

Breeding of the Common Crane (*Grus grus* L.) in Hungary since the 19th century to modern times

Attila BENEDE



Received: September 01, 2023 – Revised: October 17, 2023 – Accepted: October 18, 2023

Bende, A. 2023. Breeding of the Common Crane (*Grus grus* L.) in Hungary since the 19th century to modern times – Ornis Hungarica 31 (2): 99–109. DOI: 10.2478/orhu-2023-0022

Abstract In the present study, I summarized the data on Common Crane (*Grus grus*) nesting published in the Hungarian ornithological literature from the mid-19th century to the present day. Based on these data, it can be observed that the crane was never a frequent nesting species in Hungary. It probably nested regularly until the early 19th century, then occasionally until the 1910s, after which, apart from two occasional reports, no nesting data were available until 2015. From this year onwards, it started nesting again in the Transdanubian region. In the examined period, 55.6% of the nests (n=25) originated from the Transdanubian region, 37.0% from the Tiszántúl region, and 7.4% from the Duna-Tisza area. The observations recorded during the nesting period showed a strong correlation with the spatial distribution of confirmed nests. 82.6% of the observations recorded (n=23) were from the Transdanubian region, 13.0% from the Tiszántúl region, and 4.3% from the Duna-Tisza region.

The distribution of nesting data between regions varies not only spatially but also temporally. The nesting data from the Duna-Tisza area and Tiszántúl region date back to the 19th century, with the exception of one report, while the most recent nesting data are from the Transdanubian region (Vas and Veszprém counties).

Keywords: crane nesting, breeding biology, brood rearing, nesting habitat, breeding success

Összefoglalás Jelen tanulmányban a 19. század közepétől napjainkig összegeztem a magyar ornitológiai szakirodalomban közölt darufészkelésre vonatkozó megfigyelési adatokat. Ezek alapján megállapítható, hogy a daru sohasem volt gyakori fészkelő faj Magyarországon, de a 19. század elejéig valószínűleg rendszeresen, majd az 1910-es évekig esetenként költött, ezt követően két eseti adatközlést leszámítva 2015-ig nincs fészkelési adata. Ettől az évtől újra költ a Dunántúlon. A vizsgált időszakban a fészkelések (n=25) 55,6%-a a Dunántúlról származik, a Tiszántúl részesedése 37,0%, a Duna-Tisza közéé 7,4%. A fészkelési időszakban regisztrált megfigyelések az igazolt fészkelések területi megoszlásával szoros korrelációt mutatnak. A regisztrált megfigyelések (n=23) 82,6%-a a Dunántúlról származik, a Tiszántúl részesedése 13,6%, a Duna-Tisza közéé 4,3%.

A fészkelési adatok megoszlásában az egyes régiók között nem csupán térbeli, hanem időbeli eltérés is tapasztalható. A Duna-Tisza közéről és a Tiszántúlról származó fészkelési adatok, egy közlést leszámítva, a 19. századból származnak, míg az elmúlt időszak fészkelési adatai a Dunántúlhoz (Vas és Veszprém vármegye) köthetők.

Kulcsszavak: darufészkelés, költésbiológia, fiókanevelés, fészkelőhely, költési siker

Institute of Wildlife Biology and Management, Faculty of Forestry, University of Sopron, 9400 Sopron, Bajcsy-Zsilinszky utca 4., Hungary, e-mail: bende.attila.@uni-sopron.hu

Introduction

The species has a breeding range in the boreal and temperate regions of the Palaearctic faunal range, from Scandinavia (70°N) and north-eastern Europe through Russia (Indigirka, Kolyma) to the Far East (northern China). Currently, only sporadic nests are known south of the latitude (35°N) crossing the northern parts of France and Ukraine border (Turkey, Armenia and Azerbaijan) (Archibald & Meine 1996, Ellis *et al.* 1996, Hartwig 1997). It has patchy occurrences in the Balkan region and in Asia Minor. It formerly extended southwards through Spain, the northern regions of Italy, the northern parts of the Alps and the Carpathian Basin (Glutz von Blotzheim 1986, Schepers 2020). In the 19th century, hunting pressure and habitat loss led to the almost complete disappearance of nesting populations in central and southern Europe (eastern England, Spain, Italy, Greece, Austria, Duna-Delta) (Johnsgard 1983, Snow & Perrins 1998, Prange 2005). Since the 1960s, following the strengthening of the main nesting area (Deinet *et al.* 2013, Schepers 2020), new breeding data were recorded in several countries on the southern and western edges of the nesting periphery (Bobek *et al.* 2003, Salvi 2003, 2010, 2017, Repel *et al.* 2009, Prowse 2010, Deinet *et al.* 2013, Kever *et al.* 2018, Tichackova & Lumpe 2018, Van Der Ven 2018, Schepers 2020, Carys 2021, Jeremy 2021).

In the first half of the 18th century from Hungary, Marsigli (1726), and in the 19th century, Frivaldszky (1891) mentioned it as a nesting species. Concerning the time before the large-scale river regulations and drainages, several authors (Nagy 1917, Berzsenyi 1918, Hankó 1933, Fallon-Kund 1937, Keller 1937, Bertóti 1948) mentioned it as a regular nester in the Berek of Balaton, the Hanság of Fertőmellék and the Sárrét. According to Chernel (1903), the crane used to breed in many areas in Hungary in the past in the large swamps. According to Schenk (1917), it could not have been a frequent nester even in undisturbed, large areas of habitat otherwise potentially suitable for nesting.

