



## ***Past and Present Distribution of the Greater Flamingo (Phoenicopterus roseus Pallas, 1811) (Phoenicopteridae Bonaparte, 1831) in Bulgaria***

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**Abstract.** At least a total of 73 observations of the greater flamingo in Bulgaria have been recorded between 1864 and 2023, 69.2 % of which have been done in autumn-winter. The species has been observed in no less than 17 localities, 9 of which are located along the Bulgarian Black Sea coast. The largest number of flamingos observed at a single locality (Atanasovsko Lake) exceeds 3000 birds. Burgas wetlands (Atanasovsko Lake, Pomoriysko Lake, Poda Protected Area) are the most often visited sites in the country. In the spring of 2023 the flamingos attempted breeding (nest constructing) in Atanasovsko Lake.

**Keywords:** Water birds, Endangered birds, Birds of coastal lagunes, Changes in avian phenology.

### **Introduction**

In the recent European avifauna, the greater flamingo (*Phoenicopterus roseus* Pallas, 1811) is a Tertiary relict. The oldest fossil record of flamingoes (*Phoenicopterus* spp.) on the Balkan Peninsula originates from the Late Miocene of Pikermi, Greece (Mlíkovský, 2002).

The present conservation status of the greater flamingo is globally “Least Concern”. It is an aquatic bird, mainly occurring in brackish and saline wetlands in three zoogeographical realms – Afrotropical, Indomalayan, and Palearctic (BirdLife International, 2022; Salvador et al., 2022).

Most of present territory of Bulgaria lies out of the recent breeding species’ range (Salvador et al., 2022). The aim of the present study is to summarize and analyze all published data from the country, as well as

available unpublished observations of Bulgarian and foreign ornithologists about distribution of the greater flamingo in Bulgaria from the beginning of ornithological studies until 2023.

The species is considered as “Endangered” in the “Red Book of PR of Bulgaria” (Boev, 1985). Michev (1990) refers greater flamingos in Bulgaria as *Phoenicopterus ruber roseus* Pallas, 1811, a taxon that is now regarded as *Phoenicopterus roseus roseus* Pallas, 1811 (Dickinson & Remsen, 2013).

### **Material and Methods**

An attempt to check and gather all scattered data on the species’ observations in the country is made since the earliest publications of 19<sup>th</sup> century of foreign explorers. Brief data on the observed birds, number, date, the age of individuals, localities and references of all observations are provided, divided in

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five groups according to bird phenology: (1) spring migration (1 March - 19 April), (2) breeding season (egg laying – 20 April – 15 May; chick hatching – 15 May – 15 August), (3) autumn migration (16 August - 30 October), (4) wintering (1 November – 29 February) (after Cramp & Simmons, 1977), and (5) untimed observation (Table 1).

It should be noted that, in addition to the data collected here from published reports, a number of other data (with varying degrees of precision, some with limited access) are available, most of which coincide with the main localities

of the species presented in the article. For seasonal species' occurrence we used data of Ebird (2023). The accessible data of the Bulgarian Society for the Protection of Birds (BSPB) have been used also. Most of the observations made by the experts of the BSPB are regularly published online in various news site in the Internet. They are cited here under the names of the corresponding observers. Often the same observation was reported multiple times at different sites. In such cases, we have presented these data in the Table. 1 only once.

