

Aspects Regarding Raptors Migration over the Black Sea

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Abstract. We investigated diurnal raptors movements in the Black Sea basin. Bird migration over the western Black Sea has not been studied properly, scarce data being available mainly by Drost's paper (1930) thus referring only to the birds from Snakes Island, and few new data collected during more recent research expeditions. The study of migration over large water bodies is a very complex task, due to the difficulty of reaching these areas; observations in this paper were made from research vessels and offshore oil rigs. Our data together with previously published information provides a new insight into bird migration routes over the Black Sea. Species observed across the Black Sea basin followed routes that are part of Via Pontica Corridor and Trans-Caucasian Corridor. The aim of this paper is to have a clearer image of the migration phenomenon in this area, such data are important for management and conservation of migratory birds.

Key words: bird migration, diurnal raptors, Black Sea route, Via Pontica, Dobruja, Romania.

INTRODUCTION

The Eurasian - East African flyway is one of the main migration corridor connecting northeastern Europe and western Siberia with southern Africa, through Middle East. It is well known that during their migrations, birds are natural barriers using geographical bottlenecks, Rudescu (1958), Munteanu (1969), Mătieș (1986), etc. Romania and the Black Sea are crossed by one important component of this major flyway, which was named “the Black Sea route”. These migration routes have their origin in the north of Aral Lake and of the Caspian Sea, and have an well marked individuality even if, before reaching Dobruja, some of its secondary branches cross the Black Sea to Turkey (Munteanu, 1969).

Over the time, numerous works have been published on the avifauna of coastal Dobruja, including observation about bird migration along the Black Sea coastline, starting with early works of the late 19th century by Simpson (1861), Seebohm (1881), Alleon (1886), Almasy (1898), Sintenis (1877), to early 20th century by Licherdopol (1900), Heinrich (1927), Müller (1926), Kornis (1931), Spiss (1932, 1933) and to more recent papers of Papadopol (1955, 1956, 1963, 1968, 1970), Kummerloewe (1956, 1957a, b), Viellard (1967), Impe (1968, 1969a, b, c), Ciochia (1969, 1970, 1971, 1972), Munteanu (1966, 1970), Petrescu (1993, 1995), Petrescu et al. (2004), Gache (2005), Bănică (2004, 2007, 2008) etc.

The migration of birds, generally, and the migration of diurnal raptors over the Black Sea, have been however poorly documented over time, with only a few articles dealing with this subject in scientific literature.

The first study dealing with bird migration over the Black Sea was the one of Drost (1930), who made a one-month expedition (from the 15th of April to the 13th of May 1928) on the Snakes Island in order to make observations regarding bird spring migration. On the day of arrival, the 15th of April, 1928 he reported 23 bird species and that this number was “*not a fair average but a minimum*”. The number of species observed daily increased 3 times, and on the 10th of May 1928, it has risen to 74. During all this period, on the island there was a substantial bird migration. He carries out an ornithological inventory of 142 migratory species and two nesting bird species.

In the autumn of 2006, two ornithologists made independent, but concurrent observations on the Black Sea, Calder & Calder (2006) and Cârnat (2006). On the 4th of October 2006, between the cities of Trabzon (Turkey) and Batumi (Georgia), Calder observed thousands of birds flying around the vessel on which he traveled at night, and hundreds of birds which were resting on the vessel, occupying all places on which they could rest, but also the decks of the ship. The wind blew from East to West at a speed of over 20 m/s when it reached the port of Batumi. After sunrise, he made a complete inventory of all species remaining on board, identifying 17 bird species, including a group of 25 Hobbies (*Falco subbuteo*).

From the same year, some observations on birds over the Black Sea, collected between 2005 and 2006 and on the 7th of October 2006, where publish by Cârnat (op. cit.), who observed an impressive number of about 12,000 passerines flying beside the oil rig where he worked, heading for the Histria-Vadu area, in the East-West direction. The birds were observed between 5:30 and 6:30 AM (local time) and he noticed the very low height of the migration. He managed to identify a number of 12 species, of those that passed nearby. The birds were flying in compact flocks with a density of about 200 specimens per minute.

In 2011, some observations on birds in the southern Black Sea coast of Turkey, consisting in an inventory of 21 species, observed in March 2010, were published by Bell (2011). Finally, the most recent observations were published by Stanciu & Bănică (2012) who made observations on bird migration in the Black Sea between the 6th and the 14th of April 2008, at variable distance from 5 to 290 km from the western seashore of the Black Sea.

MATERIAL AND METHODS

Original observations were collected between 2008–2016 within different scientific expeditions: international scientific Expedition SESAME on the Black Sea (Southern European Seas: Assessing and Modelling Ecosystem Changes), on “Mare Nigrum” research vessel of the National Research and Development Institute for Marine Geology and Geoecology GEOECOMAR, between the 6th–14th of April 2008; an ornithological assessment project of Oceanographic Research and Marine Environment Protection Society Oceanic-Club, on “Delphis” vessel from the 6th of April to the 8th of May 2013; a vessel survey near Constanța harbor between the 22th–23rd of September 2014; survey on an oil rig at 200 km east of Romanian Black Sea shore from March to October 2015; and an ornithological survey on “Ocean Spirit” vessel a Black Sea Oil and Gas company project between the 24th of September to the 11th of November 2016.

Observations were made taking into account the characteristics of each expedition and two types of methods were used: transect type, in expeditions on research vessels, and vantage point, on oil rigs.

Each event was recorded together with additional information on date, time, number of individuals and behavior of the birds, observation point type, latitude and longitude. All collected data were entered into an electronic database. Additional information, as distance from the nearest seashore were subsequently calculated in ArcGIS 10 ESRI (2011). Field identification of bird species was performed directly or using optical devices: binoculars - Olympus 10 × 50, Opticron 7 × 50 with integrated compass and DSLR Canon 600D with 100–400 mm Canon lens.

RESULTS AND DISCUSSIONS

All the original observations of diurnal raptors in the Black Sea were figured with red circle on the maps of each species, together with previous observations from literature, figured with black square if they were older than 1970 and with black triangle if they were newer than 1970 (Fig. 1). The observations from published literature consisted of 132 records, the large majority from Drost (1930) (Tab. 3).

