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## The first Waterbird winter census in the Republic of Moldova

**Vitalie Ajder, Emanuel Ștefan Baltag, Laurențiu Petrencu, Igor Roșca, Lucian Eugen Bolboacă**

### Abstract

The Republic of Moldova is an Eastern European country with high biodiversity but with few monitoring programs. The first International Waterbird Census in this country was conducted in 2013. During the monitoring 23 wintering waterbird species were recorded with a total of almost 80000 individuals. The wintering seasons differ significantly between them, with a mild winter in 2014, ensuring high numbers of species and large numbers of waterbirds, and a harsh winter in 2015 when most of the water bodies were frozen. In the last winter season fewer species and numbers were recorded, but the species adapted to harsh winter conditions were well represented. The most important wintering area for waterbirds is the Upper Dniester River, between Naslavcea and Sorocea, which ensures suitable conditions for more than 20000 birds during this harsh season. This is the first country-wide monitoring programme on wintering waterbirds for the Republic of Moldova.

**Keywords:** waterbirds, winter census, Republic of Moldova

### 1. Introduction

Wetlands are among the most threatened ecosystems [16] suffering degradation due to pollutants accumulation [14], urbanization [5], invasive species [23] or other artificial and natural threats. In order to take the appropriate measures we have to permanently monitor and evaluate these ecosystems. Waterbirds are useful indicators of changes in wetlands, responding to stressors [1, 4, 2] and often are associated with changes in the structure and functioning of wetland ecosystems [18, 10, 22]. Monitoring their number and diversity can be a useful surrogate for monitoring general wetland health.

Waterbird monitoring programmes are widespread in Europe [12, 8, 17, 15], but not all the countries have managed to establish them, especially in the winter when it is logistically more difficult to conduct surveys. Due to the different habitat management strategies between countries, it is necessary to get data from various areas in order to evaluate correctly the overall waterbird population.

Trends in many waterbird species have changed significantly in recent years, due to habitat degradation, climate changes, or other factors which influence bird populations [3, 28]. Also, there are waterbird species which shift their wintering areas north-eastwards due to climate change [13]. These population changes can be evaluated in wintering grounds, especially for those areas where we do not have data on breeding numbers. In the Republic of Moldova, monitoring programmes are poorly developed due to low human and material resources and although only a small country, Moldova's bird populations is poorly studied, with some data on breeding species but with only scarce observation on wintering species and numbers.

The aim of this study is to present for the first time the winter structure of waterbirds from the Republic of Moldova. Another aim of this study was to highlight the key areas for waterbirds during this harsh season in order to promote conservation measures for those sites which provide good conditions for wintering waterbirds. This study was conducted in response to a general demand for ornithological information and aimed to evaluate the current species richness and abundance of waterbird numbers wintering in the Republic of Moldova.