**Table 1.** Observations of the greater flamingo in Bulgaria (1864-2023).

No	Date	Locality	Region	Observed birds	Reference
<b>Spring migration (1 March – 19 April)</b>					
1.	24.03.1912	near town of Svishtov	Veliko Tarnovo Region	1	Wallis (1913)
2.	28.03.1981	Atanasovsko Lake near Burgas City	Burgas Region	1	Nankinov & Darakchiev (1981)
3.	28.03.1912	Near Sofia	Sofia Region	1	Wallis (1913)
4.	10.04.2023	Atanasovsko Lake near Burgas City	Burgas Region	~600 including 80 nesting	BSPB (2023a)
5.	18.04.2023	Atanasovsko Lake near Burgas City	Burgas Region	80 nest constructing	[Mladenov] 2023
<b>Breeding period (20 April – 15 August)</b>					
6.	26.04.1991	Fishponds near Yambol City	Yambol Region	9	Nankinov & Kirilov (1992)
7.	26.04.2022	Shabla Lake	Dobrich Region	>29	Krasteva (2022)
8.	May 1966	Alepu Marsh near town of Sozopol	Burgas Region	5	Nankinov & Darakchiev (1981)
9.	End of May 1992	northern part of Atanasovsko Lake near Burgas	Burgas Region	300	Nankinov & Kirilov (1992)
10.	Spring, 2022	Shabla Lake	Dobrich Region	~	Nikolova (2022)
11.	29.05.2017	Poda Protected Area	Burgas Region	~	Vladimir Deryabin
12.	spring, 1965	Nanevska Tuzla (Taukliman)	Dobrich Region	~ 10	Slavinski (1973); Boev (1982)
13.	spring, 1890	Iskar River between the villages Kumanitsa and Vrazhdebna	Sofia Region	4	Hristovich (1893); Vasilev (1953); Boev (1982)
14.	spring and summer, 1981	Salt Farms, Atanasovsko Lake near Burgas City	Burgas Region	1 juv.	Boev (1982)
15.	17.08.2019	Atanasovsko Lake near Burgas City	Burgas Region	30	P. Iankov (unpubl. data)
16.	19.08.2019	Atanasovsko Lake near Burgas City	Burgas Region	159 (120 ad., 39 juv.)	Kehayova (2019)
17.	20.08.2023	Atanasovsko Lake near Burgas City	Burgas Region	15	Z. Boev (unpubl. data)
18.	25.08.2023	Atanasovsko Lake near Burgas City	Burgas Region	338	BSPB (2023b)
19.	late August 2019	Atanasovsko Lake near Burgas City	Burgas Region	160	Kehayova (2022)
20.	Breeding season	Mandra-Poda Lake Complex near Burgas City	Burgas Region	1-4	Kostadinova & Gramatikov (2007)
<b>Autumn migration (16 August – 30 October)</b>					
21.	01.09.1990	Valley between towns of Aytos and Kameno	Burgas Region	~1500	Nankinov & Kirilov (1992)
22.	03.09.1981	Atanasovsko Lake near Burgas City	Burgas Region	1 ad.	Boev (1982); Vatev (1991)

