GEO&BIO

2022 • vol. 23, pp 3–14
https://doi.org/10.15407/gb2303

Eggshells from archaeological sites in the collection of the National Museum of Natural History NAS of Ukraine (Kyiv, Ukraine)

Leonid Gorobets

National Museum of Natural History NAS of Ukraine (Kyiv, Ukraine)

article info

key words
Eggshell, Holocene, zooarchaeology, poultry, Ukraine.

correspondence to
Leonid Gorobets; National Museum of Natural History NAS of Ukraine; 15 B. Khmelnytsky Street, Kyiv 01054, Ukraine; Email: ornitologist@gmail.com; orcid.org/0000-0002-5492-7878

article history
Submitted: 01.12.2022 Revised: 24.12.2022. Accepted: 30.12.2022

cite as
Gorobets, L. 2022. Eggshells from archaeological sites in the collection of the National Museum of Natural History NAS of Ukraine (Kyiv, Ukraine). GEO&BIO, **23**: 3–14.

abstract

Subfossil eggshell finds are useful for many research purposes in various branches of science (zoology, history, archaeology, cultural studies, etc.). Under certain circumstances, eggshells can indicate the season in which the occupation layer formed. Since 2015, zooarchaeological materials from 53 sites have been deposited in the National Museum of Natural History NAS of Ukraine. There were eggshell fragments from 21 sites, at least 288 eggs (3809 fragments). Most of them are excavations of kitchen waste, sometimes graves or natural Holocene taphocoenoses. Accordingly, the eggshell is not a rare zooarchaeological material in sites dated from two thousand years ago and later, but rather common. However, it is difficult to detect in occupation layer without applying special methods (e.g. flotation). Together with the finds of the 20th century, the museum collection contains at least 302 eggs (4084 fragments) dating from Antiquity to the 19th century CE. Most of the finds were found during excavations in Rivne Oblast, Ukraine, in sites dated to the 16th–19th century CE. In most cases, the thickness of the fragments corresponds to the eggs of poultry. Identification is confirmed by the presence of poultry bones in the occupation layers. Shell fragments of chicken (*Gallus gallus* f. *domestica*) and goose (*Anser anser* f. *domesticus*) eggs can be identified. Measuring shell thickness does not accurately distinguish between remains of duck (*Anas platyrhynchos* f. *domesticus*), turkey (*Meleagris gallopavo* f. *domesticus*), and large chicken eggs. Eggshells may be indirect evidence of pigeon keeping. Among the wild species, fragments of swan (*Cygnus cygnus/Cygnus olor*) eggs in the ancient colony of Olbia can be identified. The use of measurements of shell thickness and egg diameter made it possible to identify with a high degree of probability the remains of eggs of the common shelduck (cf. *Tadorna tadorna*) on the site of an abandoned ancient settlement in the Crimea. A large number of finds suitable for identification indicates that this type of remains is of scientific value and should be stored in the same way as other zooarchaeological materials.

Яєчна шкаралупа з археологічних пам'яток у колекції Національного науково-природничого музею НАН України (Київ, Україна)

Леонід Горобець

Резюме. Знахідки субфосильної яєчної шкарлупи можуть бути використанні для вирішення різноманітних дослідницьких завдань у різних галузях науки (зоології, історії, археології, культурології тощо). За певних обставин яєчна шкаралупа може вказувати на сезон формування культурного шару. З 2015 р. до Національного науково-природничого музею НАН України надійшли зооархеологічні матеріали із 53 пам'яток. Фрагменти яєчної шкаралупи були виявлені в 21 пам'ятці від щонайменше 288 яєць (3809 фрагментів). Більшість із них отримано при розкопках кухонних решток, інколи поховань або природних голоценових тафоценозів. Отже, яєчна шкаралупа не є рідкісними зооархеологічними знахідками, принаймні в місцезнаходженнях віком від двох тисяч років і пізніше. Однак без використання спеціальних методик (наприклад флотації) її важко виявити в культурному шарі. Разом із знахідками з розкопок 20 ст. в колекції музею наявно рештки щонайменше 302 яєць (4084 фрагменти) віком від античності до 19 ст. н.е. Більшість знахідок походять із пам'яток 16–19 ст. н.е., які розташовані на території Рівненської обл. У більшості випадків товщина фрагментів відповідає показникам, характерним для яєць домашніх птахів. Визначення підтверджується наявністю кісток домашніх птахів у культурних шарах. Фрагменти шкаралупи курячих (*Gallus gallus* f. *domestica*) та гусячих (*Anser anser* f. *domesticus*) яєць можуть бути визначені. Промір товщини шкаралупи не дозволяє точно розрізнити рештки качиних (*Anas platyrhynchos* f. *domesticus*) та індичих (*Meleagris gallopavo* f. *domesticus*) яєць та великих курячих яєць. Поміж диких видів можуть бути точно визначені фрагменти яєць лебедів (*Cygnus cygnus/Cygnus olor*) із античної колонії Ольвія. Використання промірів товщини шкаралупи та діаметра яйця зробило можливим визначення з високою ймовірністю яєць галагаза (cf. *Tadorna tadorna*), знайдені при розкопках покинутого античного поселення. Частота знахідок та можливість визначення до виду вказують, що цей тип знахідок має наукову цінність і має зберігатись на рівні з іншими зооархеологічними матеріалами.

Ключові слова: яєчна шкаралупа, голоцен, зооархеологія, птахівництво, Україна.

Адреса для зв'язку: Л. В. Горобець; Національний науково-природничий музей НАН України; вул. Б. Хмельницького, 15, Київ, 01054 Україна; Email: ornitologist@gmail.com; orcid: 0000-0002-5492-787

Introduction

Since the appearance of archaeology, researchers have paid attention to the remains of animals. But zooarchaeology as a separate interdisciplinary area of science arose only in the second half of the 20th century, and is actively developing in the 21st century. This is due to the ability to use new methods, the variety of which is constantly increasing [Albarella 2017]. Different groups of remains have been studied unevenly. Most of the publications are on the bones of mammals, in many cases the remains of birds are described as 'unidentifiable bird' [Driver 2011]. Eggshells are mentioned mainly when describing the contents of burials, but not kitchen waste. Recently, the first article was published in which a large number of eggshells from the archaeological sites of Ukraine are mentioned. This is a description of finds from the graves of the Chernyakhiv–Sântana de Mureș Culture [Gopkalo & Rudych 2020].

Humans have used eggs for a variety of purposes from food to magical rituals. Some cultures refused to eat eggs [Serjeantson 2009]. To establish this, it is necessary that there be a purpose for searching for shells in excavations. Even if it is not possible to identify the species, under certain circumstances the shell may indicate the season of the formation of the occupation layer. Therefore, eggshells must be preserved in the same way as other kinds of zooarchaeological materials.

