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Leucistic Woodcock (*Scolopax rusticola* L.) occurrences in Hungary from the second half of the 19th century to the present day

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Abstract Publications about curiosities are known in the Hungarian and international ornithological literature since the 1800s. Although studies explaining the processes of pigmentation dysfunctions have been known since the mid-nineteenth century, these specimens still appear only as curiosities in the professional press and the terminology used to specify them is generally incorrect. The analysed genetic abnormalities causing white colour varieties in Woodcock (albinism, leucism, Ino) are due to mutations. By briefly describing the biological background of the defects, this work helps detect colour changes. In this article, we provide a broad overview of partially or completely white Woodcocks (n = 23 expl.) found in international (8 countries) and Hungarian literature. We have supplemented the literature background with our own studies. The large-scale analysis of the variability of colours and patterns was made possible by the countrywide wing sample collection within the biometric module of Woodcock Monitoring, which has been running under the coordination of the Hungarian Hunting Conservation Association since 2010. Within this framework, 12,078 samples were analysed between 2010–2018. We found that pigment deficiency occurred in the sample set only with a proportion of 0.01%. Based on the Hungarian literature and our own samples, we presented the known occurrences on maps of the state territory with boundaries before and after 1921, indicating the causes of patterns of occurrence by migration and frequencies of occurrence.

Keywords: Woodcock, *Scolopax rusticola*, curiosity, colour change, albinism, leucism, pigmentation

Összefoglalás A magyar és a nemzetközi ornitológiai szakirodalomban már az 1800-as évekből ismertek kuriózumokra vonatkozó közlések. Ugyan a XIX. század közepétől már megjelentek a pigmentációs diszfunkciók folyamataira magyarázatot adó tanulmányok is, ennek ellenére a kuriózumok továbbra is csak mint érdekességek tűnnek fel a szaksajtóban, és e fehér példányok megnevezésére használt terminológia általában hibás. A dolgozatunkban tárgyalt fehér erdei szalonka színváltozatokat eredményező genetikai rendellenességeket (albinizmus, leucizmus, Ino) mutációk okozzák. E színelváltozást okozó defektusok biológiai hátterének rövid ismertetésével e munka segíti a színelváltozások felismerését. Cikkünkben széleskörű áttekintést szerettünk volna adni a nemzetközi (8 ország) és magyar szakirodalomban fellelhető részben vagy teljesen fehér erdei szalonkákra (n = 23 pld) vonatkozóan. A fent említett irodalmi hátteret saját vizsgálatainkkal egészítettük ki. A szín- és mintázatbeli változatosság nagy mintaszámokon alapuló kutatási lehetőségét az Országos Magyar Vadászati Védegylet koordinálásával 2010-től működő Erdei Szalonka Monitoring biometriai vizsgálati modulja országos léptékű szárnyminta-gyűjtési lehetőséggel alapozta meg. Ennek keretében 12 078 példány mintáját vizsgáltuk 2010 és 2018 között. Megállapítottuk, hogy a mintában 0,01%-os részesedéssel fordultak csak elő pigmenthiányos példányok. A hazai szakirodalmi adatok és saját mintáink alapján a Királyi Magyarországra vonatkozóan, valamint a jelenlegi országhatárokon belül térképeken ábrázoltuk az ismert megkerüléseket utalva az előfordulási mintázat vonulási sajátságokban rejlő okaira, valamint a megkerülési gyakoriságokra.

Kulcsszavak: erdei szalonka, *Scolopax rusticola*, kuriózum, színváltozatok, albinizmus, leucizmus, pigmentáció

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Introduction

Birdwatchers and dedicated Woodcock hunters have always been keen on finding special-coloured Woodcock specimens. However, there are only a few historical reports of specimens showing abnormal colour in the Hungarian hunting- and scientific literature, which is no coincidence, since unique coloured specimens of this species occur only very rarely. As with other wild birds, the most common colour mutation in Woodcock is the lack of pigmentation to varying degrees till completely white feathering. The possibility to investigate colour mutations in Woodcock surfaced in 2012 following the occurrence of a specimen with partially missing pigmentation. Research on Woodcock at the Institute of Game Management and Vertebrate Zoology at the University of Sopron has been running for several decades, until 2010, however, it was not possible to study the variety of colours and patterns nationwide, on the basis of a large number of samples. The large-scale analysis of the variability of colours and patterns was made possible by the countrywide wing sample collection within the biometric module of Woodcock Monitoring, which has been running under the coordination of the Hungarian Hunting Protection Association since 2010. The Hungarian and international literature and our own results may provide an explanation for the questions about the rarely occurring pigmentation disturbances in Woodcock. Another goal is to clarify the special terminology, which is often used incorrectly until now.

Material and Methods

Our investigations are based on historical ornithological literature and wing samples (n = 12,078) collected during the Woodcock Monitoring from 2010 onwards. As part of the description of the Woodcock curiosities the following international (8 countries) and national scientific literature were analysed from 1825–2019:

England (UK): Yarrell (1843) (Url. 1), Norfolk Accredited Museum (Url. 4), Rothschild Zoological Museum (Url. 5), Anonymus (1842), Anonymus (1874), Frohawk (1900) (Url. 2).

Germany: Anonymus (1864)

Romania: Anonymus (1890)

India: Anonymus (1897)

France: Goduon (2002), Boidot (2003a, b), Boidot (2004), Boidot (2006), Bruyére (2007), Cauquil (2007), Fulchic (2007), Boidot (2008a, b), Boidot (2009), Boidot (2010), Boidot (2012b), Boidot (2013a, b), Lapasset (2017), Pascal (2019)

Italy: Pennacchini (2013), (Url. 6)

Czech Republic: (Url. 3)

Russia: Anonymus (2015), Anonymus (2018a).

Hungary: Anonymus (1870), Anonymus (1872a, b), Inkey (1873), Anonymus (1878), Dittrich (1878), Madarász (1884), Lakatos (1887), Buda (1900), Lakatos (1904), Anonymus (1906), Donászy (1907), Bodnár (1908), Szilárd (1910), Egervári (1912), Veress (1912) Szakáll (1921), Csík (1924), Karakosevic (1927), Bélaváry (1943), Szakács (1994), Iváncsics (2002), Márok (2004), Szabó (2013), László *et al.* (2013), Bende & László (2017a)

The investigations on pigmentation disorders are based on the countrywide wing sample collection within the biometric module of the Woodcock Monitoring of the Hungarian Hunting Protection Association since 2010. During sampling in spring, one wing of at least 25%, from 2011, 40% of the hunted birds were prepared, cut off at the elbow, opened to 130-160 degrees and sent by the data provider to the research. The samples served primarily to determine the age, but the resulting photographic databases offer an excellent opportunity to study the colour and the pattern based on a large number of elements in Hungary.