23.	09.09.2022	Pomoriysko Lake	Burgas Region	~3000	Suknarov (2022)
24.	16.09. 15.10.2014	Atanasovsko Lake near Burgas City	Burgas Region	2 juv.	Valcheva (2014)
25.	17.09.2019	Studen Kladenets Reservoir	Kardzhali Region	13	BSPB (2019)
26.	20.09.1984	Atanasovsko Lake near Burgas City	Burgas Region	1	Michev (1998)
27.	21.09.1999	Atanasovsko Lake near Burgas City	Burgas Region	1 juv.	Michev et al. (2004)
28.	24.09.1959	Persina Nature Reserve (Persina Island in Danube River)	Pleven Region	6	Paspaleva-Antonova (1961); Boev (1982); Vatev (1991)
29.	26.09.1981- 01.1982	Atanasovsko Lake near Burgas City	Burgas Region	1	Michev (1997, 1998)
30.	29.09.1981	near Burgas	Burgas Region	1 ad.	Vatev (1991)
31.	20.09.1984	Atanasovsko Lake near Burgas City	Burgas Region	3	P. Arsov (Michev, 1997; Michev et al., 2004)
32.	1 <sup>st</sup> week, October 2020	Burgas Lake	Burgas Region	1300	Anonym (2020)
33.	01.10.1982	near Burgas	Burgas Region	1 juv.	Vatev (1991)
34.	10.10.2017	Studen Kladenets Reservoir	Kardzhali Region	53 (14 ad., 39 juv.)	[Hristov, H.] (2017b); Anonym. (2017b)
35.	11.10.2017	Atanasovsko Lake near Burgas City	Burgas Region	38	[Kolev] (2017)
36.	15.10.1986	near Burgas	Burgas Region	1 juv.	Vatev (1991)
<b>Wintering period (1 November – 29 February)</b>					
37.	09.11.2021	Shabla Lake	Dobrich Region	8 (2 ad., 6 juv.)	[Iliev, M.] 2021
38.	09.11.2022	Pomoriysko Lake	Burgas Region	1400	Suknarov (2022)
39.	15.11.2022	Pomoriysko Lake	Burgas Region	~	Bedrosyan (2022)
40.	10.11.2001	Atanasovsko Lake near Burgas City	Burgas Region	1 juv.	Michev et al. (2004)
41.	11.11.2018	Atanasovsko Lake near Burgas City	Burgas Region	134	Uzunov (2018)
42.	12.11.2022	Atanasovsko Lake near Burgas City	Burgas Region	~2300	[Tsenova] (2022)
43.	19.11.2014	Atanasovsko Lake near Burgas City	Burgas Region	2 ad., 3 juv.	Chaleva (2014)
44.	19.11.1932	an island in Maritsa River near town of Simeonovgrad	Haskovo Region	6	Patev (1950), Vasilev (1953); Boev (1982)
45.	26.11.2020	Atanasovsko Lake near Burgas City	Burgas Region	1646	Kehayova (2021)
46.	November 2020	Atanasovsko Lake near Burgas City	Burgas Region	785	Kehayova (2021)
47.	November 2016	Studen Kladenets Reservoir	Kardzhali Region	7	[Hristov] (2017b)
48.	20.12.1962	Atanasovsko Lake near Burgas City	Burgas Region	6	Boev (1982)
49.	20.12.1970	near Burgas	Burgas Region	1	Johnson & Biber (1971); Johnson (1989), cited after Vatev (1991)
50.	30.12.2021- 01.01.2022	Atanasovsko Lake near Burgas City	Burgas Region	~20 ad., ~12 juv.	Z. Boev (unpubl. data)
51.	31.12.2022	Atanasovsko Lake near Burgas City	Burgas Region	~90	Z. Boev (unpubl. data)
52.	31.12.2022	Pomoriysko Lake near town of Pomorie	Burgas Region	~15	Z. Boev (unpubl. data)
53.	Winter	Mandra-Poda Complex near Burgas City	Burgas Region	0-5	Kostadinova & Gramatikov (2007)
54.	Winter, 2019	Atanasovsko Lake near Burgas City	Burgas Region	159	Apostolov (2020)
55.	01.01.2023	Atanasovsko Lake near Burgas City	Burgas Region	~120	Z. Boev (unpubl. data)
56.	01.01.2023	Pomoriysko Lake near town of Pomorie	Burgas Region	~45	Z. Boev (unpubl. data)
57.	12- 15.01.2023	Atanasovsko Lake and Poda Locality near Burgas City. Pomoriysko Lake near Pomorie	Burgas Region	~3000	Angelova (2023)
58.	12- 15.01.2023	Atanasovsko Lake and Poda Locality near Burgas City. Pomoriysko Lake near Pomorie	Burgas Region	2712	BSPB (2023c)
59.	14.01.2017	Arda River	Kardzhali Region	~	Anonym. (2017a)
60.	16.01.2023	Atanasovsko Lake and Poda Locality near Burgas City. Pomoriysko Lake near Pomorie	Burgas Region	>2700	Dimitrov (2023)
61.	22.01.2021	Atanasovsko Lake and Poda Locality near Burgas City. Pomoriysko Lake near Pomorie	Burgas Region	981	Anonym. (2021a)
62.	January	Pchelina Reservoir	Pernik Region	~	Anonym. (2021b)

2020 January- 63. February 2016	Studen Kladenets Reservoir	Kardzhali Region	12	[Hristov, H.] (2017a)
64. 01.02. 1982	Atanasovsko Lake near Burgas City	Burgas Region	1 ad.	Nankinov & Darakchiev (1981)
65. February 1981	Atanasovsko Lake near Burgas City	Burgas Region	1 juv.	Boev (1982)
<b>Untimed observations</b>				
66. 1864	Danube Delta	At present out of Bulgarian ~ territory		Allard (1864)
67. Migration period	Salt marshes along the Bulgarian Black Sea coast	(mainly) Burgas ~ Region		Simeonov (1972)
68. 2014-2016	Atanasovsko Lake near Burgas City	Burgas Region	3-5	Uzunov (2021)
69. [often]	along the Bulgarian Black Sea coast.	(mainly) Burgas ~ Region		Nankinov & Draktchiev (1981); Boev (1985); Michev (1990)
70. 1860-s	near town of Chemomorets	Burgas Region	~	Hristovich (1893); Patev (1950); Boev (1982)
71. 2018	Atanasovsko Lake near Burgas City	Burgas Region	4	Iankov (2019)
72. 2019	Atanasovsko Lake near Burgas City	Burgas Region	160	Adams et al. (2022)
73. 2022	Atanasovsko Lake near Burgas City	Burgas Region	>1000	Adams et al. (2022)

