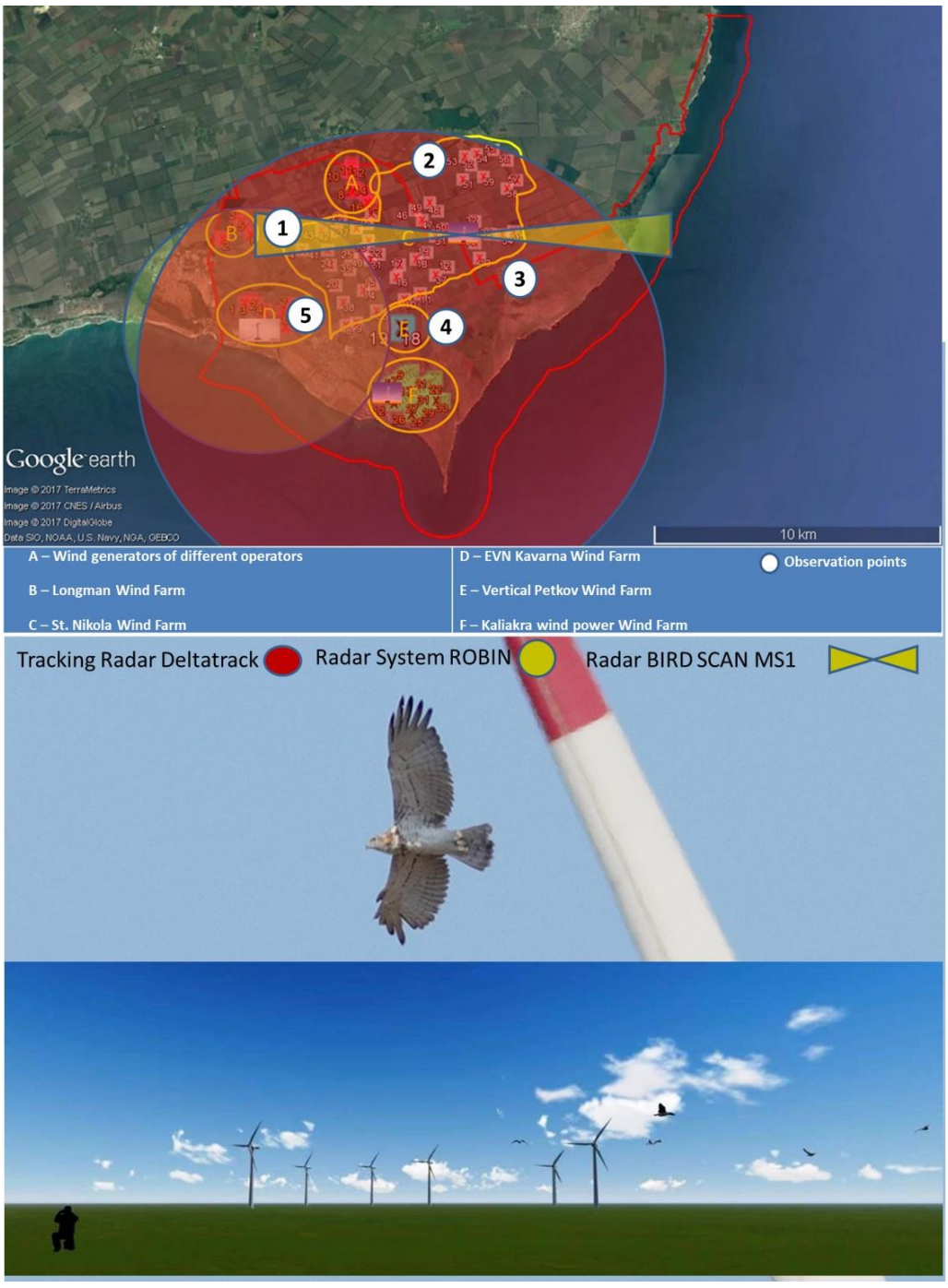
Summary of Activities and the Results of Ornithological Monitoring in the Integrated System for Protection of Birds, 2018



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Introduction

Integrated System for Protection of Birds (ISPB) includes 114 wind turbines, 95 of which are within the Kaliakra SPA BG0002051 and 19 are in the areas adjacent to the protected zone.

The ornithological monitoring of ISPB is a complex study assigned by the Wind farms, located in Kaliakra SPA BG0002051- AES Geo Energy Ltd., Kaliakra Wind Power AD, Degrets OOD, Disib OOD, Windex OOD, Long Man Invest OOD, Long Man Energy OOD, Zevs Bonus OOD, Vertikal-Petkov & Sie SD, Wind Park Kavarna East EOOD, Wind Park Kavarna West EOOD, Millennium Group OOD in 2018.

The ISPB consists of a combination of radar observations and meteorological data, integrated with field visual observations, which jointly used are essential for the accurate risk assessment and ensure that appropriate action is taken immediately to avoid collision risk. So far as potential adverse impacts of turbine collisions on birds, a Turbine Shutdown System is deployed supported by an Early Warning System.

The monitoring studies are based on the requirements of basic normative and methodological documents as follows: Environmental Protection Act, Biological Diversity Act, Bulgarian Red Data Book, Directive 92/43/EEC for habitats and species, and Directive 2009/147/EC on the conservation of wild birds, Protected Areas Act and Order RD-94 of 15.02.2018 of the Minister of Environment and Waters. Best international practices are also incorporated (T-PVS/Inf (2013) 15: https://rm.coe.int/1680746245). Detailed information on the scope, technical rules and monitoring procedures are publicly available at a dedicated website https://kaliakrabirdmonitoring.eu/.

