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## PRELIMINARY DATA ABOUT GEOGRAPHIC VARIATION OF THE CHIFFCHAFF (*PHYLLOSCOPUS COLLYBITA*) SONG IN UKRAINE

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**Abstract.** Since 2002 to 2013, we have recorded songs of 231 Chiffchaffs in 65 localities all over Ukraine except the Crimea, Danube delta and south part of the Left-bank of Dnieper Area in the Steppe zone. Analysis of geographic variation of Chiffchaff song was carried out for the territorial complexes of elements using semi-quantitative method of song analysis. The data from points were grouped by sectors in compliance with zoogeographic zoning of Ukraine (Shcherbak, 1988) because the comparison of element complexes from separate points is impossible in case of small number of data for one point. The description of dialects was carried out on these sectors. In total, 45 elements were registered for the study area. We describe some levels of distribution of elements – universal, widespread, and dialect, and some lower categories. There are six universal elements, nine widespread ones, and ten elements of a dialect range. Two dialects were found in study area – on left and right banks of Dnieper. The third Carpathians dialect may be described with the larger number of data. These are only preliminary results, since the “sectoral” method allows describe dialects roughly, the further researches are necessary for detailed elaboration. Distribution of the Chiffchaff dialects is similar with distribution of Chaffinch dialects.

**Key words:** continuous singing, song element, spatial distribution, song dialect, diversity.

**Попередні дані по географічній мінливості пісні вівчарика-ковалика (*Phylloscopus collybita*) в Україні.** - А.В. Грищенко, Є.Д. Яблонівська-Грищенко. - Беркут. 22 (2). 2013. - Для вивчення географічної мінливості пісні вівчарика-ковалика дані було зібрано протягом 2002–2013 рр. з усієї території України за виключенням Криму, дельти Дунаю та південної частини лівобережного Степу. Всього було записано пісні 231 особини з 65 точок. Аналіз географічної мінливості пісні проводився по територіальних комплексах елементів з використанням напівкількісного методу аналізу пісні. Оскільки кількість даних з кожної точки незначна, точки було об'єднано в сектори у відповідності до зоогеографічного районування України (Щербак, 1988). Виділення діалектів та аналіз розповсюдження елементів проводилися саме по цих секторах. Всього виділено 45 елементів. Було визначено рівні їх розповсюдження – універсальні (6 елементів), широко розповсюджені (9), діалектні (10), ще ряд категорій елементів, менш поширених. На досліджуваній території виявлено 2 діалекти – лівобережний та правобережний. Не виключено в подальшому при збільшенні кількості даних виділення і карпатського діалекту. Розподіл діалектів вівчарика-ковалика подібний до виявленого раніше в зяблика. Загалом, це лише попередні результати, оскільки за секторами окреслити діалекти можна лише досить схематично, і для деталізації необхідні подальші дослідження.

**Ключові слова:** пісня неперервного типу, елемент пісні, просторовий розподіл, пісенний діалект, різноманіття.

Geographic variation is the universal rule of sound communication of animals. Birdsongs are not invariable in all habitats of one species. Song changes depend on environment. Dialects are generated in this case (Simkin, 1982). Dialects are described for many bird species. Song complex may exist over a long period of time in absence of external actions (Yablonovska-Grishchenko, Grishchenko, 2011). For example, the distribution of modern dialects of the Rufous-collared Sparrow (*Zonotrichia capensis*) corresponds to the old vegetation distribution (Lougheed, 1991).

However studying of geographic variation of bird songs encounter some complexities. Descriptions of songs, allocation of their types are frequently subjective. Researches in significant territories are necessary for reduction of subjectivity and increase of reliability of allocation of dialects. For detailed allocation of dialects the large number of records from many points is required. Frequently to obtain such data inconveniently. Therefore it is necessary to have an opportunity to obtain the preliminary data on presence of dialects with the help of a small number of the data.

Some problem is inconsistency in definition of terminology. Various conceptions of dialects are used in different publications. We understand the dialect as a stable complex of song types (or elements) that is peculiar to the large area and differs from other complexes of other areas (Yablonovska-Grishchenko, 2008).

