

Seasonal migrations of the Yellow Wagtail *Motacilla flava* (Aves, Passeriformes) according to results of the trapping and ringing data for sixty-four years in the Eastern Baltic

Vladimir A. Payevsky

Laboratory of Ornithology, Zoological Institute of the
Russian Academy of Sciences, 1 Universitetskaya nab.,
199034, St. Petersburg, Russia

Anatoly P. Shapoval

Biological Station “Rybachy”, Zoological Institute of the
Russian Academy of Sciences, 32 Pobedy st., 238535,
Rybachy, Kaliningrad District, Russia

Based on the results of trapping and ringing Yellow Wagtail on the Courish (Curonian) Spit in Eastern Baltic in the amount of 3076 individuals during 1957–2020, the population numbers, the migration routes and wintering grounds are presented. The obtained seven recoveries of our rings account for only 0.23% of the efficiency of Yellow Wagtail ringing. The annual number of Yellow Wagtails captured varied widely over 64 years, from three to 206 individuals. The oscillations were wavelike in nature and showed different amplitudes. Of the seven birds with our rings found two birds in November and February were caught in the Federal Republic of Nigeria (West Africa), three birds during migration were found in Italy and two birds during the summer were found in Sweden and Finland. The length of the migration route from the Courish Spit to Nigeria was more than five thousand kilometers. The results of studying the migrations of this species in other countries and regions are discussed.

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Corresponding author: Vladimir A. Payevsky (payevsky@yandex.ru)

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Keywords

Courish (Curonian) Spit, migration routes, wintering sites, Yellow Wagtail

Introduction

The Yellow Wagtail is a polytypical migratory species of the wagtail family, widespread in Eurasia, partly in North America and Africa. It spends the winters in the tropics of Africa, in India and in

southeast Asia. In the main part of Eastern Europe, except for the northern territories of Sweden and Finland, as well as the northeast of the Leningrad region, the nominative subspecies *M. f. flava* is widespread (Gladkov 1954; Dittberner, Dittberner 1984; Cramp 1988; Tyler 2004). Subspecies *M. f. thunbergi*, common in many areas of Northeastern Europe, lives in a number of places almost sympatrically with the nominative one, which is a special problem of their identification. In Leningrad and other regions, there are bird habitats with both pure forms of these subspecies and with transitional features (Malchevsky, Pukinsky 1983; Grichik 1992; Redkin 2001; Sotnikov 2006; Noskov et al. 2020). It is believed that such territories are a zone of secondary intergradation of these two forms (Mayr 1956; Sammalisto 1961).

Migrations and wintering sites of Western European Yellow Wagtail populations have been studied quite satisfactorily (Dittberner, Dittberner 1984; Perez-Triz, Asensio 1997; Bell 2007). As for the Eastern European populations, information about their migration routes and wintering sites is available only for the population from Finland (Valkama et al. 2014). Mass migrations of birds, including the Yellow Wagtail, are taking place in the Eastern Baltic States. This species is one of more than a hundred species of birds that are caught by the staff of the Biological Station "Rybachy" (Zoological Institute, Russian Academy of Sciences) on the Courish (Curonian) Spit in order to study migrations by ringing. The information received about the migration routes of Yellow Wagtails ringed in this place was the motive for writing the article.

Materials and methods

The Courish Spit is a narrow strip of land separating the Courish Lagoon from the Baltic Sea. The spit is elongated in the direction from northeast to southwest, which coincides with the main direction of bird migration in the Eastern Baltic. Trapping and ringing of birds by the staff of the Biological Station "Rybachy" has been carried out since 1957 to the present time in two sites: at the field point "Fringilla" (55°05' N, 20°44' E) and at Rossiten Cape (55°09' N, 20°51' E).