Ten diurnal raptor species have been counted migrating over the Black Sea (Tab. 1). Comparing observations from literature with our data, a total of 13 diurnal raptor species were recorded so far migrating over the Black Sea. Among these, three new species were observed for the first time migrating over the Black Sea: Common Buzzard (*Buteo buteo*), Hen Harrier (*Circus cyaneus*) and Eleonora's Falcon (*Falco eleonorae*). The presence of the Common Buzzard was surprising because the flight characteristics of this species, namely soaring flight using the air currents, do not allow it to make long crossings over the waters.



Fig. 1 – Observation points of diurnal raptors in the Black Sea: red circle - original observations; black square - observations from literature older than 1970; black triangle - observations from literature newer than 1970.

Table 1

List of diurnal raptors species observed during migrations over the Black Sea.

No.	Species	Drost (1930)	Calder & Calder (2006)	Cârnat (2006)	Bell (2011)	present study
1	<i>Falco peregrinus</i>	●	-	●	-	-
2	<i>Falco subbuteo</i>	●	●	●	-	●
3	<i>Falco columbarius</i>	●	-	-	-	●
4	<i>Falco tinnunculus</i>	●	-	-	●	●
5	<i>Falco vespertinus</i>	●	-	-	-	-
6	<i>Falco elenora</i>	-	-	-	-	●
7	<i>Circus aeruginosus</i>	●	-	-	-	●
8	<i>Circus pygargus</i>	●	-	-	-	-
9	<i>Circus macrourus</i>	●	-	-	-	●
10	<i>Circus cyaneus</i>	-	-	-	-	●
11	<i>Accipiter nisus</i>	●	-	-	-	●
12	<i>Accipiter brevipes</i>	●	-	-	-	●
13	<i>Buteo buteo</i>	-	-	-	-	●

NOTES ON SPECIES

Buteo buteo - Common Buzzard (Fig. 2). A single individual of this species was observed resting aboard a research vessel in the morning of the 3rd of November, 2016, about 100 km East of Constanța. The specimen was identified as belonging to the nominate subspecies - *Buteo buteo buteo* and it was observed at more than 100 km from the nearest point of the seashore. Referring to the individuals of *vulpinus* subspecies Moreau (1972) mentions that almost all individuals of this widespread



Fig. 2 – Observation points of Common Buzzard - *Buteo buteo*: red circle - original observations.

subspecies, which breed from Scandinavia and the Ukraine to about 90°E, winter in Africa and avoid long sea-crossings. Also, analyzing the migration trends in table 2, it appears that this species avoids crossing the seas over distances of more than 25 km. As far as our observation is concerned, it is remarkable that the bird has ventured so far away from the mainland.

Accipiter brevipes - Levant Sparrowhawk (Fig. 3). Only two records over the Black Sea were made up to now, one on the Snake Island, on the 12th of May 1928 (Drost, 1930), and one on the 23rd of September 2014 offshore Constanța harbor, observed after a storm in the previous day.

Accipiter nisus - Eurasian Sparrowhawk (Fig. 4). The Eurasian Sparrowhawk is one of the two species of raptors with the most observations on the Black Sea, alongside with the Common Kestrel. Analyzing the migration trends in table 2, it appears that this species avoids crossing the seas over distances longer than 100 km. We have recorded individuals of this species up to 200 km offshore. Individuals were observed many times hunting and feeding on small passerines species which were resting on research vessels or oil rigs. According to the directions of flight from which they arrived or which they left, we believe that individuals of this species flew between vessels and oil rigs, in search of easy food and to rest.

Circus aeruginosus - Marsh Harrier (Fig. 5). Drost (1930) observed several individuals of this species passing over the Snake Island in 15 different days between the 18th of April and the 13th of May 1928. We observed one individual on the 6th of May 2013, in the southern area of the Romanian sea shore, passing from East to West, at a distance of about 10 km offshore. Characteristics related to migration across water bodies for this species are unknown. Moreau (1972) mentioned that *C.*

Table 2
Characteristics of raptor migrants observed over the Black Sea (based on Bildstein, 2006).

Species	Long-distance migrant	Trans-equatorial migrant	Rains migrant	Altitudinal migrant	Maximum flock size	Maximum distance traveled over water
<i>Circus macrourus</i>	●	-	-	-	<10	<25 km
<i>Circus pygargus</i>	●	●	-	-	<10	>100 km
<i>Circus cyaneus</i>	●	-	-	-	<10	>100 km
<i>Accipiter brevipes</i>	●	-	-	-	>1000	<100 km
<i>Falco vespertinus</i>	●	●	-	-	>1000	>100 km
<i>Falco eleonora</i>	●	●	-	-	>10	>100 km
<i>Falco subbuteo</i>	●	●	●	-	<100	<100 km
<i>Circus aeruginosus</i>	-	-	-	-		
<i>Accipiter nisus</i>	●	-	-	●	<10	<100 km
<i>Buteo buteo</i>	●	●	-	●	>1000	<25 km
<i>Falco tinnunculus</i>	-	-	●	-	<100	<100 km
<i>Falco columbarius</i>	●	-	-	●	<10	>100 km
<i>Falco peregrinus</i>	●	●	-	-		>100 km



Fig. 3 – Observation points of Levant Sparrowhawk - *Accipiter brevipes*: red circle - original observations; black square - observations from literature older than 1970.



Fig. 4 – Observation points of Eurasian Sparrowhawk - *Accipiter nisus*: red circle - original observations; black square - observations from literature older than 1970.

aeruginosus does not concentrate on short sea-crossings but it is not known what extent its migration is in fully “broadfront”.

Circus cyaneus - Hen Harrier (Fig. 6). On this species of harrier, we made only two observations, both in autumn of 2016: on the 22nd of October and the 30th of October, at distances between 50 km and 100 km offshore. It appears that this species

can transit water bodies over distances longer than 100 km. There is no information in literature on migration across large bodies of water, as this species would migrate across the sea.

