting in Babadag Forest. The numbers of observed birds of prey feeding actually in the analyzed area are low, due to its supporting capacity.
- Birds in migration were observed in the area of location of the wind farm, both of category of aquatic species (*Ciconia ciconia*, *Ardea cinerea* and others) and of category of birds of prey (*Buteo rufinus*, *Buteo buteo*, *Aquila pomarina*, *Hieraaetus pennatus*, *Circus cyaneus*, *Circus pygargus* and others). The observed numbers were reduced, for both categories of species of migratory birds.
- During the spring months, the predominant fly direction is North-East, suggesting the location of analyzed area at border of a migration route.
- The most sensitive hourly range (from point of view of the activity of species of diurnal birds of prey and those aquatic of high size) is between 10.30 and 12.30, hourly range corresponding to triggering of ascending thermal currents.
- From point of view of the flying activity of the exemplars of interest species (diurnal birds of prey and aquatic birds of high size), the period of maximum intensity is that found between last decade of April and first decade of May.
- Analyzing the dynamics of observations of Vantage Points (number of observations / VP), it results that the most flights were observed from VP2, aspect in connection with excellent positioning of this observation point.

- The specific composition of the birds observed during the monitoring period shows that the most flights (over 80) were recorded at species *Falco tinnunculus*, followed by *Buteo buteo* with near 60 flights and *Buteo rufinus* with 55 flights. Within middle range is found *Hieraaetus pennatus* with approx. 25 flights, *Ciconia ciconia* with approx. 18 flights and *Circus aeruginosus* with approx. 16 flights. All other observed species recorded between one and 10 flights.
- A low number of nests was observed on area of location of the wind farm, in the pasture areas; the fact that the area is intensely pastured represents a high impact factor due to the permanent disturbance created by passing of herds of domestic animals. Also in case of the lands with cultures, where periodical agricultural works are performed, the human impact constitutes a limitative factor for the nesting species.
- Nests of birds of prey were identified in the wooded area found in North of the area of location of the wind farm, which feed including in the analyzed area.
- As regards the collision risk of the birds with mobile elements of the wind turbines, as it results from tables 5.9a 5.9b it can observe that the values of actual risk of collision for the monitored period are subunit, highlighting the fact that the collision is less probable for the species of birds of high size identified in the surveyed area.
- The fauna of chiropters in the analyzed area is formed of 6 species. The only species of bat mentioned in the standard form Natura 2000 - *Rhinolophus ferrumequinum* – was not identified in the area of location of the park.
- As regards the chiropters species, it is found that the monitoring areas with higher abundance of species are near Babadag Forest, outside of the location of wind farm.
- The number of species of chiropters observed within perimeter of the wind farm is sensitively lower compared with that of the species found at its limit. As a result, the alpha diversity calculated according to the Shannon Wiener formula is also lower in the area of location of the wind farm compared with limitrophe areas.

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