Monitoring of wintering geese in the AES Geo Energy Wind Farm "St. Nikola" territory and the Kaliakra region in winter 2017/2018

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Introduction

This report presents results of the ornithological survey and monitoring at Saint Nikola Wind Farm (SNWF) in the period 01 December 2017 to 15 March 2018, continuing from similar studies in previous winters before and after construction of SNWF including period of carcass searches and Turbine Shut Down System application in winter 2017-2018. As stated in previous reports the primary objective of wintering bird studies at SNWF is to investigate the possible effects of the wind farm on geese populations, notably the Red-breasted Goose (*Branta ruficollis)* (RBG) due to its globally threatened conservation status. Previous years' wintering studies at SNWF have been reported and presented for download on the AES SNWF website.

To date, as documented by previous reports, there have been no indications that SNWF has had any adverse impact on wintering geese, including RBG, and the more abundant Greater White-fronted Goose (*Anser albifrons*) (GWFG). This report presents the latest results, from the 2017-2018 winter monitoring of SNWF.

Methods

The same methods as in previous winter surveys were applied in order to have best compatibility of the obtained data within all years. These methods were described in detail by a number of previous reports, available at: http://www.aesgeoenergy.com/site/Studies.html

Data was collected within a 'core study area' that encompassed an area centered on the SNWF wind farm, but with additional areas in a buffer that extended at least 2 km from the wind farm (Figure 1)

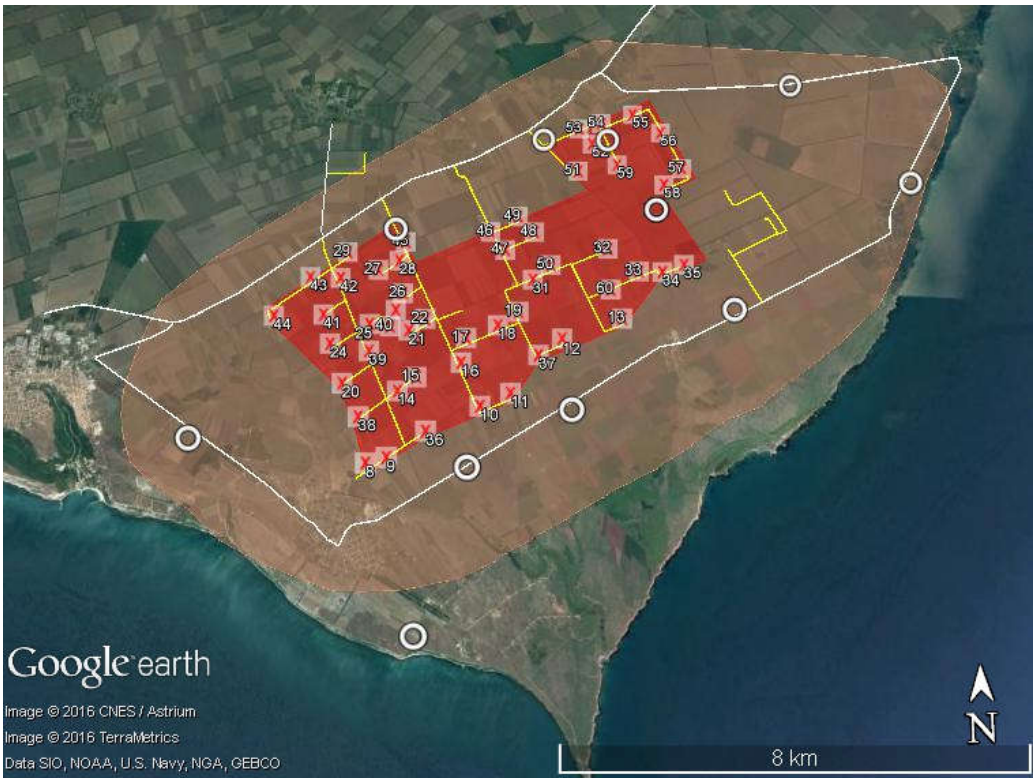

Figure 1. *Map of the "SNWF" study area (red), the "core study area" (brown) and observation points (white circles) covered by the winter monitoring 2017 – 2018.*

Searches under turbines for collision victims were set to be undertaken, as in previous winters, under a protocol for a basic seven day search interval as presented in Table 1. Details of the searching methodology were published in previous reports available at the web site http://www.aesgeoenergy.com/site/Studies.html. For the last three winters we have extended the period of searches to March 30.

