

INVESTIGATIONS ON BIRDS INHABITING
THE LITTORAL AREA, TRANSITIONAL WATERS AND
ITS SURROUNDINGS OF BULGARIAN BLACK SEA COAST
DURING THE BREEDING SEASON

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Abstract: The coastal area has very important role in the life cycle of birds, since they actively use it for breeding, feeding and migration. In the last years human impact on the coast has increased, with many nesting areas being lost because of that. A survey of the coastal birds was completed along the littoral area of the Bulgarian Black Sea coast. The studies have been made over the spring and summer of 2016, and some additional data from the 2013 – 2016 period has also been used in the study. The observations have been made using the line transect method. The birds have been registered visually, by sound and from photos. We have studied the breeding ornithofauna in the littoral area and its surroundings. This includes the main typical habitats: coastal cliffs, sand and stone beaches, dunes. The surrounding areas include grasslands, shrublands, forests, agroecosystems and buildings, situated up to 200 m from the coastline. Additionally the registrations of some conservational important bird species in the nearby wetlands are presented. We divided the birds depending their habitats in the following categories: seabirds, which breed primary in the littoral area; seabirds and waterbirds, which may nest in other areas, but also use the littoral for breeding; terrestrial birds, which nest in other areas, but may breed in the littoral; and species of birds, which only use the littoral for feeding and resting, but do not breed here. Some of the observed species from the first group were the Yelkouan Shearwater (*Puffinus yelkouan*), found only as migratory and European shag (*Phalacrocorax aristotelis*), established as nesting in the region of Tiulenovo- Kamen bryag and Kaliakra cape. In the littoral area from the second group the dominant species is the yellow-legged gull (*Larus michahellis*). Other species like

the white wagtail (*Motacilla alba*), little ringed plover (*Charadrius dubius*) and kentish plover (*Charadrius alexandrinus*) are also reported. The third group is most numerous and includes species like Northern Wheatear (*Oenanthe oenanthe*), European nightjar (*Caprimulgus europaeus*), European honey buzzard (*Pernis apivorus*), eastern olivaceous warbler (*Iduna pallida*), northern raven (*Corvus corax*) and others. Dominants in the fourth group are the great cormorant (*Phalacrocorax carbo*) and the black-headed gull (*Chroicocephalus ridibundus*). The little egret (*Egretta garzetta*) is common among the Ciconiformes, and at the ports and villages the hooded crow (*Corvus corone*) is often observed.

The biggest number of species was observed on deserted beaches without extensive human impact on them. This shows that the disturbance is an important problem for birds, with only small amount of species adapting to it.

INTRODUCTION

The coastal area has very important role in the life cycle of birds, since they actively use it for breeding, feeding and migration. The littoral area includes the Black Sea shoreline – the ecotone zone among the marine and terrestrial ecosystems. Generally, this territory is subjected to significant anthropogenic pressure because it is of interest to the tourism business. Beaches are subject to constant human presence during the breeding season of birds, which coincides with the tourist season. Over the last fifteen years on the Bulgarian coast a large number of hotels and holiday villages was built, leading to strong urbanization of the area. The tourist flow increases, as a significant number of foreigners spend their summer vacation on the Black Sea coast, which enhances anthropogenic pressure. Therefore, studies on biodiversity and how the anthropogenic factor affect it are of great importance.