## Results and Discussion

### *20<sup>th</sup> century records on the Balkans*

After Talpeanu & Paspaleva (1973) the greater flamingo is accidental in the neighbouring Romania, where it was recorded in June, October and January. The authors explained its appearance in Romania by the movement of individuals from the Caspian Sea or the Camargue (Southern France), where the species had breeding colonies. In 1969-1972 it was recorded in the Sinoe lagoon and the region of Galati on Danube River.

Boev (1985) supposed that the birds observed on the Balkan Peninsula most likely originated from the former colony from Van Lake in southeast Turkey. Currently, Turkey's main breeding colony is located in Lake Tuz (Balkiz et al., 2007).

Current studies show that some of the birds recorded in Bulgaria (Atanasovsko Lake (Burgas Wetlands) originate from Turkey, Greece, France and Spain (Desant, 2021; Kehayova, 2021; [Tsenova, 2022]). The longest distance of the young Mediterranean greater flamingos dispersion is 2231 km

from Punta de la Banya (NE Spain) to Atanasovsko Lake (Desant, 2021).

According to Michev (1990) flamingos visit Bulgaria irregularly outside the breeding period. Nankinov & Kirilov (1992) stated that there is no temporal pattern in visits of the greater flamingo to Bulgaria and all published reports from Bulgaria refer to observations of single birds and small groups. Michev et al. (2004) considered the species as vagrant in Bulgaria. After Kostadinova & Gramatikov (2007) the species is represented in Bulgaria by solitary birds that winter irregularly. More recent observations from 2000 onwards show that the species has a year-round presence in the country with several tens and even hundreds or thousands of individuals. Bulgaria is located on the northern periphery of the species' European breeding range (Michev, 1990; Salvador et al., 2022)

### *Recent distribution*

In the data-base of e-bird (Ebird, 2022) a total of 754 species' observations have been registered throughout the year (except 2<sup>nd</sup> week of

July) until 21.12.2022. These data have been gathered between 1990 and 2023.

Collected data (Table 1) show a permanent increasing number of bird records in the country during the last century, as also reported in Ebird. For the first 100 years of ornithological observations of the greater flamingo in Bulgaria (1890-1990), a total of 23 notices of encounters of the species were published in its modern territory (Table 1), representing 31.5 % of all published observations, but sightings are becoming significantly more frequent. Indeed, in 1990-2023 76.7 % of the encounters of the species were reported. We should have in mind the rapid increasing of the number of Bulgarian and foreign birdwatchers and field ornithologists in the last decades. On the other hand, the number of greater flamingos is increasing globally, the species occupied new breeding grounds in the Mediterranean (Salvador et al., 2022). Thus, the increased species' presence in Bulgaria is part of a larger process, probably also due to global warming.

In the spring of 2023, the first nesting attempts were already observed of the greater flamingo in the Atanasovsko Lake. About 80 birds from the flock of about 600 birds staying in the lake have started nesting, but eggs laid and brooding have not been detected ([Mladenov], 2023; BSPB, 2023a), so the establishment of a breeding colony at this site could occur in the next years.

The Atanasovsko Lake is defined as “the only more regular occurrence of the greater flamingo (*Phoenicopterus ruber*) in Bulgaria” in winter (Michev et al., 2015).

Despite these discrepancies in the data, we accept the overall change in the frequency of sightings over the years during the autumn-winter period is similar to the data collected by us (Table 1). There is also a coincidence in the

reduction of these observations during the spring-summer season.

**Table 2.** Seasonal distribution of the observations of *Phoenicopterus roseus* in Bulgaria between 1990 and 19.05.2023 (after Ebird, 2023).