Material and Method

This study is based on the data of nesting observations (n=25) (Lovassy 1887, 1907, Szomjas 1913, Láposi 1914, Nagy 1917, Schenk 1917, Berzsenyi 1918, Zeyk 1920, Nagy 1926, Csath, 1938, Schenk 1938a, 1938b, Sterbetz 1958, Bérczy *et al.* 1972, Keve 1978, Kaufman *et al.* 2017a, 2017b, 2018, 2021, Szekeres *et al.* 2021, Szekeres & Heffenträger 2021, Faragó *et al.* 2022, Fellner 2022, Szekeres & Németh 2022, Fellner, Z. pers comm. 2023) and observations recorded during the nesting period (n=23) (Vasvári 1921, Keller 1937, Tarján 1942, Sőregi 1958, Keve 1978, Kaufman *et al.* 2017a) from the 19th century to the present day, as known from the Hungarian ornithological literature.

I plotted the definite nesting and the hypothetical data for historical Hungary and the present territory of our country on a point map (ArcGIS 10.3). The correlation of the two data sets was performed using a two-sample t-test.

Results

Confirmed nesting sites

There is no detailed literature review on the nesting data of the crane in Hungary dating back to the 19th century, so only the works of Schenk (1917) and Berzsényi (1918) are cited in connection with earlier nesting (e.g. Hadarics & Zalai 2008, Kaufman *et al.* 2017a, Haraszthy 2019, Végvári 2021a), noting that the last nesting record of the species before 2015 was from the 1910s, from the Nagyberek near Fonyód. In addition to these publications, earlier nesting data are known as well (Lovassy 1888, Szomjas 1913, Vasvári 1921, Nagy 1926, Sterbetz 1958, Pelle 1967, Ocsovszky 1964, Keve 1978), which can be used to clarify the knowledge on the species' historical nesting areas. Based on the known nesting data from the last two centuries (n=25), the crane was not a common nesting species in Hungary even at the beginning of the period under investigation, but it was a regular nester until the 1910s.

Except for one known nesting site (1870s, Mosorini Marshes, now Mošorin, Serbia), all data come from within our present borders, from nine counties (Bács-Bodrog: 3.7%, Békés: 18.5%, Csongrád-Csanád: 11.1%, Hajdú-Bihar: 3.7%, Pest: 3.7%, Somogy: 7.4%, Szabolcs-Szatmár-Bereg: 3.7%, Vas: 22.2%, Veszprém: 22.2%). The most dominant area

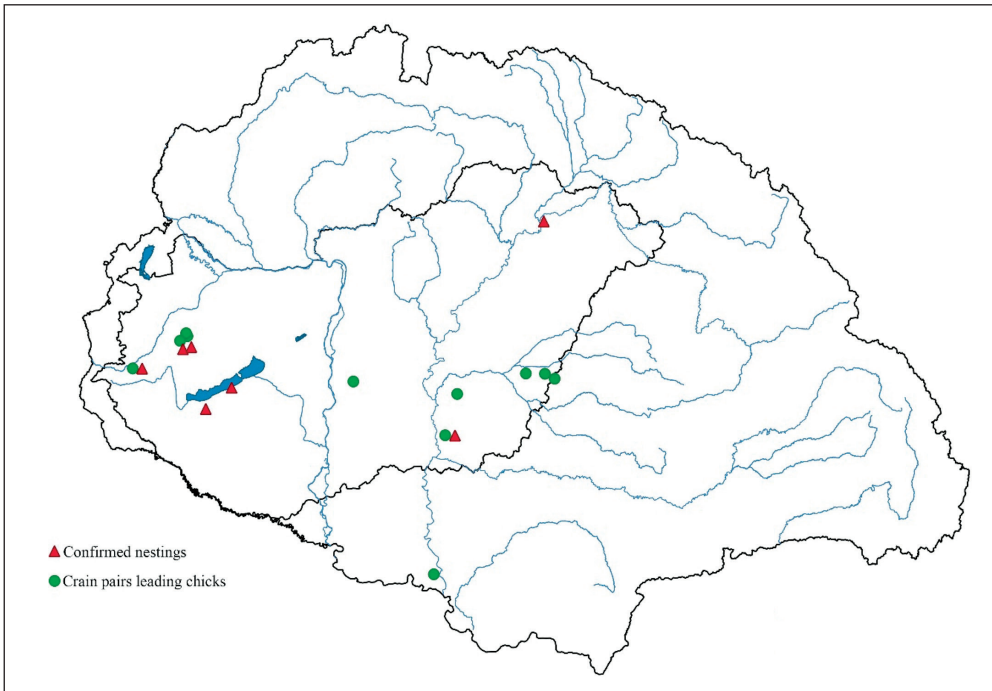


Figure 1. Geographical distribution of crane nests (n=12) and crane pairs (n=13) leading chicks in the Kingdom of Hungary and in the present territory of Hungary from the mid-1800s to the present

1. ábra Darufészkek (n=12) és csibéket vezető darupárok (n=13) földrajzi eloszlása a Magyar Királyság és Magyarország jelenlegi területén az 1800-as évek közepétől napjainkig

is Transdanubia (55.6%), followed by nests from the Tiszántúl region (37.0%), while the smallest dataset comes from the Duna-Tisza area (7.4%). In the Transdanubian region, the western region (Marcal Basin, Rába floodplain) and the Nagyberék area on the southern shore of Lake Balaton are the dominant ones. The most recent nesting data also come from here, from the border area between the counties of Vas and Veszprém (Kaufman *et al.* 2017a, Kaufman 2018, 2021, Szekeres & Heffenträger 2021, Szekeres *et al.* 2021, Faragó *et al.* 2022, Fellner pers. comm. 2023).