Material and Methods

The scientific collection of the Department of Palaeontology at the National Museum of Natural History, NAS of Ukraine (NMNHU-p) contain about five thousand eggshell fragments from palaeontological and archaeological sites. Finds from palaeontological sites are dated to the Late Miocene–Early Pleistocene. These are mainly the remains of ostrich eggs. To describe this shell, a taxonomic

revision of fossil ostriches is needed. This article presents only a catalogue of finds from archaeological sites. The oldest specimens are dated to Antiquity (7th century BCE to 3rd century CE), the latest — to the 19th century CE (Table 1). Most of the sites (20 out of 24) were excavations of kitchen waste. Three sites dated to the 1st to 4th centuries CE (Zolote, Frontove, and Komariv) were excavations of burials. One site (Tarpanchi) represents excavations of an abandoned settlement. The remains of wild animals (bones and eggshells) were found here, which fell into the occupation layer without human activity. The taphocoenosis in the Vasylivka site is of mixed formation. This is a cave in which people or animals lived at different times. These are small exceptions to the general list of sites. One shell fragment was found in Vasylivka, and the remains of two eggs were found in Tarpanchi.

With a few exceptions, all fragments are small (from a few square millimeters to a few square centimeters). The only parameter available for measurement is shell thickness. This is the main diagnostic feature for identifying eggs from archaeological material [Serjeantson 2009]. The eggshell was measured using the milling caliper, with an accuracy of 0.02 mm. The minimum number of eggs was counted. When the fragments were found in the same square (1x1 m) and had the same thickness, they have been considered as fragments of one egg. It is established that the minimum possible number of eggs in the collection is 302. The mass of eggs was calculated by the formula $W = \sqrt[0.458]{L/56.65}$, where W — egg weight, in grams; and L—shell thickness in nanometers [after: Ar *et al.* 1979] (Table 2).

Table 1. **Description of the archaeological sites from which eggshells were transferred to the collection of NMNHU-p**

Таблиця 1. **Опис археологічних пам'яток від яких фрагменти яєчної шкаралупи передано до колекції Національного науково-природничого музею НАН України**

Site	Region (oblast)	Age	Head of the excavation	Year of excavation	Findings of bird bones	
					Total	% of poultry
Basivkutske Horodyshche	Rivne	10th–first half of the 11th cent. CE	Vojtjuk O.	2020	0	—
Dubno Holy Transfiguration Monastery	Rivne	16th cent. CE	Pshenychnyj Ju. L.	2016	57	100.0%
Dubovets	Rivne	late 16th–early 19th cent. CE	Pshenychnyj Ju. L.	2019	122	90.1%
Dubovets	Rivne	17th cent. CE	Pshenychnyj Ju. L.	2018	142	93.0%
Frontove	AR Crimea	2nd cent. CE	Korpusova V. M	1965	0	—
Hatne-2	Kyiv	10th–13th cent. CE	Zotsenko I. V.	2019	26	65.4%
Komariv	Chernivtsi	3rd–4th cent. CE	Petrauskas O. V.	2019	66	95.5%
Khodosivka	Kyiv	12th–13th cent. CE	Gotun I. A.	2019	331	6.9%
Khodosivka-Snigurove	Kyiv	17th–early 18th cent. CE	Gotun I. A.	2021	0	—
Khrinnyky	Rivne	4th cent. CE	Bajuk V. G.	2022	4	50.0%
Kyrylivska, 37	Kyiv	11th cent. CE	Olenych A. M.	2016	52	90.1%
Kyrylivska, 37	Kyiv	18th cent. CE	Olenych A. M.	2016	6	100.0%
Lisnyky-Bezodnja	Kyiv	12th–first half of the 13th cent. CE	Gotun I. A.	2021	0	—
Medzhybizh	Khmelnytskyj	18th–19th cent. CE	Vetrov S. V.	2020	2654	93.8%
Olbia	Mykolaiv	7th cent. BCE–3rd cent. CE	no data	1932, 1938	530	46.0%
Pastivnyk	Rivne	12th cent. CE	Vojtjuk O.	2019	3	66.6%
Rivne	Rivne	5th–7th cent. CE	Vojtjuk O.	2019	7	100.0%
Sedniv	Chernihiv	10th–13th cent. CE	Skorohod V. M.	2020	0	—
Sophiivska Borschagivka	Kyiv	10th–13th cent. CE	Gotun I. A.	2015	6	50.0%
Sverdlovka	Chernihiv	9th–10th cent. CE	Chernenko O. E.	2017, 2019	66	63.6%
Tarpanchi	AR Crimea	1st–3rd cent. CE	Shcheglov A. N.	1960	0	—
Vasylivka	Chernivtsi	13th–17th cent. CE	Nechitaylo P. O.	2018	1889	5.1%
Vojtenky	Kharkiv	4th–5th cent. CE	Ljubichev M. V.	2016	0	—
Zarvanska 7	Khmelnytskyj	14th–first half of the 15th cent. CE	Nechitaylo P. O.	2020	24	100.0%
Zolote	AR Crimea	1st cent. CE	Korpusova V. M.	1969	48	77.1%
Zolote	AR Crimea	10th–12th cent. CE	Korpusova V. M.	1970	0	—

Table 2. **The minimum number of eggs in the collection of NMNHU-p and the poultry that could lay these eggs**
Таблиця 2. **Мінімально можлива кількість яєць в колекції Національного науково-природничого музею та домашні птахи, які могли відкласти ці яйця**

Shell thickness, mm	Minimum number of eggs in the collection	Estimated egg weight, g	Poultry covered by this range
0.14	2	7	—
0.20	2	16	domestic pigeon
0.22	5	19	
0.24	17	23	domestic chicken
0.26	29	28	
0.28	28	33	
0.30	49	38	
0.32	37	44	
0.34	30	50	domestic chicken or domestic duck
0.36	19	57	
0.38	17	64	domestic chicken, domestic duck or domestic turkey
0.40	13	71	
0.44	2	88	domestic duck or domestic turkey
0.46	3	97	
0.48	5	106	domestic goose
0.50	10	116	
0.52	6	127	
0.54	4	137	
0.56	3	149	
0.58	4	161	
0.60	8	173	
0.64	5	192	
0.68	2	227	
0.78	2	307	—

In most places where eggshells and bird bones are found, poultry bones predominate (see: Table 1). There is a high probability that the shells are remains of poultry eggs. Data on the weight range of recent poultry eggs is taken from scientific sources: 10.7–23.3 g for domestic pigeons [Islam *et al.* 2021]; less than 23 g to more than 72 g for chickens [Ar *et al.* 1979; Kerje *et al.* 2003; Kaila *et al.* 2016]; 63.8–92.2 g for turkeys [Roberts 2008]; 48.0–92.2 g for domestic ducks [Rhymer 1988; Roberts 2008]; and 101.0–198.6 g for domestic geese [Roberts 2008; Karabulut 2021]. Domesticated quail (*Coturnix japonica* Temminck et Schlegel, 1848) was not taken into account, since these birds were domesticated at the beginning of the 20th century [Lukanov 2019]. Guinea fowl (*Numida meleagris* (Linnaeus, 1758)) and pheasants (*Phasianus colchicus* Linnaeus, 1758) were also not taken into account, since the bones of these birds are not known from the archaeological sites of Ukraine [Gorobets & Rudenko 2021]. With the exception of four specimens, the estimated weight of the subfossil egg corresponds to the weight of eggs of poultry — domestic pigeons (*Columba livia* f. *domestica* Gmelin, 1789), domestic chickens (*Gallus gallus* f. *domestica* Linnaeus, 1758), domestic turkeys (*Meleagris gallopavo* f. *domesticus* Linnaeus, 1758), domestic ducks (*Anas platyrhynchos* f. *domesticus* Linnaeus, 1758), and domestic geese (*Anser anser* f. *domesticus* (Linnaeus, 1758)) (Table 2).

