

The passerine fauna of the wetlands on the North coast of the Black Sea, with emphasis on the Paddyfield Warbler (*Acrocephalus agricola*)

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Abstract - Seven species of passerine (Order Passeriformes, Class Aves) were studied at several wetlands on the North coast of the Black Sea from 1983 to 1997. Each species appeared to be considerably specialized in the kind of habitat it occupied, and as a result there were significant differences in the fauna of the wetlands according to the type of habitat present. Freshwater deltas are richest in species, despite varying water levels, while coastal sea water sand bars were occupied by only one species, the Paddyfield Warbler *Acrocephalus agricola septima*.

Introduction

The avifauna of the Black Sea wetlands is rather little known. This seems especially to be the case with the Order Passeriformes (passerines). Passerines, however, they are important habitat indicator species so a considerable amount of work has been carried out in recent years, helped enormously by the introduction in recent decades of mist-nets as an effective study tool in such difficult habitats as reedbeds and extensive marshes. This paper presents the results related to passerines from a long term study on the avifauna of these wetlands, some other results of the study already presented in Schogolev (1992).

Methods and study area

All species of Passeriformes of the wetlands on the North coast of the Black Sea were investigated during the breeding season between 1983 and 1995. The areas studied included the freshwater habitats of the Danube and Dneestr deltas and the saline lagoons of the Black Sea and field work lasted each year from May to August. Only non-woody vegetation was covered, including *Phragmites* reed beds, areas of *Typha* and other lower marsh plants (*Carex*, *Scirpus*, other Graminae, *Juncus* etc.). The coastal wetlands of north of the Black Sea are very extensive (Schogolev & Rusev, 1995)
Counts of singing birds were carried out along line

transects 100 m wide; counting was carried out within uniform habitat from a boat or by walking in the morning hours during the main spring singing period. 8000 male Passeriformes were counted while singing in total transects 118 km. Birds were also captured in mist-nets and ringed, in most cases using a large number of nets in a small area, so that almost the entire population of such areas was exhaustively caught.

Results

Seven species of Passeriformes were found to occur regularly in the pure marshes of the areas studied during the breeding season. These were the Savi's Warbler *Locustella luscinioides*, Sedge Warbler *Acrocephalus schoenobaenus*, Paddyfield Warbler, Reed Warbler *Acrocephalus scirpaceus* and Great Reed Warbler *A. arundinaceus*, Bearded Tit *Panurus biarmicus* and Reed Bunting *Emberiza schoeniclus*. In addition, there occurred Moustached Warblers *Acrocephalus melanopogon* and Marsh Warbler *A. palustris* but only as rare passage migrants (three Moustached and 12 Marsh Warblers caught in total during the study period).

Fig. 1 shows the distribution of the seven marsh species of Passeriformes in the area studied during the breeding season (May-June). The highest number of species (all seven) occur in freshwater habitats while the lowest number is found in coastal saline areas,