The data (n=10) – with the exception of one publication (1956 Hódmezővásárhely [Sterbetz, 1958]) – for Duna-Tisza area and Tiszántúl region date from the 19th century (Figure 1).

Known observations from the nesting season

The first known record, dated to June 15, 1875, comes from Ferenc Kovássy, who captured a full-grown specimen in Kócs-puszta in the area of Tiszafüred (Sőregi 1958). In 1884, Károly Antóny, a forester from Lubenyik (now Lubeník, Slovakia), shot a specimen on 18 May (Lovassy 1888). According to Vasvári (1921), Kálmán Bogyay saw three cranes flying towards Lake Kis-Balaton on 5 June 1921 in Zala County, near Komárom. According to

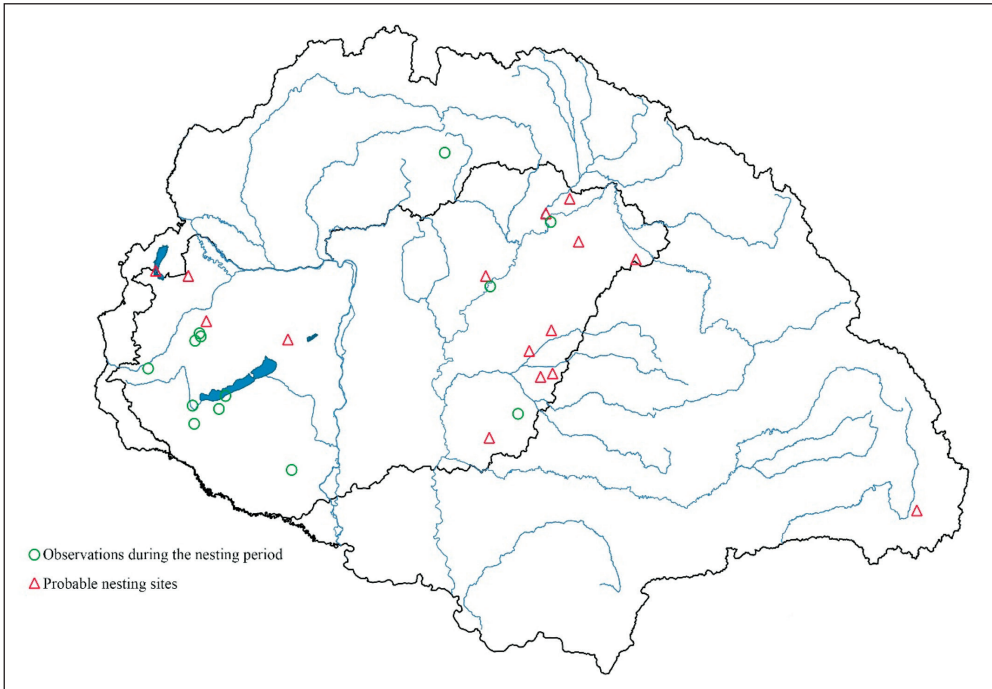


Figure 2. Geographical distribution of cranes (n=23) observed during the nesting period in the Kingdom of Hungary and the present territory of Hungary from the mid-1800s to the present day

2. ábra A fészkelési időszakban megfigyelt darvak (n=23) földrajzi eloszlása a Magyar Királyság és Magyarország jelenlegi területén az 1800-as évek közepétől napjainkig

observations by some shepherds, 12 specimens were seen in May and June 1919 and 1920 in Ormánd (Baranya county). Sándor Ajtai-Kovács observed four specimens near Zalavár (Zala county) on 8 August 1937 (Keller 1937). The observation data from Ókigyós (today Szabadkigyós, Békés county) from 1940 is known for 5 specimens (Tarján 1942). The observations of Kálmán Bogyay are mentioned by Tarjáni (1978), who states that in 1905 Bogyay encountered cranes several times in the Nagyberek. László Bogdán saw cranes in the Fonyód area on 1 June 1971.

Subsequently, it was not until 2014 that the crane was observed again. In July 2014, a specimen was observed in the Marcal Basin trying to chase away a Marsh Harrier (*Circus aeruginosus*), and another crane responded from the cover of tall vegetation. Based on this behaviour, Kaufman *et al.* (2017a) suggested that nesting was probable. Repeated attempts in the marshy area failed to conclude whether the pair was leading any chicks, so – as in 2016 – nesting was not confirmed (Kaufman *et al.* 2017b) (Figure 2).

The majority of the observations recorded during the breeding period also occurred in the Transdanubian region (82.6%), followed by the Tiszántúl regions (13.0%), while the Duna-Tisza area was the least significant (4.3%). The spatial distribution of observations recorded during the nesting period closely matches the distribution of nesting data ($P=0.9201$, $df=24$).

Discussion

Nesting

Over the last three decades, the number of individuals of nesting populations of the species has increased significantly in the nesting areas of the Crane: Scandinavia (Lundgren 1999, Lundgren & Lundin 2003, Lundgren 2018), Poland, the Baltic countries (Nowald *et al.* 1999, Budrys 2003, Ojaste *et al.* 2018), Finland, Ukraine (Gavris 1999, Veselskiy 2023), Russia (Markin 2003), Germany (Lerhmann & Mewes 2018, Schmitz Ornes 2018, Lehrmann & Nowald 2023, Schmitz-Ornés *et al.* 2023). European nesting populations of the species were estimated at 82,000–92,000 pairs in the 2000s (Schepers 2020), while BirdLife International estimated the number of nesting birds in 2015 at a minimum of 113,000 pairs, representing more than 225,000 reproductively mature specimens (Ashpole 2015). The nesting population size of the species had reached around 140,000–150,000 pairs by 2019. (Schepers 2020).