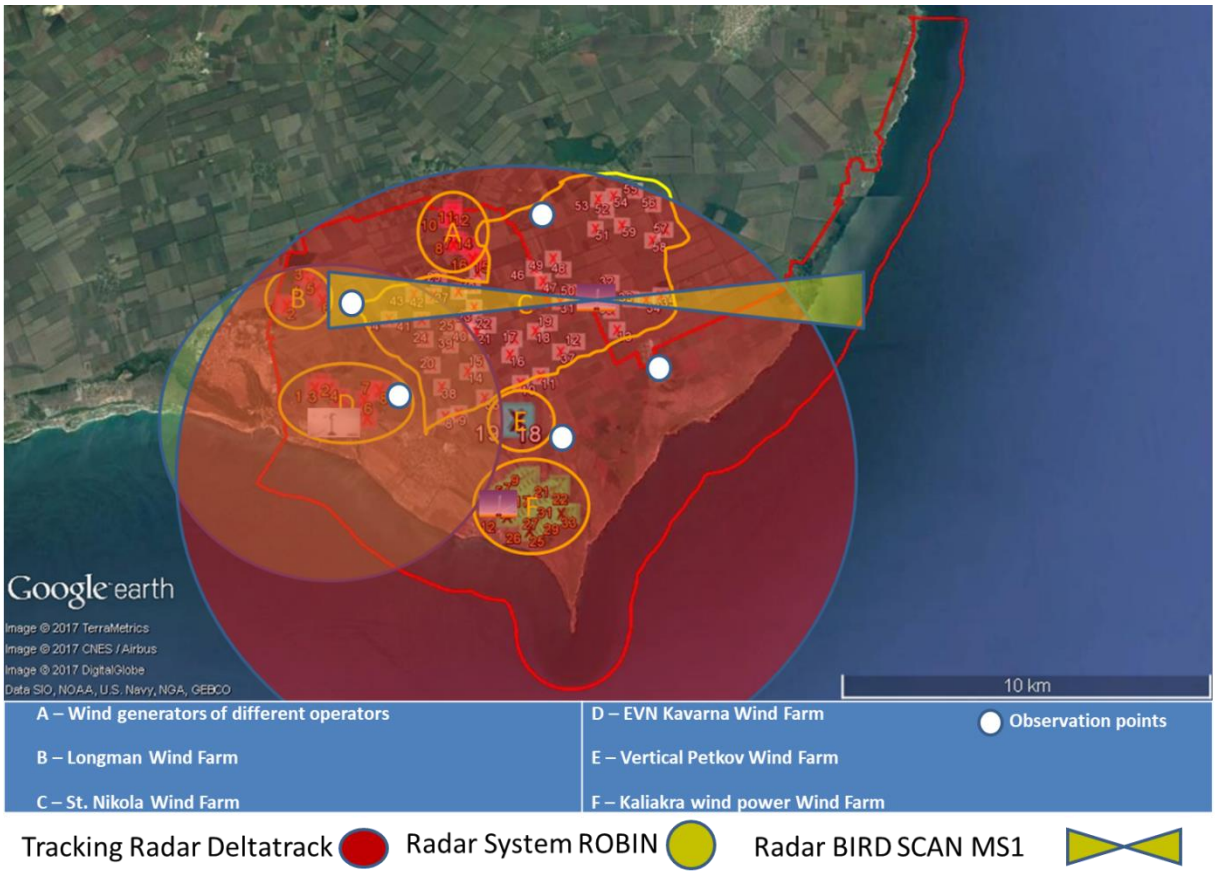

Figure 1. *A satellite photo with the location of the wind turbines covered by the ISPB and the boundaries of Kaliakra SPA (shown by the red line), together with the scope of three radar systems.*

In order to provide objective data for the bird risk assessment, this summary presents activities and results of the monitoring in 2018.

The activities were supervised and coordinated by Prof. Dr. Pavel Zehtindjiev - Ornithologist with over 25 years of research in ornithology; over 85 scientific publications in international ornithological journals; member of European Ornithologists Union and several other conservation organisations; winner of the Revolutionary Discovery Award for Ornithology of an American Ornithological Society in 2016 – The Cooper Ornithological Society; 10 years of experience in impact monitoring of wind turbines on breeding, migrating and wintering bird species in the region of Kaliakra.

Three types of radars integrated into the ISPB were used for monitoring and prevention of bird collisions:

Bird Scan MS1

The radar collects quantitative data and provides information about Migration Traffic Rate of birds through a specific sector where the fixed beam of the radar is directed (Figure 1). The quality of the data deepens on the distance to the birds and to the size of the migrating birds. In the case of ISPB the maximum distance we have used the Bird Scan MS1 radar is 10 km beam directed from west to east across the main migratory front of seasonal migrations. The data obtained by this radar system allow crude identification of ecological types of birds: for example, passerines, swifts, waders and large birds. The radar data do not allow quantification of bird migration for every bird species observed in the ISPB territory and therefore do not allow any comparison with visual observations.
These data are not used for quantification and analysis of the characteristics of migration.

Deltatrack Radar System

This radar is a tracking radar system which allows detection of a single target or group of targets and tracking of their movements in a range of around 5 km (Figure 1). It is used in the monitoring as a real time tool for the tracking of already (visually) identified bird targets in the ISPB territory. The radar is not applicable for quantitative analysis of bird migration.

Radar System Robin

This is a 3D radar system constructed for detection and tracking of moving targets in air volume of around 10 km^3 (https://www.youtube.com/watch?v=-Kb70clGHOQ&t=8s) (Figure 1). It is a real time tool for tracking of moving targets and in combination with visual observations in the field provides highly reliable data on the distance as well altitudes of birds already detected and identified by the field ornithologists. This radar does not provide quantitative data of migration at a species level because it does not allow species identification.

All three radar systems have been used as tools to assist field observations, detection of potential ingresses, and real time tracking of birds after visual observation through the ISPB during the period of monitoring.

All quantitative data and analysis of recorded bird numbers are based on the only possible quantification of bird migration of different bird species – the visual observations in the field. Locations of field observation points are presented in Figure 1.

Detailed descriptions of the technical characteristics of the three radar systems integrated within the ISPB are presented on the web site: https://kaliakrabirdmonitoring.eu/.

