INTEGRATED SYSTEM FOR PROTECTION OF BIRDS

REPORT

Monitoring of spring bird migration in the Integrated System for Protection of Birds 2020

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1. Introduction

The present study was commissioned by AES Geo Energy Ltd., Kaliakra Wind Power, EVN Kavarna, 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, and Millennium Group OOD in order to collect and summarize the information about the performance of the Integrated System for Protection of Birds (ISPB) that includes 114 wind turbines, 95 of which are within the Kaliakra SPA BG0002051 and 19 are in the areas adjacent to the protected zone.

Considering the potentially adverse effects of wind farms on environmental features, notably birds (Abbasi et al. 2014), the Integrated System for Protection of Birds (ISPB) was implemented in 2018 aiming towards systematic monitoring of any potential adverse effects, and their mitigation: primarily including fatalities through collision with rotating turbine blades, disturbance leading to the displacement of birds from feeding, drinking, roosting or breeding sites (effectively a form of habitat loss), and turbines presenting a barrier to flight movements, thereby preventing access to areas via those movements or increasing energy expenditure to fly around the turbine locations (Hötker et al. 2006, Madders & Whitfield 2006, Drewitt & Langston 2008, Masden et al. 2009, 2010, de Lucas et al. 2004, 2008, Ferrer et al. 2012).

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 (TSS) 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/.

It should be noted that this is the third report dedicated to the spring migration period and the ISPB is a subject of continuous improvement based on the observations and any challenges revealed by the several inherent monitoring protocols.

Figure 1 presents the locations of all 114 wind turbines within the study area covered by the ISPB.