Circus macrourus - Pallid Harrier (Fig. 7). Drost (1930) observed several individuals of this species passing over the Snake Island in 22 different days, between the 22nd of April and the 13th of May 1928. We observed one individual on the 21st of October 2016, at a distance of more than 150 km offshore. Analyzing the migration



Fig. 5 – Observation points of Marsh Harrier - *Circus aeruginosus*: red circle - original observations; black square - observations from literature older than 1970.



Fig. 6 – Observation points of Hen Harrier - *Circus cyaneus*: red circle - original observations.

characteristics in table 2, it appears that this species avoids crossing the seas over distances longer than 25 km.

Circus pygargus - Montagu's Harrier. Drost (1930) observed several individuals of this species passing over the Snake Island in 15 different days, during his investigations made there, between the 22nd of April and the 13th of May 1928. From 1928 until now, the species was no longer observed passing over the Black Sea during migration. Analyzing the migration characteristics in table 2, it appears that this species avoids crossing the seas over distances of more than 100 km, the closest Black Sea shore point to Snake Island being about 30 km.

Falco columbarius - Merlin (Fig. 8). Several observations were made on this species, one on the Snake Island, on the 26th of April 1928 (Drost, 1930), and three observations in autumn of 2016, one on the 15th of October and two on the 22nd of October 2016 (one morning and one evening observation), both of them at more than 150 km from the nearest seashore. Analyzing the migration characteristics in table 2, it appears that this species can transit water bodies over distances longer than 100 km. On the 22nd of October 2016, specimens recorded on the research vessel were observed feeding on small passerines that were resting on the ship. It is possible that individuals of this species, like the Eurasian Sparrow Hawk, fly between ships and marine oil rig, in search of easy food, and resting places.

Falco eleonora - Eleonora's Falcon (Fig. 9). A single individual of this species was observed on the 30th of April 2013, at about 10 km offshore. Analyzing the migration characteristics in table 2, it appears that this species can transit water bodies over distances longer than 100 km.

Falco peregrinus - Peregrine Falcon. Drost (1930) observed this species passing over the Snake Island on the 10th of May 1928. Since 1928, the species has



Fig. 7 – Observation points of Pallid Harrier - *Circus macrourus*: red circle - original observations; black square - observations from literature older than 1970.



Fig. 8 – Observation points of Merlin - *Falco columbarius*: red circle - original observations; black square - observations from literature older than 1970.



Fig. 9 – Observation points of Eleonora's falcon - *Falco eleonora*: red circle - original observations.

been observed only once over the Black Sea in 2006, in the autumn (Cârnat, 2006), when he reported that *Falco peregrinus* sometimes could be found resting and hunting among the high pillars of oil rigs. Analyzing the migration characteristics in table 2, it appears that this species can transit water bodies over distances longer than 100 km.

Falco subbuteo - Hobby (Fig. 10). Drost observed numerous individuals of this species passing over the Snake Island in 16 different days between the 18th of April

and the 13th of May 1928. More recently, Cârnat (2006) observed two individuals between the 12th – 19th of September 2006, resting and feeding on passerines on an oil rig; and Calder & Calder (2006) who reported 25 specimens observed offshore of Trabzon city (Turkey) resting on the vessel he was traveling with, on the 4th of October 2006. During our survey, we have observed this species four times, on the 22nd and the 23rd of September 2014 in front of Constanța harbor, and on the 8th and 16th of October 2016 offshore, in line with Vadu-Histria area. Analyzing the migration characteristics in table 2, it appears that this species can transit water bodies over distances of less than 100 km.

Falco tinnunculus - Common Kestrel (Fig. 11). The Common Kestrel is the most common species sighted, during the study, among all diurnal raptors, beside the Sparrowhawk. Analyzing the migration characteristics in table 2, it appears that this species avoids crossing the seas over distances longer than 100 km. Drost (1930) observed numerous individuals of this species, passing over the Snake Island in 25 different days, at the time he made observations there, between the 15th of April and the 13th of May 1928. Recently, Bell (2011) observed two migrating individuals on the 8th and the 9th of March 2010, offshore Samsun harbor (Turkey). We have observed the species on numerous occasions, both during the spring and autumn migration, as follows: On the 11th of April 2008 at a distance of about 250 km from offshore; on 12th of April 2012, about 100 km South of the Crimean Peninsula; 2 individuals on the 6th of April 2013 at about 10 km offshore; 3 individuals on the 23rd of September 2014 offshore Constanța harbor; between the 8th of April and the 14th of May 2015 numerous observations on oil rigs, more than 200 km offshore Romanian shore; between the 28th of September and the 4th of November 2016, we observed four individuals at about 100 km offshore Romanian coast of the Black Sea.

Our observations show that this species has been present throughout the western Black Sea basin, from distances between 5 and 250 km from the shoreline.



Fig. 10 – Observation points of Hobby - *Falco subbuteo*: red circle - original observations; black square - observations from literature older than 1970; black triangle - observations from literature newer than 1970.



Fig. 11 – Observation points of Common kestrel - *Falco tinnunculus*: red circle - original observations; black square - observations from literature older than 1970; black triangle - observations from literature newer than 1970.

It should be mentioned that it is the species that spends the most time on boats or oil rigs. It has often been observed hunting, feeding or resting. It was noticed even roosting on oil rigs or boats, sometimes even several nights in a row. We also believe that this species fly between vessels and marine oil rigs in search of easy food and resting places, considering the flight directions from which they arrive or where they leave. Another interesting observation made is that some birds, including Common Kestrel, are transported from shore to the sea, by vessels, a conclusion we have come from when we noticed the appearance of the birds with the arrival of the supply vessels at the oil rigs.

Falco vespertinus - Red-footed Falcon. Drost (1930) observed several individuals of this species passing over the Snake Island in 15 different days, between the 22nd of April and the 13th of May 1928. From 1928 until now the species was no longer recorded passing over the Black Sea during migration. Analyzing the migration characteristics in table 2, it appears that this species can transit water bodies over distances longer than 100 km.