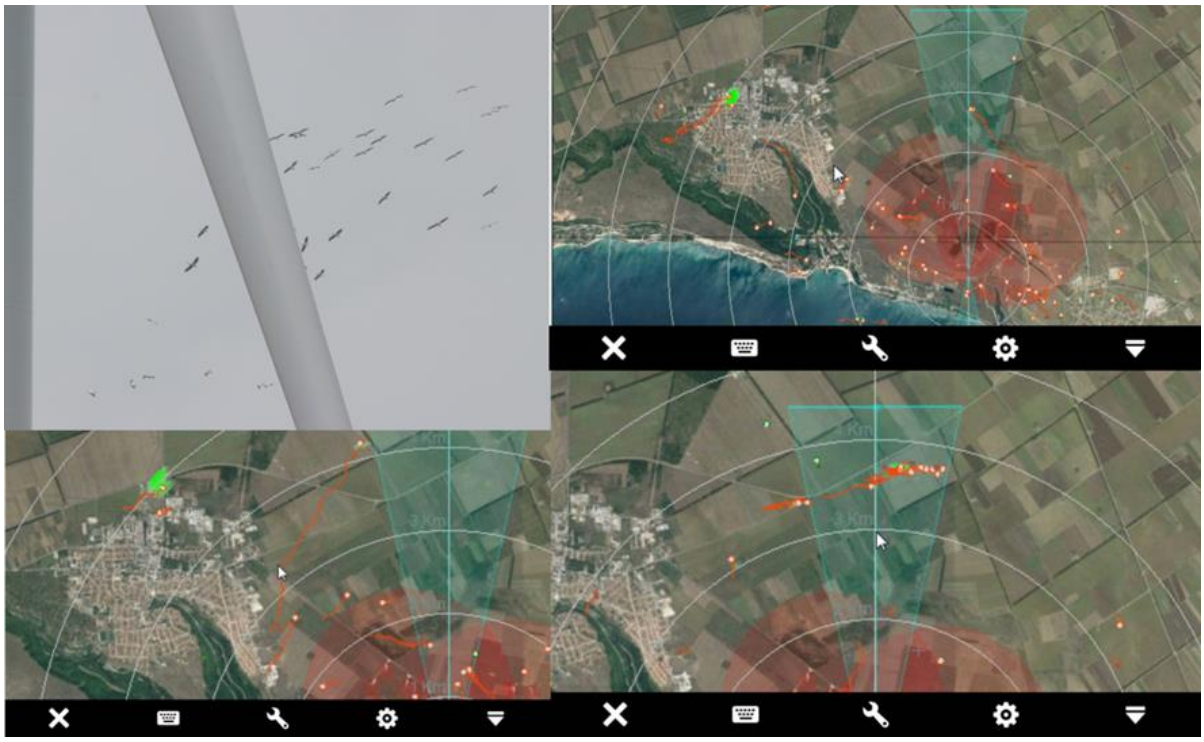

***Figure 2**. A flock of White pelicans: an illustration of the simultaneous records obtained by every ornithologist in real time information from Robin Radar System and visual observations. Every single bird and flock of birds from the target bird species were tracked by visual observations and the Robin radar simultaneously.*

Results

Spring migration

During the spring monitoring, observations were made during all 92 days of the season, with registered migratory soaring birds being detected over 70 % of the time. For the survey period (March 15 - May 15), a total of 1560 migratory and resident birds (Table 1) were registered.

***Table 1.** Number of registered birds of all ecological groups by day during the spring migration in the territory covered by ISPB.*

Period	Number of birds in Spring 2018
15-31 March	882
1-30 April	445
1-15 May	233
Total for the period	1560

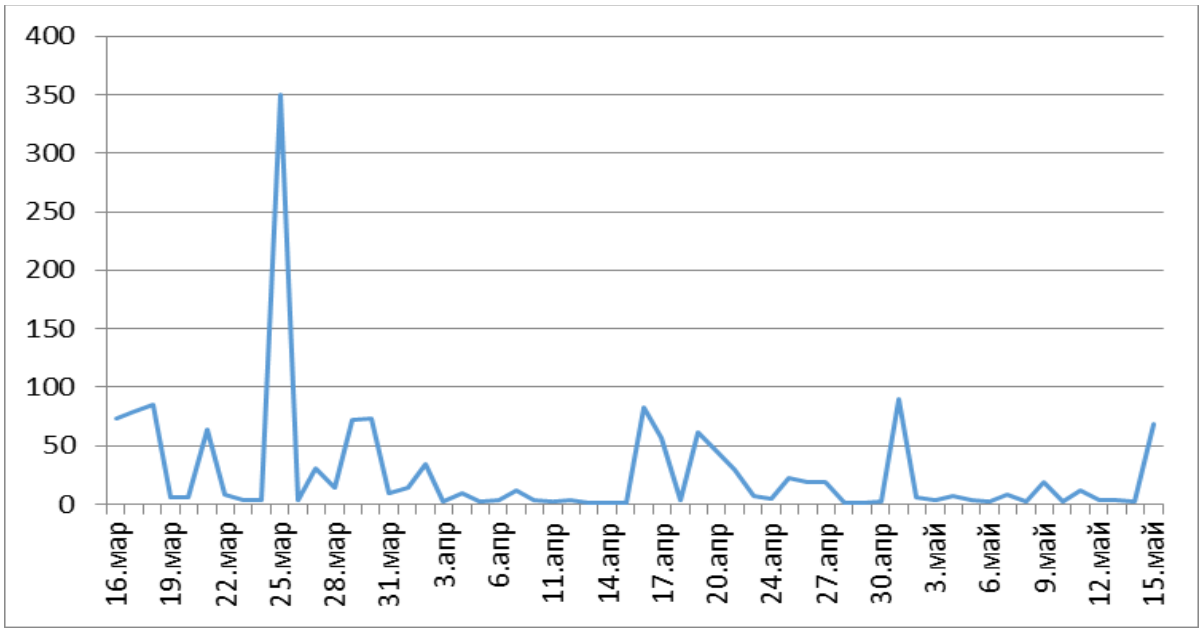

Figure 3. *Dynamics of the spring migration of birds in the ISPB territory based on visual observations during the period 15 March - 15 May 2018*

The variations in bird numbers were substantial (Figure 3). The low number of migrating birds through the study area, because of the relatively low prevalence of westerly winds in this season, did not allow for an in-depth statistical analysis of the number of birds according to wind direction.

Migratory birds were poorly represented during the spring migration period in the surveyed territory.

Of the total of 1560 birds registered in the course of the study, 1519 individuals were identified to species. The species and number of birds recorded during spring migration is shown in Table 2.

Table 2. *Composition and number of registered bird species during the period 15 March - 15 May 2018 in the ISPB territory.*

English name	***Latin name***	***Number***
Common swift	*A. apus*	*2*
Alpine swift	*A. melba*	*5*
Northern Goshawk	*A. gentilis*	*1*
Eurasian sparrowhawk	*A. nisus*	*1*
Grey heron	*A. cinerea*	*6*
Squacco heron	*A. raloides*	*1*
Booted eagle	*A. pennata*	*2*
Lesser spotted eagle	*A. pomarina*	*1*
Common buzzard	*B. buteo*	*75*
Long-legged buzzard	*B. rufinus*	*2*
Marsh harrier	*C. aeruginosus*	*23*
Hen harrier	*C. cyaneus*	*8*
Montagu's harrier	*C. pygargus*	*8*
Pallid harrier	*C. macrourus*	*1*
Short-toed snake eagle	*C. gallicus*	*5*
White stork	*C. ciconia*	*81*
Black stork	*C. nigra*	*4*
Mute swan	*C. olor*	*9*
European roller	*C. garrulus*	*3*
Raven	*C. corax*	*2*
Hooded crow	*C. cornix*	*6*
Red-footed falcon	*F. vespertinus*	*21*