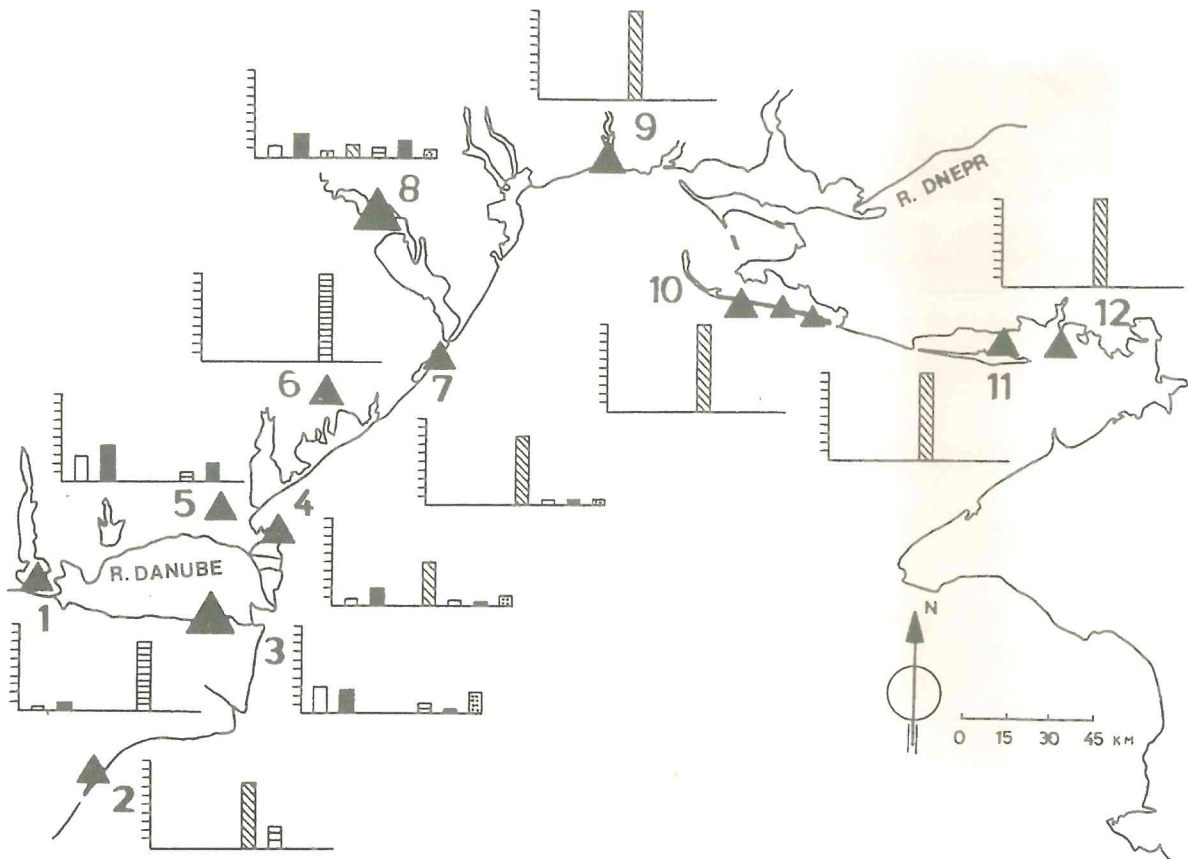


Fig. 1. Percent species composition of wetland passerines in wetlands on the North coast of Black Sea. The numbers of birds are referred to male individuals which were singing. The following species appear on the histograms in the following order from left to right:

- Locustella luscinioides*
- Acrocephalus scirpaceus*
- Acrocephalus schoenobaenus*
- Acrocephalus agricola*
- Acrocephalus arundinaceus*
- Panurus biarmicus*
- Emberiza schoeniclus*

Study areas: ▲

1. Lake Kugurlui, upper Danube Delta. Regular deep flooding, tall *Phragmites* with thick stems and *Typha angustifolia*. Density: 10 - 16 birds/km transect. (n=160, l=14 km).
2. Portitsa: lagoon with sand bar. Saline ground, flooding limited and dependent on winds, vegetation of thin-stemmed *Phragmites australis*: 16 birds/km. (n=50, l=1,5 km).
3. Central Danube Delta (800km²). Freshwater vegetation, floating reed islet with dominant species *Phragmites australis*. Lakes Isac, Jacob, Vatafu, Puju, Matitsa, Roshka. Flooding in May-June up to 1,5m depth: 16 birds/km. (n=435, l=30 km). *Remiz pendulinus* 11%
4. Deltaic sand bar with *Phragmites*. 28 birds/km. (n=103, l=2 km).
5. Old Stensovskie (72 km²), in north part of Danube Delta Freshwater marsh: Mosaic of dense *Phragmites australis* with open areas, stable water level: 28 birds/km. (n=450, l=8 km).
6. Inland part of lagoons. Significant inflow of fresh water, with patches or islands of dense, thick-stemmed *Phragmites*. (n=156, l=3 km).
7. Brackish Budaki Lagoon: Thin-stemmed *Phragmites* and *Juncus*: 30 birds/km. (n=300, l=1 km).
8. Dnestr Delta 220km²: (n=5150, l=48 km) (see Fig. 2).
9. Tiligul Lagoon: Saline area, 5-6 small islands of *Phragmites* and *Bolboschoenus maritimus*. (n=340, l=0,3 km).
10. Tendra: Sand bar, 40 km long and 100-150m wide, with *Phragmites* on the inland side: 30 birds/km, (n=420, l=5 km).
11. Djarylagtch: Sand bar with extensive areas of *Juncus maritimus* on the inland side: 23 birds/km. (n=150, l=3 km).
12. Kalançhak: Sand island with *Phragmites australis* and *Artemisia* sp. 160 birds/km. (n=500, l=1 km).

such as sand bars and sandy islets, with only one species, the Paddyfield Warbler.

