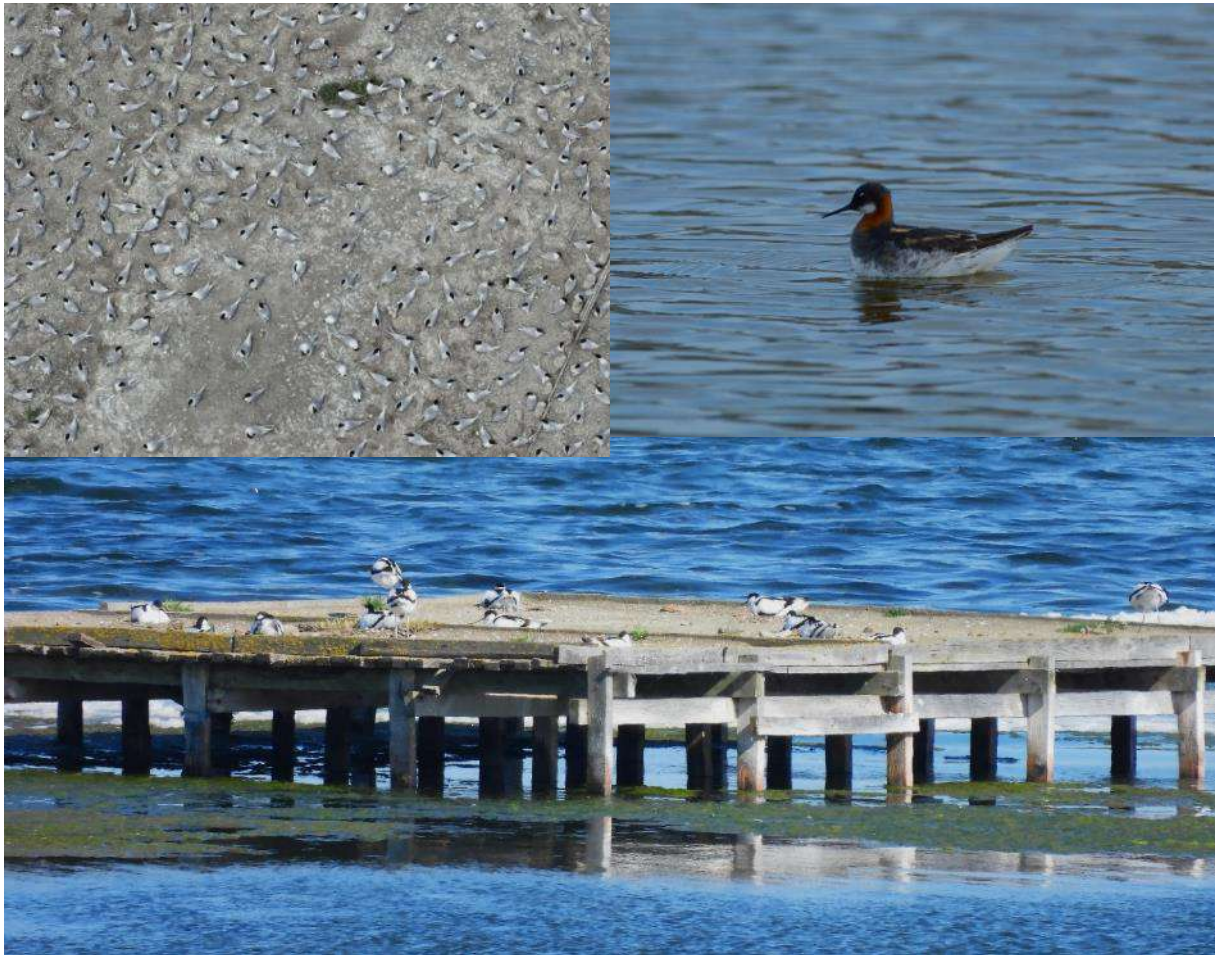




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LIFE FOR POMORIE
LAGOON



BIRDS OF POMORIE LAKE
REPORT AFTER COMPLETION OF RESTORATION
LIFE19 NAT/BG/000804 LIFE FOR POMORIE LAGOON



AUGUST, 2023

Title of the report

“Birds of Pomorie Lake – report after completion of restoration”, LIFE19 NAT/BG/000804
Technical report

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Summary

This Report presents summarized information of bird populations based on conducted surveys in the area of Pomorie Lake for the period September 2020 – August 2023, comprising line transects, vantage point transects and aerial drone surveys. The survey was made in the frame of the project LIFE19 NAT/BG/00804 LIFE FOR POMORIE LAGOON. The survey is conditionally divided into two stages. The First stage of the survey - from September 2020 to the end of September 2021 - ended with the preparation of a preliminary report, which summarized data on the current state of the site as a baseline. The Second stage of the survey lasted from October 2021 to August 2023 and summarizes the data from the monitoring of species and environmental conditions during the period when restoration works have been started and the completed. Dividing the survey in this way allows us to compare the data from the two stages to gain insight into how lagoon conditions are changing/or not changing over time as result of conducted conservation and restoration actions within the project. During this period have been completed 105 monitoring visits to the lagoon as each visit was carried out in appropriate weather conditions. The study period is divided into 4 seasons – migratory period (spring 01/03-15/05 and autumn 01/08-30/11), wintering birds 01/12-28/02 and summer visitors (incl. breeders) 16/05-31/07. The number of visits per season is as follows: 38 visits during migration period, both autumn and spring, 21 visits during wintering period and 6 visits during summer period. During the nesting period, May-June, in addition to summer visitors observation, a survey was conducted on the number of nests/colonies as well as the breeding species. The main method for registering pairs and nests was drone survey, allowing more accurate estimation of nest numbers in colonies, greater access to nests located in hard-to-reach habitats, as well as shorter field stays and correspondingly less disturbance to the species, compared to line transect survey, which was also conducted at designated locations. Estimated breeding pairs of target species are presented. For the whole monitoring period there 132 bird species in total have been recorded. These included the target species for the project – Shelduck; Sandwich, Little and Common tern; Pied avocet; Black-winged Stilt; Little stint; Dunlin; Ruff; Redshank; Black-tailed godwit; Little ringed and Kentish plover. Four new species for the site were recorded – Little bustard (*Tetrax tetrax*), Great knot (*Calidris tenuirostris*) being first observation for Bulgaria and Balkans Peninsula, White-tailed lapwing (*Vanellus leucurus*) and Eurasian stone-curlew (*Burhinus oedichnemus*). The greatest species diversity per visit was observed in April which coincides with the period of spring migration – 60 species registered. The species with the highest number observed during the winter period is Coot (8,441 ind.), while several pairs (2-3) nest in the lake, too. The highest number of observed individuals in total in the lake was observed in December – 15,759 individuals from 37 species and this coincides with the wintering period. Number of breeding pairs and relative success for target species was assessed as variable depending on conditions and is detailed below for each target species. Three of the five target breeding species have exceeded the set target values for all the three years – Common tern, Kentish plover and Little tern. Pied avocet was the species that benefited most of the restoration activities and as result exceeded the target value of 100 breeding pairs in second and third project years after restoration started. Black-winged stilt reached the target number only in 2023 and could be considered as the least beneficial of performed restorations. The flagship species of the lagoon – Sandwich tern – has shown large fluctuations in breeding numbers and after 50% increase in 2022 then dropped to record low in 2023. Complex factors affected the terns in the lagoon including the uncontrolled hydrological regime and probably the bird flu epidemic.

INTRODUCTION

Population dynamics are a key indicator of the impact on nature, and are used for assessing the efficacy of conservation and rehabilitation activities and waterbird populations are linked to the status and health of wetlands and their habitats. Therefore, the present study is mainly focused on the waterbird species found in Pomorie Lake. Data collected for other bird species are unsystematic and are not included in this report.

Waterbirds are well-known indicators of the quality of aquatic environments. If a given site regularly holds 1% or more of the flyway population of a given species, we can conclude that this area is important for this population/species (Heath et al., 2000). A flyway is a flight path used in bird migration and a flyway population is the number of individuals of a given species included in a given flyway area. The 1% criterion is used to qualify an area as a wetland of international importance under the Ramsar Convention on Wetlands and by the European Union to identify Special Protection Areas (SPAs) under the Birds Directive. It is also used by BirdLife International for identifying Important Bird Areas (IBAs) in wetlands worldwide.

General description of the site

Pomorie Wetland Complex (Pomorie Lake) is part of the Burgas Lake Complex. The size of the lagoon is 760 ha and it is recognized as national protected area (Protected Site), Natura 2000 sites (Special Protection Area BG0000152 Pomoriysko ezero, Special Area of Conservation BG0000620 Pomorie), Ramsar site and Important Bird Area. The major part of the site is a shallow coastal hyper-saline lagoon connected to the Black Sea by an artificial canal. Other associated wetland types are estuaries (River Akheloy), salt marshes, sand dunes, reed beds, salt pans, large inlets, etc. The wetland has been designated as Ramsar site mainly for its uniqueness, as one of the two coastal hyper-saline lagoons in the Black Sea region of Bulgaria converted into salinas, but it is also of high importance for the region's biodiversity. It supports many nationally and internationally red-listed plant and animal species – more than 297 bird species have been recorded, including three globally threatened ones, and some that are adapted to the hyper-saline conditions. Situated along second most important flyway in Europe – *Via Pontica* – the lagoon is an important stopover site for migratory birds and especially Charadriiformes as shallow basins substitute missing tidal zone in the Black Sea. It offers suitable conditions for wintering of Shelducks, Mute swans, Coots and other species of ducks and for breeding of several species of shorebirds and terns. The site is supporting the largest Sandwich tern (*Thalasseus sandvicensis*) colony on the Balkans and is second most important breeding site for Kentish plover (*Charadrius alexandrinus*), Common tern (*Sterna hirundo*), Little tern (*Sternula albifrons*), Gull-billed tern (*Gelochelidon nilotica*), Pied avocet (*Recurvirostra avosetta*) and Black-winged stilt (*Himantopus himantopus*) in Bulgaria. Saline conditions define importance for conservation of Caucasian dwarf goby (*Knipowitschia caucasica*) population in Bulgaria. It is the biggest location for Bulgarian Red Data Book-listed plant Sword-leaf dogbane (*Trichomitum venetum*) and a dragonfly Dark spreadwings (*Lestes macrostigma*). The site hosts 12 habitat types listed in annex I of EU Habitats Directive 92/43/EEC including priority like 1150* Coastal lagoons and 1530* Pannonic salt steppes and salt marshes, and is one of the two biggest locations of European glasswort (*Salicornia europaea*) in Bulgaria.

Project summary

LIFE19 NAT/BG/000804 Conservation of Pomorie Lake coastal lagoon project is funded by LIFE program of the EU and combines M-Pomorie Salinas Ltd, Green Balkans NGO, Bulgarian Biodiversity Foundation and biological station Tour du Valat (France). The project targets conservation of the priority habitat Coastal lagoons (1150*) and a group of bird species, listed in Annex 1 of the EU Birds Directive (Avocet,

Little, Sandwich, and Common terns) in Pomorie Lake. Main objectives include: restoration of functional infrastructure for water management in Pomorie Lake to secure the lagoon against flood and limit the pollution, and to sustain traditional salt production; long-term improvement of priority habitat 1150* Coastal lagoon in SAC Pomorie; improved breeding sites for target bird species and restored importance of the site for migratory Charadriiformes.

To achieve these objectives following actions have been planned:

- to establish a functional infrastructure for water management in Pomorie Lake to secure the lagoon against flood and limit the pollution, and to sustain traditional salt production by complete rehabilitation of 5,340 m bypass channels and 6,460 m dykes. They play a significant role in managing the water levels and quality of the Pomorie Lake, thus affecting the status of the lagoon;
- to improve the breeding sites for priority bird species by the construction of one new wooden platform (36 m²) and restoration of existing islets' (250 m²). Best practices from previous LIFE projects will be used;
- monitoring of the project activities' impact on coastal habitats;
- monitoring of dragonfly assemblages as an indicator of the change of water quality;
- monitoring of the project activities' impact on priority bird species;
- monitoring of the socio-economic impact and ecosystem services;
- developing Project Communication Strategy and Dissemination pack – website and Facebook page, info-boards and Layman's report
- networking & replication.

Condition of the site

Prior to the Project

Pomorie Lagoon has undergone some changes in the past decade: heavy rains and floods in 2014/15 have led to blocking of protective bypass channels that drain surface fresh water and prevent its inflow into the lagoon. Mud and undesired vegetation blocked the channels and significantly decreased their capacity and protection functions. The compromised infrastructure has caused ineffective water circulation. The average salinity of water in the lagoon in December 2010 (after the reconstruction in GEF project) was 30.98‰ while in May 2019 it is 12.58‰. Decreased salinity has led to the development of macrophytes, which are the main nutrition basis for Anatidae and a shift in bird species composition (from Charadriiformes to Anatidae) during migration and winter. In addition, the degradation of 1150* is also evident by the increased microalgae growth in more than 33% of the habitat's area in 2019. This is a result of increased eutrophication due to the inflow of polluted surface and underground waters from the adjacent lands.

During the Project

The low salt production and the infrastructure damages from the floods resulted in limited opportunities for important investments in maintenance activities by the M-Pomorie Salinas Ltd. In 2021 it was the first year when the Salinas have not operated and circulation of water was completely stopped from spring. During the period of the study it was witnessed how saltpans progressively drained by evaporation and since May 2021 these basins (Saltpans – North and West) have been completely dry. Areas Honyat and Malak geren dried out respectively from beginning of August and September every year. Precipitation during the autumn and winter was relatively high in 2020/21 compared to previous years and was almost 540 mm in total.

Available breeding habitat for nesting of terns and shorebirds was limited in surface resulting in failed incubation attempts by the species of terns. Presence of predators was also documented by both tracks and observations of stray dogs, jackals and foxes.

The Salinas continued to be non-functional also in 2022 and 2023, with the saltpans permanently dry. In 2021/22 precipitation was 468 mm which resulted in a lower water level in the lagoon. As a result of this, as well as the efforts during the Conservation Camp 2021 to restore and repair the nesting habitats - mainly the islet in front of the Salt Museum and the wooden platforms in the western part, the nesting conditions were favorable for the terns and shorebirds in the Pomorie lagoon in the spring of 2022. Despite the good condition of the island and the relatively large breeding population of Sandwich terns during breeding season 2022, the extremely high mortality among hatchlings and juveniles due to outbreak of epidemic (most probably bird flu) resulted in low nesting success. It is expected this impact to have its effect in subsequent breeding seasons and also in other species.

Despite relatively low rainfall in the 2022/23, its peak was in the spring and early summer (May – July) coincided with high water level of the Black Sea for a period of several months. Being separated from the sea by a sandspit through which water seeps towards the lagoon, this in turn resulted in a very high water level in the lagoon starting from early May. Available breeding habitat for nesting of terns and shorebirds in the peak of the nesting season was limited in surface with this impact continuing throughout the nesting season. Flooding of the repaired islet has limited available breeding habitat and that affected mostly the Sandwich terns.

Activities undertaken

Ecological survey

Green Balkans' experts conducted an ecological survey investigating the bird communities in the Pomorie Lake, to inform and assess the implementation of the project activities. This report sets out survey results for wintering, migrating and nesting birds in the lagoon. It is presenting results from implementation of Action D.2 Monitoring of the impact of the project activities on priority bird species during the project. Field surveys were undertaken between September 2020 and August 2023, comprising 'look-see' methodology, vantage point surveys, patrolling of the dikes and shores and drone surveys. Surveys were designed to record the numbers and species composition of wintering, migrating and nesting birds in the lake. Point transect surveys were undertaken between September and April, and from July to September at a frequency of one visit every two weeks (except when stated otherwise). There were 105 survey visits in total.

Complete tour of dikes and shores on foot for registration of nests was undertaken in the period May-June. A total of 16,200 meters of dikes and shores have been surveyed every year. Drone surveys are an important part of the study of terns' colonies and identifying nesting birds in places inaccessible by walking.

The objective of these surveys was to identify species using the area of Pomorie Lake, investigate the presence of key species indicating the potential ecological status of Pomorie Lake. The results obtained in the course of these environmental surveys are necessary for the achieving the objectives of the project. In addition to the monitoring activities of the project described above, the following additional activities were carried out.

Conservation volunteer camps

The Green Balkans' team also organized and conducted conservation activities in the form of conservation camps with volunteer after the end of each nesting season, within which activities were carried out to restore/repair the nesting habitats of key bird species. The two conservation camps (action C.1) were held between September 1-6, 2021 and 2022, respectively.

Volunteering is one of the most important parts of the conservation. Without volunteers contributing to the conservation efforts of our ecosystems and wildlife species, we could face even accelerated deterioration rates of lagoon's flora and fauna condition. Green Balkans' programs provide the opportunity to people to get up-close with amazing wildlife in the Pomorie lagoon that they otherwise would not be able to see, appreciate, become familiar with the problems of it and to take care about.

In 2021, volunteers and employees of the association conducted a series of activities focused mainly on the improving of the condition of the islet in front of the Salt Museum where Sandwich terns' colony nests. The wooden part of the islet was strengthened with an additional 150 wooden beams to protect it from the erosive impact of the waves. Substrate from the bottom of the lake - mainly clam shells, silt and sand - was also moved onto the islet bed, increasing the area of the islet.

During the 2022 conservation camp, activities were divided between the islet in front of the Salt Museum and creating a new wooden platform in the western part of the lagoon. Meteorological conditions throughout the year affect the condition of the islet - washing away the substrate, collapse of supporting beams and embankments. This makes it necessary to carry out maintenance activities on it periodically - filling the substrate, placing additional beams in order to strengthen the structure. The wooden platforms in the western part of the lake are proving quite attractive for nesting Common terns and Pied avocets. Volunteers and staff of the association managed to build an additional wooden platform there, which was then covered with substrate from lagoon's bottom.

Bird ringing and observation

Tracking ringed birds allows us to define their migratory routes and staging areas, so providing crucial information for the protected areas for birds. Other information derived from recaptures include population parameters (e.g. survival, reproductive success), which are essential to determine the causes of changes in population sizes. Within the project a colour-ringing scheme for Common terns' chicks hatched in the Pomorie Lagoon was started using red rings with white 3-letter code starting with B: BXX.

Objectives of the study

The main goals of the monitoring of the ecosystem in Pomorie Lake are:

- Determining the state of the populations of the characteristic for the lagoon waterbird and water dependent species and the target species for the project within the protected area;
- Establishing trends in the lagoon ecosystem;
- Comparison of the indicators for the condition of the populations of the target bird species with the data from the hydrochemical monitoring and the monitoring of the water level of the lake in order to improve the condition of the lake ecosystem.

CONSERVATION MEASURES

Protected Areas Act (PAA): Ministry of Environment and Water. 1998. The Act regulates the establishment and maintenance of a national network of protected areas, determines the institutions responsible for the general management, monitoring and security coverage of the protected areas, and lists the rights and obligations of the physical persons and legal entities in this regard. Section 6: Protected Sites, Article 33.

Biodiversity Act: Ministry of Environment and Water. 2002. The Act regulates the conservation of biodiversity and establishment and maintenance of a national ecological network that consists of protected areas under PAA, NATURA 2000 sites (Sites of Community Importance, Special Areas of Conservation and Special Protection Areas), Ramsar sites. determines the institutions responsible for

the general management, monitoring and security coverage of the protected areas, and lists the rights and obligations of the physical and juridical persons in this regard. Section 2: National Ecological Network, Article 3-19.

Designation of Pomorie Lake as Protected Site: State Gazette, Ordinance RD-31 of MOEW, 23 January 2001.

Designation of Pomorie Lake as Ramsar Site: Site 1229 on 24 September 2002.

Designation of Pomorie Lake as Special Protection Area: State Gazette, Ordinance RD-78 of MOEW, 9 February 2009

Designation of Pomorie Lake as Special Area of Conservation: State Gazette, Ordinance RD-1030 of MOEW, 17 December 2020

Further Classifications: Designated Important Bird Area in 1997 by BirdLife International.

Management Plan: Currently there is no approved management plan for the site. Intergrated Management Plan for SCI Pomorie, SPA Pomoriysko ezero, Ramsar Site Pomorie Wetland Complex and Protected Site Pomoriysko ezero was developed in the period 2008-2010 by Green Balkans NGO but it was not approved by Ministry of Environment and Water. Designated Protected Site as of January 23, 2001.

Implemented conservation measures: Green Balkans NGO has been implementing a long-term conservation program for Pomorie Lake since 1996 including restoration of breeding habitat for birds; restoring hydrological regime; marking the protected area complex; installing information boards; cleaning illegal dumping sites; developing management plan for the site; creating visitor centre and conducting public awareness and environmental education campaigns. As part of this program, numerous conservation projects have been implemented, with a total amount of more than EUR 1 mln. Main donors included BTCV, Bulgarian-Swiss Biodiversity Conservation Program, GEF/World Bank, Operative Program "Environment 2007-2013"; LIFE+; British-Bulgarian Society; hundreds of volunteers and others. Breeding habitat for water birds was restored in the form of islets, wooden platforms, rafts and nextboxes in the lake for nesting of Sandwich tern (*Thalasseus sandvicensis*), Pied avocet (*Recurvirostra avosetta*), Common tern (*Sterna hirundo*), Little tern (*Sternula albifrons*), Gull-billed tern (*Gelochelidon nilotica*), Mediterranean gull (*Larus melanocephalus*) and Shelduck (*Tadorna tadorna*). Considerable achievement is the restoration of the numbers of Sandwich terns. In the beginning of the program there have been only 6 nesting pairs. In 2001 the numbers of nesting pairs reached 450 continuously growing to 1,300 and 1,500 pairs in 2006-2009 and above 2,500 pairs after 2013.

ORGANISATION AND METHODS OF WORK

The aim of the scientific survey is establishing baseline values of birds at the site with emphasis on water birds and set indicator species for the project. The monitoring of birds will be implemented throughout the project duration and will be used for assessment of results from conservation actions for restoration of breeding habitat for birds and hydrological regime of the lagoon. In addition hydrochemical monitoring is conducted for parameters like salinity, pH and oxygen contents in number of stations that cover all sub-areas of the wetland.

Study design

Special attention in this report is given to the species defined as 'waterfowl'. The Ramsar Convention defines 'waterfowl' as species of birds that are 'ecologically dependent upon wetlands' and has defined 'waterbird' as being synonymous with 'waterfowl' for the purposes of the application of the

Convention. However, since the second edition of Waterfowl Population Estimates, 'waterfowl' have been defined more precisely as all species of the following European families: Ducks, Geese and Swans (Anatidae); Rails, Crakes and allies (Rallidae); Gulls, Terns and Skimmers (Laridae); Herons and Egrets (Ardeidae); Sandpipers and allies (Scolopacidae); Plovers (Charadriidae); Cormorants (Phalacrocoracidae); Grebes (Podicipedidae); Ibises and Spoonbills (Threskiornithidae); Cranes (Gruidae); Coursers and Pratincoles (Glareolidae); Storks (Ciconiidae); Stilts and Avocets (Recurvirostridae); Thick-knees (Burhinidae); Oystercatchers (Haematopodidae); Pelicans (Pelecanidae); Flamingos (Phoenicopteridae); Loons or Divers (Gaviidae).

Subject of the study are also all waterfowl or wetland dependent species which are resident at the site all year round, species which migrate to Pomorie Lake and are present only in the winter months, and late migrants which are preparing to leave to spend the winter elsewhere. The international conservation status of the birds recorded is indicated within the report in Table 12.

The following species have been identified as indicator species for the project during winter and migration:

- Little stint (*Calidris minuta*) – target number is 50 ind. during migration;
- Dunlin (*Calidris alpina*) – target number is 300 ind. during migration;
- Ruff (*Calidris pugnax*) – target number is 100 ind. during migration;
- Kentish plover (*Charadrius alexandrinus*) – target number is 25 ind. during migration;
- Little ringed plover (*Charadrius dubius*) – target number is 25 ind. during migration;
- Redshank (*Tringa totanus*) – target number is 60 ind. during migration and winter;
- Shelduck (*Tadorna tadorna*) – target number is 250 ind. during winter;
- Black-tailed godwit (*Limosa limosa*) – target number is 70 ind. during migration.

Nesting birds include:

- Sandwich tern (*Thalasseus sandvicensis*) – target number is 1,300 – 2,000 breeding pairs;
- Common tern (*Sterna hirundo*) – target number is 60 – 100 breeding pairs;
- Little tern (*Sternula albifrons*) – target number is 10 – 20 breeding pairs;
- Pied avocet (*Recurvirostra avosetta*) – target number is 60 – 100 breeding pairs;
- Kentish plover (*Charadrius alexandrinus*) – target number is 5 – 20 breeding pairs;
- Black-winged stilt (*Himantopus himantopus*) – target number is 40 – 80 breeding pairs.

To achieve this aim, the following steps were implemented:

- Complete a desk study establishing the number and location of important habitats for birds, and bird species records;
- Undertake field surveys to produce a list of bird species encountered;
- Describe the communities of birds' present, how they use habitat types present within the Field Study Area and their conservation/legislative status.
- Preparation of an up to date Checklist of bird species of Pomorie Lake.

Counting waterbirds on large open water areas, like coastal lagoons and lakes, is challenging. Different methods have been developed to conduct census of birds in these open-water environments. Depending on the local conditions, there are three main census methods: counting from the ground, from the air, or boats. Ground counts (so called 'look-see' methodology) are the simplest and most common form of census and it is the method used for this survey. It is made from the ground, on foot, but also cars are involved. The site has been covered systematically, usually by walking the same route

on each visit and stopping every few hundred meters to scan with binoculars and/or a telescope to count the birds.

The site has been divided up into sub-areas that are visible from the chosen vantage points without overlap of areas counted and without missing any part of the site. Areas were divided mainly by habitat type defined by salinity and depth. These were called as follows: Marine area; Main Lake; Honyat; Malak geren; Saltpans – north; Saltpans – west and are shown on Figure 1.

Counts have been made by scanning flocks of waterbirds (usually comprising several species) with a telescope Swarovski ATX 30-70x95 and binoculars MINOX 8x40 when appropriate, counting each species one-by-one, or in 'blocks' for bigger numbers. To avoid extreme weather conditions (thick fog, heavy rain or gale force winds), because such conditions reduce counting efficiency, the visits have been postponed until conditions are more favorable. Route for surveys and vantage points are shown in Figure 2.

For waterbirds in particular, drones overcome challenges associated with surveying locations not accessible on foot and represent a useful addition to standard survey methods. During the current study in Pomorie Lake a drone was used to determine the number of the Sandwich terns' colony and the species nesting in the reedbeds. The drone surveys were conducted in May and June, and we used DJI Mavic 2 Enterprise drone. The video and still images have been collected for follow-up counts back in the office (*Figure 3*).

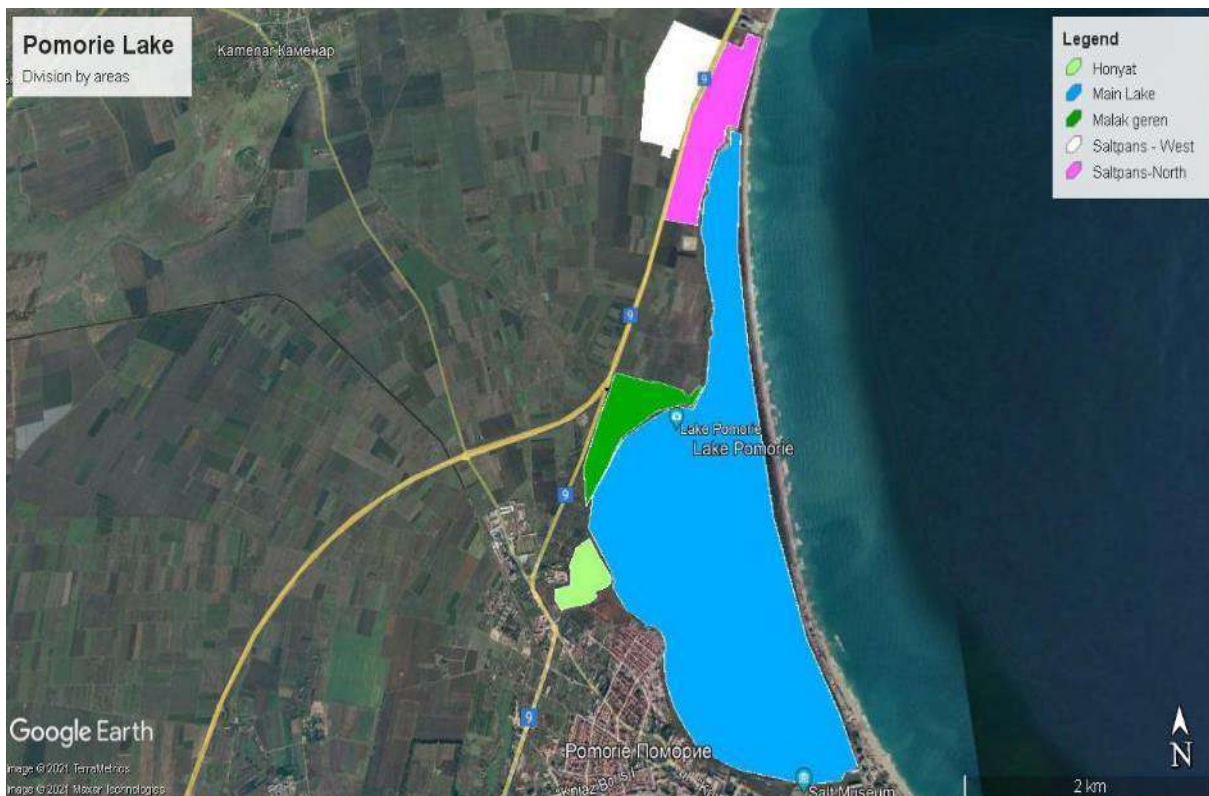


Figure 1: Division of Pomorie Lake into sub-areas based on habitat type (salinity and depth)

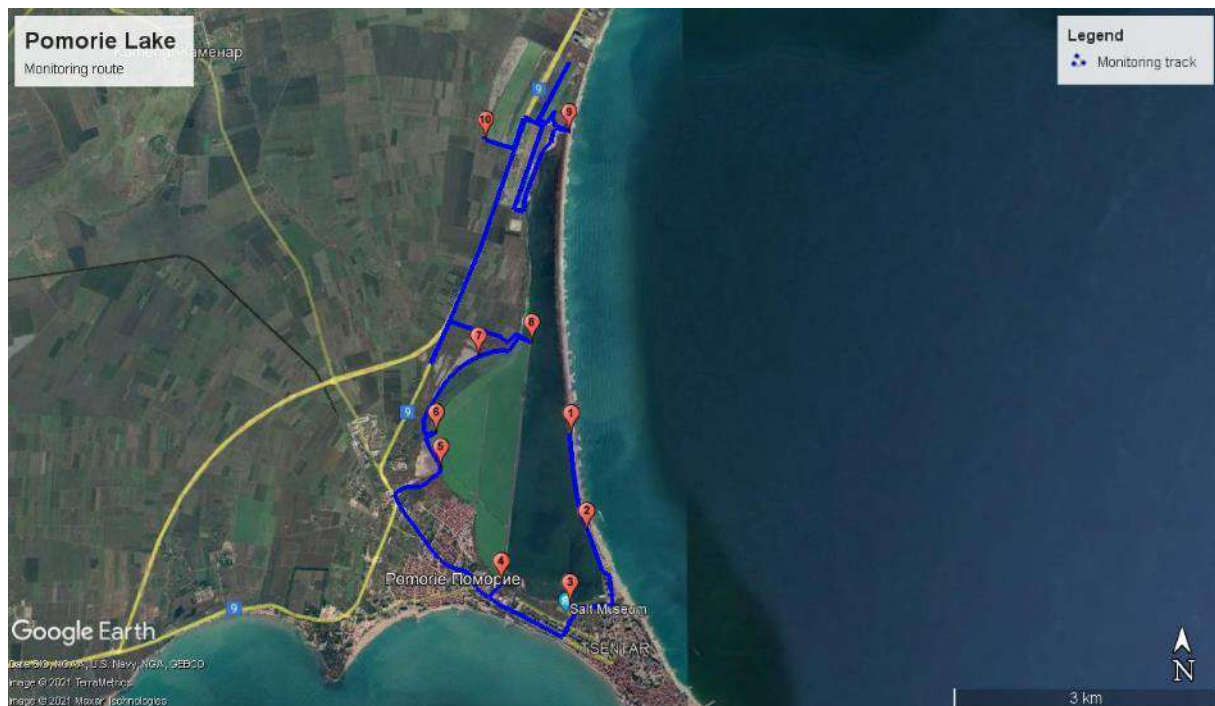


Figure 2: Monitoring route and vantage points



Figure 3: Example of drone footage

Period of the study

The survey was performed by ornithologists of Green Balkans NGO (Dimitar Popov – project manager, Galina Meshkova – biodiversity expert, Irina Kirova – Technical assistant and Ivaylo Klisurov – drone pilot) in the period September 2020 – August 2023. The area was visited once every two weeks, and observations were performed in the daytime. Daily duration of the observations was not less than 6 hours. For the monitoring of the nesting bird species the area was visited three times per month with full tour on foot of the coast and suitable nesting sites made twice to lower possible disturbance. The drone survey was carried out twice for each breeding season, so that each observation can be confirmed and validated to avoid biasing the results - once at the beginning of the breeding season and once at its peak.

Methodology used for the current survey

The study of avifauna is based on at least two visits per month to the lake area by experienced ornithologists and collection of species' (nesting, migratory, wintering, resident) numbers using a telescope; detour of the coastline and dikes for registration of nesting birds during the nesting period – May and June; collecting information on numbers and nests with the help of a drone. For the bird monitoring we have implemented point counts from vantage points covering all subareas of the wetland and transect counts for nests. The counts were conducted in the period of September 2020 – August 2023, preferably in the good weather. Each count was performed by two people, one of which have been doing observations while the other was responsible for recording. Duration of each counting day was at least 6 hours. The collected data have been recorded in a notebook and later summed into standard data collection form separated by different subareas (see the *Annex* at the end of the document).

Survey equipment

The following survey equipment was mobilized and used for the present survey:

- Binocular MINOX 8x40
- Telescopes Opticron ES 80GA ED 20-60x80 and Swarovski ATX 30-70x95
- Drone DJI Mavic 2 Enterprise

RESULTS

Summary of survey effort

In total more than 200 days of field work were performed every year including 105 days for monitoring during migration, winter and summer periods with the rest dedicated to monitoring breeding birds on foot and by drone. The total number of bird species registered during the survey period is 132. Of these, 116 species can be identified as waterbirds or wetland-dependent.

During migration and nesting periods, regular visits to the lagoon were made for observation of ringed birds. The Green Balkans' team has conducted Sanwich tern colour-ringing program at Pomorie Lake. Seven adult and 290 chicks (297 in total) of Sandwich terns were ringed in the period 2010-2013 and during the project new colour-ring program of Common terns was started and so far 15 individuals were ringed in 2022 and 2023. Subsequent monitoring of ringed individuals, as well as those ringed elsewhere but visiting the lagoon, yielded interesting and useful data, which are summarized below.

Data summary

Huge numbers of birds spend all or part of their life cycles in wetlands, which provide habitat and food sources for them to survive.

Waterbirds include:

- waterfowl such as ducks, geese and swans;
- grebes;
- pelicans;
- cormorants;
- ibises and spoonbills;
- egrets and herons;
- crakes, rails and waterhens;
- terns and gulls;
- shorebirds, which are also known as waders.

They fall into 3 main categories:

- **Colonial nesting waterbirds** require substantial floods to support large breeding events in floodplain wetlands. They include terns, egrets, ibises, pelicans, cormorants and herons.
- **Non-colonial waterbirds**, including resident shorebird species that generally don't congregate to breed but are still dependent on wetlands for nesting and feeding habitat in which to raise their young. They include waterfowl, grebes, crakes, rails and waterhens.
- **Migratory waterbirds**, such as migratory shorebirds, use a range of wetlands to rest, feed and breed during their annual long journeys between wetlands in Africa and their breeding sites in the northern Europe.

Other native bird species also depend on wetlands for all or part of the life cycle. These include warblers, passerine birds and birds of prey such as the Marsh harrier (*Circus aeruginosus*) and others, and they are also subject of this survey and included in the Report.

Diversity and abundance of bird species identified within the survey area was determined from the list of species observed. Peak counts of each species were recorded for all survey visits.

The emphasis is on species identified as indicator species for the project and also birds of conservation importance at Pomorie Lake - listed in Biodiversity Act and Red Data Book of Bulgaria, Annex 1 of the EU Birds Directive, species covering the Ramsar criteria, etc.

Conducted surveys have revealed strong relation of the species diversity to periods of migration while highest total of individuals in winter period when diversity was lower (*Figures 4 - 7*).

In terms of the number of individuals, two peaks are usually distinguished in a calendar year, which coincide with the winter period and the autumn migration. The spring minimum in terms of number of individuals coincides with a peak in the number of species during the same period. The great importance of the Pomorie Lagoon as a stopover place during migrations attracts many species, which, however, continue their movement to the nesting places and do not stay long. This determines this expression of the data.

Due to the mass autumn migration, during which birds more often form aggregations and move in large flocks, a peak is observed during this period both in terms of the number of individuals and in terms of the number of species registered. The longer stay of the birds, including young and inexperienced individuals, during which they accumulate food reserves necessary for the long migration or complete their molt cycle (gulls, etc.) causes peaks in the number of recorded individuals and also recorded species in the lagoon. The data show that the Pomorie Lagoon, as part of the Burgas Lakes complex, represents an extremely important habitat for migratory bird species, key to their survival.