English name	*Latin name*	*Number*
Eurasian hobby	*F. subbuteo*	*8*
Peregrine falcon	*F. peregrinus*	*1*
Kestrel	*F. tinnunculus*	*37*
Saker falcon	*F. cherrug*	*1*
Black kite	*M. migrans*	*1*
Common crane	*G. grus*	*62*
Demoiselle crane	*G. virgo*	*25*
Yellow-legged gull	*L. michahellis*	*43*
White-tailed eagle	*H. albicilla*	*1*
Golden oriole	*O. oriolus*	*2*
Common cormorant	*P. carbo*	*601*
White pelican	*P. onocrotalus*	*259*
European honey buzzard	*P. apivorus*	*2*
Grey partridge	*P. perdix*	*2*
European turtle dove	*S. turtur*	*1*
Common tern	*S. hirundo*	*1*
Starling	*St. vulgaris*	*80*
Hoopoe	*U. epops*	*3*
Common shelduck	*T. tadorna*	*35*
European bee-eater	*M. apiaster*	*85*
Northern lapwing	*V. vanellus*	*2*

The most numerous in spring in the region were common cormorants (*Phalacrocorax carbo*), white pelicans (*Pelecanus onocrotalus*) and some birds of prey – Common buzzards (*Buteo buteo)*, Red-footed falcon (*Falco vespertinus*), Common kestrels (*Falco tinnunculus*) and Marsh harriers (*Circus aeruginosus*) (Table 2).

In the spring of 2018, a total of 81 White storks (*Ciconia ciconia*) passed over the surveyed territory. The European nesting population of the White stork is estimated to be between 180,000 and 220,000 pairs, with about 80 % of the species migrating along the wider western Black Sea region, which also covers a part of north-eastern Bulgaria. Compared to these values, White storks flying over the Kaliakra area, substantially east of the main migratory path of White storks along the western Black Sea migration corridor, were an insignificant proportion (0.02%) of the Via Pontica population. According to Shurulinkov et al. (2011), an estimate of the total population of White stork in SE Bulgaria flying along Via Pontica in spring was 23,358 individuals in their study period. In this respect our observations confirm the low significance of the territory of Kaliakra as part of the migratory corridor for spring migrating white storks along the Via Pontica component of the larger flyway.

Similar numbers of two crane species - Common and Demoiselle cranes - were seen. Common cranes (*Grus grus*) were recorded for three days in March, and Demoiselle cranes (*G. virgo*) were observed over seven days in April and May. There was remarkable behaviour involving a pair of Demoiselle cranes which stayed in the ISPB area for nearly 30 days between April and May. A pair of these beautiful birds used a temporary pond of surface water for feeding within the territory without showing any apparent signs of fear of the nearby wind turbines.

As a result of the systematic observations carried out during the whole period of the spring migration a total of 11 stops of individual turbines, groups of turbines or entire wind farms in the territory covered by ISPB were undertaken. Detailed information on the duration of these stops is given in Table 3.

Table 3. *Data for ordered stops of wind turbines as a result of the application of ISPB in the Kaliakra study area during the 2018 spring migration of birds.*

Date	Wind park	Turbine №/ Group	Species	Number of birds	Time stopped	Time started
30.03.2018	SNWF	D, C	*Common cranes (Grus grus)*	13	13:07	13:20
02.04.2018	SNWF	F	*White pelicans (P. onocrotalus)*	19	11:07	11:29
09.04.2018	SNWF	A	*White tailed eagle (H. albicilla)*	1	12:45	12:58
11.04.2018	SNWF	B	*Demoiselle crane (G. virgo)*	2	13:25	13:41
18.04.2018	SNWF	A	*Demoiselle crane (G. virgo)*	2	11:16	11:45
18.04.2018	SNWF	B	*Demoiselle crane (G. virgo)*	2	12:15	12:48
18.04.2018	SNWF	B	*Demoiselle crane (G. virgo)*	2	13:23	14:00
18.04.2018	SNWF	B	*Demoiselle crane (G. virgo)*	2	14:05	14:17
26.04.2018	Kaliakra Wind Farm	All turbines	*Demoiselle crane (G. virgo)*	12	13:25	13:45

In order to check the effectiveness of the ISPB to prevent collisions of spring migrating birds, each of the 114 turbines covered by the ISPB programme was checked at least once a week for collision victims. According to previously performed carcass removal and searcher efficiency tests during autumn migration and in winter at SNWF, this search regime of weekly searches provides for a cost-effective method, which can also be calibrated, to discover any bird strike fatalities which may be of concern. Hence a frequency of four searches per month under every turbine allows estimation of the mortality of the birds from a collision with the turbines in the ISPB. For details, see previous studies of: http://www.aesgeoenergy.com/site/Studies.html.

Table 4. *Number of turbines searched for collision victims in the territory of ISPB during the period 15 March 15 May 2018. The Code of every turbine use the abbreviation of the wind farm and the number of the turbine used in the table abbreviations of wind farms: AE8/60 - AES Geo Energy Ltd., M1/35 - Kaliakra Wind Power, E1/8-EVN Kavarna, DC1/2 - Degrets OOD, DBГ1/5 - Disib OOD, DBГ2MN600/DBГ1HSW250 - Windex OOD, ABГ4 - Long Man Invest OOD, ABBalgarevo - Long Man Energy OOD, ABZevs - Zevs Bonus OOD, VP1/2 - Vertikal-Petkov&Sie SD, ABГ3 - Wind Park Kavarna East EOOD, ABГ1/2 - Wind Park Kavarna West EOOD, AB Millennium Group Micon/AB Millennium Group-Millennium Group OOD*

Turbine	March	April	May	Total
ABBalgarevo	3	4	2	9
ABГ1	3	5	2	10
ABГ2	3	5	2	10
ABГ3	3	5	2	10
ABГ4	4	5	2	11
ABZevs	2	5	2	9
ABMilenium group	3	4	3	10
ABMilenium group Micon	3	4	1	8
AE10	2	5	2	9
AE11	1	5	2	8
AE12	3	4	2	9
AE13	3	3	2	8
AE14	2	5	2	9
AE15	2	5	2	9
AE16	3	4	2	9
AE17	3	4	2	9
AE18	3	4	3	10
AE19	3	4	3	10
AE20	2	4	2	8

Turbine	March	April	May	Total
AE21	2	5	2	9
AE22	2	5	2	9
AE23	2	5	2	9
AE24	2	5	2	9
AE25	2	5	2	9
AE26	2	5	2	9
AE27	3	4	2	9
AE28	2	4	2	8
AE29	2	5	2	9
AE31	2	4	2	8
AE32	3	4	2	9
AE33	3	4	2	9
AE34	3	4	2	9
AE35	3	4	2	9
AE36	2	7	2	11
AE37	3	5	2	10
AE38	2	6	2	10
AE39	2	5	2	9
AE40	2	5	2	9
AE41	2	5	2	9