Results

The first mention in the literature about a Woodcock in partial white special colour, comes from an unknown author from the year 1870 (Anonymus 1870). Afterwards, in the period before the First World War (until 1921), white-feathered specimens (n = 17) from 11 counties were known hunted in the territory Kingdom of Hungary *(Figure 1)*.

Based on the published curiosities it can be stated that such specimens are known – following the distribution pattern of all killed specimens in the study area (Faragó 2009) – in Transdanubia (Somogy) and in the Central Hungarian region along the Danube (counties: Bács-Bodrog Csongrád, Pest-Pilis-Solt-Kiskun, Fejér and Komárom). In addition, the region of Northern Hungary (counties: Szabolcs, Zemplén, Borsod) was crucial and from

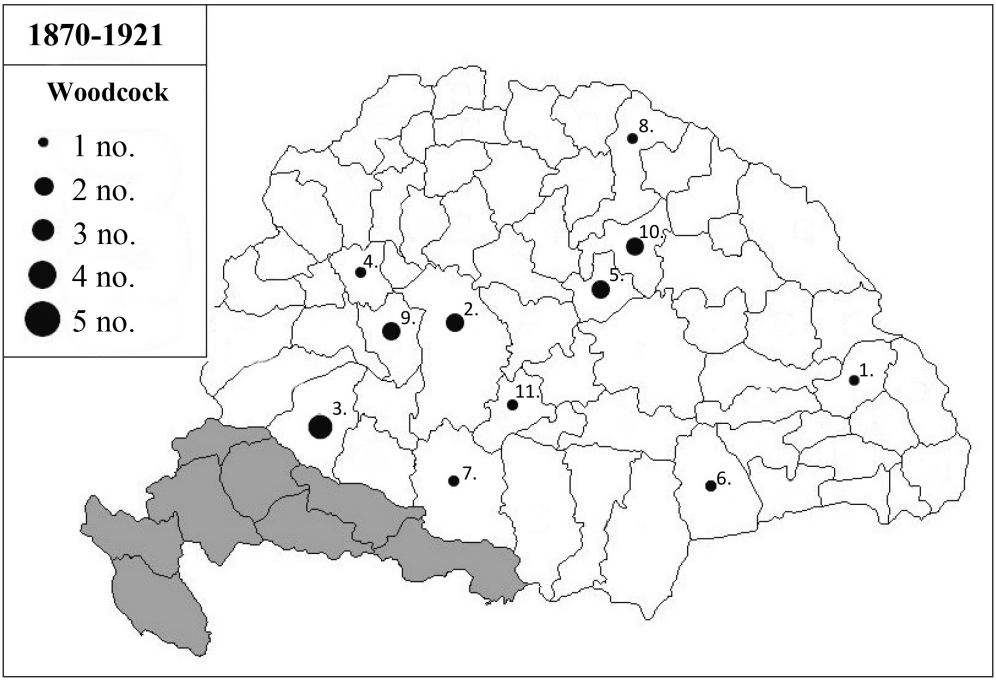

Figure 1. Occurrence of white Woodcocks in the territory Kingdom of Hungary until 1920
1. ábra Fehér szalonkák megkerülése a Királyi Magyarország területén 1920-ig

the eastern counties of Transylvania (Hunyad, Maros-Torda) are also known published data on curiosities.

These records are concentrated in the counties of the Kingdom of Hungary, where according to Faragó (2009) the largest proportion of Woodcock has been shot.

For the period from 1870 to 1921, the following literature data for the unique white-coloured Woodcock are available by County *(Figure 1).*

1. Maros-Torda County: 1870 – Görgényszentimre, Anonymus (1870),

2. Pest-Pilis-Solt-Kiskun County: 1872 – Páty, Anonymus (1872a*)*, 1872 – Budai-Mountain, Anonymus (1872b), 1878 – Royal Estate of Gödöllő, Kis-Baghi forest, Anonymus (1878),

3. Somogy County: 1873 – Somogytarnócza, Inkey (1873), 1906 – The exact location is unknown, Anonymus (1906),

4. Komárom County: 1884 – The exact location is unknown, Madarász (1884),

5. Borsod County: 1897 – The exact location is unknown, Anonymus (1897), 1908 – Révleányvár Bodnár (1908), 1921 – The exact location is unknown, Szakáll (1921),

6. Hunyad County: 1900 – Retyezát, Buda (1900),

7. *Bács-Bodrog* **County:** 1908 – Vajszka, Szilárd (1910),

8. Zemplén County: 1912 – Gálszécs*,* Veress (1912),

9. Fejér County: 1920 – Guttamási, Szabó (2013), 1920 – Lovasberény, Szabó (2013),

10. Szabolcs County: First two decades of the 1900s – Tikos Puszta, Szakáll (1921),

11. Csongrád County: 1921 – Révleányvár, Fridli (1921).

Considering the spatial distribution of the exceptional specimens within our present-day borders after the First World War (since 1921), it is obvious, that the known sites are

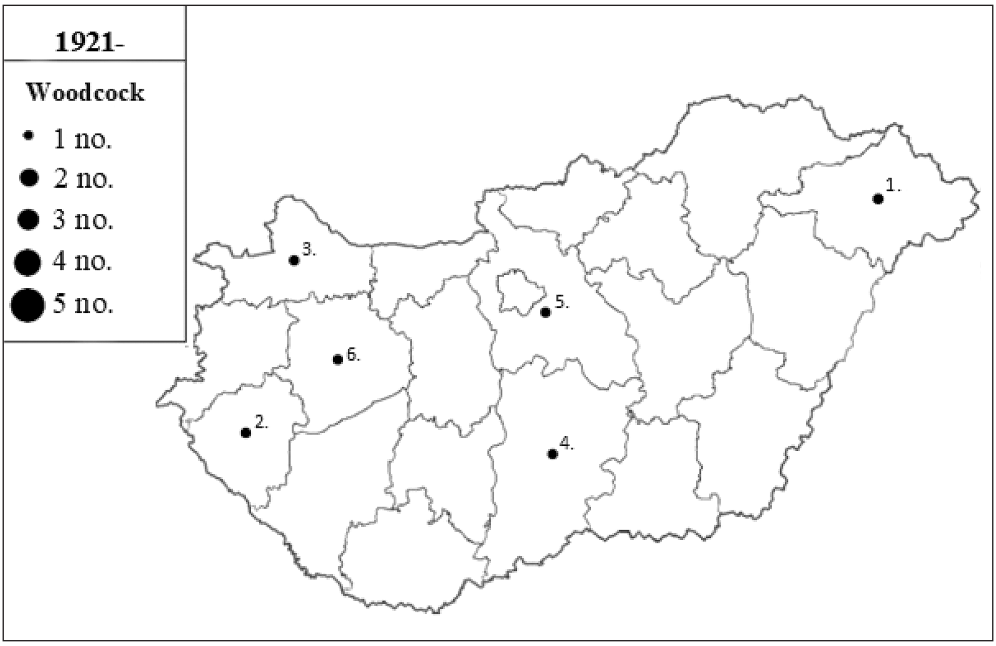

Figure 2. Occurrence of white Woodcocks in the territory of Hungary after 1921
2. ábra Fehér szalonkák megkerülése Magyarország területén 1921. után

concentrated in the counties along the main migration routes. Therefore, they are of crucial importance, similar to the territorial distribution in Kingdom of Hungary *(Figure 2)*.