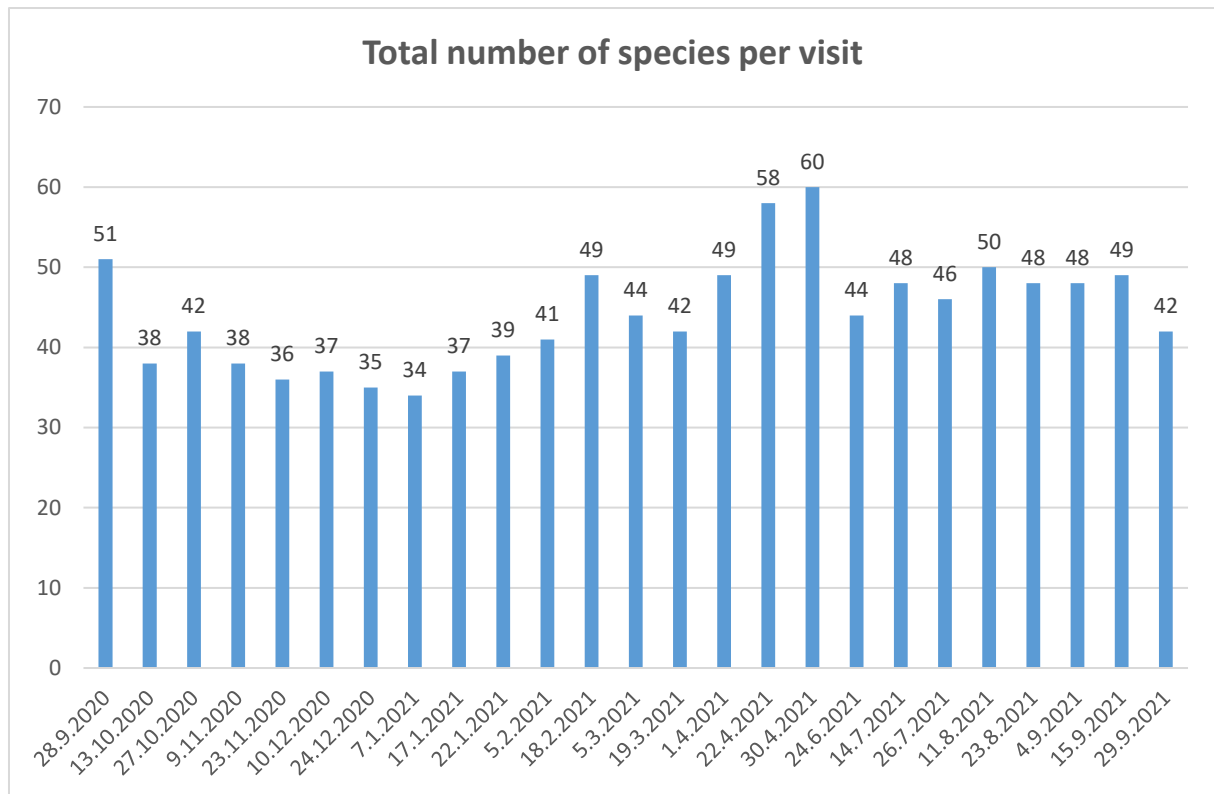


Figure 4: Total number of species observed per visit during First stage of the survey

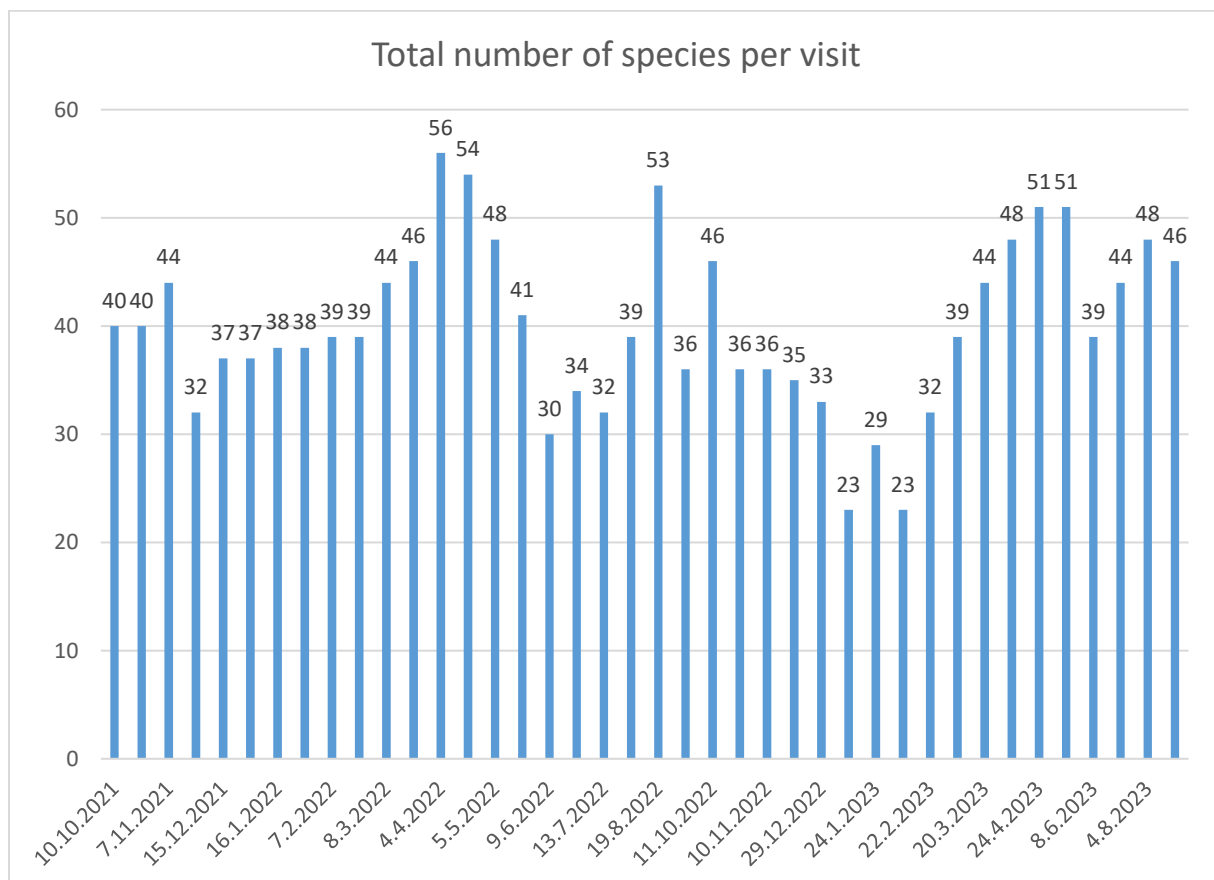


Figure 5: Total number of species observed per visit during Second stage of the survey

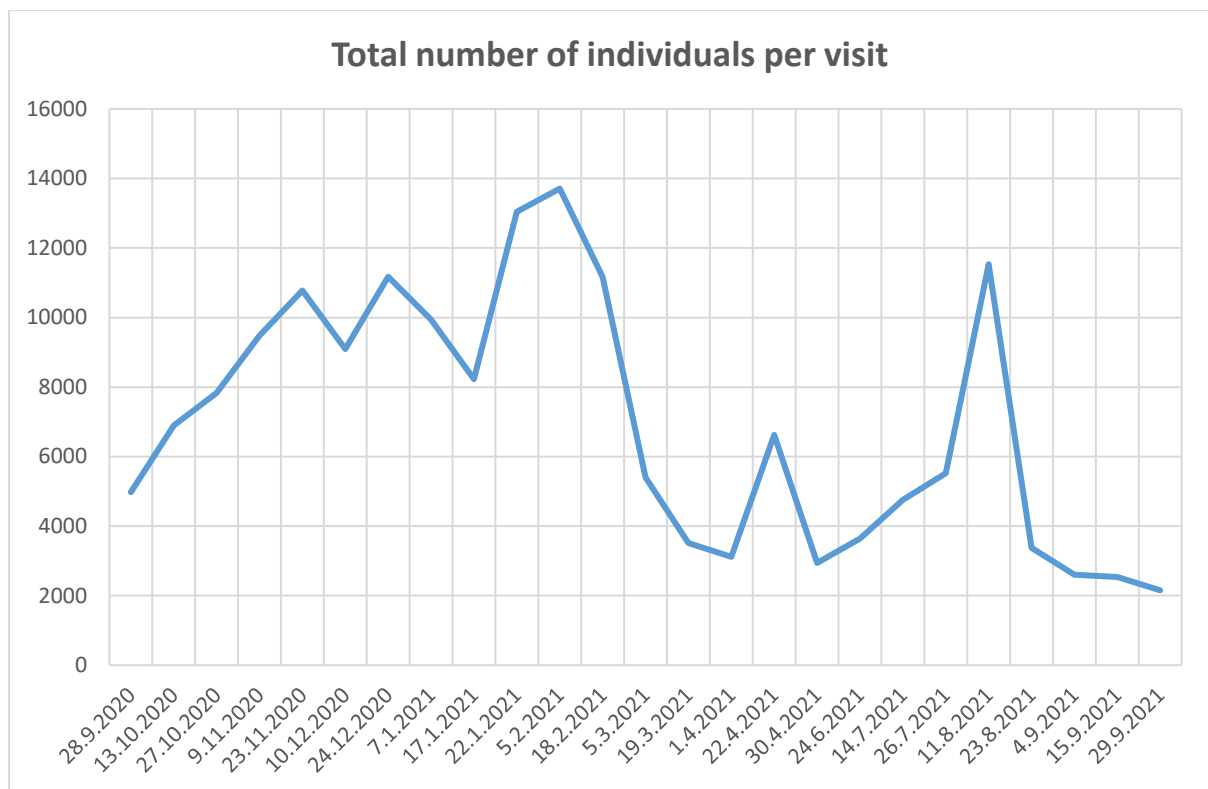


Figure 6: Total number of individuals registered per visit during First stage of the survey

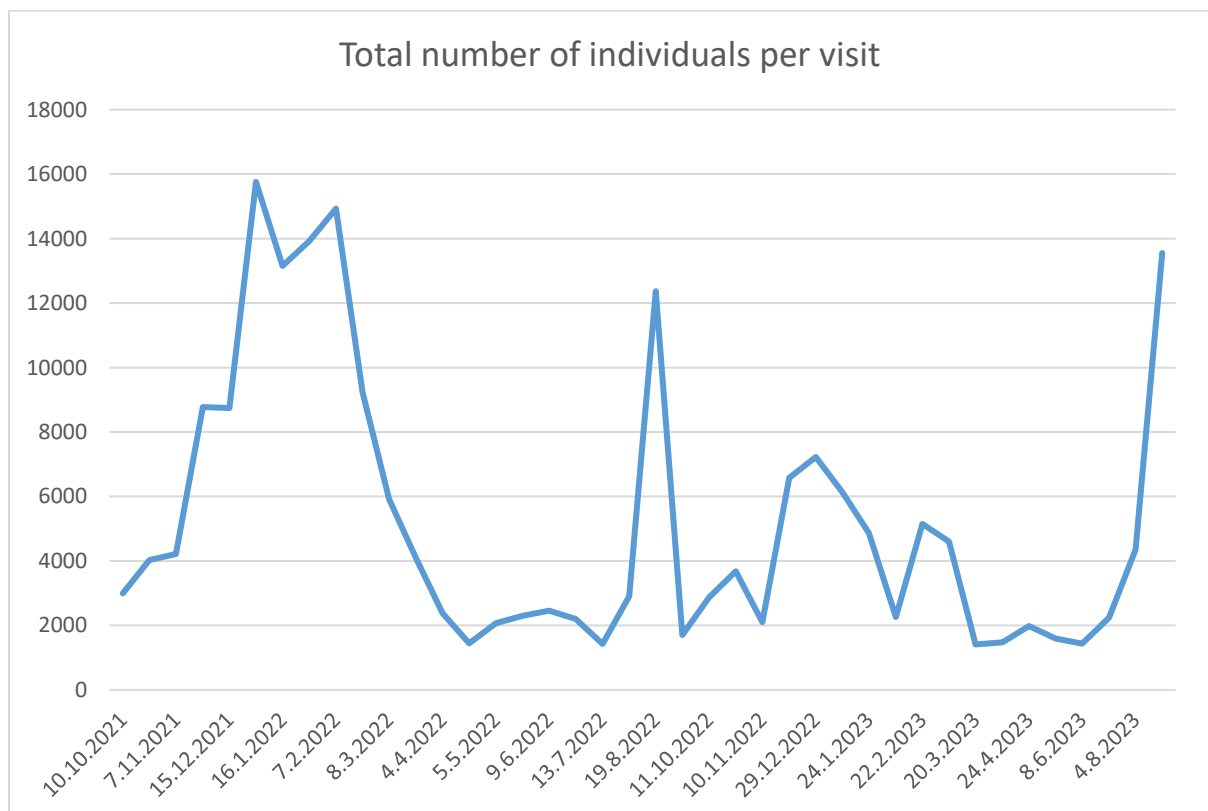
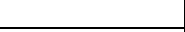


Figure 7: Total number of individuals registered per visit during second stage of the survey

Table 1: Species observed at the site by their maximum number per visit during both stages (N1 and N2) of the survey

No	English name	Latin name	N1	Period of observation	N2	
1	Black-throated loon	<i>Gavia arctica</i>	29		52	
2	Little grebe	<i>Tachybaptus ruficollis</i>	81			
3	Great crested grebe	<i>Podiceps cristatus</i>	49		54	
4	Red-necked grebe	<i>Podiceps grisegena</i>	9		15	
5	Horned grebe	<i>Podiceps auritus</i>	13		16	
6	Black-necked grebe	<i>Podiceps nigricollis</i>	167		112	
7	Yelkouan shearwater	<i>Puffinus yelkouan</i>	905		65	
8	Great cormorant	<i>Phalacrocorax carbo</i>	227		455	
9	European shag	<i>Gulosus aristotelis</i>	-		2	
10	Pygmy cormorant	<i>Microcarbo pygmeus</i>	658		270	
11	Great white pelican	<i>Pelecanus onocrotalus</i>	46		1	
12	Dalmatian pelican	<i>Pelecanus crispus</i>	8		5	
13	Eurasian bittern	<i>Botaurus stellaris</i>	1		-	
14	Black-crowned night heron	<i>Nycticorax nycticorax</i>	-		3	
15	Squacco heron	<i>Ardeola ralloides</i>	3		3	
16	Little egret	<i>Egretta garzetta</i>	22		73	
17	Great egret	<i>Ardea alba</i>	20		23	
18	Grey heron	<i>Ardea cinerea</i>	55		74	
19	Purple heron	<i>Ardea purpurea</i>	1		2	
20	Cattle egret	<i>Bubulcus ibis</i>	-		2	
21	Black stork	<i>Ciconia nigra</i>	67		30	
22	White stork	<i>Ciconia ciconia</i>	7,300		9,872	
23	Glossy ibis	<i>Plegadis falcinellus</i>	30		52	
24	Eurasian spoonbill	<i>Platalea leucorodia</i>	23		18	
25	Mute swan	<i>Cygnus olor</i>	215		141	
26	Greater flamingo	<i>Phoenicopterus roseus</i>	103		753	
27	Tundra swan	<i>Cygnus columbianus</i>	4		53	
28	Whooper swan	<i>Cygnus cygnus</i>	28		14	
29	Greater white-fronted goose	<i>Anser albifrons</i>	60		16	
30	Ruddy shelduck	<i>Tadorna ferruginea</i>	22		25	
31	Common shelduck	<i>Tadorna tadorna</i>	1,454		3,055	
32	Eurasian wigeon	<i>Mareca penelope</i>	2,067		1,420	
33	Gadwall	<i>Mareca strepera</i>	183		140	
34	Eurasian teal	<i>Anas crecca</i>	1,366		2,390	
35	Mallard	<i>Anas platyrhynchos</i>	893		2,595	
36	Northern pintail	<i>Anas acuta</i>	104		166	
37	Garganey	<i>Spatula querquedula</i>	456		105	
38	Northern shoveler	<i>Spatula clypeata</i>	409		380	
39	Red-crested pochard	<i>Netta rufina</i>	11		2	
40	Common pochard	<i>Aythya ferina</i>	258		815	
41	Ferruginous duck	<i>Aythya nyroca</i>	24		1	
42	Tufted duck	<i>Aythya fuligula</i>	287		318	
43	Greater scaup	<i>Aythya marila</i>	2		7	

44	Common eider	<i>Somateria molissima</i>	2			-	
45	Velvet scoter	<i>Melanitta fusca</i>	-			1	
46	Common goldeneye	<i>Bucephala clangula</i>	4			-	
47	Smew	<i>Mergellus albellus</i>	4			4	
48	Red-breasted merganser	<i>Mergus serrator</i>	85			80	
49	European honey buzzard	<i>Pernis apivorus</i>	19			1	
50	Black kite	<i>Milvus migrans</i>	5			-	
51	White-tailed eagle	<i>Haliaeetus albicilla</i>	1			1	
52	Short-toed snake eagle	<i>Circaetus gallicus</i>	1			1	
53	Western marsh harrier	<i>Circus aeruginosus</i>	17			16	
54	Hen harrier	<i>Circus cyaneus</i>	25			3	
55	Northern goshawk	<i>Accipiter gentilis</i>	3			-	
56	Eurasian sparrowhawk	<i>Accipiter nisus</i>	17			2	
57	Common buzzard	<i>Buteo buteo</i>	228			38	
58	Long-legged buzzard	<i>Buteo rufinus</i>	1			1	
59	Rough-legged buzzard	<i>Buteo lagopus</i>	1			-	
60	Lesser spotted eagle	<i>Clanga pomarina</i>	1			5	
61	Booted eagle	<i>Hieraaetus pennatus</i>	4			-	
62	Osprey	<i>Pandion haliaetus</i>	2			2	
63	Common kestrel	<i>Falco tinnunculus</i>	4			4	
64	Red-footed falcon	<i>Falco vespertinus</i>				2	
65	Merlin	<i>Falco columbarius</i>	1			1	
66	Peregrine falcon	<i>Falco peregrinus</i>	1			1	
67	Water rail	<i>Rallus aquaticus</i>	-			1	
68	Common moorhen	<i>Gallinula chloropus</i>	-			1	
69	Eurasian coot	<i>Fulica atra</i>	7,626			8,441	
70	Common crane	<i>Grus grus</i>	10			-	
71	Little bustard	<i>Tetrax tetrax</i>	2			-	
72	Eurasian oystercatcher	<i>Haematopus ostralegus</i>	60			56	
73	Black-winged stilt	<i>Himantopus himantopus</i>	215			210	
74	Pied avoset	<i>Recurvirostra avosetta</i>	243			244	
75	Eurasian stone-curlew	<i>Burhinus oedicnemus</i>	-			1	
76	Collared pratincole	<i>Glareola pratincola</i>	192			379	
77	Little ringed plover	<i>Charadrius dubius</i>	58			37	
78	Common ringed plover	<i>Charadrius hiaticula</i>	69			62	
79	Kentish plover	<i>Charadrius alexandrinus</i>	103			61	
80	European golden plover	<i>Pluvialis apricaria</i>	-			88	
81	Grey plover	<i>Pluvialis squatarola</i>	68			44	
82	Northern lapwing	<i>Vanellus vanellus</i>	180			272	
83	White-tailed lapwing	<i>Vanellus leucurus</i>	-			1	
84	Red knot	<i>Calidris canutus</i>	9			4	

85	Sanderling	<i>Calidris alba</i>	18		8	
86	Little stint	<i>Erolia minuta</i>	528		379	
87	Temminck's stint	<i>Calidris temminckii</i>	7		-	
88	Curlew sandpiper	<i>Calidris ferruginea</i>	33		105	
89	Dunlin	<i>Calidris alpina</i>	2,592		693	
90	Great knot	<i>Calidris tenuirostris</i>	1		-	
91	Broad-billed sandpiper	<i>Calidris falcinellus</i>	6		3	
92	Ruff	<i>Calidris pugnax</i>	512		120	
93	Common snipe	<i>Gallinago gallinago</i>	1		2	
94	Great snipe	<i>Gallinago media</i>	2		1	
95	Snipe sp.	<i>Gallinago sp.</i>	6		1	
96	Black-tailed godwit	<i>Limosa limosa</i>	144		179	
97	Bar-tailed godwit	<i>Limosa lapponica</i>	1		1	
98	Eurasian whimbrel	<i>Numenius phaeopus</i>	6		5	
99	Eurasian curlew	<i>Numenius arquata</i>	2		10	
100	Spotted redshank	<i>Tringa erythropus</i>	71		50	
101	Common redshank	<i>Tringa totanus</i>	109		94	
102	Marsh sandpiper	<i>Tringa stagnatilis</i>	95		77	
103	Common greenshank	<i>Tringa nebularia</i>	62		119	
104	Green sandpiper	<i>Tringa ochropus</i>	6		4	
105	Wood sandpiper	<i>Tringa glareola</i>	78		558	
106	Terek sandpiper	<i>Xenus cinereus</i>	1		1	
107	Common sandpiper	<i>Actitis hypoleucos</i>	34		14	
108	Ruddy turnstone	<i>Arenaria interpres</i>	48		23	
109	Red-necked phalarope	<i>Phalaropus lobatus</i>			5	
110	Parasitic jaeger	<i>Stercorarius parasiticus</i>	1		3	
111	Pallas's gull	<i>Ichthyaetus ichthyaetus</i>	1		1	
112	Mediterranean gull	<i>Ichthyaetus melanocephalus</i>	815		1186	
113	Little gull	<i>Hydrocoloeus minutus</i>	593		123	
114	Black-headed gull	<i>Chroicocephalus ridibundus</i>	1,103		923	
115	Slender-billed gull	<i>Chroicocephalus genei</i>	1		21	
116	Common gull	<i>Larus canus</i>			-	
117	Lesser black-backed gull	<i>Larus fuscus</i>	-		1	
118	Yellow-legged gull	<i>Larus michahellis</i>	223		748	
119	Gull-billed tern	<i>Gelochelidon nilotica</i>	-		18	
120	Caspian tern	<i>Hydroprogne caspia</i>	4		3	
121	Sandwich tern	<i>Thalasseus sandvicensis</i>	1,747		1,389	
122	Common tern	<i>Sterna hirundo</i>	626		604	
123	Little tern	<i>Sternula albifrons</i>	100		126	
124	Whiskered tern	<i>Chlidonias hybrida</i>	1		20	
125	Black tern	<i>Chlidonias niger</i>	-		69	
126	White-winged tern	<i>Chlidonias leucoptera</i>	8		33	
127	Short-eared owl	<i>Asio flammeus</i>	1		1	
128	Common kingfisher	<i>Alcedo atthis</i>	2		4	
129	Sand martin	<i>Riparia riparia</i>	-		1,190	
130	Bluthroat	<i>Luscinia svecica</i>	-		1	

131	Cetti's warbler	<i>Cettia cetti</i>	-	4	
132	Common reed bunting	<i>Emberiza schoeniclus</i>	-	33	

- spring migration: March 1st – May 15th
- autumn migration: August 1st – November 30th
- wintering: December 1st – February 28th
- summer visitor/breeder: 16th May – 31st July
- waterbirds/wetland-dependent

Abundance (sightings per visit) by species

MIGRATION PERIOD

Pomorie Lake directly falls into the global flyway known as *Via Pontica* (Figure 8), which birds use to make seasonal movements to-and-from nesting and wintering grounds. According to *Checklist of Birds at Pomorie Lake* (2023), there are 198 species recorded to use the area of the lake during period of spring migration, and 214 species are recorded during autumn migration. All this defines Pomorie Lake as an important stopover site for migratory birds such as waders, cormorants, pelicans, egrets and herons, terns and gulls (see Table 2).

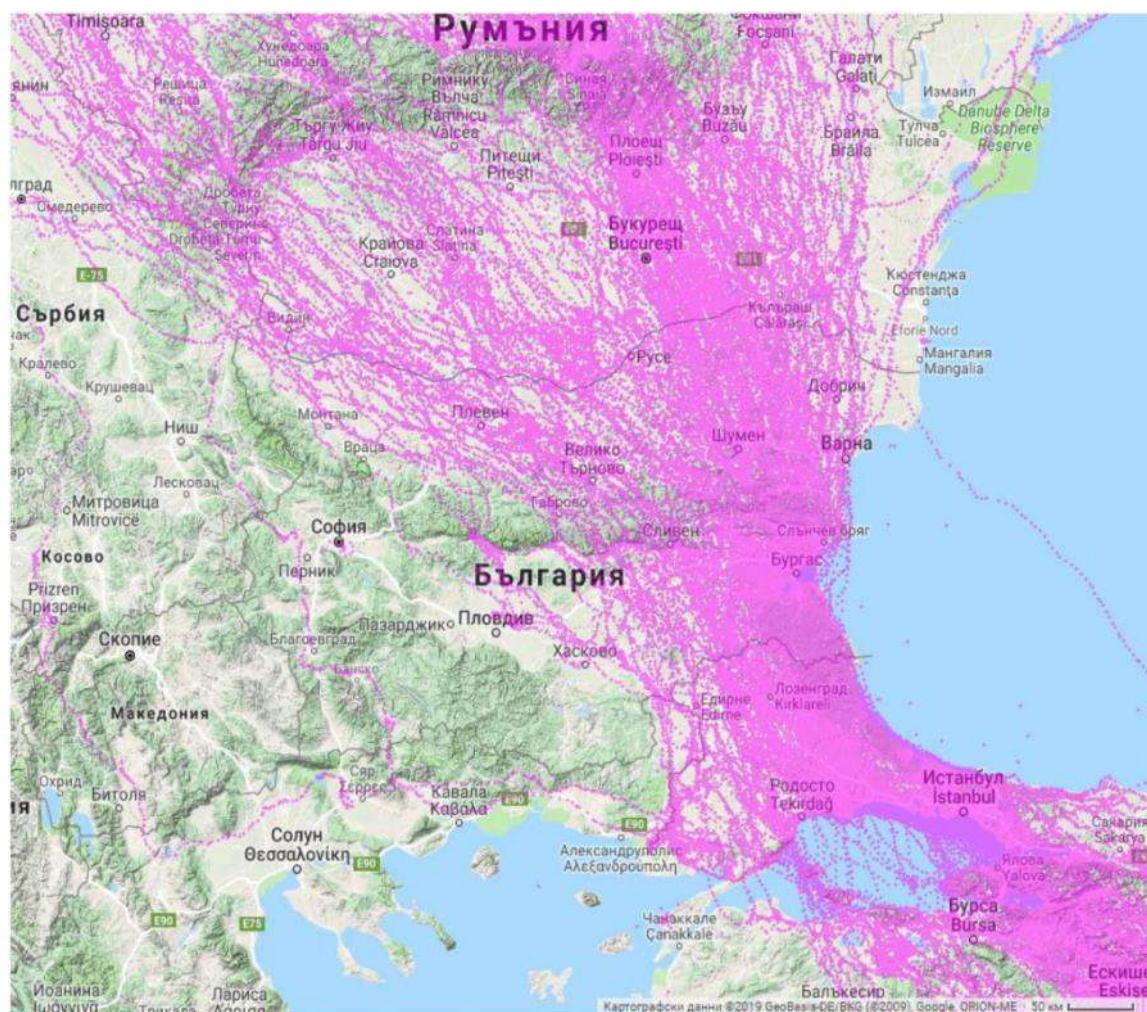


Figure 8: *Via Pontica* Flyaway based on data of satellite telemetry of birds (source: Movebank.org)

As can be seen above (Table 1), the maximum numbers of species recorded on Pomorie Lake during the two stages of the study were mainly during migration periods - spring or autumn. Of all 132 species, 49 peaked during migration in both stages of the survey, and another 57 species peaked during migration in at least one of the stages. The data presented in this way demonstrate the great importance of the lagoon for migratory waterfowl species. Their aggregation in the lake area during this period is critical to their survival during the long journey south.

During the present study information has been collected mainly on migratory species that use the lake area for feeding and resting and no special observations of the migration process in general were conducted. Although, data on migrating soaring flocks (storks, birds of prey) crossing the lake have been collected occasionally. There are 38 site visits carried out during migration period, both spring and autumn. The total number of species registered during this monitoring period is 96. Four new species for the site were observed during this period. One of them is new for Bulgaria and Balkan Peninsula and was observed during autumn migration in 2021 – Great knot (*Calidris tenuirostris*). One bird was first observed by Nikolay Kolev on 2 September and it was later observed during regular monitoring on September 15th 2021 meaning the bird has spent almost 2 weeks at the site. Other species are Little bustard (*Tetrax tetrax*), White-tailed lapwing (*Vanellus leucurus*) and Eurasian stone-curlew (*Burhinus oedicnemus*).

In recent years, many studies have been conducted on the change in the migration periods of many bird species. Many of these studies make a clear statistical link between the earlier start of migratory movements and climate change. During the monitoring conducted within the project at Pomorie Lake a significantly earlier start of the autumn migration was reported in 2021 and 2023. In 2021 it is expressed in the arrival in the lake area of typical autumn migrants at the end of June, such as the Black-tailed godwit (*Limosa limosa*) with 140 individuals registered on 26th June 2021. In 2023 the irregular autumn migration was represented by early arriving Mediterranean and Black-headed gulls – at the beginning of June. Although the main reason for the irregular timing of the migration in 2023 is different - the broken wall of the dam in Nova Kakhovka, Ukraine and the nesting habitats destroyed by the resulting floods, this extreme phenomenon complements the negative influence of other factors, such as climate change.

Among most abundant species, in terms of largest number registered throughout the years during the project, are: White stork (*Ciconia ciconia*) – 9,872, Coot (*Fulica atra*) – 5,000, Mediterranean gull (*Ichthyaeetus melanocephalus*) – 1,186 and Sandwich tern (*Thalasseus sandvicensis*) – 1,275.

INDICATOR SPECIES FOR THE PROJECT AND OTHER IMPORTANT SPECIES

Little stint (*Calidris minuta*)

This species is a full long-distance migrant that migrates overland on a broad front. It is also nomadic in parts of its wintering range (e.g. Bulgaria), moving as habitats flood or are overgrown. This species is gregarious outside of the breeding season and occurs in small groups in its winter range, often aggregating into larger flocks to roost at night. A typical migratory flock can be as large as 20-30 individuals and depends entirely on the ecological conditions of the habitat.

In the *Checklist of birds of Pomorie Lake* this species is listed as 'common spring and autumn migrant' with highest numbers registered as follows – 1,743 individuals on May 1st 2000 and 840 individuals on August 22nd 2009. The largest aggregation during the first stage of the survey – 528 individuals, was observed during migration period, on July 26th 2021, when in the basin where the flock was registered, the water level in the deepest part was 10 centimeters with extensive mudflat around. As can be seen from the diagrams below (Figures 9 and 10), the species has been observed relatively regularly in the

lagoon over the following two years, although not in record numbers. **Observed peak numbers during migration were above set target of 70 ind.** Although a typical migrant, the species has also been proven as a summer visitor, with four registrations during this period - two each in 2022 and 2023.

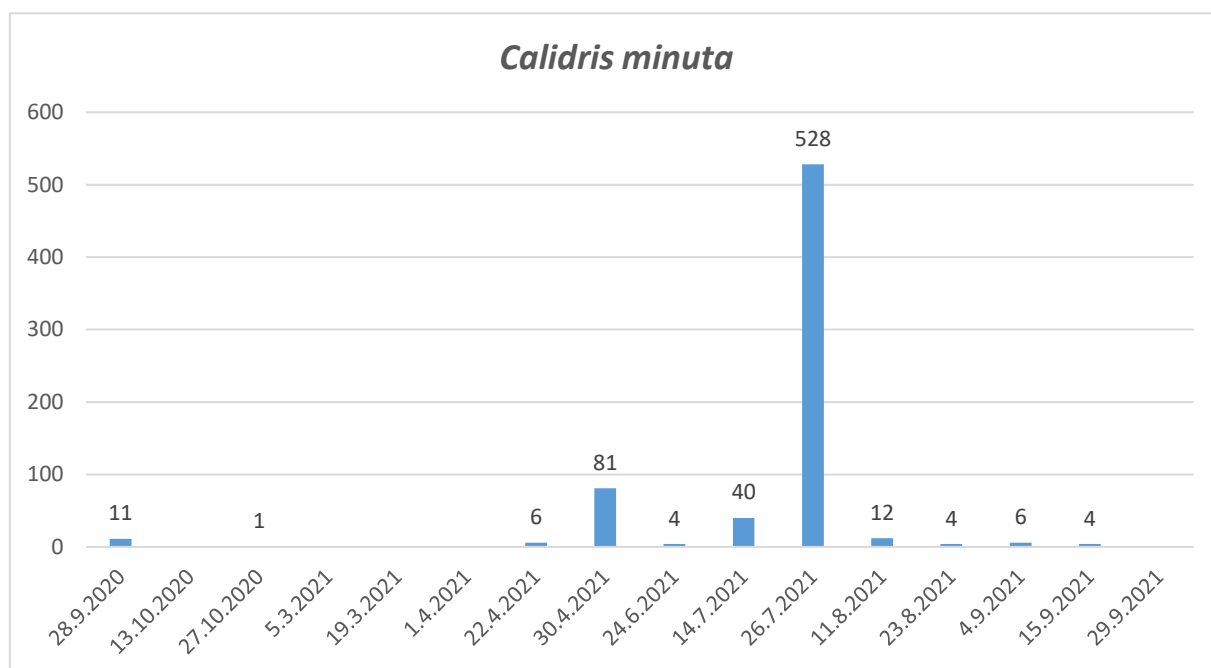


Figure 9: Observations of Little stint individuals per visit during the first stage of the survey

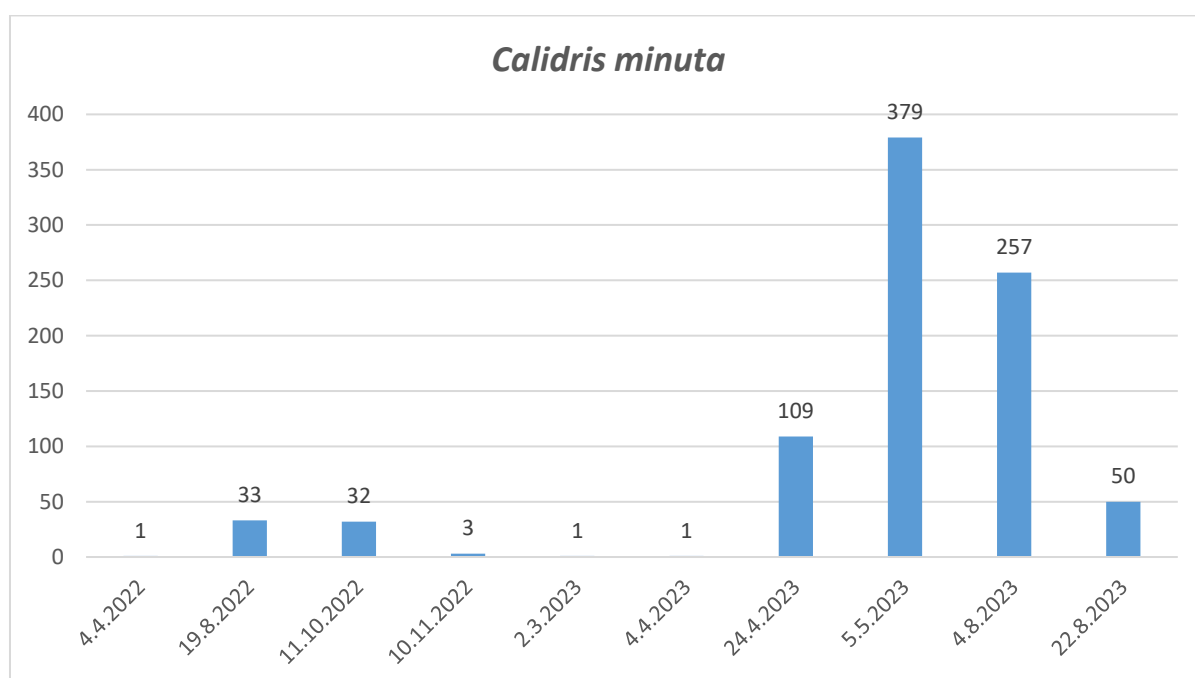


Figure 10: Observations of Little stint individuals per visit during the second stage of the survey (visits without a recorded sighting of the species are not included in the diagram)

Kentish plover (*Charadrius alexandrinus*)

Predominantly coastal species during all seasons, including migration period. It is uncommon on freshwater, even when migrating and occurs on inland habitats not far from the coast such as open

flats near brackish or saline lakes, saltpans and other, such as Pomorie Lake. The species is extremely sensitive to the hydrological regime of the habitats, on which its number in certain locations and periods depends.

In the *Checklist of birds of Pomorie Lake* this species is listed as ‘uncommon spring and autumn migrant’ with highest numbers registered respectively – 42 individuals on April 26th 2008 and 103 individuals on July 15th 2021, with the second being also the highest number of the species recorded during the first stage of the survey (Figure 11).