Geographic variation of birdsongs in Ukraine was researched by the example of Chaffinch (*Fringilla coelebs*) with its short and good-structured songs. Dialects were described

using statistical analysis of song complexes from many sites of the country (Yablonovska-Grishchenko, Grishchenko, 2007, 2011; Yablonovska-Grishchenko, 2008; Yablonovska-Grishchenko et al., 2011). These studies were conducted with our new semi-quantitative method of song analysis which reduces subjectivity in the description of sound signals and allows to allocate territorial complexes of sound signals with use of statistical methods (Yablonovska-Grishchenko, 2006). But for this area dialects were not described neither for species with continuous song nor for small number of sites. For the first time, the method for species with “continuous singing” was tested on Chiffchaff (*Phylloscopus collybita*) (Grishchenko, Yablonovska-Grishchenko, 2011). It is a convenient model species with simple song of little length and widespread in Ukraine.

The purpose of this research was to test the semi-quantitative method for studying geographic variation of songs at a small number of data, check of its efficiency for species with “continuous singing” and attempt of the draft description of dialects Chiffchaff songs.

### Materials and methods

Since 2002 to 2013, we have recorded Chiffchaff songs all over Ukraine except Crimea, Danube and south part of the Left-bank of Dniepre in Steppe zone. Records of 231 birds were collected in 65 localities (Fig. 1). Data were collected in passing during researches of geographic variation of the Chaffinch song (Yablonovska-Grishchenko, Grishchenko,