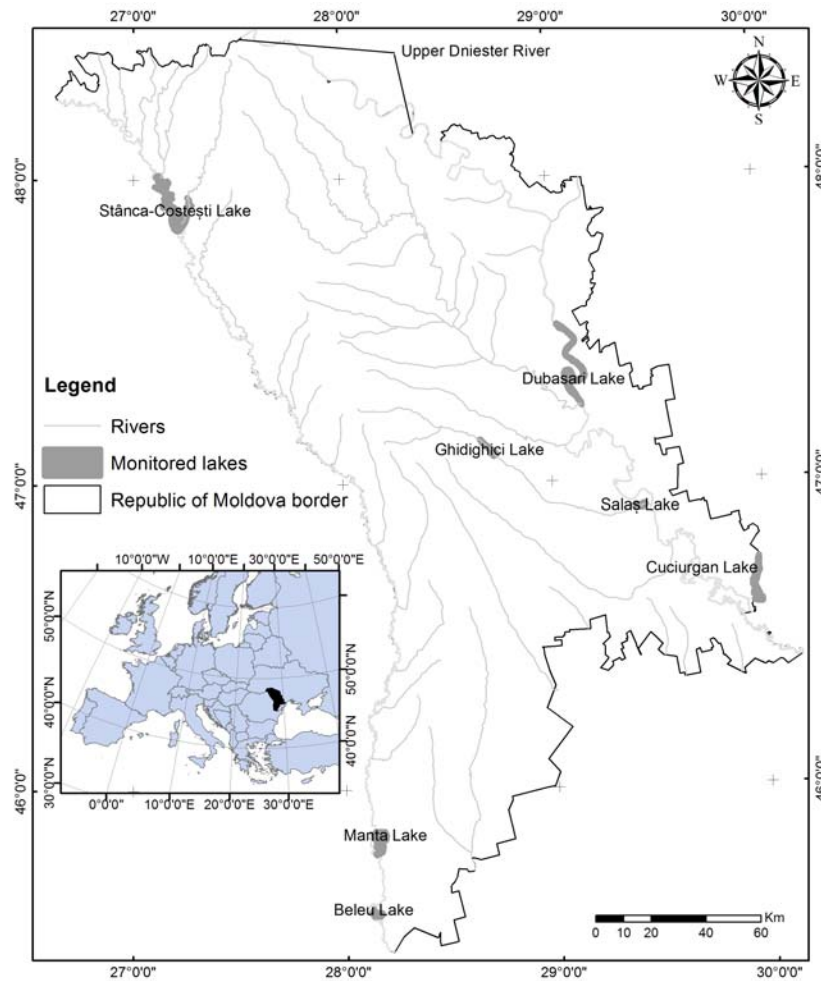
### 2. Materials and Methods

#### 2.1. Study Site

The study area is represented by the territory of the Republic of Moldova, a small Eastern European country with a total surface of 33 843.5 km<sup>2</sup>. This area is crossed by 3 621 rivers and

runlets which make a total of 16 000 km in length and 4 350 lakes totalling 300 km<sup>2</sup>. Most of the water courses and lakes are small with a low importance for waterbirds. Because of the low water volume of the rivers and lakes they freeze during

winter when the temperatures drop below -5 °C. However, there are a few lakes and river sectors which freeze rarely or not at all.



**Fig 1:** Study area location (marked with black on the small map) and the distribution of the surveyed wetlands in the Republic of Moldova during the first waterbirds winter census.

## 2.2. Data Collection Methods

In the northern hemisphere, wintering waterbird populations are monitored by the International Waterbird Census (IWC) coordinated by Wetlands International [19]. The first IWC in the Republic of Moldova was conducted in January 2013 but only two wetlands were covered that year (Beleu Lake and Manta Lake) in the South-western part of the Republic of Moldova. In the following years (2014-2015) observations were extended to include the main lakes and rivers across the entire country (Figure 1). The counts were concentrated in mid-winter period (10 – 20 January) when peak numbers of most of the species are present [8]. During this survey observers completely covered each area, counting all waterbird species using binoculars and telescopes, recording the numbers of birds swimming on the water or flying towards the observer, in order to reduce multiple counting by movements of the birds [20]. Observations started early in the morning and continued for 6 - 8 hours depending on the number of birds. All the areas were surveyed over consecutive days, in order to minimise the effect of flock movements. Birds were counted individually or in flocks of 10, 100 or 1000 individuals [9]. However, this methodology is inappropriate for surveying several waterbirds species, especially waders, due to their preference for lakes and river banks which were not accessible by foot for the entire length. These species were excluded from the current

analyses. Also, gulls are not considered here, as they are not routinely counted during the surveys and because their distribution is generally too widespread for adequate monitoring [8].

## 2.3. Habitat Selections and Statistical Analysis

### 2.3. Habitat Selections and Statistical Analysis

To detect any differences in waterbird species composition amongst different winter season we used the Friedman repeated measures analysis of variance ( $F_r$ ).

In order to analyse the human disturbance on waterbirds we determined human population within and used a buffer area of 2 km around each wetland (lake or river sector) using census data from 2014, border of human settlements delimited from orthophoto imagery and geoprocessing tools from ArcGIS software. Spearman's correlation coefficient test, was used to test for correlations between human population and waterbirds abundance.

The first year of survey (2013) was not included in the analysis because of the limited coverage. Additionally, all the counts were submitted to the International Waterbird Census, which collates wintering waterbirds on a global level [27].

## 3. Results

Having first established the International Waterbird Census within the Republic of Moldova in 2013, in 2014 monitoring

succeeded in covering a substantial proportion of the main lakes and rivers of the country - in total, 40.24% of total lake surface and one large river sector (110 km). The other wetlands, which were not covered, comprise small lakes or rivers with low volume which typically freeze over during the winter season.

Estimates were derived for 23 waterbird species (Table 1) totalling almost 80000 wintering waterbirds during the period

2014–2015. In 2014 more species and numbers were recorded than in the following year (Table 2). Regarding the distribution of the waterbirds during the winter season, the highest numbers were recorded on Dniester River between Naslavcea and Soroca (50.25%) and Stânca Costești Lake (30.09%), which are in the northern part of the country (Fig 1).