Data on the time of the appearance of poultry in Ukraine were also taken into account. Chickens, ducks, and geese have been known in the region since Antiquity [Gorobets & Rudenko 2021]. From the 17th–18th century CE, domestic turkeys have been kept in Ukraine (our data, based on the study of turkey remains from the site Nastasivka II; specimen numbers in the collection NMNHU-p from NoAv-487 to NMNHU-p NoAv-532). Bones of domestic pigeons are very rare in the medieval and older settlements of Ukraine [Gorobets & Kovalchuk 2017] and are common in the layers of the 17th–19th centuries (our data based on the identification of birds in the collection of NMNHU-p). Therefore, a 0.2–0.22 mm thick shell (calculated weight 16–19 g) from the medieval layers was identified as Aves indet., and from the layers of the 16th–19th century as cf. *Columba livia* f. *domestica*.

There are ranges common to two or three species (chickens, ducks, and turkeys). In most cases, it is not possible to make an accurate identification. There are three exceptions. The shell from Vojtenky, Kyrylivska 37, and Zarvanska 7 was identified as cf. *Gallus gallus* f. *domestica*, and not *Gallus gallus* f. *domestica*/*Anas platyrhynchos* f. *domesticus*, since remains of chickens were found in the sites, but the remains of ducks were absent.

In several cases, remains of eggs of wild birds were found (reliably or highly probably). Two thin (0.14 mm) shell fragments from the medieval site Sverdlovka belonged to small wild birds. In Olbia (an ancient colony on the Black Sea coast), fragments of large eggs were found (thickness 0.78 mm, estimated weight 307 g) (Fig. 1). These are probably two different eggs, since they were found in different years—in 1932 and 1938. Most of the birds of the Ukrainian fauna lay eggs weighting less than 300 g. The egg of the tawny eagle (*Aquila rapax* (Temminck, 1828)) weights 93 g [Ar *et al.* 1979], of the great bustard (*Otis tarda* Linnaeus, 1758)—130 g [Jingjun *et al.* 1998], of the demoiselle crane (*Anthropoides virgo* (Linnaeus, 1758))—134 g [Johnsgard, 1983], of the great white pelican (*Pelecanus onocrotalus* Linnaeus, 1758)—152–226 g [Jones 1979]. Among the birds of the fauna of Ukraine, only swans have an egg weighing more than 300 g. The whooper swan (*Cygnus cygnus* (Linnaeus, 1758)) egg weighs 284–324 g [Rees *et al.* 2008], while the mute swan (*Cygnus olor* (Gmelin, 1789)) egg weighs 294–397 g [Birkhead 1984]. Therefore, shell fragments from Olbia can be accurately identified as remains of swan eggs.

The remains of two eggs from the Tarpanchi locality are identified as cf. *Tadorna tadorna* (Linnaeus, 1758). This is an identification made by Professor M. Voinstvensky (1916–1996), not by the author of the article (L. Gorobets). Finds in Tarpanchi differ from other sites. These are not the remains of poultry, but wild birds that nested on the ruins of an ancient settlement. The eggs are well preserved (see: Fig. 1) and their diameter can be measured. Measurements were taken according to [Shatkovska *et al.* 2018]. The diameter of the eggs is 45 mm, which corresponds to both the common shelduck (*Tadorna tadorna*) and some birds of prey. However, a comparison with the eggs of recent birds shows that birds of prey have a large difference between the radii of the infundibular and cloacal zone. In *Tadorna tadorna* the difference is small. Therefore, I agree with the conclusion of M. Voinstvensky.

No goose bones were found in the medieval site Khrinnyky, but there is a talon phalanx of a white-tailed eagle (*Haliaeetus albicilla* (Linnaeus, 1758)). The eggs of these birds are similar in size, so a fragment of the shell from Khrinnyky is identified as *Anser anser* f. *domesticus*/*Haliaeetus albicilla*.

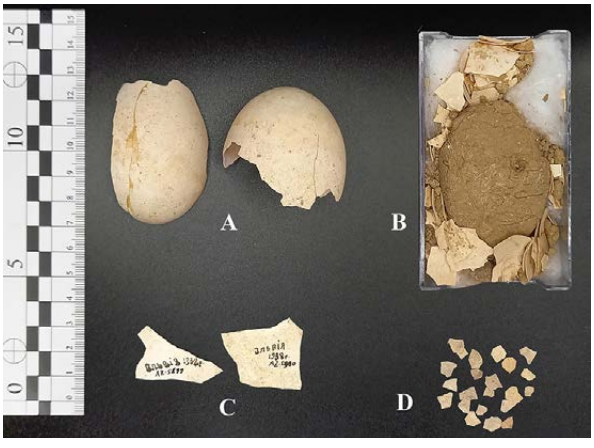

Fig. 1. Remains of eggs of various preservation. (A) large fragments; it is possible to measure the diameter (Tarpanchi; cf. *Tadorna tadorna*; specimens NMNHU-p NoAZ-3582 and NMNHU-p NoAZ-3583); (B) the shell broke up into separate fragments, but it is possible to estimate the size of the egg by the internal filling (Frontove; *Gallus gallus* f. *domestica*; specimen NMNHU-p NoAv-11192); (C) separate large fragments that can be collected by hand (Olbia; *Cygnus cygnus*/*C. olor*; specimens NMNHU-p NoAZ-5899 and NMNHU-p NoAZ-5900); (D) separate small fragments; sieving is necessary for collection (Dubovets; *Gallus gallus* f. *domestica*; specimen NMNHU-p NoAv-5641).

Рис. 1. Рештки яєць різної збереженості. A — великі фрагменти, наявна можливість проміряти діаметр (Тарпанчі; cf. *Tadorna tadorna*; екз. NMNHU-p NoAZ-3582 та NMNHU-p NoAZ-3583); B — шкаралупа розсипалась на окремі фрагменти, але існує можливість оцінити розміри яйця по внутрішньому наповненню (Фронтове; *Gallus gallus f. domestica*; екз. NMNHU-p NoAv-11192); C — окремі великі фрагменти, які можуть бути зібрані руками (Ольвія; *Cygnus cygnus*/*C. olor*; екз. NMNHU-p NoAZ-5899 та NMNHU-p NoAZ-5900); D — окремі невеликі фрагменти, для збору необхідне просіювання (Дубовець; *Gallus gallus f. domestica*; екз. NMNHU-p NoAv-5641).