In the first of them, birds are caught in the great so-called "Rybachy-type" traps, in the second one - with mist nets. Rybachy-type traps (Figs 1-2) for catching migratory birds and their structure and mechanism of action are described in detail (Eric 1967; Dolnik, Payevsky 1976; etc.). Traps are active for 7 months of the year, from the end of March to the beginning of November. Duration of work by each trap (unchanged design) varied very slightly over the years, due to several days of the beginning of spring and the end of autumn trapping. Trapping and ringing of birds is accompanied by their lifetime examination, if possible, determination of sex and age, as well as standard measurements of wing length and body weight. The subspecies of Yellow Wagtails caught were not determined, which was impossible to do for one individual, without comparison with others. Most of the dimensional parameters in these forms, as in other forms of the Yellow Wagtail, overlap significantly, and cannot serve as a basis for their differentiation (Payevsky 1976; Redkin 2001). According to the information on the distribution of subspecies, as indicated above, migrating individuals in the Eastern Baltic could belong to both the nominate and subspecies *M. f. thunbergi*.

Lists of all quantitative data on trapping, ringing and reports of the finds of ringed birds have been published (Payevsky 1971; Bolshakov et al. 1999-2014; Bolshakov et al. 2001; Shapoval et al. 2017-2022). In these publications, with information about the returns of the rings, the coordinates of the points of location, the time elapsed since the day of the ringing, the distance and the azimuth are given.



Figure 1. Rybachy trap in the Courish Spit. Photo V. Payevsky.

Result

The number of migrating Yellow Wagtails. The distribution by year of the number of individuals of this species caught on the Courish Spit is shown in Fig. 3. Unlike a number of other, much more numerous species caught, the number of Yellow Wagtails caught changed dramatically and frequently from year to year. Despite the large interannual differences, the coefficient of determination $R^2 = 0.2024$ means some slight downward trend in the number.

Efficiency of ringing. For 64 years, from 1957 to 2020, 3076 individuals of the Yellow Wagtail were caught and ringed on the Courish Spit and only 7 recoveries of our rings were received, i.e. reports of the detection of ringed birds, allowing us to judge the range and direction of migration movements, as well as their life expectancy. The received 7 ring recoveries amount to $0.23 \pm 0.01\%$ of the number of ringed ones.

Migration movements, wintering areas. Of the seven Yellow Wagtails found with our rings, two birds in November and February were caught in the Federal Republic of Nigeria (West Africa), three birds were found in Italy (two killed in September, one caught in April), and two birds, in August and June, were found in Sweden and Finland (Fig. 4). The length of the route to Nigeria from the ring site was 5,160 km. The azimuth of the flight from the Courish Spit to Nigeria is 192° . The speed of autumn migration movement within Europe could be set only for one bird. A young male, ringed in our point on August 26 was killed in Italy on September 9, 1252 km from the place of ringing. This gives an average daily speed of its movement equal to 89 km.



Figure 2. *The end chambers of the Rybachy trap. Photo V. Payevsky.*

Life expectancy according to banding data. According to the time elapsed from the moment of ringing to the discovery of the bird, in five individuals it was possible to understand the number of years they lived with the ring, although in some birds their age during ringing was not known. According to these data, the age (in years) at the time of detection of a bird with a ring was 2 years old for two birds, 3 years for one, and two birds with an age of 2+ and 3+.

Discussion

The distribution by year of the number of individuals caught on the Courish Spit (Fig. 3) may indicate both different numbers of these migrating birds in different years and different conditions of their trapping by traps, which depends on weather and the changes in the landscape of the Spit in different years. The commitment of Yellow Wagtails to the open biotope that existed on the Courish Spit in the 1950s and 1960s coincides with a higher number of captured birds of this species, and the gradual change of this biotope – the overgrowth of the Spit with dense pine forest in subsequent years – with a decrease in their number. The representativeness of the number of captured birds for the purpose of long-term accounting of their numbers has been repeatedly discussed (for an overview, see Payevsky, 2008). Unlike a number of other, much more numerous species, the number of Yellow Wagtails caught changed dramatically and frequently from year to year. Despite such large interannual differences, the coefficient of determination $R^2 = 0.2024$ means some slight downward trend in the population numbers.