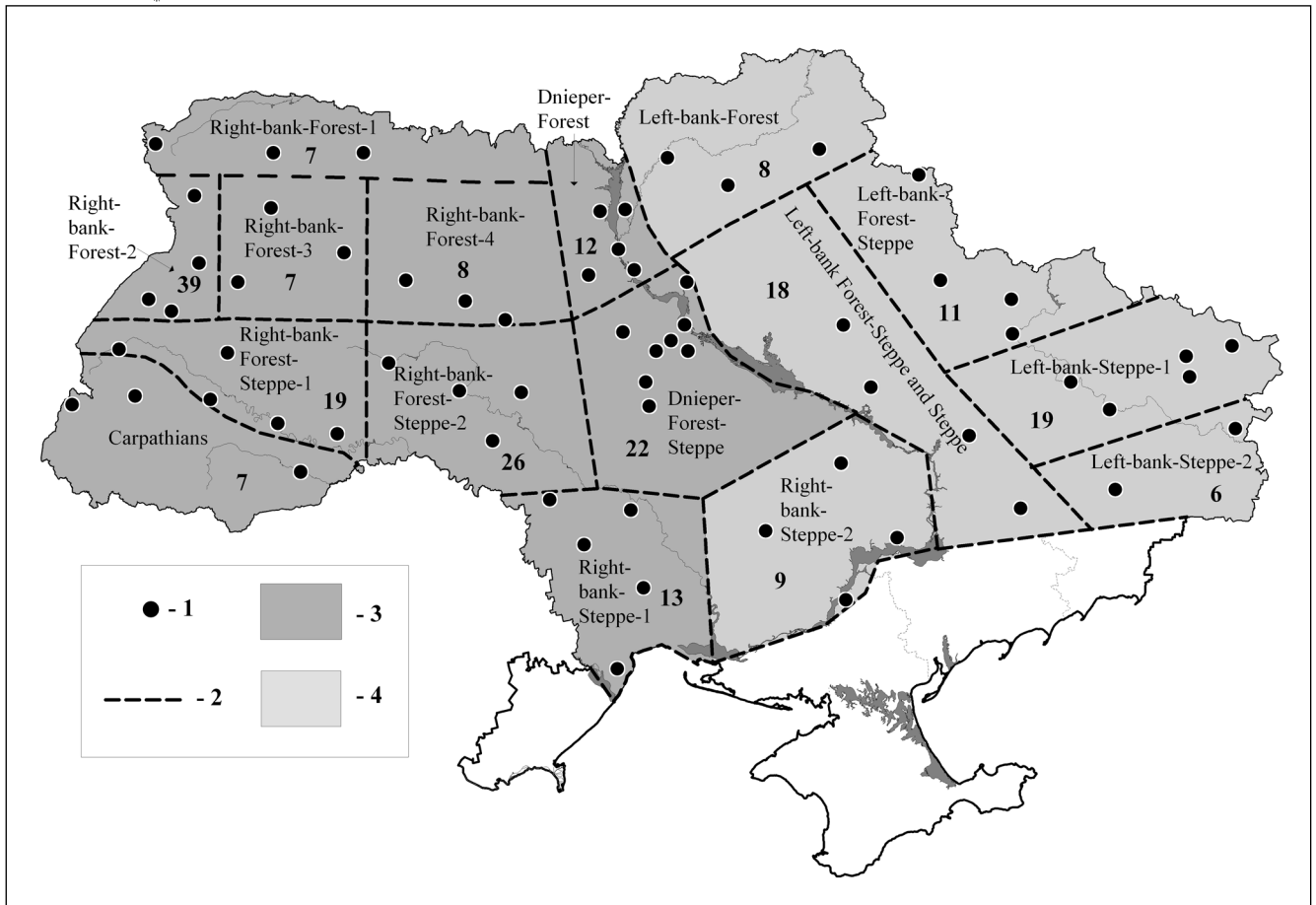


Fig. 1. Points of records, names of sectors and draft contours of song dialects of the Chiffchaff in Ukraine.

1 – points of records; 2 – borders of sectors, figures indicate numbers of records; 3 – Right-bank dialect; 4 – Left-bank dialect.

Рис. 1. Розподіл точок запису по секторах та попередні контури піснених діалектів вівчарика-ковалика в Україні.

1 – точки запису; 2 – межі секторів, цифри показують кількість записів; 3 – Правобережний діалект; 4 – Лівобережний діалект.

2007; Yablonovska-Grishchenko, 2008 etc.). Songs were recorded using digital camcorders Sony TRV-110E and TRV-550E with external microphones and linear recorder Olympus LS11. Sound files were saved in Wave-format. Sound data were not compressed. Sonograms were generated using Sonic Foundry Sound Forge 5.0 and Syrinx 2.5s (John Burt, <http://www.syrinxpc.com>).

We analysed songs by elements. All elements were described using semi-quantitative method of song analysis (Yablonovska-Grishchenko, 2006). This method allows for decreasing subjectivity in sonogram analysis. Any element is described as a complex of epithets (“formula of element”) and after comparison these formulas using cluster analysis an alphanumeric code is received. Epithets are specific for each species. Table of epithets for Chiffchaff and groups of elements were presented earlier (Grishchenko, Yablonovska-Grishchenko, 2011).

Consecution of alphanumeric codes of elements in song is a “song formula”. Still elements of “continuous singing” have no constant place in song, and song types as stable consecutions of elements were not found. However, some constant groups of elements registered in certain some parts of song may name “song type” for “continuous singing” (Ivanitsky et al., 2009; Ivanitsky, Marova, 2010; Marova et al., 2010).

We made an attempt to reveal the constant pairs of elements in Chiffchaff song. However, any such pairs were not found.

Therefore analysis of geographic variation of Chiffchaff song was carried out for the complexes of elements but not complexes of song types.

Earlier for Chaffinch songs, we used data from many sites for any region with sizable number of records by one point. This method helped to describe dialect structure neatly. However, the comparison of song (or element) complexes from separate points is impossible in case of small number of data for one point. The data from points were grouped by sectors in compliance with zoogeographic zoning of Ukraine (Shcherbak, 1988). 16 sectors have been allocated in study area (Fig. 1). Number of them is approximately equal for each of zoogeographic zones. Sectoral element complexes were completed for every sector from lists of elements of all its points.

Similarity measure between these complexes was determined using Chekanovsky-Sørensen index. Dendrogram of region complexes similarity (Fig. 2) was obtained by Ward’s method (the method of intraclass dispersion minimization – Pesenko, 1982) in PAST 1.65. Contact areas were determined using different methods of clusterization. Dialect clusters remain stable, but contact areas clusters sided with different



clusters when different methods of clusterization were used since their complexes include elements of different dialects.

The allocation of elements in different parts of study area and its connections with zoogeographic zones and found dialects were analyzed too.

There are three levels of distribution of elements – universal, widespread and dialect. Universal elements are registered in more than two thirds of regions in study area. Widespread ones are detected in more than half of sectors. Dialect ones are found in one dialect only and sometimes in small part of sectors of other dialect bordering with the first one (in contact area). Some elements do not belong to these categories, but insufficient number of data doesn't allow describe other levels.