Table 1. Number of searches per turbine in the period 01 December 2017 – 30 March 2018.

№ Turbine	December	January	February	March	Total
8		3	3	3	9
9		3	3	3	9
10		2	4	3	9
11		2	4	2	8
12	1	4	3	4	12
13	1	4	3	3	11
14		2	3	3	8
15		2	3	3	8
16		2	4	4	10
17	1	4	3	4	12
18	1	4	3	4	12
19	1	5	3	3	12
20		2	3	3	8
21		1	4	3	8
22		1	4	3	8
23		2	4	3	9
24		1	3	3	7
25		2	3	3	8
26		1	4	3	8
27		1	4	4	9
28		1	4	3	8
29		3	3	3	9
31	1	3	3	3	10
32	1	4	3	3	11
33	1	4	3	3	11
34	1	4	3	3	11
35	1	4	3	3	11
36		3	3	3	9
37	1	4	3	4	12
38		1	3	3	7
39		2	3	3	8
40		2	3	3	8
41		2	3	3	8
42		2	3	3	8
43		2	3	3	8
44		2	3	3	8
45		2	4	4	10

№ Turbine	December	January	February	March	Total
46	1	3	4	3	11
47	1	4	4	3	12
48	1	3	4	3	11
49	1	3	4	3	11
50	1	4	3	3	11
51	1	3	4	3	11
52	1	3	4	3	11
53	1	4	4	3	12
54	1	3	4	3	11
55	1	3	4	3	11
56	1	3	4	3	11
57	1	3	4	3	11
58	1	3	4	3	11
59	1	3	4	3	11
60	1	4	3	3	11
Grand Total	**26**	**142**	**179**	**162**	**509**

A detailed information of methods underlying the decisions and procedures for switching off turbines (the Turbine Shutdown System: TSS) under a risk of bird collisions, is described in a number of previous reports and in the Owner Ornithological Monitoring Plan. The feeding grounds and flight activity of geese within the wind farm and surrounding areas identified in the winter surveys were investigated daily and the number of feeding geese at these sites and weather conditions (i.e. heavy mist, fog) were the bases of decisions for the TSS for reduction of the collision risk. As in previous winters, if substantial goose activity at SNWF coincided with weather conditions of adverse visibility then the TSS would be enacted. During this winter monitoring the TSS has been also effectively enacted to avoid any possibility of collision for White-tailed eagles (*Haliaeetus albicilla*) which were seen and any observations of two species of pelicans (see Table 5).

All observations per day were digitalized and mapped for analysis and presentation in this report.

List of participants in the observations

Dr. Victor Metodiev Vasilev – Field ornithologist; Qualified carcass searcher
Senior researcher in the Faculty of Biology, University of Shumen, Bulgaria
Member of BSPB since 1992

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Student in Biology

Results and Discussion

Temporal dynamics and composition of species

Unusually low numbers of geese were observed in the 2017-2018 winter monitoring period. Geese were observed within the core study area between 16 January 2018 and 11 March 2018. There was only one day with observations of geese in February. The numbers of geese observed in the core study area each day are presented in Table 2 and in Annex1.

No Greylag Goose (*Anser anser*) was observed during the monitoring period in winter 2017-2018.

Table 2. All observed geese numbers by species and day of monitoring in the core study area.