For the period 1921–2019 the following literature data are available for unique white-feathered Woodcock, based on *Figure 2*:

1. Szabolcs-Szatmár-Bereg County: 1994 – Tiszakerecseny (Szakács 1994),

2. Zala County: 2002 – Csöde, Iváncsics (2002),

3. Győr-Moson-Sopron County: 2004 – Himod (Márok 2004),

4. Bács-Kiskun County: 2010 – The exact location is unknown (Faragó *et al.* 2013, Bende & László 2014),

5. Pest County: 2012 – The exact location is unknown László *et al.* (2013, 2014),

6. Veszprém County: 2018 – Noszlop (Bende & László 2019).

As already mentioned, the importance of Transdanubia (Zala, Győr-Moson-Sopron, Veszprém counties) with regard to the location of white specimens remains unchanged, but the Danube-Tisza region (Pest, Bács-Kiskun counties), and the region of northern Hungary (Szabolcs-Szatmár-Bereg County) is also important. There are no data from the counties of the Tiszántúl region because of the low forest cover and consequently small hunting bag.

According to the Woodcock harvest from the period 2010–2014, it is apparent that the curiosity sites – despite the few data of exceptionally brightly coloured specimens – are tied to the three main migration routes representing by the amounts of hunted specimens (Faragó *et al.* 2012a, b, 2014, 2015, 2016).

Discussion

Colour and pattern determining pigments

In Woodcock, the correct designation of the white colour mutations and the various disturbances leading to white feathers is generally difficult, which is why incorrect terminology is often found in ornithological literature. In order to correctly identify these colour mutations, it is important to know the process of normal pigmentation, and which pigments play a role in the development of species-specific colour and pattern of feathers. The so-called classic "wild dominant" colour of Woodcock is determined by two types of melanin eumelanin and pheomelanin. In feathers containing both forms of melanin, eumelanin is primarily located in the middle of the feathers, while pheomelanin at the edges, creating the species-specific pattern. Melanin is produced through a multistage chemical process known as melanogenesis, where the oxidation of the amino acid tyrosine is catalysed by the tyrosinase enzyme. Melanin polymer molecules are oxidized during the process. However, the degree of oxidation can vary, and thus the intensity of the colour produced. Black is the most oxidized form, while brown indicates a weaker oxidation state (Mason 1953, Rawles 1953, Lubnow 1963). Process of pigmentation may be disturbed due to malfunctions in genetic and physiological processes. Any disturbance in the formation of melanin or other pigments, as well as in the transport and incorporation of pigment granules, can potentially affect the bird's colour. Among the above, the most common anomalies in Woodcock are the disruption of

melanoblast spreading and the incomplete or completely inhibited uptake of pigments into the feather cells. The uneven spread of the pigment may depend on the partial lack of melanin or on the dysfunction of the cells responsible for pigmentation (Pennacchini 2013). The disruption in the production of the pigmentation enzyme, tyrosinase, may also inhibit the normal process of melanin production and thereby the pigment synthesis. The disruption in the production of the pigmentation enzyme, tyrosinase, may also inhibit the normal process of melanin production and thereby the pigment synthesis. The pheo- and eumelanin-producing melanocytes are formed by melanoblasts that develop in the embryonic spinal cord at an early embryonic stage and then spread to the skin and feather follicles. This process is genetically determined and in case of disruption the spread is hindered. This means that no pigment grains can be added to the feather cells as the feathers grow, because the producing melanoblasts are missing in the feather follicles and certain areas remain unpigmented. The white colour due to a hereditary pigment disorder occurs early and does not change with age. The feather pigmentation can also be inhibited by disorders of melanin synthesis or pigment transport (van Grouw 2013). According to international and Hungarian literature, a pigmentary lack in the most bird species, as well as in Woodcock is most common on the wings, especially on the flight feather (Bende & László 2014, 2017a, b, 2018a, b, 2019). Each part of the body can develop this lesion, which often shows bilateral symmetry. The reason for this is due to the early stages of embryonic development described above, because most often affected by leucism is the plumage of body parts furthermost of the vertebral canal. These processes can lead to lower or fully missing pigmentation in some feathers.

Albinism and leucism

In the Hungarian and international ornithological and hunting literature there are often repots of birds with different pigment deficiencies called "***albino***" (Anonymus 1864, Anonimus 1906, Donászy 1907, Bodnár 1908, Fridli 1921, Szakáll 1921, Iváncsics 2002, Szabó 2013, Anonymus 2018a), or "***partial albino***" (Karakosevic 1927, Rollin 1964, Buckley 1982, 1987, Ogilvie 2001, Márok 2004, Anonymus 2015). We must admit that it is wrong.

From the second half of the 19th century and the beginning of the 20th century, we find some observations on the colour and pattern variation of Woodcock (Lakatos 1887, Donászy 1907, Bodnár 1908, Csík 1927).

These papers usually report on pigment-deficient birds (white, grey, possibly completely white), which often have a faint pattern on their feathers. In addition to the generally white-feathered specimens with few dark patterns, there are also reports of so-called "colourful" Woodcock with spotty lack of pigmentation. However, these names are not explicit and in many cases contradictory. Bodnár (1908) first emphasizes how important it is to understand the physiological factors that cause colour deviations in Woodcock. Fox and Vevers (1960) defined albinism as the complete absence of both melanins not only in the feathers, but in the iris and the skin, due to a congenital tyrosinase deficiency, which is why not only the plumage (white), but also the feet, claws and eyes are pigment-free. Real albino individuals are very rare in wild birds because of the stereo blindness of their pigment-free eyes (van Grouw 2006). Until now, no real albino Woodcock specimen was reported. In the

