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Research article

First European Neogene record of true pheasants from Gorna Sushitsa (SW Bulgaria)

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http://zoobank.org/E9DAE47B-3FD3-48B3-82A3-66424477E3F1

Abstract: A late Miocene (Middle Turolian) ulna is described as a holotype of *Phasianus bulgaricus* sp. n.. This find is the first record of Neogene true pheasants in Europe.

Keywords: Gorna Sushitsa locality, Miocene avifauna, Neogene birds, pheasants, Sandanski Basin, Turolian

Introduction

- Fossil records of large phasianids

Olson (1985) summarises that Phasianinae Horsfield, 1821 were abundant in the Tertiary of Europe and all of the pre-Pliocene species have been assigned to extinct genera. The Neogene records of pheasants in Europe are extremely scant (Mlikovsky, 2002). Numerous records of large phasianids are known from the Pleistocene – *Phasianus colchicus* Linnaeus, 1758 (Europe), *Ph. nicheti* Bastin, 1933 (France; considered nomen nudum), *Ph. yanshansis* Wanpo Lianhai, 1984 (China), *Phasianus* sp. (several dozens of localities) (Tyrberg, 1998) and *Ph. soemmerringii* (Japan) and *Ph. versicolor* Vieillot, 1825 (Japan) (Tyrberg, 2008). Several genera of large phasianids have been described from the Neogene of Mongolia and China (see the Comparison section). In the Eastern Palaearctic from the Late Pleistocene of Northern Vietnam, a number of large phasianids have been recently found: *Gallus gallus* (Linnaeus, 1758), *Ph. colchicus, Lophura diardi* (Bonaparte, 1856), *L. nycthemera* (Linnaeus, 1758), *L. edwardsi* (Oustalet, 1896), *Lophura* aff. *imperialis* Delacour & Jabouille, 1924 / *L. edwardsi* (Oustalet, 1896) var. *hatinhensis, Chrysolophus amherstiae* Leadbeater, 1829, *Chrysolophus* sp., *Polyplectron bicalcaratum* (Linnaeus, 1758), *Polyplectron* cf. *germaini* Elliot, 1866, *Syrmaticus* cf. *reevesii* (Gray, 1829), cf. *Lophophorus* sp. (Boev, in prep.). Therefore, the described specimen of Gorna Sushitsa represents the oldest known pheasant from European Neogene localities.

- Associated fauna and age of the Gorna Sushitsa locality

During the last decades, a very rich terrestrial megafauna has been uncovered in the locality: Bovidae Gray, 1821: *Palaeoreas lindermayeri* (Wagner, 1848), *Paleotragus* cf. *rouenii* Gaudry, 1861, *Tragoportax amalthea* (Roth & Wagner, 1854), *Prostrepsiceros rotundicornis* (Weithofer, 1888), *Pikermicerus gaudryi* Kretzoi, 1941, *Oioceros rothi* (Wagner, 1857), *Tragoportax* sp., and *Gazella* sp.; Equidae Gray, 1821: *Hipparion theobaldi* (Lydekker, 1882), *Cremohipparion mediterraneum* (Roth & Wagner, 1855), *Hipparion matthewi* Abel, 1926, and Hipparionini indet.; Rhinocerathisae: *Ceratotherium neumayeri* Osborn, 1900

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and *Chilotherium* sp.; Giraffidae Gray, 1821: *Helladotherium duvernoyi* Gaudry 1860 and Giraffidae gen.; Chalicotheriidae Gill, 1872: *Ancylotherium pentelicum* (Gaudry & Lartet, 1856) and *Chalicotherium goldfussi* J. J. Kaup, 1833; Cercopithecidae Gray, 1821: *Mesopithecus pentelicus* Wagner, 1839; Suidae Gray, 1821: *Propotamohoerus* sp.; Hyaenidae Gray, 1869: *?Hyaenotherium magnum* Simeonov, 1989 (now a synonym of *Hyaenictitherium wongii* (Zdansky, 1924)); Proboscidea indet. (Spassov et al., 2006; Spassov et al., 2019).

Spassov et al. (2019) precise that Gorna Sushitsa site represents a complex of 12 localities. The age of the site based on the collected specimen of the described pheasant is determined as Middle Turolian. This site is mentioned as GS8. Böhme et al. (2018) dated it to 7.36 Mya, i.e. ca. 30 000 years older than the Pikermi locality in Greece, using a complex of methods of sedimentology, palaeontology and palaeomagnetism. The dominant landscape around the GS8 site is characterised as xerophytic open woodland/shrubland (Spassov et al., 2019).