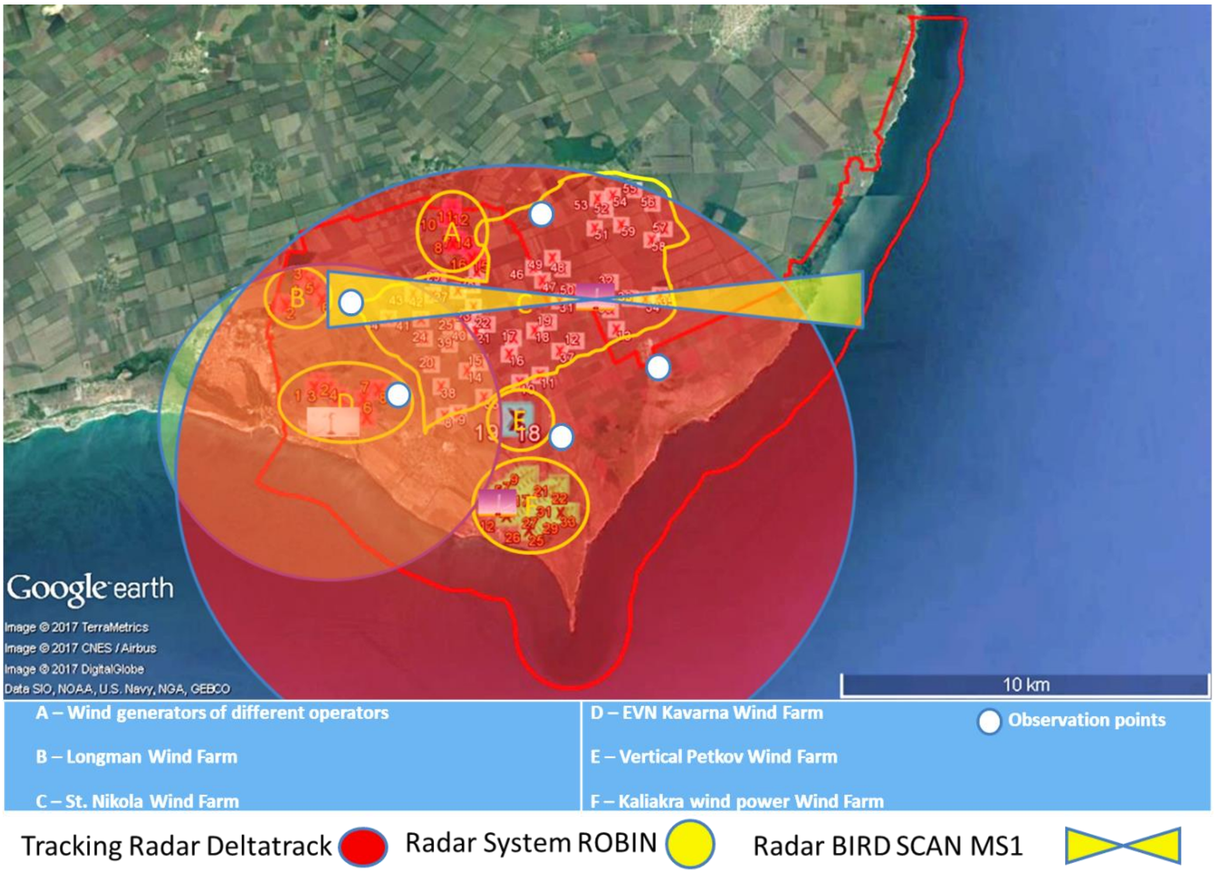

Figure 1. *A satellite photo with the location of the wind turbines covered by the ISPB and the boundaries of Kaliakra SPA (shown by the red line), together with the scope of three radar systems.*

The current report present results of monitoring of the ISPB territory described above in spring 2020. The objectives and tasks of the study are the same as presented before in the report for spring 2018 and 2019 available at the web site of ISPB (https://kaliakrabirdmonitoring.eu/). In order to collect comparative data on spring migration in 2018, 2019 and 2020 the same methods were applied in the study by the same team of ornithologists as described in detail in the report for spring migration 2018 (https://kaliakrabirdmonitoring.eu/)

2. Results

2.1. Dynamics of spring migration and direction of migrating birds

During the spring monitoring, observations were made during all 61 days of the season (15 March – 15 May), with registered migratory, soaring birds being detected over 70 % of the time both in spring 2018, 2019 and 2020. For the surveyed season, a total of 1560 migratory and resident birds were registered in 2018 with 3578 in 2019 and 1252 in 2020 (Table 1).

Table 1. *Number of registered birds of all taxa by dates during the spring migration period in the territory covered by ISPB.*

Period	Number of birds in Spring 2018	Number of birds in Spring 2019	Number of birds in Spring 2020
15-31 March	882	1900	738
1-30 April	445	1203	397
1-15 May	233	476	117
Total for the season	1560	3578	1252

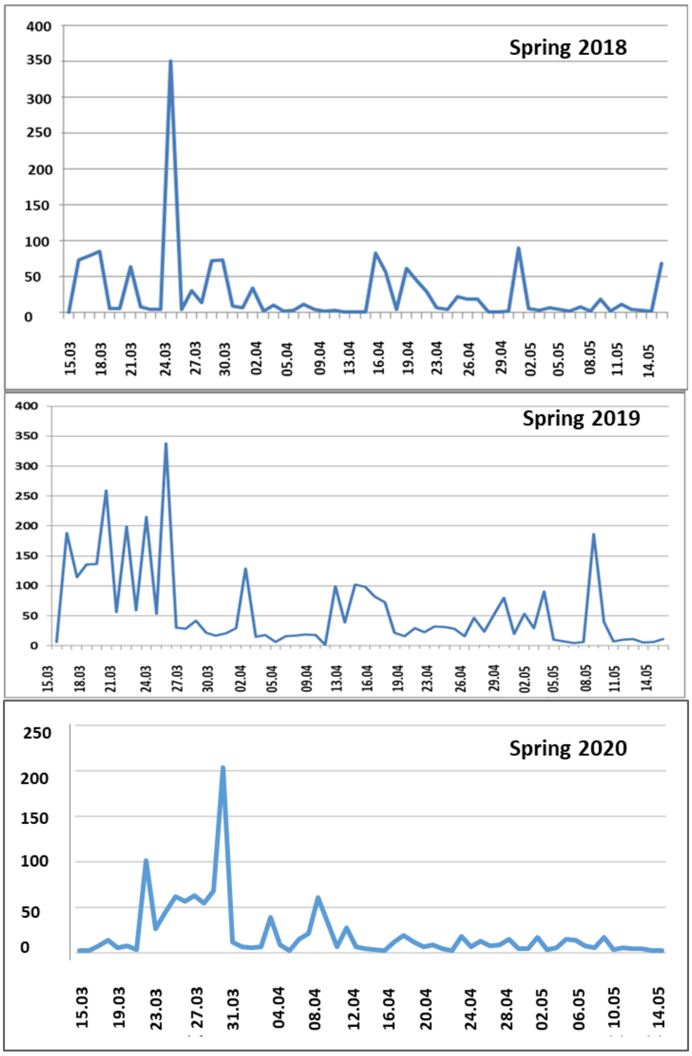

Figure 2. *Dynamics of the spring migration of birds in the ISPB territory based on visual observations during the period 15 March - 15 May in 2018, 2019 and 2020.*