published specimens with white feathers, the eyes, the skin and the unfeathered horny formations were always pigmented, accordingly, these partially pigment-deficient individuals are not albinos in the correct terminology, but leucistic mutations, which means white, with some pigmentation in some places. The common terminology for these "white-varicoloured" birds is "partial albinism", which is by definition not interpretable. Individuals lacking colour to varying degrees are not partial albinos, but so-called leucistic birds (Anonymus 2018b). Leucism is characterized by the presence of the tyrosinase enzyme, so that these birds produce melanin, and the colouring deficiency occurs only in feathers. The developing plumage is partially or completely white, but the eyes are always dark and the beak, legs and claws are also pigmented (van Grouw 2006). The white feathers of leucistic birds are not completely pigment deficient, as there are also Woodcocks known with almost entirely white feathers. On closer examination, however, the plumage is slightly brown or silvery, and the pattern of normal birds is partially or completely recognizable. These specimens are not albinos, as the colouring melanins are present, but their abnormal quality or even lower quantity can lead to an almost completely white feather. The very low concentration and strong dilution of the colouring agents in the plumage result in a very pale whitish colour. This disorder is called "melanin dilution", of which many types are also known in Woodcock (e.g. pastel, Isabella, etc.). In extreme cases, this lesion can also be resulted in an almost white feathering. There are also known mutations in which the amount of melanin remains unchanged, but not in quality, which in extreme cases leads to hardly coloured feathers. This change is known in the literature as "brown mutation". In fact, albinism is much less common than most ornithologists thought. By now it is well known that white discolouration in nature is rarely caused by albinism, but by any kind of leucism or by a non-hereditary reason such as disease, malnutrition (van Grouw 2013).

The Ino mutation

The Ino mutation is a strong qualitative reduction of eumelanin and pheomelanin. This phenomenon is often confused with albinism in bright Ino individuals. The mutation is based on a single gene linked to the sex chromosome in each species (van Grouw 2013). The affected specimens do not develop species-specific colour due to the quantitative reduction and deficient oxidation of eumelanin and pheomelanin, resulting in spectacular colour loss. The oxidation degree of melanin varies, so that black eumelanin can be dark to very light brown, whereas reddish-brown pheomelanin is always very pale or even barely visible. The plumage has a faint pattern, particularly at higher levels of eumelanin, which is typically noticeable in species where the feathers usually contain white parts, like the feathers of Woodcock *(Figure 3).* The mutant Ino bird has reddish eyes, although the iris pigments are not absent, but melanin is in a slightly oxidized state. Due to the available pigment materials, these birds have much better sight than an albino. It is to claim that the red-eyed white birds registered under natural conditions are certainly Inos and not albinos. This recessively inherited mutation occurs only in females (van Grouw 2013). Some publications (Boidot 2003a, 2014) with contradictory statements are known in France about the Ino mutation. Boidot (2003) refers in his article to a very white Woodcock, described as a pastel in a photo published by

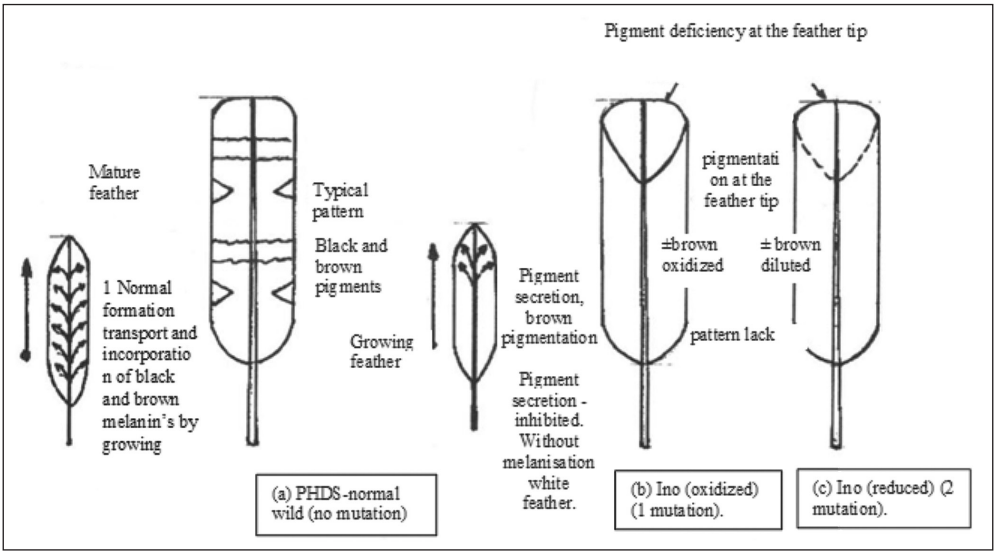

Figure 3. Pigmentation of normal wild dominant and Ino mutant plumage during feather development (following Boidot 2003a)

3. ábra A normál vad domináns és az Ino mutáns tollazat pigmentációja a toll fejlődése során (Boidot 2003a nyomán)

(a): Normal wild dominant plumage (PHDS) („PHDS" = Plumage Habituel el à Dominante Sauvage):
Regular allocation of pigments during feather growth
Both black and brown melanins are present developing colour and pattern characteristical for Woodcock.
Irregular allocation of pigments – Ino mutation:
Inhibited melanisation after beginning of feather growth: black melanin disappears
(b): only slightly oxidized brown eumelanin or **(c):** only diluted brown eumelanin is present (Boidot 2003a)

M. Bernard Laoue. However, according to the author, the plumage of this specimen can be classified as Ino. Boidot (2014) also points to a specimen previously described as an Isabella mutant, where the Ino mutation is considered to be a realistic possibility, but the misdescription of colour in the earlier description cannot be excluded. However, no reliable literature on the occurrence of this mutation in the Woodcock is known. The publications contain photographs of preparations in which the characteristics of the mutation (such as eye colour, limbs, skin pigmentation, etc.) are not clearly identifiable. Another difficulty in describing the mutation is the lack of a sexual dimorphism, which makes it impossible to determine the sex of the Woodcock based on morphological characteristics.

International review

One of the first uniquely coloured specimen reported in **England** in 1825 was published in the ornithological journal "*The Natural History of British Birds*". This colour graphic depicts an almost completely pigment-deficient Woodcock (Url. 1). Both collections of the Norfolk Accredited Museum (Url. 4), and the Rothschild Zoological Museum (Url. 5)

exhibit each a leucistic, pure white Woodcock specimen. In the year 1842, the Regélő Pesti Fashion Magazine (Regélő Pesti Divatlap) informs the readers about observing a real curiosity. This specimen had been breeding in the same nest for five years. Finally, the special bird was shot and stuffed (Anonymus 1842). In 1874, a white coloured Woodcock flushed during a driven hunt near Waterford was reported in Hunter and Competition Magazine. The cited Field noted that white-spotted Woodcock is not that rare, but the pure white is a real *„rara avis"* (rare bird, weiße Krähe) (Anonymus 1874). Frederick William Frohawk, a British naturalist, published in 1900 a scientific drawing of a heavily underpigmented specimen entitled "Study of a white Woodcock" (Url. 2).

