

# Report on estimation of the Aquatic Warbler population in Belarus, 2010

produced within the framework of the following projects:

*“International Cooperation for Aquatic Warbler Conservation – RSPB’s support for a charitable purpose”,*

activity 4.1. Coordination of AW counts 2010 in most important breeding sites in Belarus. Estimation of Belarusian AW population.

*“Catalyzing sustainability of the wetland protected area system in Belarusian Polesie through increased management efficiency and realigned land use practices”*

Counts of animals indicator species in zakazniks “Sporaŭski”, “Zvaniec”, “Siaredniaja Prypiac” and “Prostyr”.

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## **1. AIMS AND OBJECTIVES OF THE STUDY**

The principle aim of the study was to conduct aquatic warbler counts at the most important Belarusian breeding sites being occupied more or less regularly. The following objectives were established:

- 1) Estimate aquatic warbler breeding population in Belarus in the year 2010 and improve monitoring scheme for Zvaniec mire;
- 2) Refine the borders and calculate area of habitat suitable for the species;
- 3) Map all the singing males at the sites where full counts were carried out;
- 4) Involve and train a considerable number of APB volunteers to perform aquatic warbler monitoring;

## **2. METHODS**

The counts were carried out according to the international aquatic warbler monitoring scheme which was developed within the framework of the LIFE-Nature Project (Poland and Germany). The counts started one hour before the sunset and lasted for 2 hours maximum – the period of the highest singing activity of males. This time was enough to cover a monitoring route making up to 2 km. Counts were not attempted in windy or rainy weather.

Counts were simultaneously conducted by 1-5 persons at each monitoring route. Teams of 2 or more persons were moving in rows. For the counts at sample plots the distance between counters made 50 m, for the full counts it equaled to 50-100 m. Before being mapped, each vocalizing male had to be observed by at least 2 counters. Such methodology allows receiving reliable data from volunteers possessing different level of experience.

Depending on the size of the site and availability of volunteers the following methods were used:

- Counts on sample plots (Zvaniec).
- Full counts (most of other sites)

Area of suitable habitat was estimated basing on publications and satellite images analysis with subsequent field check during the counts.

### 3. RESULTS

#### 3.1 AW numbers

Aquatic warbler counts were carried out at 12 out of 14 Belarussian breeding sites (Fig.1) from May 24<sup>th</sup> to July 10<sup>th</sup>, 2010. Double counts were carried out at 16 sample plots in Zvaniec (the most detailed counts ever executed at this mire). Full single counts were executed at 78% of the area occupied by AW in Sporava (the most detailed counts ever carried out at this mire as well). Full counts were carried out at the majority of remaining AW sites. Two new small localities were discovered within breeding site Middle Prypiac. Korabje and Mikaševičy hold 10 singing males in total. Overall AW population in Belarus in the year 2010 is estimated at **3,100-5,557** singing males (Tab.1).



Fig.1: Location of the Aquatic Warbler breeding sites in Belarus.

Tab.1: Estimation of AW population in Belarus

	Name of site / locality	Year	Coordinator	Number of counts	Type of counts	Accuracy	Area, ha**	Population on site, males	
								min	max
<b>1</b>	<b>Zvaniec</b>						<b>6,150</b>	<b>2,254</b>	<b>4,428</b>
	<i>Zvaniec East (Selišča)</i>	2010	UM	1	full	good(obs)	125	20	20
	<i>Zvaniec Central</i>	2010	UM	2	reg. plots	good(est)	5,575	2,254	4,428
	<i>Zvaniec West</i>	2010	UM	1	guess	poor(susp)	*450	0	253
<b>2</b>	<b>Dzivin</b>						<b>158</b>	<b>9</b>	<b>9</b>
	<i>Dzivin-Chabovičy</i>	2010	UM	1	full	good(obs)	28	0	0
	<i>Dzivin-Liubań</i>	2010	UM	1	full	good(obs)	63	0	0
	<i>Dzivin-Rudziec</i>	2010	UM	1	full	good(obs)	67	9	9
<b>3</b>	<b>Sporava</b>						<b>1,301</b>	<b>501</b>	<b>640</b>
	<i>c.30 localities</i>	2010	UM	1	full/est	good(est)	1,301	501	640
<b>4</b>	<b>Dzikoje</b>						<b>1,277</b>	<b>162</b>	<b>231</b>
	<i>Dzikoje</i>	2008	VF	1	full/est	good(est)	869	158	216
	<i>Hlybokaje</i>	2006	NC	1	full/est	good(est)	35	2	5
	<i>Lomaŭka</i>	2006	NC	1	full	good(obs)	139	0	0
	<i>Naraŭ</i>	1996-2005	NC	1	full/est	good(est)	234	2	10
<b>5</b>	<b>Ščara</b>						<b>211</b>	<b>40</b>	<b>55</b>
	<i>Babrovickaje</i>	2010	DL	1	full	good(obs)	3	0	0
	<i>Ščara-Dabramysł</i>	2010	DL	2	full/est	good(est)	123	29	44
	<i>Ščara-Kańki</i>	2010	DL	1	full	good(obs)	12	3	3
	<i>Ščara-Sviacica</i>	2010	DL	1	full	good(obs)	71	8	8
	<i>Vyganaščanskaje</i>	2010	DL	1	full	good(obs)	2	0	0
<b>6</b>	<b>Middle Prypiac</b>						<b>647</b>	<b>34</b>	<b>34</b>
	<i>Jasiel'da</i>	2010	DL	2	full	good(obs)	42	0	0
	<i>Korabje***</i>	2010	MD	2	full	good(obs)	67	8	8
	<i>Mikaševičy***</i>	2010	AN	1	full	good(obs)	23	2	2
	<i>Styr</i>	2010	MD	2	full	good(obs)	515	24	24
<b>7</b>	<b>Prostyr</b>						<b>800</b>	<b>10</b>	<b>50</b>
	<i>Prostyr</i>	2010	DZ	-	guess	poor(susp)	*500	10	50
	<i>Zarelišča</i>	2010	DL	1	full	good(obs)	300	0	0
<b>8</b>	<b>Almany</b>	2010	MD	1	estimate	med(est)	<b>*1,500</b>	<b>0</b>	<b>0</b>
<b>9</b>	<b>Dzitva</b>	2010	DL	1	full	good(obs)	<b>31</b>	<b>2</b>	<b>2</b>
<b>10</b>	<b>Hajna</b>	2010	SL	1	full	good(obs)	<b>711</b>	<b>0</b>	<b>0</b>
<b>11</b>	<b>Lielčycckaja Ubarč</b>	2010	PP	-	guess	poor(susp)	<b>*600</b>	<b>0</b>	<b>0</b>
<b>12</b>	<b>Servač</b>	2010	OL	1	full	good(obs)	<b>272</b>	<b>31</b>	<b>31</b>
<b>13</b>	<b>Stary Žadzien</b>	2006	VF	1	estimate	med(est)	<b>*600</b>	<b>20</b>	<b>40</b>
<b>14</b>	<b>Svislač</b>	2010	DV	1	full	good(obs)	<b>212</b>	<b>37</b>	<b>37</b>
	<b>TOTAL estimate</b>						<b>14,470</b>	<b>3,100</b>	<b>5,557</b>