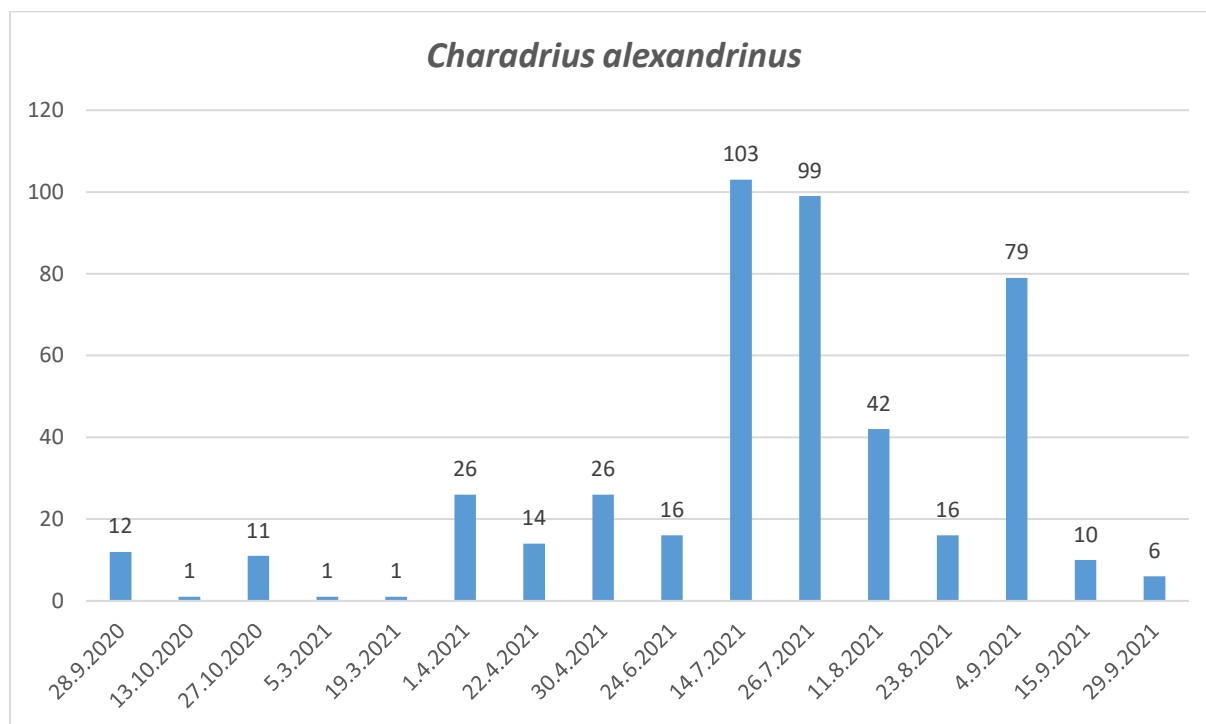


Figure 11: Observations of Kentish plover individuals per visit during the first stage of the survey

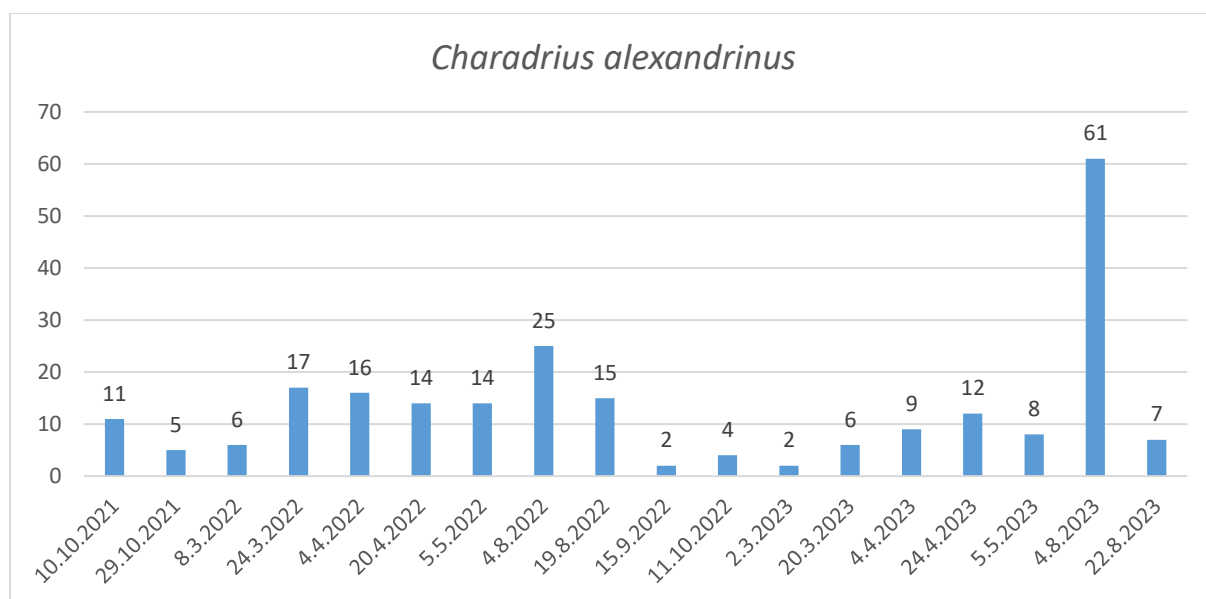


Figure 12: Observations of Kentish plover individuals per visit during the second stage of the survey (visits without a recorded sighting of the species are not included in the diagram)

The second stage's data show that the species is typical of the lake and is regularly observed here during migration (Figure 12). **Observed peak numbers during migration cover the set target of 25 ind.** Despite the dried up basins in the area of the saltpans, the species maintains relatively stable numbers in the site during this period using other basins of the lagoon. Its habitats in the Pomorie Lagoon area represent an important part of the sites supporting the migration of the species along the Western Black Sea coast.

Dunlin (*Calidris alpina*)

This species is a fully migratory circumpolar breeder with several sub-populations that employ a number of migration strategies, from short coastal flights to long, non-stop flights overland on a broad front. The sub-population that breeds in the Arctic and subarctic regions of Northern Europe and Asia migrates long distances to arrive in its Southeast Asia, Middle East and African wintering grounds from late-July, returning again between March and early-April. In the non-breeding season this species is also frequent at wide variety of freshwater and brackish wetlands, including lagoons, muddy shores, flooded fields, saltworks, sandy coasts. The species is omnivorous during the non-breeding season, consuming mostly polychaete worms and small gastropods, as well as insects (dipteran flies and beetles), crustaceans, bivalves, plant matter and occasionally small fish, access to which it finds in shallow areas and spills.

In the *Checklist of birds of Pomorie Lake* this species is listed as 'common spring and autumn migrant' with highest numbers of 555 and 667 individuals respectively in March 24th 2022 and November 9th 2020, during the present survey. The highest number registered for this species during migration period of the first stage of the survey is 483 individuals on March 19th 2021 (Figure 13).

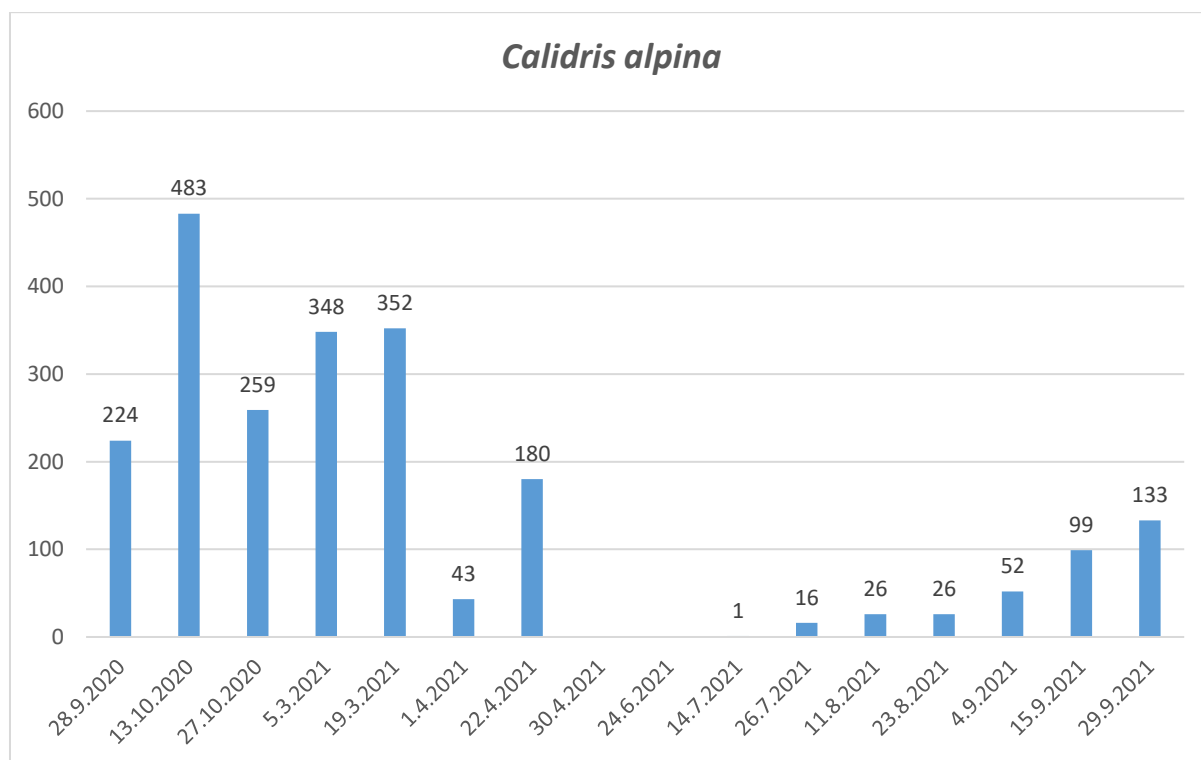


Figure 13: Observations of Dunlin individuals per visit during the first stage of the survey

The highest number registered for this species during migration period in the final two years of the project is 555 individuals on March 24th 2022 (Figure 14).

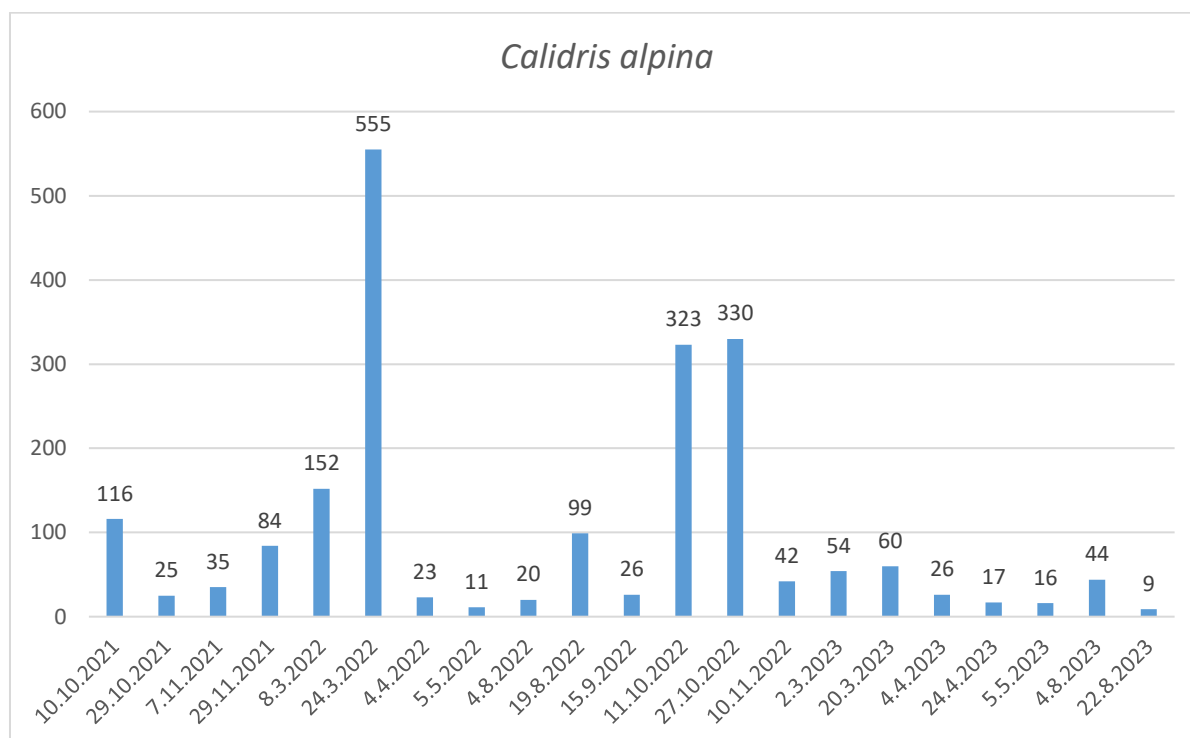


Figure 14: Observations of Dunlin individuals per visit during the second stage of the survey (visits without a recorded sighting of the species are not included in the diagram)

Although being a typical migrant, the species was also recorded during this period as a summer visitor with two registrations – May 20th 2022 and July 20th 2023, with one individual each. The species is common in the lagoon during migration, often forming aggregations of high numbers. **Observed peak numbers during migration are above the set target of 300 ind.** The area of Pomorie Lake represents an important part of the habitats of the species during its migration.

Ruff (*Calidris pugnax*)

Another very characteristic species for coastal lagoons and salt marshes during migration is Ruff. Suitable foraging habitats include littoral belts, deltas, coastal saltmarshes, and other. During the non-breeding season, the species occupies the muddy margins of brackish, saline and alkaline lakes, ponds, usually roosting at night in the shallow waters of lake shores. Outside of the breeding season its diet is varied, including small crustaceans, spiders, small molluscs, annelid worms, frogs and small fish, which the species finds in the shallow areas of its habitats. This species is fully migratory and the bulk of the population winters in sub-Saharan Africa, and the coastal lagoons like Pomorie Lake represent an important stopover for resting and feeding which is a key factor for successful migration.

The highest number of this species according to *Checklist of birds of Pomorie Lake* is registered during spring migration – 1,240 individuals on April 19th 2000. During migration period in the first stage of the survey the highest number registered is 512 individuals, observed also during spring migration on April 30th, which is also the highest recorded abundance of the species for the entire study period (Figure 15).

The species is often found on Pomorie Lake during the migration period as proven also in the second stage of the survey (Figure 16). Although with dry basins in the salt pans area, its habitats in the lagoon are an important part of the sites supporting the migration of the species. **Observed peak numbers are above the set target value of 100 ind. during migration.** During the present study it was also recorded as a summer visitor with three sightings during the summer period – July 13th 2022, June 8th 2023 and July 20th 2023 with 15, 2 and 19 individuals respectively.

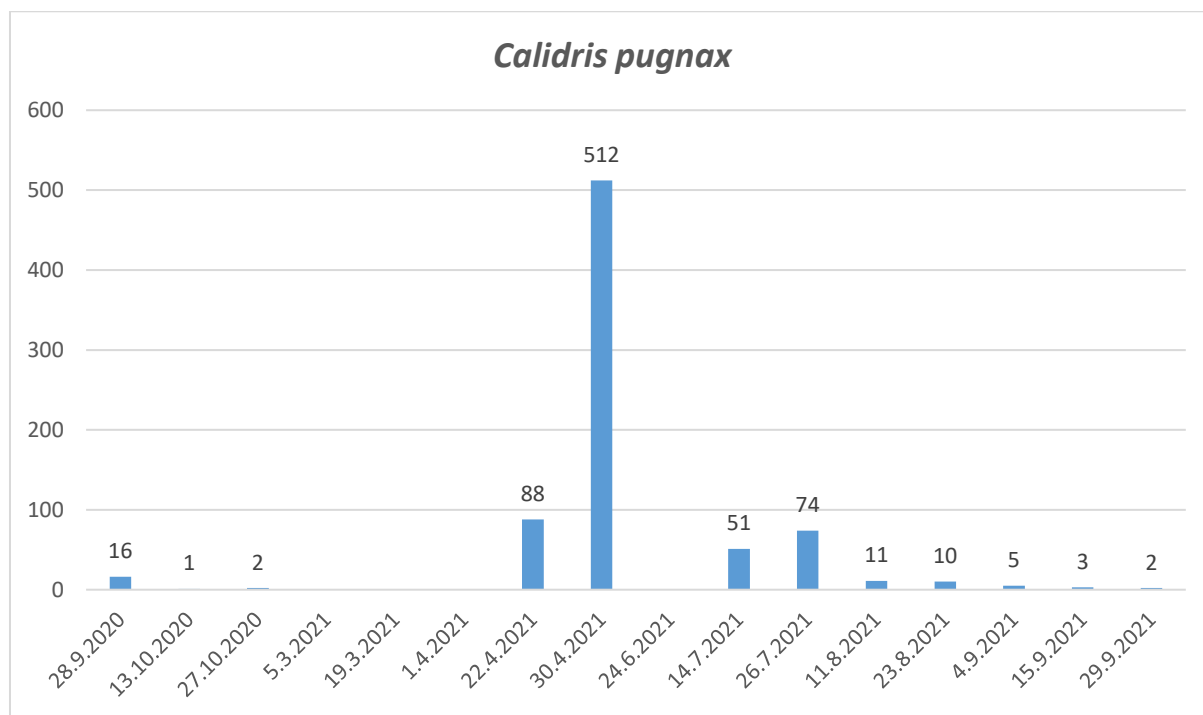


Figure 15: Observations of Ruff individuals per visit during the first stage of the survey

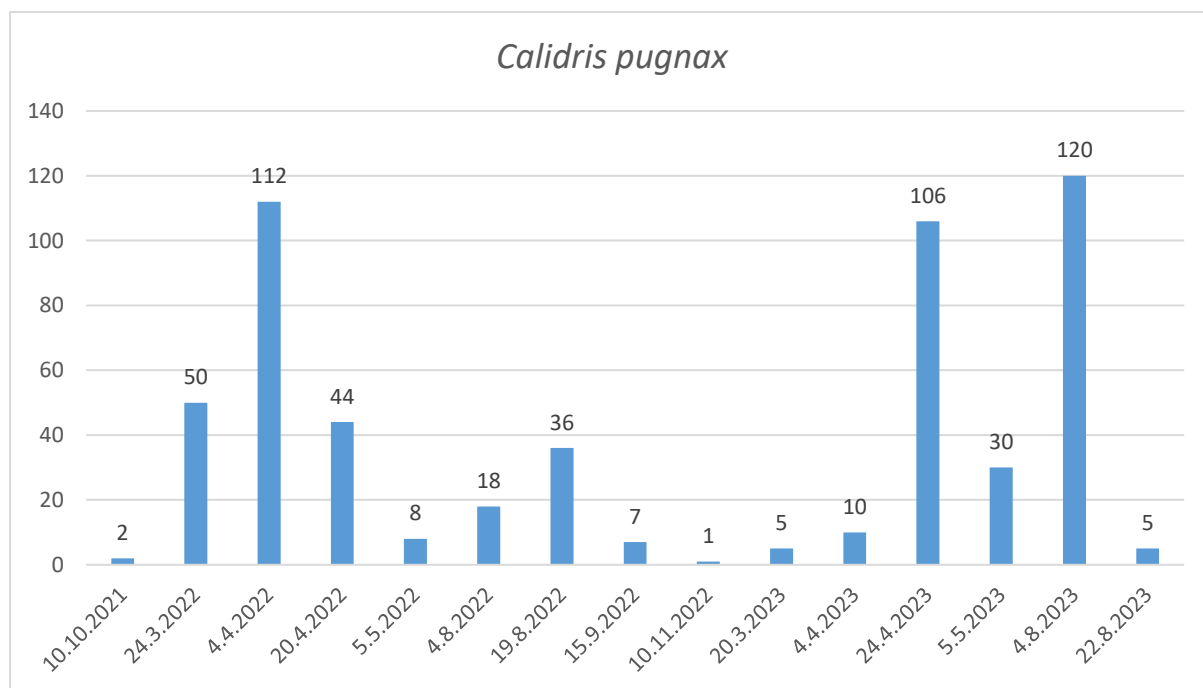


Figure 16: Observations of Ruff individuals per visit during the second stage of the survey (visits without a recorded sighting of the species are not included in the diagram)

Little ringed plover (*Charadrius dubius*)

This species is fully migratory in much of its range. This species is mainly solitary throughout the non-breeding season and on migration, occasionally occurring in flocks of not more than 10 individuals. In the *Checklist of birds of Pomorie Lake* this species is listed as ‘rare spring and autumn migrant’ with highest numbers of 72 individuals on August 19st 2008 during autumn migration. The highest number recorded in migration period during the project is in autumn migration of 2021 – 58 individuals on July 26th 2021 (Figure 17).

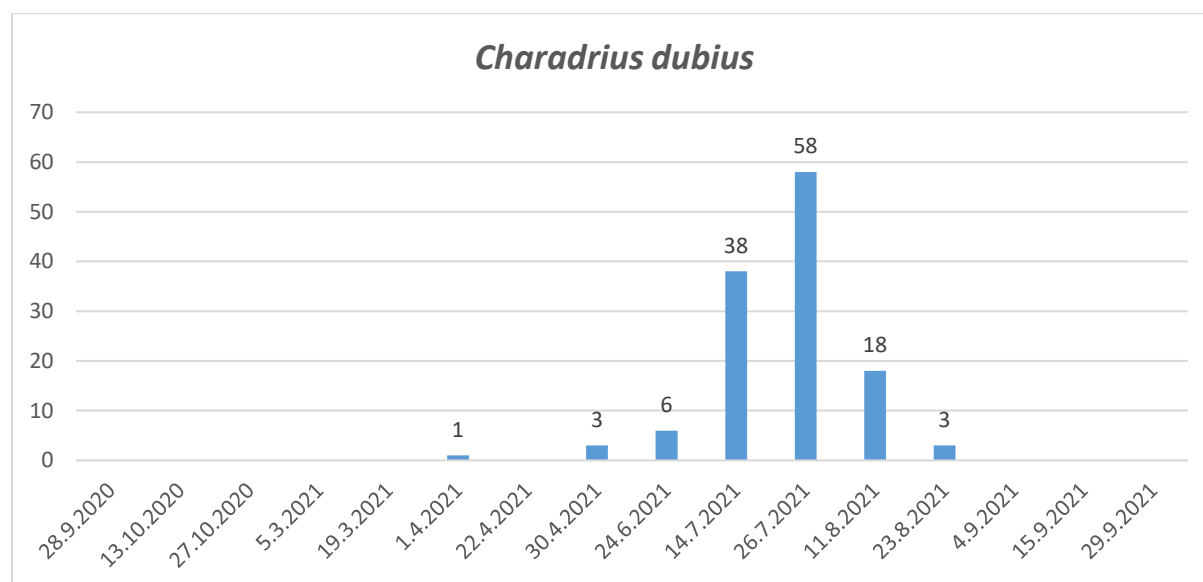


Figure 17: Observations of Little ringed plover individuals per visit during the first stage of the survey

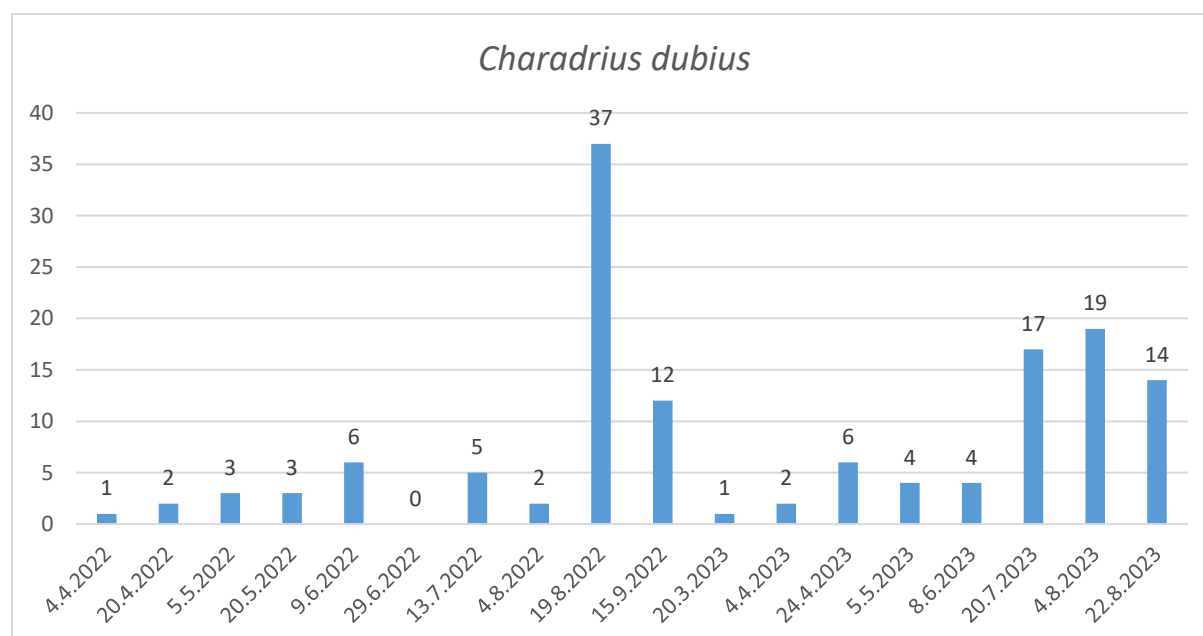


Figure 18: Observations of Little ringed plover individuals per visit during the second stage of the survey (visits without a recorded sighting of the species are not included in the diagram)

The species is most abundant at Pomorie Lagoon during the autumn and spring migration period (Figure 18). In the present study it was also recorded as a summer visitor/breeder with eight registrations, included in the diagrams above. The data show that, although with dry basins in the

saltpans, its habitats in the lagoon area are an important part of the places supporting the migration of the species. **The target value for that species was 25 ind. and it has been exceeded with exception of autumn 2023.**

Redshank (*Tringa totanus*)

Most populations of this species are fully migratory and travel on a broad front over land and along coasts. In the *Checklist of birds of Pomorie Lake* this species is listed as 'common spring and autumn migrant' with highest numbers of 1,200 individuals on October 10th 1989. The highest number recorded in migration period of the first stage of the survey is during autumn migration – 109 individuals on September 4th 2021 (Figure 19).

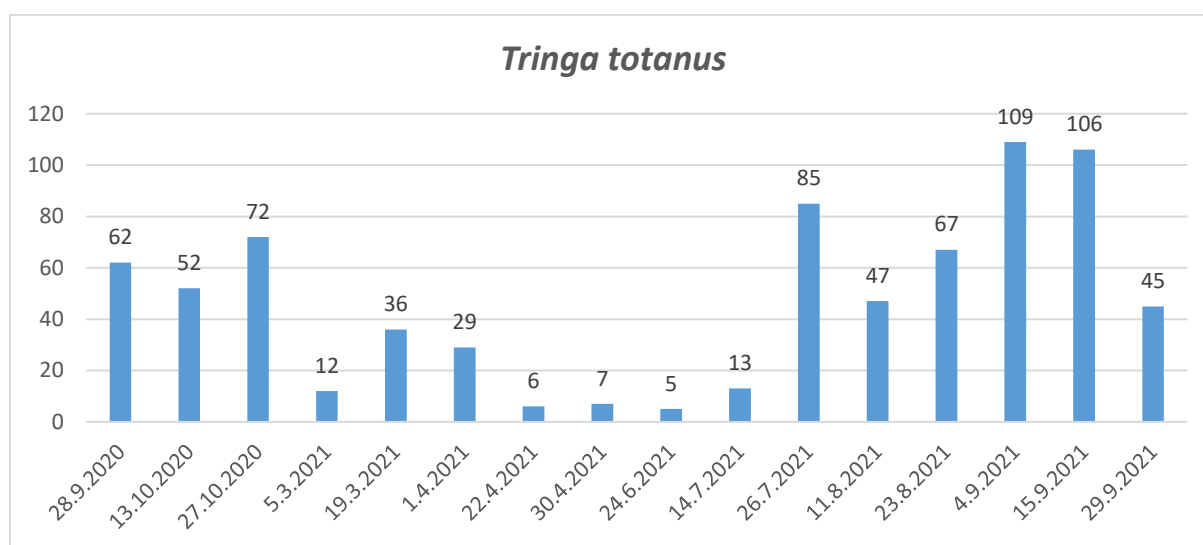


Figure 19: Observations of Redshank individuals per visit during the first stage of the survey

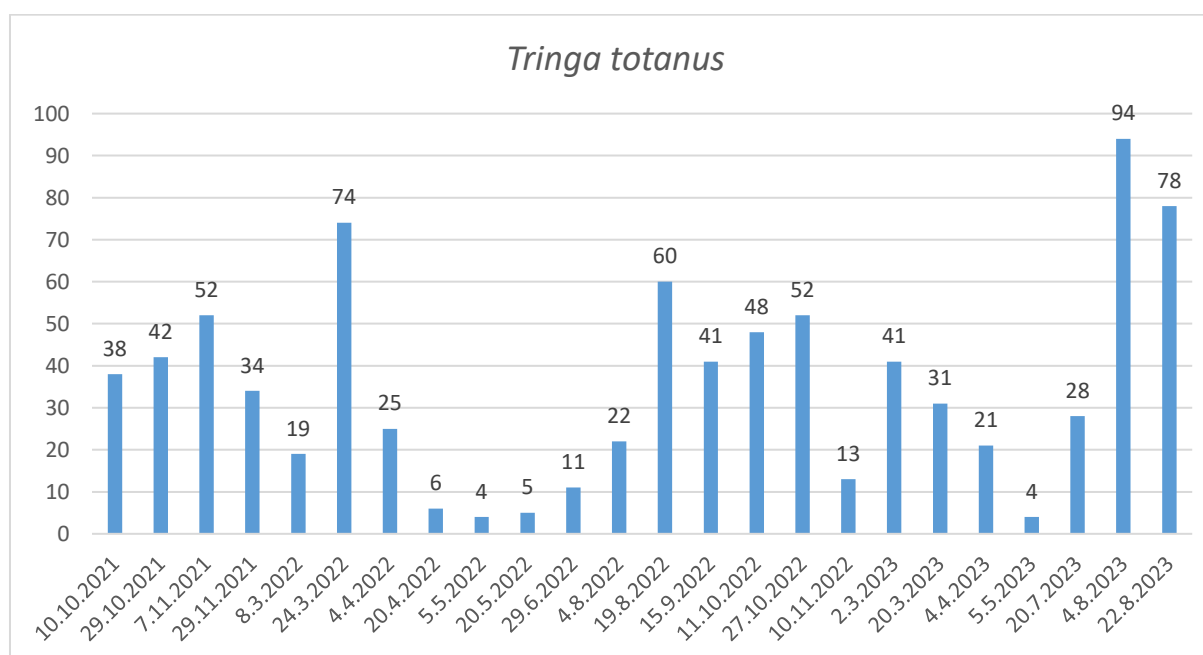


Figure 20: Observations of Redshank individuals per visit during the second stage of the survey (visits without a recorded sighting of the species are not included in the diagram)

The diagrams (Figures 19 and 20) show that the species is common in the lake during the migration period. Especially during the second stage of the study, it was observed during almost every monitoring visit. Of the four visits where no individual of the species was recorded, three were during the summer period, although it is also an occasional summer visitor. One visit without a recorded individual of the species also occurred during spring migration. This is possibly due to the shorter stay of the birds in the lake during this period, suggesting a lower chance of being detected. **The set target of 60 ind. during migration has been exceeded with the exception of spring 2023.**

Black-tailed godwit (*Limosa limosa*)

In its non-breeding range the species inhabits brackish habitats - mud flats and salt-water lagoons. In the *Checklist of birds of Pomorie Lake* this species is listed as 'common spring and autumn migrant' with highest numbers of 700 individuals on April 19th 2006. The highest number recorded in 2021 migration period is during autumn migration – 144 individuals on August 11th (Figure 21).

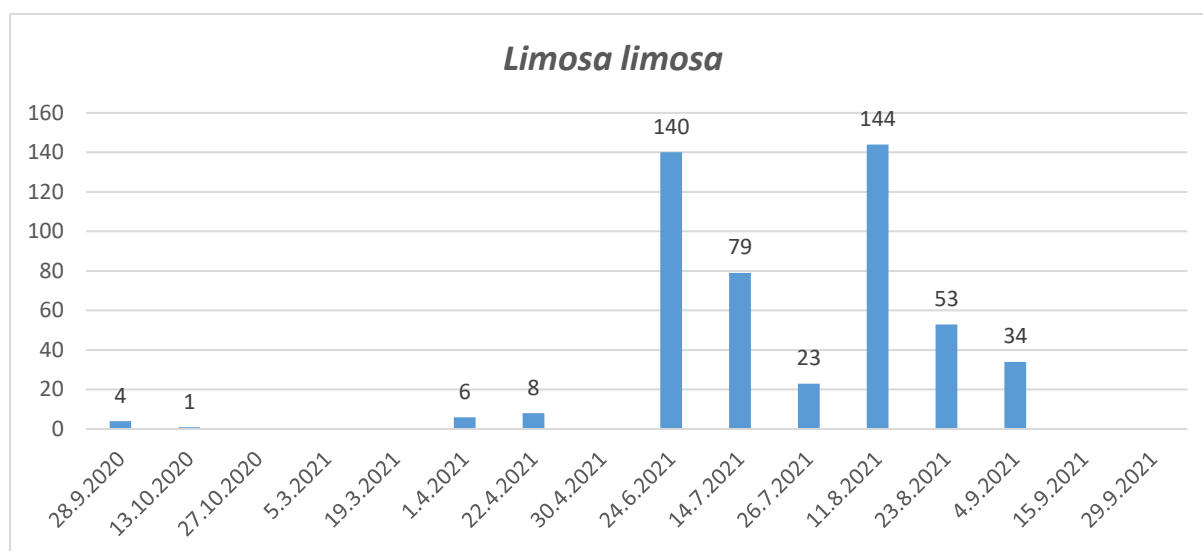


Figure 21: Observations of Black-tailed godwit individuals per visit during the first stage of the survey

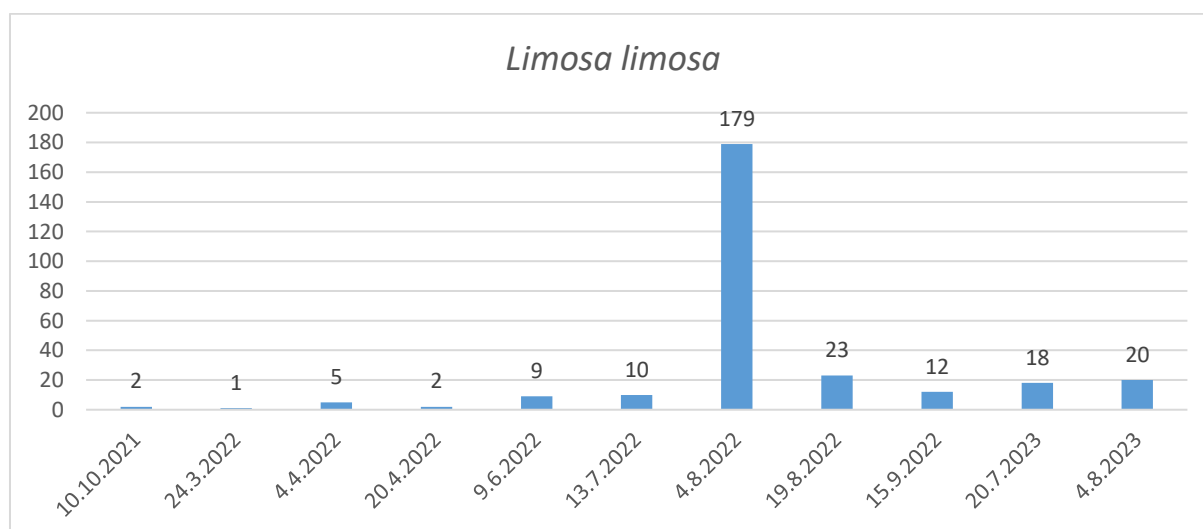


Figure 22: Observations of Black-tailed godwit individuals per visit during the second stage of the survey (visits without a recorded sighting of the species are not included in the diagram)

As the diagrams show (Figures 21 and 22), the species is a regular visitor to the lake during migration but in low numbers with peaks being in short periods being evidence for short staging and resting. During the present study, the highest number was recorded during the autumn migration - 179 individuals. The species was also established as a summer and winter visitor, and during the summer period its number is also relatively high - 140 individuals is the maximum recorded. **The set target of 70 ind. has been exceeded in 2021 and 2022, but not achieved in 2023 indicating deterioration of the site for the species as a consequence of the non-operating saltpans.**

Individuals recorded in the summer are probably young/non-breeding individuals. It should be noted, however, that in the last two years a certain disturbance in the timing of the migration process of some waterfowl species has been noticed, resulting in a noticeably earlier start of the autumn migration. It is very possible that the reason for this is the epidemic of bird flu, which was detected among these species in Europe during the same period. Another reason for the early departure of breeding grounds, especially for species nesting in the Ukrainian coastal region, may be the destruction of their habitats by Russia's military actions there. An example in this regard is the case of destruction of the Nova Kakhovka dam, which led to the destruction of all bird's nesting habitats along the coast there.

Pied avocet (*Recurvirostra avoseta*)

Northern populations migrate south between August and October and return to the breeding grounds between March and May, staging on route in large numbers at certain sites. Outside of the breeding season the species inhabits coastal and inland saline lakes and mudflats, lagoons, saltpans and rarely occurs on inland freshwater lakes and rivers. The species is threatened in Europe by human disturbance and deteriorated hydrological condition of the habitats.

In the *Checklist of birds of Pomorie Lake* this species is listed as 'common spring and autumn migrant' with highest numbers of 1,500 individuals on August 12th 1966. The highest number recorded this season for the species during the first stage of the survey is 243 individuals on June 24th (Figure 23). Although a summer population by definition, these include also nearby hatchlings that move around the area's wetlands to feed.