Date	A. albifrons	Anser/ Branta	B. ruficollis	Total
16.1.2018	44			44
17.1.2018		40	200	240
18.1.2018		6		6
20.1.2018	762		43	805
23.1.2018	32			32
24.1.2018	106	570	85	761
25.1.2018			60	60
26.1.2018	50	290		340
28.1.2018	38	482	50	570
2.2.2018		25		25
1.3.2018	100			100
3.3.2018	350		220	570
5.3.2018	72	47	3	122
9.3.2018		120		120
11.3.2018	26			26
Grand Total	**1580**	**1580**	**661**	**3821**

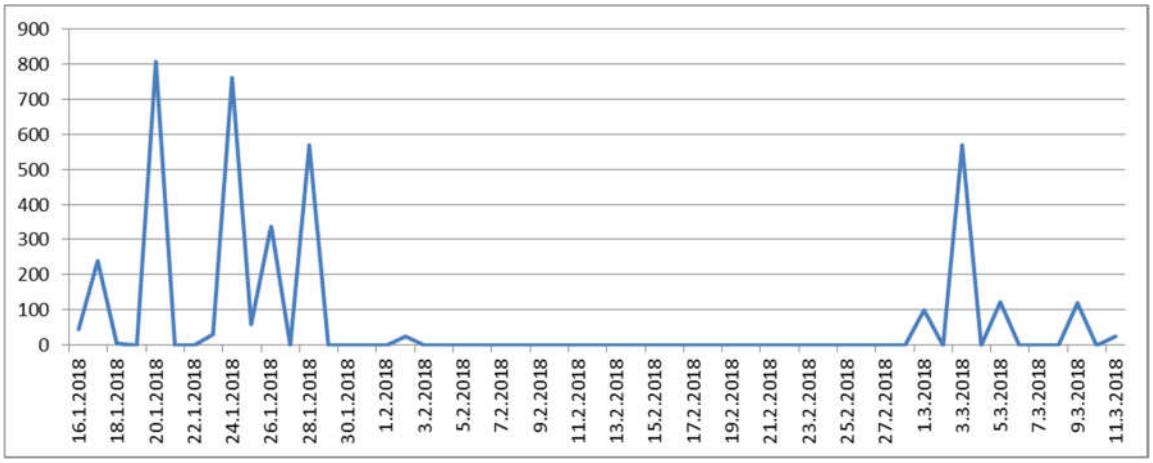

Figure 2. *Temporal distribution of geese (all species) observed in the core study area in winter 2017-2018.*

Unusual for the season and the long-term records, but two pelican species were observed, also recorded in the previous three winters (see winter reports 2014-2015, 2015-2016 and 2016-2017): two White Pelicans (*Pelecanus onocrotalus)* were observed on 23 January 2018 and two Dalmatian Pelicans (*Pelecanus crispus*) were observed on 3 March 2018 (Table 3).

The numbers of birds per species, excluding geese species, are presented in Table 3.

Table 3. The total number of observed birds of different species (excluding geese: see Table 2 for geese) in the core study area (Figure 1) recorded in winter season 2017 - 2018.

Species	December	January	February	March	Total
A. acuta				26	26
A. alba		2		3	5
A. cinerea		2			2
A. crecca				16	16
A. flammeus			2		2
A. gentilis	1	1			2
A. nisus	2	5	3	4	14
A. penelope				5	5
A. platyrhynchos				78	78
A. pratensis		50			50
A. qurquedula				196	196
B. buteo	7	68	39	30	144
B. lagopus	1	1		2	4
B. rufinus	1		12	3	16
C. aeruginosus	2			4	6
C. albus		7			7
C. alpina				3	3
C. cannabina			21		21
C. carduelis			18	12	30
C. chloris			20	7	27
C. ciconia				1	1
C. corax	1			1	2

Species	December	January	February	March	Total
C. cornix			2		2
C. cyaneus	13	53	39	13	118
C. cygnus		58	64	70	192
C. ferrugenea				1	1
C. macrourus		2			2
C. olor		10	5	9	24
F. coelebs				45	45
F. columbarius		1			1
F. tinnunculus	3	6	6	3	18
G. gallinago				2	2
G. grus				2	2
L. cachinans			10		10
L. excubitor		1			1
L. ichthyaetus			1		1
L. limosa				13	13
L. michahellis	8	3			11
M. alba				1	1
M. calandra		248	67	185	500
N. arquata				2	2
P. apricaria		37		219	256
P. carbo		117	229	778	1124
P. crispus				2	2
P.onocrotalus		2			2
P. falcinellus		1			1
P. ochruros			1		1
P. perdix		25			25
P. pugnax			1	286	287
P. squatarola				75	75
S. rusticola				1	1
S. torquatus				1	1
S. vulgaris			49	313	362
T. pilaris			119		119
T. viscivorus				69	69
U. epops				9	9
V. vanellus				52	52
Grand Total	**39**	**700**	**708**	**2542**	**3989**