Several recent nesting records are known from the southern and western periphery of the nesting area (UK (Carys 2021), Belgium (Nowald & Prange 2013, Keever *et al.* 2018, Jeremy 2021), the Netherlands (Van Der Ven 2018), France (Salvi 2003, 2010, 2017), Czech Republic (Tichackova & Lumpe 2018), Slovakia (Repel *et al.* 2009). This nesting area expansion reached Hungary as well (Kaufman & Hencz 2015, Kaufman *et al.* 2017a, 2017b, Kaufman 2018, 2021, Haraszthy 2019, Szekeres & Heffenträger 2021, Szekeres *et al.* 2021, Végvári 2021a, Fellner 2022, Szekeres & Németh 2022).

In the last three decades or less, the migration phenology of European populations has changed, probably due to climate change. Previously, the entire population was migratory

in Europe, spending the winter in the Iberian Peninsula and North Africa. Nowadays, migratory populations are travelling increasingly shorter distances as the wintering grounds shift northwards, and in some parts of Europe former migratory populations are overwintering in areas such as the British Isles, Belgium and even France or Germany (Fintha 1993, Végvári, 2009). From the northern nesting areas (Finland, Baltic States) the cranes arrived in our region along the so-called Baltic-Hungarian migration route and continued to their wintering grounds from Tunisia to Sakhalin, but the total size of the overwintering flocks is also increasing in Hungary. The Tiszántúl region of the country plays a more important role in the autumn migration, although cranes are also increasingly frequent autumn visitors in the west Hungarian region. The conditions of the eastern Hungarian region favour the species during migration, with its extensive feeding and roosting sites (large cornfields, drained fishponds) (Fintha 1993, Végvári & Tar 2002). Another factor in the polarisation between the two regions of the country is the choice of nesting site. Habitats suitable for nesting are typically available only in the Transdanubian area, so the plastic, adaptive migration strategy of the crane in response to changes in environmental factors, the spatial and temporal pattern of feeding and resting sites and nesting areas explain the polarisation of migration data and breeding occurrences between the eastern and western regions of the country.

The cranes preferred marshy, open nesting areas in Belgium (Kever *et al.* 2018), while in the UK they settled in reedbeds in the Norfolk Broads and flooded grasslands in Cambridgeshire (Bridge & Morgan 2018). For nests (n=126) surveyed in Germany, Mewes & Rauch (2012) found that a smaller percentage of nesting pairs (34%) chose this type of habitat, with more than half (56%) of breeding pairs nesting in the forest (willow, birch, and alder swamps).

During recent successful nesting events recorded in Hungary, cranes built their nests in open areas, but under the shelter of the lesser and the greater pond sedges (*Carex acutiformis*, *C. riparia*) providing sufficient cover (Kaufman & Hencz 2015, Kaufman *et al.* 2017a). The known nests from Hungary (Marcal Basin, Rába floodplain) (Kaufman *et al.* 2017a, Szekeres *et al.* 2022, Fellner pers. comm. 2023) were in open, marshy areas similar to the Belgian nesting sites.

For crane nesting, permanent water cover is required in the area (Leito *et al.* 2005), which – considering the average territory size of almost 250 ha (Mannson *et al.* 2013) – does not provide adequate habitat for even some pairs of cranes in the current state of the Marcal Basin and the Rába floodplain without habitat reconstruction intervention. In Belgium, cranes prefer to nest in a variety of peat bogs and shallow, islands with vegetation surrounded by water, and the recent reconstruction of the Hautes Fagnes area will help them to colonise as much as possible (Kever *et al.* 2018). In Hungary, conservation interventions to support wintering (for example the creation of feeding areas and roosting sites ensuring their tranquillity, the organisation of autumn flooding in drier years, and the appropriate timing of draining fish ponds) are a priority for conservation (Végvári 2009), but no interventions to support nesting have been implemented so far. Based on the above, we can expect to see nesting of the crane in Hungary in the coming years, but the lack of suitable nesting areas will limit the establishment of significant numbers of the species.

Acknowledgements

I would like to express my thanks to Dr. Csaba Németh, Zsófia Szekeres, Zoltán Fellner, Péter Hencz, Angéla Belső, Dr. Gábor Kaufman, Attila Kovács and Nikolett Németh for providing me with their field experience and their previously unpublished data in connection with the recent crane surveys. Only the data collected by them, together with the literature data on Crane nesting in historical Hungary, can provide a clear picture of recent Crane nestings in Hungary.