The variations in bird numbers were substantial within the spring seasons of migration covered by the monitoring study period (Figure 2). The total number of observed birds in the ISPB territory in spring 2019, was more than double that observed in spring 2018 and 2020. Despite this variation in the overall recorded abundance of birds, the seasonal dynamics in numbers of birds in the three years remained relatively similar, including an identical date for the peak of migration on 26 March in 2018 and 2019; and 29 March in 2010.

An important parameter for determining the impact of wind turbines on birds is whether or not the general direction of the migration was changed by the presence of the turbines. For birds with registered flight directions, the distribution of directions in spring 2018, 2019 and 2020 is presented in Table 2.

***Table 2**. Proportion of registered birds by direction during spring migration on the territory of ISPB for the period 15 March - 15 May 2018,2019 and 2020. In grey are the expected directions for the prevailing spring migration.*

Direction	Percent of birds 2018	Percent of birds 2019	Percent of birds 2020
N	28,88%	19,73%	23,76%
NE	41,91%	34,51%	56,16%
NW	5,98	7,15%	1,08%
NNW	0,34%	8,83%	0
NNE	2,82%	0,06%	0
ENE	0	1,93%	0
WNW	0,13%	0	0
WSW	0	0,50%	0
S	1,75%	3,63%	4,54%
SE	0,54%	3,27%	2,38%
E	9%	4,81%	6,59%
ESE	0	0,14%	0
SW	2,8%	5,76%	1,30%
SSW	0	0,08%	0
W	1,68%	3,80%	4,21%

The main direction of flight in the migratory birds during spring migration in three years 2018, 2019 and 2020 was N-NE. There was no observed deviation from the seasonal expectation of migratory flight directions which were centred towards the north and northeast as expected given the species' destinations (Table 2). No changes were identified in the migratory directions of the birds due to the proximity to wind turbines under surveillance.

2.2. Species composition and number of birds

The species and number of birds recorded during spring migration in 2018, 2019 and 2020 are shown in Table 3.

***Table 3.** Composition and number of registered bird species during the period 15 March - 15 May 2018, 2019 and 2020 in the ISPB territory.*

Species name	*Number in Spring 2018*	*Number in Spring 2019*	*Number in Spring 2020*
A. alba		*22*	
A. apus	*2*	*18*	
A. cinerea	*6*	*136*	*78*
A. gentilis	*1*	*1*	
A. heliaca		*1*	
A. melba	*5*	*9*	
A. nisus	*1*	*12*	*11*
A. pennata	*2*		
A. pomarina	*1*	*3*	*1*
A. purpurea		*1*	*31*

Species name	*Number in Spring 2018*	*Number in Spring 2019*	*Number in Spring 2020*
A. querquedula		*240*	
A. ralloides	*1*		
A. heliaca			*1*
B. buteo	*75*	*137*	*61*
B. oedicnemus		*6*	
B. rufinus	*1*	*27*	*33*
C. aeruginosus	*23*	*70*	*45*
C. canorus		*3*	
C. ciconia	*81*	*205*	*81*
C. corax	*2*	*31*	*4*
C. cornix	*6*	*13*	
C. coturnix		*1*	
C. cyaneus	*8*	*38*	*3*
C. frugilegus		*2*	
C. gallicus	*6*	*17*	*3*
C. garrulus	*4*		
C. macrourus	*1*	*6*	*3*
C. nigra	*4*	*1*	
C. olor	*9*	*12*	*6*
C. pygargus	*8*	*41*	*20*
C. ridibundus		*26*	
E. alba			*9*
E. garzetta		*1*	
F. cherrug	*1*		
F. coelebs		*305*	
F. columbarius		*1*	
F. peregrinus	*1*	*1*	*1*
F. subbuteo	*8*	*18*	*12*
F. tinnunculus	*37*	*61*	*30*
F. vespertinus	*21*	*11*	*13*
G. grus	*62*		*182*
G. virgo	*25*		*63*
H. albicilla	*1*		
H. caspia			*5*
L. fuscus		*1*	*12*
L. melanocephalus		*120*	
L. limosa			*29*
L. michahellis	*43*	*56*	
M. alba		*1*	
M. apiaster	*85*	*130*	*10*
M. flava		*2*	
M. migrans	*1*	*1*	*5*
N. nicticorax			*3*
O. oriolus	*2*		
P. apivorus	*2*	*1*	*1*
P. apricaria		*4*	
P. carbo	*601*	*1452*	*434*
P. falcinellus		*37*	
P. haliaetus		*1*	
P. onocrotalus	*259*	*201*	
P. pugnax			*61*
P. perdix	*2*		
S. melanocephala		*2*	
S. rusticola		*1*	
S. turtur	*1*		
S.hirundo	*1*		
St. vulgaris	*80*		
T. tadorna	*35*	*3*	
T. ochropus			*1*