Total number of observed goose species and their locations

The total numbers of all observed individuals of three species of goose, RBG (*Branta ruficollis*) and GWFG (*Anser albifrons*) during the whole period of the winter monitoring 2017-2018 in the core study area, are shown in Table 4 (as noted earlier no Greylag Goose were seen in 2017-2018 winter).

Table 4. The number of geese of different species recorded in the core study area in winter 2017/2018.

Species	**January**	**February**	**March**	**Total**
A. albifrons	1032		548	1580
Anser/ Branta	1388	25	167	1580
B. ruficollis	438		223	661
Grand Total	**2858**	**25**	**938**	**3821**

The recorded movements of geese as well as feeding locations were mapped day by day (see Annex 1). Identification of all individuals in the mixed flocks of geese is impossible from a distance in early morning and evening hours. The numbers indicated in the maps, presented in Annex 1 represent total geese numbers observed day by day in the period when RBG were present in the core study area. The green color indicates fields with wheat potentially suitable for feeding geese. Feeding geese of any species were not observed in either the core study area or in the wider SNWF study area in winter 2017-2018.

The same color-coding and symbols are used in summarized presentations of all observed mapped records of geese for January, February and March, shown in Figure 3, 4 and 5 respectively.

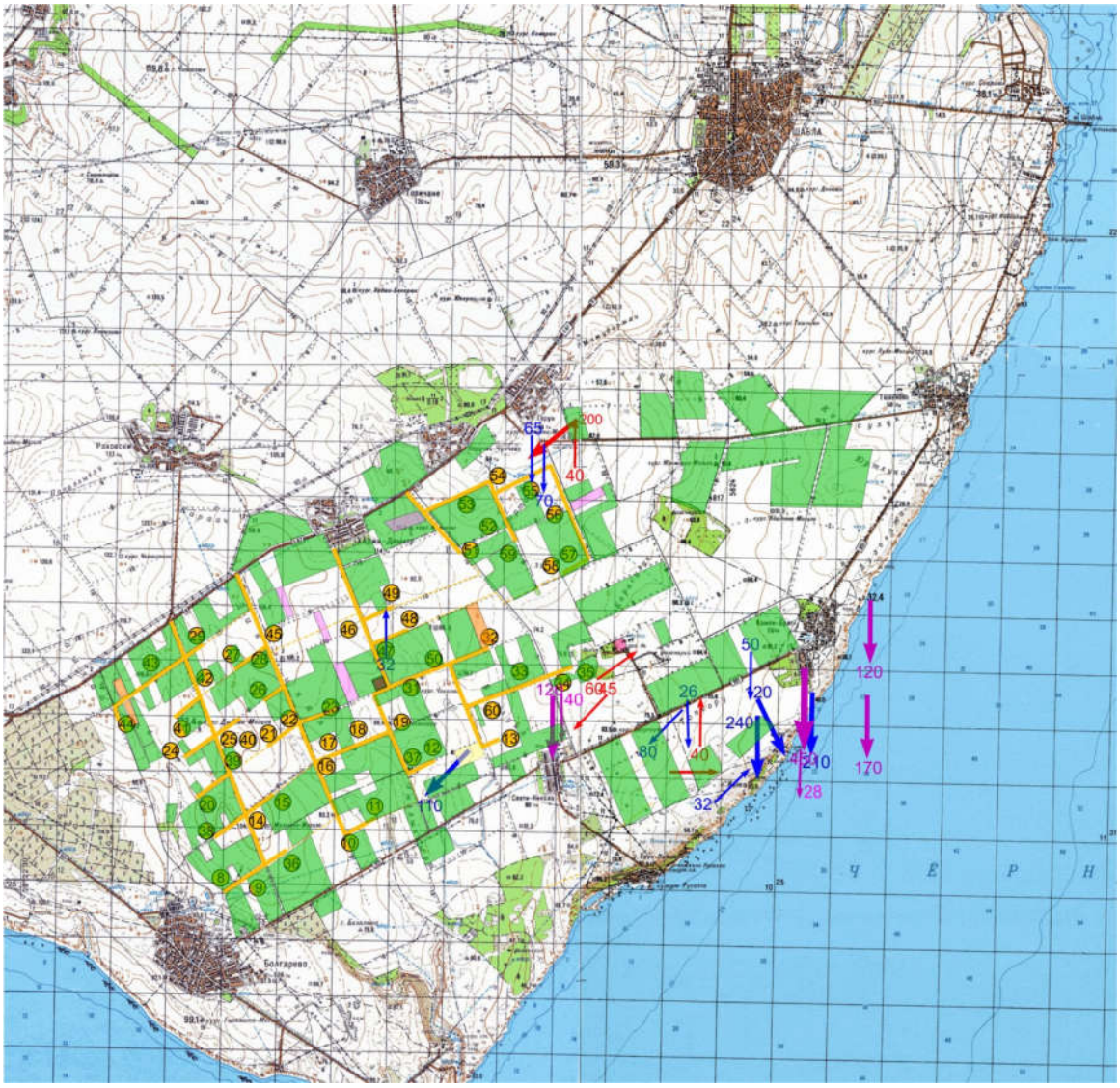

Figure 3. *Spatial summary of geese records in January 2017.*

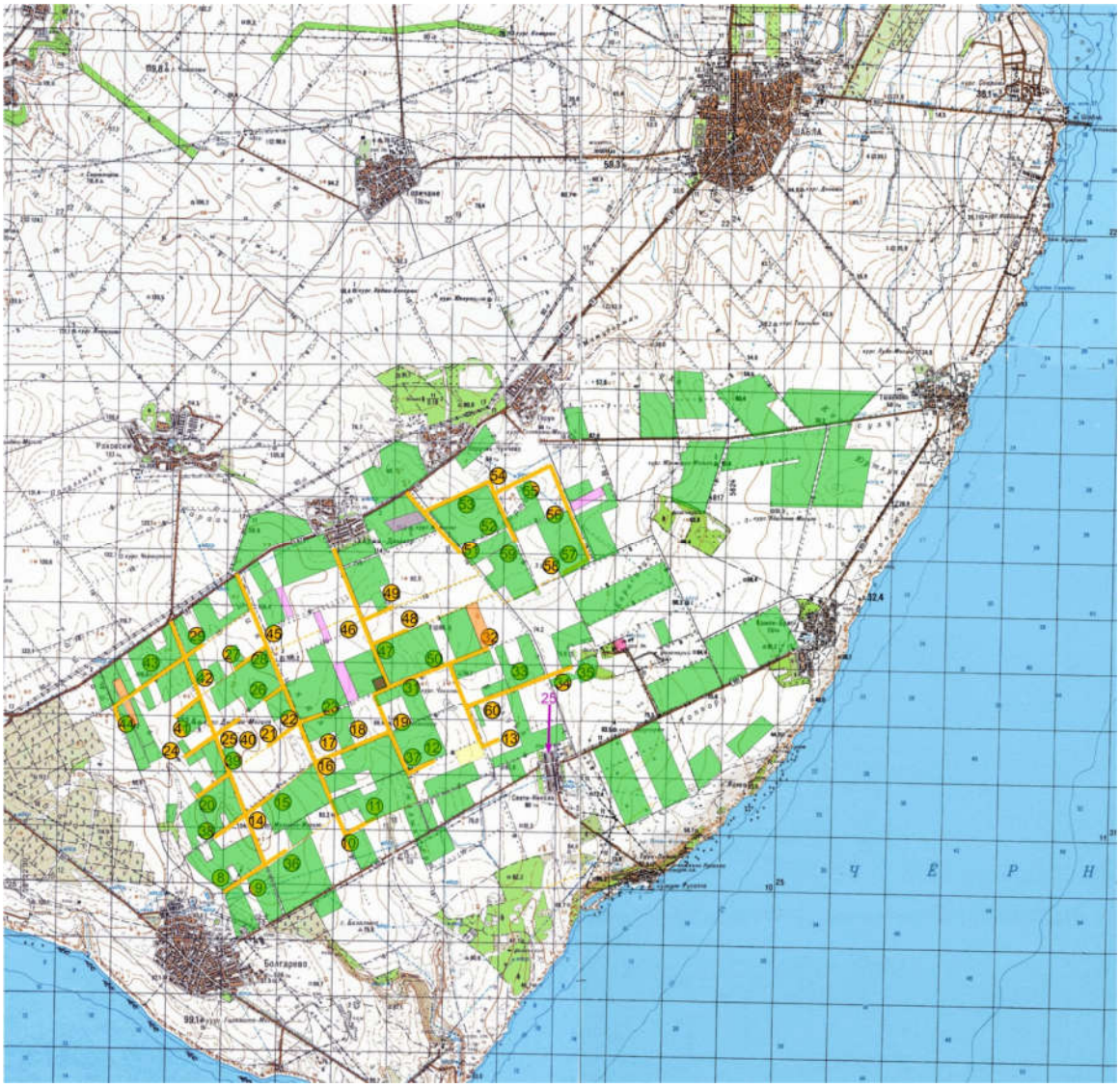

Figure 4. *Spatial summary of mixed species geese flocks in February 2018*

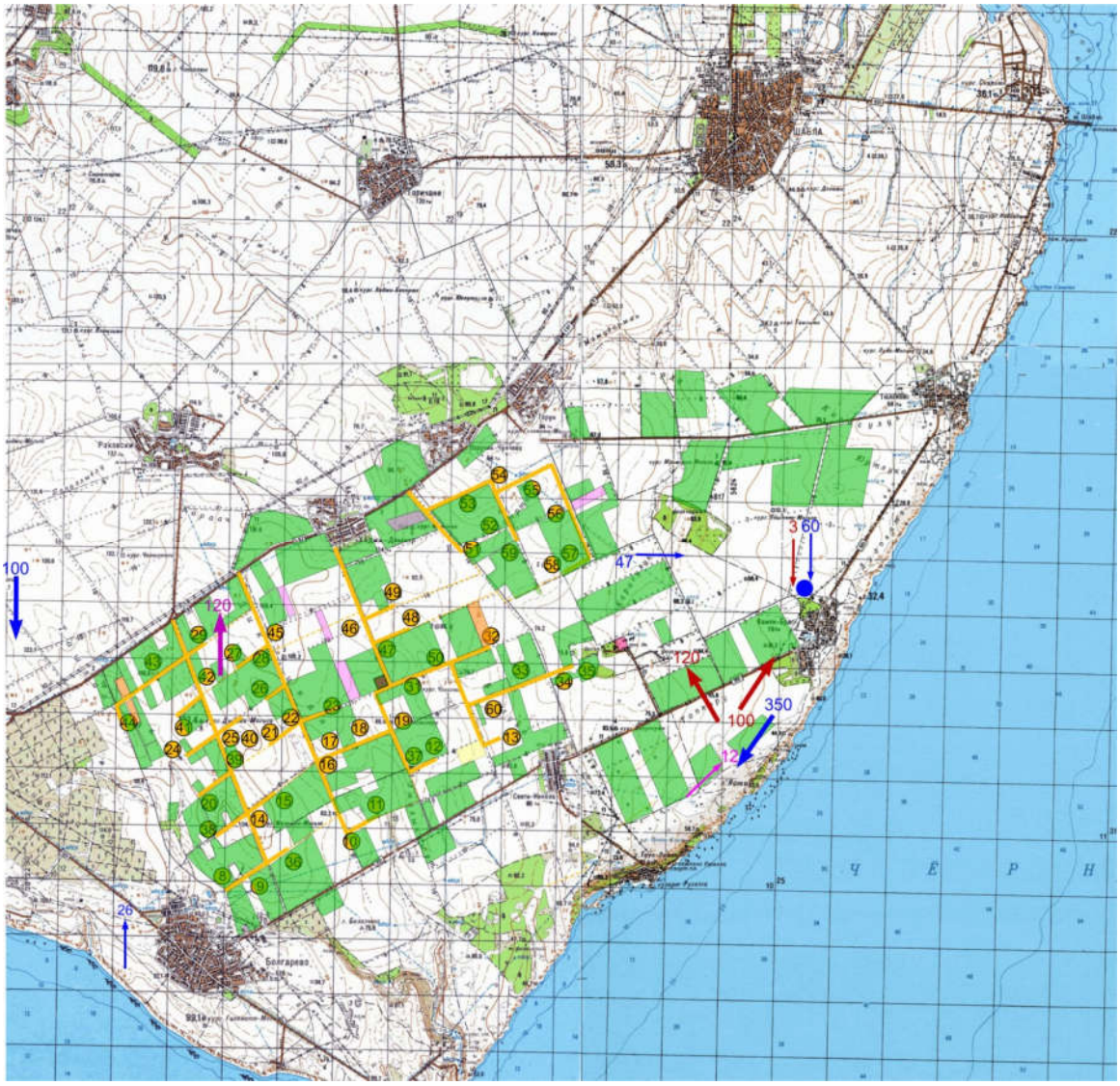

Figure 5. *Spatial summary of geese records in March 2018*

In total, very low numbers of geese of all observed species were present in the SNWF and core study areas. Unusually low numbers of wintering geese was also observed in Bulgaria and Romania in general in the winter season 2017-2018 (http://wildlifeconservation.bg/english/red-breasted-goose-wintering-season-2017-2018/ and http://savebranta.org/en/news/the-peak-of-red-breasted-geese-numbers-in-coastal-dobrudzha-registered-at-the-end-of-january).