The catalogue of eggshell fragments is presented in Table 3.

Table 3. **Catalogue of eggshell fragments housed in the collection of NMNHU-p (chronological order)**

Таблиця 3. **Каталог фрагментів яєчної шкаралупи в колекції ННПМ (хронологічний порядок)**

Site (sequence from ancient to younger)	Age	Specimen number NMNHU-P	Species	Shell thickness, mm	Number of fragments
Olbia	7th cent. BCE–3rd cent. CE	NoAZ-5899	*Cygnus cygnus/C. olor*	0.78	1
		NoAZ-5900	*Cygnus cygnus/C. olor*	0.78	1
Tarpanchi	1st–3rd cent. CE	NoAZ-3582	cf. *Tadorna tadorna*	0.34	1
		NoAZ-3583	cf. *Tadorna tadorna*	0.36	7
Zolote	1st cent. CE	NoAv-11187	*Gallus gallus f. dom.*	0.26	24
Frontove	2nd cent. CE	NoAv-11188	*Gallus gallus f. dom.*	0.28	19
		NoAv-11189	*Gallus gallus f. dom.*	0.28	38
		NoAv-11190	*Gallus gallus f. dom.*	0.28	45
		NoAv-11191	*Gallus gallus f. dom.*	0.3	31
		NoAv-11192	*Gallus gallus f. dom.*	0.32	40
		NoAv-11193	*Gallus gallus f. dom.*	0.32	22
		NoAv-11194	*Gallus gallus f. dom.*	0.32	4
		NoAv-11195	*Gallus gallus f. dom.*	0.32	31
Vojtenky	4th–5th cent. CE	NoAZ-6262	*Gallus gallus f. dom.*	0.24	7
		NoAZ-6263	*Gallus gallus f. dom.*	0.26	28
		NoAZ-6264	*Gallus gallus f. dom.*	0.28	35
		NoAZ-6265	*Gallus gallus f. dom.*	0.3	66
		NoAZ-6266	*Gallus gallus f. dom.*	0.32	27
		NoAZ-6267	cf. *Gallus gallus f. dom.*	0.34	20
Komariv	3rd–4th century CE	NoAv-7136	*Gallus gallus f. dom.*	0.32	20
Khrinnyky	4th cent. CE	NoAv-11047	*Gallus gallus f. dom.*	0.26	4
		NoAv-11048	*Gallus gallus f. dom.*	0.32	8
		NoAv-11049	*Anser anser f. dom./Haliaeetus albicilla*	0.5	1
Rivne	5th–7th cent. CE	NoAv-7061	*Gallus gallus f. dom.*	0.32	10
Sverdlovka	8th–10th cent. CE	NoAv-1723	*Gallus gallus f. dom.*	0.32	8
		NoAv-7043	Aves indet.	0.14	35
		NoAv-7044	Aves indet.	0.22	3
		NoAv-7045	Aves indet.	0.14	4
		NoAv-7046	*Gallus gallus f. dom.*	0.32	5
		NoAv-7047	*Gallus gallus f. dom.*	0.26	15
		NoAv-7048	*Anser anser f. dom.*	0.6	2
Basivkutske Horodyshche	10th–11th cent. CE	NoAv-8008	*Gallus gallus f. dom.*	0.3	22
		NoAv-8009	*Gallus gallus f. dom.*	0.3	50
Pastivnyk	12th cent. CE	NoAv-8010	*Anser anser f. dom.*	0.5	1
		NoAv-8011	*Gallus gallus f. dom.*	0.3	9
		NoAv-8012	*Gallus gallus f. dom.*	0.26	2
Kyrylivska 37	11th cent. CE	NoAZ-6431	*Gallus gallus f. dom.*	0.24	7
		NoAZ-6432	*Gallus gallus f. dom.*	0.26	7
		NoAZ-6433	*Gallus gallus f. dom.*	0.28	9
		NoAZ-6434	*Gallus gallus f. dom.*	0.3	4
		NoAZ-6435	*Gallus gallus f. dom.*	0.32	2
		NoAZ-6436	cf. *Gallus gallus f. dom.*	0.34	2
		NoAZ-6437	cf. *Gallus gallus f. dom.*	0.38	4
Sophiivska Borschagivka	10th–13th cent. CE	NoAZ-6257	Aves indet.	0.2	4
		NoAZ-6258	*Gallus gallus f. dom.*	0.24	2
		NoAZ-6259	*Gallus gallus f. dom.*	0.26	11
		NoAZ-6260	*Gallus gallus f. dom.*	0.3	4
		NoAZ-6261	*Anser anser f. dom.*	0.5	2
Hatne-2	10th–13th cent. CE	NoAv-7168	*Gallus gallus f. dom.*	0.3	4
		NoAv-7169	*Gallus gallus f. dom.*	0.32	4
		NoAv-7170	*Anser anser f. dom.*	0.52	1
		NoAv-7171	*Gallus gallus f. dom.*	0.3	11
		NoAv-7172	*Gallus gallus f. dom.*	0.3	10
		NoAv-7173	*Anser anser f. dom.*	0.68	10
Lisnyky-Bezodnja	12th–13th cent. CE	NoAv-11050	*Gallus gallus f. dom.*	0.32	80