As mentioned above, of all the species observed, only the Common Buzzard is a species that exploits but depends maximum on the air currents in the seasonal movements that it makes from nesting places to the wintering place and back. Concerning other species of raptors, we can say that they do not depend, to a large extent, on air currents, and they travel through active flight, compensating for the lack of favorable currents or the presence of some unfavorable currents by flapping wings.

The characteristics of migration for the 13 diurnal raptor species that were observed migrating over the Black Sea are presented in table 2. There are four types of analyzed features: long-distance migrants are the species in which at least 20% of the total population migrates more than 1,500 km one way; trans-equatorial migrants are

Table 3

List of diurnal raptors species observed during migrations over the Black Sea (literature data).

Crt. No.	Species	Observation date	Source	Number of individuals	Behaviour	Observation point	Latitude	Longitude	Distance to the nearest seashore (km)
1.	<i>Accipiter brevipes</i>	12/05/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	33.3
2.	<i>Accipiter nisus</i>	20/04/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	33.3
3.	<i>Accipiter nisus</i>	22/04/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	102.7
4.	<i>Accipiter nisus</i>	24/04/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	55.1
5.	<i>Accipiter nisus</i>	27/04/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
6.	<i>Accipiter nisus</i>	01/05/1928	Drost (1930)	30	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
7.	<i>Accipiter nisus</i>	02/05/1928	Drost (1930)	10	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
8.	<i>Accipiter nisus</i>	03/05/1928	Drost (1930)	6	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
9.	<i>Accipiter nisus</i>	04/05/1928	Drost (1930)	2	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
10.	<i>Accipiter nisus</i>	06/05/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
11.	<i>Accipiter nisus</i>	07/05/1928	Drost (1930)	4	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
12.	<i>Accipiter nisus</i>	08/05/1928	Drost (1930)	3	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
13.	<i>Accipiter nisus</i>	09/05/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
14.	<i>Accipiter nisus</i>	10/05/1928	Drost (1930)	2	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
15.	<i>Accipiter nisus</i>	11/05/1928	Drost (1930)	2	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
16.	<i>Accipiter nisus</i>	12/05/1928	Drost (1930)	2	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
17.	<i>Accipiter nisus</i>	13/05/1928	Drost (1930)	2	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
18.	<i>Circus aeruginosus</i>	18/04/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
19.	<i>Circus aeruginosus</i>	19/04/1928	Drost (1930)	2	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
20.	<i>Circus aeruginosus</i>	20/04/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
21.	<i>Circus aeruginosus</i>	21/04/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
22.	<i>Circus aeruginosus</i>	22/04/1928	Drost (1930)	2	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
23.	<i>Circus aeruginosus</i>	23/04/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
24.	<i>Circus aeruginosus</i>	24/04/1928	Drost (1930)	2	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
25.	<i>Circus aeruginosus</i>	01/05/1928	Drost (1930)	3	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
26.	<i>Circus aeruginosus</i>	02/05/1928	Drost (1930)	2	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
27.	<i>Circus aeruginosus</i>	03/05/1928	Drost (1930)	2	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
28.	<i>Circus aeruginosus</i>	04/05/1928	Drost (1930)	3	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
29.	<i>Circus aeruginosus</i>	05/05/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
30.	<i>Circus aeruginosus</i>	10/05/1928	Drost (1930)	3	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
31.	<i>Circus aeruginosus</i>	12/05/1928	Drost (1930)	4	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
32.	<i>Circus aeruginosus</i>	13/05/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
33.	<i>Circus macrourus</i>	22/04/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
34.	<i>Circus macrourus</i>	23/04/1928	Drost (1930)	4	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
35.	<i>Circus macrourus</i>	24/04/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
36.	<i>Circus macrourus</i>	25/04/1928	Drost (1930)	2	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
37.	<i>Circus macrourus</i>	26/04/1928	Drost (1930)	3	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
38.	<i>Circus macrourus</i>	27/04/1928	Drost (1930)	9	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
39.	<i>Circus macrourus</i>	28/04/1928	Drost (1930)	3	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
40.	<i>Circus macrourus</i>	29/04/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
41.	<i>Circus macrourus</i>	30/04/1928	Drost (1930)	3	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
42.	<i>Circus macrourus</i>	01/05/1928	Drost (1930)	6	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
43.	<i>Circus macrourus</i>	02/05/1928	Drost (1930)	4	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
44.	<i>Circus macrourus</i>	03/05/1928	Drost (1930)	2	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4

Table 3 (continued)