**Results and discussion**

**Peculiarities of spatial distribution of elements**

In total, 45 elements were registered for the study area. It is less then we described earlier (Grishchenko, Yablonovska-Grishchenko, 2011), since we did not analyze songs of Danube and Crimean birds.

The spatial variability between element complexes is good marked. The distribution of elements is not homogeneous at this territory. Some elements have wide spread occurrence, others are typical for certain areas. Six universal elements were found in more than two thirds sectors all over study area (Fig. 3A). Nine widespread elements were found in more then half sectors (Fig. 3B). All these elements are among three describing sooner groups of elements – from the most simple elongated to U-shaped and the most complicated zigzag (Grishchenko, Yablonovska-Grishchenko, 2011). Less widespread, than dialect, elements also concern to all three groups.

Ten elements have a dialect range – six for the right-bank of Dnieper dialect and four for the left-bank one (Fig. 3C, 3D). The right-bank elements are among all three groups. The left-bank ones are presented by more simple groups – elongated and U-shaped. Remaining elements have a narrow distribution. For Chaffinch smaller number of dialect types and more simple structure of songs also it is revealed in a left-bank dialect (Yablonovska-Grishchenko, Grishchenko, 2007; Yablonovska-Grishchenko, 2008).

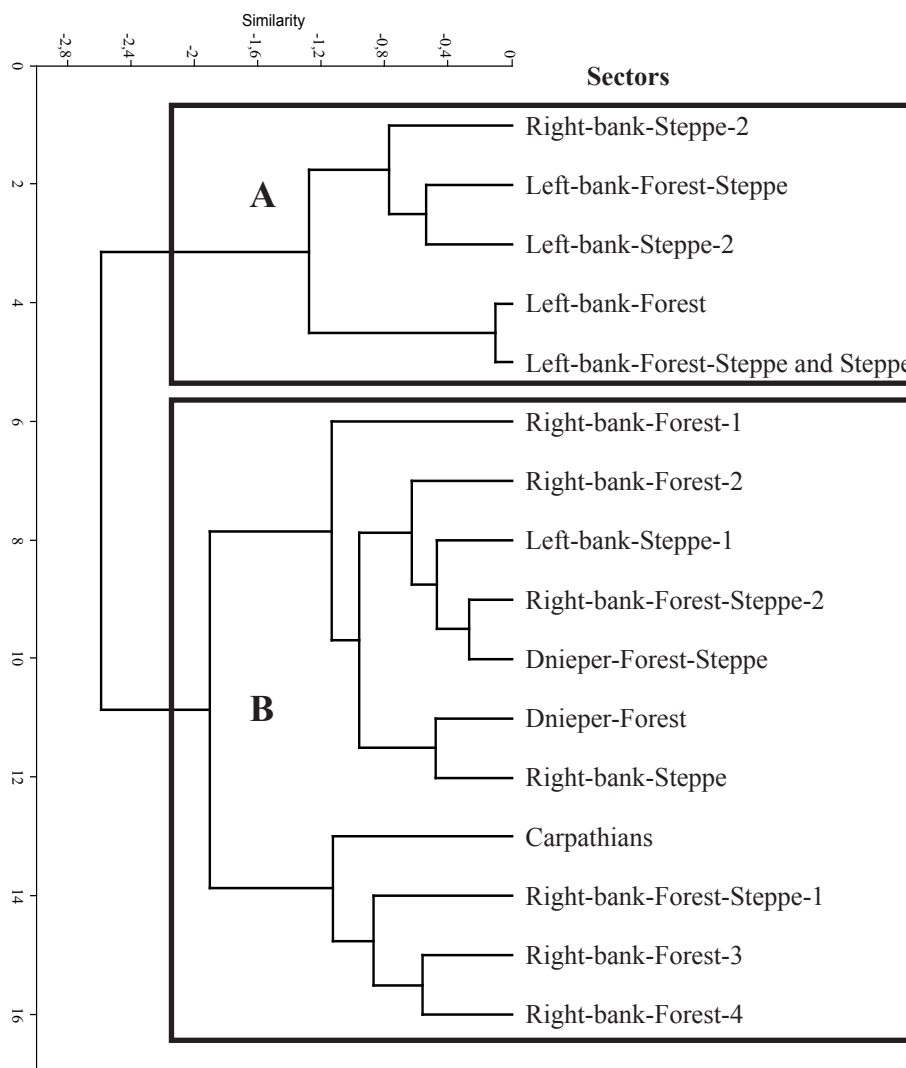


Fig. 2. Dendrogram of similarity of territorial element complexes.