References

- Archibald, G. W. & Meine, C. D. 1996. Family Gruidae, Cranes. – In: del Hoyo, J., Elliott, A., Sargatal, J. & Bateman R. (eds.) 1996. Handbook of the Birds of the World, Vol. 3. (Hoatzin to Auks). – Lynx Edicions, Barcelona, p. 88.
- Ashpole, J., Burfield, I., Ieronymidou, C., Pople, R., Wheatley, H. & Wright, L. 2015. *Grus grus* (Linnaeus, 1758). – European Red List of Birds 2015. http://datazone.birdlife.org/userfiles/file/Species/erlob/summarypdfs/22692146_grus_grus.pdf
- Baer, W. 1907. Die Brutplätze des Kranichs in Deutschland [The breeding sites of the Crane in Germany]. – Ornithologische Monatschrift 32: 196–204. (in German)
- Bertóti, I. 1948. 50 év óta csak átvonuló vendégünk a daru [The Crane has been a passing guest for 50 years]. – Magyar Vadász 1(9):13. (in Hungarian)
- Berzsenyi, Z. 1918. A daru fészkelése a balatoni berkekben [The Crane nesting along Lake Balaton]. – Természettudományi Közlöny 50: 124–125. (in Hungarian)
- Bérczy, T., Mosanszky, A., Sterbetz, I. & Szlivka, L. 1972. A kárpát-medencei daruvonulás időszerű kérdései [Contemporary issues of Crane migration in the Carpathian Basin]. – Aqulia 78–79: 11–43. (in Hungarian)
- Budrys, R. 2003. Common Crane in Lithuania. – In: Chavez-Ramirez, F. (ed.) 2005. Proceedings of the Ninth North American Crane Workshop, 17–20. Januar 2003. Sacramento, California: North American Crane Working Group, pp. 69–78.
- Bridge, D. & Morgan, A. 2018. Common Crane (*Grus grus*) in the UK. not yet common – but getting there? – In: Dessalegn, G. (ed.) Proceedings of the 9th European Crane Conference 2018. Arjuzanx, France, 3–7. December 2018, pp. 31–36.
- Chernel, I. (ed.) 1903. Madarak 2. Varjúszerű madarak (folyt.), papagályszerű madarak, galambszerű madarak, tyúkszerű madarak, guvatszerű madarak, daruszerű madarak – Brehm: Az állatok világa. „Tierleben” című nagy művének magyarba átültetett kiadása [Birds 2. Crow-like birds (cont.), parrot-like birds, pigeon-like birds, hen-like birds, gull-eyed birds, crane-like birds – Brehm: The World of Animals. A translation into Hungarian of his great work ‘Tierleben’]. – Budapest. pp. 648–657. (in Hungarian)
- Carys, M. 2021. Record-breaking breeding year for Britain’s Common Crane. – Cropped-Discover Wildlife – BBC Wildlife Magazine – <https://www.discoverwildlife.com/news/record-breaking-breeding-year-for-britains-common-crane/>
- Csath, A. 1938. Békés vármegye madárvilága [Birds of Békés county]. – Dobay János Könyvnyomdája, Gyula (in Hungarian)
- Deinet, S., Ieronymiou, C., McRae, L., Burfield, I. J., Foppen, R. P., Collen, B. & Böhm, M. 2013. Wildlife Comeback in Europe: The recovery of selected mammal and bird species. Final report to Rewilding Europe by ZSL, Birdlife International and the European Bird Census Council. – Zoological Society of London, London
- Ellis, D. H., Gee, G. F. & Mirande, C. M. 1996. Cranes: Their Biology, Husbandry, and Conservation. – National Biological Service, Washington D.C., pp. 263–288.
- Fallon-Kund, A. 1937. Daru és túzok Somogyban [Cranes and Bustards in Somogy County]. – Nimród Vadászújság 25: 256. (in Hungarian)
- Faragó, Á., Harsányi, K., Kutschi, P., Ottó, E. & Szentirmai, I. 2022. Az Őrségi Nemzeti Park Igazgatóság madártani tevékenységei 2022-ben [Ornithological activities of the Őrség National Park Directorate in 2022]. – Cinege 27: 19–26. (in Hungarian)