Freshwater habitats in the Dnestr Delta

The Dnestr Delta (220 km²) carries a much richer in wetland passerine species than the coastal sand bars and sandy islands, with seven species, the proportion of each one varying according to the dominant habitat of

the different parts of the Delta (Fig. 2). A basic underlying factor affecting the entire fauna of the Delta is the intensity of flooding. The upper Delta, where floods are more intense and most frequent, there are fewer species and smaller, more dispersed populations of passerines. The middle part of the Delta, which floods to intermediate depths (1 to 1.5 m water depth), has the highest number of species and the densest populations. The richness of the avifauna in this part of the Delta is partly due to the presence of about 40 floating reed islets,



Fig. 2. Percent species composition of wetland passerines in different parts and habitats of the Dnestr Delta (all freshwater). See Fig. 1 for species sequence. The numbers of birds are referred to male individuals which were singing

1. Upper part of delta. Flooding exceeds 1.5m in depth. *Phragmites* grows lean, straight stems, without tangling. Density of 16 birds/km transect. (n=63, l=4 km).
2. The same as (1) with lower reeds. (n=130, l=3 km).
3. Fringing reedbeds of lake. Thick-stemmed *Phragmites*, Density of 20 birds/km transect. (n=96, l=2 km).
4. Central marsh. Moderate flooding, of about 1.3m depth. Diverse vegetation dominated by *Phragmites* and floating islands. Density of 28-32 birds/km transect. (n=2800, l=8 km).
5. *Phragmites*/short-grass meadow ecotone. Flooding to 50cm depth. Density of 23 birds/km transect. (n=90, l=4 km).
6. Dense *Phragmites*. Density of 23 birds/km transect. (n=70, l=1,5 km).
7. *Phragmites*/*Phleum* meadow ecotone at southern end of delta, on shore of estuarine lagoon. Flooding to 40 cm depth. Density of 28 birds/km transect, dropping to 17 birds/km during drought period. (n=930, l=6,6 km).
8. West-facing shore of estuarine lagoon with *Phragmites*. Density of 25 birds/km transect. (n=95, l=2,5 km).
9. As in (8), but facing South-West. Density of 16 birds/km transect. (n=225 l=5,6 km).
10. Deltaic sand bar near river mouth, facing South-East, with *Phragmites*. Density of 26 birds/km transect. (n=480, l=2.2 km).
11. North-East facing shore of estuarine lagoon with *Phragmites*. (20 birds/km). (n=53, l=3 km).
12. *Phragmites australis* and *Carex aelata* marsh at river mouth. Flooding up to 30 cm due to wind action. Density of 20 birds/km transect. (n=102, l=5 km).

n=number of birds recorded from male singing
l= distance of transect (dotted lines)

each about 0.3-0.5 ha in area, covered by a vegetation of *Phragmites australis* and *Thelypteris palustris*. When the delta is in flood many birds find sanctuary on these floating reed islets and when the flood recedes the birds spread out from there once again. In the lowest part flooding is very limited (20-40 cm) and the vegetation is composed mainly of *Phragmites australis*, *Carex aelata* and *Phleum* spp. Here the dominant factors are the prevailing winds and wave action, affecting the distribution of sediment and consequently vegetation and topography. Over the entire delta the passerine fauna is richest at ecotones whilst the deepest parts of uniform, closed habitats are the poorest.

In the entire Dnestr Delta the populations of the seven main Passeriformes are estimated the years 1979-1991, as follows: Savi's Warbler 130 pairs, Sedge Warbler 100 pairs, Paddyfield Warbler 120 pairs, Reed Warbler 280 pairs, Great Reed Warbler 120 pairs, Bearded Tit 230 pairs and Reed Bunting 90 pairs (Schogolev, 1992). The populations of the Great Reed Warbler and Bearded Tit show strong annual fluctuations whilst the other five species tend to have more stable populations. Great Reed Warbler in particular, showed a very marked increase as a result of a rise in the water level in 1978 and 1995 whilst Bearded Tit decreased significantly in 1978, 1987, 1991 and in 1993. In general, the passerine population of the Delta is kept low by the deep floods during the breeding season. The overall density of passerine nests in the Delta is only about 5 nests / km².