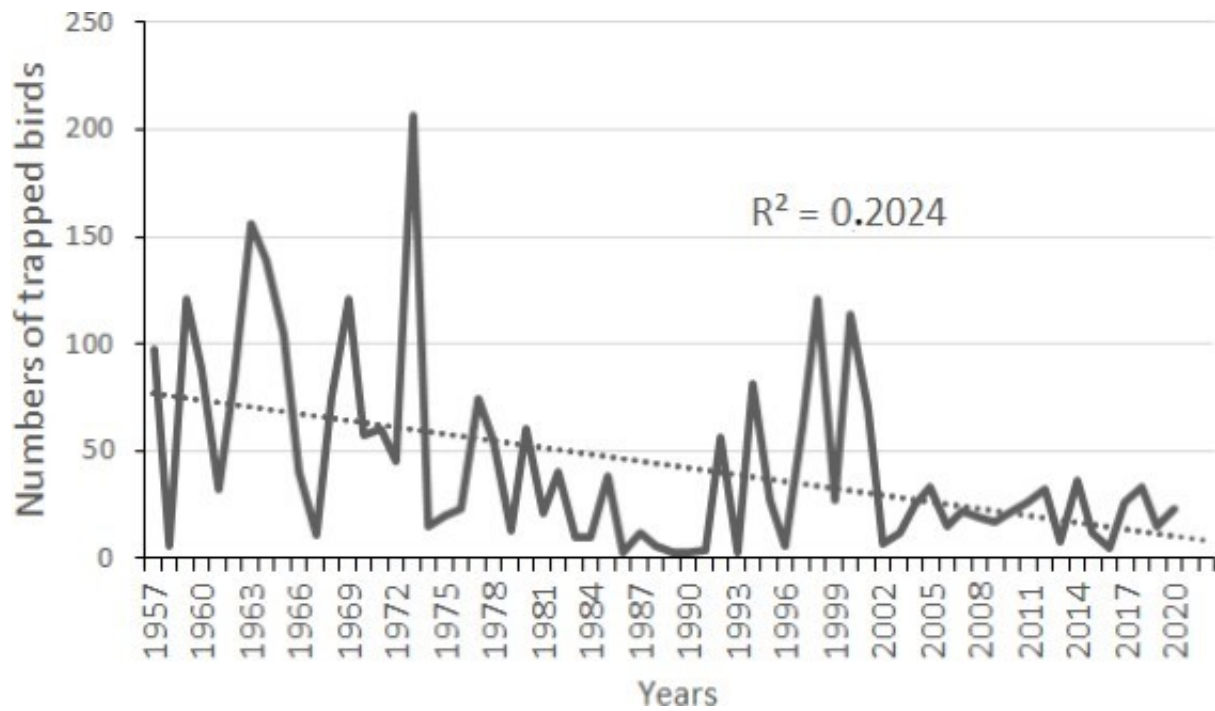


Figure 3. The number of Yellow Wagtails caught and ringed on the Courish Spit in different years for 64 years, 1957-2020.