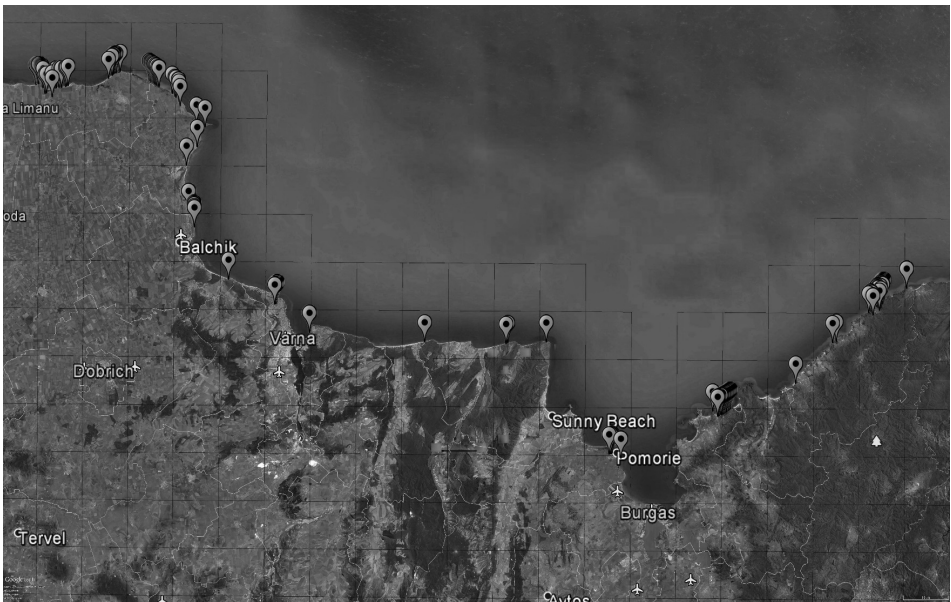
Until now, there are no particular investigations on birds targeted at the littoral zone especially. The main studies on the avifauna along the Bulgarian Black Sea coast are focused primarily on coastal lakes (Dimitrov 2000, Dimitrov et al, 2000, Dimchev 2003, 2004). Considerable number of rare and endangered birds nest there, which is a basis for the creation of a significant number of protected areas and zones for which management plans have been developed. (BSPB, 2002; Georgiev, 2002, 2003, 2004, 2005). The other part of the studies considers bird migration (Donchev, S. 1959)

In this regard, studies in the littoral zone along the coast are part of a global researches on avifauna in general, which have been carried out a long time ago. (Baumgart 1987; Georgiev, 1976). Specialized articles refer individual observations. (Georgiev et al, 2003)

Studies on birds in the marine area and in particular on *Puffinus puffinus* were published by Nankinov, 1989, 1992, 1993, 1999. Actual review of the research on the birds occurring in the offshore waters, territorial waters and waters of the exclusive economic zone of Bulgaria has been made by Michev et al, 2014.

MATERIALS AND METHODS

A survey of the coastal birds was completed along the littoral area of the Bulgarian Black Sea coast and the surrounding habitats included within the 200 m zone from the shoreline. The studies have been made over the spring and summer of 2016, and some additional data from the 2013 – 2016 period has also been used in the study. The study used the established by the Environmental Executive Agency methodology for field studies of birds. The line transects and vantage points have been used. The total length of the transects is 74 km, most commonly between 1 и 5 km.



Map of the studied area on the Bulgarian coastline

We studied the breeding ornithofauna in the littoral area and its surroundings. This includes the main typical habitats: coastal cliffs, sand and stone beaches, dunes. The surrounding areas includes grasslands, shrublands, forests, agroecosystems and buildings, situated up to 200 m from the coastline. Additionally the registrations of some conservational important bird species in the nearby wetlands are presented.

The area covered in this study do not fully coincide with the littoral zone of the Black Sea coast and includes some adjacent habitats. The birds in the marine area are examined at a distance up to four kilometers from the shore, and smaller species up to 1 km. This includes the coastal waters, which are up to 200 m and part of the territorial waters of Bulgaria. These limits are imposed by the possibilities of optics that was used in the study - binoculars (10x50) and binocular tubes with zoom of 100x. The study covers the breeding season of birds.

Birds are determined visually and by sound. Some difficult to recognize species have been photographed and then recognized by pictures. Nikon D90 camera with 70-300 mm lens and video camera with 100x zoom have been used. To the moment we do not succeed to find appropriate ecological classification of marine birds. In this regard, we are proposing the following ecological classification of the birds depending on their habitat usage in the following categories:

1. Seabirds, which breed primary in the littoral area;
2. Seabirds and waterbirds, which may nest in other areas, but also use the littoral for breeding;
3. Terrestrial birds, which nest in other habitats near the littoral, but some of them may also use the littoral for breeding;
4. Species of birds, which only use the littoral for feeding and resting, but do not breed here.
5. An additional fifth category includes the waterbirds that breed or rest in the nearest surrounding wetlands of the littoral. This data was not included in the analysis, because most of it was gathered only from the studies at the end of the breeding season. Since the period of this study includes the beginning and the end of the breeding season, a comparison of these moments has been made.