There was no evidence of the human population within 2km of wetland sites affecting the number of waterbirds recorded

**Table 1:** Species composition and numbers during the waterbird winter census in the Republic of Moldova for 2014 – 2015 period.

Common name	Species	2014 survey	2015 survey	Totals per species
Little Grebe	<i>Tachybaptus ruficollis</i>	355	119	474
Great Crested Grebe	<i>Podiceps cristatus</i>	3	0	3
Great Cormorant	<i>Phalacrocorax carbo</i>	12	0	12
Whooper Swan	<i>Cygnus cygnus</i>	604	160	764
Mute Swan	<i>Cygnus olor</i>	1 901	1 606	3 507
White-fronted Goose	<i>Anser albifrons</i>	3 001	2	3 003
Greylag Goose	<i>Anser anser</i>	1 864	1	1 865
Red-breasted Goose	<i>Branta ruficollis</i>	3	0	3
Ruddy Shelduck	<i>Tadorna ferruginea</i>	9	0	9
Common Shelduck	<i>Tadorna tadorna</i>	51	0	51
Northern Pintail	<i>Anas acuta</i>	2	4	6
Northern Shoveler	<i>Anas clypeata</i>	0	34	34
Common Teal	<i>Anas crecca</i>	629	36	665
Eurasian Wigeon	<i>Anas penelope</i>	156	14	170
Mallard	<i>Anas platyrhynchos</i>	35 323	23 909	59 232
Gadwall	<i>Anas strepera</i>	104	0	104
Common Pochard	<i>Aythya ferina</i>	433	75	508
Tufted Duck	<i>Aythya fuligula</i>	2 037	593	2 630
Greater Scaup	<i>Aythya marila</i>	0	10	10
Common Goldeneye	<i>Bucephala clangula</i>	1 414	3 746	5 160
Smew	<i>Mergellus albellus</i>	75	42	117
Goosander	<i>Mergus merganser</i>	30	193	223
Common Coot	<i>Fulica atra</i>	800	344	1 144
Totals per period		48 806	30 888	79 694

The most numerous species was Mallard which represented almost three quarters (74.32%) of the wintering waterbird population in the Republic of Moldova (Table 1). Other species of relatively high abundance were: Common

Goldeneye (6.47%), Mute Swan (4.40%), White-fronted Goose (3.77%), Tufted duck (3.30%), Greylag Goose (2.34%) and Eurasian Coot (1.44%).

**Table 2:** Bird numbers for each surveyed site per year during mid-winter counts in the Republic of Moldova for 2014 – 2015 period. (\* measured in linear km)

Site name	2014 survey	2015 survey	Totals per species	Lake surface (km <sup>2</sup> )
Beleu Lake	9 149	14	9 163	6.3
Congaz Lake	540	0	540	5.1
Dubăsari Lake	678	864	1542	67.5
Ghidighici Lake	153	0	153	6.8
Manta Lake	3 204	0	3 204	4.5
Upper Dniester River	19 649	20 401	40 050	110*
Sălaș Lake	150	0	150	3.7
Stânca-Costești Lake	14 370	9 609	23 979	59
Taraclia Lake	913	0	913	15.1
Totals per period	48 806	30 888	79 694	

Although species abundance between the two years was significant differently ( $F_t = 3.841$ ,  $df = 1$ ,  $P = 0.007$ ) the main species are similar. During the 2015 survey, when the winter was harsher fewer White-fronted Geese and more Common Goldeneyes were recorded, furthermore, during this harsh winter, 10 individuals of Great Scaup and Red-breasted Goose, both rare species for the Republic of Moldova were recorded. This species, cross latter the Republic of Moldova during their flight to the wintering grounds (Romania and Bulgaria), but it is very rear during the mid-winter period.

#### 4. Discussion

Monitoring wintering waterbirds in the Republic of Moldova

is challenging because there are no prior data on their distribution during this harsh season. In this area, winter waterbirds surveys were not developed in the past, only occasional counts being recorded. In 2013 the first coordinated survey of winter waterbirds survey was introduced, covering two large wetlands from South-east of the Republic of Moldova. The next year coverage increased to include all the main lakes (larger than 1.5 km<sup>2</sup>) within the country. Due to a low number of ornithologists it was not feasible to cover all the rivers and lakes from the Republic of Moldova, but nonetheless all the most important areas for migration, which are also the largest water bodies were included. Furthermore, those sites which were not covered are typically frozen in

January, becoming unsuitable for wintering waterbirds. This assertion can be supported from data collected in 2014 for 17 small lakes from the north and central part of the Republic of Moldova and also sectors from large rivers (Prut and Dniester rivers), all of which were completely frozen.