Site (sequence from ancient to younger)	Age	Specimen number NMNHU-P	Species	Shell thickness, mm	Number of fragments
Khodosivka	12th–13th cent. CE	NoAv-6485	*Anser anser f. dom.*	0.64	6
		NoAv-6486	*Anser anser f. dom.*	0.64	3
		NoAv-6490	*Gallus gallus f. dom.*	0.3	10
		NoAv-6510	*Anser anser f. dom.*	0.64	8
		NoAv-6529	*Gallus gallus f. dom.*	0.3	30
		NoAv-6548	*Anser anser f. dom.*	0.64	2
		NoAv-6553	*Gallus gallus f. dom.*	0.3	3
		NoAv-11052	*Gallus gallus f. dom.*	0.24	8
		NoAv-11053	*Gallus gallus f. dom.*	0.26	17
		NoAv-11054	*Gallus gallus f. dom.*	0.28	11
		NoAv-11055	*Gallus gallus f. dom.*	0.3	9
		NoAv-11056	*Gallus gallus f. dom.*	0.24	16
		NoAv-11057	*Gallus gallus f. dom.*	0.26	23
		NoAv-11058	*Gallus gallus f. dom.*	0.3	13
		NoAv-11060	*Gallus gallus f. dom.*	0.24	9
		NoAv-11061	*Gallus gallus f. dom.*	0.26	25
		NoAv-11062	*Gallus gallus f. dom.*	0.28	14
		NoAv-11063	*Gallus gallus f. dom.*	0.3	25
		NoAv-11064	*Gallus gallus f. dom.*	0.32	15
Sedniv	10th–13th cent. CE	NoAv-8035	*Gallus gallus f. dom.*	0.3	3
Zolote	10th–12th cent. CE	NoAZ-6366	*Gallus gallus f. dom.*	0.3	11
Zarvans′ka	14th–15 cent. CE	NoAv-7398	cf. *Gallus gallus f. dom.*	0.34	15
Vasylivka	13th–17th cent. CE	NoAv-3131	*Anser anser f. dom.*	0.6	1
Dubno Holy Transfiguration Monastery	16th cent. CE	NoAZ-6337	*Anser anser f. dom.*	0.6	4
		NoAZ-6338	*Anser anser f. dom.*	0.54	2
		NoAZ-6339	*Gallus gallus f. dom./Anas platyrhynchos f. dom.*	0.4	1
		NoAZ-6340	*Gallus gallus f. dom.*	0.3	2
Dubovets	late 16th–early 19th cent. CE	NoAv-7112	*Gallus gallus f. dom./Anas platyrhynchos f. dom.*	0.34	2
		NoAv-7113	*Anser anser f. dom.*	0.64	2
		NoAv-7114	*Gallus gallus f. dom./Anas platyrhynchos f. dom.*	0.34	4
		NoAv-7115	*Gallus gallus f. dom./Anas platyrhynchos f. dom.*	0.34	4
		NoAv-7116	*Gallus gallus f. dom.*	0.32	3
		NoAv-7117	*Gallus gallus f. dom./Anas platyrhynchos f. dom.*	0.34	1
		NoAv-7118	*Gallus gallus f. dom.*	0.32	15
		NoAv-7119	*Anser anser f. dom.*	0.5	1
		NoAv-7120	*Gallus gallus f. dom.*	0.3	4
		NoAv-7121	*Gallus gallus f. dom.*	0.26	2
		NoAv-7122	*Gallus gallus f. dom./Anas platyrhynchos f. dom.*	0.36	2
Dubovets	second half of the 17th– early 19th cent. CE	NoAv-5510	*Gallus gallus f. dom.*	0.28	3
		NoAv-5521	*Gallus gallus f. dom.*	0.32	5
		NoAv-5522	*Gallus gallus f. dom.*	0.26	10
		NoAv-5523	*Gallus gallus f. dom.*	0.28	8
		NoAv-5636	*Gallus gallus f. dom.*	0.28	9
		NoAv-5641	*Gallus gallus f. dom.*	0.3	22
		NoAv-5642	*Anser anser f. dom.*	0.48	2
		NoAv-5643	*Anser anser f. dom.*	0.56	5
		NoAv-5644	*Gallus gallus f. dom./Anas platyrhynchos f. dom./Melleagris gallopavo f. dom.*	0.4	3
Dubovets	17th cent. CE	NoAv-5509	*Gallus gallus f. dom.*	0.3	2
		NoAv-5511	*Gallus gallus f. dom.*	0.26	11
		NoAv-5512	*Gallus gallus f. dom.*	0.3	8
		NoAv-5513	*Gallus gallus f. dom.*	0.32	1
		NoAv-5514	*Gallus gallus f. dom./Anas platyrhynchos f. dom.*	0.34	8
		NoAv-5515	*Gallus gallus f. dom./Anas platyrhynchos f. dom./Melleagris gallopavo f. dom.*	0.38	12
		NoAv-5516	*Gallus gallus f. dom./Anas platyrhynchos f. dom./Melleagris gallopavo f. dom.*	0.4	17
		NoAv-5517	*Gallus gallus f. dom.*	0.3	31
		NoAv-5518	*Gallus gallus f. dom.*	0.32	30
		NoAv-5519	*Gallus gallus f. dom./Anas platyrhynchos f. dom.*	0.36	32

Site (sequence from ancient to younger)	Age	Specimen number NMNHU-P	Species	Shell thickness, mm	Number of fragments
		NoAv-5520	*Gallus gallus f. dom./Anas platyrhynchos f. dom./Melleagris gallopavo f. dom.*	0.38	11
		NoAv-5524	*Gallus gallus f. dom.*	0.3	15
		NoAv-5525	*Gallus gallus f. dom.*	0.24	42
		NoAv-5526	*Gallus gallus f. dom.*	0.26	44
		NoAv-5527	*Gallus gallus f. dom.*	0.28	20
		NoAv-5528	*Gallus gallus f. dom.*	0.3	13
		NoAv-5529	*Gallus gallus f. dom.*	0.32	9
		NoAv-5530	*Gallus gallus f. dom./Anas platyrhynchos f. dom.*	0.34	4
		NoAv-5531	*Gallus gallus f. dom./Anas platyrhynchos f. dom.*	0.36	8
		NoAv-5532	*Gallus gallus f. dom./Anas platyrhynchos f. dom./Melleagris gallopavo f. dom.*	0.38	5
		NoAv-5533	*Gallus gallus f. dom./Anas platyrhynchos f. dom./Melleagris gallopavo f. dom.*	0.4	10
		NoAv-5534	cf. *Columba livia f. dom.*	0.2	8
		NoAv-5535	*Anser anser f. dom.*	0.5	7
		NoAv-5536	*Anser anser f. dom.*	0.56	15
		NoAv-5537	*Anser anser f. dom.*	0.6	42
		NoAv-5538	*Gallus gallus f. dom.*	0.24	44
		NoAv-5539	*Gallus gallus f. dom.*	0.26	20
		NoAv-5540	*Gallus gallus f. dom.*	0.28	13
		NoAv-5541	*Gallus gallus f. dom.*	0.3	9
		NoAv-5542	*Gallus gallus f. dom./Anas platyrhynchos f. dom.*	0.34	4
		NoAv-5543	*Gallus gallus f. dom./Anas platyrhynchos f. dom.*	0.36	8
		NoAv-5544	*Gallus gallus f. dom./Anas platyrhynchos f. dom./Melleagris gallopavo f. dom.*	0.4	5
		NoAv-5545	*Anas platyrhynchos f. dom./Melleagris galopavo f. dom.*	0.44	10
		NoAv-5546	*Anas platyrhynchos f. dom./Melleagris galopavo f. dom.*	0.46	8
		NoAv-5547	*Anser anser f. dom.*	0.5	7
		NoAv-5548	*Gallus gallus f. dom.*	0.3	15
		NoAv-5549	*Anser anser f. dom.*	0.58	42
		NoAv-5550	*Anser anser f. dom.*	0.68	44
		NoAv-5551	*Gallus gallus f. dom.*	0.26	20
		NoAv-5552	*Gallus gallus f. dom.*	0.28	13
		NoAv-5553	*Gallus gallus f. dom.*	0.3	9
		NoAv-5554	*Gallus gallus f. dom.*	0.32	4
		NoAv-5555	*Gallus gallus f. dom./Anas platyrhynchos f. dom.*	0.34	8
		NoAv-5556	*Gallus gallus f. dom./Anas platyrhynchos f. dom.*	0.36	5
		NoAv-5557	*Gallus gallus f. dom./Anas platyrhynchos f. dom./Melleagris gallopavo f. dom.*	0.38	10
		NoAv-5558	*Gallus gallus f. dom./Anas platyrhynchos f. dom./Melleagris gallopavo f. dom.*	0.4	8
		NoAv-5559	*Anser anser f. dom.*	0.48	7
		NoAv-5560	*Anser anser f. dom.*	0.52	15
		NoAv-5561	*Anser anser f. dom.*	0.6	42
		NoAv-5562	*Gallus gallus f. dom.*	0.24	44
		NoAv-5563	*Gallus gallus f. dom.*	0.26	20
		NoAv-5564	*Gallus gallus f. dom.*	0.28	13
		NoAv-5565	*Gallus gallus f. dom.*	0.3	9
		NoAv-5566	*Gallus gallus f. dom.*	0.32	4
		NoAv-5567	*Gallus gallus f. dom./Anas platyrhynchos f. dom.*	0.34	8
		NoAv-5568	*Gallus gallus f. dom./Anas platyrhynchos f. dom.*	0.36	5
		NoAv-5569	*Gallus gallus f. dom./Anas platyrhynchos f. dom./Melleagris gallopavo f. dom.*	0.38	10
		NoAv-5570	*Gallus gallus f. dom./Anas platyrhynchos f. dom./Melleagris gallopavo f. dom.*	0.4	8
		NoAv-5571	cf. *Columba livia f. dom.*	0.22	7
		NoAv-5572	*Gallus gallus f. dom.*	0.24	15
		NoAv-5573	*Gallus gallus f. dom.*	0.26	42
		NoAv-5574	*Gallus gallus f. dom.*	0.28	44
		NoAv-5575	*Gallus gallus f. dom.*	0.3	20
		NoAv-5576	*Gallus gallus f. dom.*	0.32	13
		NoAv-5577	*Gallus gallus f. dom./Anas platyrhynchos f. dom.*	0.34	9
		NoAv-5578	*Gallus gallus f. dom./Anas platyrhynchos f. dom.*	0.36	4