In the mid-1980's a dam was built on the Dnestr River and the period of the filling up of the artificial lake created by the dam coincided with a long drought in 1986. By the spring of 1987 there had been a long period of very low flow of the river. Passerine populations declined by 50-70% as shown by standard transects, depending on habitat. In following years, with the return of more normal water flow rates and flooding, these populations recovered. Passerines are also seriously affected by winter and spring fires in *Phragmites australis*: each year 10-40% of the total area of these reedbeds is burnt and when the breeding season comes these reedbeds cannot be used for breeding. However, the young reedbed growing in the summer becomes rich in insect life and attracts many birds at that time of the year.

Bearded Tits and Reed Buntings are the first to start breeding, then follow Savi's Reed and Sedge Warblers, and finally Great Reed Warblers and, last of all, Paddyfield Warblers. In all these species replacement clutches are laid e.g. after extensive floods, so the breeding season tends to be protracted, with nests containing eggs as late as mid-July in Bearded Tit, Paddyfield and Reed Warblers. In 1997 and 1998 a great decline (80%) of Reed Warbler was observed at Dnestr's and Danube's Deltas.

Paddyfield Warbler at North coast of Black Sea

A total of over 11,000 birds were caught and ringed, of which 70-75% consisted of Paddyfield Warbler. There was a considerable number of recaptures at the same site as the original ringing in following years, including about 700 recaptures of Paddyfield Warbler, which is easily caught in its ecotone habitat (see below). Finally a search was made for nests of these species, especially of the Paddyfield Warbler, of which about 400 nests were found.

The northern coast of the Black Sea population of Paddyfield Warbler, apparently without any competition, occurring in a very specialized coastal habitat, alone over large areas (Figs. 1, 2 and 3). Because of this lack of competition it reaches high population levels. The success of the species in the area is further indicated by the apparently high productivity, with juveniles forming about 70% of the total birds caught each year. It differs from other *Acrocephalus* species in the later breeding season, on average 20 days later than its congenics. The peak of the migration period is within the 11-20 May decade and most first eggs are laid in the 18-23 May period. The autumn migration begins from the beginning of July and by 3-5 August all adults have left, whilst juveniles remain about a month later, the last leaving in early September. Thus, the total duration of the Paddyfield Warbler's stay in the area of the Black Sea is about 130 days, of which about 90 days are occupied by movements and 35 days of breeding. The total population of this species on the northern coast of the Black Sea is estimated at 1,000-1,200 pairs in the middle of May of 1983-1991, before the start of breeding, corresponding to 3,000-3,500 adult birds, assuming an average sex ratio of about 2 males:1 female (Fig. 3). The Paddyfield Warbler is restricted to a very narrow ecotone, always coastal, usually no more than 20 m wide, on the edge of *Phragmites* beds where they adjoin *Artemisia* sp. shrubs on the sea coast or, less often, on the edge of reedbeds growing on raised sandy banks of open saline but in some cases even fresh water. Nests are most frequently located in stands of *Phragmites australis*, more rarely in *Artemisia* sp., *Juncus* sp., *Bolboschoenus maritimus* and *Carex aelata*. They are built very low, at a height of up to 35 cm from the ground and are 9-23 m apart, with two exceptional cases of nests being 2 m and 3.5 m apart. There is normally no surface water under the nests and clutches consist of 4-6 eggs.

Wherever it occurs, the Paddyfield Warbler is distributed in concentrations of 8-30 birds. The highest density of birds is found near *Artemisia* vegetation,