Species name	***Number in Spring 2018***	***Number in Spring 2019***	***Number in Spring 2020***
T. torquatus		*1*	
U. epops	*3*	*12*	
V. vanellus	*2*	*2*	
Number of species	***43***	***53***	***32***

32 bird species were observed in ISPB territory in three spring seasons. The most numerous birds in spring in the region for three migratory seasons were Common cormorants (*Phalacrocorax carbo*) and some birds of prey – Common buzzards (*Buteo buteo)*, Red-footed falcon (*Falco vespertinus*), Common kestrels (*Falco tinnunculus*) and Marsh harriers (*Circus aeruginosus*) (Table 3). One of the most numerous species in the previous two spring seasons, the White pelican (*Pelecanus onocrotalus*), was not observed in the spring migration monitoring of 2020, but a flock of 120 white pelicans was observed out with the programmed monitoring period in the ISPB territory (on 29 May 2020) and is not presented in Table 3.

Between 81 and 205 White storks (*Ciconia ciconia*) passed over the surveyed territory in the three spring seasons. 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. According 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.

Common buzzards, Marsh harriers, Eurasian hobby (*Falco subbuteo*) Common kestrels and Red-footed falcon were the most numerous birds of prey recorded during spring migration. The proportional contribution to records of raptors from the five most commonly recorded species during spring migration 2018, 2019 and 2020 is shown in Figure 3.