Site (sequence from ancient to younger)	Age	Specimen number NMNHU-P	Species	Shell thickness, mm	Number of fragments
		NoAv-5579	*Gallus gallus f. dom./Anas platyrhynchos f. dom./Melleagris gallopavo f. dom.*	0.38	8
		NoAv-5580	*Gallus gallus f. dom./Anas platyrhynchos f. dom./Melleagris gallopavo f. dom.*	0.4	5
		NoAv-5581	*Gallus gallus f. dom.*	0.28	10
		NoAv-5582	*Anser anser f. dom.*	0.48	8
		NoAv-5583	*Gallus gallus f. dom.*	0.3	7
		NoAv-5584	*Anas platyrhynchos f. dom./Melleagris gallopavo f. dom.*	0.46	15
		NoAv-5585	*Gallus gallus f. dom.*	0.32	42
		NoAv-5586	*Gallus gallus f. dom.*	0.24	44
		NoAv-5587	*Gallus gallus f. dom.*	0.26	20
		NoAv-5588	*Gallus gallus f. dom.*	0.28	13
		NoAv-5589	*Gallus gallus f. dom.*	0.3	9
		NoAv-5590	*Gallus gallus f. dom.*	0.32	4
		NoAv-5591	*Gallus gallus f. dom./Anas platyrhynchos f. dom.*	0.34	8
		NoAv-5592	*Gallus gallus f. dom./Anas platyrhynchos f. dom.*	0.36	5
		NoAv-5593	*Gallus gallus f. dom./Anas platyrhynchos f. dom./Melleagris gallopavo f. dom.*	0.38	10
		NoAv-5594	*Gallus gallus f. dom./Anas platyrhynchos f. dom./Melleagris gallopavo f. dom.*	0.4	8
		NoAv-5595	*Anser anser f. dom.*	0.48	7
		NoAv-5596	*Anser anser f. dom.*	0.54	15
		NoAv-5597	*Anser anser f. dom.*	0.6	42
		NoAv-5598	*Gallus gallus f. dom.*	0.3	44
		NoAv-5599	*Gallus gallus f. dom.*	0.26	20
		NoAv-5600	*Gallus gallus f. dom.*	0.24	13
		NoAv-5601	*Gallus gallus f. dom.*	0.26	9
		NoAv-5602	*Gallus gallus f. dom.*	0.28	4
		NoAv-5603	*Gallus gallus f. dom.*	0.3	8
		NoAv-5604	*Gallus gallus f. dom.*	0.32	5
		NoAv-5605	*Gallus gallus f. dom./Anas platyrhynchos f. dom.*	0.34	10
		NoAv-5606	*Gallus gallus f. dom./Anas platyrhynchos f. dom.*	0.36	8
		NoAv-5607	*Gallus gallus f. dom./Anas platyrhynchos f. dom./Melleagris gallopavo f. dom.*	0.38	7
		NoAv-5608	*Gallus gallus f. dom./Anas platyrhynchos f. dom./Melleagris gallopavo f. dom.*	0.4	15
		NoAv-5609	*Anser anser f. dom.*	0.48	42
		NoAv-5610	*Anser anser f. dom.*	0.5	44
		NoAv-5611	*Anser anser f. dom.*	0.52	20
		NoAv-5612	*Anser anser f. dom.*	0.54	13
		NoAv-5613	*Anser anser f. dom.*	0.6	9
		NoAv-5614	*Gallus gallus f. dom.*	0.24	4
		NoAv-5615	*Gallus gallus f. dom.*	0.26	8
		NoAv-5616	*Gallus gallus f. dom.*	0.28	5
		NoAv-5617	*Gallus gallus f. dom.*	0.3	10
		NoAv-5618	*Gallus gallus f. dom.*	0.32	8
		NoAv-5619	*Gallus gallus f. dom./Anas platyrhynchos f. dom.*	0.34	7
		NoAv-5620	*Gallus gallus f. dom./Anas platyrhynchos f. dom.*	0.36	15
		NoAv-5621	*Gallus gallus f. dom./Anas platyrhynchos f. dom./Melleagris gallopavo f. dom.*	0.38	42
		NoAv-5622	cf. *Columba livia f. dom.*	0.22	44
		NoAv-5623	*Gallus gallus f. dom.*	0.26	20
		NoAv-5624	*Gallus gallus f. dom.*	0.28	13
		NoAv-5625	*Gallus gallus f. dom.*	0.3	9
		NoAv-5626	*Gallus gallus f. dom.*	0.32	4
		NoAv-5627	*Gallus gallus f. dom./Anas platyrhynchos f. dom.*	0.34	8
		NoAv-5628	*Gallus gallus f. dom./Anas platyrhynchos f. dom.*	0.36	5
		NoAv-5629	*Gallus gallus f. dom./Anas platyrhynchos f. dom./Melleagris gallopavo f. dom.*	0.38	10
		NoAv-5630	*Gallus gallus f. dom./Anas platyrhynchos f. dom./Melleagris gallopavo f. dom.*	0.4	8
		NoAv-5631	*Anas platyrhynchos f. dom./Melleagris galopavo f. dom.*	0.46	7
		NoAv-5632	*Anser anser* f. *dom.*	0.5	15
		NoAv-5633	*Anser anser* f. *dom.*	0.52	42