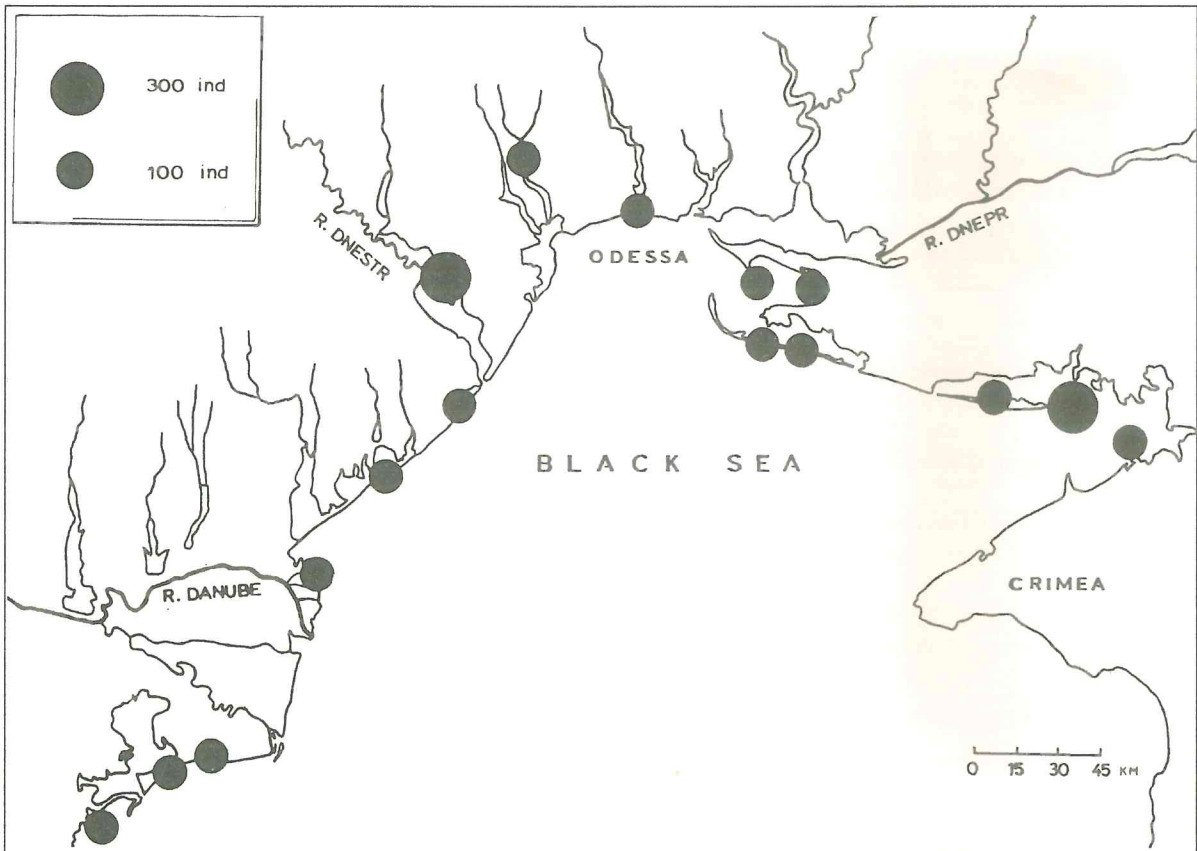


Fig. 3. Distribution of Paddyfield Warbler *Acrocephalus agricola* on the North coast of the Black Sea. Numbers denote breeding individuals.

probably because of its richness in insect life, and there may be 35-44 nests and 130-180 birds per km of reedbed/*Artemisia* ecotone in June. The more usual level of bird density is 2-3 nests and 30-50 birds per km of ecotone. The sex ratio of captured birds shows great differentiation according to habitat. In the richest *Artemisia*-adjoining habitats the ratio of males to females may be 1:1 to 1.5:1 but in the poorer habitats 4:1 or even up to 8:1, and the average for the whole population is about 2:1.

The populations of Paddyfield Warbler may show a very dynamic behaviour, with significant fluctuations from year to year as a result of changes in the vegetation, as exemplified by the case of the Kalanchak (Fig. 1, N 12): this is a long and narrow sandy island (1 km long by 150 m wide), whose vegetation was almost totally destroyed in 1981 by strong wave action. In following years vegetation started to develop again and in 1985 and 1986 there was a rich plant community with *Phragmites australis* and *Artemisia* sp. This vegetation attracted a very large breeding population of Paddyfield Warbler (about 350 adult birds), and the

concentration was so dense that of about 100 nests built, 30 were abandoned before egg-laying, probably due to interference between birds of neighbouring territories. In these years the ratio of males to females was 1.5:1. In 1987 the vegetation was degraded by cold spring and possibly other related reasons, and the effect was that the population of the Paddyfield Warbler was reduced by 37%, the number of nests was reduced by 67%, whilst the ratio of males to females increased to 1.7:1 and breeding was delayed by about 15 days. In 1988 the population remained approximately the same as in 1987, even though the weather was not as cold as in 1987.