A – The Left-bank dialect, B – The Right-bank dialect.

Рис. 2. Дендрограма подібності територіальних пісенних комплексів.

A – Лівобережний діалект, B – Правобережний діалект.

**Song dialects of Chiffchaff in Ukraine**

Two clusters were separated at dendrogram (Fig. 2). They may be described as dialects – Right-bank (concerning Dnieper) and Left-bank. These clusters remain stable at use of various methods of clusterization, that confirms existence of precisely separated dialects.

One sector takes place in cluster of the dialect of opposite bank. It locates in the possible contact area (sector of Right-bank-Steppe-2: Fig. 1). This sector was moved between left-bank and right-bank dialects' clusters at use of different methods of clusterization, that also specifies its possible belonging to the contact area. To the north the contact area is not revealed. Sectors stably remain in the clusters.

But the sector of Left-bank-Steppe-1 may be a clusterization mistake since we have a little data from sectors of Left-bank Steppe region. We expect specific elements may be found in South-East of the Left-bank Steppe, by analogy with specific song complex of Chaffinch in it (Yablonovska-Grishchenko, Grishchenko, 2011).

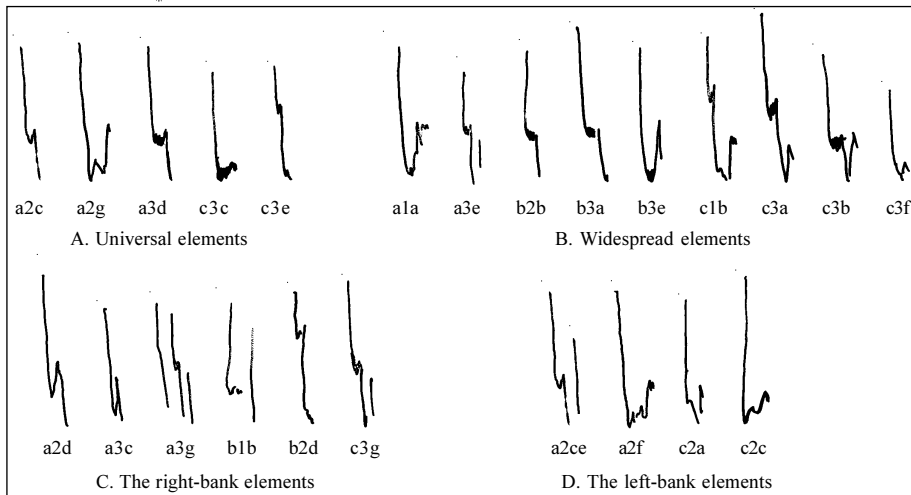


Fig. 3. Different categories of elements of Chiffchaff songs.  
Рис. 3. Різні категорії елементів пісні вівчарика-ковалика.

Allocation of elements also confirmed the presence of two dialects: left-bank and right-bank elements were clearly delineated. But the third Carpathians dialect may be described with the larger number of data.

The similar distribution of dialects was found for Chaffinch (Yablonovska-Grishchenko, Grishchenko, 2007; Yablonovska-Grishchenko, 2008). The Right-bank, Left-bank and Carpathian dialects were described and the left-bank song types penetrate into the right-bank dialect in southern part of Forest-steppe zone and northern part of Steppe zone. For Chaffinch between dialects well expressed contact area located along Dnieper on its both banks is found.

It is expressed better on the right bank, is especial in a steppe zone. On left bank it is essential already. For Chiffchaff we have revealed a contact area also in a southern part of the investigated territory. However it does not mean its absence across all Dnieper. It can be also narrow on the left coast and can be found out at the further researches.

Thus, the similarity of dialect distribution in Chiffchaff and Chaffinch song allows suppose the Chiffchaff archaic dialects presence in the south-west and south-east of Ukraine, and in Carpathians since ones for Chaffinch were found (Yablonovska-Grishchenko, Grishchenko, 2011).

#### Peculiarities of dialects

The majority of elements was found in the both dialects (universal – 13%, widespread – 20%, and elements of some points in both dialects – 24%). However, some elements are characteristic for each dialect. This is a group of elements of dialect and less common ranges.