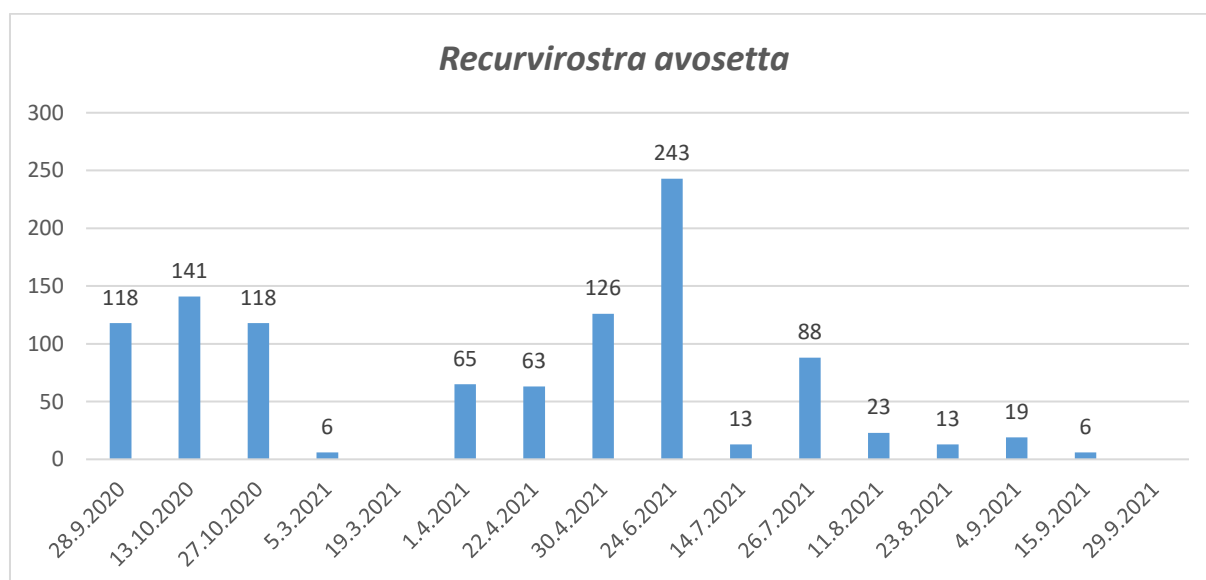


Figure 23: Observations of Pied avocet individuals per visit during the first stage of the survey

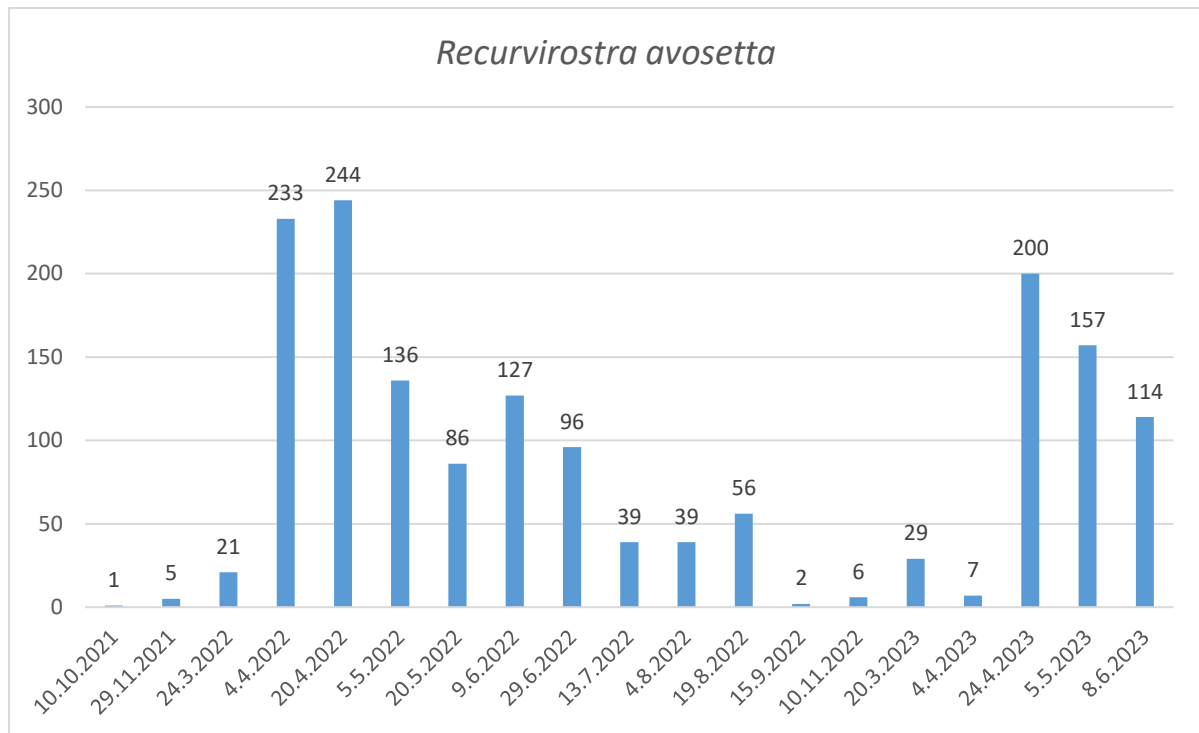
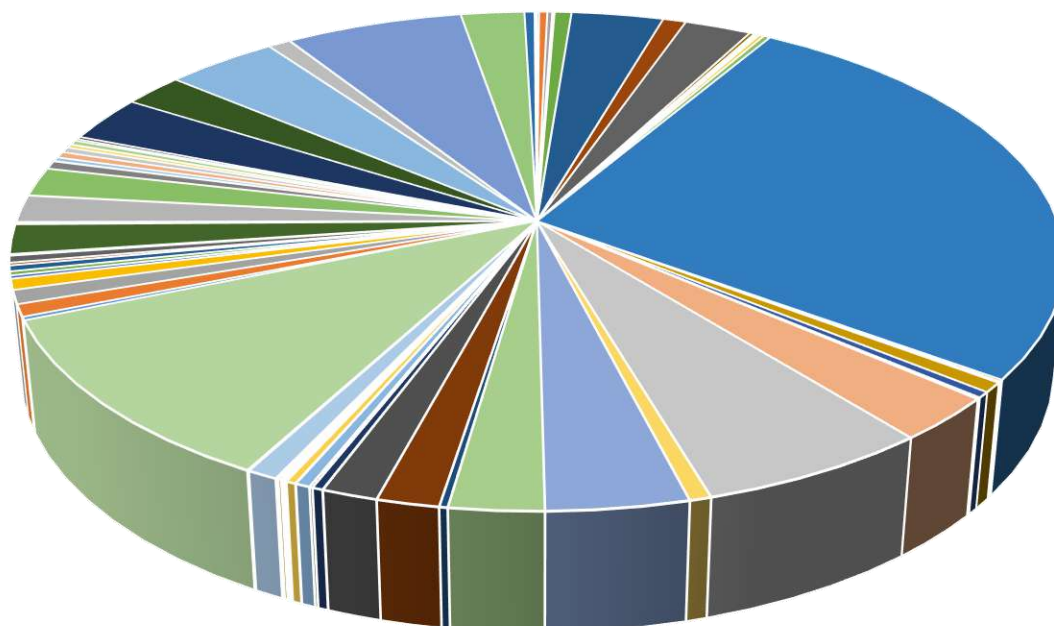


Figure 24: Observations of Pied avocet individuals per visit during the second stage of the survey (visits without a recorded sighting of the species are not included in the diagram)

Data from the second survey period confirm the importance of the lagoon for the species, especially during migration (Figure 24). A higher number of the species was observed during spring migration - 244, compared to autumn - 56. It is also important to underline the fact that no Avocets were observed in autumn migration in 2023 with all birds departing from the site in beginning of July.

Overview of the bird species and their highest numbers observed during the migration period of the survey are shown in figures 25 and 26. In the diagram (Figure 26) showing the maximum numbers of species during migration during the second stage of the study, some species are not included. Species recorded with only one individual are often vagrants or rare visitors to the lake, and although very curious and interesting, and mostly rare, they do not form part of the permanent avifauna of the lake. Large soaring birds fly over the lake area in large flocks during migration, but do not actively use its habitats. The yellow-legged gull has no conservation significance. All of these species are excluded from this chart for convenience and data visualization, but are present in the overall lagoon data.

Migrating bird species by largest number



■ <i>Gavia arctica</i>	■ <i>Tachybaptus ruficollis</i>	■ <i>Podiceps cristatus</i>
■ <i>Podiceps grisegena</i>	■ <i>Podiceps auritus</i>	■ <i>Podiceps nigricollis</i>
■ <i>Puffinus yelkouan</i>	■ <i>Phalacrocorax carbo</i>	■ <i>Microcarbo pygmeus</i>
■ <i>Pelecanus onocrotalus</i>	■ <i>Pelecanus crispus</i>	■ <i>Botaurus stellaris</i>
■ <i>Ardeola ralloides</i>	■ <i>Egretta garzetta</i>	■ <i>Ardea alba</i>
■ <i>Ardea cinerea</i>	■ <i>Ardea purpurea</i>	■ <i>Ciconia nigra</i>
■ <i>Ciconia ciconia</i>	■ <i>Plegadis falcinellus</i>	■ <i>Platalea leucorodia</i>
■ <i>Cygnus olor</i>	■ <i>Phoenicopertus roseus</i>	■ <i>Cygnus cygnus</i>
■ <i>Tadorna ferruginea</i>	■ <i>Tadorna tadorna</i>	■ <i>Mareca penelope</i>
■ <i>Mareca strepera</i>	■ <i>Anas crecca</i>	■ <i>Anas platyrhynchos</i>
■ <i>Anas acuta</i>	■ <i>Spatula querquedula</i>	■ <i>Spatula clypeata</i>
■ <i>Netta rufina</i>	■ <i>Aythya ferina</i>	■ <i>Aythya nyroca</i>
■ <i>Aythya fuligula</i>	■ <i>Aythya marila</i>	■ <i>Somateria molissima</i>
■ <i>Mergus serrator</i>	■ <i>Pernis apivorus</i>	■ <i>Milvus migrans</i>
■ <i>Haliaeetus albicilla</i>	■ <i>Circus gallicus</i>	■ <i>Circus aeruginosus</i>
■ <i>Circus cyaneus</i>	■ <i>Accipiter gentilis</i>	■ <i>Accipiter nisus</i>
■ <i>Buteo buteo</i>	■ <i>Hieraaetus pennatus</i>	■ <i>Pandion haliaetus</i>
■ <i>Falco tinnunculus</i>	■ <i>Falco columbarius</i>	■ <i>Fulica atra</i>
■ <i>Haematopus ostralegus</i>	■ <i>Himantopus himantopus</i>	■ <i>Recurvirostra avosetta</i>
■ <i>Glareola pratincola</i>	■ <i>Charadrius dubius</i>	■ <i>Charadrius hiaticula</i>
■ <i>Charadrius alexandrinus</i>	■ <i>Pluvialis squatarola</i>	■ <i>Vanellus vanellus</i>
■ <i>Calidris canutus</i>	■ <i>Calidris alba</i>	■ <i>Calidris minuta</i>
■ <i>Calidris temminckii</i>	■ <i>Calidris ferruginea</i>	■ <i>Calidris alpina</i>
■ <i>Calidris tenuirostris</i>	■ <i>Calidris falcinellus</i>	■ <i>Calidris pugnax</i>
■ <i>Gallinago gallinago</i>	■ <i>Gallinago media</i>	■ <i>Limosa limosa</i>
■ <i>Limosa lapponica</i>	■ <i>Numenius phaeopus</i>	■ <i>Numenius arquata</i>
■ <i>Tringa erythropus</i>	■ <i>Tringa totanus</i>	■ <i>Tringa stagnatilis</i>
■ <i>Tringa nebularia</i>	■ <i>Tringa ochropus</i>	■ <i>Tringa glareola</i>
■ <i>Xenus cinereus</i>	■ <i>Actitis hypoleucos</i>	■ <i>Arenaria interpres</i>
■ <i>Stercorarius parasiticus</i>	■ <i>Ichthyaeetus melanocephalus</i>	■ <i>Hydrocoloeus minutus</i>
■ <i>Chroicocephalus ridibundus</i>	■ <i>Chroicocephalus genei</i>	■ <i>Larus michahellis</i>
■ <i>Hydroprogne caspia</i>	■ <i>Thalasseus sandvicensis</i>	■ <i>Sterna hirundo</i>
■ <i>Sternula albifrons</i>	■ <i>Chlidonias hybridus</i>	■ <i>Chlidonias leucopterus</i>
■ <i>Asio flammeus</i>	■ <i>Alcedo atthis</i>	■ <i>Riparia riparia</i>

Figure 25: Bird species observed during migration by their largest number during the first stage of the survey

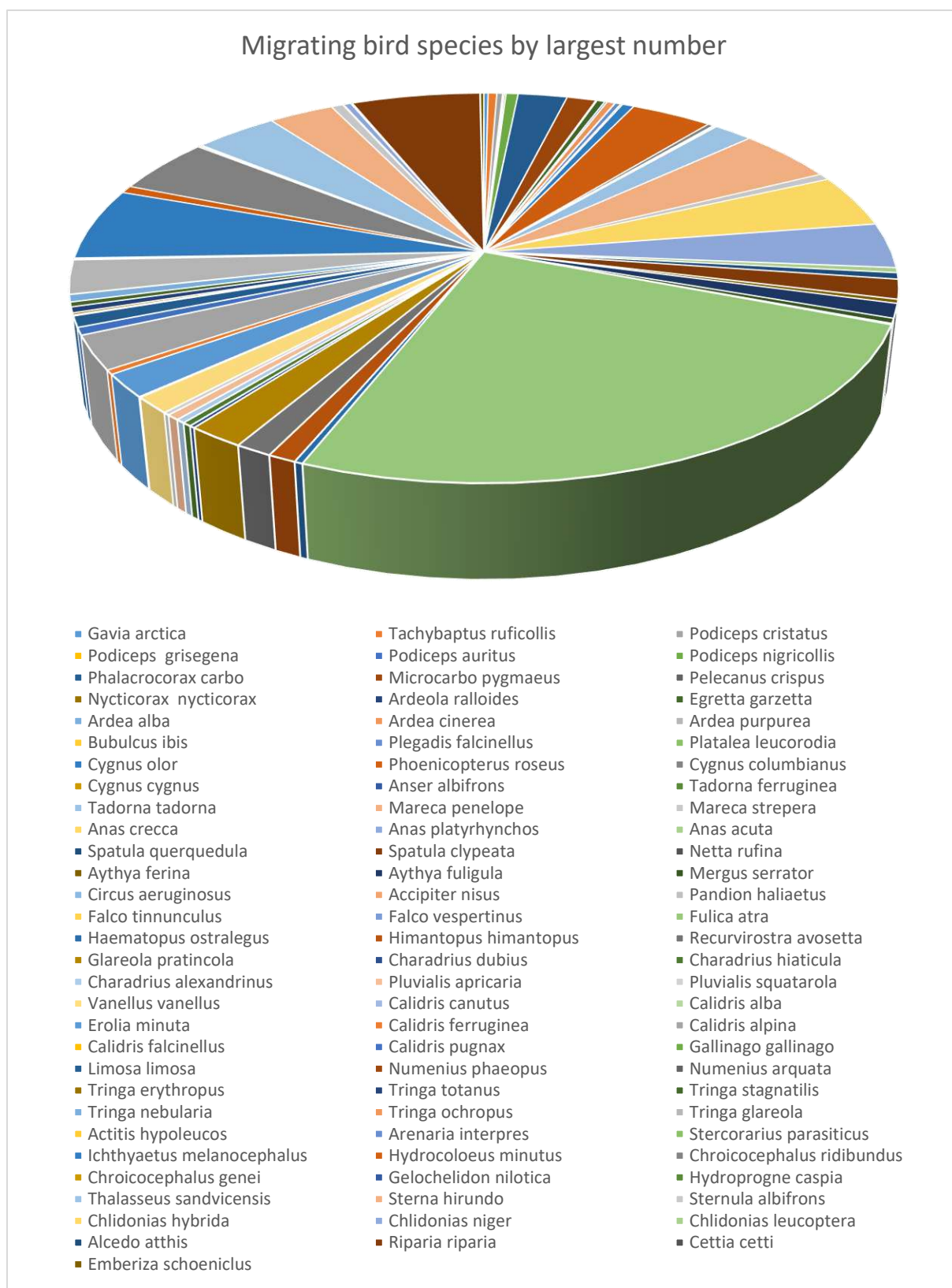


Figure 26: Bird species observed during migration by their largest number during the second stage of the survey

Table 2: Species registered during migration period in the first stage of the survey (number per visit)

Видове	28.9. 2020	13.10. 2020	27.10. 2020	5.3.2 021	19.3. 2021	1.4.2 021	22.4. 2021	30.4. 2021	24.6. 2021	14.7. 2021	26.7. 2021	11.8. 2021	23.8. 2021	4.9.2 021	15.9. 2021	29.9. 2021
<i>Gavia arctica</i>	3	0	17	0	15	16	16	22	1	1	0	0	0	0	0	0
<i>Tachybaptus ruficollis</i>	16	20	27	41	44	32	0	1	0	0	0	4	6	1	49	81
<i>Podiceps cristatus</i>	32	49	39	17	12	32	21	15	1	18	5	4	8	2	13	12
<i>Podiceps grisegena</i>	9	0	7	0	0	1	0	0	0	0	3	0	2	0	2	0
<i>Podiceps auritus</i>	0	0	0	2	1	13	0	0	0	0	0	0	0	0	0	0
<i>Podiceps nigricollis</i>	5	11	21	52	167	80	17	7	0	0	0	0	0	0	1	0
<i>Puffinus yelkouan</i>	0	0	0	0	0	3	905	281	0	0	0	0	0	0	0	0
<i>Phalacrocorax carbo</i>	114	227	41	43	25	63	44	76	117	153	103	86	80	42	88	5
<i>Microcarbo pygmeus</i>	49	99	107	186	243	658	97	43	6	22	42	51	68	65	46	45
<i>Pelecanus onocrotalus</i>	46	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0
<i>Pelecanus crispus</i>	4	3	1	0	0	0	2	4	0	3	2	0	0	0	0	8
<i>Botaurus stellaris</i>	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
<i>Ardeola ralloides</i>	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0

<i>Egretta garzetta</i>	16	0	0	0	0	1	12	22	14	16	8	9	12	15	6	1
<i>Ardea alba</i>	4	5	3	8	20	19	0	5	4	2	1	0	0	2	0	5
<i>Ardea cinerea</i>	28	46	41	35	32	29	4	7	20	29	12	16	32	25	22	23
<i>Ardea purpurea</i>	0	0	0	0	0	0	1	1	1	0	1	0	0	0	0	0
<i>Ciconia nigra</i>	0	0	0	0	0	0	27	0	2	4	4	1	1	2	0	67
<i>Ciconia ciconia</i>	0	0	0	0	0	0	2808	0	2	0	0	7300	0	0	0	0
<i>Plegadis falcinellus</i>	0	0	0	0	0	0	6	28	0	30	10	6	2	0	0	0
<i>Platalea leucorodia</i>	23	0	2	6	2	0	2	4	1	1	0	3	0	0	0	0
<i>Cygnus olor</i>	33	98	174	77	64	61	50	35	9	9	12	12	22	18	11	16
<i>Phoenicopterus roseus</i>	88	0	103	12	11	0	0	0	0	0	0	0	0	7	4	28
<i>Cygnus cygnus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Tadorna ferruginea</i>	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0
<i>Tadorna tadorna</i>	219	145	18	784	871	739	346	272	77	70	14	20	29	4	0	0
<i>Mareca penelope</i>	10	270	1713	376	144	100	22	2	0	0	0	0	0	0	0	14
<i>Mareca strepera</i>	0	0	4	159	74	95	88	46	40	6	76	0	3	0	6	0
<i>Anas crecca</i>	842	1038	670	183	95	54	18	9	0	0	0	0	557	736	214	360
<i>Anas platyrhynchos</i>	332	689	526	197	95	52	13	41	134	155	204	447	221	228	326	175

<i>Anas acuta</i>	29	29	35	54	62	35	0	0	0	0	0	0	0	0	0	8
<i>Spatula querquedula</i>	0	0	0	0	60	22	30	21	13	9	0	456	0	0	2	0
<i>Spatula clypeata</i>	2	65	40	409	319	254	29	2	0	0	0	0	0	0	0	40
<i>Netta rufina</i>	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
<i>Aythya ferina</i>	0	0	0	46	79	34	0	0	7	1	0	1	4	0	8	0
<i>Aythya nyroca</i>	0	0	0	0	1	0	24	12	0	0	0	0	0	0	0	0
<i>Aythya fuligula</i>	0	0	0	109	54	0	0	0	0	0	0	1	0	0	0	0
<i>Aythya marila</i>	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Somateria molissima</i>	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
<i>Mergus serrator</i>	0	0	1	49	53	73	0	0	0	0	0	0	0	0	0	0
<i>Pernis apivorus</i>	0	0	0	0	0	0	0	19	0	0	0	0	0	0	0	16
<i>Milvus migrans</i>	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0
<i>Haliaeetus albicilla</i>	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
<i>Circaetus gallicus</i>	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
<i>Circus aeruginosus</i>	4	5	7	6	7	13	5	2	3	3	2	4	3	16	9	6
<i>Circus cyaneus</i>	0	0	0	0	0	0	1	0	0	0	0	0	0	25	0	0
<i>Accipiter gentilis</i>	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Accipiter nisus</i>	3	17	1	1	1	1	2	0	0	1	0	0	0	0	1	4

<i>Buteo buteo</i>	0	0	52	32	0	0	228	0	0	0	0	0	0	0	0	0
<i>Hieraaetus pennatus</i>	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0
<i>Pandion haliaetus</i>	0	0	0	0	0	0	2	0	0	0	0	0	0	1	0	0
<i>Falco tinnunculus</i>	0	1	0	1	0	2	4	3	2	2	0	2	0	0	0	2
<i>Falco columbarius</i>	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Fulica atra</i>	692	1123	2981	1978	434	270	67	58	15	28	32	81	101	0	23	13
<i>Haematopus ostralegus</i>	4	3	2	1	8	4	3	10	2	20	60	33	25	22	14	13
<i>Himantopus himantopus</i>	0	0	1	0	1	14	98	118	131	215	128	93	13	13	2	0
<i>Recurvirostra avosetta</i>	118	141	118	6		65	63	126	243	13	88	23	13	19	6	
<i>Glareola pratincola</i>	0	0	0	0	0	0	43	16	32	183	192	36	14	12	51	0
<i>Charadrius dubius</i>	0	0	0	0	0	1	0	3	6	38	58	18	3	0	0	0
<i>Charadrius hiaticula</i>	23	13	2	0	0	1	2	40	0	0	0	1	8	69	59	30
<i>Charadrius alexandrinus</i>	12	1	11	1	1	26	14	26	16	103	99	42	16	79	10	6
<i>Pluvialis squatarola</i>	21	21	24	47	25	29	4	11	0	1	0	13	12	12	11	6

<i>Vanellus vanellus</i>	0	0	1	1	30	3	3	4	5	87	102	29	63	6	79	122
<i>Calidris canutus</i>	0	0	0	1	0	0	0	9	0	0	0	0	0	0	0	0
<i>Calidris alba</i>	18	0	0	0	0	0	0	0	0	0	0	4	0	2	8	3
<i>Calidris minuta</i>	11		1				6	81	4	40	528	12	4	6	4	
<i>Calidris temminckii</i>	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0
<i>Calidris ferruginea</i>	2	0	0	0	0	0	33	20	0	1	19	0	0	5	2	0
<i>Calidris alpina</i>	224	483	259	348	352	43	180			1	16	26	26	52	99	133
<i>Calidris tenuirostris</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
<i>Calidris falcinellus</i>	0	0	0	0	0	0	0	0	0	0	0	0	4	6	1	0
<i>Calidris pugnax</i>	16	1	2				88	512		51	74	11	10	5	3	2
<i>Gallinago gallinago</i>	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
<i>Gallinago media</i>	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0
<i>Limosa limosa</i>	4	1	0	0	0	6	8	0	140	79	23	144	53	34	0	0
<i>Limosa lapponica</i>	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
<i>Numenius phaeopus</i>	0	0	0	0	0	0	0	6	0	1	0	1	2	2	1	0
<i>Numenius arquata</i>	2	1	0	0	0	1	0	0	0	2	0	1	1	2	2	1
<i>Tringa erythropus</i>	3	4	0	0	0	0	45	71	37	19	58	3	12	2	8	0

<i>Tringa totanus</i>	62	52	72	12	36	29	6	7	5	13	85	47	67	109	106	45
<i>Tringa stagnatilis</i>	10	0	0	0	0	1	5	2	0	23	95	14	47	37	8	8
<i>Tringa nebularia</i>	6	8	12	0	6	9	62	35	3	19	43	45	40	37	35	24
<i>Tringa ochropus</i>	0	1	0	0	1	1	0	0	1	0	6	0	0	0	0	0
<i>Tringa glareola</i>	0	0	0	0	0	0	0	0	3	30	78	22	28	11	9	0
<i>Xenus cinereus</i>	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
<i>Actitis hypoleucos</i>	0	0	0	0	0	0	0	1	3	20	34	17	3	0	0	0
<i>Arenaria interpres</i>	0	0	0	1	1	0	0	4	0	0	5	48	15	14	12	0
<i>Stercorarius parasiticus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
<i>Ichthyaetus melanocephalus</i>	243	815	401	0	0	0	14	0	5	43	318	135	105	48	53	31
<i>Hydrocoloeus minutus</i>	16	0	3	0	0	0	0	1	7	91	593	60	20	2	0	0
<i>Chroicocephalus ridibundus</i>	1103	655	172	4	5	8	26	3	174	694	665	407	432	317	225	136
<i>Chroicocephalus genei</i>	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
<i>Larus michahellis</i>	95	109	104	103	30	23	67	65	56	526	201	223	193	14	55	19
<i>Hydroprogne caspia</i>	3	0	0	0	0	0	0	0	0	0	0	0	0	2	1	4

<i>Thalasseus sandvicensis</i>	363	644	18	3	31	90	917	590	1747	1367	752	1275	784	331	819	639
<i>Sterna hirundo</i>	8	0	0	0	0	0	2	13	448	447	626	225	204	134	17	1
<i>Sternula albifrons</i>	0	0	0	0	0	0	31	100	97	64	31	23	5	5	0	0
<i>Chlidonias hybridus</i>	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
<i>Chlidonias leucopterus</i>	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0
<i>Asio flammeus</i>	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Alcedo atthis</i>	1	0	0	1	0	2	0	0	0	0	2	1	0	0	2	1
<i>Riparia riparia</i>	0	0	0	0	0	0	2	10	0	0	0	0	0	0	0	0

Table 3: Species registered during migration period in the second stage of the survey (number per visit)

Species/Date	10. 10. 21	29. 10. 21	7. 11. 21	29. 11. 21	8. 3. 22	24. 3. 22	4. 4. 22	20. 4. 22	5. 5. 22	4. 8. 22	19. 8. 22	15. 9. 22	11. 10. 22	27. 10. 22	10. 11. 22	2. 3. 23	20. 3. 23	4. 4. 23	24. 4. 23	5. 5. 23	4. 8. 23	22. 8. 23
<i>Gavia arctica</i>	0	31	5	0	20	11	4	39	13	0	1	0	6	36	6	13	13	13	5	4	0	0
<i>Tachybaptus ruficollis</i>	54	81	51	34	23	17	14	9	0	2	21	0	18	23	2	14	11	13	0	0	8	9
<i>Podiceps cristatus</i>	13	14	10	1	18	40	42	21	15	12	28	30	45	25	7	16	42	54	10	5	35	32
<i>Podiceps grisegena</i>	0	4	15	0	0	1	1	0	0	0	0	0	4	5	0	0	1	1	0	0	10	3
<i>Podiceps auritus</i>	0	0	0	0	0	16	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
<i>Podiceps nigricollis</i>	0	3	13	5	99	112	45	5	0	0	0	5	5	22	25	10	7	3	0	0	1	1

<i>Phalacrocorax carbo</i>	77	110	455	52	14	49	23	51	133	3	17	12	72	142	36	103	6	31	68	44	58	69
<i>Gulosus aristotelis</i>	0	0	0	0	1	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0
<i>Microcarbo pygmaeus</i>	30	41	44	35	48	131	270	84	66	11	60	7	52	115	100	119	239	126	75	65	44	64
<i>Pelecanus onocrotalus</i>	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
<i>Pelecanus crispus</i>	0	0	5	1	1	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0
<i>Nycticorax nycticorax</i>	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Ardeola ralloides</i>	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0
<i>Egretta garzetta</i>	0	1	0	0	0	0	13	5	5	44	73	5	2	1	0	0	0	1	7	11	11	6
<i>Ardea alba</i>	1	18	2	1	3	3	0	0	0	0	2	0	23	11	3	2	6	2	2	2	0	0
<i>Ardea cinerea</i>	33	48	36	24	21	7	18	5	1	7	8	27	74	32	9	18	7	0	0	3	10	16
<i>Ardea purpurea</i>	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Bubulcus ibis</i>	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0		0	0	0	0	0
<i>Ciconia nigra</i>	0	0	0	0	0	0	0	0	0	0	0	30	0	0	0	0	0	0	0	0	0	0
<i>Ciconia ciconia</i>	0	0	0	0	0	0	1	0	1	0	7950	2	0	0	0	0	0	0	1	1	0	9872
<i>Plegadis falcinellus</i>	0	0	0	0	0	0	0	0	0	52	1	0	0	0	0	0	0	19	0	9	8	0
<i>Platalea leucorodia</i>	4	0	0	0	0	0	0	0	0	0	18	0	0	0	0	0	0	0	3	1	0	0
<i>Cygnus olor</i>	25	67	97	109	46	30	27	13	29	30	9	17	60	69	76	94	60	51	29	18	14	8
<i>Phoenicopiterus roseus</i>	108	322	310	67	46	58	2	11	330	753	350	46	335	559	723	243	25	7	72	2	0	81
<i>Cygnus columbianus</i>	0	0	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Cygnus cygnus</i>	0	0	14	0	1	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0
<i>Anser albifrons</i>	0	5	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Tadorna ferruginea</i>	0	0	0	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Tadorna tadorna</i>	1	7	1	58	364	339	186	153	46	56	35	0	0	0	3	129	188	179	162	90	14	3

<i>Mareca penelope</i>	144	597	545	900	146	185	0	0	0	0	0	0	41	175	420	178	17	4	3	0	0	0
<i>Mareca strepera</i>	0	4	12	14	77	26	14	26	36	0	7	2	0	0	0	108	39	49	55	32	9	10
<i>Anas crecca</i>	438	495	873	757	356	163	27	13	1	0	4	138	460	425	140	330	110	34	15	0	0	0
<i>Anas platyrhynchos</i>	251	704	361	746	161	75	42	14	19	26	84	8	81	320	144	304	92	11	21	23	28	14
<i>Anas acuta</i>	10	35	15	0	16	19	6	0	2	0	0	0	3	45	4	83	31	14	4	0	0	0
<i>Spatula querquedula</i>	0	0	0	0	4	105	49	38	11	0	32	0	0	0	0	9	4	34	8	6	0	7
<i>Spatula clypeata</i>	29	124	171	320	236	186	160	66	11	0	0	0	14	62	1	102	137	104	83	0	0	0
<i>Netta rufina</i>	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Aythya ferina</i>	0	43	59	62	64	43	33	0	0	63	0	0	0	0	0	59	0	0	0	0	0	0
<i>Aythya nyroca</i>	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Aythya fuligula</i>	0	4	2	28	234	72	32	0	0	0	0	0	0	0	4	113	13	0	0	0	0	0
<i>Aythya marila</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
<i>Melanitta fusca</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
<i>Mergus serrator</i>	0	7	28	27	80	50	14	1	0	0	0	0	1	7	20	79	60	28	1	0	0	0
<i>Circaetus gallicus</i>	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Circus aeruginosus</i>	2	10	11	7	10	5	4	5	3	2	3	2	7	5	1	6	3	6	1	4	1	0
<i>Circus cyaneus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
<i>Accipiter nisus</i>	0	2	2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
<i>Buteo buteo</i>	0	0	0	2	5	0	1	1	0	0	0	0	0	0	0	2	1	1	0	2	0	0
<i>Buteo rufinus</i>	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Clanga pomarina</i>	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Pandion haliaetus</i>	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Falco tinnunculus</i>	1	0	1	0	1	0	1	3	3	0	4	0	4	0	0	0	0	1	2	0	2	0
<i>Falco vespertinus</i>	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2

<i>Falco columbarius</i>	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Rallus aquaticus</i>	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
<i>Gallinula chloropus</i>	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Fulica atra</i>	2	439	507	5000	3321	1502	502	99	13	0	55	0	0	0	103	2263	13	0	2	6	0	0
<i>Haematopus ostralegus</i>	4	1	0	0	1	1	4	4	4	18	56	0	0	0	0	2	12	9	7	7	34	14
<i>Himantopus himantopus</i>	0	0	0	0	0	1	47	85	98	187	105	0	0	0	0	0	0	31	70	80	45	18
<i>Recurvirostra avosetta</i>	1	0	0	5	0	21	233	244	136	39	56	2	0	0	6	0	29	7	200	157	0	0
<i>Glareola pratincola</i>	0	0	0	0	0	0	0	4	0	13	6	0	0	0	0	0	0	0	379	3	20	13
<i>Charadrius dubius</i>	0	0	0	0	0	0	1	2	3	2	37	12	0	0	0	0	1	2	6	4	19	14
<i>Charadrius hiaticula</i>	18	4	4	0	2	4	0	2	2	0	62	7	23	17	1	1	5	14	2	9	17	42
<i>Charadrius alexandrinus</i>	11	5	0	0	6	17	16	14	14	25	15	2	4	0	0	2	6	9	12	8	61	7
<i>Pluvialis apricaria</i>	0	0	0	0	88	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Pluvialis squatarola</i>	16	7	6	4	34	4	2	3	12	0	30	3	28	44	18	12	21	1	10	20	4	25
<i>Vanellus vanellus</i>	7	18	44	272	75	1	10	0	5	171	247	0	4	0	63	0	13	5	3	0	116	83
<i>Vanellus leucurus</i>	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Calidris canutus</i>	0	0	0	0	0	0	0	0	4	0	0	0	3	0	0	0	0	0	0	0	0	0
<i>Calidris alba</i>	0	0	0	0	0	0	0	0	0	0	0	0	8	7	0	0	0	0	0	0	0	0
<i>Erolia minuta</i>	0	0	0	0	0	0	1	0	0	0	33	0	32	0	3	1	0	1	109	379	257	50
<i>Calidris ferruginea</i>	0	0	0	0	0	0	0	12	69	0	7	7	3	0	0	3	0	0	15	59	23	0
<i>Calidris alpina</i>	116	25	35	84	152	555	23	0	11	20	99	26	323	330	42	54	60	26	17	16	44	9
<i>Calidris falcinellus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3
<i>Calidris pugnax</i>	2	0	0	0	0	50	112	44	8	18	36	7	0	0	1	0	5	10	106	30	120	5

<i>Gallinago gallinago</i>	0	0	0	0	1	0	2	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0
<i>Gallinago media</i>	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Gallinago sp.</i>	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
<i>Limosa limosa</i>	2	0	0	0	0	1	5	2	0	179	23	12	0	0	0	0	0	0	0	0	20	0
<i>Limosa lapponica</i>	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
<i>Numenius phaeopus</i>	0	0	0	0	0	0	0	0	0	4	2	0	0	0	4	0	0	1	0	3	5	0
<i>Numenius arquata</i>	1	1	1	0	0	0	0	1	0	2	10	1	4	3	0	0	5	4	2	4	1	3
<i>Tringa erythropus</i>	0	0	0	0	0	0	5	33	15	12	0	11	0	0	0	0	0	2	10	10	23	2
<i>Tringa totanus</i>	38	42	52	34	19	74	25	6	4	22	60	41	48	52	13	41	31	21	0	4	94	78
<i>Tringa stagnatilis</i>	0	0	0	0	0	0	48	47	0	3	77	15	0	0	1	0	0	19	5	0	33	26
<i>Tringa nebularia</i>	5	3	6	3	3	4	16	119	12	0	39	2	20	18	1	2	10	11	51	12	83	30
<i>Tringa ochropus</i>	0	0	2	4	0	1	1	3	0	0	0	0	0	0	0	0	2	3	0	0	3	0
<i>Tringa glareola</i>	0	0	0	0	0	0	0	6	11	13	558	82	6	0	0	0	0	2	10	12	89	65
<i>Xenus cinereus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
<i>Actitis hypoleucos</i>	0	0	0	0	0	0	1	4	2	1	4	0	0	0	0	0	0	0	2	1	10	10
<i>Arenaria interpres</i>	0	0	0	0	0	0	0	0	13	0	13	1	5	4	0	0	0	0	0	1	17	23
<i>Phalaropus lobatus</i>	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0
<i>Stercorarius parasiticus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0
<i>Ichthyaetus ichthyaetus</i>	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
<i>Ichthyaetus melanocephalus</i>	1186	39	47	0	0	0	0	0	9	0	95	2	34	30	0	0	0	1	12	6	174	112
<i>Hydrocoloeus minutus</i>	0	0	0	0	0	3	1	0	0	41	60	0	0	0	0	0	0	0	0	0	101	123
<i>Chroicocephalus ridibundus</i>	196	489	138	27	3	3	6	0	0	923	900	671	173	714	59	16	0	0	0	5	454	416

<i>Chroicocephalus genei</i>	3	0	2	0	0	7	0	0	0	0	0	0	0	21	5	0	4	4	2	0	0	0
<i>Larus michahellis</i>	47	75	41	89	105	93	99	44	86	8	60	46	71	92	15	74	77	39	60	24	460	212
<i>Gelochelidon nilotica</i>	0	0	0	0	0	0	0	0	18	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Hydroprogne caspia</i>	0	0	0	0	0	0	0	0	0	0	2	0	3	0	0	0	0	0	0	2	0	0
<i>Thalasseus sandvicensis</i>	110	107	90	0	1	1	174	86	644	15	202	412	770	265	39	1	1	468	193	275	390	491
<i>Sterna hirundo</i>	1	0	0	0	0	0	0	2	25	77	604	4	0	0	0	0	0	0	2	19	184	586
<i>Sternula albifrons</i>	0	0	0	0	0	0	0	0	52	43	109	8	0	0	0	0	0	0	60	67	7	88
<i>Chlidonias hybrida</i>	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0
<i>Chlidonias niger</i>	0	0	0	0	0	0	0	0	69	0	0	0	0	0	0	0	0	0	0	6	0	6
<i>Chlidonias leucoptera</i>	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2	12	0	0
<i>Alcedo atthis</i>	4	1	4	2	1	0	3	0	0	0	1	0	0	1	0	0	1	0	1	0	0	0
<i>Riparia riparia</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	1190	800
<i>Luscinia svecica</i>	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
<i>Cettia cetti</i>	0	0	0	0	0	0	2	4	2	0	0	0	0	0	0	1	2	3	3	2	0	0
<i>Emberiza schoeniclus</i>	0	0	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

WINTERING PERIOD

Over 80 species of birds were registered during winter period in Pomorie Lake in the first stage of the survey, either resident, on passage to more southerly areas or to spend the entire winter here. They seek out the relatively undisturbed wetland areas for ice-free feeding conditions and for safe roosting opportunities. In some cases, significant proportions of the biogeographic populations of water birds overwinter here (e.g. Common shelduck and Mute swan both cover Ramsar 1% criteria). During wintering period were conducted 9 visits to the lake in this stage.