\* The sites are not sufficiently surveyed. The area of suitable habitat is considerably overestimated due to mosaic structure of site. Further surveys are needed to refine (reduce) these numbers.

- \*\* Area of suitable habitat
- \*\*\* New localities discovered only in 2010

### **Type of counts**

Full = full counts covered the whole site.

Full/est = full counts were executed for the most part of the site and minimum figure corresponds to the number of counted males, an estimation resulting in a maximum figure was produced for the rest of the site.

Reg. plots = counts were implemented at sample plots located regularly.

### **Accuracy**

Good (Observed) = based on reliable or representative quantitative data derived from complete counts.

Good (Estimated) = based on reliable or representative quantitative data derived from sampling or interpolation.

Medium (Estimated) = based on incomplete quantitative data derived from sampling or interpolation.

Poor (Suspected) = based on no quantitative data, but guesses derived from circumstantial evidence.

## **3.2 Area of suitable habitat**

Borders of suitable habitat were refined by monitoring experts during counts basing on assessments of suitable vegetation structure. Pictures and maps of all AW sites covered by this survey are presented in the attachment (Fig. 6-40). The accuracy level for the borders definition corresponds to the accuracy level for the counts presented in Table 1. The total area suitable for the species in Belarus is estimated at **14,470 ha** basing on data from all 14 AW sites known to date.

It should be still noted that 4 of these sites (Aĺmany, Lieĺcyckaja Ubarė, Prostyr and Stary Źadzien) are not yet sufficiently surveyed. The area of suitable habitat for these sites is roughly estimated at 3,200 ha. It is a considerable overestimation due to mosaic structure of the sites. Further surveys are needed to refine (reduce) this number.

In the year 2010 **9,016 ha** of suitable habitat were occupied by the species. This figure, estimated rather accurately, still does not 100% correspond to the “area of occupancy” (AOO), just corresponding to the area of suitable habitat where counts took place and the species were registered (the data for Dzikoje delivered in 2008 and for the other sites - in 2010).

## **3.3 Location of singing males**

Aquatic warbler singing males were mapped with GPS at all the sites occupied by the species and where full counts were performed. Altogether 631 males at 8 sites were mapped in the year 2010. The results are presented in the annex. (Fig. 25-40)

### **3.4 Participation of volunteers**

Taking into consideration the vast areas occupied by the species in Belarus, representative data on AW numbers can only be obtained using the help of numerous volunteers. More than 60 intrepid explorers from Belarus, Germany, Latvia, Netherlands, Poland and Ukraine walked through the largest open fen mires of Europe counting this globally threatened bird, getting to know the species and its unique habitats.

Below goes a detailed description of the AW monitoring results for the most important Belarusian breeding sites: Zvaniec and Sporava mires.

### **Zvaniec**

The total area of IBA “Zvaniec” equal to 16,230 ha includes the area of 10,460 ha protected as a National landscape reserve (zakaznik) “Zvaniec”. Satellite images analysis with subsequent field checks made during aquatic warbler census in the year 2010 allowed to allocate the area suitable for AW roughly. The area makes about **6,150 ha** in total (Fig.2).

The area suitable for the species in the central part of the mire equals to 5,575 ha, the corresponding area located in the eastern part makes 125 ha. The western part has not been surveyed, however, it contains separate patches potentially suitable for aquatic warbler having the total area of about 450 ha.

**Eastern part.** There is a small 125 ha patch of open fen mire in the eastern part of IBA. **20** singing males were counted at this sub site in the course of full counts.

**Central part.** The estimated area suitable for aquatic warbler in the central part of IBA makes 5,575 ha. Considering the scale of this sub site, AW was counted at regularly located sample plots. The data from sample plots was extrapolated to the entire territory covered with sampling.

The following pattern was noticed during AW monitoring in Biebrza National Park, Poland, carried out within the framework of EU LIFE-Nature Project “Conserving AW in Poland and Germany”. Along with the overall decline in AW numbers for whole site, and with the reduction of area suitable for the species, at some sub sites where optimal habitat conditions are preserved AW density and numbers may even increase. Overgrowing of open fen mire with reeds and bushes results in fragmentation of suitable habitat and to decrease in its area thus leading to decline in number of birds. Due to decrease in area of suitable biotope birds could form local accumulations at the remaining optimal patches. Therefore, placing sample plots/transects at optimal habitats and extrapolating data to the total area of the mire could potentially lead to overestimation.