The diversity of elements in the Right-bank dialect is higher than in the Left-bank one. There are 39 elements in it, including six dialect elements. Seven elements are less widespread. The left-bank dialect is represented by 32 elements, including four dialect elements and two less widespread elements. Dialect elements belong to more primitive groups – elongated and U-shaped (Fig. 3.A).

Number of Chaffinch song types is fairly smaller at the left bank dialect too (Yablonovska-Grishchenko, 2008). It

may well be that distribution of the dialect features from different species is nonrandom.

Evidently, these are only preliminary results, since the “sectoral” method of a grouping of the data and at use semi-quantitative a method of the analysis songs appeared possible allows to describe dialects roughly and to find the most important regions for the next studies even on the fragmentary data. More data is needed to outline their borders precisely.

These results are confirmed efficiency of a tested method.

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#### REFERENCES

- Grishchenko A.V., Yablonovska-Grishchenko E.D. (2011): [Typologization of Chiffchaff song elements]. - *Berkut*. 20 (1-2): 159-164. (In Russian).
- Ivanitsky V.V., Marova I.M. (2010): [To problem of vocal memory in Oscines: super-complicated acoustic constructions in song of Pallas' Leaf Warbler (*Phylloscopus proregulus*)]. - *Doctady Akademii nauk*. 432 (3): 426-429. (In Russian).
- Ivanitsky V.V., Marova I.M., Bochkareva E.N. (2009): [Structure of advertising vocalization of the Blyth' Reed Warbler (*Acrocephalus dumetorum*, Sylviidae): exists the queue of different songs performance in species with wealthy repertoire?]. - *Zool. journ.* 88 (3): 326-338. (In Russian).
- Lougheed P.H.S.C. (1991): Variation in Duration and Frequency Characters in the Song of the Rufous-collared Sparrow, *Zonotrichia capensis*, with Respect to Habitat, Trill Dialects and Body Size. - *Condor*. 93 (3): 856-870.
- Marova I.M., Ivanitsky V.V., Veprintseva O.D. (2010): [Individual, population and geographic differentiation in advertising song of the Blyth' Reed Warbler (*Acrocephalus dumetorum*, Sylviidae)]. - *Zool. journ.* 89 (6): 724-740. (In Russian).
- Pesenko Yu.A. [Principles and methods of quantitative analysis in faunistic researches]. Moscow: Nauka, 1982. 1-287. (In Russian).
- Simkin G.N. (1982): [Actual problems in researches of bird sound communications]. - *Ornitologiya*. Moscow. 17: 36-54. (In Russian).
- Shcherbak N.N. (1988): [Zoogeographical division of Ukrainian SSR]. - *Vestnik zoologii*. 3: 22-31. (In Russian).
- Yablonovska-Grishchenko E.D. (2006): Semi-quantitative method of song similarity analysis on an example of Chaffinch songs in Ukraine. - *Berkut*. 15 (1-2): 197-203.
- Yablonovska-Grishchenko E.D. (2008): [Spatial and temporal variability of Chaffinch (*Fringilla coelebs coelebs* L.) song in Forest and Forest-Steppe zones of Ukraine and Ukrainian Carpathians]. - Thesis for a candidate degree of biological science. Kyiv. 1-227. (In Ukrainian).
- Yablonovska-Grishchenko E.D., Grishchenko V.N. (2007): [Dialects of Chaffinch song in forest and forest-steppe zones of Ukraine and in the Ukrainian Carpathians]. - *Berkut*. 16 (1): 111-122. (In Russian).
- Yablonovska-Grishchenko E.D., Grishchenko V.N. (2011): [Relic regional complex of Chaffinch (*Fringilla coelebs*) song in South-Eastern Ukraine]. - *Bird ecology: species, community, interrelations*. Proc. of the meeting commemorating the 150th anniversary of the birth of N.N. Somov (1861-1923). 1-4.12.2011. Kharkiv, Ukraine. Kharkiv. 1: 253-263. (In Russian).
- Yablonovska-Grishchenko E.D., Grishchenko V.N., Tsvelykh A.N. (2011): [Danube song dialect of the Chaffinch in the south-west of Ukraine]. - *Berkut*. 20 (1-2): 165-172. (In Russian).