A curiosity bagged in **Germany** can be read in the Hunter's Magazine of 1864: "*White Woodcock shot near Duisburg this year*," is written to the "Jagdzeitung" from Düsseldorf. Count Spee's hunter killed the special bird on the evening courtship flight (Anonymus 1864). In **Romania**, near Crajova (today Craiova), a completely snow-white Woodcock was shot, and it was taken to the museum in Brasov, is written to a German Hunting Magazine (Anonymus 1890). Some recent literature from **Russia** is also known: An article on albinism reports about a white leucistic curiosity, partially dotted with brown pattern (Anonymus 2018a). On October 15, 2015, a hunter shot a Woodcock with pigment deficiency in the Aleksandrovsky district (Vladimir region). Pigment deficiencies appeared on the right and left wings for some flight feather and coverts (Anonymus 2015).

In the Hunter's Magazine an unknown Hungarian hunter reports on his hunting experiences in **India** in 1897. He was watching his prey of nearly 70 Woodcocks when he noticed the following phenomenon: 5 specimens of the hunting bag were of an abnormal colour. Two of them had white flight feathers and coverts on their wings (Anonymus 1897).

The richest knowledge of the colours of the Woodcock was published in **France**. French experts distinguish three categories based on varying levels of pigment deficiency of Woodcock (Boidot 2012a):

1. category: Less than 10% of the plumage is white.
2. category: 10–50% of the plumage is white.
3. category: More than 50% of the plumage is white.

Pigment deficiency can occur anywhere on the body but the wing feathers are the most affected. Thus, in most publications refer on birds to greater or lesser extent pigment deficient on the wing, but there are also reports of white discoloration varying degrees on different feathers on the body (Goduon 2002, Boidot 2003a, b, 2004, 2006, Bruyére 2007, Cauquil 2007, Fulchic 2007, Boidot 2008a, b, Boidot 2009, 2010, 2013a, b, Lapasset 2017, Pascal 2019).

Photos about some partially white specimens are also known from **Italy** (Pennacchini 2013). Among the reference materials of taxidermist Stefano Panfili (Url. 6) is a photo about a Woodcock with pigment deficiency in the head and neck, while on the body white feathers are only scattered.

In the **Czech Republic**, on October 27, 2011, a young Woodcock with a white flight feather on the left wing was caught at the Červenohorském Sedle. The specialty of this bird is that it is the only known pigment-deficient specimen which was caught by bird ringers and not shot during hunting (Url. 3).

Pigment deficient Woodcocks in the Hungarian hunting literature

From the mid-20th century to the First World War, articles on curiosities appeared relatively frequently in the hunting press, later, such reports are rarely to read. One of the first published reports of a white specimen in Hungary came from an October hunt in 1870 in Görgényszentimre. The special bird was shot by Tivadar Bormenissza (Anonymus 1870). Subsequently, a special coloured bird was shot in the vineyards near Páty. Its breast and mantle were completely white, the plumage pattern ashy-gray instead of brown, only the tail was slightly coloured (Anonymus 1872a). Also, in the Buda Hills in the year 1872, Councillor Schwartzer shot a special-coloured Woodcock that was completely white with the exception of three black tail feathers and some normal coloured breast feathers. According to the description, the bird had yellow, so pigmented beak and legs (Anonymus 1872b). In 1873, Count István Erdődy shot a white Woodcock on the estate of Count Ferenc Széchenyi in Somogytarnóca (Inkey 1873). In March 1878, Joseph Manhalt, a forest keeper in the royal estate of Gödöllő, in the Kis-baghi forest successfully hunted a Woodcock with partially white plumage. According to the description, the body feathers had normal colour, while the wings were completely white except for a flight feather. The special bird was immediately sent to Vienna, to the ornithological collection of Crown Prince Rudolf (Anonymus 1878, Dittrich 1878). A white Woodcock is also known from Komárom County that was shot in 1884. This bird was exhibited in the collection of the Hungarian National Museum together with a whitish pale exemplar of unknown origin (Madarász 1884). In 1897, a hunter named J. Nagy sent a very interesting Woodcock exemplar form County Borsod to Adolf Lendl's workshop in Buda for stuffing. According to the description, the bird was completely white (Anonymus 1897). At the turn of the century, Adam Buda mentions a white Woodcock as a rare curiosity in a report on hunting in Retyezát. This bird was shot by Samuel Mátra during the autumn hunting (Buda 1900). Lakatos (1904) also refers in his book "*The Forest Snipe and its Hunting*" to some abnormally coloured, partially or completely white Woodcock exemplars prepared by Adolf Lendl taxidermist in Buda. Another completely white specimen was reported to being shot in 1906 by Count Tivadar Jankovich on his estate in Somogy County (Anonymus 1906). According to Bodnár (1908), in the collection of 272 exemplars of the Gymnasium in Hódmezővásárhely there was a plenty of ornithological specialties, as well as a multi-coloured Woodcock. Also, in 1908, a white Woodcock was shot by Countess Emilné Széchenyi in the forest near Vajszka, Bács-Bodrog County (Szilárd 1910).

On March 30, 1912, János Novák, a military officer, shot a unique Woodcock in the Kisazari forest near Gálszécs (Zemplén County). The pure white plumage of this bird had only a few dark feathers, and the flight feathers were of an abnormal light brown colour (Veress 1912). This specimen was also taken to the taxidermist Lendl's workshop for stuffing (Egervári 1912). Near Lovasberény and Guttamási, completely white Woodcocks were shot in the 1920s as well (Szabó 2013). In March 1921, a "multi-coloured Woodcock" was shot, which had two white flight feathers on both wings, two white coverts on the left and underpigmented alula on the right (Szakáll 1921). In the same report, Szakáll mentions another unpublished white Woodcock of the collection of the Gymnasium in Hajdúnánás.

On April 8, 1921 a forester Ernő Fridli, informed in the journal Hunting about an "albino Woodcock" with pigment deficiency in the first three flight feathers and the alula of the left wing and in the first flight feather of the right wing. The bird was shot by Count József Majláth (Fridli 1921).

After the First World War, news of unique coloured Woodcocks became rare in the professional journals, except for a few, but interesting records. Milivoj Karakosevic shot a unique specimen on the courtship flight on March 13, 1927. The wingtip and the alulae on both sides were snow-white (Karakosevic 1927). In 1943, a white Woodcock was observed located in the South. The bird was flushed during the autumn wild boar hunt but could not be shot (Bélaváry 1943). Unfortunately, the location of the last two records has remained unknown.

After the Second World War, news of unique coloured Woodcocks are hardly known. The frequency of colour deficiencies may not have decreased, but the reason why publication of appearance these birds was no longer considered important is unknown.

After 1943, the next announcement is from 1994. This year on March 19, Miklós Janisch shot an abnormally coloured Woodcock near Tiszakerecseny (Szabolcs-Szatmár-Bereg County), which had two white primaries and white alulae on both wings (Szakács 1994).

