ACTA ZOOL. CRACOV.	33	8	133—147	KRAKÓW, 30. IX. 1990

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Fossil remains of birds from Dziadowa Skała Cave, Central Poland

[with 1 text-fig.]

Szczątki ptaków kopalnych z Jaskini w Dziadowej Skale

Abstract. Remains of 20 species of birds from Dziadowa Skała Cave, Central Poland, are described. Successive layers of the sediments are dated back to the Eemian Interglacial, the Vistulian and the Holocene. The most interesting fossils among them are those of *Tetrao urogallus* and *Lyrurus tetrix* from the Eemian Interglacial because those species have not been known from that period in Poland. It seems that at least clumps of trees must have covered the nearby area at the time of sedimentation of all layers containing bird fossils.

I. INTRODUCTION

Dziadowa Skała Cave is situated in the northern part of the Kraków—Wieluń Jurassic Ridge. Its exact location and description were published by DYLIK et al. (1954) and CHMIELEWSKI (1958). Fossil bones of Eemian as well as of Vistulian and Holocene age were found during the excavations carried out in 1952—1954. Some of them, chiefly *Microtinae* and big mammals, were studied by KOWALSKI (1958). For some reasons, however, bird fossils were not studied.

The stratigraphy of the sediments of Dziadowa Skała Cave seems to be well known and little mixed. In addition, fossils from nearby localities have already been studied (MADEYSKA 1981). Taking it into account it seemed that the material from Dziadowa Skała Cave could provide interesting supplementary data on fossil birds of the area.

I am indebted to Prof. Dr W. CHMIELEWSKI and Prof. Dr K. KOWALSKI for their help in estimating the fossils' age. Thanks are also due to my father, Prof. Dr Z. BOCHEŃSKI, for his comments on the draft of this paper.

II. MATERIAL AND METHODS

The material from Dziadowa Skała Cave is not very abundant. It consists of 104 bird bones belonging to at least 75 individuals representing 20 species (Table I). Bird remains were found in 9 lavers.

Table I

Fossil bird remains of Dziadowa Skała Cave, central Poland. N — number of bones, MNI —minimum number of individuals

Species	Layers												Total	
	3 b		3 c		4		5		7		7/8		8		9		10		10/11		11		10 or 11			
	N	MNI	N	MNI	N	MNI	N	MNI	N	MNI	N	MNI	N	MNI	N	MNI	N	MNI	N	MNI	N	MNI	N	MNI	N	MNI
Anser cf. *anser* (Linnaeus, 1758)	—		—		—		—		—		—		1	1	—		—		—		—		—		1	1
Anas cf. *penelope* Linnaeus, 1758	—		—		—		—		1	1	—		—		—		—		—		—		—		1	1
Falco tinnunculus Linnaeus, 1758	—		—		—		—		2	2	—		—		—		—		—		—		—		2	2
Lagopus lagopus (Linnaeus, 1758)	—		—		—		—		7	3	4	1	4	2	—		—		—		—		—		15	6
Lagopus sp.	—		—		—		—		1	1	—		1	1	—		—		—		—		—		2	2
Tetrastes bonasia (Linnaeus, 1758)	—		—		—		—		—		—		1	1	—		—		—		—		—		1	1
Lyrurus tetrix (Linnaeus, 1758)	—		1	1	—		2	1	—		—		2	2	—		4	2	—		—		—		9	6
Tetrao urogallus Linnaeus, 1758	2	2	1	1	1	1	—		2	2	—		2	2	—		4	2	—		—		—		12	10
Gallus gallus Linnaeus, 1758 (*domesticus*)	—		—		—		—		—		—		1*	1	5	2	6	3	—		1	1	1	1	14	8
Gralliformes indet.	—		—		—		—		—		—		2	1	—		1	1	—		1	1	—		4	3
Crex crex (Linneaus, 1758	—		—		—		—		—		—		—		1	1	—		—		—		—		1	1
Columba palumbus Linnaeus, 1758	—		—		—		—		—		—		—		—		—		1	1	—		—		1	1
Bubo bubo (Linnaeus, 1758) ?	—		—		—		—		1	1	—		—		—		—		—		—		—		1	1
Strix aluco Linnaeus, 1758	—		—		—		—		—		—		2	1	1	1	—		—		1	1	—		4	3
Dendrocopos major (Linnaeus, 1758)	—		—		—		—		—		—		—		—		1	1	—		—		—		1	1

Dendrocopos major (Linnaeus, 1758) aut *D. leucotos* (Bechstein, 1803)	—		—		—		—		—		—		—		—		—		—		1	1	1	1					
Sturnus vulgaris Linnaeus, 1758	—		—		—		—		—		—		—		1	1	—		—		—		1	1					
Corvus monedula Linnaeus, 1758	—		—		—		4	2	—		1	1	—		—		—		—		—		5	3					
Corvidae indet.	—		—		—		3	1	—		—		—		—		—		—		—		3	1					
Turdus merula Linnaeus, 1758	—		—		—		1	1	—		1	1	—		1	1	—		—		—		3	3					
Turdus cf. *philomelos* C. L. Brehm, 1831	—		—		—		—		—		—		—		1	1	—		—		—		1	1					
Turdus viscivorus Linnaeus, 1758	—		—		—		—		—		—		—		—		—		—		1	1	1	1					
Turdus torquatus Linnaeus, 1758 aut *T. pilaris* Linnaeus, 1758	—		—		—		—		—		—		—		1	1	—		1	1	—		2	2					
Turdus sp.	—		—		—		—		—		—		—		4	3	—		—		1	1	5	4					
Coccothraustes coccothraustes (Linnaeus, 1758)	—		—		—		1	1	—		—		—		3	1	—		—		—		4	2					
Passeriformes indet.	—		—		—		—		—		2	2	—		2	2	—		—		—		4	4					
Aves indet.	—		—		—		—		3	3	2	2	—		—		—		—		—		5	5					
Total	2	2	2	2	1	1	2	1	23	15	7	4	22	18	7	4	29	19	1	1	4	4	4	4	104	75				

* The bone of *Gallus gallus* must have got accidentally to the mixed layer 8.