Crt. No.	Species	Observation date	Source	Number of individuals	Behaviour	Observation point	Latitude	Longitude	Distance to the nearest seashore (km)
45.	<i>Circus macrourus</i>	04/05/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
46.	<i>Circus macrourus</i>	05/05/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
47.	<i>Circus macrourus</i>	06/05/1928	Drost (1930)	2	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
48.	<i>Circus macrourus</i>	07/05/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
49.	<i>Circus macrourus</i>	08/05/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
50.	<i>Circus macrourus</i>	09/05/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
51.	<i>Circus macrourus</i>	10/05/1928	Drost (1930)	2	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
52.	<i>Circus macrourus</i>	11/05/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
53.	<i>Circus macrourus</i>	12/05/1928	Drost (1930)	2	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
54.	<i>Circus macrourus</i>	13/05/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
55.	<i>Circus pygargus</i>	28/04/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
56.	<i>Circus pygargus</i>	29/04/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
57.	<i>Circus pygargus</i>	30/04/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
58.	<i>Circus pygargus</i>	01/05/1928	Drost (1930)	2	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
59.	<i>Circus pygargus</i>	02/05/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
60.	<i>Circus pygargus</i>	03/05/1928	Drost (1930)	2	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
61.	<i>Circus pygargus</i>	04/05/1928	Drost (1930)	2	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
62.	<i>Circus pygargus</i>	05/05/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
63.	<i>Circus pygargus</i>	06/05/1928	Drost (1930)	2	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
64.	<i>Circus pygargus</i>	07/05/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
65.	<i>Circus pygargus</i>	08/05/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
66.	<i>Circus pygargus</i>	09/05/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
67.	<i>Circus pygargus</i>	10/05/1928	Drost (1930)	2	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
68.	<i>Circus pygargus</i>	11/05/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
69.	<i>Circus pygargus</i>	12/05/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
70.	<i>Falco columbarius</i>	26/04/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
71.	<i>Falco peregrinus</i>	19/09/2006	Cârnat (2006)	1	feeding	Ship	44°28'34.673"	29°26'36.092"	35.4
72.	<i>Falco peregrinus</i>	10/05/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
73.	<i>Falco subbuteo</i>	19/09/2006	Cârnat (2006)	1	feeding	Ship	44°28'34.673"	29°26'36.092"	35.4
74.	<i>Falco subbuteo</i>	18/04/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
75.	<i>Falco subbuteo</i>	19/04/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
76.	<i>Falco subbuteo</i>	27/04/1928	Drost (1930)	2	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
77.	<i>Falco subbuteo</i>	28/04/1928	Drost (1930)	6	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
78.	<i>Falco subbuteo</i>	29/04/1928	Drost (1930)	2	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
79.	<i>Falco subbuteo</i>	01/05/1928	Drost (1930)	10	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
80.	<i>Falco subbuteo</i>	02/05/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
81.	<i>Falco subbuteo</i>	03/05/1928	Drost (1930)	5	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
82.	<i>Falco subbuteo</i>	04/05/1928	Drost (1930)	3	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
83.	<i>Falco subbuteo</i>	05/05/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
84.	<i>Falco subbuteo</i>	06/05/1928	Drost (1930)	3	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
85.	<i>Falco subbuteo</i>	07/05/1928	Drost (1930)	2	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
86.	<i>Falco subbuteo</i>	10/05/1928	Drost (1930)	3	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
87.	<i>Falco subbuteo</i>	11/05/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
88.	<i>Falco subbuteo</i>	12/05/1928	Drost (1930)	2	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4

Table 3 (continued)

Crt. No.	Species	Observation date	Source	Number of individuals	Behaviour	Observation point	Latitude	Longitude	Distance to the nearest seashore (km)
89.	<i>Falco subbuteo</i>	13/05/1928	Drost (1930)	2	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
90.	<i>Falco subbuteo</i>	04/10/2006	Calder (2006)	25	on ship	Ship	41°26'53.380"	38°32'39.473"	35.4
91.	<i>Falco tinnunculus</i>	08/03/2010	Bell (2011)	1	feeding	Ship	42°10'48.000"	37°21'43.200"	35.4
92.	<i>Falco tinnunculus</i>	09/03/2010	Bell (2011)	1	feeding	Ship	41°45'00.000"	37°13'58.800"	35.4
93.	<i>Falco tinnunculus</i>	15/04/1928	Drost (1930)	2	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
94.	<i>Falco tinnunculus</i>	16/04/1928	Drost (1930)	3	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
95.	<i>Falco tinnunculus</i>	17/04/1928	Drost (1930)	2	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
96.	<i>Falco tinnunculus</i>	18/04/1928	Drost (1930)	2	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
97.	<i>Falco tinnunculus</i>	19/04/1928	Drost (1930)	2	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
98.	<i>Falco tinnunculus</i>	20/04/1928	Drost (1930)	3	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
99.	<i>Falco tinnunculus</i>	21/04/1928	Drost (1930)	2	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
100.	<i>Falco tinnunculus</i>	22/04/1928	Drost (1930)	3	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
101.	<i>Falco tinnunculus</i>	23/04/1928	Drost (1930)	5	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
102.	<i>Falco tinnunculus</i>	26/04/1928	Drost (1930)	10	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
103.	<i>Falco tinnunculus</i>	27/04/1928	Drost (1930)	7	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
104.	<i>Falco tinnunculus</i>	30/04/1928	Drost (1930)	4	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
105.	<i>Falco tinnunculus</i>	01/05/1928	Drost (1930)	12	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
106.	<i>Falco tinnunculus</i>	02/05/1928	Drost (1930)	17	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
107.	<i>Falco tinnunculus</i>	03/05/1928	Drost (1930)	7	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
108.	<i>Falco tinnunculus</i>	04/05/1928	Drost (1930)	4	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
109.	<i>Falco tinnunculus</i>	05/05/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
110.	<i>Falco tinnunculus</i>	06/05/1928	Drost (1930)	2	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
111.	<i>Falco tinnunculus</i>	07/05/1928	Drost (1930)	3	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
112.	<i>Falco tinnunculus</i>	08/05/1928	Drost (1930)	4	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
113.	<i>Falco tinnunculus</i>	09/05/1928	Drost (1930)	2	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
114.	<i>Falco tinnunculus</i>	10/05/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
115.	<i>Falco tinnunculus</i>	11/05/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
116.	<i>Falco tinnunculus</i>	12/05/1928	Drost (1930)	2	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
117.	<i>Falco tinnunculus</i>	13/05/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
118.	<i>Falco vespertinus</i>	22/04/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
119.	<i>Falco vespertinus</i>	23/04/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
120.	<i>Falco vespertinus</i>	26/04/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
121.	<i>Falco vespertinus</i>	27/04/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
122.	<i>Falco vespertinus</i>	29/04/1928	Drost (1930)	2	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
123.	<i>Falco vespertinus</i>	30/04/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
124.	<i>Falco vespertinus</i>	01/05/1928	Drost (1930)	2	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
125.	<i>Falco vespertinus</i>	02/05/1928	Drost (1930)	9	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
126.	<i>Falco vespertinus</i>	03/05/1928	Drost (1930)	7	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
127.	<i>Falco vespertinus</i>	04/05/1928	Drost (1930)	5	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
128.	<i>Falco vespertinus</i>	05/05/1928	Drost (1930)	6	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
129.	<i>Falco vespertinus</i>	06/05/1928	Drost (1930)	3	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
130.	<i>Falco vespertinus</i>	07/05/1928	Drost (1930)	3	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
131.	<i>Falco vespertinus</i>	12/05/1928	Drost (1930)	2	in flight	Snake Island	45°15'10.793"	30°12'23.735"	35.4
132.	<i>Falco vespertinus</i>	13/05/1928	Drost (1930)	1	in flight	Snake Island	45°15'10.793"	30°12'23.735"	53.6

species that migrate over long distances, at which at least 20% of the total population migrates across the Equator; rains migrants are species that regularly migrate in response to seasonal rains; altitudinal migrants are species in which at least some populations are known to migrate from high-altitude breeding areas to lower areas during nonbreeding season.