As it's seen from *Figure 39* and *Table 4*, the most abundant species (no of individuals per visit) were as follows: Coot (*Fulica atra*) – 7,626 individuals, Dunlin (*Calidris alpina*) – 2,592 individuals, Eurasian wigeon (*Mareca penelope*) – 2,067 individuals, Eurasian teal (*Anas crecca*) – 1,366 individuals, Shelduck (*Tadorna tadorna*) – 1,454 individuals. One new species for the site was recorded during the winter period – two individuals of Little bustard (*Tetrax tetrax*) were observed on 18 February 2021.

In the second stage of the survey there were 66 species recorded during winter period. Climate change is causing significantly warmer winters, fewer ice days per year and relatively high average air temperatures. According to National Institute of Meteorology and Hydrology data, of the three winter months with average monthly temperatures above the norm in winter 22/23, January and December stand out (over 4-4.5°C on average for the country). There is a relatively colder period in the first half of February, but it is usually very short and not so prominent along the coast, where the warming effect of sea water is more pronounced. All this leads to a gradual shift in the wintering grounds of some species, and while some species remain in the north of our country, due to the lack of snow and/or ice cover, others move to their wintering places in the south (Africa, Asia Minor) without need for intermediate stops.

Careful observation of this process, as well as the collection of data to follow it, is extremely important, since we do not know the trend in climate change, nor its duration, cyclicity, or any other perspective. The process of gradual displacement of the wintering grounds of some species and the abandonment of certain sites can be temporary, and the processes reversible. But this can lead to the neglect of temporarily abandoned wintering grounds and deterioration of their condition, even to the disappearance by conversion to urban area and overbuilding of some of them. Which, if climate trends change in the future, could have catastrophic consequences for the species that depend on them.

INDICATOR SPECIES FOR THE PROJECT AND OTHER IMPORTANT SPECIES

Common shelduck (*Tadorna tadorna*)

The species shows preference for saline habitats and muddy or sandy estuaries in coastal regions, and occurs inland on saline and brackish lakes. Its largest concentrations in Bulgaria have been registered during the winter in the Pomoriysko and Atanasovsko lakes, and in the Southern Black Sea coast its total numbers being 2,081 at average, with a maximum of 4,224 (Michev & Profirov, 2003). During 2021 winter period the species was registered in the lake with highest number of 1,454 individuals on February 5th (*Figure 27*). In the second stage of the survey new peak for the site was recorded – 3,055 ind. on December 15th 2022 (*Figure 28*). **The set target of 250 ind. in winter has been exceeded in all winters of the project.**

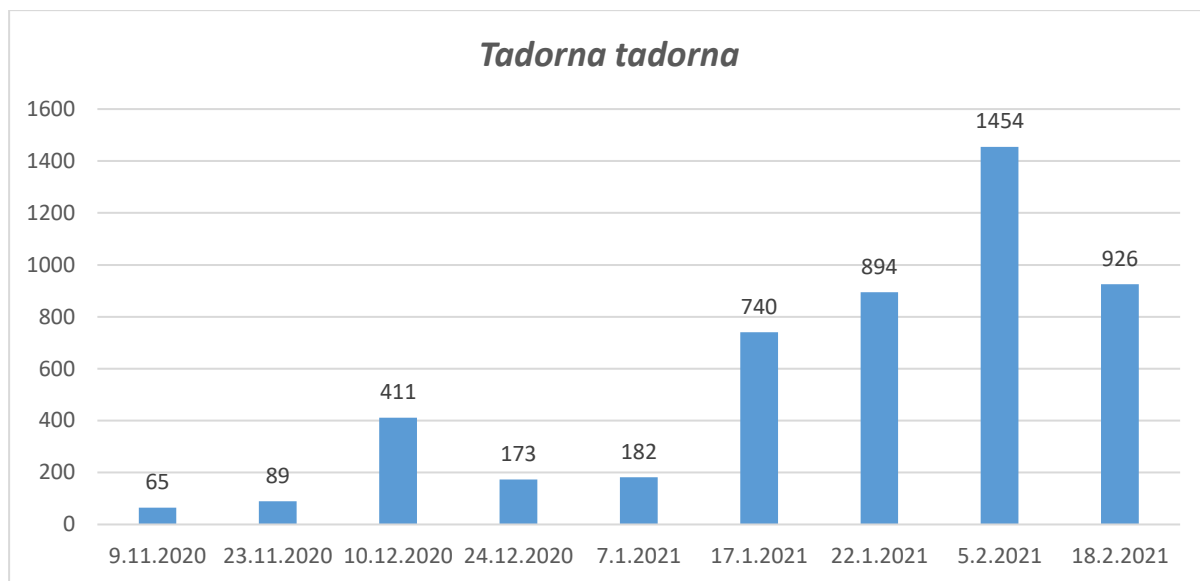


Figure 27: Observations of Common shelduck individuals per visit in winter during first stage of the survey

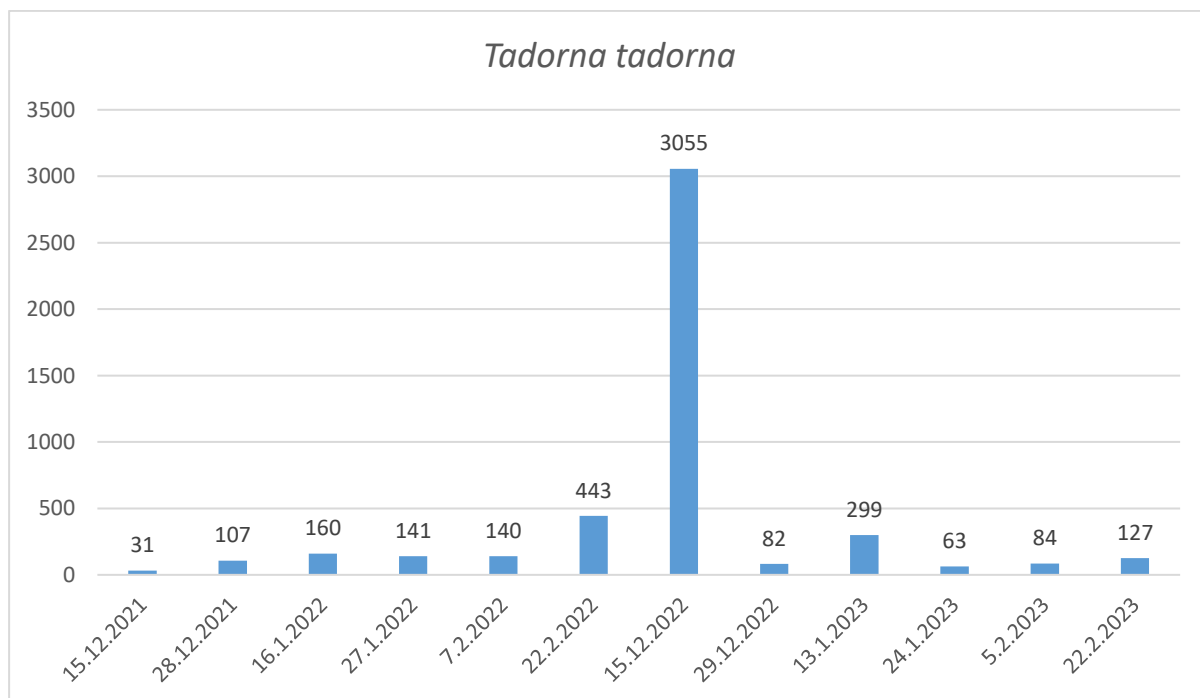


Figure 28: Observations of Common shelduck individuals per visit in winter during second stage of the survey

Redshank (*Tringa totanus*)

During the winter the species is largely coastal, occupying rocky, muddy and sandy beaches, saltmarshes, tidal mudflats, saline and freshwater coastal lagoons. During the non-breeding season the species feeds on insects, spiders and annelid worms, as well as molluscs, crustaceans and occasionally small fish which are abundant in Pomorie Lake. According to Checklist of birds of Pomorie Lake the highest number for the species registered in the lagoon during winter period is 110 individuals on January 17th 2009. During winter period in the first stage of the survey the species was registered

in the lake with highest number of 68 individuals on February 5th (Figure 29). In the second stage of the survey the largest registered number for the species was 59 on January 16th 2022 (Figure 30).

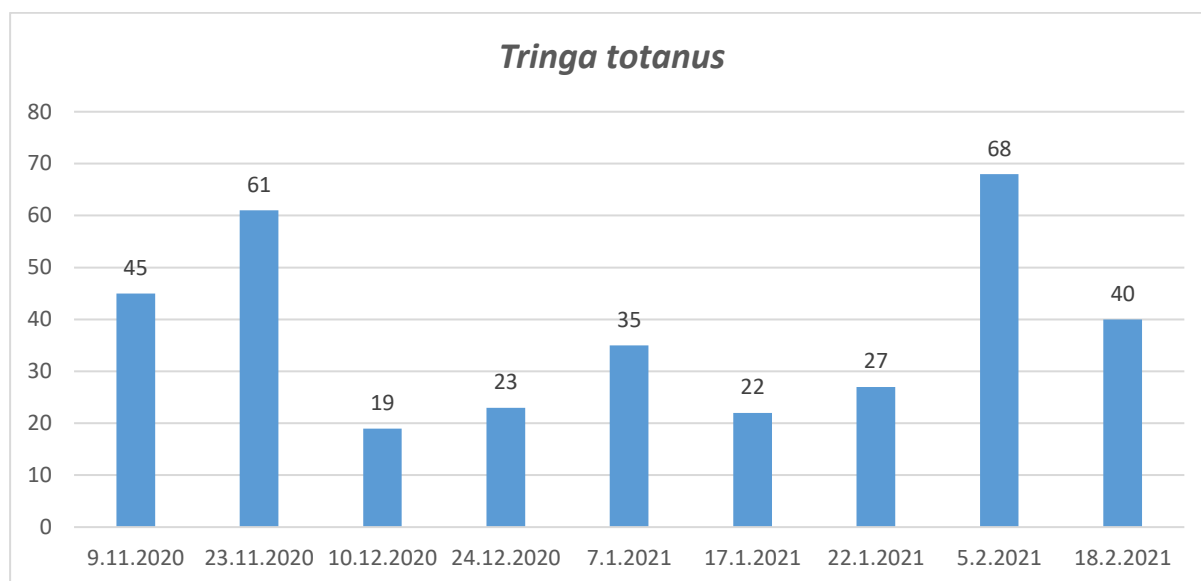


Figure 29: Observations of Redshank individuals per visit in winter during first stage of the survey

The diagrams show the relatively constant presence of the species in the lagoon. The conditions that the lake provides are important for the survival of the species during the winter months.

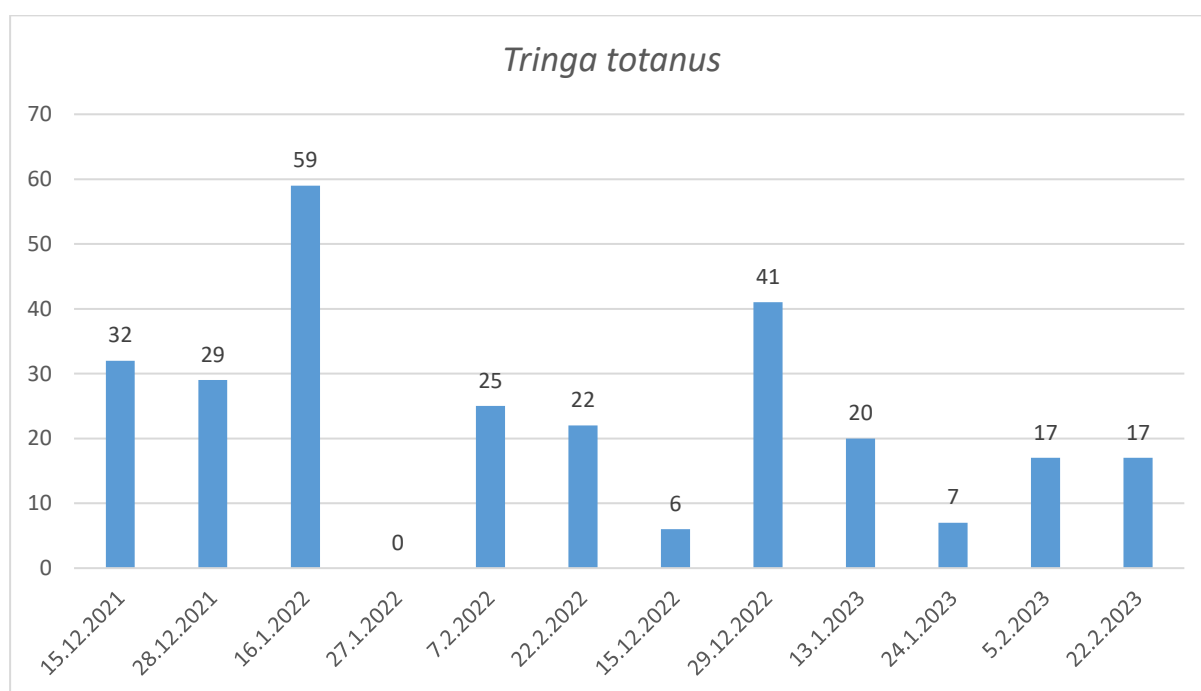


Figure 30: Observations of Redshank individuals per visit in winter during second stage of the survey

Little stint (*Calidris minuta*)

The species is strongly dependent from water level in its habitats for feeding and roosting, that's why it is considered as indicator species for the hydrological condition of Pomorie Lake. According to *Checklist of birds of Pomorie Lake* the highest number for the species registered in the lagoon during

winter period is 300 individuals on December 13th 2007. During winter period of the first stage of the survey the species was registered in the lake with highest number of 12 individuals on December 24th.

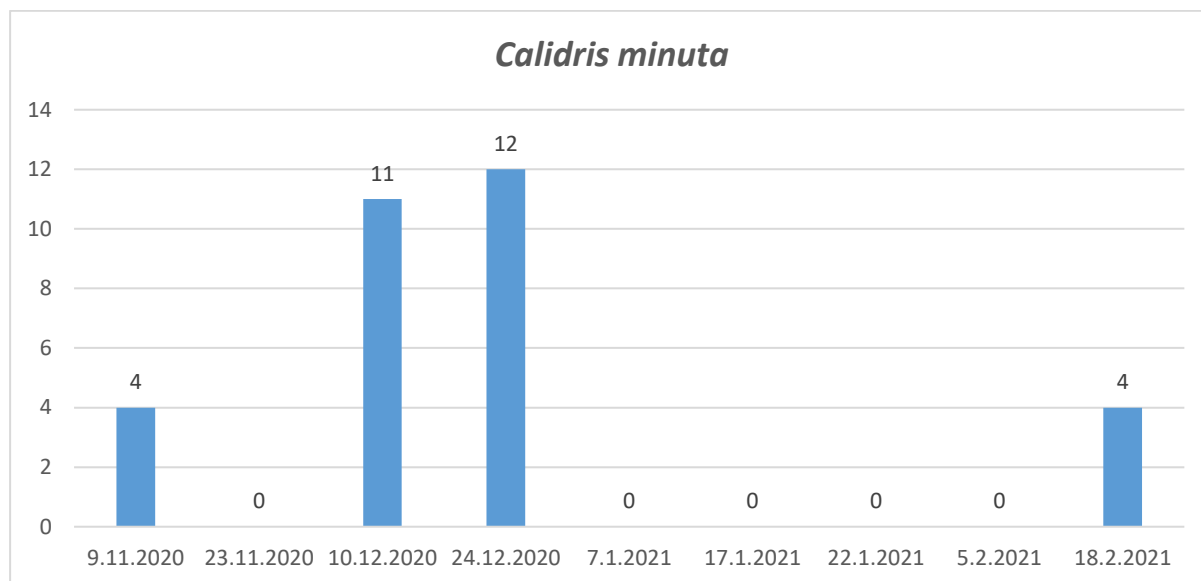


Figure 31: Observations of Little stint individuals per visit in winter during first stage of the survey

During second stage of the survey the species was registered only once in the winter period with 7 individuals on December 15th 2022. The permanent drying of the saltpans' basins, due to their non-functioning, as well as the side basins, during the period of low water, leads to a temporary decrease in the area of the habitats suitable for the species - shallow muddy areas. The species has been recorded annually in the lake area although with shorter stays and in lower numbers, indicating deterioration of the site. However it represents important habitat for the species' movements during the winter months underlining significance of saltpans' operation.

Pied avocet (*Recurvirostra avoseta*)

One of the species entirely linked to salty wetlands. It finds its food in the shallow areas of the habitats, which makes it notably sensitive to the water level and the hydrological regime of wetlands. It is the reason to be considered as a key species for the project.

In the *Checklist of birds of Pomorie Lake* (first edition) the species is listed as 'rare winter visitor' with the highest number of 79 individuals recorded on January 6th 2010. During winter period of the first stage of the survey the species was registered in the lake with highest number of 177 individuals in late autumn on November 23rd (Figure 32).

During the second stage of the survey the species was registered with highest number of 130 individuals on December 15th 2022. There are also four registrations during the winter period with numbers of 2-4 individuals. The annual presence of the species during the winter months in the lake area indicates its importance for the survival of the species during this period and for its conservation in general.

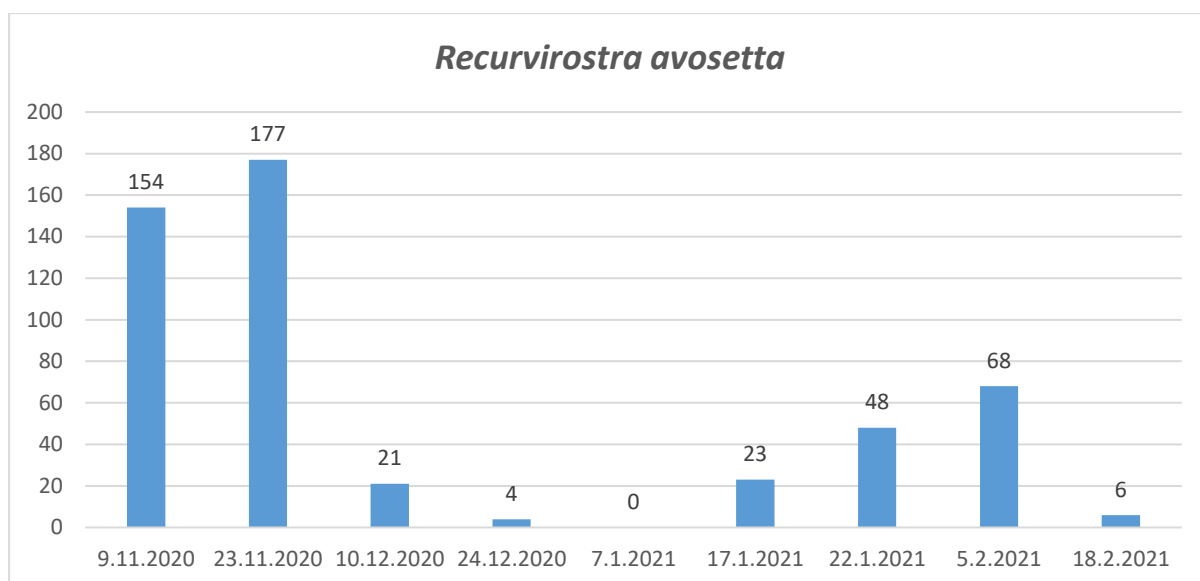


Figure 32: Observations of Pied avocet individuals per visit in winter during first stage of the survey

Kentish plover (*Charadrius alexandrinus*)

As species strongly dependent on saline wetlands Kentish plover is considered indicator for the status of lake's ecosystem. It finds its food in shallow and muddy areas of the lake and thus its presence and number are indicative of the hydrological regime.

In the *Checklist of birds of Pomorie Lake* (first edition) the species was listed as 'very rare winter visitor' with 2 individuals recorded on February 18th 2002. During the winter period in first stage of the survey the species was registered with new peak of 17 individuals on December 24th (Figure 19).

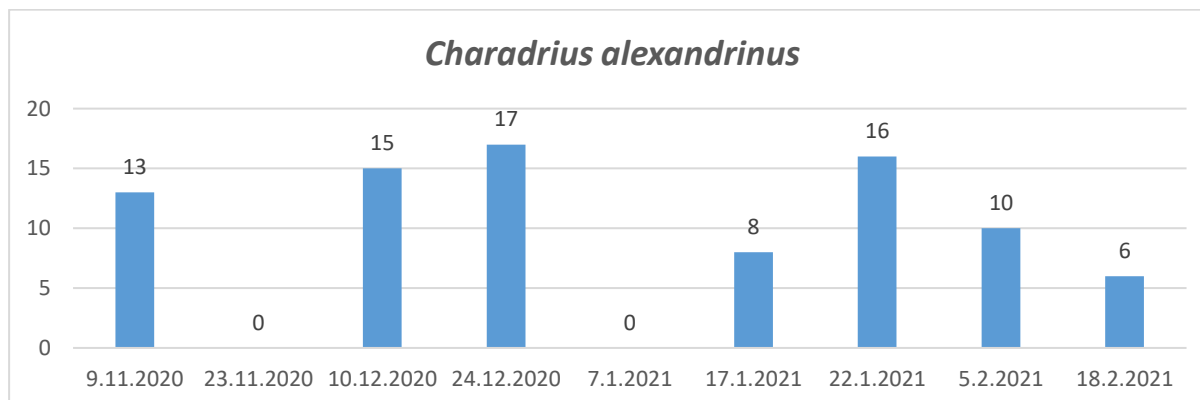


Figure 33: Observations of Kentish plover individuals per visit in winter during first stage of the survey

During the second stage of the survey the species was registered during five visits with numbers of 1-9 individuals (Figure 34).

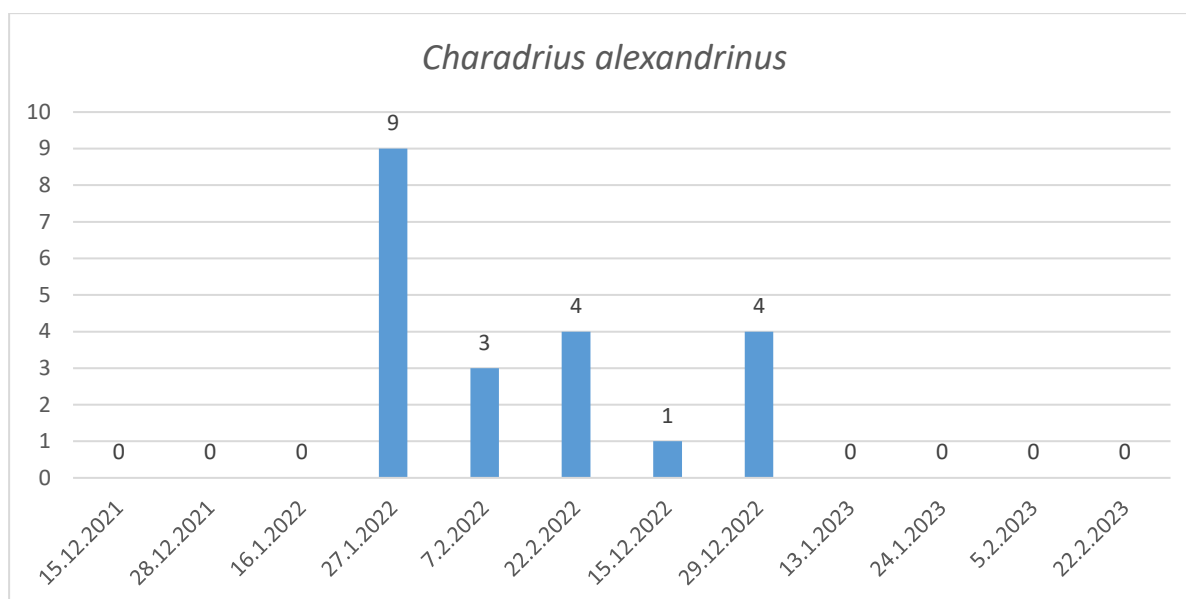


Figure 34: Observations of Kentish plover individuals per visit in winter during second stage of the survey

Eurasian coot (*Fulica atra*)

Usually the most abundant species during winter period at Pomorie Lake. As such, its numbers during the winter period are also considered in this report. Its numbers usually varies within certain limits, depending on the meteorological conditions, and the highest numbers are reported in extremely cold conditions, when the birds are looking for ice-free water areas, such as those found in saltwater wetlands and specifically in Pomorie Lake.

According to *Checklist of birds of Pomorie Lake* (first edition) the highest registered number for the species during wintering period was 18,135 individuals on January 15th 1982. During the winter period of the first stage of the survey the species was registered in the lake with highest number of 7,626 individuals on February 5th.

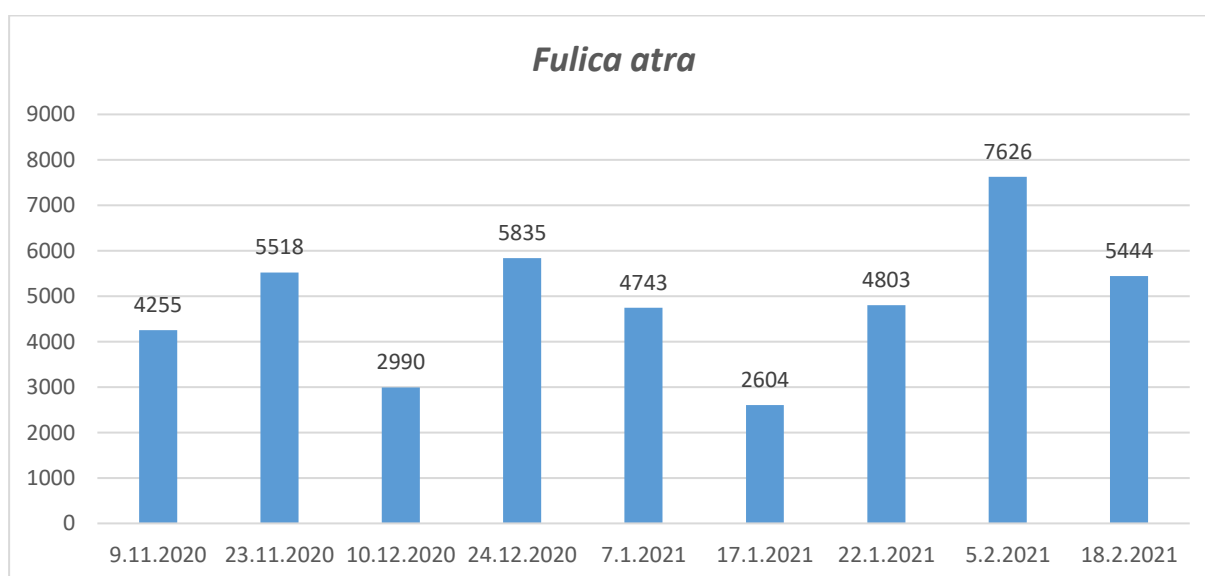


Figure 35: Observations of Eurasian coot individuals per visit in winter during first stage of the survey

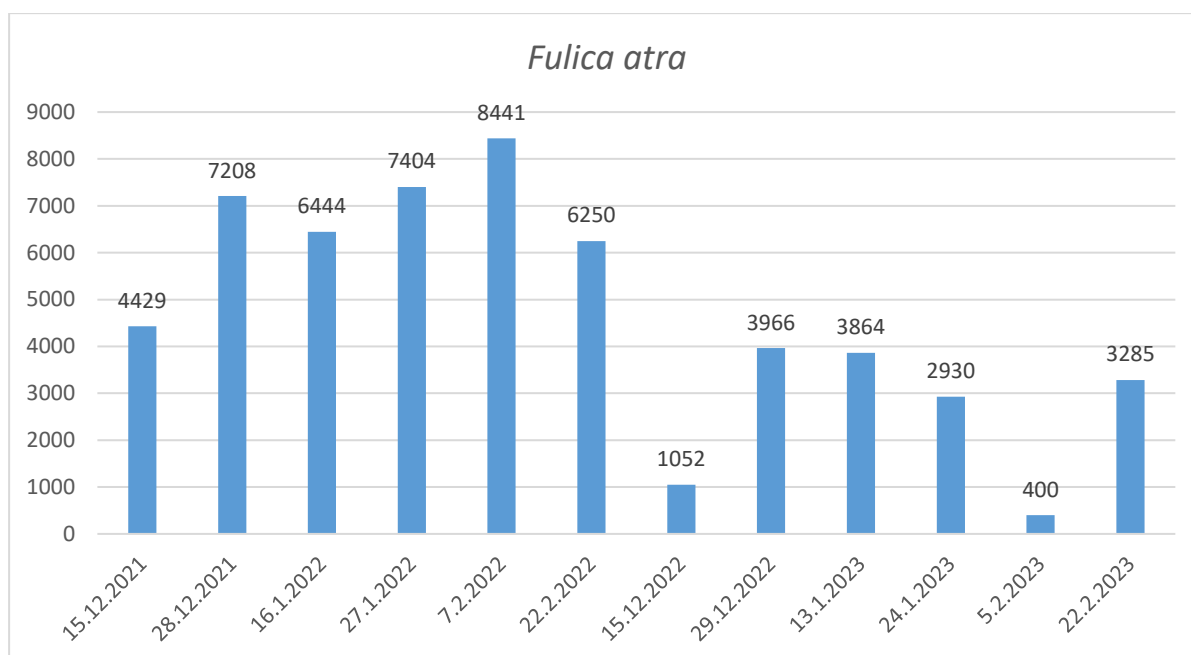


Figure 36: Observations of Eurasian coot individuals per visit in winter during second stage of the survey

This is the species with traditionally high numbers in the lake during the winter months – 8,441 individuals is the highest number registered in the lake during the whole survey (Figure 36). Lake habitats provide important food resources for the species' survival during the winter months and its aggregation.

Dunlin (*Calidris alpina*)

This is another species that depends entirely on shallow and muddy habitats for feeding and roosting and thus provides data on hydrological status of the wetlands it inhabits, such as Pomorie Lake.

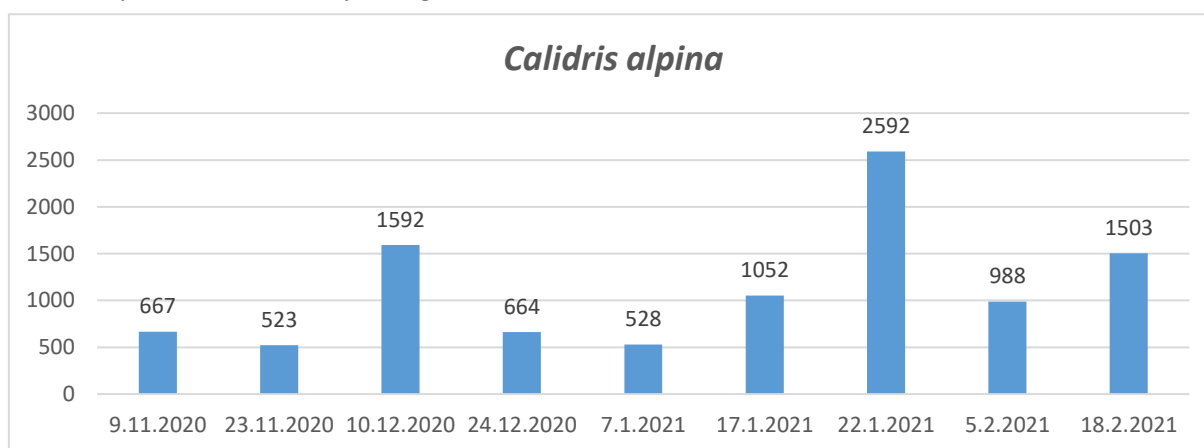


Figure 37: Observations of Dunlin individuals per visit in winter during first stage of the survey

In the *Checklist of birds of Pomorie Lake* (first edition) the species is listed as Fairly common winter visitor with highest number of 838 individuals registered on December 1st 1999. During the current study new peak number of the species in winter at Pomorie Lake was registered with 2,592 individuals on January 22nd 2021 (Figure 37).

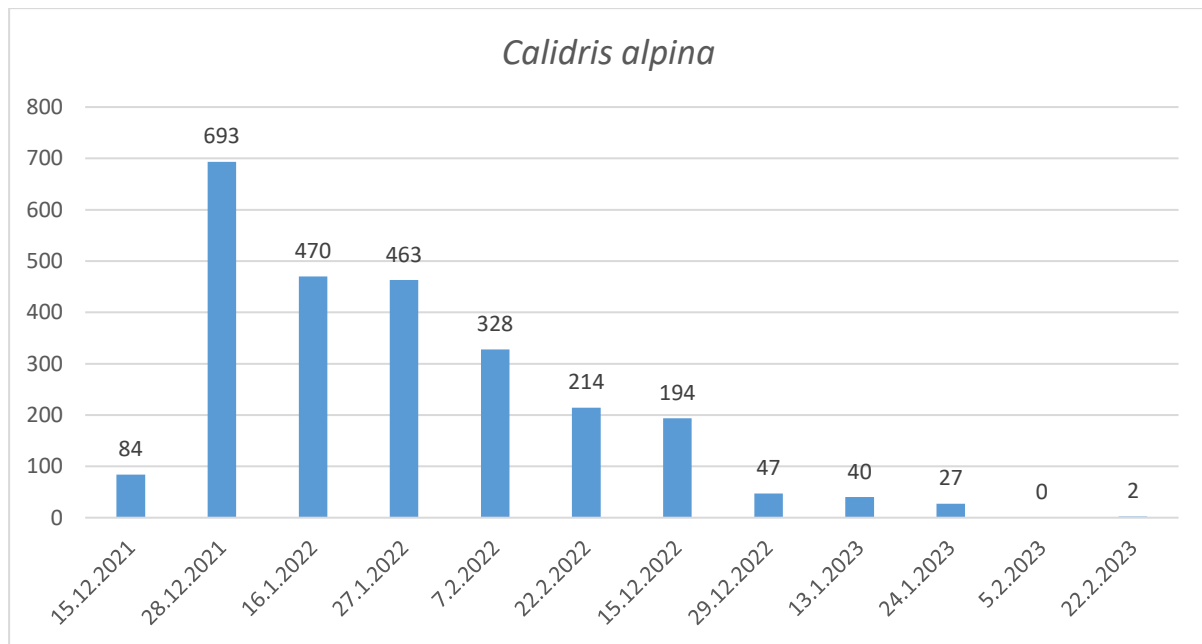


Figure 38: Observations of Dunlin individuals per visit in winter during second stage of the survey

The peak winter number recorded for the species during the first stage of the survey was result of the saltpans operating during that period and, accordingly, the water-filled shallow basins in the northern part of the lake provided optimal feeding habitat. During the second stage of the study, the salt pans were already non-functional and permanently dry. However, the species was present in the lake area permanently in winter with relatively high numbers in the winter 2021/22 while in 2022/23 the numbers further decreased (Figure 38). This shows the great importance of the lagoon for the survival of the species in winter.