This first large study on winter waterbirds in the Republic of Moldova recorded almost 80000 individuals from 23 species, comparable with other studies from Central Europe [17, 15].

In January 2014, the winter was atypically mild, and it seems probable that this led to the presence of a large number of widely dispersed waterbirds, across the entire study area. Although the majority of the birds (69.7%) were recorded in the northern part of the country, large numbers were counted in South-West, on Manta and Beleu Lakes (25.31%). During the following winter when temperatures dropped below 0°C for many days in December and January, this led in widespread freezing of lakes throughout the Republic of Moldova. During this year, 66.05% of the waterbirds were recorded on Upper Dniester River, between Naslavcea and Soroca but only a small percent (2.8%) downstream of the Dubasari Dam, on a small river sector which normally remains unfrozen due to the high velocity water streams from the hydroelectric turbines. The remaining 31.1% were recorded downstream of Stânca-Costești Dam, associated with the stilling pond of the hydroelectric power station. Analysis of the data from 2014-2015 suggests that the Upper Dniester River is the most important wintering area for waterbirds, from the study area. The human presence and the physical structure of riverbanks can positively influence waterbirds [7], sometimes through food provisioning for some species by people [20]. This is not the case for Upper Dniester, despite the area being surrounded by human habitation. Our analysis did not detect any correlation between human population density and habitation extent and waterbird abundance species makeup. We suggest that the most important characteristic of this area is the fast current river which leads to unfrozen periods throughout the entire winter period. Also, the site is on the border with Ukraine and in accordance with the Republic of Moldova laws, hunting is therefore forbidden in this area. If the winter is very harsh (which was not the case during the IWC) this river sector can partially freeze, but generally there will remain large unfrozen expanses.

The survey recorded 21 species in 2014, compared to 17 species in the 2015 winter season. This decrease in species number is much greater than can be explained by the negative trends of some waterbirds apparent in some European countries [8, 17]. More likely, the large decrease is primarily due to the contrasting severity of the weather between the two years. In the first season when the winter was milder, and accordingly, species which forage the study area during early or late winter (e.g. Great Crested Grebe, Ruddy Shelduck, Common Shelduck or Goose species) were present throughout the winter. In contrast, during the 2015 survey, when the winter temperature drops below 0 °C for long periods, more Common Goldeneyes and Great Scaup, species which are adapted to low temperatures, were recorded whereas those species less able to cope without large areas of unfrozen water vacated the country.

The numbers of waterbirds was higher in the 2014 survey, again due to the large areas of unfrozen water that were available. During this season we recorded large numbers of geese, which typically winter in the southern part of our study area using Beleu and Manta Lakes as roosting places (unpublished data). These geese were not recorded in January 2014 when the lakes were frozen despite wintering numbers of these species being on the increase in Europe [17].

In common with other studies from Central Europe [15, 11, 17], Mallard is by far the most abundant waterbird species during the winter. The differences in Mallard numbers between the two counting winters are high (with 48% more birds in the first winter compared with the second). Although the winter population of this species is declining across Europe [26, 24, 25, 8, 6], this difference is more influenced by the weather condition and the availability of the feeding and roosting areas. Of the 21 species recorded during 2014, all but five, four of which are exclusively winter visitors to the Republic of Moldova were recorded at lower numbers in 2015 survey. These data reveals a high fluctuation of the waterbirds species during the winter season, which appears to be related to the climate conditions. As yet there is an insufficient time series to analyse the population trend, a minimum of 5 years of continuous survey being required [12, 21].

During migration the waterbirds are distributed on all of the main large lakes from the study area (unpublished data), but, in the winter, they concentrate especially in the northern part of the country. Upper Dniester River becomes the most important wintering area for waterbirds from the Republic of Moldova. This site is at the border with Ukraine and the efforts to protect it should be shared by both countries. In the Republic of Moldova this site is designated as Important Bird Area and also, a part of it is a RAMSAR Site, but there is no information on wintering birds and also there are no conservation measures to protect them. The main threat for this site is poaching, especially with traps.

The new waterbird surveys from the Republic of Moldova developed within the International Waterbird Census, emphasize the efforts of the local ornithologists to fill the knowledge gaps within this small country. This study can be considered the most reliable ever taken in all of the Republic of Moldova territory and will provide a baseline for future reporting.

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