Turbine	March	April	May	Total
AE42	2	5	2	9
AE43	2	5	2	9
AE44	2	5	2	9
AE45	3	4	2	9
AE46	2	4	3	9
AE47	2	4	3	9
AE48	2	4	3	9
AE49	2	4	3	9
AE50	2	3	2	7
AE51	3	5	2	10
AE52	3	5	2	10
AE53	3	5	2	10
AE54	3	5	2	10
AE55	3	5	2	10
AE56	3	5	2	10
AE57	3	5	2	10
AE58	3	5	2	10
AE59	3	5	2	10
AE60	3	3	2	8
AE8	2	4	2	8
AE9	2	5	2	9
DBΓ1	1	5	2	8
DBΓ1HSW250	2	5	2	9
DBΓ2	1	5	2	8
DBΓ2MN600	2	5	2	9
DBΓ3	1	5	2	8
DBΓ4	1	4	2	7
DBΓ5	3	4	2	9
DC1	3	4	2	9
DC2	3	4	2	9
E00	2	4	2	8
E01	2	5	2	9
E02	1	5	2	8
E04	2	5	2	9
E05	2	5	2	9
E07	1	5	2	8
E08	2	5	2	9
E09	2	4	2	8
M1	3	4	2	9

Turbine	March	April	May	Total
M10	2	4	2	8
M11	2	4	2	8
M12	2	4	2	8
M13	3	4	2	9
M14	3	4	2	9
M15	3	4	2	9
M16	3	4	2	9
M17	3	4	2	9
M18	3	4	2	9
M19	3	4	2	9
M2	3	4	2	9
M20	3	4	3	10
M21	3	4	3	10
M22	3	4	3	10
M23	3	4	3	10
M24	3	4	3	10
M25	2	4	3	9
M26	2	4	3	9
M27	2	4	3	9
M28	2	5	2	9
M29	2	5	2	9
M3	3	4	2	9
M30	2	5	2	9
M31	2	5	2	9
M32	2	5	2	9
M33	2	5	2	9
M34	2	5	2	9
M35	2	5	2	9
M4	2	4	2	8
M5	2	4	2	8
M6	2	4	2	8
M7	2	4	2	8
M8	2	4	2	8
M9	2	4	2	8
VP1	3	4	2	9
VP2	3	4	2	9
Total	**272**	**510**	**242**	**1024**

Five intact bodies of birds were documented during the 1024 searches under individual turbines during the 2018 spring migration of birds in ISPB territory. (Table 5). There were six records of feathers or single feather. Such findings of single feathers as well as groups of body feathers are often remains of hunting and feeding of raptor species in the wind farms.

Table 5. *Records of bird remains recorded by 1024 searches under the ISPB study area's turbines during the 2018 spring migration period*

Species name	***Feathers***	***Feather***	***Intact***	***Part of the body (wings)***	***Total***
Alauda arvensis			*1*		*1*
Accipiter nisus			*1*		*1*
Asio otus			*1*		*1*
Buteo buteo			*1*	*1*	*2*
Carduelis carduelis				*1*	*1*
Larus sp.	*1*	*1*			*2*
Motacilla alba	*3*				*3*
Perdix perdix	*1*		*1*		*2*
Phylloscopus sp.				*1*	*1*
Grand Total	***5***	***1***	***5***	***3***	***14***

There was no recorded case of collision with the turbines of any target bird species for the period of TSS application in ISPB during the monitoring in spring 2018.

Conclusions

During the monitoring, there were no apparent changes in the main characteristics of the ornithofauna typical for the spring migration in the whole country and the specific characteristics of the species composition and phenology of bird migration in NE Bulgaria.

The results of the monitoring confirmed the relatively low importance of the ISPB territory for migratory birds in spring and the absence of negative influence of the operating wind farms on bird populations during their spring migration.

The migration periods, the species composition, the dynamics in number of birds, the daily activity, the height of the flights, as well as the feeding, resting and roost sites of the flying birds passing through the area indicated the absence of a barrier effect of the 114 wind turbines.

The data presented in this report confirmed the absence of any adverse impact on sensitive bird species of the order Ciconiiformes, Pelecaniformes, Falconiformes, Gruiformes using migratory ascending air flows (thermals) for movement over long distances.

All these species were found to occasionally cross the study site, and their observed behaviour in respect to wind turbines did not indicate major changes which would impact on the energetics of these species during daily movements.

The quantitative characteristics of bird migration in the ISPB area during spring 2018, and the absence of mortality among the target bird species allows a continued conclusion that 114 wind turbines covered by ISPB do not present a risk of adverse impact to migratory birds. The application of the ISPB's safeguards potentially was and can be an ongoing contributory part of the minimal risk posed to birds from wind farms in the Kaliakra region.

Autumn migration

During the autumn monitoring, observations were made during all 92 days of the season in 2018 (01.08 - 31.10.2018). There were a total of 16973 birds of 53 species.