The maximum number of geese including RBG in SNWF was observed in mixed species flocks between 17 and 30 January.

The proportion of RBG could not always be precisely evaluated but in all the observations available where the proportions of species could be identified it was consistent with previous winters' records, and varied between 10% and 50%. The numbers of geese observed in

February was much lower than the number of geese in January. In March, there was a second peak in number of flying geese on passage of both dominant species.

All observed geese in winter 2017-2018 were in flight and, as noted earlier, no feeding geese were registered in the wider SNWF study area or the core study area (see Fig. 1). The number of flights per day is presented in Table 2.

The reason for the relatively low number of wintering geese in Bulgaria in general was likely due to the exceptionally mild winter and high temperatures in the 2017-2018 winter. Detailed analyses of correlation between ambient temperature and number of geese in SNWF territory in the last 10 years, and discussion of the role of temperature, are presented in a previous report (http://www.aesgeoenergy.com/site/images/Winter%20Report%202016-2017.pdf).

Carcass monitoring results

All 52 turbines were programmed to be searched every seventh day (if the areas under turbines were accessible) for carcasses during the whole winter survey period (1st December 2016 – 15th March 2017) when more birds are at risk of collision. The last wintering geese in SNWF are typically observed at the beginning of March; therefore, for surety of adequate coverage, the searches continued until the end of March. The actual frequencies of searches are presented in Table 1. The weather condition (ambient temperature, rain and snow coverage) which may have an impact on the frequency and results of the searches has been previously discussed in several winter monitoring reports available at: http://www.aesgeoenergy.com/site/Studies.html.

Searcher efficiency and carcass persistence has been examined twice during winter monitoring at SNWF – in February 2010 and in January 2016. The results were similar and broadly confirm the efficiency in searches and carcass removal rates under turbines for a programme of searches every seven days.