Material and methods

The examined find represents an incomplete left ulna bone. All measurements are given in millimetres (Table 1). The taxonomy follows Mlíkovský (2002) and Dickinson & Remsen (2013). The osteological terminology is after Baumel & Witmer (1993) and Livezey & Zusi (2006).

Abbreviations: Anatomical: dex. – dextra; m. – musculus; prox. – proximalis; sin – sinistra; Institutional: NHM – Natural History Museum, formerly British Museum (Natural History), Tring; NMNHS – National Museum of Natural History (Bulgarian Academy of Sciences), Sofia.

Systematic part

Order GALLIFORMES (Temminck, 1820)
Family Phasianidae Horsfield, 1821
Subfamily Phasianinae Horsfield, 1821
Genus *Phasianus* Linnaeus, 1758
***Phasianus bulgaricus* sp. n.**

Holotype: ulna prox. sin. NMNHS 15143 (Fig. 1), collections of the Vertebrate Animals Department of the National Museum of Natural History, Sofia, Bulgarian Academy of Sciences. Collected in 2006 by the joint Bulgarian-French team, during the palaeontological field excavations, organised by the NMNHS.

Etymology: The name *bulgaricus* is given after the name of Bulgaria, the country where the specimen originates from.

Measurements: Table 1; Fig. 2.

Differential diagnosis: A medium-sized fossil species in the genus *Phasianus*, differing from the recent *Phasianus colchicus* by: (1) the wider depressio m. brachialis; (2) the more approached medial edge of depressio m. brachialis to the medial linea intermuscularis on the medial side of the bone; (3) wider impressio m. scapulotricipitis; (4) the blunt instead sharp, ending of depressio m. brachialis at its proximal end; (5) more straight, instead bent lateral edge of the profile of the bone in dorsal view; (6) blunt instead sharp, ending of depressio m. brachialis at its proximal end.

Preservation: The holotype represents a proximal bone fragment, which is almost 2/3 of the total length of the bone (Fig. 1).

Locality: Vicinity of Gorna Sushitsa Village (Fig. 3), SE of town of Sandanski (Blagoevgrad Region, SW Bulgaria; Fig. 4); 41°555′N, 23°384′E (Spassov et al., 2019). UTM grid: FM73.

Chronology: MN11-12 zone, Middle Turolian (Spassov et al., 2019).

Description: The specimen is of good preservation. The distal third is missing and the total length of the bone fragment is 47.1 mm. All morphological details of an ulna bone are excellently preserved, incl. lineae intermusculares, foramina nutritia, specific edges, papilae remigiales caudales, etc.

Comparisons

The specimen shows all the features of medium-sized gallinaceous birds – medium or even short ulna, well-developed (wide and relatively short) impressio brachialis and shallow relief on the facies articularis proximalis. Its morphological characteristic suggest the find belongs to Phasianidae (i.e. Phasianinae), see below. Both osteometrically and osteomorphologically the examined specimen approaches to genus *Phasianus*. Relatively blunt olecranon, crescent-shaped bent diaphysis, well-developed sharp proximal edge of depressio brachialis and the thicker proximal half

Fig. 1. *Phasianus bulgaricus* sp. n. – ulna sin. prox. NMNHS 15143 (holotype) Gorna Sushitsa Village (Blagoevgrad Region): ventral view (a), medial view (b), dorsal view (c). Photographs: Assen Ignatov; *Phasianus colchicus* sp. n. – ulna sin. prox. NMNHS 60/2016 Brestnitsa (Lovech Region, NC Bulgaria): ventral view (d), medial view (e), dorsal view (f). Photographs: Zlatozar Boev.

of the bone suggest a pheasant of *Phasianus*. In addition, the specimen NMNHS 15143 was compared with 38 phasianid species (23 recent and 15 fossil) to confirm it belongs to Phasianidae and to identify its genus.

- Comparison with recent phasianids

— *Tetrao urogallus* Linnaeus, 1758: smaller; deeper and well-developed impressio m. scapulotricipitis on dorso-lateral side of the bone; shallower depressio m. brachialis.
— *Tetrao tetrix* Linnaeus, 1758: similar by general morphology and size; much deeper and well-developed impressio m. scapulotricipitis on dorso-lateral side of the bone. In medial view pr. olecrani more massive, blunt and directed dorsally instead longitudinally. Depressio m. brachialis wider.
— *Gallus lafayettii* Lesson, 1831: larger; shallower cotyla ventralis.
— *Gallus sonneratii* Temminck, 1813: relatively shorter cotyla dorsalis (measurement “b”); wider depressio m. brachialis.