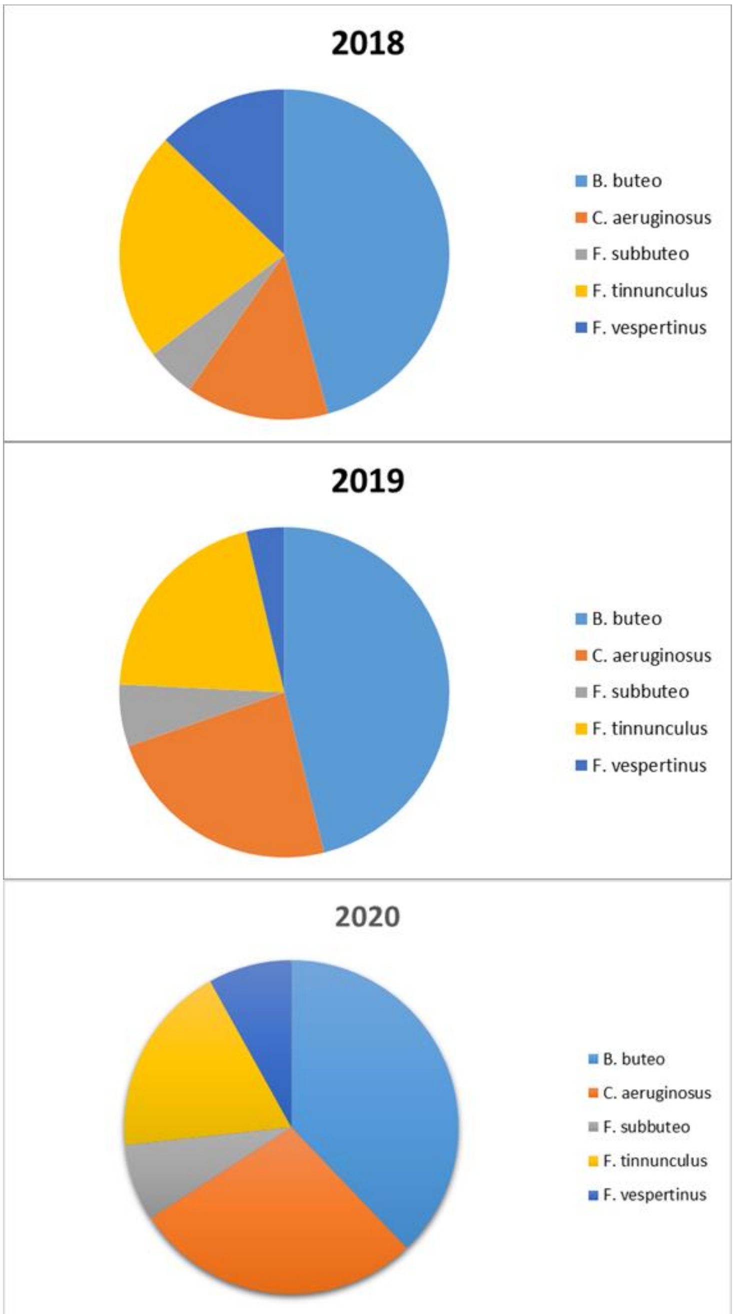

Figure 3. *Proportional representations of the five most numerous birds of prey recorded during spring migration 2018, 2019 and 2020 respectively.*

2.3. Frequency of appearance

During the spring migration in 2018, 2019 and 2020 over the surveyed area, migratory species of soaring birds were noted on an average of 80 % of the days covered by the spring migration survey programme. In the majority of days, only one bird was observed, predominantly Falconiformes, some of which are local breeding species for the area. These were mostly Common buzzard and Common kestrel. These species were regularly observed to hunt in the area covered by ISPB in all three spring seasons. Flocks of migratory birds having more than three individuals were observed in only a few days. In most cases, they were flocks of cormorants. Another more regularly observed species was Red-footed falcon. The most frequent migrant during the spring monitoring period was the Common buzzard. White storks were observed on only nine days during the monitoring in spring 2018, 28 days in spring 2019 and 27 days in 2020. In fact, only three flocks of White storks were observed respectively in 2018 and 2019 spring migration periods and only one flock in spring 2020. The other White storks observed in spring migration periods were single individuals and most probably breeding individuals which were observed in different days of the monitoring.

2.4. Altitude of flights

The substantial majority of observed migrating birds in the monitoring periods of 2018, 2019 and 2020 passed through the area with wind turbines at altitudes below 300 m above the ground. Over 70 %, 60 % and 90% of birds were observed to fly at a height of less than 200 m above ground level in spring 2018, 2019 and 2020 respectively. No changes in flight height due to the proximity of wind turbines were observed. The distribution of migratory birds according to flight altitude is shown in Figure 4.