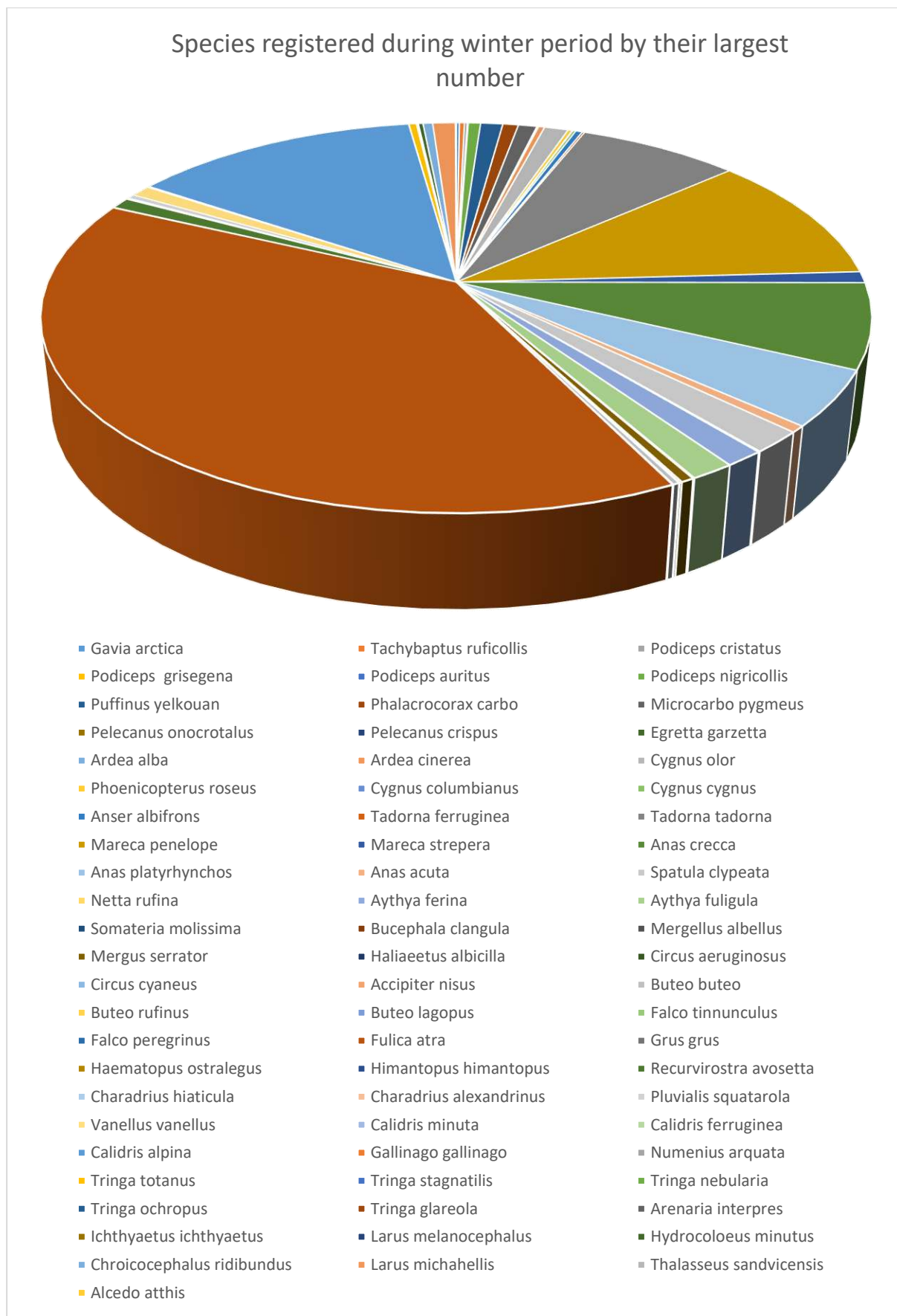


Figure 39: Bird species registered during winter period in the first stage of the survey by their largest number

Given the longer period the second stage of the survey covers, some species are excluded from the diagram (Figure 40) in order to better visualize the data. Species registered only once with low numbers (1-2 individuals) are excluded. Large soaring birds are also excluded, as they only fly over the lake and do not actively use its habitats.

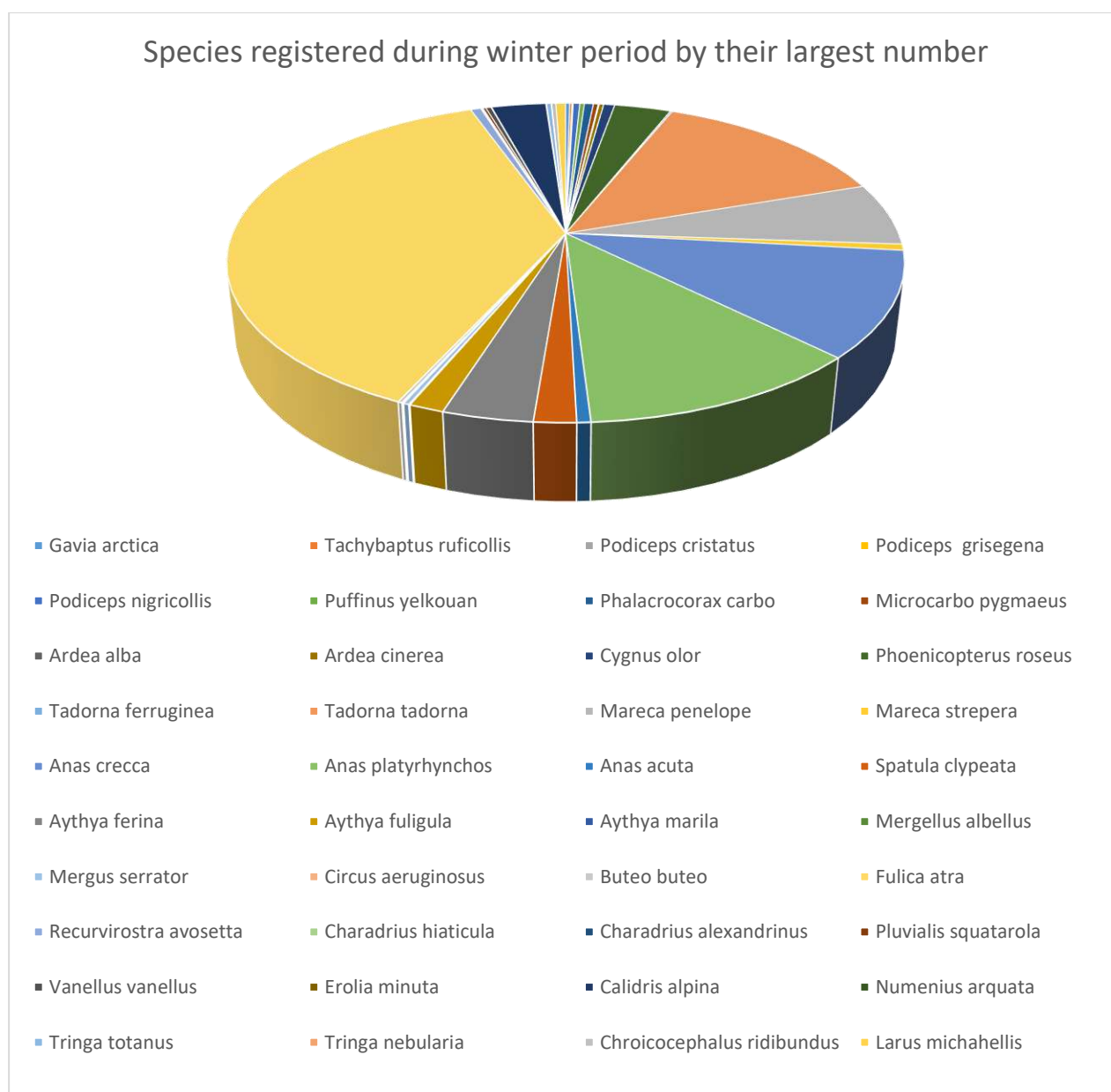


Figure 40: Bird species registered during winter period in the second stage of the survey by their largest number

Table 4: Species registered during wintering period in the first stage of the survey

Species	9.11.2020	23.11.2020	10.12.2020	24.12.2020	7.1.2021	17.1.2021	22.1.2021	5.2.2021	18.2.2021
<i>Gavia arctica</i>	8	28	1	13	2	0	2	29	5
<i>Tachybaptus ruficollis</i>	36	37	28	0	27	25	38	45	38
<i>Podiceps cristatus</i>	16	4	9	3	4	4	8	15	26
<i>Podiceps grisegena</i>	3	0	0	0	0	0	0	0	0
<i>Podiceps auritus</i>	0	0	5	0	0	1	0	0	1
<i>Podiceps nigricollis</i>	11	10	45	25	55	48	50	111	92
<i>Puffinus yelkouan</i>	0	0	0	0	0	0	0	0	200
<i>Phalacrocorax carbo</i>	38	86	32	3	38	52	140	23	20
<i>Microcarbo pygmeus</i>	167	102	55	29	113	64	33	78	85
<i>Pelecanus onocrotalus</i>	0	0	0	0	4	0	0	0	0
<i>Pelecanus crispus</i>	6	0	0	0	0	0	1	0	0
<i>Egretta garzetta</i>	0	0	0	0	1	0	0	0	0
<i>Ardea alba</i>	1	0	3	5	6	2	3	4	9
<i>Ardea cinerea</i>	37	55	33	53	39	49	35	27	28
<i>Cygnus olor</i>	175	215	195	55	156	166	161	185	154
<i>Phoenicopterus roseus</i>	5	2	1	23	5	0	27	39	1
<i>Cygnus columbianus</i>	0	0	0	4	0	0	0	0	0
<i>Cygnus cygnus</i>	0	0	0	4	0	0	0	28	0
<i>Anser albifrons</i>	0	0	0	0	0	0	60	0	0
<i>Tadorna ferruginea</i>	22	0	0	0	0	0	0	0	2
<i>Tadorna tadorna</i>	65	89	411	173	182	740	894	1454	926
<i>Anas penelope</i>	1695	1792	1998	2067	1373	1214	1552	581	744
<i>Mareca strepera</i>	0	4	8	26	41	74	105	81	183
<i>Anas crecca</i>	698	879	512	1184	1366	855	679	410	278
<i>Anas platyrhynchos</i>	893	691	684	675	667	625	884	707	344
<i>Anas acuta</i>	23	63	22	0	56	38	30	104	53
<i>Spatula clypeata</i>	81	37	91	24	119	304	157	346	279
<i>Netta rufina</i>	0	2	0	0	0	0	2	0	11
<i>Aythya ferina</i>	0	14	0	7	54	26	258	104	71
<i>Aythya fuligula</i>	0	12	0	0	28	72	27	138	287

<i>Somateria molissima</i>	0	0	0	0	0	0	0	0	2
<i>Bucephala clangula</i>	0	0	0	0	0	0	0	4	2
<i>Mergellus albellus</i>	0	0	0	0	0	4	0	1	2
<i>Mergus serrator</i>	30	69	53	45	43	52	31	79	85
<i>Haliaeetus albicilla</i>	0	0	0	0	0	0	0	0	1
<i>Circus aeruginosus</i>	6	17	10	15	11	12	14	7	17
<i>Circus cyaneus</i>	1	1	2	1	0	1	1	0	0
<i>Accipiter nisus</i>	0	0	1	0	0	1	0	0	1
<i>Buteo buteo</i>	1	43	2	19	5	2	2	6	3
<i>Buteo rufinus</i>	0	1	0	0	0	0	0	0	0
<i>Buteo lagopus</i>	0	0	0	0	1	0	0	0	0
<i>Falco tinnunculus</i>	0	1	2	1	0	0	0	0	0
<i>Falco peregrinus</i>	0	1	0	0	0	0	0	0	0
<i>Fulica atra</i>	4255	5518	2990	5835	4743	2604	4803	7626	5444
<i>Grus grus</i>	0	10	0	0	0	0	0	0	0
<i>Haematopus ostralegus</i>	0	0	0	0	1	1	0	1	0
<i>Himantopus himantopus</i>	0	1	1	1	0	0	0	0	0
<i>Recurvirostra avosetta</i>	154	177	21	4	0	23	48	68	6
<i>Charadrius hiaticula</i>	6	0	3	7	0	6	5	5	2
<i>Charadrius alexandrinus</i>	13	0	15	17	0	8	16	10	6
<i>Pluvialis squatarola</i>	30	19	21	26	20	13	67	68	33
<i>Vanellus vanellus</i>	180	0	0	0	23	0	0	85	3
<i>Calidris minuta</i>	4	0	11	12	0	0	0	0	4
<i>Calidris ferruginea</i>	8	0	0	0	0	0	0	0	0
<i>Calidris alpina</i>	667	523	1592	664	528	1052	2592	988	1503
<i>Gallinago gallinago</i>	0	0	0	0	0	0	0	0	1
<i>Numenius arquata</i>	1	0	0	0	0	0	0	0	1
<i>Tringa totanus</i>	45	61	19	23	35	22	27	68	40
<i>Tringa stagnatilis</i>	0	1	0	0	0	0	0	0	0
<i>Tringa nebularia</i>	7	0	1	0	0	3	4	0	3
<i>Tringa ochropus</i>	0	0	0	1	4	0	5	1	0
<i>Tringa glareola</i>	0	0	0	1	0	0	0	0	0
<i>Arenaria interpres</i>	2	0	0	0	1	0	0	1	0

<i>Ichthyaetus ichthyaetus</i>	0	0	0	0	0	0	0	0	1
<i>Ichthyaetus melanocephalus</i>	0	0	0	1	0	0	0	0	0
<i>Hydrocoloeus minutus</i>	0	0	0	0	0	0	42	0	0
<i>Chroicocephalus ridibundus</i>	50	87	26	0	3	8	2	70	27
<i>Larus michahellis</i>	35	117	186	129	189	51	204	91	113
<i>Thalasseus sandvicensis</i>	0	5	1	0	0	0	0	6	3
<i>Alcedo atthis</i>	1	0	1	0	0	0	0	2	0

Table 5: Species registered during wintering period in the second stage of the survey

Species/Date	15.12.20 21	28.12.20 21	16.1.20 22	27.1.20 22	7.2.20 22	22.2.20 22	15.12.20 22	29.12.20 22	13.1.20 23	24.1.20 23	5.2.20 23	22.2.20 23
<i>Gavia arctica</i>	0	23	16	12	6	21	52	28	0	0	0	34
<i>Tachybaptus ruficollis</i>	30	26	27	0	16	20	0	10	16	0	0	2
<i>Podiceps cristatus</i>	2	0	7	4	2	10	0	3	0	3	3	9
<i>Podiceps grisegena</i>	0	0	0	0	0	0	0	4	0	0	0	0
<i>Podiceps nigricollis</i>	10	22	53	22	38	84	1	6	1	0	13	9
<i>Puffinus yelkouan</i>	0	58	0	0	0	0	0	0	0	0	0	0
<i>Phalacrocorax carbo</i>	44	84	115	9	36	20	4	9	8	11	25	4
<i>Microcarbo pygmaeus</i>	33	5	3	0	3	62	55	8	4	20	3	47
<i>Ardea alba</i>	3	1	11	0	3	2	1	0	8	1	2	2
<i>Ardea cinerea</i>	25	39	58	3	52	20	4	28	22	15	21	5
<i>Cygnus olor</i>	135	141	109	116	89	46	71	129	131	30	25	78
<i>Phoenicopterus roseus</i>	246	628	719	285	81	24	136	695	397	206	585	83
<i>Tadorna ferruginea</i>	0	2	3	0	0	1	25	0	0	0	0	0
<i>Tadorna tadorna</i>	31	107	160	141	140	443	3055	82	299	63	84	127
<i>Mareca penelope</i>	615	195	1019	1115	1420	556	528	491	35	86	0	284
<i>Mareca strepera</i>	82	140	68	109	125	81	1	28	16	21	53	34
<i>Anas crecca</i>	1284	2390	1972	1453	1154	394	53	478	450	450	409	538
<i>Anas platyrhynchos</i>	823	2595	647	1791	1403	216	595	773	469	457	171	87
<i>Anas acuta</i>	31	90	40	54	58	30	166	84	125	94	107	28

<i>Spatula clypeata</i>	380	328	226	155	187	176	287	116	125	239	9	66
<i>Aythya ferina</i>	122	504	629	464	815	70	4	0	0	19	141	141
<i>Aythya fuligula</i>	65	176	158	132	318	227	5	0	0	20	70	181
<i>Aythya marila</i>	1	0	7	3	2	0	0	0	0	0	0	2
<i>Mergellus albellus</i>	0	0	1	4	1	0	0	0	0	0	0	0
<i>Mergus serrator</i>	32	50	31	15	25	30	13	36	33	48	53	50
<i>Circus aeruginosus</i>	16	11	10	7	12	9	0	5	2	3	1	1
<i>Buteo buteo</i>	10	0	7	2	2	0	38	12	0	0	0	0
<i>Fulica atra</i>	4429	7208	6444	7404	8441	6250	1052	3966	3864	2930	400	3285
<i>Recurvirostra avosetta</i>	0	4	2	2	3	0	130	0	0	0	0	0
<i>Charadrius hiaticula</i>	0	18	0	3	2	9	2	4	0	3	0	0
<i>Charadrius alexandrinus</i>	0	0	0	9	3	4	1	4	0	0	0	0
<i>Pluvialis squatarola</i>	17	26	30	20	24	8	14	39	0	1	2	5
<i>Vanellus vanellus</i>	39	0	0	0	0	68	0	6	0	0	0	0
<i>Erolia minuta</i>	0	0	0	0	0	0	7	0	0	0	0	0
<i>Calidris alpina</i>	84	693	470	463	328	214	194	47	40	27	0	2
<i>Numenius arquata</i>	0	0	0	0	0	0	9	1	0	0	0	1
<i>Tringa totanus</i>	32	29	59	0	25	22	6	41	20	7	17	17
<i>Tringa nebularia</i>	0	0	6	1	3	5	3	7	0	3	0	7
<i>Chroicocephalus ridibundus</i>	23	25	9	4	3	40	44	4	0	52	36	0
<i>Larus michahellis</i>	91	125	29	107	108	63	19	81	60	48	33	23

BREEDING PERIOD

The following breeding codes for bird species, according to *Checklist for Birds of Pomorie Lake*, are used in this Report:

Table 6: Breeding codes according to *Checklist of Birds of Pomorie Lake*

Code	Definition
Very rare	Breeding at intervals of at least 10 years (where reliable data exists)
Rare	Breeding less than annually
Scarce	Less than 10 pairs breeding annually
Uncommon	Between 10 and 99 pairs breeding annually
Fairly common	Between 100 and 999 pairs breeding annually
Common	Between 1000 and 9999 pairs breeding annually
Abundant	More than 10000 pairs breeding annually

According to *Checklist of birds of Pomorie Lake* (2010), the number of species registered to nest in the lake's area is 57. According to updated data from Green Balkans experts collected during the regular monitoring of the lake, this number has been complemented to 70. The table below presents the species nesting in the area of the lake and its adjacent parts, and their breeding status codes.

Table 7: Bird species registered in Pomorie Lake during nesting period and their breeding status codes

Species	Breeding status code	Species	Breeding status code
<i>Podiceps cristatus</i>	Rare breeder	<i>Apus apus</i>	Uncommon breeder
<i>Tachybaptus ruficollis</i>	Rare breeder	<i>Galerida cristata</i>	Scarce breeder
<i>Ixobrychus minutus</i>	Scarce breeder	<i>Alauda arvensis</i>	Scarce breeder
<i>Ciconia ciconia</i>	Rare breeder	<i>Hirundo rustica</i>	Regular breeder
<i>Cygnus olor</i>	Scarce breeder	<i>Delichon urbicum</i>	Scarce breeder
<i>Tadorna tadorna</i>	Scarce breeder	<i>Cecropis daurica</i>	Scarce breeder
<i>Mareca strepera</i>	Scarce breeder	<i>Motacilla flava</i>	Scarce breeder
<i>Anas platyrhynchos</i>	Scarce breeder	<i>Erithacus rubecula</i>	Scarce breeder
<i>Circus aeruginosus</i>	Scarce breeder	<i>Luscinia megarhynchos</i>	Uncommon breeder
<i>Falco tinnunculus</i>	Scarce breeder	<i>Oenanthe oenanthe</i>	Scarce breeder
<i>Perdix perdix</i>	Scarce breeder	<i>Turdus merula</i>	Scarce breeder
<i>Coturnix coturnix</i>	Scarce breeder	<i>Cettia cetti</i>	Uncommon breeder
<i>Rallus aquaticus</i>	Scarce breeder	<i>Locustella luscinioides</i>	Uncommon breeder
<i>Gallinula chloropus</i>	Scarce breeder	<i>Acrocephalus palustris</i>	Scarce breeder
<i>Fulica atra</i>	Scarce breeder	<i>Acrocephalus scirpaceus</i>	Uncommon breeder
<i>Himantopus himantopus</i>	Uncommon breeder	<i>Acrocephalus arundinaceus</i>	Uncommon breeder
<i>Recurvirostra avosetta</i>	Fairly common breeder	<i>Hippolais pallida</i>	Scarce breeder
<i>Haematopus ostralegus</i>	Rare breeder	<i>Curruca communis</i>	Scarce breeder
<i>Glareola pratincola</i>	Rare breeder	<i>Panurus biarmicus</i>	Scarce breeder
<i>Charadrius dubius</i>	Scarce breeder	<i>Parus major</i>	Scarce breeder
<i>Charadrius alexandrinus</i>	Uncommon breeder	<i>Oriolus oriolus</i>	Scarce breeder

<i>Vanellus vanellus</i>	Scarce breeder	<i>Lanius collurio</i>	Scarce breeder
<i>Ichthyaetus melanocephalus</i>	Rare breeder	<i>Lanius minor</i>	Rare breeder
<i>Chroicocephalus ridibundus</i>	Rare breeder	<i>Pica pica</i>	Uncommon breeder
<i>Larus michahellis</i>	Uncommon breeder	<i>Corvus monedula</i>	Scarce breeder
<i>Gelochelidon nilotica</i>	Rare breeder	<i>Corvus cornix</i>	Scarce breeder
<i>Thalasseus sandvicensis</i>	Common breeder	<i>Sturnus vulgaris</i>	Scarce breeder
<i>Sterna hirundo</i>	Fairly common breeder	<i>Passer domesticus</i>	Fairly common breeder
<i>Sternula albifrons</i>	Uncommon breeder	<i>Passer hispaniolensis</i>	Uncommon breeder
<i>Tyto alba</i>	Scarce breeder	<i>Passer montanus</i>	Scarce breeder
<i>Athene noctua</i>	Scarce breeder	<i>Chloris chloris</i>	Scarce breeder
<i>Alcedo atthis</i>	Scarce breeder	<i>Carduelis carduelis</i>	Scarce breeder
<i>Upupa epops</i>	Scarce breeder	<i>Emberiza schoeniclus</i>	Scarce breeder
<i>Coracias garrulus</i>	Scarce breeder	<i>Emberiza melanocephala</i>	Scarce breeder
<i>Streptopelia decaocto</i>	Uncommon breeder	<i>Emberiza calandra</i>	Scarce breeder

Results of breeding bird surveys

Habitat loss is a primary factor for species decline in many regions globally. Water-level management is widespread and illustrates how contemporary climate can interact directly and indirectly with numerous biological and abiotic factors to influence nesting success of bird species. As the coastline of Pomorie Lake shifts with deterioration of the hydrological conditions, important breeding sites for colonial and semi-colonial nesting waterbirds are disappearing. In many recent studies flooding has been a leading cause of nest failure for a variety of species, especially those that nest on the ground. As a result, eggs or chicks can get wet and cold enough that they die, even if the nest stays intact. For many species the survival rate of nests is influenced by laying date and nesting period (laying versus incubation) (José Javier Cuervo, 2005).

Food availability also affects the reproductive success of animal populations. However, food availability includes both prey abundance and its accessibility, which are regulated by different environmental processes. Deteriorated hydrological conditions in Pomorie Lake hinder the access of the nesting species to food resources and at the same time change its abundance thus becoming the reason for low nesting success.

Colonial breeding in birds provides protection from predators and may be particularly important when birds have to cope with an invasive predator. However, the impact of invasive predators is serious and may be the reason for low nesting success. Terrestrial predators - jackals, foxes, stray dogs and cats - have been considered as serious problem in the Pomorie Lake area for years given the close vicinity of wetland to the town. Use of dikes and embankments as a nesting ground by colonial waterbirds has been a well-documented ecological trap.

All this shows us the many challenges that nesting bird populations face and how delicate the balance of conditions necessary for a successful nesting season is. That's why major part of the Green Balkans NGO's activities through the years included the restoration and creation of artificial islands and platforms in order to prevent or minimize this impact on the ground nesting bird species.

KEY SPECIES FOR THE PROJECT

Sandwich tern (*Thalasseus sandvicensis*)

The Sandwich tern (*Thalasseus sandvicensis*) is a species that inhabits wetlands - seas, lakes, dams, rivers and more. The world population is estimated at about 490,000 - 640,000 individuals (Wetlands International 2015). The European population numbers 79,900 - 148,000 couples, which is equivalent to 160,000 - 295,000 sexually mature individuals (BirdLife International 2015). In the IUCN Red List, the species is in the Least Concern category, it is included in Annex II of the Berne Convention, in Annex II of the Bonn Convention, European Conservation Status: SPEC 2, in Annex I in the Birds Directive. In Bulgaria it is listed in the category "endangered species", included in Annexes II and III of the BDA. The species is highly susceptible to destruction of breeding grounds, egg robbery, terrestrial predators, high water levels, illegal construction, tourism, sports and fishing.

In the 1870s and 1880s, the species bred along the entire Black Sea coast and after then it is recorded only during migration or was not found at all. Confirmed nesting in Bulgaria was registered in the 1980s in Atanasovsko Lake with a switch to Pomorie Lake in the late 1990s. Nowadays, the species breeds mainly on Pomorie Lake. The number varies from several hundred to few thousand pairs, depending on the condition of the breeding grounds. In 2013 breeding birds reach 2,400 pairs in Pomorie Lake, a consequence of long-term efforts of Green Balkans: building artificial islands suitable for nesting and reducing disturbance.



Figure 41: Drone image of the Sandwich terns' colony in 2021

During the project duration we observed three breeding seasons (2021, 2022 and 2023) that showed large fluctuations in the breeding numbers. The data were collected through direct observations and with the help of a drone, the images of which were subsequently analyzed. In **2021** there were 1,094

pairs registered at the site. Those were main colony of 944 pairs on the existing small islet in front of the Salt Museum (Fig. 41). In the beginning of June further approximately 150 pairs were observed on wooden platforms in western part of the lagoon but these were abandoned a week later. That makes breeding population as **944 breeding pairs in 2021**. In general, the nesting success of the species this season, based on data collected for previous years during regular monitoring of the lake from Green Balkans' experts and data in *Checklist for birds in Pomorie Lake*, can be considered as low. One of the hypotheses about the reasons for this is the relatively cold spring and cool June with considerable rainfall concentrated in short time, which coupled with disrupted hydrological regime resulted in limited available area of only 220 m².

First conservation camp in September 2021 has been directed at improving the state of the breeding islet by repairing the woodwork and piling sediment to raise its level. Spring in **2022** had favourable meteorological conditions with relatively small amount of rain and thus the efforts in the conservation camp have not been in vain as available surface of the breeding islet was extended to 460 m² (Figure 42). As a result of these factors numbers of breeding pairs in the colony were higher than in 2021 **and reached 1436 pairs that being more than 50% increase on annual basis when compared to 2021**. This positive result unfortunately has not contributed significantly to breeding success. In beginning of July less than 100 alive chicks were counted with numerous dead (more than 70). In the end of July no adults were present and mass mortality of chicks and lower amongst adults was recorded (Figure 43). In the end of August when the colony has permanently left the islet, a site visit was made and min. 320 dead chicks were counted together with 10 adults (one being ringed in Ukraine). Estimated mortality rate for chicks was approx. 90%. One hypothesis for that mass mortality was related to the outbreak of the Highly Pathogenic Bird Flu observed widely in the North Sea bird colonies that has also affected heavily Sandwich tern colonies in Wadden Sea. It is also important to underline that in the breeding



Figure 42: Drone image of the Sandwich terns' colony in 2022

season of 2022 number of sightings of ringed Sandwich terns originating from Pomorie Lake was very low: only 5 compared to average of 17. In the previous 4 years that number varied from 11 to 33.

Other potential factor that should be considered is the war in Ukraine started in February 2022 with the Russian invasion. Negative impact of the war on several coastal protected areas was reported by Ukrainian researchers. Along Ukrainian Black Sea and Sea of Azov coastline the largest Sandwich tern colonies in the basin are located. One hypothesis for the low number of observed locally-hatched and ringed birds at Pomorie Lake could be occupation of the islet mostly by birds originating from northern part of the Black Sea that arrived earlier and colonized other areas where there was no disturbance by warfare.



Figure 43: Drone image of dead Sandwich terns (chicks and adults) in 2022

The **conservation camp in 2022** has been focused mainly on building a new wooden platform in the western part of the lagoon to improve breeding conditions for Avocets and Common terns but effort was also dedicated to strengthening the islet. Wooden parts were reinforced with gravel to limit the impact of waves. Conditions in winter and spring of **2023** were relatively good but in May water level started to increase flooding the islet almost completely. High water has not dropped until August (Figure 44). Available surface was limited to less than 60 m². Sandwich terns have occupied remains of old concrete wall adjacent to the islet (Figure 45), dikes in the Salt Museum salt pans (Figure 46) and other small islet there (Figure 47) with **total number of 283 pairs**. That was **the lowest number for more than 20 years**. Some hatchlings were observed in mid-June but heavy rain on 20 June led to complete abandonment of site with remaining eggs and **no successful breeding at all**. There were several factors that caused this negative result. One hypothesis is related to bird flu that has affected heavily colonies in western Europe. In June 2023 outbreak of bird flu caused mass mortality in

Sandwich tern colony in Venice Lagoon, Italy (M. Basso, pers. comm.) so it obviously reached the Mediterranean Sea where birds from the Black Sea regularly winter. That can be one reason for the low numbers of the pairs that attempted breeding at Pomorie Lagoon in 2023, even though up to 1000 Sandwich terns were observed at the islet in late April and early May. Limited surface definitely had negative impact as that species has preference for larger colony that provide higher security against predators. Among the breeding birds rings from Poland, Romania, Ukraine and Denmark were seen.



Figure 44: High water level and flooded islet in July 2023



Figure 45: Sandwich terns nesting on old concrete wall next to islet in 2023



Figure 46: Sandwich terns nesting on dike in Salt Museum saltpans in 2023



Figure 47: Sandwich terns nesting on islet in Salt Museum saltpans in 2023



Figure 48: Locations of Sandwich tern pairs/colonies at Pomorie Lake in 2021



Figure 49 and Figure 50: Locations of Sandwich tern pairs/colonies at Pomorie Lake in 2022 and 2023

As can be seen from the diagram below (Figure 51), the **target value of nesting pairs has been achieved only in 2022**. Main reasons for that include following accumulated factors:

- **disrupted hydrological regime of the lagoon and resulted operation of saltpans** – saltpans require huge amounts of water that ensure lower water level in the breeding season and larger surface of breeding islets;
- **bird flu outbreak** – even if no dead birds were collected and tested for bird flu in Bulgaria, the common wintering ground and the fact outbreak caused mass mortality in Italy hints it has affected Black Sea birds, too;
- **war in Ukraine after Russian invasion** had negative impact on the most important breeding sites for the species in the Black Sea.

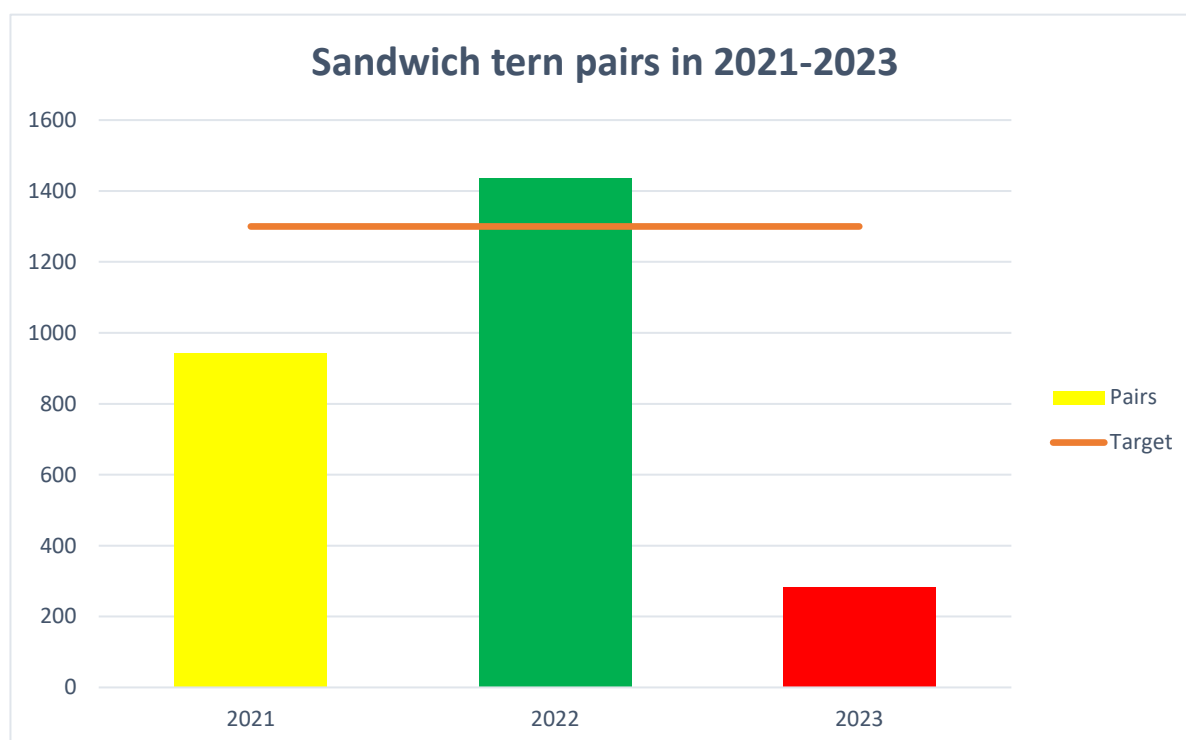


Figure 51: Sandwich tern pairs in 2021 – 2023 and target value

During the regular monitoring, Sandwich terns ringed as chicks in the colony have been observed. These are presented in *Table 8*.

Table 8: Observations of Sandwich terns ringed as chicks in the colony

Date ringed	Ring code	Autumn 2020	Spring 2021	Breeding 2021	Autumn 2021	Spring 2022	Autumn 2022	Spring 2023	Autumn 2023
23.6.2010	CAB		15.4.2021						
23.6.2010	CAD			29.5.2021	23.9.2021	17.4.2022			
23.6.2010	CAT			29.5.2021					
23.6.2010	CBN		1.4.2021						
6.7.2011	CCP		22.4.2021	7.5.2021		14.4.2022			
6.7.2011	CDV		22.4.2021	2.5.2021	6.8.2021; 24.8.2021				
6.7.2011	CDZ		17.4.2021						
6.7.2011	CHZ			4.6.2021	10- 11.8.2021; 20.8.2021			4.4.2023; 14.4.2023	

6.7.2011	CJJ			29.5.2021					
6.7.2011	CJK				24.9.2021; 25.9.2021				
6.7.2011	CKK		28.3.2021						
6.7.2011	CNT		16.4.2021	2.5.2021; 15.5.2021					
26.6.2012	CPD		22.4.2021	8.5.2021: male - copulating		24.4.2022			
26.6.2012	CPH			29.5.2021				20- 21.5.2023 - breeding	
26.6.2012	CPK			2.5.2021; 7- 8.5.2021; 29.5.2021	1.9.2021; 4.9.2021				
26.6.2012	CSN			3.5.2021	22.6.2021; 24.6.2021				
5.7.2013	CVD		17.4.2021		24.6.2021; 27.6.2021	24.4.2022		11.6.2023 - breeding	
26.6.2012	CAN				15.9.2021				
26.6.2012	CAD			29.5.2021	10.8.2021			25.5.2023; 4.6.2023 - breeding	
26.6.2012	CAK							1.4.2023	
26.6.2012	CAN								22.8.2023
26.6.2012	CBF				4.9.2021; 10.9.2021; 12- 13.9.2021; 15.9.2021; 27.9.2021				
26.6.2012	CBK			29.5.2021					
5.7.2013	CDZ			29.5.2021		17.4.2022; 24.4.2022		14.4.2023	
26.6.2012	CNB	13.10.2020		3.5.2021	26.7.2021; 11.8.2021; 12.9.2021; 25.9.2021; 28.9.2021; 3.10.2021				
26.6.2012	CNH	7.9.2020; 22.9.2020; 29.9.2020; 4.10.2020; 13.10.2020			5.9.2021; 29.9.2021; 6.10.2021; 12.10.2021		23.9.2022; 24.9.2022; 25.9.2022; 2.10.2022; 9.10.2022; 10.10.2022; 22.10.2022; 27.10.2022	27.5.2023; 31.5.2023 - breeding	
26.6.2012	CJA				10.8.2021; 1.9.2021			23.5.2023; 25.5.2023; 31.5.2023	
26.6.2012	CJN		19.3.2021						

26.6.2012	CPD		11.6.2021	19.8.2021; 24.8.2021; 12- 13.9.2021; 15.9.2021			20.7.2023
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Additionally, during the monitoring several Sandwich terns ringed in other locations abroad have been observed at Pomorie Lagoon. These are presented in *Table 9*.