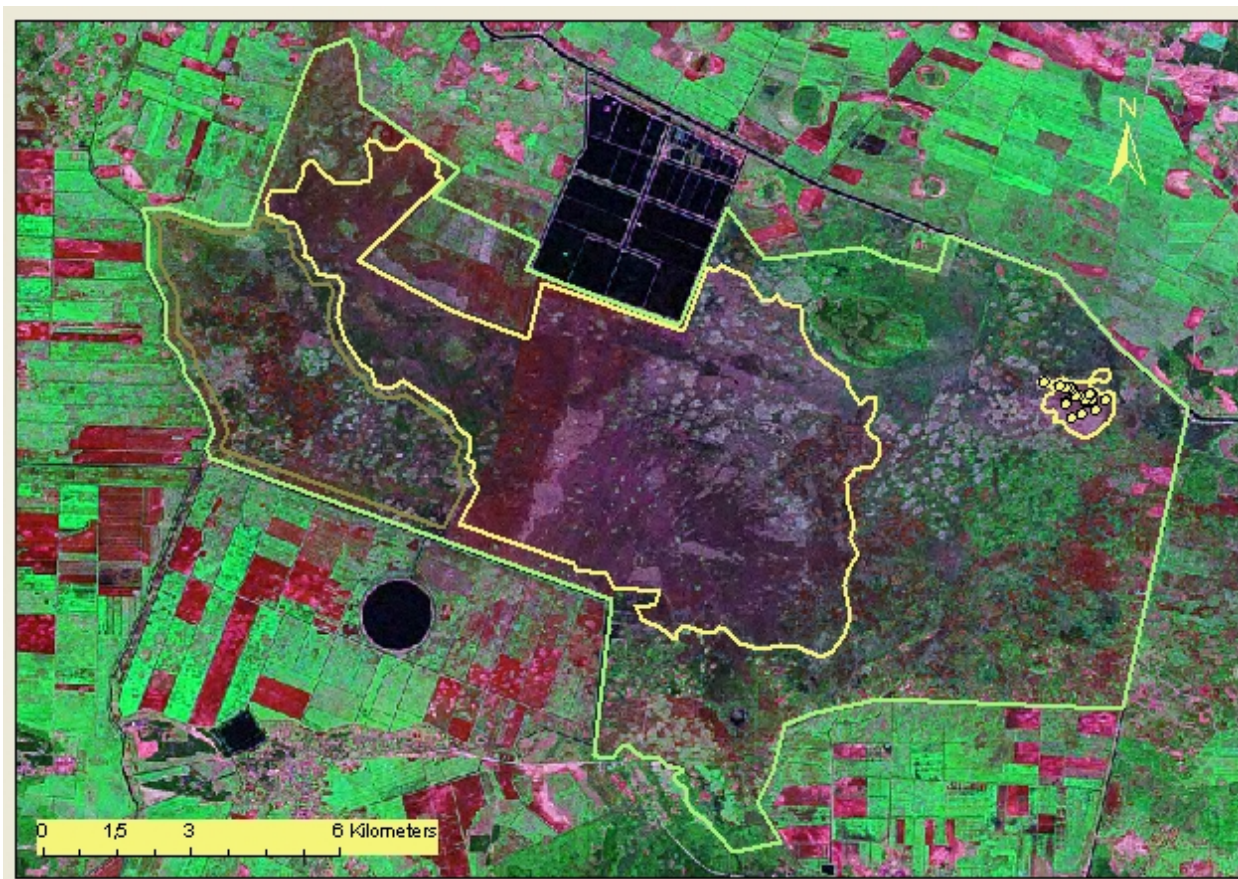


Рис.2: **Area suitable** for aquatic warbler in Zvaniec (marked with yellow line, AW males counted in eastern part – yellow dots, not surveyed area – brown, boundaries of IBA “Zvaniec” – green).

For the purpose of the current study AW numbers were estimated basing on the data obtained from counts at 17 regularly located sample squares. Apart from suitable habitat, sample squares covered adjacent areas. Such approach allows to pay particular attention to the edges of the mire where succession processes (and consequently decrease in number of birds) are more actual.

The area of 5,700 ha (57 km<sup>2</sup>) in the central part of the mire was covered with a 1 x 1 km grid. The grid covers both suitable habitat and the adjacent territories. 19 sample squares were chosen regularly (every third square) basing on the grid (Fig.3). Altogether 17 monitoring squares were covered with counts between May 24<sup>th</sup> and July 5<sup>th</sup>, 2010. Double counts were performed for 16 squares out of those, a single count took place for 1 monitoring square, 2 squares were not sampled because of a limited availability of people able to take part in the counts (a random reason). Herewith, AW counts of the year 2010 are currently the most detailed counts ever conducted for Zvaniec.