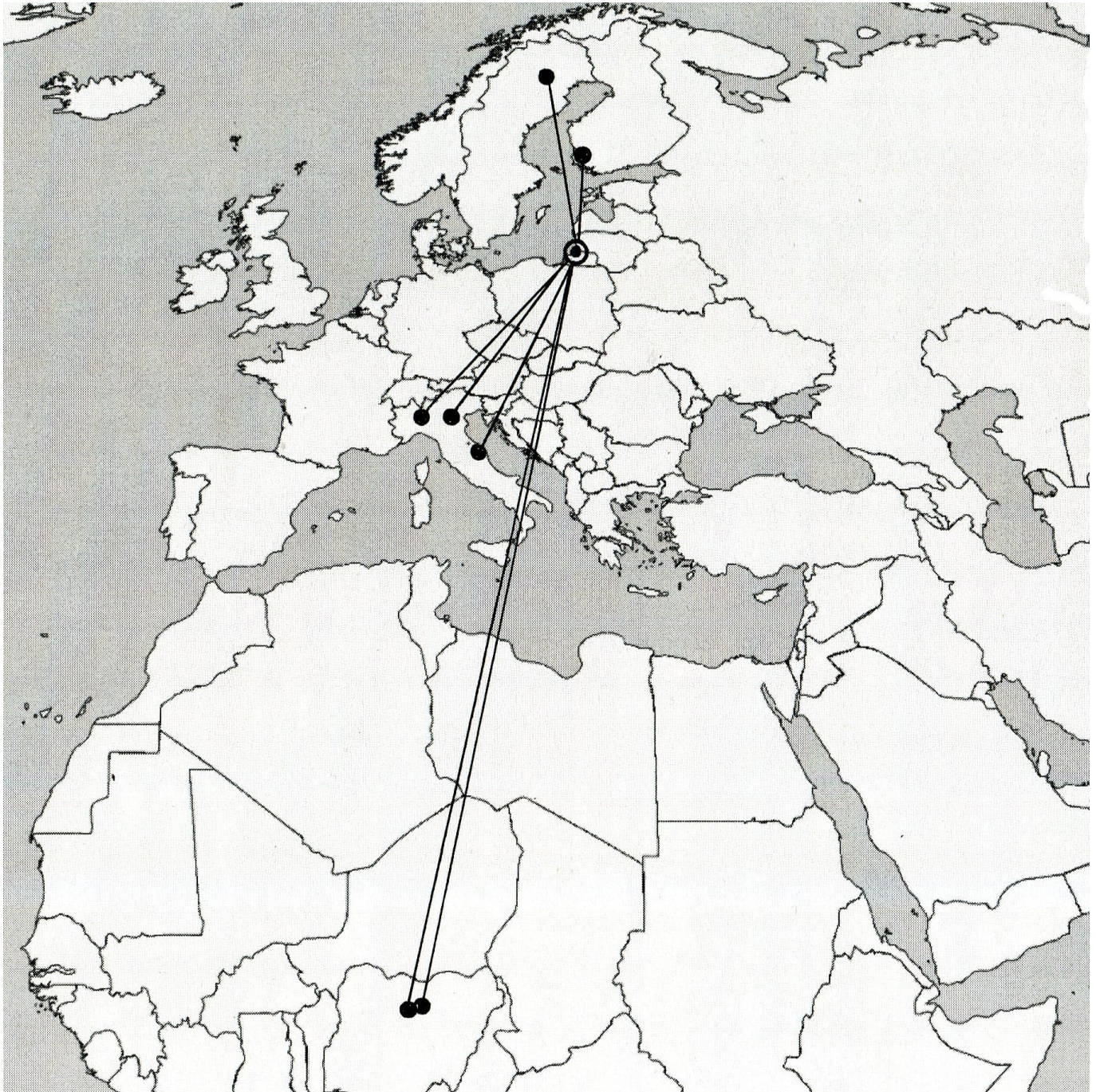


Figure 4. Distribution of Yellow Wagtails ringed on the Courish Spit, on migration routes (Italy), wintering grounds (Nigeria) and on the presumed breeding territories (Sweden and Finland).

The 7 ring recoveries obtained are $0.23 \pm 0.01\%$ of the number of ringed ones, which is among the least effective of our ringing of birds from the order Passeriformes, where the range of average values varies from 0.06% in the Willow Warbler *Phylloscopus trochilus* to 2.6% in the Song Thrush *Turdus philomelos* (Payevsky, Shapoval 1998). The calculation for individual years of the dependence of the number of ring recoveries on the number of ringed individuals showed the absence of a direct relationship by the Spearman rank correlation coefficient: $r_p = 1 - 6\sum d^2 / n_3 - n = 0.49$ (n.s.). Previously, we have already tested this dependence on different bird species and found out that in many cases there is no reliable correlation. Apparently, weather and other conditions of the year can somehow influence this indicator. It is also known that since the eighties of the last century, information has appeared in the ornithological literature about a significant decrease in

the proportion of ring recoveries compared to previous decades. The analysis of this phenomenon allowed us to conclude that the change in people's attitude to the importance and need to report a ringed bird is the most important reason for the reduction in the proportion of ring recoveries (Payevsky, Shapoval 2013).