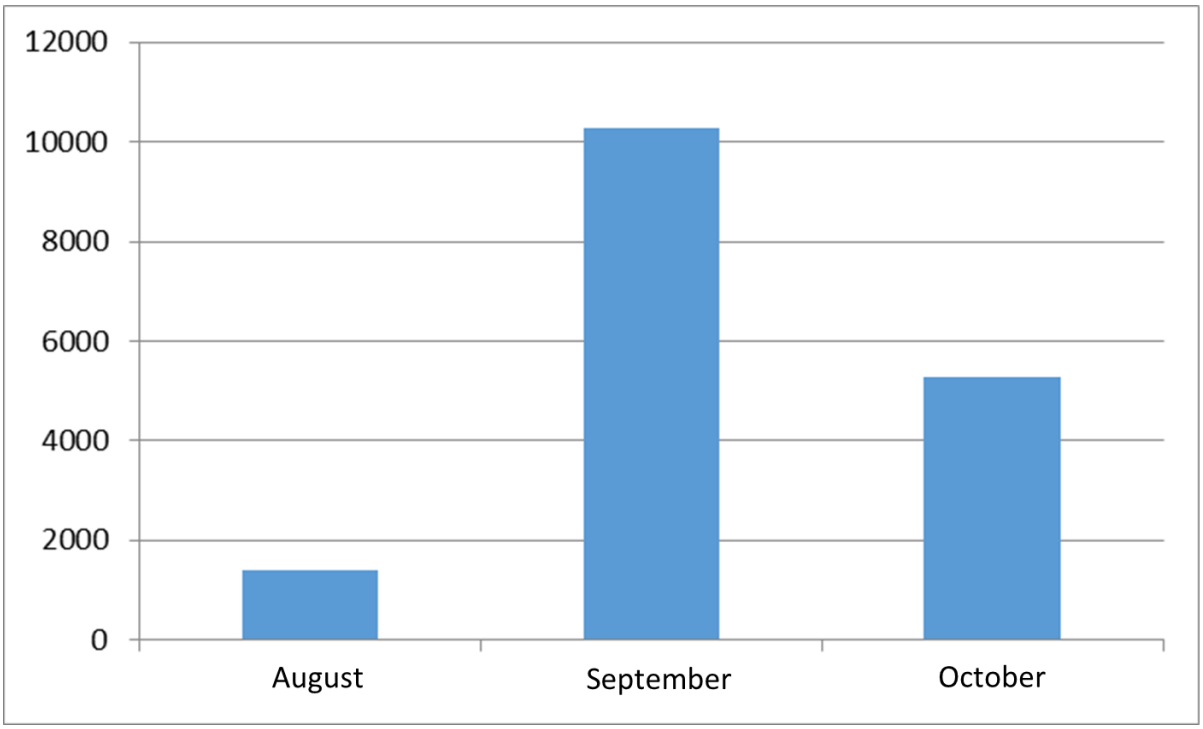

Figure 4. *Number of registered birds by months during the 2018 autumn migration in the territory of ISPB.*

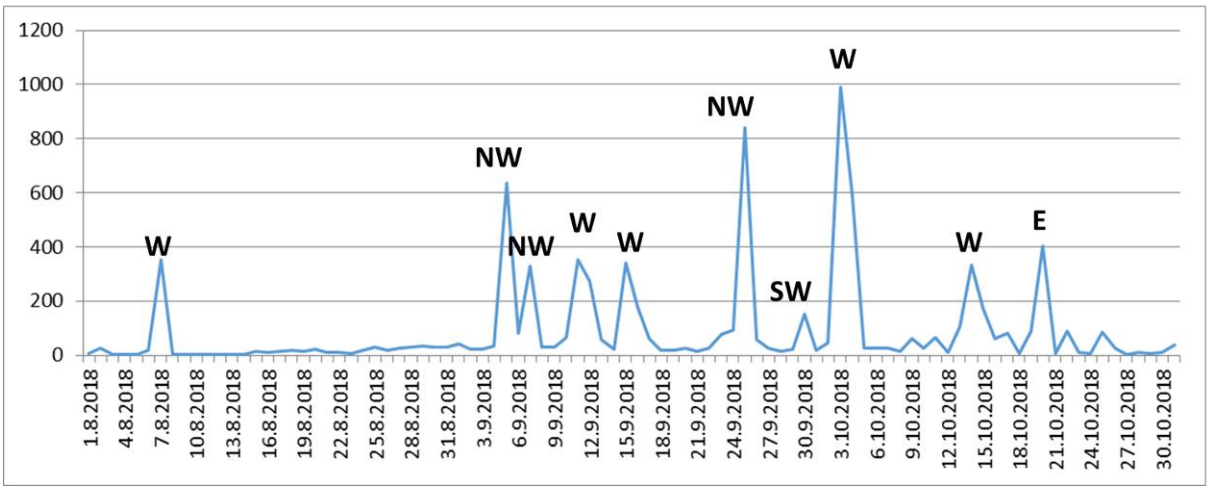

Figure 5*. Dynamics of the autumn migration of the flying bird species in the ISPB territory according to visual observations during the period 01 August - 31 October 2018. Letters indicate the direction of wind in days with increased number of migrating birds.*

The number of birds in the ISPB study area apparently depended on the direction of the wind in autumn 2018. Of the 10 peak days with intense migratory flights of birds: in nine, westerly winds prevailed, and in only one day with a relatively high number of registered migrants, the wind direction was eastern (Figure 5).

The recorded number of individuals according to species during autumn migration is shown in Table 6.

Table 6. *Composition of species and number of registered birds over the period 01 August to 31 October 2018 in the ISPB territory.*

Species name	Number
A. brevipes	309
A. gentilis	1
A. nisus	242
A. cinerea	21
A. purpurea	2
A. pennata	30
A. pomarina	232
B. buteo	2642
B. rufinus	58
B. lagopus	3
C. aeruginosus	442
C. cyaneus	37
C. pygargus	88
C. macrourus	8
C. gallicus	94
C. ciconia	451
C. nigra	54
C. garrulus	1
C. corax	15
C. cornix	6
C. monedula	35
C. frugilegus	14
C. oenas	44
C. palumbus	1200
F. vespertinus	472
F. subbuteo	48
F. peregrinus	4

Species name	Number
F. tinnunculus	272
F. cherrug	2
F. columbarius	2
F. eleonorae	3
M. migrans	71
M. milvus	2
M. alba	414
M. apiaster	2963
M. calandra	1430
G. grus	100
G. virgo	13
L. michahellis	234
L. fuscus	1
H. albicilla	1
H. rustica	1000
P. carbo	576
P. onocrotalus	2021
P. apivorus	801
P. haliaetus	17
P. leucorodia	5
P. roseus	1
P. perdix	10
R. riparia	76
St. vulgaris	400
V. vanellus	4
E. garzetta	1

The most numerous migrating birds in the autumn of 2018 in the region were Common buzzards (*Buteo buteo*) and White pelicans (*Pelecanus onocrotalus*) with over 2,000 individuals of each species (Table 6). Bee-eaters (*Merops apiaster*) were also numerous with over 2,900 individuals registered during the autumn migration period. Third, with a little more than 1,000 individuals were Barn swallow (*Hirundo rustica*), Calandra lark (*Melanocorypha calandra*), and Wood pigeon (*Columba palumbus*), flocks of which were registered feeding in the ISPB during the autumn migration in 2018.

As a result of the simultaneous observations of five constantly attended observation points with assistance from three radar systems (Figure 1) during the whole period of the autumn migration, a total of 7 stops of single turbines, groups of turbines in the territory of SNWF. The stop orders given to the engineers on duty were executed in a timely manner, thus avoiding any collision risk of birds passing through the territory. Detailed information on the duration of these stops is given in Table 7.