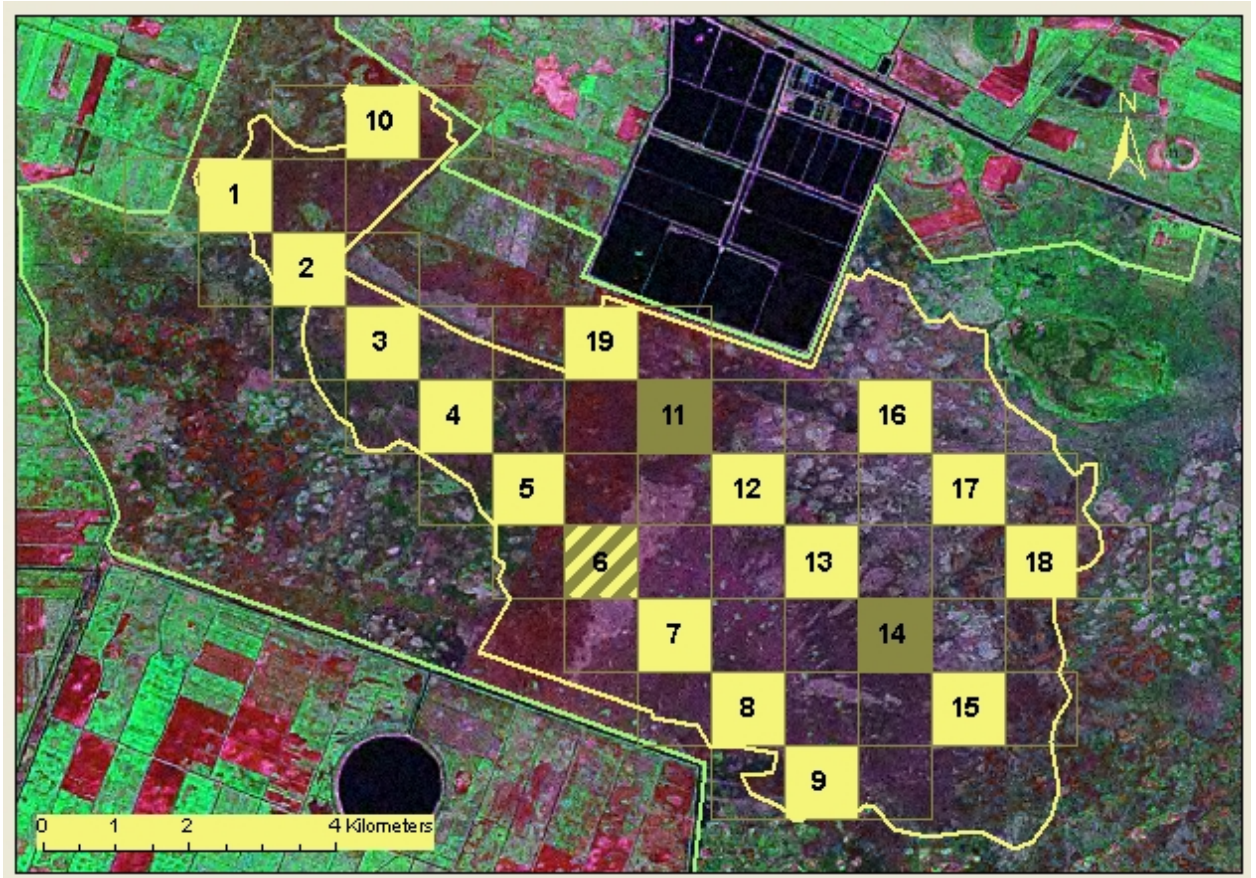


Fig.3: Location of **sample squares** in Central part of Zvaniec. (*area suitable for AW – yellow, double counted sample squares – yellow, single counted – dashed, not counted – brown, boundaries of IBA “Zvaniec” – green*)

One sample plot with dimensions of 1,000m x 100m (50, 150m) was chosen within each sample square. The length of the sample plots corresponded to the length of the sample squares; the width of the majority of sample plots was 100 m as 3 persons normally took place in the counts. In some particular cases plots were surveyed by 2 or 4 counters and the width of plots was making 50 m and 150 m respectively (random reason). The southern border of each sample plot (guiding line) was running parallel to the southern side of the sample square at a distance of 250m (Fig.4).

Each sample plot was counted by 2-4 persons. The first counter started counting right from the western (eastern) end of the guiding line. The rest of them were located to the North from guiding line at 50m distance from each other. All the counters were moving in one row in latitude direction parallel to the guiding line. Those located at the edges were equipped with GPS navigators: they were using latitude degrees as a reference and saving their factual tracks. AW density was calculated as the number of singing males registered within the boundaries of sample plots divided by factual area of sample plots covered with counts, which was calculated



basing on saved tracks. Singing males outside the sample plots as well as all females and other bird species were registered just for reference.