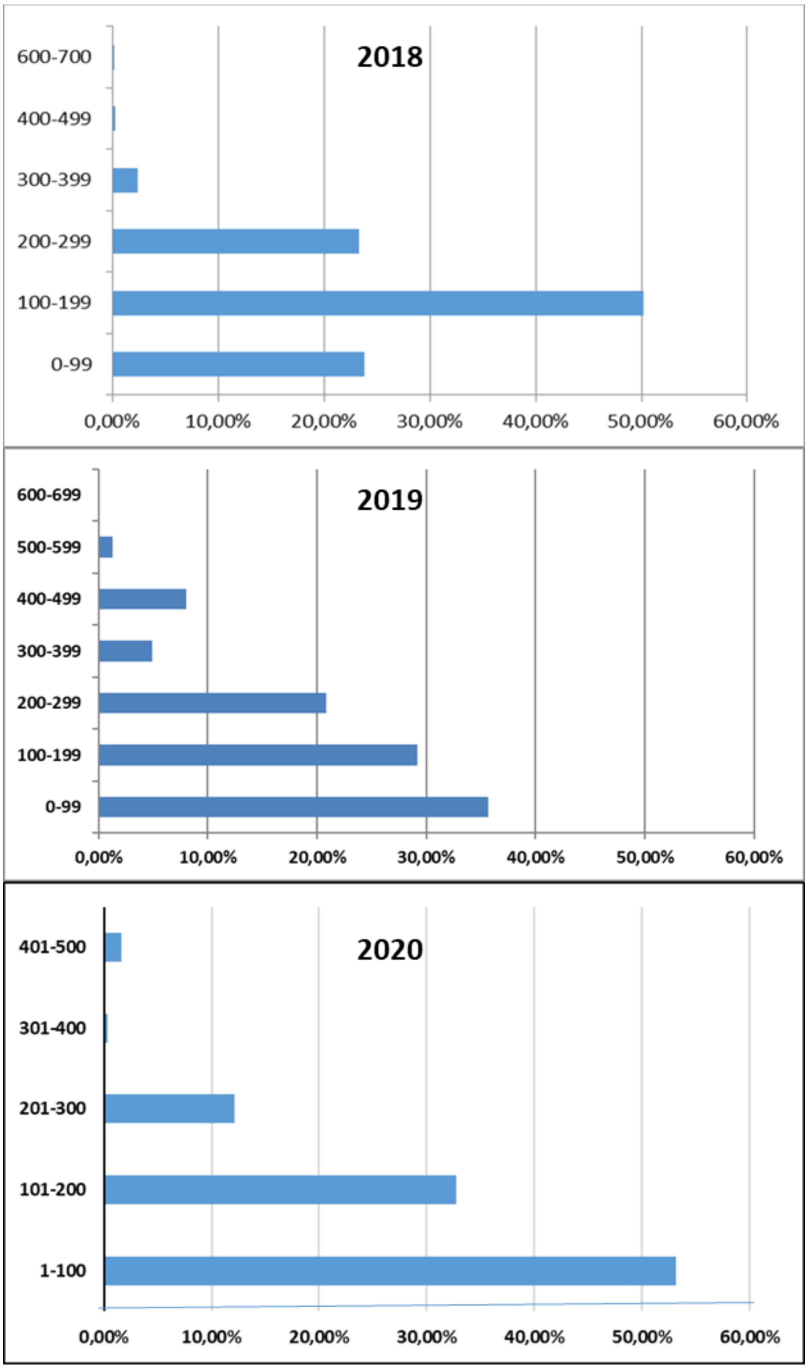

Figure 4. *Distribution of passing birds in 10 % classes according to flight altitude (m) in spring 2018,2019 and 2020*

2.5. Ordered and automatic wind turbine stops during the spring migration period

No stops of turbines were ordered under the Turbine Shutdown System (TSS) during the spring migration period of 2020. This was primarily because all the observed birds passing through the ISPB territory were outside the zone of the risk of collision with turbines.

2.6. Flocks of target bird species for ISPB as observed in spring migration

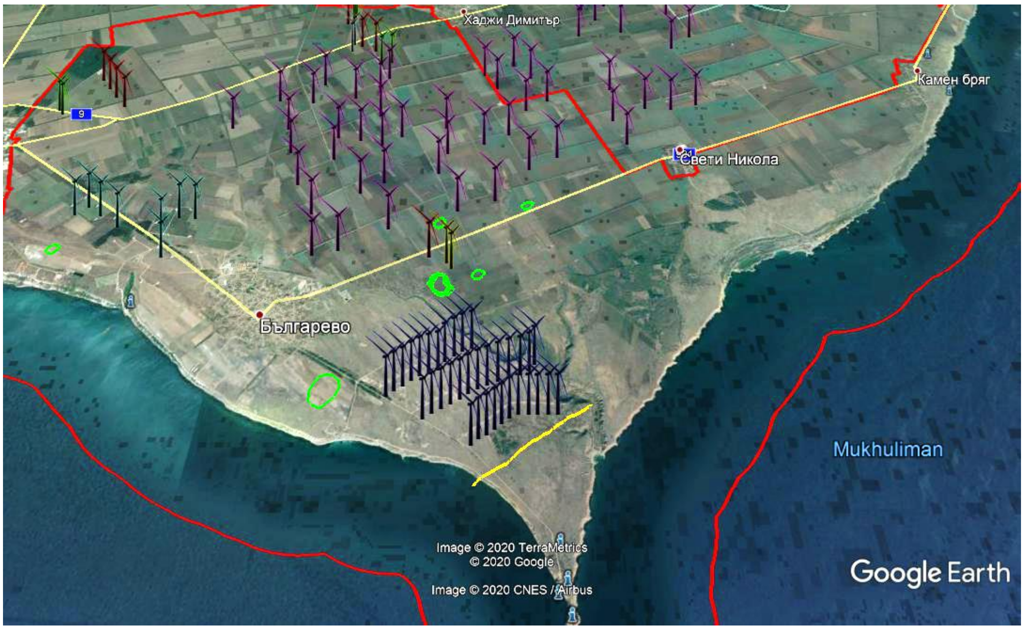

Figure 5. *Flock of 22 Grey herons (yellow)observed 28 March 2020 and in green the feeding territories of mixed flocks of Common and Demoiselle cranes*