Table 7. *Data for ordered stops of wind turbines as a result of the application of EWS in ISPB during the autumn migration of birds in 2018.*

Date	*Wind Farm*	*Turbine code №/ Group*	*Species*	*Number of birds*	*Time stop*	*Time restart*
05.09.2018	*SNWF*	*D*	*P. apivorus*	*17*	*16:14*	*16:20*
10.09.2018	*SNWF*	*B*	*C. ciconia*	*7*	*9:31*	*9:41*
12.09.2018	*SNWF*	*C*	*P. onocrotalus*	*17*	*10:25*	*10:33*
12.09.2018	*SNWF*	*E*	*P. onocrotalus*	*13*	*10:33*	*10:44*
12.09.2018	*SNWF*	*B*	*P. haliaetus*	*2*	*13:30*	*13:41*
12.09.2018	*SNWF*	*D*	*P. haliaetus*	*2*	*13:33*	*13:41*
12.09.2018	*SNWF*	*C*	*P. haliaetus*	*2*	*13:36*	*13:41*

Date	*Wind Farm*	*Turbine code №/ Group*	*Species*	*Number of birds*	*Time stop*	*Time restart*
3.10.2018	*KWF*	*B*	*P. onocrotalus*	*550*	*9:19*	*9:36*

According to previously performed carcass removal and searcher efficiency tests during autumn migration and in winter at SNWF (and repeated in autumn 2018 with similar results), a search regime of weekly searches provided for a cost-effective method, which can also be calibrated on the potential for missed carcasses, to discover any bird strike fatalities which may be of concern. Hence a frequency of four searches per month under every turbine allowed estimation of the mortality of the birds from a collision with all 114 turbines in the ISPB. This also allowed estimation of bird mortality from collision with the 95 turbines of SNWF included in the ISPB. For details see previous studies on the same territory: http://www.aesgeoenergy.com/site/Studies.html

The total number of searches per turbine in ISPB is presented in Table 8.

Table 8. *Table 5. Number of turbines searched for collision victims in the territory of ISPB during the period 01 August to 31 October 2018. The Code of every turbine use the abbreviation of the wind farm and the number of the turbine used in the table abbreviations of wind farms: AE8/60 - AES Geo Energy Ltd., M1/35 - Kaliakra Wind Power AD, E1/8-EVN Kavarna, DC1/2 - Degrets OOD, DBГ1/5 - Disib OOD, DBГ2MN600/DBГ1HSW250 - Windex OOD, ABГ4 - Long Man Invest OOD, ABBalgarevo - Long Man Energy OOD, ABZevs - Zevs Bonus OOD, VP1/2 - Vertikal-Petkov&Sie SD, ABГ3 - Wind Park Kavarna East EOOD, ABГ1/2 - Wind Park Kavarna West EOOD, AB Millennium Group Micon/AB Millennium Group-Millennium Group OOD*

Turbine	Aug.	Sept.	Oct.	Total
ABBalgarevo	4	4	4	12
ABГ1	3	5	4	12
ABГ2	3	5	4	12
ABГ3	3	5	4	12
ABГ4	3	5	4	12
ABMilenium group	6	6	5	17
ABMilenium group Micon	2	2	3	7
AE10	4	4	4	12
AE11	4	4	4	12
AE12	4	4	5	13
AE13	4	4	5	13
AE14	3	5	4	12
AE15	3	5	4	12
AE16	4	4	4	12
AE17	4	4	4	12
AE18	4	4	5	13
AE19	4	4	5	13
AE20	3	5	4	12
AE21	4	4	4	12
AE22	4	4	4	12
AE23	4	4	4	12
AE24	3	5	4	12
AE25	3	5	4	12
AE26	4	4	4	12

Turbine	Aug.	Sept.	Oct.	Total
AE27	4	4	4	12
AE28	4	4	4	12
AE29	3	5	4	12
AE31	4	4	5	13
AE32	4	4	5	13
AE33	4	4	5	13
AE34	4	4	5	13
AE35	4	4	5	13
AE36	3	5	4	12
AE37	4	4	5	13
AE38	3	5	4	12
AE39	3	5	4	12
AE40	3	5	4	12
AE41	3	5	4	12
AE42	3	5	4	12
AE43	3	5	4	12
AE44	3	5	4	12
AE45	4	4	4	12
AE46	4	4	5	13
AE47	4	4	5	13
AE48	4	4	5	13
AE49	4	4	5	13
AE50	4	4	5	13
AE51	4	4	13	21
AE52	4	4	4	12

Turbine	Aug.	Sept.	Oct.	Total
AE53	4	4	4	12
AE54	4	4	4	12
AE55	4	4	4	12
AE56	4	4	4	12
AE57	4	4	4	12
AE58	4	4	4	12
AE59	4	4	4	12
AE60	4	4	5	13
AE8	3	5	4	12
AE9	3	5	4	12
DBГ1	3	5	4	12
DBГ1HSW250	3	5	4	12
DBГ2	3	5	4	12
DBГ2MN600	3	5	4	12
DBГ3	4	5	4	13
DBГ4	4	4	4	12
DBГ5	4	4	4	12
DC1	4	4	4	12
DC2	4	4	4	12
E00	4	4	5	13
E01	3	5	4	12
E02	3	5	4	12
E04	3	5	4	12
E05	3	5	4	12
E07	3	5	4	12
E08	3	5	4	12
E09	4	4	4	12
M1	3	4	4	11
M10	4	4	4	12
M11	3	4	4	11
M12	4	4	5	13
M13	4	4	5	13
M14	4	4	5	13
M15	4	4	5	13

Turbine	Aug.	Sept.	Oct.	Total
M16	4	4	5	13
M17	4	4	5	13
M18	4	4	5	13
M19	4	4	5	13
M2	3	4	4	11
M20	4	4	5	13
M21	4	4	5	13
M22	4	4	5	13
M23	4	4	5	13
M24	4	4	5	13
M25	4	4	5	13
M26	4	4	5	13
M27	4	4	5	13
M28	4	4	5	13
M29	4	4	5	13
M3	3	4	4	11
M30	4	4	5	13
M31	4	4	5	13
M32	4	4	5	13
M33	4	4	5	13
M34	4	4	5	13
M35	4	4	5	13
M4	3	4	4	11
M5	3	4	4	11
M6	3	4	4	11
M7	3	4	4	11
M8	4	4	4	12
M9	4	4	4	12
VP1	3	4	4	11
VP2	3	4	4	11
ABZevs	3	5	4	12
Grand Total	**415**	**488**	**506**	**1409**

As a result of 1409 searches under 114 individual turbines between 1 August and 31 October 2018 a total of eight dead birds of six species were identified as being fatalities through collision (Table 9). Individuals found as collision victims did not involve the target ISPB species.