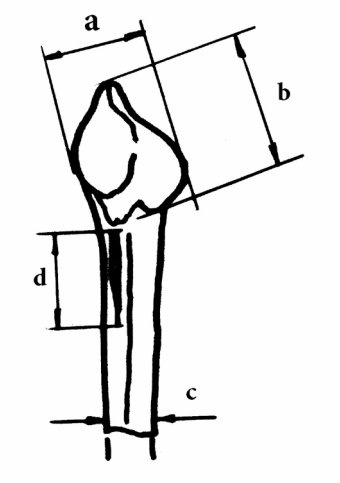

Fig. 2. Measurements of proximal ulna in large Phasianids. Drawing: Vera Htistova.

Fig. 3. Gorna Sushitsa locality and the present landscape in the surroundings of the Gorna Sushitsa Village. Photograph: Nikolay Spassov.

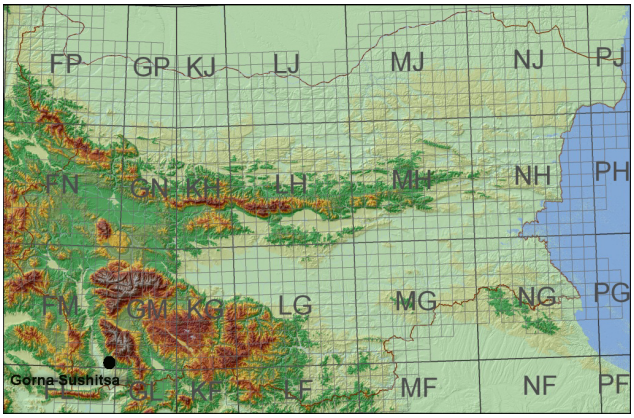

Fig. 4. Location of the Gorna Sushitsa locality.

Table 1. Comparison of the measurements of the ulna prox. of fossil and recent Phasianidae (ref. to Fig. 2)