Site (sequence from ancient to younger)	Age	Specimen number NMNHU-P	Species	Shell thickness, mm	Number of fragments
		NoAv-5634	*Anser anser* f. *dom.*	0.54	44
		NoAv-5635	*Anser anser* f. *dom.*	0.58	20
		NoAv-5637	*Gallus gallus f. dom./Anas platyrhynchos f. dom.*	0.34	7
		NoAv-5638	*Gallus gallus f. dom.*	0.3	40
		NoAv-5639	*Gallus gallus f. dom.*	0.26	3
		NoAv-5640	*Gallus gallus f. dom.*	0.3	6
		NoAv-5645	*Gallus gallus f. dom.*	0.3	23
		NoAv-5646	*Anser anser f. dom.*	0.5	3
		NoAv-5647	*Gallus gallus f. dom.*	0.3	48
		NoAv-5648	*Gallus gallus f. dom./Anas platyrhynchos f. dom.*	0.36	23
		NoAv-5649	*Gallus gallus f. dom.*	0,24	21
		NoAv-5650	*Gallus gallus f. dom.*	0.26	16
		NoAv-5651	*Gallus gallus f. dom.*	0.28	6
		NoAv-5652	*Gallus gallus f. dom.*	0.3	32
		NoAv-5653	*Gallus gallus f. dom.*	0.32	42
		NoAv-5654	*Gallus gallus f. dom./Anas platyrhynchos f. dom.*	0.34	20
		NoAv-5655	*Gallus gallus f. dom./Anas platyrhynchos f. dom.*	0.36	20
		NoAv-5656	*Gallus gallus f. dom./Anas platyrhynchos f. dom./Melleagris gallopavo f. dom.*	0.38	9
		NoAv-5657	*Gallus gallus f. dom./Anas platyrhynchos f. dom./Melleagris gallopavo f. dom.*	0.4	3
		NoAv-5658	*Anser anser f. dom.*	0.5	6
		NoAv-5659	*Anser anser f. dom.*	0.52	9
		NoAv-5660	*Anser anser f. dom.*	0.58	5
		NoAv-5661	*Anser anser f. dom.*	0.6	10
		NoAv-5662	*Gallus gallus f. dom.*	0.28	10
		NoAv-5663	*Gallus gallus f. dom.*	0.3	21
		NoAv-5664	*Gallus gallus f. dom.*	0.32	16
		NoAv-5665	*Gallus gallus f. dom./Anas platyrhynchos f. dom.*	0.34	6
		NoAv-5666	*Gallus gallus f. dom./Anas platyrhynchos f. dom.*	0.36	11
		NoAv-5667	*Gallus gallus f. dom.*	0.24	4
		NoAv-5668	*Gallus gallus f. dom.*	0.26	7
		NoAv-5669	*Gallus gallus f. dom.*	0.28	13
		NoAv-5670	*Gallus gallus f. dom.*	0.3	24
		NoAv-5671	*Gallus gallus f. dom.*	0.32	13
		NoAv-5672	*Gallus gallus f. dom./Anas platyrhynchos f. dom.*	0.34	14
		NoAv-5673	*Gallus gallus f. dom./Anas platyrhynchos f. dom./Melleagris gallopavo f. dom.*	0.38	6
		NoAv-5674	*Anser anser* f. *dom.*	0.52	3
		NoAv-5675	*Anser anser* f. *dom.*	0.58	4
		NoAv-5676	*Gallus gallus f. dom.*	0.28	6
		NoAv-5677	*Gallus gallus f. dom.*	0.3	2
		NoAv-5678	*Gallus gallus f. dom.*	0.32	5
		NoAv-5679	*Gallus gallus f. dom./Anas platyrhynchos f. dom.*	0.34	6
		NoAv-5680	*Gallus gallus f. dom./Anas platyrhynchos f. dom.*	0.38	3
		NoAv-5681	*Anas platyrhynchos f. dom./Melleagris gallopavo f. dom.*	0.44	1
		NoAv-5682	*Gallus gallus f. dom./Anas platyrhynchos f. dom.*	0.34	5
		NoAv-5683	cf. *Columba livia f. dom.*	0.22	1
		NoAv-5684	*Gallus gallus f. dom.*	0.26	2
		NoAv-5685	*Gallus gallus f. dom.*	0.28	6
		NoAv-5686	*Gallus gallus f. dom.*	0.3	15
		NoAv-5687	*Gallus gallus f. dom.*	0.32	11
		NoAv-5688	*Gallus gallus f. dom./Anas platyrhynchos f. dom.*	0.34	15
		NoAv-5689	*Gallus gallus f. dom./Anas platyrhynchos f. dom.*	0.36	6
		NoAv-5690	*Gallus gallus f. dom.*	0.28	9
		NoAv-5691	*Gallus gallus f. dom.*	0.3	15
Medzhybizh	18th–19th cent. CE	NoAv-10563	*Gallus gallus f. dom.*	0.38	36
		NoAv-10564	*Gallus gallus f. dom./Anas platyrhynchos f. dom.*	0.34	34
		NoAv-10565	*Gallus gallus f. dom./Anas platyrhynchos f. dom.*	0.34	37
		NoAv-10566	*Gallus gallus f. dom.*	0.36	48
		NoAv-11145	*Gallus gallus f. dom.*	0.32	1
		NoAv-11146	*Anser anser f. dom.*	0.56	1
Khodosivka-Snigurove	17th–18th cent. CE	NoAv-11067	cf. *Columba livia f. dom*	0.22	1