- Fellner, Z. 2022. Természetjárás, természetmegfigyelés online blog [Nature hiking, nature observation online blog]. – <http://fellnifoto.blogspot.com/2022/06/2022-es-hamvas-retiheja-tabor.html> (in Hungarian)
- Fintha, I. 1993. A magyarországi őszi daruvonulás értékelése az elmúlt évek adatai alapján, tekintettel az európai kutatások újabb eredményeire [Autumn Crane migration in Hungary, with a special reference to the recent records]. – *Aquila* 100: 137–150. (in Hungarian and English)
- Frivaldszky, J. 1891. Aves Hungariae. Enumeratio systematica avium Hungariae cum notis brevibus biologicis, locis inventionis virorumque a quibus oriuntur [Birds of Hungary. Systematic specification of the birds of Hungary with short notes of their biology and finding places]. – Franklin Társulat, Budapest, pp. 126–127. (in Latin)
- Gavris, G. G. 1999. *Grus grus* in the Ukraine – abundance, distribution, habitats and protection problems. – In: Prange, H., Nowald, G. & Mewes, W. (eds.) 1999. Proceedings 3rd European Crane Workshop, Germany, pp. 47–49.
- Glutz von Boltzheim, U. N. (ed.) 1986. Handbuch der Vögel Mitteleuropas. Band 5. Gruiformes (2. Teil). 2., durchgesehene Auflage [Handbook of birds in Central Europe. Vol. 2. Gruiformes (Part 2.), revised edition]. – AULA-Verlag, Wiesbaden, pp. 567–614. (in German)
- Hadarics, T. & Zalai, T. 2008. Magyarország madarainak névjegyzéke – Nomenclator Avium Hungariae – An annotated list of the birds of Hungary. – MME, Budapest, p. 99. (in Hungarian with English Summary)
- Hankó, B. 1933. A hajdani Alföld ősi állatvilága. A debreceni Tisza István Tudományos Társaság Honismertető Bizottságának Kiadványai, VIII. kötet. 1931–1932. [The ancient fauna of the former Great Plain. Publications of the Committee of the Tisza István Scientific Society of Debrecen, Vol. VIII. 1931–1932]. – 29. füzet, Debrecen, pp. 41–44.
- Haraszthy, L. 2019. Daru *Grus grus* Linneus, 1758. – In: Haraszthy, L. (ed.) Magyarország fészkelő madarainak költésbiológiája. 1. kötet. Fácánféléktől a sólyomfélékig (Non-Passeriformes) [Breeding Biology of the Nesting Birds of Hungary. Vol. 1. From Pheasants to Falcons (Non-Passeriformes)]. – Pro Vértés nonprofit Zrt., Csákvár, pp. 301–306. (in Hungarian)
- Hartwig, P. 1997. *Grus grus*, Crane. – In: Hagemeyer, E. J. M. & Blair, M. J. (eds.) The EBCC Atlas of European Breeding Birds: Their Distribution and Abundance. – T & AD Poyser, London, pp. 240–241.
- Jeremy, H. 2021. Meet the first two Common Cranes ever to be born in Belgium. – <https://www.birdlife.org/news/2021/07/14/cuteness-alert-first-crane-chicks-are-born-belgium/>
- Johnsgard, P. A. 1983. Cranes of the World: Eurasian Crane (*Grus grus*). – Biological Sciences. University of Nebraska-Lincoln, pp. 217–239.
- Keller, O. 1937. Daru a Balaton környékén [Cranes around Lake Balaton]. – *Természetudományi Közlöny* 69: 622–623. (in Hungarian)
- Keve, A. 1978. A Balaton déli partjának madárvilága [Birds of the southern shore of Lake Balaton]. – *Somogyi Múzeumok Közleményei* 3: 461–501. (in Hungarian)
- Kaufman, G. 2018. Kaufman pictures online blog. – <http://kaufmang.blogspot.com/2018/08/belepve-nyarba.html> (in Hungarian)
- Kaufman, G. 2021. Kaufman pictures online blog. – <http://kaufmang.blogspot.com/2021/06/most-junius-veget-irjuk.html> (in Hungarian)
- Kaufman, G. & Hencz, P. 2015. Száz év után újra költ a daru hazánkban! [After a hundred years, the crane is nesting again in our country!]. – *Madártávlat* 22(4): 33. (in Hungarian)
- Kaufman, G., Hencz, P. & Kovács, A. 2017a A daru (*Grus grus*) költése Magyarországon [Breeding of the Crane (*Grus grus*) in Hungary]. – *Aquila* 124: 63–70. (in Hungarian)
- Kaufman, G., Hencz, P. & Kovács, A. 2017b A daru újabb költése Magyarországon [New breeding of the Crane in Hungary]. – <http://kaufmang.blogspot.com/2017/07/a-daru-ujabb-koltese-magyarorszagon.html> (in Hungarian)
- Kever, D., Paquet, J. Y. & Vandezande, G. 2018. Common Cranes *Grus grus* in Belgium: evolution of migration pattern over the past five decades, increase of resting and breeding possibilities. – In: Dessalegn, G. (ed.) Proceedings of the 9th European Crane Conference 2018. – Arjuzanx, France, 3–7. December 2018., pp. 24–30.
- Láposi, J. 1941. Amikor a darutoll dísz tárgy volt [When the crane feather was an ornament]. – *A Természet* 27: 144–145. (in Hungarian)
- Lerhmann, A. & Mewes, W. 2018. Density and distribution of Common Crane in Germany and its federal states since the 1970s. – In: Dessalegn, G. (ed.) Proceedings of the 9th European Crane Conference 2018. Arjuzanx, France, 3–7. December 2018., pp. 19–22.