Taking into account the fact that populations that migrate through the Courish Spit may be from Sweden and Finland, as well as the probable non-linearity of bird movement, the total length of their migration routes from nesting sites can reach about 6,200 km. The obtained indicators of the age of birds 2 and 3 years of life are at the lower age level. According to the European ringing of this bird species, the oldest Yellow Wagtail was 8 years and 5 months old (Rydzewski 1978).

In the middle of the last century, in connection with the study of arboviruses carried by birds, new centers for the study of bird migrations using the ringing were organized in many countries. The participation of birds in the circulation of about 90 arboviruses has been proven, of which 16 are particularly dangerous, responsible for the occurrence of epidemic outbreaks (Lvov, Ilyichev 1979). The results of ringing of Yellow Wagtails in different places of Eurasia are discussed in some publications. The Center for Ringing and Tagging birds in the USSR in the 1960s had seventeen returns of rings from this species (Lebedeva 1968). They were represented by birds ringed in other countries, namely in Nigeria, India and Italy, where new centers for trapping and ringing birds were organized. Birds ringed in Nigeria were found in the Leningrad oblast in May, in the Khmelnytskyi oblast of Ukraine in September, and in the Brest oblast of Belarus in November. The directions of their movements are undoubtedly confirmed by our data, indicating that the migration routes of a number of Eastern European populations of the Yellow Wagtail run through Italy, and their wintering sites are in Nigeria. The northernmost of the Eastern European populations of Yellow Wagtail, birds from Finland, spend the winter months, in addition to Nigeria, also in other countries of West Africa: Ivory Coast, Ghana, Cameroon and the Central African Republic (Valkama et al. 2014).

In a monograph devoted to all aspects of the life of the Yellow Wagtail (Dittberner, Dittberner 1984), their migrations are described in detail, mainly according to the data of ringing in Germany, and maps of the routes of their movements in other parts of Eurasia are also given. One of these maps, where the directions of birds' flights from different wintering sites to breeding sites are given, confirms the data we have obtained, as well as data on the ringing of this species in India. The Yellow Wagtails wintering in India belong to populations from the central regions of the Eastern European territories of Russia, including the Volga region, and their migration passes through Western Siberia and Kazakhstan (Fig. 5).

According to the data on the capture of Yellow Wagtails migrating through the Iberian Peninsula and the Balearic Islands (Perez-Triz, Asensio 1997), most of the ringed birds in September and November belong to populations from western and central Europe, Britain and Scandinavia. They fly mainly along the seashores. The main flight to Africa passes through the Strait of Gibraltar, but sometimes there are winter finds of ringed birds of this species on the Iberian Peninsula itself. Based on this, the ways of crossing the Mediterranean Sea by Eastern European wagtail populations after passing Italy are most likely to pass over Corsica, Sardinia, Algeria and Tunisia. The data collected through the analysis of various sources indicate the expansion of the range of African wintering of a number of subspecies of the Yellow Wagtail to the north over the past centuries. However, the wintering range of the western subspecies *Motacilla flava flavissima* in Africa has not changed for 170 years, from 1848 to 2017, and it is located between the tropic of Cancer and the tropic of Capricorn, while using the same habitat conditions: shores of lakes, rivers, swamps, savannas and cultivated fields, often together with zebras and antelopes, and cattle grazing (Ferlini 2016). Back in the 1960s, it was pointed out (Curry-Lindahl 1964) that in the African tropics, the Yellow Wagtail has a much wider ecological range than in Palearctic breeding grounds - it is found in large numbers on banana plantations, in very arid savannas together with herds of elephants, buffaloes, antelopes, and on islands with lying crocodiles. In wintering areas, there is a wide individual plasticity of the territorial behavior of Yellow Wagtails. Some birds

foraged in flocks, while others occupied individual territories in the most productive habitats (Wood 1979). As for the nominative, eastern subspecies wintering in Nigeria, its wintering sites have not changed, but the timing of spring pre-migration obesity in wintering in more northern regions, where there is less rain, was later, and in southern regions earlier than usual, which is probably due to general climate change (Bell 2007). Spring migration from West Africa follows a sequence associated with the arrival of spring in breeding grounds, and not in response to precipitation in Africa, as previously thought, since molting, fat accumulation and migration are controlled endogenously. Nevertheless, competition from local birds may be an important factor influencing the specific timing of the return movement (Wood 1992).