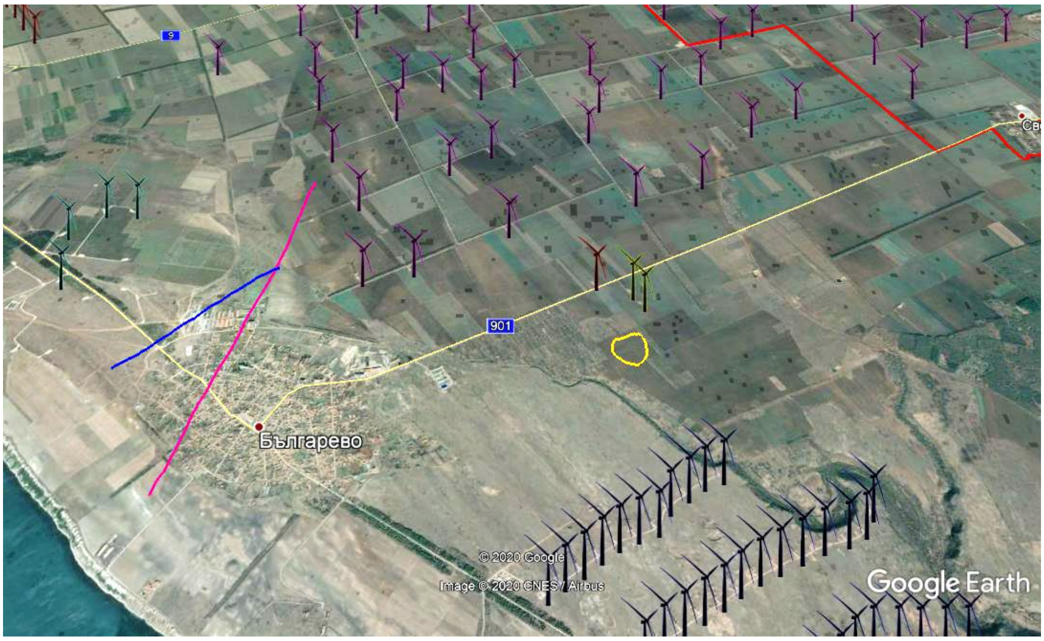

Figure 6. *Flock of 16 Common cranes (yellow), 25 Purple herons (blue) and 42 White storks (pink) observed 30 March 2020 г*

2.7. Results of searches for collision victims

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 when the access to searched area was possible. According to previously performed carcass removal and searcher efficiency tests during autumn migration and in winter at SNWF (and repeated in autumn 2018 for ISPB territory), 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. For details, see previous studies of: http://www.aesgeoenergy.com/site/Studies.html and results of previous ISPB reports at https://kaliakrabirdmonitoring.eu/.

The total of turbine searches per turbine is presented in Table 4.

Table 4. *Number of turbines searched for collision victims in the territory of ISPB during the period 15 March 15 May 2020. The Code of every turbine incudes the abbreviation of the wind farm and the number of the turbine:* ***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 number	March 2020	April 2020	May 2020	Total
ABБългарево	2	4	3	9
ABГ1	2	4	2	8
ABГ2	2	4	2	8
ABГ3	2	4	2	8
ABГ4	2	4	2	8
ABМилениум груп	2	5	2	9
ABМилениум груп Микон	2	5	2	9
AE10	2	4	3	9
AE11	2	4	3	9
AE12	3	4	2	9
AE13	2	5	2	9
AE14	3	4	2	9
AE15	3	4	2	9
AE16	2	4	3	9
AE17	2	4	3	9
AE18	3	4	2	9
AE19	3	4	2	9
AE20	3	4	2	9
AE21	2	4	3	9
AE22	2	4	3	9
AE23	2	4	3	9
AE24	2	4	2	8
AE25	2	4	2	8
AE26	2	4	3	9
AE27	2	5	2	9
AE28	2	4	3	9
AE29	2	4	2	8
AE31	2	5	2	9
AE32	2	5	2	9
AE33	2	5	2	9
AE34	2	5	2	9
AE35	2	5	2	9
AE36	3	4	2	9
AE37	3	4	2	9
AE38	3	4	2	9
AE39	2	4	2	8
AE40	2	4	2	8
AE41	2	4	2	8
AE42	2	4	2	8
AE43	2	4	2	8
AE44	2	4	2	8
AE45	2	5	2	9
AE46	3	4	2	9
AE47	3	4	2	9
AE48	3	4	2	9