From our observations, the autumn migration of diurnal raptors over the Black Sea runs between the 15th of September and the 10th of November (Fig. 12). The spring migration over the Black Sea runs from the 1st of April to the 15th of May. The highest diurnal activity is between 13:00 – 19:00 (local time), same as Drost observed in 1928.

We observed that some species spent long time on boats or oil rigs. *Falco tinnunculus* has been observed on vessels from several hours, up to a few days. This species was observed daily on one oil rig from May until the beginning of August and we assume that it was a single individual, or a couple.

Analyzing Drost's observations in the spring of 1928 and those of autumn 2016 (the longest periods of observations of the Black Sea migration), migration is more intense in spring, raptors travel in small flocks, while autumn migration is less intense, birds traveling alone or at most two.

In the terms of migratory corridors through the western part of the Black Sea basin, we can consider that our observations overlaps on the Western Black Sea Corridor or Via Pontica, as it is well known. Insufficient observations in the East of the Black Sea do not give us a clear picture of the migration in that area, but we can believe that these routes are part of the Trans-Caucasian Corridor. Both corridors are part of the major flyway in Palearctic region, Eurasian-East African Flyway.

In autumn, birds flying from North to South or North-West to South-East are likely to visit first the important bird areas in the North-western Black Sea (Odessa area, Dniprov's'ka Gulf and Tendriv's'ka Gulf), in which the Dniester and Dnieper rivers flow, but also in the Danube Delta area of the Western Black Sea. All of these areas are stopping point and final destination for birds coming from the south during the spring migration. These two major areas are also favorable for the recovery of energy stocks.

The lateral winds towards the migration direction play a significant role in the movement of these birds, having the tendency to divert the birds from their course, thus reaching the sea where they will exploit the upward currents on the small islands (Agostini et al., 2007). This can be one explanation for the large number of raptors observed by Drost in 1928 on the Snake Island in the Black Sea. However, in the absence of these islands (the Snake Island being the only one in the Western Black Sea basin), birds take every opportunity to rest and recover their energy, thus arriving on such occasions to be seen on boats or oil rigs.

In the western part of the Black Sea, we highlighted two routes, one in the Danube Delta, the Dniester and the Dnieper Delta, and another in the Crimean

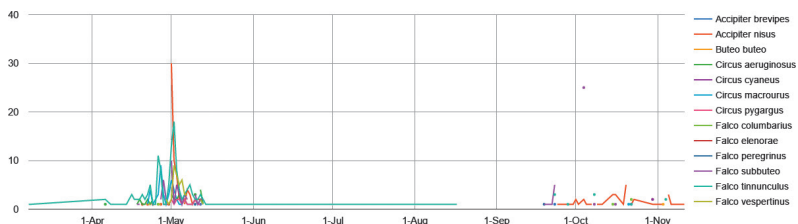


Fig. 12 – Migration periods for diurnal raptors migrating across the Black Sea.

Table 4

Diurnal raptor observations during migrations over the Black Sea (original observations).