RESULTS AND DISCUSSION

As a result of our study 100 species of birds have been identified. They are described in Table 1.

Table 1. Species composition and their distribution according ecological categories

| Species | Beginning of the breeding season | End of the breeding season | Ecological group |
|-----------------------------------|----------------------------------|----------------------------|------------------|
| <i>Podiceps cristatus</i> | - | + | 4,5 |
| <i>Tachybaptus ruficollis</i> | - | + | 5 |
| <i>Puffinus yelkouan</i> | + | - | 1 |
| <i>Pelecanus onocrotalus</i> | - | + | 5 |
| <i>Phalacrocorax aristotelis</i> | + | + | 1 |
| <i>Phalacrocorax carbo</i> | + | + | 4,5 |
| <i>Ixobrychus minutus</i> | - | + | 5 |
| <i>Nycticorax nycticorax</i> | - | + | 5 |
| <i>Ardeola ralloides</i> | - | + | 5 |
| <i>Ardea purpurea</i> | - | + | 5 |
| <i>Ardea cinerea</i> | - | + | 3,4,5 |
| <i>Egretta garzetta</i> | - | + | 4,5 |
| <i>Ciconia ciconia</i> | + | - | 3 |
| <i>Cygnus olor</i> | - | + | 4,5 |
| <i>Anser anser rubrirostris</i> | - | + | 4 or 5 |
| <i>Tadorna tadorna</i> | + | + | 2,4 |
| <i>Anas platyrhynchos</i> | - | + | 5 |
| <i>Aythya nyroca</i> | - | + | 3 |
| <i>Circus aeruginosus</i> | + | + | 3,5 |
| <i>Circus pygargus</i> | - | + | 3 |
| <i>Pernis apivorus</i> | + | - | 3 |
| <i>Falco tinnunculus</i> | + | + | 2,3 |
| <i>Coturnix coturnix</i> | + | - | 3 |
| <i>Gallinula chloropus</i> | - | + | 5 |
| <i>Fulica atra</i> | - | + | 5 |
| <i>Burhinus oedicnemus</i> | + | + | 3 |
| <i>Haematopus ostralegus</i> | - | + | 4 |
| <i>Vanellus vanellus</i> | - | + | 4 |
| <i>Charadrius dubius</i> | + | + | 1,2 |
| <i>Charadrius hiaticula</i> | + | - | 4 |
| <i>Charadrius alexandrinus</i> | - | + | 1,2 |
| <i>Numenius arquata</i> | - | + | 4 |
| <i>Tringa nebularia</i> | - | + | 5 |
| <i>Tringa stagnatilis</i> | - | + | 5 |
| <i>Tringa tetanus</i> | - | + | 5 |
| <i>Actitis hypoleucos</i> | - | + | 2,4 |
| <i>Arenaria interpres</i> | - | + | 4 |
| <i>Calidris alpina</i> | - | + | 5 |
| <i>Larus michahelis</i> | + | + | 2,4 |
| <i>Larus canus</i> | - | + | 4 |
| <i>Larus cahinans</i> | + | + | 4 |
| <i>Larus melanocephalus</i> | - | + | 4 |
| <i>Chroicocephalus ridibundus</i> | - | + | 4 |
| <i>Larus minutus</i> | - | + | 4 |
| <i>Hydroprogne caspia</i> | - | + | 4 |
| <i>Sterna hirundo</i> | - | + | 4 |
| <i>Sterna albifrons</i> | - | + | 4 |
| <i>Sterna sandvichensis</i> | - | + | 4 |
| <i>Streptopelia decaocto</i> | + | + | 3 |
| <i>Streptopelia turtur</i> | + | + | 3 |
| <i>Caprimulgus europaeus</i> | + | + | 3 |
| <i>Apus apus</i> | + | - | 4 |