Species	a	b	c	d	e
Fossil – Gorna Sushitsa					
Phasianus bulgaricus sp. n. NMNHS 15 143	10.1	14.1	5.3	ca. 16.0	4.4
Recent					
Phasianus colchicus NHM 1979.10.1	9.8	13.8	5.0	11.9	4.9
Phasianus colchicus NHM 1985.9.1	8.3	12.4	3.9	10.8	4.3
Phasianus colchicus NHM 1985.42.1	7.8	12.0	3.9	8.2	3.0
Gallus lafayettei NHM 1985.42.1	6.7	10.0	3.5	8.0	2.1
Gallus sonneratii NHM 1985.42.2	8.2	12.8	4.6	10.0	4.0
Gallus sonneratii NHM 1975.105.13	8.9	13.0	4.5	10.0	3.7
Gallus gallus NHM 1850.8.15.21 [wild; Timor]	8.0	12.0	3.9	11.3	3.8
Tragopan satyra NHM.12.3.5	87	13.2	4.2	12.0	3.1
Tragopan satyra NHM.18.67.12.3.4	10.5	15.3	5.3	12.6	3.4
Ithaginis cruentus NHM 1952.2.101	8.3	ca. 12.8	4.3	11.2	3.3
Tragopan temminckii NHM 1999.11.2	7.7	11.8	4.0	10.8	3.2
Tragopan temminckii NHM 1976. 1.1	9.4	13.3	4.5	10.5	4.3
Tragopan caboti NHM 1976. 1.1	7.2	11.2	3.5	9.7	3.0
Lophophorus impejanus NHM 1977.19.1	10.9	16.8	5.4	13.2	4.4
Lophura leucomelanos NHM 1865.10.9.19	8.5	12.3	4.1	8.7	2.5
Crossptilon auritum NHM 1868.9.12.23	9.7	14.2	5.4	12.8	4.0
Lophura nycthemera NHM 1984. 75.1	8.8	12.3	4.9	10.8	3.5
Lophura ignita rufa NHM 1869.10.19.18	9.9	14.4	5.2	16.3	4.7
Lophura swinhoii NHM 1966.55.36	8.5	12.4	4.6	12.2	3.6
Lophura erythropthalmus NHM 1865.5.10.13	8.6	13.0	4.9	12.0	2.8
Chrysolophus pictus NHM 1850.11.13.16	5.7	8.4	3.0	6.0	2.3
Chrysolophus amherstiae NHM 1980.2.1	7.4	10.8	4.2	ca. 9.8	2.2
Syrmaticus reevesi NHM 1867.5.22.1	8.6	11.8	4.9	10.7	3.4
Syrmaticus soemmerringi NHM 1952.2.130	8.7	12.4	4.1	10.5	3.9
Syrmaticus soemmerringi NHM 1860.8.25.7	8.4	12.8	4.0	9.8	3.5
Polyplectron chalcurum NHM 1848.10.31.9	6.1	7.6	3.3	7.8	1.7
Polyplectron emphanum NHM 1848.10.31.9	6.4	9.4	3.4	8.9	2.4
Polyplectron malacense NHM 1848.10.31.9	6.0	9.3	3.0	8.0	ca. 1.8
Rheinardia ocellata NHM 1926.9.8.1169	10.8	13.9	4.4	13.3	3.9
Afropavo congensis NHM 1989.19.16	11.0	14.2	4.6	13.4	5.0
Afropavo congensis NHM 1977.20.1	10.3	5.2	5.5	4.2	4.6
Tetrao tetrix NHM 1952.2.19	10.0	14.4	5.2	14.7	3.9
Tetrao tetrix NHM 1952.2.21	8.2	12.2	4.2	13.3	2.7
Tetrao tetrix NHM 1930.3.24.18	9.5	13.7	4.8	13.3	3.6
Tetrao tetrix NHM 1952.2.20	8.8	13.5	4.5	12.3	3.1
Tetrao tetrix NHM 1909- 10.14.1	9.7	14.0	4.9	14.0	3.3
Tetrao tetrix NHM 1905.10.20.1	8.5	12.7	4.4	12.5	3.0
Tetrao tetrix NHM 1909.10.14.2	8.5	12.3	4.2	12.2	2.8
Tetrao tetrix NHM 1984.54.1	8.9	13.5	4.6	11.7	3.2
Tetrao urogallus NHM 1851.11.10.48	16.1	23.4	7.9	22.6	5.5
Tetrao urogallus NHM 1927.12.27.154	16.7	22.7	7.6	23.1	5.1

— *Gallus gallus bankiva* Temminck, 1813 [wild; Timor]: larger; much less developed papilae remigiales caudales; wider depressio m. brachialis.

— *Tragopan satyra* (Linnaeus, 1758): deeper and well-developed impressio m. scapulotricipitis; wider depressio m. brachialis; blunt instead sharp,

ending of depressio m. brachialis at its proximal end.
— *Ithaginis cruentus* (Hardwicke, 1821): much less developed papilae remigiales caudales; wider depressio m. brachialis; relatively thicker disaphysys in the proximal end; deeper impressio m. scapulotricipitis.
— *Tragopan temminckii* (J.E. Gray, 1831): wider and shallower depressio m. brachialis; rounder, instead angular dorsal edge of cotyla dorsalis.
— *Tragopan caboti* (Gould, 1857): larger; outlining edge of the depressio m. brachialis in proximal end rounder, instead of sharpened.
— *Lophophorus impejanus* (Latham, 1790): deeper, elongated in shape, instead of short and triangular impressio m. scapulotricipitis; shallower depressio m. brachialis in proximal end.
— *Lophura leucomelanos* (Latham, 1790): shallower depressio m. brachialis in proximal end; deeper impressio m. scapulotricipitis.
— *Crossptilon auritum* (Pallas, 1811): less developed papilae remigiales caudales; wider depressio m. brachialis; thicker olecranon.
— *Lophura nycthemera* (Linnaeus, 1758): shallower medial edge of depressio m. brachialis; more straight diaphysys.
— *Lophura ignita rufa* (Raffles, 1822): deeper impressio m. scapulotricipitis; shallower cotyla ventralis.
— *Lophura swinhoii* (Gould, 1863): wider and shallower depressio m. brachialis; edge of proximal end of depressio m. brachialis rounder.
— *Lophura erythrophthalma* (Raffles, 1822): larger cotyla ventralis; deeper impressio m. scapulotricipitis.
— *Syrmaticus reevesi* (J. E. Gray, 1829) and *Chrysolophus pictus* (Linnaeus, 1758): larger; more robust; deeper impressio m. scapulotricipitis.
— *Syrmaticus soemmerringi* (Temminck, 1830): tip of olecranon directed more dorsally; deeper impressio m. scapulotricipitis.
— *Chrysolophus amherstiae* (Leadbeater, 1829): deeper and straight, instead of curved impressio m. scapulotricipitis.
— *Polyplectron chalcurum* Lesson, 1831, *P. napoleonis* Lesson, 1831 (labelled as *P. emphanum*), *P. malacense* (Scopoli, 1786): larger; relatively wider and shallower depressio m. brachialis; tip of olecranon directed more dorsally.
— *Rheinardia ocellata* (Elliot, 1871): tip of olecranon directed more dorsally; deeper impressio m. scapulotricipitis; shape of the edge of depressio m. brachialis more round at the proximal end.
— *Afropavo congensis* Chapin, 1936: cotyla dorsalis round, instead of angular; olecranon sharper; edge of depressio m. brachialis in prox. end more transversal; shallower depressio m. brachialis.
— *Ph. colchicus* Linnaeus, 1758: extremely similar (see differential diagnosis).