Site (sequence from ancient to younger)	Age	Specimen number NMNHU-P	Species	Shell thickness, mm	Number of fragments
Kyrylivska 37	18th cent. CE	NoAv-11068	*Gallus gallus f. dom.*	0.32	1
		NoAv-11068	*Gallus gallus f. dom./Anas platyrhynchos f. dom.*	0.34	1
		NoAZ-6441	*Gallus gallus f. dom.*	0.24	2
		NoAZ-6442	*Gallus gallus f. dom.*	0.26	6
		NoAZ-6443	*Gallus gallus f. dom.*	0.28	7
		NoAZ-6444	*Gallus gallus f. dom.*	0.3	20
		NoAZ-6445	*Gallus gallus f. dom.*	0.32	20
		NoAZ-6446	*Gallus gallus f. dom./Anas platyrhynchos f. dom.*	0.34	12
		NoAZ-6447	*Gallus gallus f. dom./Anas platyrhynchos f. dom.*	0.36	8
		NoAZ-6448	*Gallus gallus f. dom./Anas platyrhynchos f. dom./Melleagris gallopavo f. dom.*	0.38	5
		NoAZ-6450	*Gallus gallus f. dom.*	0.24	1
		NoAZ-6451	*Gallus gallus f. dom.*	0.26	3
		NoAZ-6452	*Gallus gallus f. dom.*	0.28	5
		NoAZ-6453	*Gallus gallus f. dom.*	0.3	14
		NoAZ-6454	*Gallus gallus f. dom.*	0.32	16
		NoAZ-6455	*Gallus gallus f. dom./Anas platyrhynchos f. dom.*	0.34	8
		NoAZ-6456	*Gallus gallus f. dom./Anas platyrhynchos f. dom.*	0.36	8
		NoAZ-6457	*Gallus gallus f. dom./Anas platyrhynchos f. dom./Melleagris gallopavo f. dom.*	0.38	6
		NoAZ-6458	*Gallus gallus f. dom./Anas platyrhynchos f. dom./Melleagris gallopavo f. dom.*	0.4	5

Discussion

It is widely believed that egg fragments are very rarely preserved in occupation layers. In fact, they are harder to collect than the bones of large animals. Archaeologists collect all objects from graves. But in the case of kitchen waste, excavation workers are careful (collect small fragments, use flotation, etc.) when there is an appropriate research request. Zooarchaeology is a relatively young branch of science. In the 19th–20th centuries, in the territory of Ukraine, only a few scientists studied the remains of animals from archaeological sites. They were predominantly palaeontologists, and domesticated animals were not in their area of scientific interest [Yanish 2016]. Since 2014, the NMNHU-p has been actively cooperating with archaeologists and accepting animal bones and fragments of eggshells for storage. Zooarchaeological material was obtained from 53 sites. Eggshell fragments were found in 21 localities (40%). Accordingly, this type of finds is often present in the occupation layers. During the period of 2016–2022, the collection received 3809 fragments of at least 288 eggs. Whereas in the 20th century, 275 fragments were received, of at least 14 eggs from five localities. In most cases, shell fragments can be identified, especially if the sample also contains bird bones. They can be used for various research tasks (in archaeology, history, zoology, cultural studies, etc.), which are described in the corresponding guide [Serjeantson 2009].

References

Albarella, U. 2017. Zooarchaeology in the twenty-first century: where we come from, where we are now, and where we are going. *In:* Albarella, U., H. Russ, K. Vickers, S. Viner-Daniels (Eds). *The Oxford Handbook of Zooarchaeology*. Oxford, 3–22.

Ar, A., H. Rahn, Ch. V. Paganelli. 1979. The avian egg: mass and strength. *Condor*, **81**: 331–337.

Birkhead, M. 1984. Variation in the weight and composition of Mute Swan (Cygnus olor) eggs. *The Condor*, **86**: 489–490.

Driver, J. C. 2011. Identification, Classification and Zooarchaeology. *Ethnobiology Letters*, **2**: 19–39.

Gopkalo, O., T. Rudych. 2020. Bird eggs from the Chernyakhiv-Sântana de Mureş Culture's graves. *City: History, Culture, Society*, **11** (4): 91–115.

Gorobets, L., O. Kovalchuk. 2017. Birds in the medieval culture and economy of the East Slavs in the 10–13th centuries AD. *Environmental Archaeology*, **22** (2): 147–165.

Gorobets, L., N. Rudenko. 2021. Remains of birds from the Northwest Black Sea ancient settlements. *Environmental Archaeology*, **27** (3): 306–322.

Islam, O., S. Khatun, M. Famous, Md. N. Uddin. 2021. Comparative studies on squab growth performance and egg morphometrical attributes of different pigeon breeds. *Animal Husbandry, Dairy and Veterinary Science*, **5**: 1–5.

Jingjun, W., T. Xiuhua, G. Zhaohong, D. Fenggou, H. Shouhua, [et al.]. 1998. Artificial incubation of Great bustard (Otis tarda) eggs. *Journal of Forestry Research*, **9**: 81–86.
Johnsgard, P. A. 1983. Cranes of the world: demoiselle crane (Anthropoides virgo). *In:* Johnsgard P. (Ed.). *Cranes of the World*, **13**: 95–102.
Jones, P. J. 1979. Variability of egg size and composition in the great white pelican (Pelecanus onocrotalus). *Auk*, **96** (2): 407–408.
Kaila, O. P., V. Sankhyan, J. K. Reen, R. K. Vijh, Y. P. Thaku. 2016. Biometry, production potential and genetic characterization of Red Jungle Fowl (Gallus gallus f. dom.) reared under captivity from western Himalayan state of Himachal Pradesh, India. *International Journal of Approximate Reasoning*, **51**: 406–410.
Karabulut, O. 2021. Relationship between weight, volume and specific gravity of goose eggs before incubation. *Journal of Advances in VetBio Science and Techniques*, **6** (2): 90–99.
Kerje, S., Ö. Carlborg, L. Jacobsson, K. Schütz, C. Hartmann, [et al.]. 2003. The twofold difference in adult size between the red junglefowl and White Leghorn chickens is largely explained by a limited number of QTLs. *Animal Genetics*, **34**: 264–274.
Lukanov, H. 2019. Domestic quail (Coturnix japonica domestica), is there such farm animal? *World's Poultry Science Journal*, **75** (4): 1–11.
Rees, E. C., J. M. Black, C. J., Spray, S. Thorisson, 2008. Comparative study of the breeding success of Whooper Swans Cygnus cygnus nesting in upland and lowland regions of Iceland. *Ibis*, **133**: 365–373.
Rhymer, J.M. 1988. The effect of egg size variability on thermoregulation of Mallard (Anas platyrhynchos) offspring and its implications for survival. *Oecologia*, **75**: 20–24.
Roberts, V. 2008. *British Poultry Standards.* Hoboken, Wiley-Blackwell, 1–472.
Serjeantson, D. 2009. Birds. *Cambridge:* Cambridge University Press, 1–512.
Shatkovska, O. V., M. Ghazali, I. S. Mytiai, N. Druz. 2018. Size and shape correlation of birds' pelvis and egg: Impact of developmental mode, habitat, and phylogeny. *Journal of Morphology*, **279** (11): 1–33.
Yanish, Ye. Yu. 2016. Archaeozoology — discipline at the interface of sciences. *Visnyk Nacionalnoji Academiji Nauk Ukrajiny*, **7**: 55–68. [In Ukrainian]