Tab. 1. Species composition and their distribution according ecological categories

| Species | Beginning of the breeding season | End of the breeding season | Ecological group |
|----------------------------------|----------------------------------|----------------------------|------------------|
| <i>Apus melba</i> | - | + | 4 |
| <i>Upupa epops</i> | + | + | 2,3 |
| <i>Merops apiaster</i> | + | + | 2 |
| <i>Coracias garrulus</i> | - | + | 2,4 |
| <i>Melanocorypha calandra</i> | + | + | 3 |
| <i>Alauda arvensis</i> | + | + | 3 |
| <i>Gallerida cristata</i> | + | + | 3 |
| <i>Delichon urbicum</i> | + | + | 2,3,4 |
| <i>Riparia riparia</i> | - | + | 2 |
| <i>Hirundo rustica</i> | + | + | 2,3 |
| <i>Hirundo daurica</i> | + | + | 2,3 |
| <i>Motacilla alba</i> | + | + | 2,3 |
| <i>Motacilla cinerea</i> | - | + | 4 |
| <i>Motacilla flava</i> | - | + | 4 |
| <i>Lanius collurio</i> | + | + | 3 |
| <i>Lanius minor</i> | + | - | 3 |
| <i>Lanius senator</i> | + | - | 3 |
| <i>Erithacus rubecula</i> | + | + | 3 |
| <i>Luscinia megarhynchos</i> | + | + | 3 |
| <i>Oenanthe oenanthe</i> | + | + | 2,3 |
| <i>Oenanthe pleschanka</i> | + | - | 2 |
| <i>Oenanthe isabellina</i> | - | + | 3 |
| <i>Acrocephalus arundinaceus</i> | + | + | 5 |
| <i>Hippolais olivetorum</i> | + | - | 3 |
| <i>Iduna pallida</i> | + | - | 3 |
| <i>Sylvia communis</i> | + | - | 3 |
| <i>Parus major</i> | + | + | 3 |
| <i>Parus caeruleus</i> | + | + | 3 |
| <i>Aegialus caudatus</i> | + | - | 3 |
| <i>Ficedula parva</i> | - | + | 4 |
| <i>Muscicarpa striata</i> | - | + | 4 |
| <i>Emberiza citrinella</i> | + | - | 3 |
| <i>Emberiza melanocephala</i> | + | - | 3 |
| <i>Emberiza cirrus</i> | + | + | 3 |
| <i>Emberiza cia</i> | + | - | 3 |
| <i>Emberiza schoeniculus</i> | - | + | 4 |
| <i>Fringilla coelebs</i> | + | - | 3,4 |
| <i>Carduelis carduelis</i> | + | - | 3 |
| <i>Carduelis chloris</i> | + | - | 3 |
| <i>Sturnus vulgaris</i> | + | + | 3,4 |
| <i>Passer domesticus</i> | + | + | 3 |
| <i>Passer hispaniolensis</i> | + | + | 2,3 |
| <i>Passer montanus</i> | + | + | 3 |
| <i>Garrulus glandarius</i> | + | + | 3 |
| <i>Pica pica</i> | + | + | 3 |
| <i>Corvus corone</i> | + | - | 3,4 |
| <i>Corvus monedula</i> | + | - | 3,4 |
| <i>Corvus corax</i> | - | + | 2 |

Typical species from the first group were the Yelkouan Shearwater (*Puffinus yelkouan*), found mainly as migratory. Large flock of about 1200 individuals have been observed at Kaliakra cape at 17 april 2016. The birds fed in the sea at 2.5 km from the shoreline. European shag (*Phalacrocorax aristotelis*), has been established as nesting in the region of Tiulenovo- Kamen bryag and Kaliakra cape. At 17.04.2016 the birds carryng nest material have been observed at Kaliakra rocky beach. In the littoral area from the second group the dominant species is the yellow-legged gull (*Larus michahellis/cachinans*). By using photo-identification among these closely related species we found that the *L. michahelis* strongly predominate. *Larus cachinans* was presented by only few individuals registered on Durankulak shoreline. The little ringed plover (*Charadrius dubius*), which can be included in the two first groups was often observed during the study as breeding species. The third group is most numerous and includes variable common terrestrial bird species. Some of them use only their typical habitats (grasslands, bushlands and forest communities situated closely to the littoral area). Such species are the shrikes, crows, warblers, buntings, etc. Other species can nest in the littoral area: wheatears, wagtails, swallows.