• Comparison with fossil phasianids

Tetrao conjugens Janossy, 1974 and *T. partium* (Kretzoi, 1961) are known from the early Pliocene to Late Pleistocene, while *T. macropus* Janossy, 1976 and *T. praeurogallus* Janossy, 1969 are Late Pliocene to Middle Pleistocene species (Janossy, 196). *Tetrao rhodopensis* Boev, 1998 is with considerable chronostratigraphic differences: dated to the Early Pliocene (Ruscinian, MN zone 14; 5.4-3.4 Ma) and lacking of homologous skeletal elements. The preserved distal humerus (which is part of the humeroulnar joint) of *T. rhodopensis* suggests much bigger proximal ulna and, thus, can be excluded from our comparison. *Miogallus altus* (Milne-Edwards, 1869) is another species with considerable chronostratigraphic differences: MN 3-8, and lacking of homologous skeletal elements (Mlikovsky, 2002; Sanchez-Marco, 2006). All species (recent and fossil) of *Pavo* Linnaeus, 1758 and *Afropavo* Chapin, 1936 are considerably larger, while these of genera *Alectoris* Kaup, 1829, *Francolinus* Stephens, 1819, *Perdix* Linnaeus, 1758, *Arborophila* Hodgson, 1837, *Ammoperdix* Gould, 1851, and *Coturnix* Bonnaterre, 1791 are much smaller than specimen NMNHS 15143. In the same way, all fossil taxa of the genera *Paraortyx* Gaillard, 1908, *Palaeocryptonyx* Depéret 1892, *Bantamyx* Kurochkin, 1982 and *Pirortyx* Brodkorb, 1964 are significantly smaller than the compared specimen is. *Lophogallus naranbulakensis* Zelenkov & Kurochkin, 2010 is known with its humerus and femur from the Middle Miocene of Mongolia (Zelenkov & Kurochkin, 2010), while *Syrmaticus kozlovae* Kurochkin, 1985 is known with its humerus and coracoid from the Middle Pliocene of Mongolia (Kurochkin, 1985). Thus, both are incomparable. The Miocene *Linquornis gigantis* Yeh, 1980 from China was a large pheasant, similar in size to *Pavo* (Zelenkov & Kurochkin, 2010). *Phasianus* sp.: acording Mlikovsky (2002), the only Neogene re-

cord of g. *Phasianus* in Europe came from the Early Pleistocene (formerly Late Pliocene; MN 17) locality of Varshets (NW Bulgaria). Boev (2002) listed a find of *Phasianus* sp. This specimen (NMNHS 256) represents a distal half of coracoid dex. Its age is Middle Villafranchian (MN 17) and could not be compared.

Discussion

The above-presented comparison shows that the NMNHS 15143 find could not be referred to any of the recent and fossil species belonging to the genus. The Pleistocene Palaearctic pheasants are of considerable chronostratigraphic differences. The Neogene Palaearctic record of true pheasants consists of finds of only "*Phasianus* sp.". Thus the Middle Turolian specimen of Gorna Sushitsa should be distinguished under a separate name as a new species. *Phasianus bulgaricus* sp. n. is the oldest known true pheasant in Europe.

The dominating semi-open-land grass/forested savannah habitat in the region, dating back to ca. 7.36 Mya, indicates the more open-habitat preferences of *Ph. bulgaricus* sp. n. This completely agrees with the habitats of the large mammals fauna (Spassov et al., 2019).

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