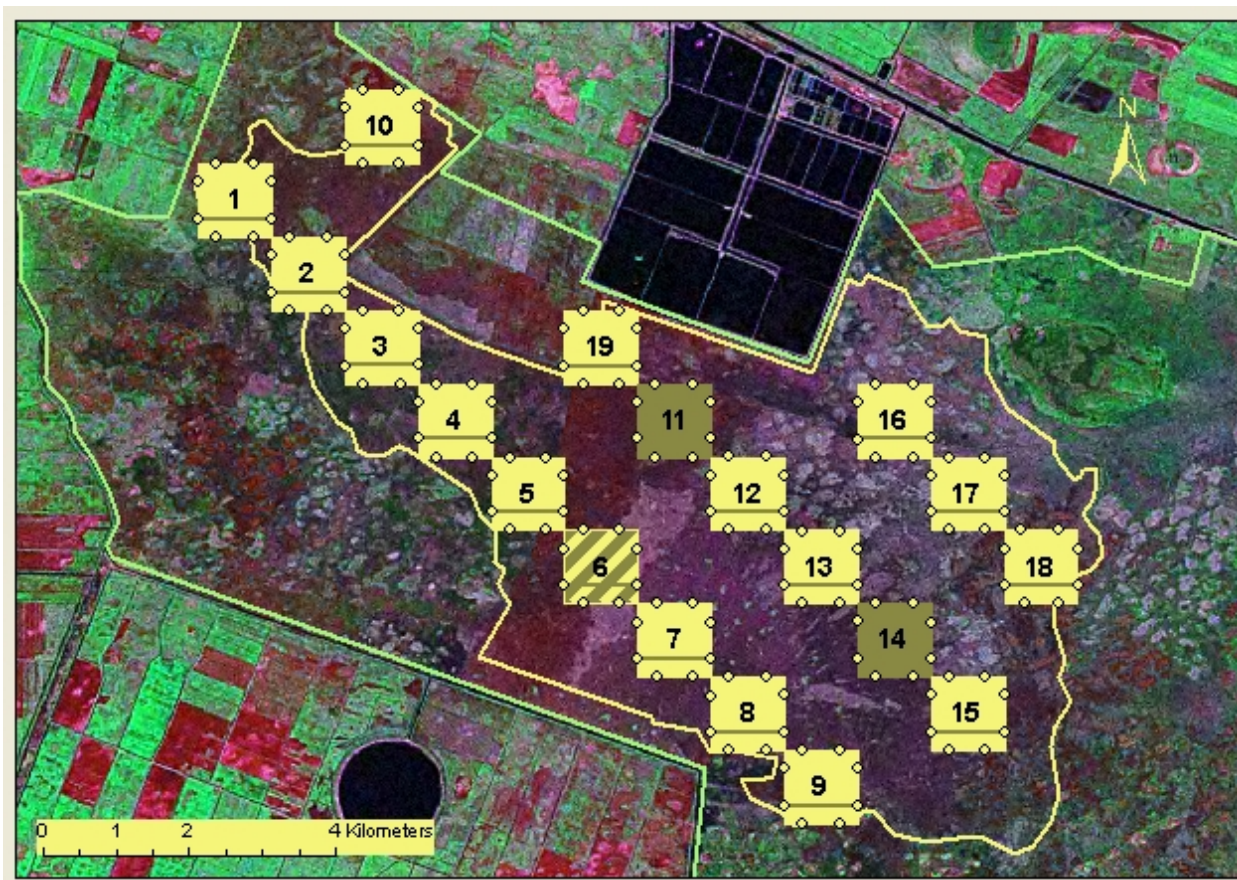


Fig.4: Location of **sample plots** in Central part of Zvaniec (*area suitable for AW – yellow, double counted sample squares – yellow, single counted – dashed, not counted – brown, **guiding lines of sample plots** – brown, boundaries of IBA “Zvaniec” – green*)

The results of the counts at sample plots are presented in Table 2. The data received from the first counts was used for further calculations. The second counts discovered a decrease in number of species reflecting seasonal variations

**Western part.** This part of the mire has an area of 2,250 ha (Fig.2). It is heavily overgrown with shrubs and highly fragmented. This part of Zvaniec is not covered by the survey due to its limited accessibility. There is no published data on confirmed registrations of AW for this area. However, some separate patches of open fen mire are potentially suitable for AW. About 20% of the western part of Zvaniec, that is 450 ha or 4.5 km<sup>2</sup>, make up the area for such habitat (*Skuratovich A. Personal communication*). Basing on the average density of 56 males/km<sup>2</sup> calculated for the central part, potential AW numbers in the western part could be estimated at **0 – 253** singing males.

Table 2: Estimation of AW numbers in the Central part of Zvaniec

	Sample plot	Density, males/km <sup>2</sup>		Number, males	LCI*, (min) males	UCI*, (max) males
		1 <sup>st</sup> counts (23 <sup>th</sup> May-7 <sup>th</sup> June)	2 <sup>nd</sup> counts (28 <sup>th</sup> June-5 <sup>th</sup> July)			
	1	55	30			
	2	15	10			
	3	45	35			
	4	95	10			
	5	30	80			
	6	-	60			
	7	70	70			
	8	50	40			
	9	0	20			
	10	89	30			
	11	-	-			
	12	100	50			
	13	50	40			
	14	-	-			
	15	110	95			
	16	60	220			
	17	30	0			
	18	0	0			
	19	100	70			
<b>Mean</b>		56	51			
<b>SD</b>		36	52			
<b>SE</b>		9	13			
<b>Area, km<sup>2</sup></b>		57	57			
<b>1<sup>st</sup> counts</b>				<b>3,202</b>	<b>2,234</b>	<b>4,155</b>
<b>2<sup>nd</sup> counts</b>				<b>2,884</b>	<b>1,478</b>	<b>4,289</b>

\* Lower and upper confidence limits were calculated by Johannes Kamp, RSPB through bootstrapping using R-statistics software.

The total number of AW in Zvaniec is estimated at **2,254-4,428** singing males (Tab.3).

Table 3: Estimation of the total number of AW in Zvaniec.

Part of the mire	Type of counts	Area of suitable habitat, ha	Mean number, males	Min number, males	Max number, males
<b>Eastern</b> (Sielišča)	full counts	125 (2%)	20	20	20
<b>Central</b> (1 <sup>st</sup> counts)	counts at regular sample plots	5,575 (91%)	3,202	2,234	4,155
<b>Western</b>	guess	450 (7%)*	126	0	253
<b>TOTAL</b>		<b>6,150 (100%)</b>	<b>3,349</b>	<b>2,254</b>	<b>4,428</b>

\* Potentially suitable habitat. In order to confirm its occupancy by AW as well as to define the area occupied by the species, further surveys are needed.



## Sporava

The site has a protection status of National biological reserve (zakaznik) “Sporaŭski” with the total area of IBA equal to 19,384 ha. Satellite images analysis with subsequent field checks during Aquatic Warbler census in the year 2010 allowed to allocate the area suitable for AW: **1,301 ha** in total (Fig.5).

**Surveyed part.** *Full single* counts of aquatic warbler covered **78%** (1,019 ha) of the area potentially suitable for the species. The counts executed in the year 2010 are currently the most detailed counts ever performed for Sporava. The part surveyed consists of 20 separate sub sites (Fig.5). The results are presented in Table 4.