The fourth group includes clusters of different bird species during the post-breeding period, which match the beginning of the autumn migrations. These birds often move at family groups and the parents continue to feed their youngs.

The little egret (*Egretta garzetta*) is common among the Ciconiformes, and at the ports and villages the hooded crow (*Corvus corone*) is often observed.

The first and the third ecological group are showing stable number of bird species at the beginning and the end of the breeding season. These birds are specialized to their nesting habitats.

The second group includes birds, which are more adaptive and because of that the species composition is dynamic.

The fluctuations in the fourth group are explained with the fact that it includes great number of local migrating and long-distance migrating birds, registered at the beginning of the autumn migration.

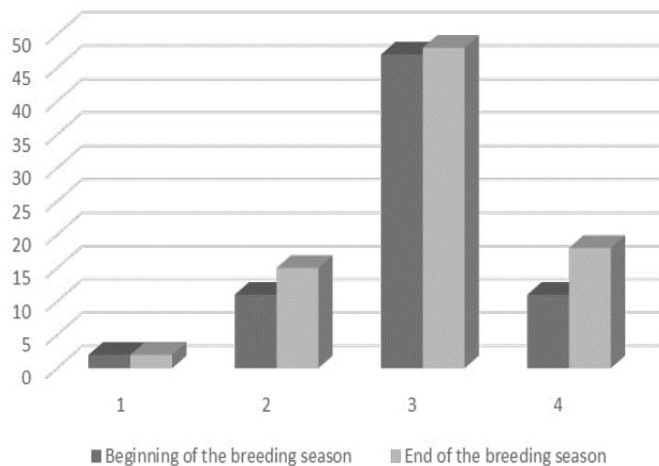


Fig. 1. Comparison of the bird groups at the beginning and the end of the breeding season

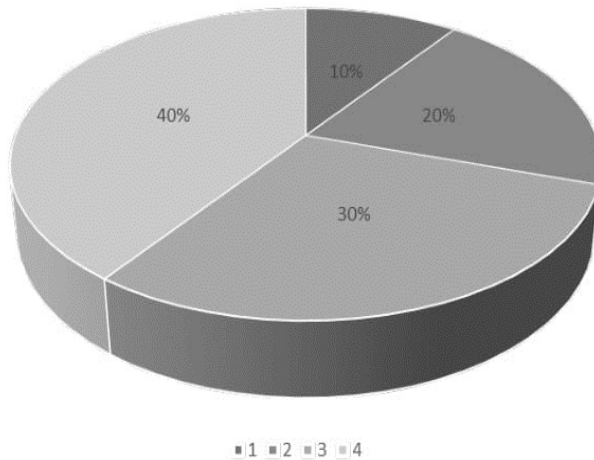


Fig. 2. Distribution of the observed bird species by their ecological group

Some species are included in more than one category depending to their particular behavior – breeding, resting and feeding, post-breeding local migrations and wandering. In this connection the category of the greylag goose (*Anser anser*) is not clear. At 22.08.2016 a family group of 2 adults and 4 young have been observed in Durankulak lake (Orlovo blato area) and this group fall into the 5th category. On the next day another group of 2 adults and 3 almost independent youngs were observed flying in NE direction from the lake to the sea shoreline. So we still have no reliable observation that the greylag goose uses the littoral area during breeding season.

Biggest number of species were observed on deserted beaches without big human impact on them. This shows that the disturbance is important problem for birds, with only small amount of species adapting to it.

In this regard, the main negative operating factors are habitat destruction, disturbance and persecution of individuals by trampling of nests and young.

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