Table 9: Observations of Sandwich terns ringed in other locations abroad

Date observed	Ring	Date ringed	Location of ringing
7.9.2020	K47	6.4.2020	Atlit Salt pans, Israel
4.10.2020	K47	6.4.2020	Atlit Salt pans, Israel
27.5.2021	ITP	29.4.2009	Salina Di Comacchio, Ferrara, Italy
29.5.2021	ITP	29.4.2009	Salina Di Comacchio, Ferrara, Italy
10.8.2021	K32	6.4.2020	Atlit Salt pans, Israel
15.8.2021	K32	6.4.2020	Atlit Salt pans, Israel
16.8.2021	K32	6.4.2020	Atlit Salt pans, Israel
24.9.2021	K31	6.4.2020	Atlit Salt pans, Israel
24.9.2021	K44	6.4.2020	Atlit Salt pans, Israel
27.9.2021	K47	6.4.2020	Atlit Salt pans, Israel
29.6.2022	K58	22.2.2022	Atlit Salt pans, Israel
28.4.2023	K49	13.4.2020	Atlit Salt pans, Israel
22.8.2022	ES00195		Ukraine
30.8.2022	IHL		Italy
25.5.2023	E101715	9.9.2021	Sacalin Island, Danube Delta Reserve, Romania
25.5.2023	ES01XXX		Ukraine
25.5.2023	PLO 421	20.7.2009	Ujście Wisły, Poland
27.5.2023	MARK?		Denmark
27.5.2023	E101715	9.9.2021	Sacalin Island, Danube Delta Reserve, Romania
20.6.2023	PLO 421	20.7.2009	Ujście Wisły, Poland
12.7.2023	MPP	16.6.2022	Salinas De San Pedro Del Pinatar, Murcia, Spain

Common tern (*Sterna hirundo*)

The Common tern (*Sterna hirundo*) is in the Least Concern category in the IUCN Red list of endangered species. The species breeds between April and June in solitary pairs or colonially in groups of up to several thousand pairs, laying eggs on the ground in habitats inaccessible to predators - islands and coastal sand spits. There are isolated nesting sites along the Black Sea coast (mainly around Burgas), along the Danube, Maritsa, Arda, Struma and Ogosta rivers. In Bulgaria it is numerous in Pomorie Lake, Atanasovsko Lake and Poda Protected Area, where it nests on artificial islands and platforms built especially for this purpose.

The species is a strongly migratory coastal seabird. It winters further south, being found along the coast of Africa (excluding northern Africa), returning to the breeding grounds in April as it is seen from the diagram below. The main threats to the species are the drying of wetlands, water pollution, disturbance during the breeding season, urbanization of nesting sites.

During the current study, that was the second most numerous species following the Sandwich tern. In late May and early June 2021, we recorded 141 pairs – 64 of these were nesting on wooden platforms in salt pans and southwestern part of the lagoon. With drying out of salt pans that platform was abandoned while the rest were occupied shortly by Sandwich terns that have chased away the Common terns. 74 pairs were nesting in the salt pans of the Salt Museum – 42 on an islet and 32 along dikes. Heavy rains in June have caused flooding of nests and many of these were abandoned. In July number of pairs in the Salt Museum salt pans has decreased to approx. 50 pairs. In beginning of July another colony was detected on an islet formed from eroded dikes and thanks to drone survey 292 pairs were counted there mixed with approx. 40 pairs of Little Tern (Fig. 52). Thus, **breeding pairs in 2021 are estimated as 342**. In mid-August visit to the large colony on this islet revealed breeding success was quite low with many abandoned nests and eggs (at least 50%). That was probably caused by predators. These late or second broods were observed as late as on 15th September with hatchlings aged about 10-12 days. In general, the nesting success of the species in 2021, based on existing data can be considered as stable – low breeding success was compensated with much higher number of pairs.



Figure 52: Drone image of the Common terns' colony in 2021

In beginning of June **2022, total of 161 pairs of Common tern** were recorded as incubating at the site. The highest number was again occupying the islet formed from eroded dikes – 76 pairs and other concentrations were at the salt pans of Salt Museum with 56 (most of these using the small islet there) and 23 pairs nested on the restored islet occupied by the Sandwich tern colony (Figure 54). In general, the breeding population of the species in 2022, based on existing data **can be considered as stable**:

the target value of 100 breeding pairs was exceeded and no negative events like mass mortality of chicks, flooding and abandoning of nesting sites were observed. That year a colour ringing scheme for the species at Pomorie Lagoon was initiated using red rings with 3-letter white code starting with “B”. First 3 chicks were ringed in the colony nesting on the small islet in the Salt Museum saltpans (Figure 55).

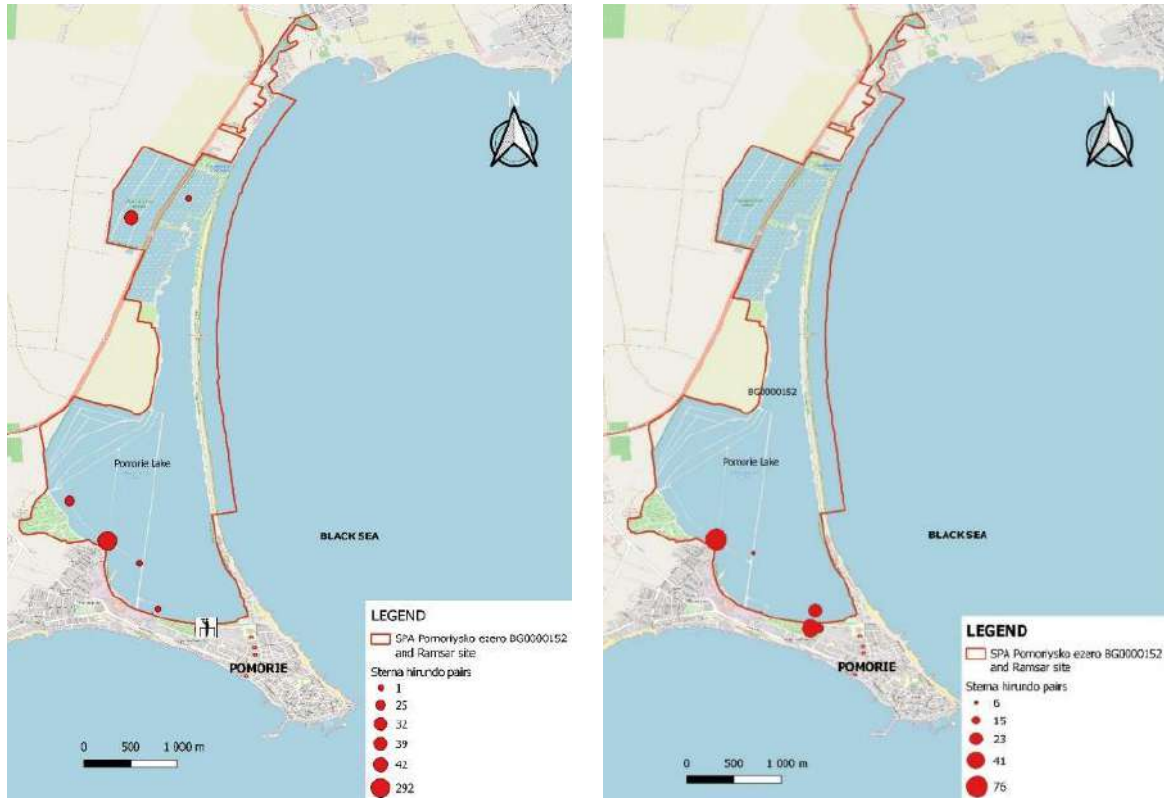


Figure 53 and Figure 54: Location of registered Common tern pairs/colonies at Pomorie Lake in 2021 and 2022



Figure 55: Drone image of the Common terns' colony nesting in islet in Salt Museum saltpans in 2022

In **2023**, as stated above in the section for the Sandwich tern, the conditions were not very good in terms of high water level. In the **end of May**, a **total of 133 pairs** have been recorded at the site, with the highest number of these was again occupying the islet formed from eroded dikes – 105 pairs, 12 pairs were nesting on the wooden platforms (10 of these on the newly-built one), 13 were nesting on the repaired islet in front of Salt Museum and only three were in the museum’s salt pans (Figure 56). In the beginning of July situation has changed and the eroded dikes’ islet was completely abandoned and the majority of pairs (66) have moved to the restored islet in front of Salt Museum while in the in the museum’s salt pans number of pairs increased to 16 (Figure 57).

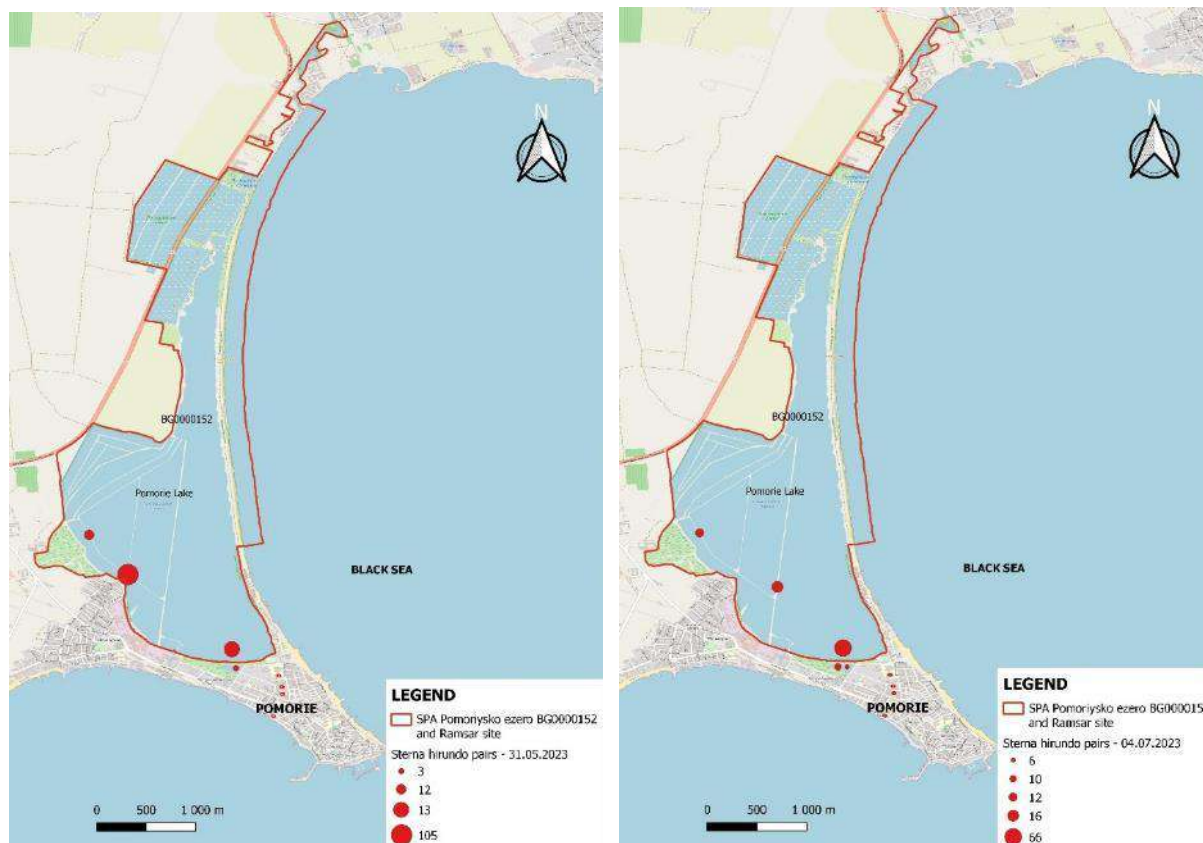


Figure 56 and Figure 57: Location of registered Common tern pairs/colonies at Pomorie Lake in May and July 2023

As the diagram (Figure 58) shows breeding numbers of Common terns have exceeded the target value of 100 pairs in all three years of the study. Breeding success though was fluctuating and losses of clutches were observed with many abandoned eggs in both 2021 and 2023 as well as change of nesting locations. Late broods were also observed with hatchlings as late as July and August. Initial nest loss is the common reason for late nesting, which is kind of a compensation measure for the species. Although typically singlebrooded, Common tern pairs occasionally attempt to raise a second brood (Hay 1984). Later egg laying and hatching can also be linked to the colder start of the nesting season. **Epidemic of non-determined agent** was reported to have caused mass mortality of Common (99%) and Little tern (70%) chicks in Atlit Salt pans, Israel (Y. Kiat, pers. comm.) in 2022 and 2023. Mass abandonment of clutches encountered at Pomorie in 2021 and to lower degree in 2023 could also be result of that, given the clear link between the two sites revealed by numerous ringed birds.

As mentioned above, a colour-ringing scheme for the species was initiated at Pomori Lagoon in 2022. Ringed chicks and their later recoveries are presented in Table 10.

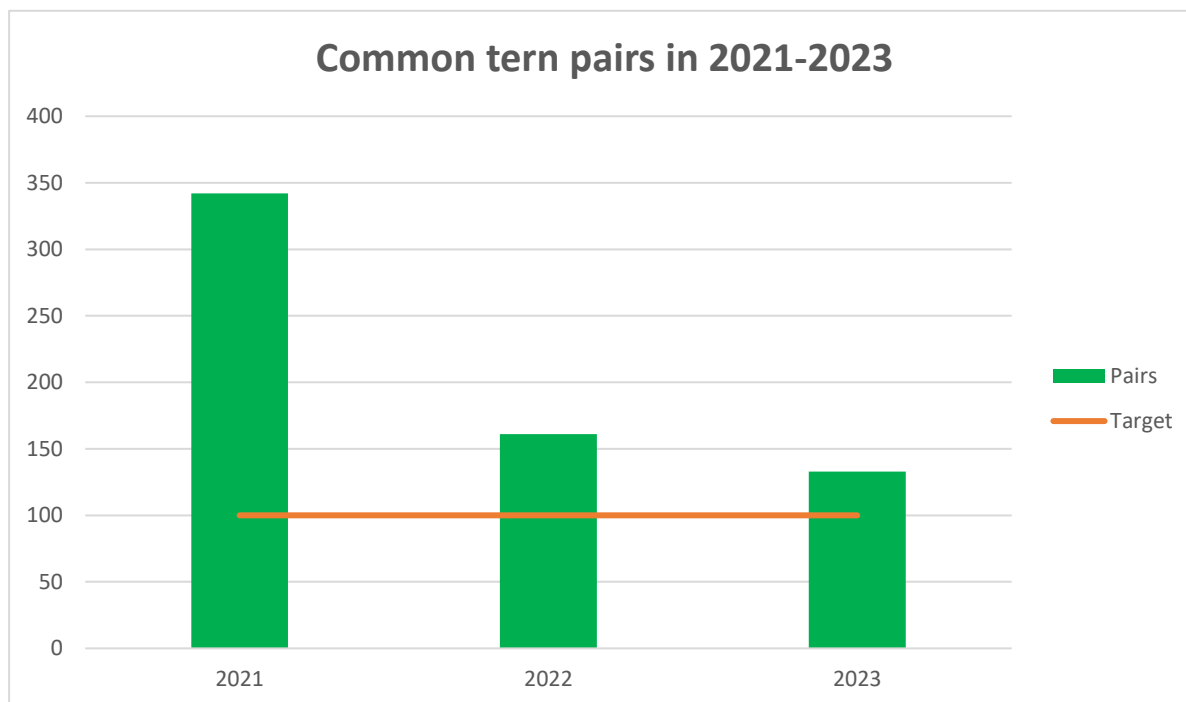


Figure 58: Common tern pairs in 2021 – 2023

Table 10: Ringed Common tern chicks at Pomorie Lagoon and recoveries

Ringed	Ringling location	Code	Recovery date	Recovery location
13.7.2022	Islet in Salt Museum	BAA		
13.7.2022	Islet in Salt Museum	BAB	30.8.2022	In front of visitor centre
7.7.2023	On dike in Salt Museum saltpan	BAC	29.7.2023; 22.8.2023	In front of Salt Museum
7.7.2023	On dike in Salt Museum saltpan	BAD		
7.7.2023	On dike in Salt Museum saltpan	BAF	22.8.2023	In front of Salt Museum
7.7.2023	On dike in Salt Museum saltpan	BAH		
5.8.2023	On dike in Salt Museum saltpan	BAJ	22.8.2023; 1.9.2023; 3.9.2023	In front of Salt Museum
22.8.2023	Islet in Salt Museum	BAK	3.9.2023	At natal islet
22.8.2023	Islet in Salt Museum	BAL		
22.8.2023	Islet in Salt Museum	BAN	1.9.2023; 2.9.2023; 3.9.2023	At natal islet
22.8.2023	Islet in Salt Museum	BAP	1.9.2023; 2.9.2023	At natal islet
3.9.2023	Islet in Salt Museum	BAS	3.9.2023	At natal islet
3.9.2023	Islet in Salt Museum	BAT		
3.9.2023	Islet in Salt Museum	BAV		
3.9.2023	Islet in front of Salt Museum	BAZ		

During the monitoring Common terns with colour rings have been observed. These were originating from Bulgaria, Israel, Poland and Hungary. Information about ringing details was not received for all of them. Breeding was confirmed for the tern with yellow ring from Israel (I3A) in both 2022 and 2023 at the same location: the small islet in the saltpans of Salt Museum. Available information is presented in Table 11.

Table 11: Observed Common terns with colour rings during monitoring

Date observed	Ring	Date ringed	Location of ringing
3.5.2021	BAD	7.7.2015	Atanasovsko Lake, Bulgaria
8.5.2021	BZC		Atanasovsko Lake, Bulgaria
15.5.2021	BZC		Atanasovsko Lake, Bulgaria
29.5.2021	GZU	10.5.2020	Atlit Saltpans, Israel
5.6.2021	BAK		Atanasovsko Lake, Bulgaria
7.7.2021	IZX	26.4.2015	Atlit Saltpans, Israel
14.7.2020	GWE	8.4.2019	Atlit Saltpans, Israel
11.8.2021	BAH		Atanasovsko Lake, Bulgaria
20.8.2021	GWE	8.4.2019	Atlit Saltpans, Israel
20.8.2021	GAE	29.3.2021	Atlit Saltpans, Israel
3.9.2021	IPZ	23.4.2018	Atlit Saltpans, Israel
3.9.2021	BNC		Atanasovsko Lake, Bulgaria
12.9.2021	23Y	10.6.2015	Zbiornik Jezirsko, Glinno, Poland
12.9.2021	T60	17.7.2017	Poroszló (Tisza-tó), Hungary
12.9.2021	G89	29.4.2018	Atlit Saltpans, Israel
13.5.2022	ITM	4.5.2015	Atlit Saltpans, Israel
14.5.2022	BAD	7.7.2015	Atanasovsko Lake, Bulgaria
14.5.2022	GWE	8.4.2019	Atlit Saltpans, Israel
14.6.2022	GWE	8.4.2019	Atlit Saltpans, Israel
12.7.2022	I3A	2.2.2017	Atlit Saltpans, Israel
19.8.2022	IPZ	23.4.2018	Atlit Saltpans, Israel
30.8.2022	IPZ	23.4.2018	Atlit Saltpans, Israel
25.5.2023	I3A	2.2.2017	Atlit Saltpans, Israel
27.5.2023	I3A	2.2.2017	Atlit Saltpans, Israel
15.6.2023	KR7	18.6.2021	Rakitje, Zagreb, Croatia
16.6.2023	KR7	18.6.2021	Rakitje, Zagreb, Croatia
16.6.2023	I3A	2.2.2017	Atlit Saltpans, Israel
18.6.2023	HEF	23.6.2021	Biale Piątkowo, Poland
8.7.2023	BAD	7.7.2015	Atanasovsko Lake, Bulgaria
12.7.2023	MUT	10.8.2021	Wyspa Wyniesiona, Poland
20.7.2023	I3A	2.2.2017	Atlit Saltpans, Israel
20.7.2023	BAD	7.7.2015	Atanasovsko Lake, Bulgaria
22.7.2023	I3A	2.2.2017	Atlit Saltpans, Israel
25.7.2023	7Y6	16.6.2022	Jez. Dąbie, Lubczyna, Poland
25.7.2023	KRU	24.6.2022	Rakitje, Zagreb, Croatia
27.7.2023	BAD	7.7.2015	Atanasovsko Lake, Bulgaria
29.7.2023	BTV	18.6.2021	Zb.Gzel, Rybnik, Śląskie, Poland
29.7.2023	7Y6	16.6.2022	Jez. Dąbie, Lubczyna, Poland

3.8.2023	IPZ	23.4.2018	Atlit Saltpans, Israel
3.8.2023	IE3	12.4.2018	Atlit Saltpans, Israel
3.8.2023	I3A	2.2.2017	Atlit Saltpans, Israel
5.8.2023	IPZ	23.4.2018	Atlit Saltpans, Israel
6.8.2023	I3A	2.2.2017	Atlit Saltpans, Israel
6.8.2023	IE3	12.4.2018	Atlit Saltpans, Israel
21.8.2023	GAE	29.3.2021	Atlit Saltpans, Israel
21.8.2023	IPZ	23.4.2018	Atlit Saltpans, Israel
22.8.2023	IPZ	23.4.2018	Atlit Saltpans, Israel
22.8.2023	N47	14.6.2015	Mocsa (Váli-tó), Hungary
23.8.2023	I3A	2.2.2017	Atlit Saltpans, Israel
1.9.2023	I3A	2.2.2017	Atlit Saltpans, Israel
1.9.2023	H88	14.7.2021	Mocsa (Váli-tó), Hungary
3.9.2023	H31	3.7.2021	Mocsa (Váli-tó), Hungary

Little tern (*Sternula albifrons*)

In Bulgaria the species is found in the wetlands around Bourgas, including Pomorie Lake, Lakes Shabla and Durankulak and on the Danube coast - the swamps of the island of Belene and the Tsibar marsh. During migration it can be observed in other places, mainly along the Black Sea coast. The species winters in Africa. Spring migration is in April-May, and autumn - in August-September as it's seen from the diagram below. The species is in the Least Concern category in the IUCN Red List. According to the Bulgarian legislation the species is in the category Endangered. This is a strongly migratory coastal seabird, which usually fishes in very shallow water only a few centimeters deep, conditions that Pomorie Lake does offer. It breeds between May and July in solitary pairs or small monospecific groups usually of 1-15 pairs (rarely over 40 pairs). Breeding often get timed to coincide with peak fish abundance. The species breeds on barren or sparsely vegetated beaches, islands and spits of sand, saltmarshes, saltpans etc.

In the end of May 2021, 19 pairs were observed in single pairs or groups of 2 and max. 5 nests (Figure 59). The unstable weather in June probably caused failure in breeding for most of these. In the beginning of July higher number of pairs was observed (42) on an islet formed by eroded dikes together with almost 300 pairs of Common terns. Later inspection in mid-August though has revealed that many of the nests were abandoned but that was valid to smaller extent for the Little terns – probably about 30% were lost. **Breeding pairs for 2021 were estimated as 42.** In general, the nesting success of the species this season, based on data collected for previous years during regular monitoring of the lake from Green Balkans' experts and data provided in *Checklist for birds in Pomorie Lake*, **can be considered as stable.**

Weather conditions in 2022 have been favourable and in beginning of June in total 38 pairs of Little terns have been recorded. Highest share was using the islet formed by eroded dikes together with Common terns. Smaller numbers nested in the saltpans of the Salt Museum and along one of the internal dikes in the lagoon (Figure 60). **Breeding pairs for 2021 were estimated as 38.** In general, the nesting success of the species this season, based on data collected for previous years during regular monitoring of the lake from Green Balkans' experts and data provided in *Checklist for birds in Pomorie Lake*, **can be considered as stable.**

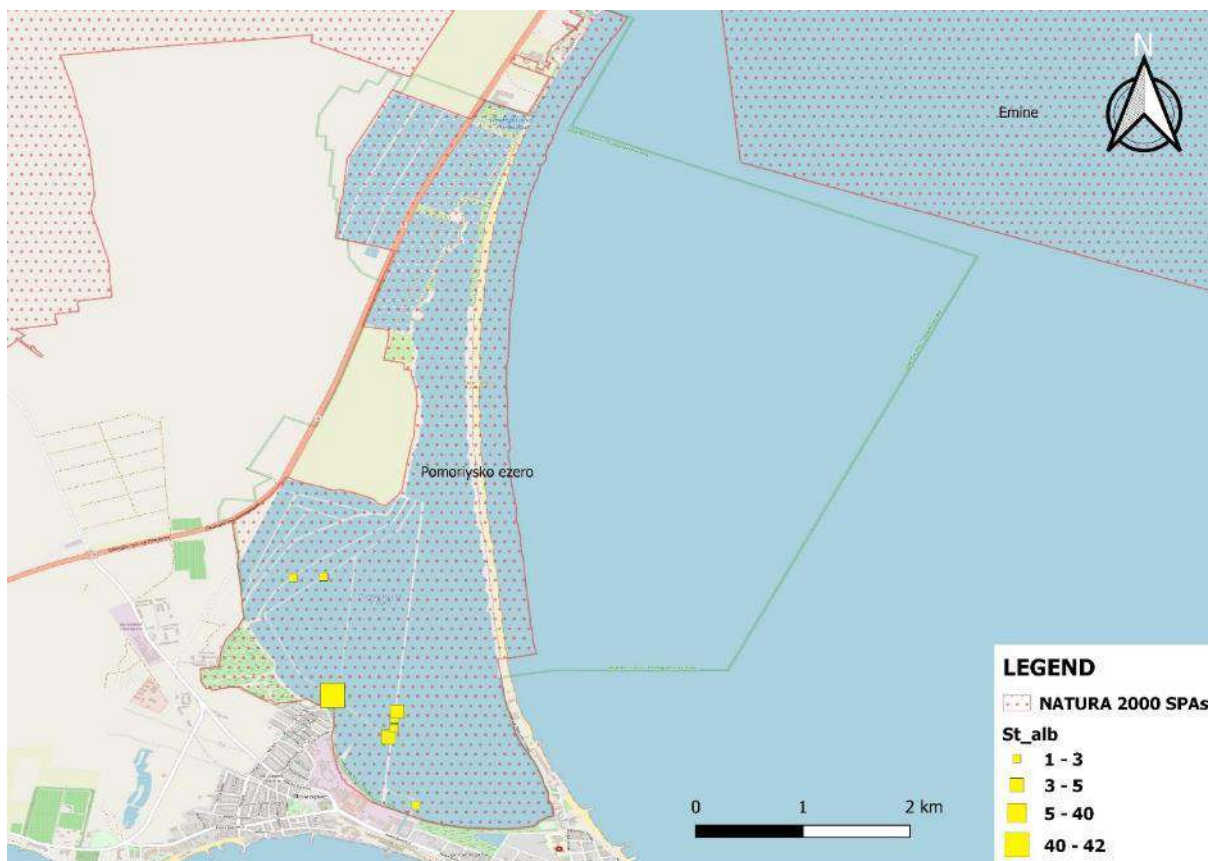


Figure 59: Location of the registered Little tern pairs at Pomorie Lake in 2021



Figure 60 and Figure 61: Location of the registered Little tern pairs at Pomorie Lake in 2022 and 2023

Despite worse conditions in 2023 that affected heavily the Sandwich terns colony breeding islet, the numbers of breeding pairs of Little terns were stable. In the end of May, Little tern pairs were estimated at 59 with the majority of these using the islet formed by eroded dikes together with Common terns, Pied avocets and Black-winged stilts. Other main breeding site were Salt Museum salt pans that host 8 pairs (Figure 61). **Breeding pairs for 2021 were estimated as 59.** Despite of this relatively high number of pairs, **breeding success of the species this season was low as inspection in July revealed that the largest colony has abandoned the nesting site leaving many nests.**

The diagram below (Figure 62) shows that target number of pairs (20) has been exceeded throughout the project duration. Though, similar like the other terns, high rate of abandonment of nesting sites and clutches was observed leading to generally low breeding success. Reasons for that are should be same as those described for the Common tern above.

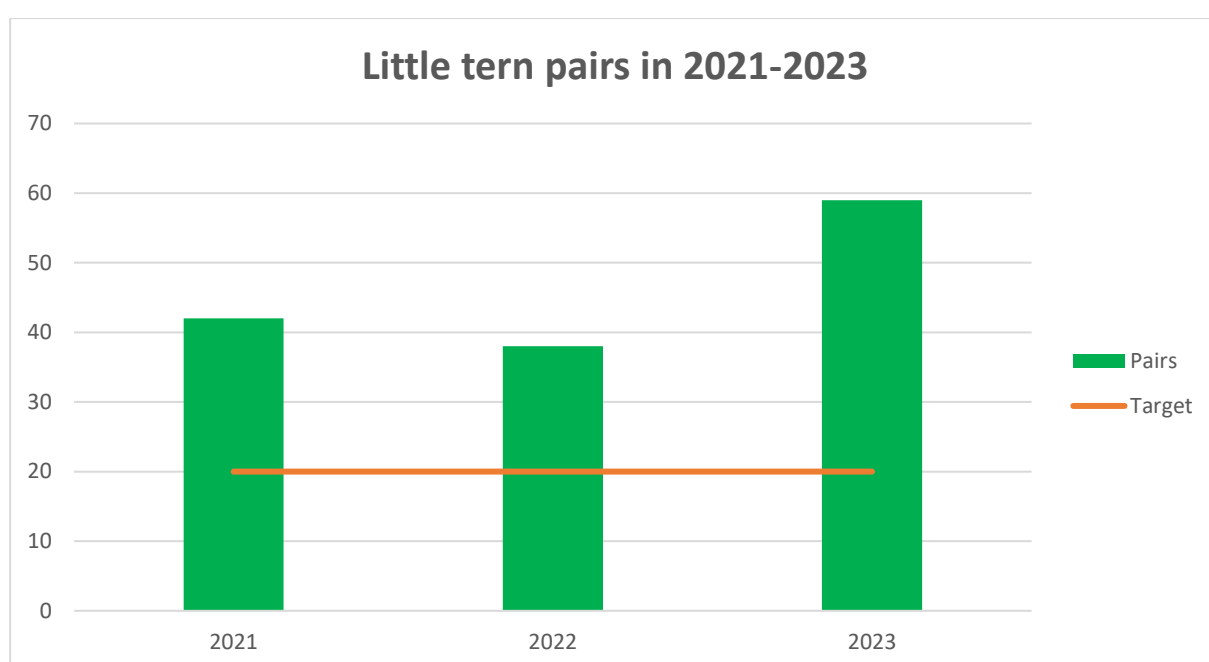


Figure 62: Little tern pairs in 2021 – 2023



Figure 63: Little terns nesting in Salt Museum salt pans

Pied avocet (*Recurvirostra avosetta*)

In Bulgaria it is found mainly in wetlands along the Black Sea coast - Pomorie Lake, Atanasovsko Lake, Poda Protected Area, Shabla Tuzla and other. Winters in the Mediterranean and Africa. Spring migration is usually in March-April, and autumn - in August-October as it's seen from the diagram below. The species is in the Least Concern category in the IUCN Red List. According to the Bulgarian legislation the species is in the category Endangered. It is listed on Annex I of the EU Birds Directive and Annex II of the Bern Convention. It breeds from April to August in large colonies usually of between 10 and 70 pairs, as it is observed also in Pomorie Lake. The species breeds in flat open areas with islands, ridges, spits or margins of bare sand, clay or mud and sparse short vegetation including saltpans, coastal lagoons such as Pomorie Lake. The most important characteristics of breeding habitats appear to be water levels which gradually decline over the summer to expose additional feeding areas, and high salt concentrations that prevent the development of excessive emergent and shoreline vegetation (Johnsgard et al. 1981). The nest is a scrape that may be positioned in a variety of sites including on bare sand, dried mud, short grass, dead vegetation and built-up mounds of debris. Artificially constructed nesting sites in coastal locations such as islands or rafts covered with sparse vegetation are considered successful in attracting breeding pairs and increasing breeding success of this species and these are measures provided at Pomorie Lake, too.

During the **2021 breeding season there were 36 pairs registered** (Figure 64). It should be noted low number of pairs in May when only 21 were found in the site – that being probably the lowest number for that time of the year. 8 of these that attempted to nest on wooden platforms were soon chased away by Common terns that subsequently were replaced by Sandwich terns before these also abandoned them. Main breeding area was the Sandwich tern colony islet and Salt Museum's saltpans. Those experienced the adverse weather conditions (low temperatures and heavy rains) that caused mass failure due to flooding of dikes. **In general, the nesting success of the species this season can be considered as extremely low**, as no nests have been registered on the inner dikes of the lake, which are usually main nesting habitat of the species. The reason for this, based on the literature about the species, can be the problems with the hydrological regime of the lake including decreased salinity.

Breeding season in 2022 has been much more successful for the Pied avocets at Pomorie Lake. The islet repaired during the volunteer conservation camp in 2021 has provided main nesting site for the species with more than half of the registered 95 pairs breeding there. Other important sites were again the wooden platforms and the saltpans of the Salt Museum (Figure 65).

In **2023**, the positive trend for recovery of breeding numbers of Avocets at Pomorie Lake has been maintained. The newly-created wooden platform during conservation camp in 2022 was occupied by 12 pairs with further 19 using the nearby 3 older platforms. Other important breeding site was the islet formed by eroded dikes where 58 pairs were counted in end of May (Figure 66). **Total number of nesting pairs in Pomorie Lake in 2023 was recorded as 123 – the highest during the project duration.**

As it's seen from the diagram below (Figure 67) the set target of 80 nesting pairs has not been reached only in the first project year, but that was also the lowest number of breeding pairs registered at the site. After habitat restoration activities were conducted during the project, the target value was exceeded. We can conclude that the Pied avocet is the species that benefited mostly from the performed habitat restoration activities occupying the restored islet in 2022 and newly created wooden platform in the following year (Figure 68).