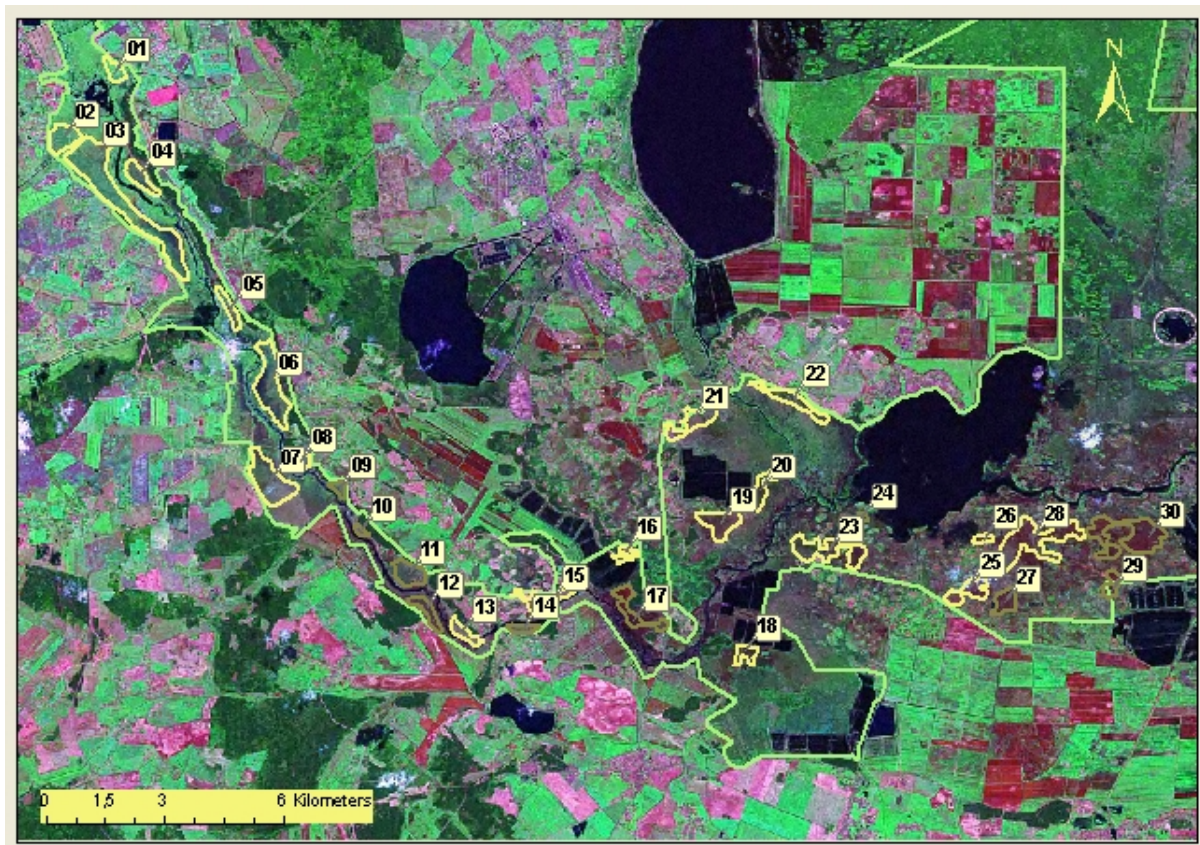


Fig.5: Location of area suitable for AW in Sporava (*suitable areas, where full counts were performed, are marked with yellow, potentially suitable habitats that were not surveyed – brown, boundaries of IBA “Sporava” – green*)

Table 4: Results of full counts within the surveyed part.

N <sup>o</sup>	Name of locality	Area, ha	AW numbers, singing males
01	Stryhiń	18	8
02	Zdzitava_Biaroza	39	18
03	Piasčanka_Šylin	208	146
04	Novaje	31	6
05	Halavickija	21	5
06	Perasudavičy*	97	48
07	Kasciuki	85	45
08	Vysokaje	18	2
13	Mastyki_chutar	19	2
15	Mitraŭka	55	14
16	Hieĺčykaŭ_Kašyĺ	12	1
18	Chomsk	20	1
19	Zdzitava_chutar	47	12
20	Zašešnieŭ	28	10
21	Zdzitava	47	37
22	Sporava	41	39
23	Kakoryca_5_8_9	67	29
25	Kakoryca_4	37	9
26	Kakoryca_3	8	7
28	Kakoryca_1_2_6_7	121	62
<b>Total</b>		<b>1,019</b>	<b>501</b>

\* – before 2010 this sub site was named Vysokaje

### The part not surveyed.

Counts were *not* performed at **22%** (281 ha) of the area potentially suitable for the species. This area consists of 10 separate sub sites (Table 5).

Table 5: Unsurveyed part of Sporava potentially suitable for aquatic warbler.

N <sup>o</sup>	Name of locality	Area, ha	AW numbers, singing males
09	Vysokaje_chutar	10	-
10	Puzi	6	-
11	Mastyki	38	-
12	Čarniejevičy	24	-
14	Žabier	11	-
17	Kašyĺ	37	-
24	Kakoryca_10	9	-
27	Kakoryca_12	27	-
29	Kakoryca_11	18	-
30	Kakoryca_13	102	-
<b>Total</b>		<b>282</b>	



The potential number of AW in unsurveyed area could be estimated at **0-139** singing males, basing on the average density of 49 singing males/km<sup>2</sup> estimated for the surveyed area and the total area of unsurveyed plots 2.82 km<sup>2</sup>.

**The total number** of AW in Sporava is estimated at **501-640** singing males (Tab.6).

Table 6: Estimation of the total AW number in Sporava.