On March 20, 2002, Gyula Radics shot a Woodcock with white primaries in Csöde, Zala County, the partial pigment lack extended also to primary coverts (Iváncsics 2002). On the morning flight in March 2004, a very similar specimen was shot by Zsolt Gombás near Himod (Győr-Moson-Sopron County), with two snow-white primaries and alulae on both wings. The rare prey was taken to taxidermist Kálmán Geiger's workshop in Sopron (Márok 2004). In the 12 078 wing samples received in our institute as part of Woodcock Bag Monitoring, only two partially pigment-deficient curiosities occurred. In 2010, a Woodcock was shot in Bács-Kiskun County, with a single pigment deficient feather: one of the secondary coverts had a white tip and a patternless vane (Faragó *et al.* 2013, Bende & László 2014, 2017a, b, 2018a, b). Among the samples collected in 2012 came from Pest County, there was a specimen with white primaries (László *et al.* 2013, 2014).

In spring 2018, a white Woodcock was shot as part of the sampling monitoring. This ornithological rarity is almost completely pigment-free, pigmented spots were only found on the back, on the tail feathers and partly on their coverts. This immature white Woodcock was shot on March 26, 2018 by Zsolt Marton near Noszlop (Veszprém County) on a reedy, bushy terrain nearby an alder forest. According to the hunter, the bird was flying late, lonely at the end of the courtship flight.

Concluding remarks

Based on the above, it can be concluded that the literature on the colour- and pattern variability of Woodcock is poor in both national and international context, which is not accidental, as birds of extraordinary colour are rare among individuals of this species. The most common discoloration, as in other wild bird species, is the white, so called pigment deficient mutation. In the description of birds with white-varicoloured plumage commonly used terms are "albino, partial albino or showing notes of albinism", but we know, that partially pigment-deficient individuals, so-called leucistic birds are not albinos. Findings regarding

the INO mutation in Woodcock are found in French literature, but no reliable occurrence of this mutation is known until now. The size of the hunting bag is not negligible in terms of curiosity occurrence. An overview of the Hungarian statistics on Woodcock hunting bag data available from 1875 to the present shows, that it makes less than 0.1% of the total bag in Europe. In the light of this small amount of data, the occurrence of a unique leucistic Woodcock carries extremely valuable information. The occurrences of these rare birds are focused in areas of the considerable hunting bags, linked to the three major migratory pathways of the species, considered both royal and present-day Hungary.

Over the past 150 years, hunting of about twenty pigment deficient Woodcock has been published by dedicated hunters of the species. The uniqueness of these findings also illustrates that in our own studies as part of the Woodcock Sampling Monitoring, in the wing samples (n = 12,078) examined between 2010 and 2018, only three individuals showed pigment deficiency. Even in the case of the most common pigment anomalies, this is only 0.03% of the Hungarian bag. Even in French or Italian hunting bags, which are much larger than our local sampling possibilities such leucistic specimens are very rare. The appearance of almost entirely white individuals is a really rare event. It would be great, also in Hungary, resurrecting the tradition of reporting about the unique bird occurrences, expanding the ornithological knowledge available on Woodcock.

Request

The knowledge of white colour varieties and the list of curiosities is incomplete, so the authors ask everybody kindly to send any further information on this subject to them.

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References

Anonymus 1842. Fehér szalonka [White Woodcock]. – Regélő Pesti Hírlap 1(83): 912. (in Hungarian)
Anonymus 1864. Fehér szalonka [White Woodcock]. – Vadász és Verseny-Lap 8(23): 375–376. (in Hungarian)
Anonymus 1870. Vadász-táska [Hunting bag]. – Vadász és Verseny-Lap 14(23): 208. (in Hungarian)
Anonymus 1872a Fehér szalonkát lőttek [They shot a white Woodcock]. – Vadász és Verseny-Lap 16(43): 315. (in Hungarian)
Anonymus 1872b Egy fehér szalonkát lőtt dr. Schwartzer tanácsos [A white Woodcock was shot by dr. Schwartzer councillor]. – Nefelejts 14(44): 530. (in Hungarian)
Anonymus 1874. Természeti ritkaságok és ritka vadak [Natural rarities and rare wildlife]. – Vadász és Verseny-Lap 18(8): 69. (in Hungarian)
Anonymus 1878. Rövid hírek [Short news]. – Veszprém Megyei Heti Közlöny 4(11): 46. (in Hungarian)
Anonymus 1890. Szalonka-albínó [Woodcock-albino]. – Vadász Lap 11(6): 82. (in Hungarian)
Anonymus 1897. Az erdei szalonka Indiában [Woodcock in India]. – Vadász Lap 18(27): 360–362. (in Hungarian)