Crt. No.	Species	Observation date	Time	Number of individuals	Behaviour	Observation point type	Latitude	Longitude	Distance to the nearest seashore (km)
1.	<i>Accipiter brevipes</i>	23/09/2014		1	in flight	Survey ship	44°5'50.330"	28°44'04.650"	2.4
2.	<i>Accipiter nisus</i>	24/09/2016	5:53 PM	1	in flight	Survey ship	44°4'15.150"	29°58'21.698"	86.4
3.	<i>Accipiter nisus</i>	30/09/2016	5:44 PM	1	in flight	Survey ship	44°7'45.088"	30°03'27.094"	83.6
4.	<i>Accipiter nisus</i>	01/10/2016	2:50 PM	1	in flight	Survey ship	44°12'57.442"	29°48'52.751"	66.7
5.	<i>Accipiter nisus</i>	01/10/2016	3:52 PM	1	in flight	Survey ship	44°9'49.712"	29°52'11.179"	73.7
6.	<i>Accipiter nisus</i>	02/10/2016	5:27 PM	1	in flight	Survey ship	44°8'24.709"	29°54'03.560"	77.0
7.	<i>Accipiter nisus</i>	04/10/2016	7:33 AM	1	in flight	Survey ship	44°27'12.629"	29°34'00.624"	35.9
8.	<i>Accipiter nisus</i>	04/10/2016	1:27 PM	1	in flight	Survey ship	44°24'49.313"	29°36'38.945"	40.9
9.	<i>Accipiter nisus</i>	07/10/2016	6:15 PM	1	in flight	Survey ship	44°28'59.308"	29°00'33.534"	11.9
10.	<i>Accipiter nisus</i>	09/10/2016	11:31 AM	1	in flight	Survey ship	44°26'36.020"	28°51'38.970"	4.7
11.	<i>Accipiter nisus</i>	11/10/2016	5:54 PM	1	in flight	Survey ship	44°9'08.150"	29°53'20.105"	75.4
12.	<i>Accipiter nisus</i>	15/10/2016	4:02 PM	1	in flight	Survey ship	44°7'45.728"	30°01'46.981"	82.5
13.	<i>Accipiter nisus</i>	15/10/2016	4:37 PM	1	in flight	Survey ship	44°6'00.767"	29°57'31.957"	82.9
14.	<i>Accipiter nisus</i>	15/10/2016	5:31 PM	1	in flight	Survey ship	44°5'43.703"	29°56'42.068"	83.0
15.	<i>Accipiter nisus</i>	16/10/2016	7:42 AM	1	in flight	Survey ship	44°31'05.275"	29°24'11.736"	29.3
16.	<i>Accipiter nisus</i>	16/10/2016	10:32 AM	1	in flight	Survey ship	44°29'53.279"	29°09'27.256"	21.7
17.	<i>Accipiter nisus</i>	16/10/2016	11:27 AM	1	in flight	Survey ship	44°29'25.296"	29°05'24.403"	17.3
18.	<i>Accipiter nisus</i>	19/10/2016	4:22 PM	1	in flight	Survey ship	44°29'04.783"	29°02'23.017"	14.0
19.	<i>Accipiter nisus</i>	20/10/2016	9:30 AM	2	in flight	Survey ship	44°11'59.514"	29°50'02.422"	68.9
20.	<i>Accipiter nisus</i>	20/10/2016	9:59 AM	1	in flight	Survey ship	44°10'43.745"	29°51'22.612"	71.7
21.	<i>Accipiter nisus</i>	20/10/2016	3:00 PM	1	in flight	Survey ship	44°4'39.158"	29°58'25.136"	85.7
22.	<i>Accipiter nisus</i>	20/10/2016	5:27 PM	1	in flight	Survey ship	44°4'41.268"	29°57'52.204"	85.4
23.	<i>Accipiter nisus</i>	22/10/2016	4:43 PM	1	feeding	Survey ship	44°9'45.299"	29°52'26.544"	73.9
24.	<i>Accipiter nisus</i>	23/10/2016	7:18 AM	1	feeding	Survey ship	44°25'01.852"	29°36'12.391"	40.4
25.	<i>Accipiter nisus</i>	23/10/2016	8:46 AM	1	on ship	Survey ship	44°26'12.905"	29°34'57.018"	38.0
26.	<i>Accipiter nisus</i>	30/10/2016	11:02 AM	1	in flight	Survey ship	44°30'41.882"	29°26'40.438"	29.4
27.	<i>Accipiter nisus</i>	01/11/2016	1:42 PM	1	in flight	Survey ship	44°10'50.941"	30°08'03.196"	82.1
28.	<i>Accipiter nisus</i>	03/11/2016	3:47 PM	1	in flight	Survey ship	44°4'18.001"	29°58'10.916"	86.2
29.	<i>Accipiter nisus</i>	05/11/2016	7:31 AM	2	feeding	Survey ship	44°4'17.764"	29°58'11.856"	86.2
30.	<i>Accipiter nisus</i>	05/11/2016	10:23 AM	1	feeding	Survey ship	44°4'17.616"	29°58'11.809"	86.2
31.	<i>Accipiter nisus</i>	06/11/2016	8:19 AM	1	in flight	Survey ship	44°4'17.854"	29°58'12.400"	86.2
32.	<i>Accipiter nisus</i>	11/11/2016	11:40 AM	1	in flight	Survey ship	44°4'18.401"	29°58'10.236"	86.2
33.	<i>Accipiter nisus</i>	03/05/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
34.	<i>Accipiter nisus</i>	28/09/2015		1	in flight	Oil rig	44°16'25.115"	31°01'39.929"	129.6
35.	<i>Accipiter nisus</i>	29/09/2015		1	in flight	Oil rig	44°16'25.115"	31°01'39.929"	129.6
36.	<i>Accipiter nisus</i>	05/10/2015		1	in flight	Oil rig	44°16'25.115"	31°01'39.929"	129.6
37.	<i>Accipiter nisus</i>	06/10/2015		1	in flight	Oil rig	44°16'25.115"	31°01'39.929"	129.6
38.	<i>Buteo buteo</i>	03/11/2016	7:43 AM	1	in flight	Survey ship	44°4'17.054"	29°58'11.183"	86.2
39.	<i>Circus aeruginosus</i>	06/04/2013		1	in flight	Survey ship	43°55'00.088"	28°41'12.275"	4.1
40.	<i>Circus cyaneus</i>	22/10/2016	5:19 PM	1	in flight	Survey ship	44°9'40.784"	29°52'31.969"	74.1
41.	<i>Circus cyaneus</i>	30/10/2016	11:41 AM	2	in flight	Survey ship	44°30'41.836"	29°26'40.495"	29.4
42.	<i>Circus macrourus</i>	21/10/2016	2:00 PM	1	in flight	Survey ship	44°10'48.907"	30°08'08.390"	82.2
43.	<i>Falco columbarius</i>	15/10/2016	4:18 PM	1	in flight	Survey ship	44°6'57.748"	29°59'53.520"	82.7
44.	<i>Falco columbarius</i>	22/10/2016	7:28 AM	1	feeding	Survey ship	44°4'17.666"	29°58'33.506"	86.4
45.	<i>Falco columbarius</i>	22/10/2016	5:41 PM	1	feeding	Survey ship	44°9'29.894"	29°52'41.869"	74.5
46.	<i>Falco elenora</i>	30/04/2013		1	in flight	Survey ship	44°39'36.320"	29°01'38.946"	3.5
47.	<i>Falco subbuteo</i>	08/10/2016	10:59 AM	1	in flight	Survey ship	44°28'10.747"	29°01'14.437"	13.5

Table 4 (continued)