Part of the mire	Type of counts	Area of suitable habitat, ha	% from total suitable habitat	Min number, males	Max number, males
<b>Surveyed</b>	Full	1,019	78	501	501
<b>Not surveyed</b>	Estimation	282	22	0	139
<b>TOTAL</b>		<b>1,301</b>	<b>100</b>	<b>501</b>	<b>640</b>

Location of every single male counted in Sporava was mapped in 2010 (Fig.6).

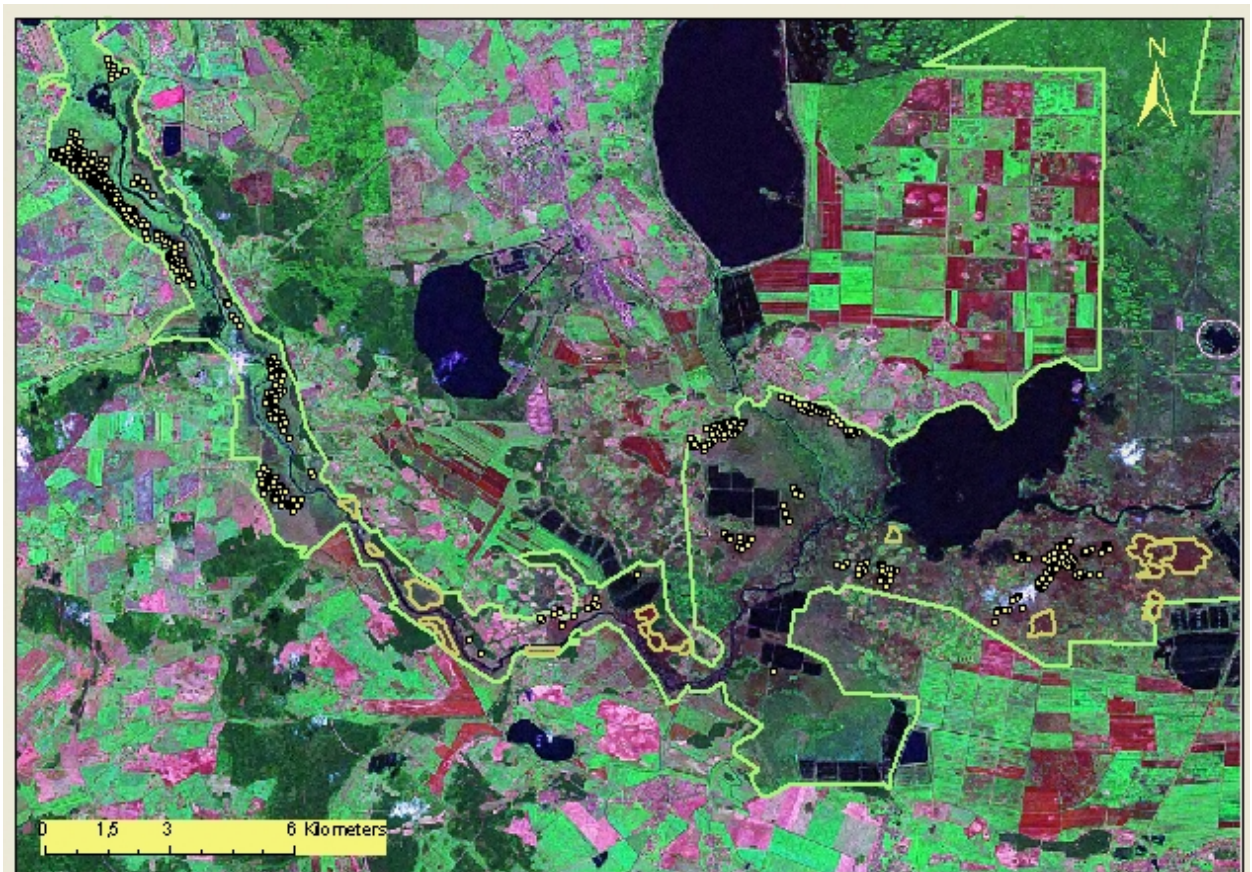


Fig.6: Location of singing males in Sporava (yellow dots, potentially suitable habitats that were not surveyed – brown, boundaries of IBA “Sporava” – green)

#### 4. TRENDS

Relatively comparable data were received in 2006, 2009 and 2010 for the most important AW breeding site **Zvaniec**. In these years the counts were implemented at sample plots (random in 2006, regular since 2009) with subsequent extrapolation to the whole area suitable for the species. The number of sample plots was sufficient for obtaining representative data. For the second biggest AW site **Sporava** the data delivered from nearly full counts are more or less comparable. Such counts were performed in Sporava in 2007, 2008 and 2010. In **Dzikoje** representative data were received in 2008 only (before 2006 the population was overestimated,, in 2007 it was underestimated). Results are presented in Table 7.