Systematic searches under turbines (Table 1) in the 2017-2018 winter resulted in four sets of remains being found which may have been associated with a collision with the turbines: one Common gull (*Larus canus*) and three Common buzzards (*Buteo buteo*) (Fig. 6). These species are of least concern according to the IUCN criteria and are not listed in Bulgarian Red Data Book. The Common Gull carcass was in a severely decomposed condition indicating a long time period after its death (Fig. 6). The carcass was found in a shelter belt and probably the bird had died in the summer but was not discovered then because of dense vegetation; which had been lost in the winter. No birds of this species were seen in the winter (Table 3) but were recorded earlier in the year. Therefore, this carcass should be not considered as a victim of collision in the winter period.

No body parts or intact remains of geese which could be considered as collision victims were detected after an accumulation of 509 searches under different turbines in the period 1 December 2017 – 30 March 2018 (Table 1). Therefore, no evidence for collision of any goose species, including RBG, has been found in the winters 2010 - 2018 when geese were present and turbines were operating.

Figure 6. *The carcasses of three Common Buzzards (Buteo buteo) were recorded in SNWF as victims of collision in winter 2017-2018. One older carcass (upper right corner) of Common Gull (Larus canus) had probably resulted from a death in summer 2017.*

The TSS in the 2017-18 winter was activated in situations where White-tailed Eagles (*Haliaeetus albicilla*) and pelicans of two species White pelicans (*Pelecanus onocrotalus*) and Dalmatian pelicans (*Pelecanus crispus*) were observed in SNWF. There were no occasions when the TSS required activation because of collision conditions which may have endangered geese. All of the turbine stops associated with the bird observations and the reasons why they were enacted are given in Table 5.

Table 5. Circumstances of turbine stops under the TSS associated with minimizing collision risk of sensitive bird species during the winter 2017-2018 in SNWF. Refer to previous reports for the wind turbine groupings (WTG).

Date	Stop time	Re-start time	Species	Species	Number of birds	WTG	Ordered by	Remarks
16.01.2018	11:45	12:22	*Haliaeetus albicilla*	White-tailed eagle	1	T13, T33, T34, T35	I. Raykov	flying in low altitude 50-100m between the turbines
23.01.2018	12:12	12:17	*Pelecanus onocrotalus*	White pelican	2	E	Y. Yankov	flying in low altitude 50-100m between the turbines
3.3.2018	13:25	13:54	*Pelecanus crispus*	Dalmatian pelican	2	B, D, E	K. Bedev	flying in low altitude 50-100m between the turbines

Conclusions

The relatively mild 2017-2018 winter is probably the main reason for the low number of observed geese of two species in the vicinity of SNWF in this season.

Daily observations from December 2017 to March 2018 (inclusive) revealed that the recorded presence of geese in and around SNWF was compressed into a short time period within the winter, which was essentially the same as already established in studies 2008 – 2017.

The number of wintering geese observed in SNWF during winter broadly corresponded to the total number of wintering geese in the larger region of coastal Dobroudzha region; but was lower, in keeping with SNWF being a fundamentally less-preferred area (grossly and intrinsically, irrespective of the wind farm's presence).

The studies in the 2017-2018 winter continued to show that SNWF is not a source of collision mortality for wintering geese, even though they fly through or feed within SNWF (with varying regularity but sometimes frequently – as in previous winters). The evidence for this is that no remains of geese that could be attributed to collision with SNWF's turbines were found during systematic searches under operational turbines in any of the eight winters when SNWF has been operational.

No gross displacement (disturbance) reaction from geese has been observed for the period 2008-2018 as a result of SNWF's construction and operation. Observed numbers of geese of all three species as well as observed spatial distribution of flying and feeding geese does not indicate gross displacement from the operational SNWF or its immediate environs.

From research associated directly with SNWF described in the present report (and see previous SNWF winter reports on the AES website, and earlier surveys) the core study area remains a feeding ground for RBG as well as GWFG, but it also remains an unimportant area for both species, as indicated in pre-construction studies. Consequently, and based on other studies, SNWF presents no material threat through preventing use of food supplies (and especially in light of other agricultural practices such as crop type and field size of the preferred crop of geese). SNWF also poses no material risk of mortality to geese through collision with turbine blades.