Month	Number of observations	Percent of total number of observations
January	56	8.2
February	55	8.0
March	39	5.7
April	17	2.5
May	21	3.1
June	22	3.2
July	22	3.2
August	48	7.1
September	123	18.0
October	122	17.8
November	96	14.0
December	116	17.0
<b>Total</b>	<b>737</b>	<b>107.8<sup>1</sup></b>

<sup>1</sup> The sum of all months of the year according to Ebird data exceeds 100%. It is likely that some of the observations span consecutive days of two consecutive months.

When taking into account the seasonality of the greater flamingo in Bulgaria it is necessary to consider the following: 1) Studies on the distribution, numbers and residence of the species for the whole country are lacking; 2) The species in Bulgaria and on the Balkans in general occurs year-round (Figs. 1-2), although the majority of individuals in the region are wintering. Regardless of the number of committed observations, the number of specimens observed has two distinct peaks - autumn (September) and winter (December), corresponding to the periods of the most massive movements during the autumn migration and (sometimes) during the winter. About 61.6 % of the observations have been done in the autumn-winter period (Tables 1-3).



**Fig. 1.** Wintering grater flamingos (*Phoenicopterus roseus*) and Common Shelducks (*Tadorna tadorna*) in the Atanasovsko Lake near Burgas City, 31.12.2022. Photo: Z. Boev.



**Fig. 2.** Summering grater flamingos (*Phoenicopterus roseus*) in the Atanasovsko Lake near Burgas City, 20.08.2023. Photo: Zlatozar Z. Boev.

### Conclusions

In the last 2-3 decades, the number of the greater flamingo sightings in Bulgaria has increased sharply. The species has been observed in no less than 17 localities, most of which are located along the Bulgarian Black Sea coast. 76.7 % of the encounters of the species were reported in the period 1990-2023.

The greater flamingo occurs in Bulgarian wetlands throughout the year (Tables 1-3). About 69.2 % of the

observations in Bulgaria have been done in the autumn-winter period.

**Table 3.** Comparison of seasonal distribution of the observations of *Phoenicopterus roseus* in Bulgaria between 1864 and 2023 and data of Ebird (2022) from 1990 to 2022.

Period	Number of observations	Percentage of all timed observations	Percentage of all observations after Ebird (2022)
Spring migration	5	7.7	~8.2
Breeding season	15	23.1	~19.1
Autumn migration	16	24.6	~35.8
Wintering season	29	44.6	~47.2
Untimed	(8)	-	-

The largest number of flamingos observed at a single observation exceeds 3000 birds. Burgas wetlands (Atanasovsko Lake, Pomoriysko Lake, Poda Protected Area) are the most often visited sites.

Sometimes flocks also visit the shallows in dams in the interior of the country.

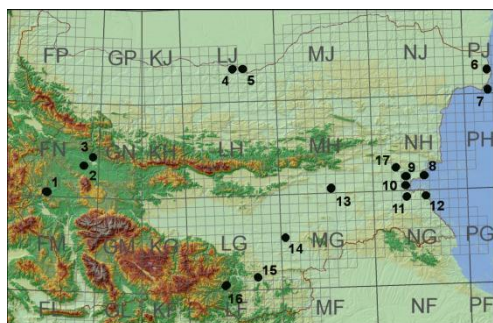
In the spring of 2023 about 80 flamingos attempted breeding - observed are nest-building without egg-laying.

Of the 17 established localities of the species in the country, 2 are located along the Danube River, 3 – in the interior of Western Bulgaria, 4 – in the interior of Southern Bulgaria and 8 – on the Black Sea Coast (Fig. 3).

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**Fig. 3.** Distribution of the greater flamingos (*Phoenicopterus roseus*) in Bulgaria: Pchelina Reservoir (1); Sofia (2); Kumanitsa-Vrazhdebna (3); Persina Nature Reserve (4); Svishtov (5); Shabla Lake (6); Nanevska Tuzla (7); Pomoriysko Lake (8); Atanasovsko Lake (10); Mandra Lake and Poda Protected Locality (11); Alepy Marsh and Chernomorets (12); Fishponds near Yambol (13); Simeonovgrad (14); Studen Kladenets Reservoir (15); Arda River (16); Aytos (17).

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