Table 7: Dynamics of AW population numbers at most important sites

Site	1995-2005 <sup>(a)</sup>	2006	2007	2008	2009	2010
<b>Zvaniec</b>	<b>3,000-6,000</b>  Counts at 2 sample plots (2 transects within each sample plot)	<b>4,223-5,159</b>  Single counts at 10 random sample plots. Extrapolation to 76.1 km <sup>2</sup>	-	-	<b>2,896-5,798</b>  Single counts at 14 regular sample plots. Extrapolation to 63.0 km <sup>2</sup>	<b>2,254-4,428</b>  Double counts at 16 regular sample plots. Extrapolation to 57.0 km <sup>2</sup>  Full counts at 1.25 km <sup>2</sup>  Guess 0-253 males was performed for 4.5 km <sup>2</sup> of potential unknown sub sites
<b>Sporava</b>	<b>690-2,120</b>  Counts at 3 transects	<b>2,373-2,531</b>  Double counts at 3 transects. Extrapolation to 37.7 km <sup>2</sup>	<b>617-1016</b>  Full counts at c.50% of suitable habitat (b)  Estimation was produced for the remaining area	<b>?</b>  Full single counts at ???% of suitable habitat  Estimation was produced for the remaining area	-	<b>501-640</b>  Full single counts at 78% (10.2 km <sup>2</sup> ) out of 13.0 km <sup>2</sup> of suitable habitat.  Estimation was produced for the remaining 2.8 km <sup>2</sup>
<b>Dzikoje</b>	<b>1,200-1,500</b>	<b>325-375</b>  Double counts at 4 transects Extrapolation to 6 km <sup>2</sup>  Guess 50-100 males was performed for potential unknown sub sites	<b>98-148</b>  Full single counts at c.50% of suitable habitat (c)  Estimation was produced for the remaining area	<b>158-216</b>  Full single counts at c.75% of suitable habitat  Estimation was produced for the remaining area	-	-

(a) Скарбы прыроды Беларусі – Treasures of Belarusian Nature: Тэрыторыі, якія маюць міжнар. значэнне для захавання біял. разнастайнасці. / А.В. Казулін [і інш.]. – 2-ое выд., перапрац., дап. – Мн.: Беларусь, 2005. – ст.16,43,59.

(b) Single counts were performed in Kakoryca, double counts in Piasčanka and Perasadavičy, triple counts in Kasciuki. The total number for Sporava was estimated basing on data from 2<sup>nd</sup> counts.

(c) In one sub site (Vybrady) full double counts were performed

First of all, it should be emphasized that apart from possible population decline these numbers reflect an improvement of methodology and the use of bigger number of sample plots in case of Zvaniec. In case of Sporava the numbers reflect an increase in area covered with full counts (up

to 78% of suitable habitat in 2010) and the detalization of suitable habitat borders. However, with respect to obvious decrease in suitable habitat confirmed by satellite images analysis, the numbers given in Table 7 may be regarded as reflecting a population decline to some extent. Nevertheless, at least two more years of monitoring using a comparable methodology are required in order to prove statistically the possible decline..

Another reason for possible population decline in **Zvaniec**, apart from reduction and fragmentation of suitable habitat, is an unfavorable water regime registered in 2009 and especially in 2010 (Table 8). Water level measurements were taken for each sample plot by a person moving at a 50 m distance to the North from the guiding line (parallel to it)(Fig.4). Measurements were taken in 0, 250, 500, 750, 1000 m from the starting point. In case when point location corresponded to a channel, a mineral island etc., the measurements were not taken (or taken at another point).

Along with the overall decline in AW numbers in **Sporava**, at some sub sites where optimal habitat conditions are preserved AW numbers may even increase. From one side, this fact may reflect seasonal variations in numbers of species (Kozulin A., *et al.*, 2004), from the other side, it could be regarded as a decrease of suitable habitat due to mire overgrowing at its peripheral parts.

Table 8: Water level in Zvaniec.

	<b>2009</b> 8.06-1.07	<b>2010</b> 24.05-6.06	<b>2010</b> 28.06-4.07
Mean water level above the ground, cm	18.8	25.2	18.8
SD	6.9	8.3	6.5
Difference between mean water level and mean tussock height, cm	7.1	1.4	7.8
Number of measurements	67	65	50



## 5. THREATS

As listed in International Species Action Plan for the Aquatic Warbler and in Management Plans for zakazniks “Sporaŭski” and “Zvaniec”, the most important threats for AW breeding population are: change in hydrological regime of key sites; habitat changes due to abandonment of land use; habitat changes due to uncontrolled burning; unsuitable management by cutting or grazing.

**Change in hydrological regime of key sites.** Recently implemented conservation measures helped preventing critical decrease of water level in Zvaniec. Water regulating facilities installed proved to be ineffective for floods prevention. In particular, a considerable flood was registered during AW counts in 2010 in Zvaniec (Tab.8). Water level close to the tussocks height or higher opposes successful nesting of the aquatic warbler during the nesting period from May till June (especially in combination with absence of litter layer) (Vergeichik, L. & A. Kozulin, 2006: 163–174.). In addition to this, a high water level during vegetation season leads to faster development of reeds and to subsequent reduction of habitats suitable for ground nesting birds including aquatic warbler (Zvaniec Management Plan).

Hydrological regime of the floodplain in Sporava is influenced by Sialiec fish farm located upstream Jasiel'da river. New water operation regulations for Sialiec fish farm securing a water regime that is optimal for biodiversity are applied since 2009. The mean water level (N=75) in Sporava was about 5.4 cm above the ground from June to July 2010. Such water level is optimal for AW nesting in compliance with the publications (Vergeichik, L. & A. Kozulin, 2006: 163–174.).

**Habitat changes due to abandonment of land use.** Development of plant successions is an important factor for almost all aquatic warbler breeding sites in Belarus. Overgrowing of open fens with reeds and bushes leads to decrease of areas suitable for the species.

**Habitat changes due to uncontrolled burning.** In 2010 uncontrolled burning was NOT registered at any AW site.

**Unsuitable management by cutting or grazing.** Mechanized mowing was registered during the breeding season in newly discovered breeding locality Korabje (8 singing males) located in zakaznik “Middle Prypiac”. On July 3<sup>rd</sup>, 2010 about 1 ha of out of 67 ha of suitable habitat was mown. Considering this insignificant amount, even early mowing can not be viewed as a threat. On the contrary, it could be regarded as a factor stopping undesirable plant successions: mowing with regular tractors takes place at drier patches surrounding the mire and partly including edges

of the mire – starting points of succession development. However, technically mowing with regular tractors is possible at c. 40 out of 67 ha of this locality and its intensification could potentially threat 4-5 singing males.

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