- Lerhmann, A. & Nowald, G. 2023. The Crane population in Germany – new insights. – In: Dessalegn, G. (ed.) Proceedings of the 10th European Crane Conference 2023. Tartu, Estonia, 21–27. August 2023., pp. 71–79.
- Leito, A., Ojaste, I., Truu, J. & Pala, A. 2005. Nest site selection of the Eurasian Crane (*Grus grus*) in Estonia: an analysis of nest record cards. – *Ornis Fennica* 82: 44–54.
- Lundgren, S. & Lundin, G. 2003. Status of the Common Crane (*Grus grus*) in Sweden in the end of the 20th century. – In: Salvi, A. (ed.) Proceedings of the 4th European Crane Conference, Verdun, France, 11–13. November 2003., pp. 11–16.
- Lovassy, S. 1888. Adalékok Magyarország ornithológiájához, vonatkozólag a fészkelési és elterjedési viszonyokra [Additions to the ornithology of Hungary, with reference to nesting and distribution]. – *Mathematikai és Természettudományi Közlemények* 22(5): 213–240. (in Hungarian)
- Lundgren, S. 1999. Breeding areas, population density and reproduction of Common Cranes (*Grus grus*) in the Tranemo Area, South of Sweden. – Proceedings 3rd European Crane Workshop, Germany, pp. 23–25.
- Markin, Y. M. 2003. Eurasian Crane in the European Russia – Population density and distribution habitats. – In: Salvi, A. (ed.) Proceedings of the 4th European Crane Conference, Verdun, France, 11–13. November 2003., pp. 26–29.
- Mannson, J., Nilsson, L. & Hake, M. 2013. Territory size and habitat selection of breeding Common Cranes (*Grus grus*) in a boreal landscape. – *Ornis Fennica* 90: 65–72.
- Marsigli, L. F. 1726. Danubius Pannonico Mysicus, hydrographicis historicis, physicis perlustratus et in sex Tomo digestus. Aves aquaticae circa Danubium et Tibiscum viventes [Danubius Pannonico-mysicus: observationibus geographicis, astronomicis, hydrographicis, historicis, physicis, perlustratus et in sex tomos digestus. Waterbirds around the Danube and Tisza]. – TOM. V. p. 154. (in Latin)
- Mewes, W. & Rauch, M. 2012. Der Schlupferfolg von Kranichgelegen *Grus grus* in einem Untersuchungsgebiet in Mecklenburg-Vorpommern in den Jahren 2003 bis 2012 [The hatching success of Crane nests *Grus grus* in a study area in Mecklenburg-Western Pomerania in the years 2003 to 2012]. – *Vogelwelt* 133: 195–212. (in German)
- Nagy, J. 1917. Daru-tanulmányok és megfigyelések Csanád megyéből [Crane studies and observations from Csanád county]. – *Aquila* 24: 174–190. (in Hungarian)
- Nagy, J. 1926. Darutójások a debreceni kollégium gyűjteményében [Crane eggs in the collection of the Debrecen College]. – *Aquila* 32–33: 255. (in Hungarian)
- Nowald, G., Drobelt, E., Leito, A. & Vaverins, G. 1999. Der Brut bestand des Kranichs (*Grus grus*) in Estland, Lettland und Litauen: Siedlungsdichte, Verbreitung und Brut platztypen [The breeding population of the Crane (*Grus grus*) in Estonia, Latvia and Lithuania: Settlement density, distribution and breeding site types]. – *Vogelwelt* 120: 281–284. (in German)
- Nowald, G. & Prange, H. 2013. Common Crane *Grus grus*. – In: Deinet, S., Ieronymidou, C., McRae, L., Burfield, I. J., Foppen, R. P., Collen, B. & Böhm, M. (eds.) Wildlife comeback in Europe. The recovery of selected mammal and bird species. – Final Report to Rewilding Europe by ZSL, BirdLife International and the European Bird Census Council. London, UK: ZSL., pp. 254–259.
- Ojaste, I., †Leito, A. & Sepp, K. 2018. Monitoring of the Eurasian Crane population in Estonia. – In: Dessalegn, G. (ed.) Proceedings of the 9th European Crane Conference 2018. Arjuzanx, France, 3–7. December 2018., pp. 11–14.
- Ocsovszky, L. 1964. Előfordulási és fészkelési adatok a Tiszántúlról – Ornithological data from East-Hungary. – *Aquila* 69–70: 268. (in Hungarian and English)
- Pelle, I. 1967. Madártani hírek Kelet-Vajdaságból [Ornithological news from Eastern Vojvodina]. – *Aquila* 73–74: 190–191. (in Hungarian)
- Prange, H. 2005. The status of the Common Crane (*Grus grus*) in Europe-breeding, resting, migration, wintering and protection. – In: Chaverz-Ramirez, F. (ed.) Proceedings of the 9th North American Crane Workshop, 17–20. January 2003. Sacramento, California: North American Crane Working Group, pp. 69–78.
- Prowse, S. R. 2010. Cranes in the UK: Past, Present and Future. – In: Nowald, G., Weber, A., Fanke, J., Weinhardt, E. & Donner, N. (eds.) Proceedings of the 7th European Crane Conference, Stralsund, Germany, 14–17. October 2010., pp. 57–59.
- Repel, M., Chrašč, P., Pačenovszký, S. & Uhrin, J. 2009. Migrácia a prvé doložené hniezdenie žeriava populavého (*Grus grus*) na Slovensku [Migration and first documented breeding of the Crane (*Grus grus*) in Slovakia]. – *Tichodroma* 21: 73–77. (in Slovakian with English Summary)