Crt. No.	Species	Observation date	Time	Number of individuals	Behaviour	Observation point type	Latitude	Longitude	Distance to the nearest seashore (km)
48.	<i>Falco subbuteo</i>	16/10/2016	8:18 AM	1	in flight	Survey ship	44°31'04.652"	29°19'39.508"	31.3
49.	<i>Falco subbuteo</i>	22/09/2014		1	in flight	Survey ship	44°6'26.273"	28°45'46.109"	4.4
50.	<i>Falco subbuteo</i>	23/09/2014		5	in flight	Survey ship	44°5'50.330"	28°44'04.650"	2.4
51.	<i>Falco tinnunculus</i>	28/09/2016	6:30 PM	1	in flight	Survey ship	44°3'16.348"	29°57'21.758"	87.5
52.	<i>Falco tinnunculus</i>	08/10/2016	1:05 PM	2	in flight	Survey ship	44°27'14.386"	28°59'31.913"	12.5
53.	<i>Falco tinnunculus</i>	08/10/2016	1:25 PM	1	in flight	Survey ship	44°27'10.476"	28°59'05.798"	12.0
54.	<i>Falco tinnunculus</i>	22/10/2016	3:47 PM	1	in flight	Survey ship	44°8'09.780"	29°54'06.458"	77.5
55.	<i>Falco tinnunculus</i>	04/11/2016	7:31 AM	1	in flight	Survey ship	44°20'24.511"	28°40'57.410"	0.1
56.	<i>Falco tinnunculus</i>	11/04/2008		1	feeding	Survey ship	43°1'05.999"	30°40'32.902"	177.5
57.	<i>Falco tinnunculus</i>	12/04/2012		1	feeding	Survey ship	43°42'13.979"	32°45'45.608"	105.8
58.	<i>Falco tinnunculus</i>	06/04/2013		2	in flight	Survey ship	43°55'00.088"	28°41'12.275"	4.1
59.	<i>Falco tinnunculus</i>	23/09/2014		3	in flight	Survey ship	44°5'50.330"	28°44'04.650"	2.4
60.	<i>Falco tinnunculus</i>	08/04/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
61.	<i>Falco tinnunculus</i>	11/04/2015		1	in flight/on ship	Oil rig	44°20'53.959"	30°58'26.900"	121.9
62.	<i>Falco tinnunculus</i>	13/04/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
63.	<i>Falco tinnunculus</i>	14/04/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
64.	<i>Falco tinnunculus</i>	24/04/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
65.	<i>Falco tinnunculus</i>	25/04/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
66.	<i>Falco tinnunculus</i>	26/04/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
67.	<i>Falco tinnunculus</i>	27/04/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
68.	<i>Falco tinnunculus</i>	28/04/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
69.	<i>Falco tinnunculus</i>	29/04/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
70.	<i>Falco tinnunculus</i>	30/04/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
71.	<i>Falco tinnunculus</i>	01/05/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
72.	<i>Falco tinnunculus</i>	02/05/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
73.	<i>Falco tinnunculus</i>	03/05/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
74.	<i>Falco tinnunculus</i>	05/05/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
75.	<i>Falco tinnunculus</i>	06/05/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
76.	<i>Falco tinnunculus</i>	07/05/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
77.	<i>Falco tinnunculus</i>	08/05/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
78.	<i>Falco tinnunculus</i>	09/05/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
79.	<i>Falco tinnunculus</i>	10/05/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
80.	<i>Falco tinnunculus</i>	11/05/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
81.	<i>Falco tinnunculus</i>	12/05/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
82.	<i>Falco tinnunculus</i>	13/05/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
83.	<i>Falco tinnunculus</i>	14/05/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
84.	<i>Falco tinnunculus</i>	16/05/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
85.	<i>Falco tinnunculus</i>	18/05/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
86.	<i>Falco tinnunculus</i>	19/05/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
87.	<i>Falco tinnunculus</i>	20/05/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
88.	<i>Falco tinnunculus</i>	21/05/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
89.	<i>Falco tinnunculus</i>	22/05/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
90.	<i>Falco tinnunculus</i>	23/05/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
91.	<i>Falco tinnunculus</i>	24/05/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
92.	<i>Falco tinnunculus</i>	25/05/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
93.	<i>Falco tinnunculus</i>	26/05/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
94.	<i>Falco tinnunculus</i>	27/05/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9

Table 4 (continued)

Crt. No.	Species	Observation date	Time	Number of individuals	Behaviour	Observation point type	Latitude	Longitude	Distance to the nearest seashore (km)
95.	<i>Falco tinnunculus</i>	28/05/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
96.	<i>Falco tinnunculus</i>	29/05/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
97.	<i>Falco tinnunculus</i>	30/05/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
98.	<i>Falco tinnunculus</i>	31/05/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
99.	<i>Falco tinnunculus</i>	01/06/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
100.	<i>Falco tinnunculus</i>	02/06/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
101.	<i>Falco tinnunculus</i>	03/06/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
102.	<i>Falco tinnunculus</i>	04/06/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
103.	<i>Falco tinnunculus</i>	05/06/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
104.	<i>Falco tinnunculus</i>	06/06/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
105.	<i>Falco tinnunculus</i>	07/06/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
106.	<i>Falco tinnunculus</i>	08/06/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
107.	<i>Falco tinnunculus</i>	10/06/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
108.	<i>Falco tinnunculus</i>	14/06/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
109.	<i>Falco tinnunculus</i>	24/06/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
110.	<i>Falco tinnunculus</i>	04/07/2015		1	in flight	Oil rig	44°20'53.959"	30°58'26.900"	121.9
111.	<i>Falco tinnunculus</i>	20/07/2015		1	in flight	Oil rig	44°16'25.115"	31°01'39.929"	129.6
112.	<i>Falco tinnunculus</i>	21/07/2015		1	in flight	Oil rig	44°16'25.115"	31°01'39.929"	129.6
113.	<i>Falco tinnunculus</i>	08/08/2015		1	in flight	Oil rig	44°16'25.115"	31°01'39.929"	129.6
114.	<i>Falco tinnunculus</i>	13/08/2015		1	in flight	Oil rig	44°16'25.115"	31°01'39.929"	129.6
115.	<i>Falco tinnunculus</i>	17/08/2015		1	in flight	Oil rig	44°16'25.115"	31°01'39.929"	129.6

Peninsula that reach the Turkish straits (Panuccio et al., 2017). In the eastern part of the Black Sea we highlighted only one route that connects the Caucasus Mountains to the same Pontic Mountains in northern Turkey.

From there, the birds continue migrating to the wintering areas through the Anatolian Plateau. The birds that we noticed migrating from North to South in spring migration probably come from the Bosphorus Strait. According to our own observations and literature information, atmospheric conditions can severely influence the migration of birds across the Black Sea, all the previous studies Drost (1930), Cârnat (2006), and Calder & Calder (2006), observing birds migrating from east to west, a surprising direction, abnormal for the study area.

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