Anonymus 1906. Fehér szalonka [White Woodcock]. – Zoológiai Lapok. Illusztrált közlemények a tudományos és gazdasági állattan, vadászat, állatvédelem és sport köréből 8(7): 82. (in Hungarian)
Bende, A. & László, R. 2019. Erdei szalonka (*Scolopax rusticola* L.) színváltozatok és kuriózumok Magyarországon [Woodcock (*Scolopax rusticola* L.) colour variations and curiosities in Hungary]. – In: Facskó, F. & Király, G. (eds.) VII. Kari Tudományos Konferencia, Tanulmánykötet, Sopron: Soproni Egyetem Kiadó (inpres) (in Hungarian)
Bende, A. & László, R. 2018a Woodcock (*Scolopax rusticola* L.) diversity of wing sample colours and patterns in 2013 in Hungary. – XVII. International Conference on Application of Natural-, Technological- and Economic Sciences [International Conference on Application of Natural-, Technological- and Economic Sciences]. – In: Pozsgai, A. & Puskás, J. (eds.) Konferenciakötet. –ELTE, Szombathely, pp. 111–114. (in English)
Bende, A. & László, R. 2018b Erdei szalonka (*Scolopax rusticola* L.) színváltozatok előfordulása 2014-ben Magyarországon [Woodcock (*Scolopax rusticola* L.) diversity of wing sample colours and patterns in 2014 in Hungary]. – Természet-, Műszaki- és Gazdaságtudományok Alkalmazása XVII. Nemzetközi Konferencia. Eötvös Lóránd Tudományegyetem Savaria Egyetemi Központ [International Conference on Application of Natural-, Technological- and Economic Sciences]. – In: Pozsgai, A. & Puskás, J. (eds.) Konferenciakötet. – ELTE, Szombathely, pp. 42–46. (in Hungarian)
Bende, A. & László, R. 2017a Erdei szalonka (*Scolopax rusticola* L.) színváltozatok előfordulása 2011-ben Magyarországon [Woodcock (*Scolopax rusticola* L.) diversity of wing sample colours and patterns in 2011 in Hungary]. – In: Bidló, A. & Facskó, F. (eds.) Soproni Egyetem Erdőmérnöki Kar VI. Kari Tudományos Konferencia Konferenciakötet. Soproni Egyetem Kiadó, Sopron 168. (in Hungarian)
Bende, A. & László, R. 2017b Az erdei szalonka (*Scolopax rusticola* L.) szárnyminták szín- és mintázatbeli változatossága 2010-ben Magyarországon [Woodcock (*Scolopax rusticola* L.) diversity of wing sample colours and patterns in 2010 in Hungary]. – XVI. Természet-, Műszaki- és Gazdaságtudományok Alkalmazása Nemzetközi Konferencia [International Conference on Application of Natural-, Technological- and Economic Sciences]. – In: Füzesi, I., Kovács, E. & Puskás, J. (eds.) Az előadások összefoglalói [Abstracts of the Presentations]. –ELTE, Szombathely 23. (in Hungarian)
Bélaváry, D. 1943. Egy s más a szalonkákról [One and other things about the Woodcock]. – Vadászat-Magyar Vadászújság 3(8): 115–117. (in Hungarian)
Boidot, J-P. 2003a Curiosités-Deux Bécasses des bois à plumage inhabituel [Curiosities-Two Woodcocks with abnormal plumage]. – La Mordorée No. 225: 31–34. (in French)
Boidot, J-P. 2003b Curiosités-plumage inhabituel [Curiosities-abnormal plumage]. – La Mordorée No. 228: 274. (in French)
Boidot, J-P. 2004. Curiosités [Curiosities]. – La Mordorée No. 231: 178. (in French)
Boidot, J-P. 2006. Bécasse a panachure balnche limitée [Woodcock with limited white plumage]. – La Mordorée No. 238: 96. (in French)
Boidot, J-P. 2008a Cas d'un plumage inhabituel [Case of unusual plumage]. – La Mordorée No. 246: 88–89. (in French)
Boidot, J-P. 2008b Cas d'un plumage inhabituel [Case of unusual plumage]. – La Mordorée No. 245: 33–34. (in French)
Boidot, J-P. 2009. Curiosités [Curiosities]. – La Mordorée No. 249: 23–25. (in French)
Boidot, J-P. 2010. Différentes observations de bécasses des bois a panachure blanche limitée [Different observations of Woodcock with limited white variegation]. – La Mordorée No. 255: 219–221. (in French)
Boidot, J-P. 2012a Bécasse des bois à plumage inhabituel [Woodcock with unusual plumage]. – La Mordorée No. 261: 29–38. (in French)
Boidot, J-P. 2012b Curiosités [Curiosities]. – La Mordorée No. 264: 65–66. (in French)
Boidot, J-P. 2013a Plumage aberrant [Aberrant plumage]. – La Mordorée No. 265: 25. (in French)
Boidot, J-P. 2013b Curiosités [Curiosities]. – La Mordorée No. 266: 40. (in French)
Boidot, J-P. 2014. Curiosités. Un plumage inhabituel assez exceptionnel [Curiosities. Unusual plumage quite exceptional]. – La Mordorée No. 270: 12–20. (in French)
Bruyére, A. 2007. Blanches comme neige [White as snow]. – La Mordorée No. 244: 335. (in French)
Bodnár, B. 1908. A Maros-Tisza-közének madárvilága [The birds of the Maros-Tisza Intermediate]. – Vadászat és Állatvilág 8(17): 167–175. (in Hungarian)
Buckley, P. A. 1982. Avian Genetics. – In: Petrak, M. (ed.) Diseases of Cage and Aviary Birds. 2nd ed. pp. 21–110.
Buda, Á. 1900. A Retyezát aljából [From the bottom of Retyezát Mountain]. – Vadász-Lap 21(36): 484–485. (in Hungarian)

Cauquil, P. 2007. Curiosités [Curiosities]. – La Mordorée No. 244: 335. (in French)
Csík, I. 1924. Az erdei szalonkáról [About the Woodcock]. – Nimród 12(18): 279. (in Hungarian)
Dittrich, L. 1878. Fehér szalonka [White Woodcock]. – Vadász és Verseny-Lap 22(1): 79. (in Hungarian)
Donászy, F. 1907. Az erdei szalonka és vadászata [Woodcock and the hunt of it]. – Vadászat és Állatvilág 7(6): 77. (in Hungarian)
Egervári, Gy. (ed.) 1912. Különféle [Various]. – Vadász Lap 33(11): 147. (in Hungarian)
Faragó, S. 2009. A történelmi Magyarország vadászati statisztikái 1879–1913. [Hunting statistics of Historic Hungary between 1879–1913.]. – NYME Egyetem Kiadó, Sopron, pp. 231–237.
Faragó, S., László, R. & Bende, A. 2012a Az erdei szalonka (*Scolopax rusticola*) teríték monitoring eredményei 2010-ben Magyarországon [Results of the Hungarian Woodcock *(Scolopax rusticola)* Bag Monitoring in 2010]. – Magyar Vízivad Közlemények 22: 285–296. (in Hungarian)
Faragó, S., László, R. & Bende, A. 2012b Az erdei szalonka *(Scolopax rusticola)* teríték monitoring eredményei 2011-ben Magyarországon [Results of the Hungarian Woodcock *(Scolopax rusticola)* Bag Monitoring in 2011. – Magyar Vízivad Közlemények 22: 297–310. (in Hungarian)
Faragó, S., László, R. & Bende, A. 2014. Az erdei szalonka *(Scolopax rusticola)* teríték monitoring eredményei 2012-ben Magyarországon [Results of the Hungarian Woodcock *(Scolopax rusticola)* Bag Monitoring in 2012]. – Magyar Vízivad Közlemények 24: 283–295. (in Hungarian)
Faragó, S., László, R. & Bende, A. 2015. Az erdei szalonka *(Scolopax rusticola)* teríték monitoring eredményei 2013-ban Magyarországon [Results of the Hungarian Woodcock *(Scolopax rusticola)* Bag Monitoring in 2013]. – Magyar Vízivad Közlemények 25: 289–302. (in Hungarian)
Faragó, S., László, R. & Bende, A. 2016. Az erdei szalonka *(Scolopax rusticola)* teríték monitoring eredményei 2014-ben Magyarországon [Results of the Hungarian Woodcock *(Scolopax rusticola)* bag monitoring in 2014]. – Magyar Vízivad Közlemények 27: 284–296. (in Hungarian)
Fox, H. M. & Vevers, G. 1960. The nature of animal colours. – London, Publisher: Sidgwick & Jackson
Fridli, E. 1921. Albínó szalonka [Albino Woodcock]. – Vadászat-Magyar Vadászújság 4(11): 201. (in Hungarian)
Fulchic, R. 2007. Curiosités [Curiosities]. – La Mordorée No. 244: 331. (in French)
Goduon, M. J. 2002. Curiosités [Curiosities]. – La Mordorée No. 223: 192. (in French)
Inkey, I. 1873. Vadászat-Sport [Hunting-Sport]. – Vadász és Verseny-Lap 17(49): 361. (in Hungarian)
Iváncsics, L. 2002. Zalában albínó szalonka [Albino Woodcock in Zala County]. – Nimród 90(7): 38. (in Hungarian)
Karakosevic, M. 1927. Részleges albinó-szalonka [Partly albino Woodcock]. – Vadászat-Magyar Vadászújság 27(10): 171. (in Hungarian)
Lakatos, K. 1887. Az erdei szalonka természetrajzi leírása [Biological description of Woodcock]. – Vadász-Lap 8(1): 7. (in Hungarian)
Lakatos, K. 1904. Az erdei szalonka és vadászata (Vadászati monográfia) [Woodcock and the hunt of it (Hunting monograph)]. –Endrényi Lajos, Szeged (in Hungarian)
Lapasset, J. 2017. Bécasses à panachures limitées. Quand la passion l'emporte [Woodcock with limited variegations. When passion wins]. – La Mordorée No. 281: 53. (in French)
László, R., Bende, A. & Faragó, S. 2013. Szín és mintázatbeli eltérések a magyarországi erdei szalonka szárnyminták között [Colour and pattern differences between Hungarian Woodcock wings]. – In: Bidló, A. & Szabó, Z. (eds.) IV. Kari Tudományos Konferencia Kiadvány – Nyugat-magyarországi Egyetem Erdőmérnöki Kar, Sopron, pp. 265–268. (in Hungarian)
Lubnow, E. 1963. Melanine bei Vögeln und Säugetieren [Melanins in birds and mammals]. – Jornal für Ornithologie 104: 69–81. (in German)
Madarász, Gy. 1884. Rendellenes színezésű madarak a Magyar Nemzeti Múzeum gyűjteményében [Birds with abnormal colours in the collection of the Hungarian National Museum]. – Természetrajzi Füzetek 8(3): 187–198. (in Hungarian)
Mason, H. S. 1953. The structure of melanins. – In: Gordon, M. (ed.) Pigment cell growth. – Proceedings of the 3rd Conference on the biology of normal and atypical pigment cell growth, New York, pp. 277–303.
Márok, T. 2004. Fehér szárnyú szalonka [White-winged Woodcock]. – Nimród 92(8): 36.
Pascal, 2019. Pour le plaisir des yeux, la bécasse du jour [For the pleasure of the eyes, the Woodcock of the day]. – La Mordorée No. 290: 46. (in French)
Rawles, M. E. 1953. Origin of the mammalian pigment cell and its role in the pigmentation of hair. – In: Gordon, M. (ed.) Pigment Cell Growth – Proceedings of the 3rd Conference on the biology of normal and atypical pigment cell growth, New York, pp. 1–15.