- Schmitz-Ornés, A., Barwisch, I. & †Mewes, W. 2023. Family behavior after hatching of young Eurasian Cranes (*Grus grus*) in their breeding grounds of Northern Germany. – In: Dessalegn, G. (ed.) Proceedings of the 10th European Crane Conference 2023. Tartu, Estonia, 21–27. August 2023., p. 53.
- Salvi, A. (ed.) 2003. Current situation of the Common Crane in France. – In: Salvi, A. (ed.) Proceedings of the 4th European Crane Conference, Verdun, France, 11–13. November 2003. p. 45.
- Salvi, A. 2010. Eurasian crane *Grus grus* study in France over the last 30 years: a review. – In: Nowald, G., Weber, A., Fanke, J., Weinhardt, E. & Donner, N. (eds.) Proceedings of the 7th European Crane Conference. Stralsund, Germany, 14–17. October 2010., pp. 30–37.
- Salvi, A. 2017. La nidification de la Grue cendrée (*Grus grus*) en France [The nesting of the Crane (*Grus grus*) in France]. – *Ciconia* 41: 57–69. (in French)
- Schenk, J. 1917. A daru fészkelése és átvonulása Magyarországon [Nesting and migration of the crane in Hungary]. – *Természettudományi Közlöny* 49(685–686): 786. (in Hungarian)
- Schenk, J. 1938a Der Zug des Kranichs in historischen Ungarn [The migration of the Crane in historical Hungary]. – *Journal für Ornithologie* 86(1): 54–58. (in German)
- Schenk J. 1938b A daruvonulás a történelmi Magyarországon [The migration of the Crane in historical Hungary]. – *A Természet* 31: 130–134.
- Schepers, F. 2020. *Grus grus*, Common Crane. – In: Keller, V., Herrando, S., Voříšek, P., Franch, M., Milanese, P., Martí, D., Anton, M., Klvaňová, A., Kalyakin, M. V., Bauer, H. G. & Foppen, R. P. B. (eds.) European Breeding Bird Atlas 2: Distribution, Abundance and Change. – European Bird Census Council & Lynx Editions, Barcelona, pp. 228–229.
- Schmitz Ornes, A. 2018. Influence of disturbances on the incubation temperature of Eurasian Cranes (*Grus grus*) in different habitats. – In: Dessalegn, G. (ed.) Proceedings of the 9th European Crane Conference 2018. Arjuzanx, France, 3–7. December 2018., pp. 93.
- Sőregi, J. 1958. Egy régi és egy újabb vadászlőjegyzék madártani adatai [Ornithological data from an old and a recent hunting register]. – *Aquila* 65: 312–314. (in Hungarian)
- Snow, D. W. & Perrins, C. M. 1998. The Birds of the Western Palearctic. Concise ed. Vol. 1. Non-Passerines. – Oxford University Press, Oxford, pp. 511–514.
- Sterbetz, I. 1958. 1955–56–57. évi adatok Hódmezővásárhely madárfaunájához [Data for the bird fauna of Hódmezővásárhely in 1955–56–57]. – *Aquila* 65: 310–311. (in Hungarian)
- Szekeres, Zs. & Heffenträger, G. 2021. A daru költése Vas megyében [Nesting of the crane in Vas county]. – <https://www.orseginemzetipark.hu/hu/hirek/a-daru-koltese-vas-megyeben.html> (in Hungarian)
- Szekeres, Zs., Németh, Cs. & Heffenträger, G. 2021. Daru fészkelése a Rába-völgyben [Crane nesting in the Rába valley]. – *Madártávlat* 28(3): 23. (in Hungarian)
- Szekeres, Zs. & Németh, Cs. 2022. A daru (*Grus grus*) 2022. évi költése Vas megyében [Breeding of the Crane (*Grus grus*) in Vas county in 2022]. – *Cinege* 27: 40–42. (in Hungarian)
- Szomjas, G. 1913. Madártani jegyzetek Szabolcs megyéből [Ornithological notes from Szabolcs County]. – *Aquila* 20: 523–524. (in Hungarian)
- Tarján, T. 1942. Az ókigyósi szikes pusztá vízimadarai 1939- és 1940-ben [Waterfowl of the Ókigyós salt wasteland in 1939 and 1940]. – *Aquila* 46: 458–459. (in Hungarian)
- Tichackova, M. & Lumpe, P. 2018. Current development of the Common Crane population in the Czech Republic. – In: Dessalegn, G. (ed.) Proceedings of the 9th European Crane Conference 2018. Arjuzanx, France, 3–7. December 2018., pp. 15–17.
- Van Der Ven, J. 2018. Short note about breeding Cranes (*Grus grus*) in the Netherlands. – In: Dessalegn, G. (ed.) Proceedings of the 9th European Crane Conference 2018. – Arjuzanx, France, 3–7. December 2018., pp. 23.
- Vasvári, M. 1921. Kisebb Közlemények – Daru nyáron [Smaller Announcements – Crane in summer]. – *Aquila* 28: 174. (in Hungarian)
- Veselskiy, M., Franchuk, M., Khymyn, M., Panchuk, O., Kuzmenko, T., Zhuravchak, R., Gryb, O. & Bashta, A-T. Matveev, M. 2023. Common Crane in the region of Right-Banked Ukrainian Polissia. – In: Dessalegn, G. (ed.) Proceedings of the 10th European Crane Conference 2023. Tartu, Estonia, 21–27. August 2023., pp. 62–64.
- Végvári, Zs. 2009. Daru *Grus grus* (Linnaeus, 1758). – In: Csörgő, T., Karcza, Zs., Halmos, G., Magyar, G., Gyurácz, J., Szépl, T., Bankovics, A., Schmidt, A. & Schmidt, E. (eds.) Magyar madárvonulási atlasz [Hungarian Bird Migration Atlas]. – Kossuth Kiadó, Budapest, pp. 265–269. (in Hungarian with English Summary)

- Végyvári, Zs. 2021a A daru (*Grus grus*) vonulása a Hortobágyon 2005–2016 között [Migration of the Crane (*Grus grus*) in the Hortobágy between 2005–2016]. – *Virgo* 1: 85–115. (in Hungarian)
- Végyvári, Zs. 2021b Daru *Grus grus* (Linneus, 1758) [Crane *Grus grus* (Linneus, 1758)]. – In: Szép, T., Csörgő, T., Halmos, G., Lovászi, P., Nagy, K. & Schmidt, A. (eds.) Magyarország madáratlasza [Bird Atlas of Hungary]. – Agrárminisztérium, Magyar Madártani és Természetvédelmi Egyesület, Budapest, pp. 182–183. (in Hungarian with English Summary)
- Végyvári, Zs. & Tarr, J. 2002. Autumn roost side selection by the Common Crane *Grus grus* in the Hortobágy National Park, Hungary, between 1995–2000. – *Ornis Fennica* 79: 101–110.
- Zeyk, M. 1920. Die Vögel Siebenbürgens [The Birds of Transylvania]. – *Aquila* 27: 71–243. (in German)