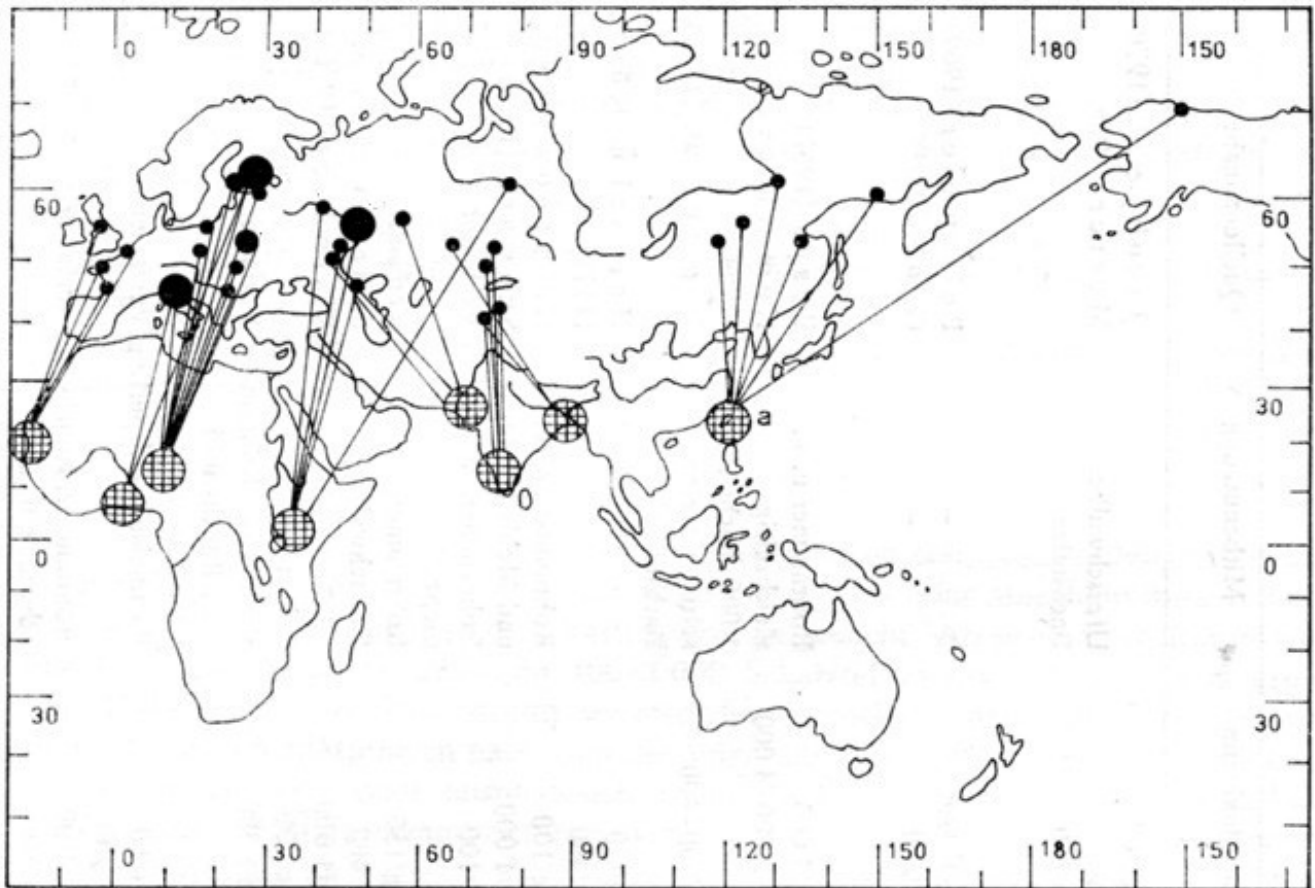


Figure 5. Migrations directions of different populations of Yellow Wagtails from wintering sites to breeding sites according to ringing data (from Dittberner, Dittberner, 1984, with changes).

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