Rollin, N. 1962. Abnormal white, yellow and fawn plumages. – In: Yealland, J. J. (ed.) Ornithological Journal Bulletin of the British Ornithologists' Club 82: 83–86.
Rollin, N. 1964. Non-hereditary and hereditary abnormal plumage. – Bird Research (2): 1–44.
Szabó, I. 2013. Bóbitás fürj, szikaszarvas, világrekord őzbak. Fejezetek Fejér megye vadászattörténelméből [Gambel's Quail, Sika Deer, world record Roe Deer. Chapters from the hunting history of Fejér County]. – Meran Fülöp Vadászati és Muzeológiai Alapítvány, Csákberény, p. 96. (in Hungarian)
Szakács, K. 1994. Fehér tollú szalonka [White feathered Woodcock]. – Nimród 82(8): 43. (in Hungarian)
Szakáll, D. 1921. Tarka szalonka [Multicolored Woodcock]. – Vadász-Lap 4(10): 186–187. (in Hungarian)
Szilárd, F. 1910. Illúzió és valóság [Illusion and reality]. – Vadász-Lap 31(11): 184–187. (in Hungarian)
van Grouw, H. 2006. Not every white bird is an albino: Sense and nonsense about colour aberrations in birds. – Dutch Birding – International journal on Palearctic birds, January, pp. 79–88.
van Grouw, H. 2013. What colour is that bird? The causes and recognition of common colour aberrations in birds. – British Birds 106: 17–29.
Veress, D. 1912. Fehér szalonka [White Woodcock]. – Vadászat és Állatvilág 12(4): 91. (in Hungarian)

Websites

Anonymus 2018a Al'binosy [Albinos]. – Ohota i rybalka-Rubrika: Interesnye fakty ohoty i rybalki (Альбиносы. In Охота и рыбалка – Рубрика: Интересные факты охоты и рыбалки.) Online magazin. Downloaded from: http://hawkv.ru/albinosy/ (in Russian)
Anonymus 2018b Albino animals and birds. Downloaded from http://messybeast.com/albinism/albinoindex.htm (in English)
Anonymus 2015. Val'dshnep-al'binos [Woodcock-albino]. – Ohota i rybalka-Rubrika: Interesnye fakty ohoty i rybalki. (Вальдшнеп-альбинос. Охота и рыбалка- Рубрика: Интересные факты охоты и рыбалки.) Downloaded from: https://www.ohotniki.ru/hunting/news /2015/11/04/645027-valdshnepalbinos.html (in Russian)
Pennacchini, P. 2013. Una beccaccia dal piumaggio insolito [A Woodcock with unusual plumage]. – Beccacce che Passione, No. 2. Downloaded from: http://www.caffeditrice.com/una-beccaccia-dal-piumaggio-insolito/ (in Italian)
Ogilvie, M. 2001. Albinism, partial albinism and all the other -isms! Downloaded from: https://www.birdsofbritain.co.uk/features/mao-jun-01.htm (in English)
Url. 1. Downloaded from: https://www.alamy.com/stock-photo-color-engraving-of-the-Woodcock-bird-scolopax-rusticola-in-its-natural-170790086.html (in English)
Url. 2. Downloaded from: https://bidtoart.com/en/fine-art/Woodcock-white-variety/942499 (in English)
Url. 3. Downloaded from: http://www.fkcso.cz/chs/scorus.html (in Czech)
Url. 4. Downloaded from: http://www.nationaltrustcollections.org.uk/object/1400355 (in English)
Url. 5. Downloaded from: http://messybeast.com/albinism/albino-index.htm (in English)
Url. 6. Downloaded from: https://it-it.facebook.com/tassidermiastefanopanfili /photos/ beccaccia-scolopax-rusticola-affetta-da-leucismo-variazione-di-colore-naturale-s/1226077530779413/ (in Italian)