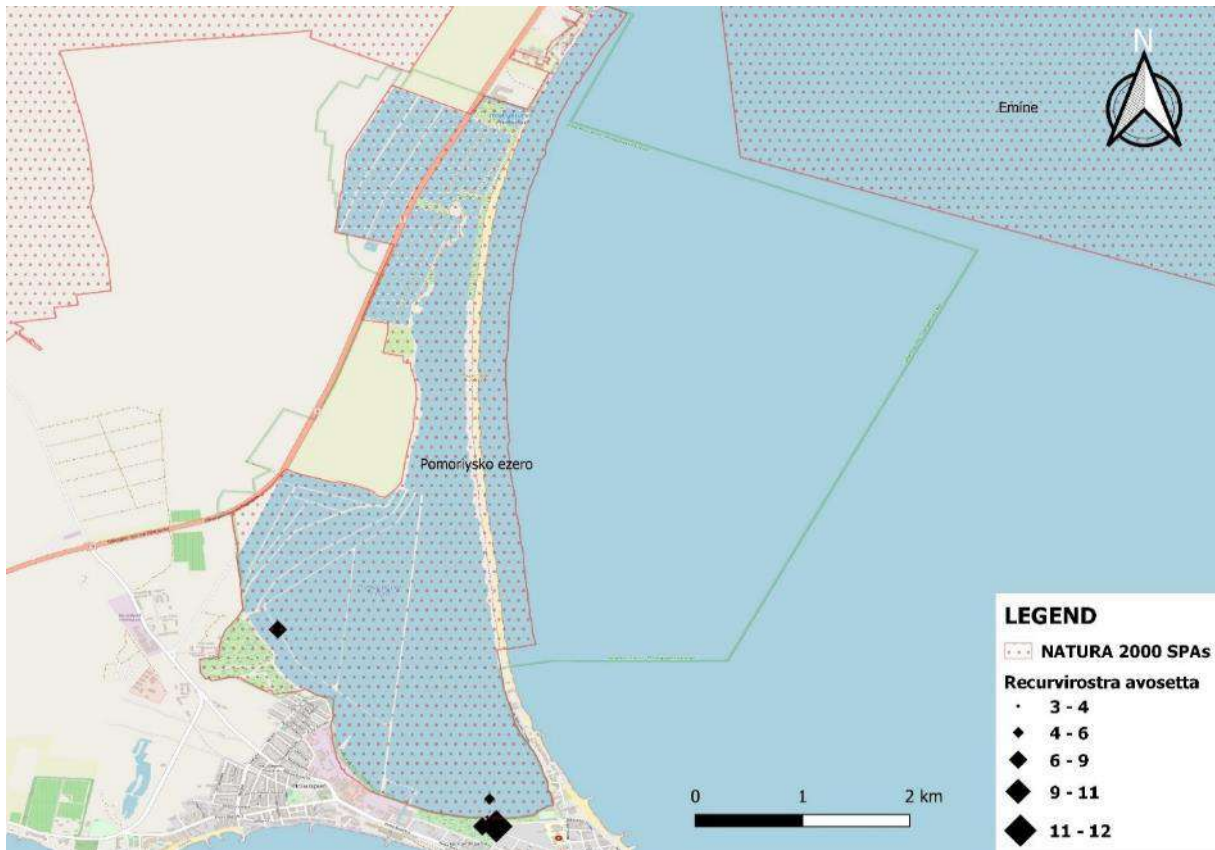


Figure 64: Locations of registered Pied avocet pairs at Pomorie Lake in 2021

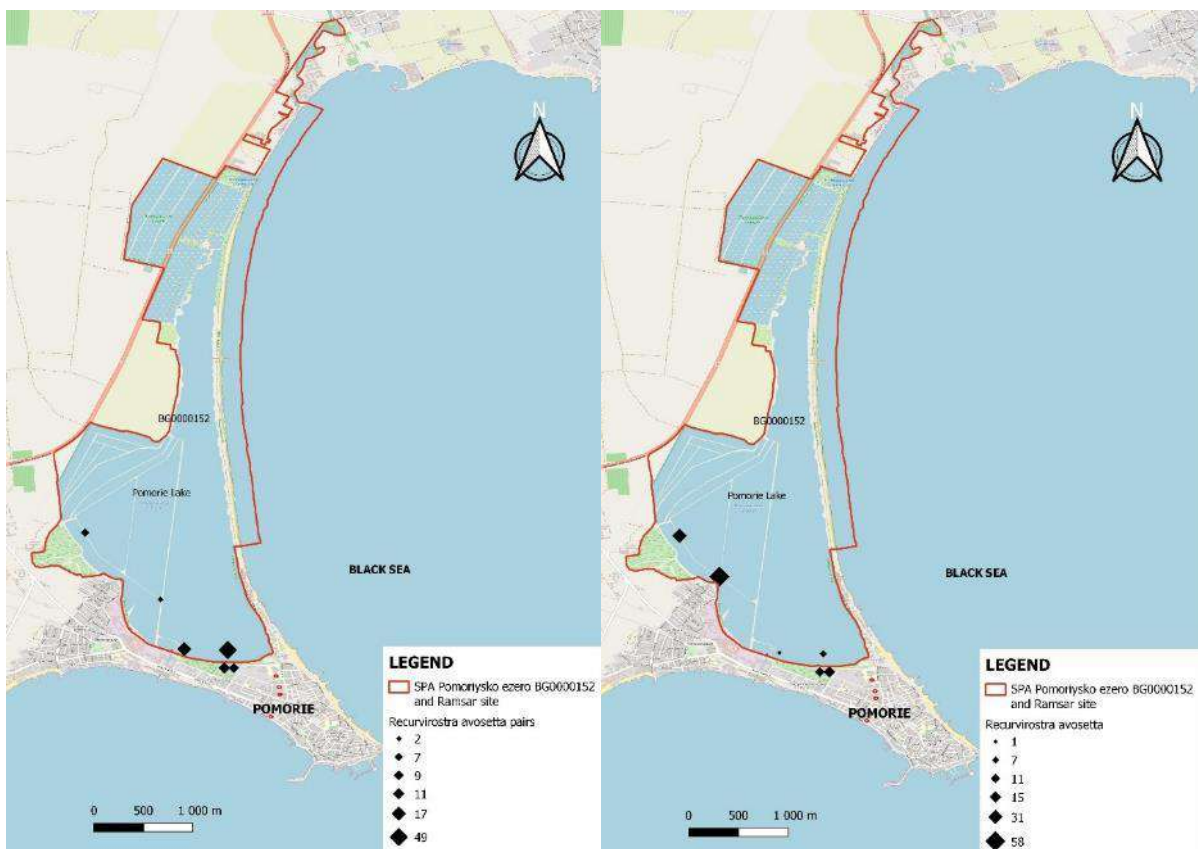


Figure 65 and Figure 66: Locations of registered Pied avocet pairs at Pomorie Lake in 2022 and 2023

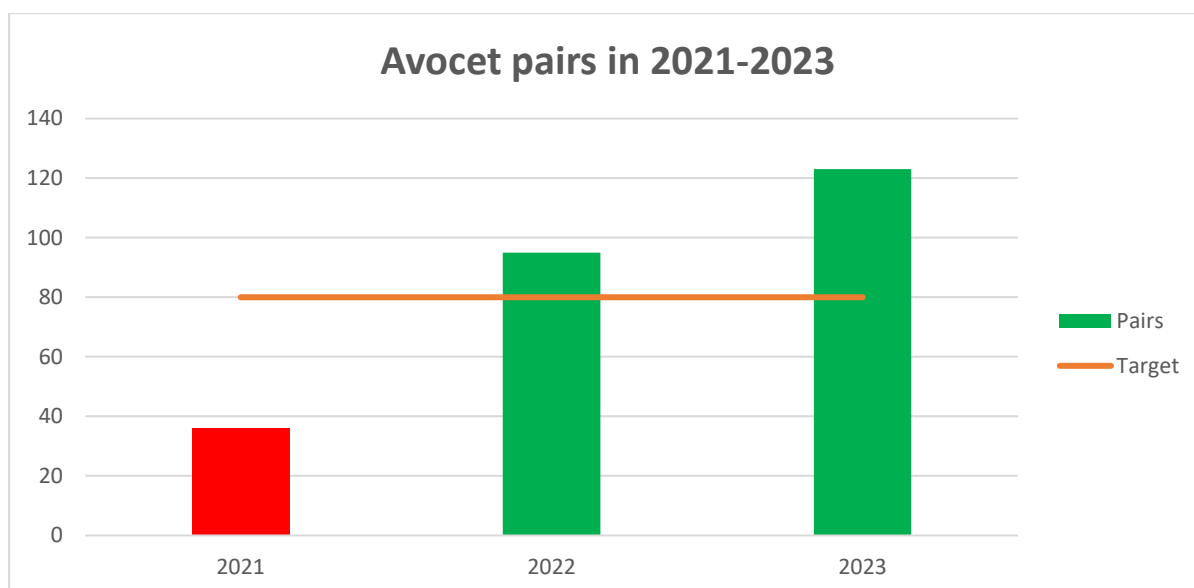


Figure 67: Pied avocet pairs in 2021 – 2023



Figure 68: Drone image of Pied avocets nesting on new platform, created within the project

Black-winged stilt (*Himantopus himantopus*)

In Bulgaria it is found in the wetlands along the Black Sea coast, especially in the saline Pomorie and Atanasovsko Lakes, the Thracian lowlands, the wetlands along the Danube and others. The species is in the Least Concern category in the IUCN Red List. According to the Bulgarian legislation the species is in the category Endangered. Protected by EU Birds Directive and 4 other international agreements –

Annex I and II of Bern Convention, Annex II of Bonn Convention, Annex II of the Convention on Migratory Species of Wild Animals. European populations of this species make long-distance migratory movements, travelling southwards to their wintering grounds between August and November and returning to their breeding areas between March and April. As it is seen from the diagram below there is a clear peak in the number of the species on Pomorie Lake in July and it is abundant in the area of the lake in the period April-August. An interesting phenomenon is the observation of an individual in the lake during the winter months. The species usually breeds solitarily or in loose colonies of 2-50. The species typically breeds in shallow freshwater and brackish wetlands with sand, mud or clay substrates and open margins, islets or spits near water level. Suitable habitats include marshes and swamps, shallow lake edges, riverbeds, flooded fields, but also breed around more saline environments such as coastal lagoons and salt pans. Outside of the breeding season the species occupies the shores of large inland waterbodies and estuarine or coastal habitats, coastal lagoons. The nest is a depression or shallow scrape positioned on hard ground near water on a hummock or amongst grass. Alternatively, the nest may be a more elaborate platform of vegetation constructed on a floating mass of aquatic vegetation. The species nests singly or in loose colonies, showing a preference for open areas close to foraging sites with good all-round (360 degree) visibility.



Figure 69: Black-winged stilt with chicks breeding at Pomorie Lake

During the breeding season of 2021 there were 26 pairs registered in the site (Figure 70). This number is **very low** and success was further decreased as most nests seemed to have suffered from predation by stray dogs and others. **In general, the nesting success of the species this season can be considered as low.**

The breeding season of 2022 has confirmed that **negative trend** and **there were only 23 pairs recorded** at the site (Figure 71). Distribution was similar like in 2021 with most nests situated in southern part of the lagoon including salt pans of the Salt Museum. Just like with Pied Avocet the largest decline was related to lack of nesting pairs along internal dikes in the lagoon.



Figure 70: Locations of the registered Black-winged stilt pairs at Pomorie Lake in 2021



Figure 71 and Figure 72: Locations of the registered Black-winged stilt pairs at Pomorie Lake in 2022 and 2023

In total 53 pairs were recorded at the site in 2023 with the largest number nesting on the islet formed by eroded dikes occupied also by Pied avocets, Little and Common terns (Figure 72). Approximately 80% of nesting pairs were concentrated there. Despite of that relatively high number of nesting pairs **the breeding success was low** as that islet was completely abandoned in the beginning of July. On the restored islet in front of the Salt Museum there were 2 pairs nesting each year.

The breeding season in 2023 was the only when the target value of 50 breeding pairs was achieved (Figure 73). The Black-winged stilt is the species that has least benefited of the restoration activities and that is to great extent due to specific biology of the species: it is building nests with plenty of vegetation material and is the least inclined to occupy man-made habitat like islets and platforms. The most beneficial measure is controlled hydrological regime but as described above the external strong negative effect as result of the road construction and destroyed swamp led to cease of saltworks operation and uncontrollable hydrological regime.

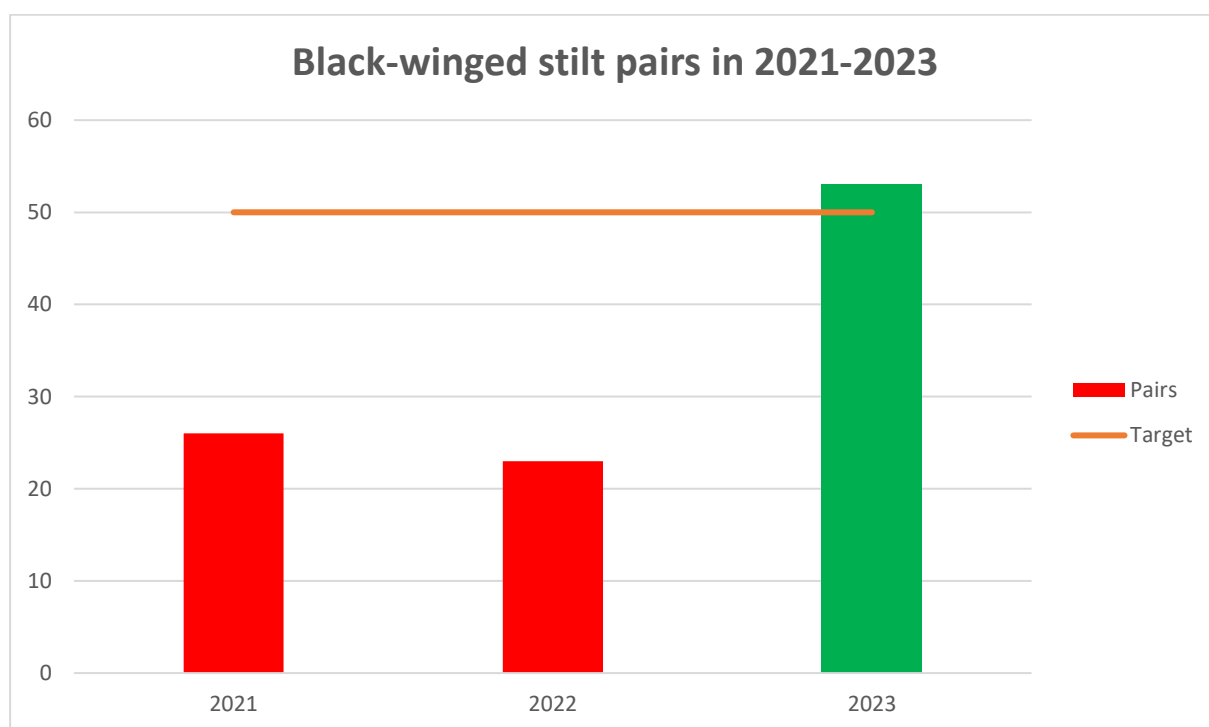


Figure 73: Black-winged stilt pairs in 2021 – 2023

Kentish plover (*Charadrius alexandrinus*)

In Bulgaria it is found around the Pomorie and Atanasovsko Lakes, Poda Protected Area, Shablenska Tuzla, Durankulak Lake and their adjacent beaches. According to the Bulgarian legislation the species is in the category Critically Endangered. The species is in the Least Concern category in the IUCN Red List and is listed in Annex I of the EU Birds Directive and Annex II of the Bern Convention. Most inland and northern coastal populations of the species, such as considered, are fully migratory and have distinct separate breeding and wintering ranges (del Hoyo et al. 1996). The species occupies its breeding grounds chiefly from March to October, with the southward migration peaking in September. The species nests solitarily or in loose semi-colonial groups, usually in densities of 0.5 to 20 pairs per hectare (exceptionally up to 100 pairs per hectare), and sometimes in association with other species. During all seasons the species is predominantly coastal and is usually found on sand, silt or dry mud surfaces. It is uncommon on freshwater, even when migrating (Hayman et al. 1986). Typical habitats

include sandy, pebbly or muddy shores, dunes, coastal lagoons, coastal marshes, etc. The nest is a shallow scrape positioned near water on bare earth or in sparse vegetation, often on slightly raised ground and partly sheltered by plants or near conspicuous objects such as grass clumps or shrubs. The species nests in semi-colonial groups, with nests spaced between 2 and 5 m. The species is threatened by the disturbance of coastal habitats (e.g. tourists trampling nests and disturbing roosts on beaches). One of the serious threats to the species is the deterioration of the hydrological regime of the species' habitats. It is also threatened by the degradation and loss of wetland habitat through environmental pollution, urbanisation.



Figure 74: Kentish plovers with chicks at Pomorie Saltpans in 2021

During **the breeding season in 2021** there were 12 pairs registered in the site. Most of these (7 pairs) were in the saltpans where chicks were also observed and the rest were recorded along the sand spit separating the lagoon from the sea (Figure 75). In general, the nesting success of the species this season, based on data collected for previous years during regular monitoring of the lake from Green Balkans' experts and data in *Checklist for birds in Pomorie Lake*, **can be considered as stable**.

During **the breeding season in 2022** there were 14 pairs registered in the site. Since the saltpans have ceased operation no breeding pairs were observed there. All pairs were recorded in the sand dunes along the sand spit that separates the lagoon from the Black Sea (Figure 76). The nesting success of the species in **2022 can be considered as stable**.

During **the breeding season in 2023** there were again 14 pairs registered in the site in the second part of May. Survey in the beginning of May has shown more than 20 pairs to demonstrate breeding behaviour, but probably some of these were still migrating. Just like in 2022 no pairs were detected in the dry saltpans. All pairs were recorded in the sand dunes along the sand spit that separates the lagoon from the Black Sea (Figure 77). The nesting success of the species in **2023 can be considered as stable**.

The diagram (Figure 78) is showing that the target value of 10 pairs nesting at the site was exceeded throughout the project confirming the importance of the site for that declining species. Despite of that since the saltpans are not operating and the hydrological regime is uncontrolled traditional breeding locations have been lost. Early breeding (before mass beach tourism) of the species is helping the species to breed relatively undisturbed on the sand spit, but in recent years a running event is organized on the spit and despite efforts to inform and avoid the sand dunes was made that was to no avail.

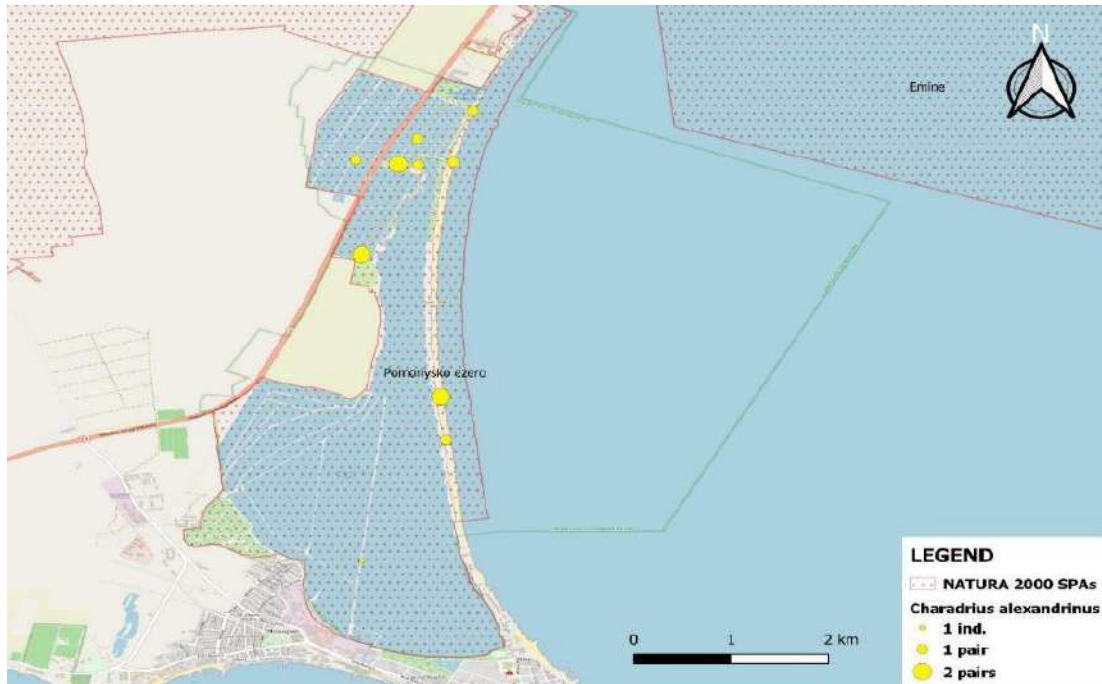


Figure 75: Locations of Kentish plover pairs registered at Pomorie Lake in 2021



Figure 76 and Figure 77: Locations of Kentish plover pairs registered at Pomorie Lake in 2022 and 2023

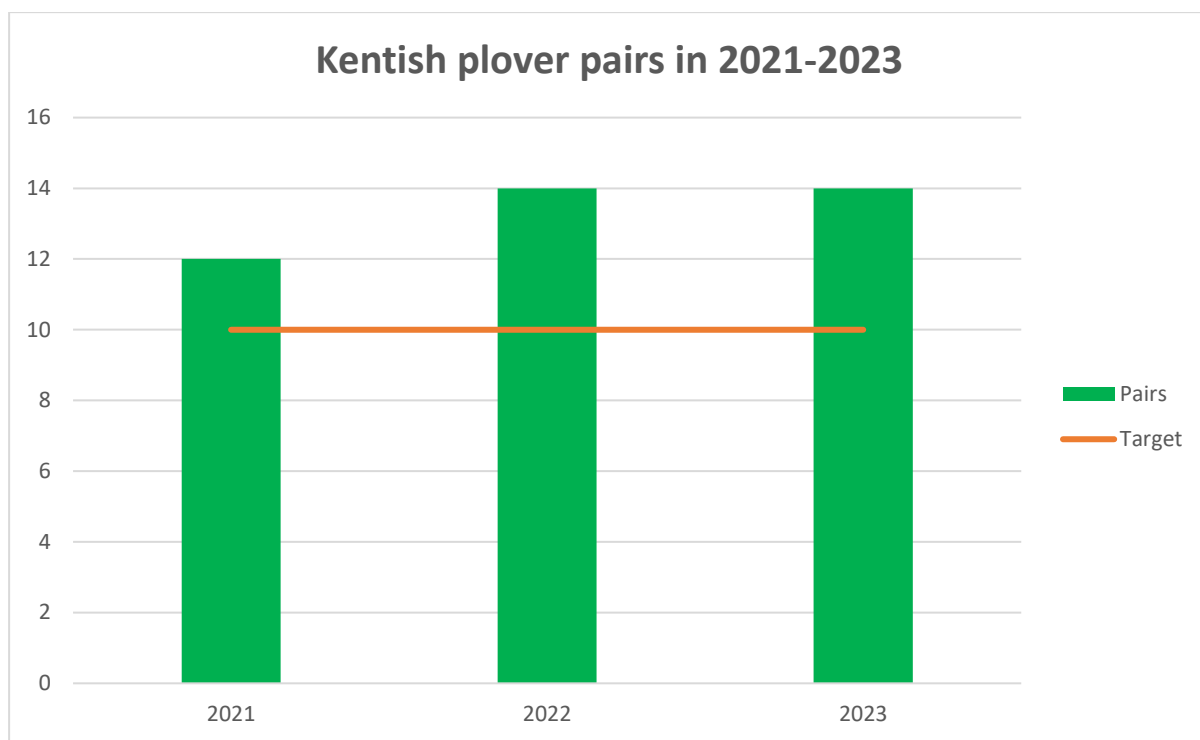


Figure 78: Kentish plover pairs in 2021 – 2023

Other species

During the current breeding bird surveys several other species of water birds have been observed to breed in the site.

Shelduck (*Tadorna tadorna*) is traditional breeder at the site, that is one of most important in the country for the species including as wintering grounds. During previous years nest-boxes for Shelduck have been installed in dikes of Pomorie Lake. Eggshells were recorded in 2015 suggesting some of the boxes were used. In 2021, traces of down and feathers were also observed close to one of the boxes but no birds were found inside any of these. During the breeding season of **2021 there were 12 pairs registered** (Figure 79) at the site. No nests were found but later during the breeding season several adults with 18 chicks were observed. Most of the pairs were observed in the saltpans. In the breeding season of **2022 number of observed pairs was only 5 and in 2023 that number was 6**. Juveniles were observed in 2023 to confirm successful breeding.

Mute swan (*Cygnus olor*) is traditionally breeding at the site and the number of pairs during the three years of the study varied between 2 and 4. Those have been philopatric and nests were in almost identical locations. Survival of the chick varied but minimum number per pair was 2 and maximum 5.

Gadwall (*Mareca strepera*) is other duck species that is regularly breeding at the site. Number of pairs varied between 2 and 3. Chicks and juveniles were observed in 2023 confirming successful breeding. were detected during the breeding season but no nests were found.

Coot (*Fulica atra*) is irregular breeder at Pomorie Lake. In breeding season of 2021 one nest was observed while at least one more pair was detected in the site. In the following two years no nests were found but presence of birds suggested probable breeding.

Little ringed plover (*Charadrius dubius*) is also irregularly breeding at the site and 3 pairs were recorded in 2021 at saltpans and on the sand spit next to the Black Sea. In following years 3 pairs were confirmed again to breed at the sand spit near the dry saltpans.

Oystercatcher (*Haematopus ostralegus*) is not confirmed as breeding in the site despite a pair was observed 5 years ago displaying breeding behaviour. In the breeding season of 2021, two pairs were detected to display breeding behaviour and alert calls. No nests were found. In 2022, one successful pair has bred in the dry saltpans – it was observed on the roof of concrete building with 2 chicks in June. In 2023, breeding attempts were observed but nesting was not confirmed.

Lapwing (*Vanellus vanellus*) was observed during past breeding seasons. In 2021, one chick was observed in the saltpans and two pairs displayed breeding behaviour. No breeding pairs were detected in 2022, but in 2023 two pairs displayed breeding behaviour.

Marsh harrier (*Circus aeruginosus*) is a raptor that is regularly breeding at the site. In 2021, thanks to the drone one nest was located and 5 eggs were counted in it. Presences of breeding pair was also evident in the following two years.

Collared pratincole (*Glareola pratincola*) is irregular breeder in the vicinity of the lagoon depending on the crop rotation. In 2021 some sunflower and corn fields around the lagoon provided suitable habitat. In late breeding season many juveniles were observed suggesting colonies bred at the site. Estimated breeding pairs were at least 30. No breeding was confirmed in the following two years.

All located nests and probable locations of these species over the three-year period are shown in Figures 80-82.

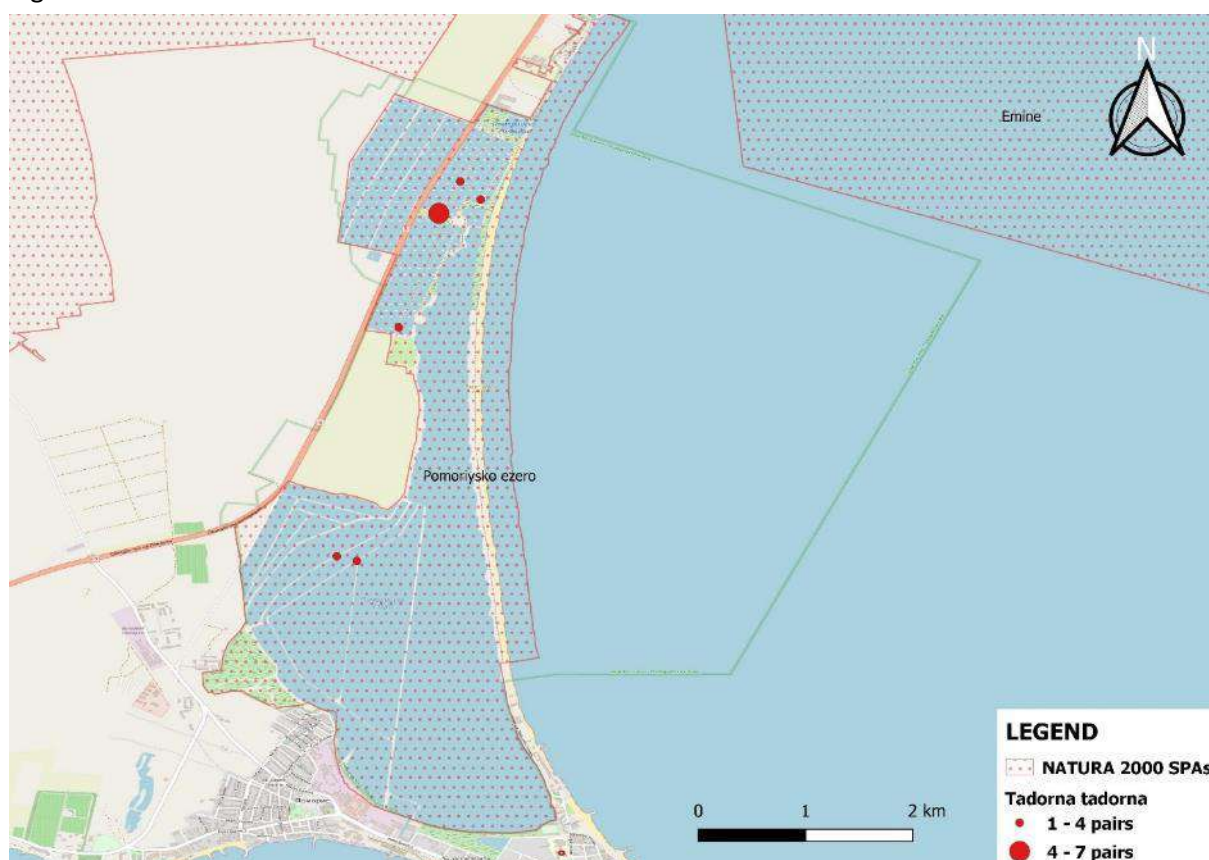


Figure 79: Common shelduck pairs at Pomorie Lake in 2021

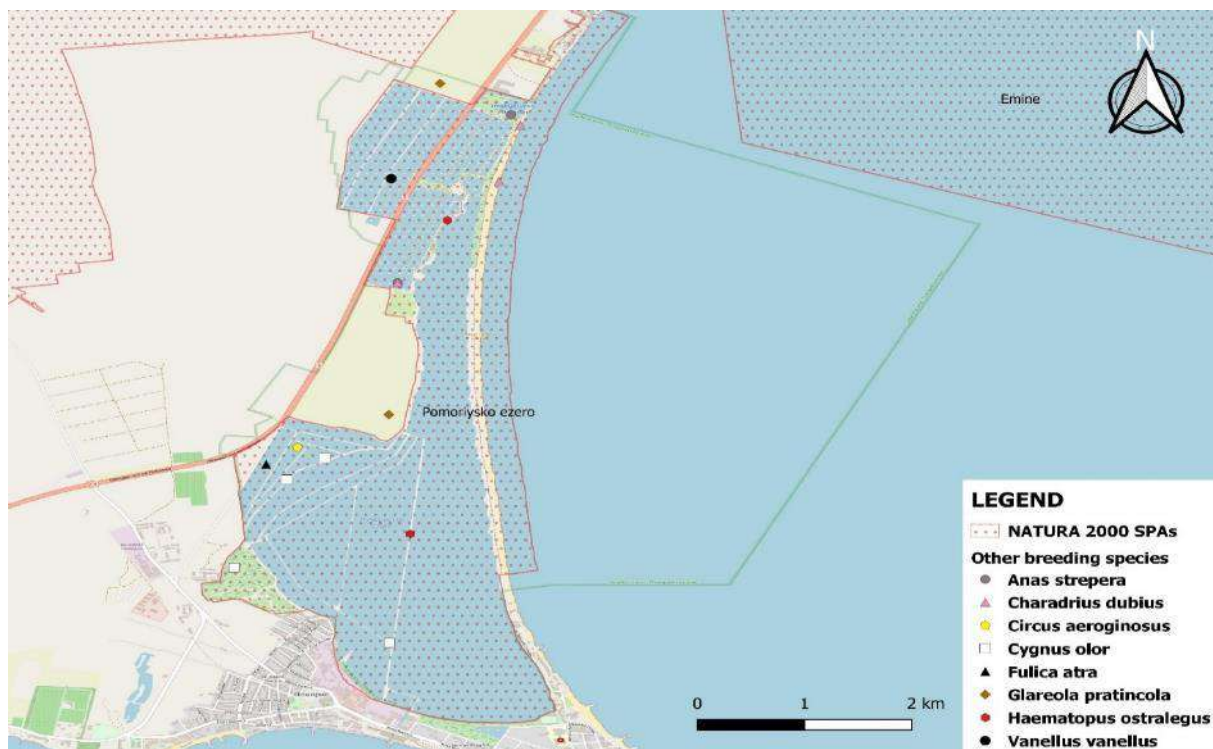


Figure 80: All registered nests and locations of probable breeders in 2021



Figure 81 and Figure 82: All registered nests and locations of probable breeders in 2022 and 2023

Table 12: International conservation status of the registered species, subject of this survey

Species	IUCN	Birds Directive Annexes	Bern Directive Appendices	AEWA Annexes	Bonn Convention Annexes
<i>Gavia arctica</i>	LC	I	I	II	-
<i>Tachybaptus ruficollis</i>	LC	-	II	II	-
<i>Podiceps cristatus</i>	LC	-	III	II	-
<i>Podiceps grisegena</i>	LC	-	II	II	-
<i>Podiceps auritus</i>	VU	I	II	II	-
<i>Podiceps nigricollis</i>	LC	-	II	II	-
<i>Puffinus yelkouan</i>	LC	I	I	-	-
<i>Phalacrocorax carbo</i>	LC	-	III	II	-
<i>Microcarbo pygmeus</i>	LC	I	I	II	-
<i>Pelecanus onocrotalus</i>	LC	I	I	II	-
<i>Pelecanus crispus</i>	LC	I	I	II	I; II
<i>Botaurus stellaris</i>	LC	I	II	II	-
<i>Ardeola ralloides</i>	LC	I	I	II	-
<i>Egretta garzetta</i>	LC	I	I	II	-
<i>Ardea alba</i>	LC	I	I	II	II
<i>Ardea cinerea</i>	LC	-	III	II	-
<i>Ardea purpurea</i>	LC	I	I	II	-
<i>Ciconia nigra</i>	LC	I	I	II	II
<i>Ciconia ciconia</i>	LC	I	I	II	II
<i>Plegadis falcinellus</i>	LC	I	I	II	II
<i>Platalea leucorodia</i>	LC	I	I	II	II
<i>Cygnus olor</i>	LC	II	III	II	II
<i>Phoenicopiterus roseus</i>	LC	I	I	II	II
<i>Cygnus columbianus</i>	EN	I	I	II	II
<i>Cygnus cygnus</i>	LC	I	I	II	II
<i>Anser albifrons</i>	LC	II	III	II	II
<i>Tadorna ferruginea</i>	LC	I	I	II	II
<i>Tadorna tadorna</i>	LC	-	II	II	II
<i>Mareca penelope</i>	LC	II; III	III	II	II

<i>Mareca strepera</i>	LC	II	III	II	II
<i>Anas crecca</i>	LC	II; III	III	II	II
<i>Anas platyrhynchos</i>	LC	II; III	III	II	II
<i>Anas acuta</i>	LC	II; III	III	II	II
<i>Spatula querquedula</i>	LC	II	III	II	II
<i>Spatula clypeata</i>	LC	II; III	III	II	II
<i>Netta rufina</i>	LC	II	III	II	II
<i>Aythya ferina</i>	VU	II; III	III	II	II
<i>Aythya nyroca</i>	LC	I	I	II	I
<i>Aythya fuligula</i>	LC	II; III	III	II	II
<i>Aythya marila</i>	VU	II; III	III	II	II
<i>Somateria molissima</i>	VU	II; III	III	II	II
<i>Bucephala clangula</i>	LC	II	III	II	II
<i>Mergellus albellus</i>	LC	I	I	II	II
<i>Mergus serrator</i>	NT	II	III	II	II
<i>Pernis apivorus</i>	LC	I	I	-	I
<i>Milvus migrans</i>	LC	I	II	-	II
<i>Haliaeetus albicilla</i>	LC	I	I	-	I; II
<i>Circaetus gallicus</i>	LC	I	I	-	II
<i>Circus aeruginosus</i>	LC	I	I	-	II
<i>Circus cyaneus</i>	NT	I	I	-	II
<i>Accipiter gentilis</i>	LC	-	II	-	II
<i>Accipiter nisus</i>	LC	-	II	-	II
<i>Buteo buteo</i>	LC	-	II	-	II
<i>Buteo rufinus</i>	LC	I	I	-	II
<i>Buteo lagopus</i>	LC	-	II	-	II
<i>Hieraaetus pennatus</i>	LC	I	I	-	II
<i>Pandion haliaetus</i>	LC	I	I	-	II
<i>Falco tinnunculus</i>	LC	-	II	-	II
<i>Falco columbarius</i>	LC	I	I	-	II
<i>Falco peregrinus</i>	LC	I	I	-	II
<i>Fulica atra</i>	NT	II; III	III	II	-
<i>Grus grus</i>	LC	I	I	-	II

<i>Tetrax tetrax</i>	VU	I	I	-	-
<i>Haematopus ostralegus</i>	VU	II	III	II	-
<i>Himantopus himantopus</i>	LC	I	I	II	II
<i>Recurvirostra avosetta</i>	LC	I	I	II	II
<i>Glareola pratincola</i>	LC	I	I	II	II
<i>Charadrius dubius</i>	LC	-	II	II	II
<i>Charadrius hiaticula</i>	LC	-	II	II	II
<i>Charadrius alexandrinus</i>	LC	I	I	II	II
<i>Pluvialis squatarola</i>	LC	II	III	II	II
<i>Vanellus vanellus</i>	VU	II	III	II	II
<i>Calidris canutus</i>	LC	II	III	II	II
<i>Calidris alba</i>	LC	-	II	II	II
<i>Calidris minuta</i>	LC	-	II	II	II
<i>Calidris temminckii</i>	LC	-	II	II	II
<i>Calidris ferruginea</i>	VU	-	II	II	II
<i>Calidris alpina</i>	LC	-	II	II	II
<i>Calidris tenuirostris</i>	NE	-	-	-	II
<i>Calidris falcinellus</i>	LC	-	II	II	II
<i>Calidris pugnax</i>	LC	I; II	I	II	II
<i>Gallinago gallinago</i>	LC	II; III	III	II	II
<i>Gallinago media</i>	LC	I	I	II	II
<i>Limosa limosa</i>	VU	II	III	II	II
<i>Limosa lapponica</i>	LC	I; II	I	II	II
<i>Numenius phaeopus</i>	LC	II	III	II	II
<i>Numenius arquata</i>	VU	II	III	II	II
<i>Tringa erythropus</i>	LC	II	III	II	II
<i>Tringa totanus</i>	LC	II	III	II	II
<i>Tringa stagnatilis</i>	LC	-	II	II	II
<i>Tringa nebularia</i>	LC	II	III	II	II
<i>Tringa ochropus</i>	LC	-	II	II	II
<i>Tringa glareola</i>	LC	I	II	II	II
<i>Xenus cinereus</i>	LC	I	I	II	II
<i>Actitis hypoleucos</i>	LC	-	II	II	II

<i>Arenaria interpres</i>	LC	-	II	II	II
<i>Stercorarius parasiticus</i>	LC	-	III	-	-
<i>Ichthyophaga ichthyophaga</i>	LC	-	III	II	-
<i>Ichthyophaga melanocephalus</i>	LC	I	I	II	II
<i>Hydrochelidon minutus</i>	NE	I	I	II	-
<i>Chroicocephalus ridibundus</i>	LC	II	III	II	-
<i>Chroicocephalus genei</i>	LC	I	I	II	II
<i>Larus michahellis</i>	LC	-	III	II	-
<i>Hydroprogne caspia</i>	LC	I	I	II	II
<i>Thalasseus sandvicensis</i>	LC	I	I	II	II
<i>Sterna hirundo</i>	LC	I	II	II	-
<i>Sternula albifrons</i>	LC	I	I	II	II
<i>Chlidonias hybrida</i>	LC	I	I	II	-
<i>Chlidonias leucopterus</i>	LC	-	II	II	II
<i>Asio flammeus</i>	LC	I	I	-	I
<i>Alcedo atthis</i>	VU	I	I	-	-
<i>Riparia riparia</i>	LC	-	II	-	-

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Annex: Data collection worksheet

Species/latin	Species/english	Migration	Marine area	Main lake	Brackish waters (Honyat)	Brackish waters (M. geren)	Salt pans North	Salt pans West	Total
<i>Gavia arctica</i>	Black-throated loon								0
<i>Gavia immer</i>	Common loon								0
<i>Tachybaptus ruficollis</i>	Little grebe								0
<i>Podiceps cristatus</i>	Great crested grebe								0
<i>Podiceps grisegena</i>	Red-necked grebe								0
<i>Podiceps auritus</i>	Horned grebe								0
<i>Podiceps nigricollis</i>	Black-necked grebe								0
<i>Calonectns diomedea</i>	Scopoli's shearwater								0
<i>Puffinus yelkouan</i>	Yelkouan shearwater								0
<i>Phalacrocorax carbo</i>	Great cormorant								0
<i>Gulosus aristotelis</i>	European shag								0
<i>Microcarbo pygmeus</i>	Pygmy cormorant								0
<i>Pelecanus onocrotalus</i>	Great white pelican								0
<i>Pelecanus crispus</i>	Dalmatian pelican								0
<i>Botaurus stellaris</i>	Eurasian bittern								0
<i>Ixobrychus minutus</i>	Little bittern								0
<i>Nycticorax nycticorax</i>	Black-crowned night heron								0
<i>Ardeola ralloides</i>	Squacco heron								0
<i>Egretta garzetta</i>	Little egret								0
<i>Egretta alba</i>	Great egret								0
<i>Ardea cinerea</i>	Grey heron								0
<i>Ardea purpurea</i>	Purple heron								0
<i>Ciconia nigra</i>	Black stork								0
<i>Ciconia ciconia</i>	White stork								0
<i>Plegadis falcinellus</i>	Glossy ibis								0