Table 9. *Victims of collision with turbines during the autumn migration period in 2018.*

Species	Number	Red data boock	IUCN
A. apus	1	Not listed	LC
A. melba	1	Not listed	LC
A. arvensis	1	Not listed	LC
B. Buteo	2	Not listed	LC
L.michahellis	3	Not listed	LC
Larus sp.	1	Not listed	LC
M. alba	1	Not listed	LC

Species	Number	Red data boock	IUCN
M. calandra	1	Not listed	LC
P. perdix	2	Not listed	LC
P. pica	1	Not listed	LC
S. vulgaris	1	Not listed	LC
F. tinnunculus	2	Not listed	LC
E. citrinella	1	Not listed	LC
Total	**18**		

Conclusions

During the monitoring, there were no apparent changes in the main characteristics of the ornithofauna typical for the autumn migration in the whole country and the specific characteristics of the species composition and phenology of bird migration in NE Bulgaria.

The results of the monitoring confirmed the relatively low importance of the ISPB territory for the migatory birds in autumn and the absence of negative influence of the operating wind farms on bird populations passing through the ISPB during their autumn migration.

The migration periods, the species composition, the dynamics in number of birds, the daily activity, the elevation of flights, as well as the feeding, resting and roost sites of the flying birds passing through the area indicated the absence of a barrier effect of the 114 wind turbines covered by ISPB in autumn migration period.

The data presented in this report confirmed the absence of impact on sensitive bird species of order Ciconiiformes, Pelecaniformes, Falconiformes, Gruiformes using migratory upward airflows (thermals) to move (soaring) over long distances in autumn migration period.

All these species were found during the study to cross the site using suitable habitats without the need to increase their energy losses in their daily movements and to change their migratory strategy in the period of autumn mugration.

The quantitative characteristics of bird migration in the ISPB area during autumn 2018, and the absence of mortality among the target bird species allows a continued conclusion that the studied wind farms do not present a risk of adverse impact to migratory birds. The application of the ISPB's safeguards potentially was and can be an ongoing contributory part of the minimal risk posed to birds from wind farms in the Kaliakra region.

A study of wintering geese in the ISPB was carried out in the period of 01 December 2018 to 28 February 2019. The results are reported in the respective seasonal report. A summary will be included in the annual report for 2019.

List of participants in the observations

- **Dr. Victor Vasilev -Field ornithologist**

Senior researcher in the Faculty of Biology, University of Shumen. Member of BSPB and participant in several conservation projects in Bulgaria. Author of over 20 scientific publications in international journals.

- **Dr. Dimitar Dimitrov- Field ornithologist**

Institute of Biodiversity and Ecosystem Research – Bulgarian Academy of Sciences. Author of over 20 scientific publications in international ornithological journals. 5 years of experience in impact monitoring in the region of Kaliakra. Member of BSPB.

- **Ivaylo Antonov Raykov - Field ornithologist**

Museum of Natural History, Varna. Author of over 20 scientific publications in international journals. 5 years of experience in impact monitoring in the region of Kaliakra. Member of BSPB.

- **Veselina Raikova - Field ornithologist**

Natural History Museum of Varna. Member of BSPB. Author of more than 10 publications in international scientific journals. 10 years of experience in impact monitoring study of wind turbines in the study area.

- **Kiril Ivanov Bedev - Field ornithologist**

Researcher in Institute of Biodiversity and Ecosystem Research at the Bulgarian Academy of Sciences. Active member of conservation organization Green Balkans. Long term study on migrating birds and biodiversity of Burgas Lakes. Author of three articles in Bulgarian Red Data Book. Expertise in biotechnology, conservation biology and environmental monitoring. Over 7 years of experience in impact monitoring of wind parks in Bulgaria. Member of Balkani NGO for conservation of birds and nature.

- **Yanko Yankov - Field ornithologist**

Student in Biology, University of Shumen. 7 years of experience in impact monitoring of birds in Wind Park projects in NE Bulgaria. Member of BSPB.

- **Nikolay Bunkov - Field ornithologist**

PhD Student in Institute of Biodiversity and Ecosystem Research – Bulgarian Academy of Sciences

- **Dr. Martin Petrov Marinov – Qualified carcass searcher**

Institute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences. Expert in behavioral ecology and personality of birds

- **Boyan Michev – Field ornithologist**

PhD Student in Institute of Biodiversity and Ecosystem Research at the Bulgarian Academy of Sciences, Department of Ecosystem Research, Environmental Risk Assessment and Conservation Biology.
Expert in radar ornithology and analysis of the radar data for bird monitoring. Member of the European Network for Weather radar application in ornithology.

- **Nikolay Velichkov - Field ornithologist**

Field studies of the distribution and number of breeding bird species ENVEKO, Inspection of use of pesticides and pedigrees in the framework of the project "Urgent measures for the protection of the Egyptian Vulture (*Neophron percnopterus*) BSPB".
Monitoring the migration of birds species composition and the number of nesting fauna 2007-2012 "Ecotan" EOOD. 10 years of experience in impact monitoring study of wind turbines in the study area

- **Rusi Todorov Ivanov - Field ornithologist**

Bulgarian Swiss Program for Biodiversity Conservation - Bourgas Wetlands Project 1998 - 2004 mid-winter census of water birds 1998 - 2005 - BSPB. Monitoring of the ornithofauna of Burgas wetlands - monthly 1998 - 2005 2011 ECOTAN -Monitoring during the breeding season of the Imperial Eagle (*A. heliaca*) - Sladun village. 2011 Monitoring of the flying birds during the autumn migration of the reserve At. lake. ECOTAN. Study of the spatial migration of *L. michahellis* by marking with colored rings. - GICB 2010 - 2018 2011 -2013d Mapping and Determination of the Conservation Status of Natural Habitats and Species - Phase 1, Lot 7 - Determination and Minimization of Risks for Wild Birds. Union Econet - MOEW

- **Jelyazko Dimitrov Dimitrov - Field ornitologist**

Member of BSPB from 31.12.2006 to 31.12.2010. Trained to monitor the severity of collisions of birds with wind turbines.

- **Dimitar Jelyazkov Dimitrov - Field ornitologist**

Student in Biology at Sofia University Kliment Ohridski. Field activities - participation in a number of field studies - monitoring of some important zones on the territory of Bulgaria. (Durankulak lake and the Shabla lake complex (2010 - 2013)) and the Soil Field (2014-2017), regular winter monitoring of waterfowl in Shabla and Durankulak Lake in connection with the Life + project (2011 - 2017), monitoring of *Spermophilus cittelus* in the reintroduced colony near Kotel (2017), census of cetacean mammals on the northern Black Sea coast with ECO-Nord association, voluntary observer initiatives on reintroduction of the griffon vulture in the Kresna Gorge.