Turbine number	March 2020	April 2020	May 2020	Total
AE49	3	4	2	9
AE50	2	5	2	9
AE51	3	4	2	9
AE52	3	4	2	9
AE53	3	4	2	9
AE54	3	4	2	9
AE55	3	4	2	9
AE56	3	4	2	9
AE57	3	4	2	9
AE58	3	4	2	9
AE59	3	4	2	9
AE60	2	5	2	9
AE8	3	4	2	9
AE9	3	4	2	9
DBГ1	2	4	2	8
DBГ1HSW250	2	4	2	8
DBГ2	2	4	2	8
DBГ2MN600	2	4	2	8
DBГ3	2	4	2	8
DBГ4	2	5	2	9
DBГ5	2	5	2	9
DC1	2	5	2	9
DC2	2	5	2	9
E00	2	4	3	9
E01	2	4	2	8
E02	2	4	2	8
E04	2	4	2	8
E05	2	4	2	8
E07	2	4	2	8
E08	2	4	2	8
E09	2	4	3	9
M1	2	4	3	9
M10	2	5	2	9
M11	2	5	2	9
M12	2	5	2	9
M13	2	5	2	9
M14	2	5	2	9
M15	2	5	2	9
M16	2	5	2	9
M17	2	5	2	9
M18	2	5	2	9
M19	2	5	2	9
M2	2	4	3	9
M20	3	4	2	9
M21	3	4	2	9
M22	3	4	2	9

Turbine number	March 2020	April 2020	May 2020	Total
M23	3	4	2	9
M24	3	4	2	9
M25	3	4	2	9
M26	3	4	2	9
M27	3	4	2	9
M28	3	4	2	9
M29	3	4	2	9
M3	2	4	3	9
M30	3	4	2	9
M31	3	4	2	9
M32	3	4	2	9
M33	3	4	2	9

Turbine number	March 2020	April 2020	May 2020	Total
M34	3	4	2	9
M35	3	4	2	9
M4	2	5	2	9
M5	2	5	2	9
M6	2	5	2	9
M7	2	5	2	9
M8	2	5	2	9
M9	2	5	2	9
VP1	2	4	3	9
VP2	2	4	3	9
АВЗевс	3	4	2	9
Grand Total	**269**	**488**	**245**	**1002**

13 records of dead birds after collision with wind turbines were documented during the 2020 spring migration of birds in ISPB territory (Table 5). Most numerous among the confirmed collision victims during the study period were Skylarks and Common starling; but only four and two respectively (Table 5). No case of turbine collision for the target bird species identified in the ISPB programme was registered during the monitoring in spring 2020 (the target species are listed at https://kaliakrabirdmonitoring.eu/).

Table 5. *Confirmed collision victims and species' conservation status as recorded during the 2020 spring migration period. Red Data Book refers to the Bulgarian classification, and LC under the IUCN column refers to the Least Concern category of species' international conservation status as determined by IUCN.*

English name	***Species name***	***Number of birds***	***Red Data Book***	***IUCN***
Eurasian skylark	*Alauda arvensis*	*4*	*not listed*	*LC*
Common Starling	*Sturnus vulgaris*	*2*	*not listed*	*LC*
Common chaffinch	*Fringilla coelebs*	*1*	*not listed*	*LC*
Grey partridge	*Perdix perdix*	*1*	*not listed*	*LC*
Eurasian sparrowhawk	*Accipiter nisus*	*1*	*not listed*	*LC*
Common blackbird	*Turdus merula*	*1*	*no listed*	*LC*
Eurasian blackcap	*Sylvia atricapilla*	*1*	*no listed*	*LC*
Lesser whitethroat	*Sylvia curruca*	*1*	*not listed*	*LC*
Common Wood pigeon	*Columba palumbus*	*1*	*not listed*	*LC*

3. CONCLUSIONS

1) 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 spring bird migration in NE Bulgaria.

2) 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.

3) The results suggested an absence of a barrier effect of the 114 wind turbines for spring migrants.

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

5) 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.

6) The quantitative characteristics of bird migration in the ISPB area during spring 2020, 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 spring 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.

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