In the southern part of the Tiligul lagoon (Fig. 1, N 9) there are six small islands (0.3-0.5 ha each). The total population of Paddyfield Warbler on these islands is about 150 individuals. Here, the birds are closely connected with *Bolboschoenus maritimus* which forms meadows over damp ground (no surface water) with a height of 40-50 cm. When the water level of the lagoon is low and the islands are not covered by water there is a healthy population of warblers of the islands

but when the water level rises (e.g. due to high rainfall) the warbler population declines. For example, in 1985, when the water level was 40 cm up, and the *Bolboschoenus* meadows were flooded the Paddyfield Warbler population declined by 36% and the number of nests by 75% in comparison with the previous year (1984). The ratio of males to females was 1,6:1 in 1985 but it rose to 2,2:1 in 1986. Very frequently the breeding season on these islands is delayed by up to 15 days due to the flooding of the *Bolboschoenus* vegetation, compared with other populations. In the cold spring of 1987 the Tiligul population of Paddyfield Warbler was reduced by 65%.

The Dnestr mouth population of Paddyfield Warbler is concentrated on a 2 km raised sand bank, unique within the Dnestr Delta, which is covered by a peculiar mixed vegetation of *Phragmites australis*, *Althaea officinalis*, *Tanacetum vulgare* and *Eupatorium cannabinum*. The birds build their nests in clumps of *Carex elata* in the adjacent wet *Phragmites* and *Carex* vegetation and make regular flights to the dry sand bank to feed. In some years, when these reedbeds are burnt (e.g. 1988 and 1994) or grazed by cattle (e.g. 1987), these populations had been vanished. The Budaki Lagoon population (Fig. 1, N 7) corresponds to about 80 nests (30 nests / km ecotone in the best parts). In 1991 and 1992 this population was adversely affected by an increase in the Dece Snake *Natrix tessellata* population, the snakes removing the eggs from a large proportion of the nests. The coastal sand bars of the Lagoon also seemed to act as a migratory corridor for birds breeding further west (Danube Delta?), since a total of about 700-800 adult birds were caught in the spring and then again in the autumn, with a significant number of retraps between the two seasons. This migratory population has been intensively studied since 1983 and it remained fairly stable up to 1991, in terms of number of birds caught and of recapture rates. Then in the spring of 1992 there was a 75% reduction in this population, probably due to some weather factors affecting the birds in their winter quarters or staging places. The male to female ratio in this population was 1.7:1. In 1997 and 1998 a decline of 80% of this species was observed at Black Sea.

Discussion

The presence of Moustached Warbler and Marsh Warbler as rare passage migrants is contrary to what is suggested by the distribution maps in Cramp (1992), where both of these species appear to breed along the NE coast of the Black Sea, and one would expect a larger representation in the total number caught if they were regular breeding species in the area. The same applies to River and Grasshopper Warblers *Locustella fluviatilis* and *L. naevia*, both of

which are shown to breed in the area but none of them was caught during the study period.

The conclusion of my observations is that most wetland passerine species are depended on the type of vegetation and can thus be very useful indicators of the ecological state of the wetlands, where they occur.

Systematic and intensive ringing of two populations of Paddyfield Warbler in the Dnestr Estuary, in the brackish Budaki Lagoon and on the headland formed by the mouth of the River Dnestr respectively, 28 km apart, showed that these two populations are distinct and isolated, at least during the May-August period when ringing takes place, despite the short distance between them.

Based on about 700 between-year retraps of Paddyfield Warblers it could be concluded that the populations of this species in the wetlands of the North coast of the Black Sea show a very high site fidelity for both adults and juveniles. Between year recaptures for both age classes occurred almost entirely within 100-150 m of the original capture, one to four years later. Only two site changes were recorded, one year later, both of female birds which were probably attracted by singing males while migrating and settled 80 km NE (Tiligul Lagoon) of the original capture site. In addition, one would expect that radical condition alterations, like those described for Kalanchak island, would regularly cause shifts in each place of considerable portions of the population.

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Riassunto - Sono state studiate sette specie di passeriformi localizzate in diverse zone umide della costa settentrionale del Mar Nero dal 1983 al 1997. Ciascuna specie sembra specializzata nel tipo di habitat utilizzato cosicché si assiste ad una significativa differenziazione tra le comunità di aree diverse. I delta dei fiumi sono i più ricchi di specie, nonostante il variare del livello idrico, mentre le aree costiere sono occupate da una sola specie, la Cannaiola di Serdow *Acrocephalus agricola septima*.

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