Numbers of layers used in this paper follow those of CHMIELEWSKI (1958). The age of the fossils in particular layers was estimated on the basis of the descriptions given by KOWALSKI (1958) and with Prof. CHMIELEWSKI'S help. The results are as follows (only layers containing bird remains are mentioned): layers 3b, 3c, 4 and 5 were deposited in the Eemian Interglacial, layer 7 — in the Upper Pleniglacial of the Vistulian (the first stadial after the Hengelo/Denekamp Interstadial), layer 8 — in the Upper Pleniglacial of the Vistulian and the Late Glacial (ca. 25 000—12 000 BP), layer 9, 10 and 11 — in the Holocene.

Unless otherwise stated, the measurements of the bones of *T. urogallus* and *L. tetrix* from the Eemian Interglacial were taken in the way proposed by ERBERSDOBLER (1968). The same applies to the abbreviations of measurements.

The following abbreviations were used in the description of the material: prox. — proximal part, dist. — distal part, Roman numerals used after the numbers of layers indicate the numbers of trenches.

The material belongs to the collection of the Institute of Systematic of Animals and Evolutions, Polish Academy of Sciences, Kraków.

III. RESULTS

Anser cf. *anser* (LINNAEUS, 1758)

Material: layer 8, VI (Vistulian): tarsometatarsus — dex. almost complete.

Morphology of the bone shows characteristic features of the genus *Anser*. The bone is of *A. anser* dimensions. However, *A. fabalis* cannot be excluded because of its similar size (BACHER 1967).

Remarks: Fossils of *A. anser* are known in Poland from the Holocene deposits only (BOCHEŃSKI 1989). Although layer 8 is older, it is so mixed that all conclusions connected with age of the fossils must be drawn very cautiously.

Anas cf. *penelope* LINNAEUS, 1758

Material: layer 7, V (Vistulian): Phalanx I dig. majoris alae, incomplete.

Morphology of the bone indicates that it belonged to a medium-size duck of the genus *Anas*. Other species of the genus are of different size and representatives of other genera differ from *A. penelope* morphologically.

Remarks: Fossils of *A. penelope* are known in Poland since the Late Vistulian (BOCHEŃSKI 1989). Layer 7 is of Upper Pleniglacial age. It means that this bone is the oldest fossil of the species in Poland.

Falco tinnunculus LINNAEUS, 1758

Material: layer 7, VI (Vistulian): humerus sin. complete, juv.; femur dex. complete.

Morphology of these bones is typical of *Falconiformes*. Their measurements and comparisons with recent bones excluded other species of the genus *Falco*. Different degree of ossification indicates that these bones belonged to two individuals.

Remarks: The Kestrel is known in Polish fossils since the Upper Pleniglacial (BOCHEŃSKI 1989).

Lagopus lagopus LINNAEUS, 1758

Material: layer 7, VI (Vistulian): humerus sin. prox.; layer 7, V: coracoideum sin. scapular part, humerus dex. almost complete, ulna dex. complete, radius sin. prox., tarsometatarsus sin. incomplete, tarsometatarsus dex. complete; layer 7/8, III (Vistulian): humerus dex. prox., scapula sin. prox., 2 femora sin. and dex. complete; layer 8, VI (Vistulian): humerus dex. prox.; layer 8, V: humerus dex. complete, tibiotarsus sin. dist., tarsometatarsus dex. prox.

Lagopus sp.

Material: layer 7, VI (Vistulian): ulna dex. dist.; layer 8, V (Vistulian): scapula dex. prox.

Morphology of the bones is typical of the genus *Lagopus*. Most of them are of *L. lagopus* size (KRAFT 1972). In two cases, however, it was impossible to determine the species.

Remarks: Both species of *Lagopus* often dominate among fossils in Poland (BOCHEŃSKI 1974). The oldest finding of the Willow Grouse in Poland comes from the Middle Pleistocene of Kozi Grzbiet (BOCHEŃSKI 1984) and of the Ptarmigan from the Early Vistulian (BOCHEŃSKI 1989).

The mean length of tarsometatarsus in *L. lagopus* changes gradually: the smallest is in the Lower Pleniglacial and the largest in the recent individuals (BOCHEŃSKI 1974, 1985). The lengths of the two tarsometatarsi from layer 7 lie within the limits typical of the Upper Pleniglacial (BOCHEŃSKI 1985). This confirms the age of the layer estimated by CHMIELEWSKI (1958).

Tetrastes bonasia (LINNAEUS, 1758) juv.

Material: layer 8, V (Vistulian): coracoideum dex. complete.

Although the sternal part of the bone is not fully ossified, the morphology of the scapular part as well as the bone shaft rule out other possible species of similar size (i.e. *P. perdix* and *L. mutus*) (KRAFT 1972).

Remarks: *T. bonasia* appeared in Polish fossil remains in the Holocene (BOCHEŃSKI 1989). The bone from Dziadowa Skała Cave was found in the mixed layer 8 of Upper Pleniglacial age, so it could have got there accidentally from a Holocene layer.

Lyrurus tetrix (LINNAEUS, 1758)

Material: layer 3c, VIII (Eemian): coracoideum dex. sternal part; layer 5, VI (Eemian): 2 ulnae sin. prox. and dex. dist.; layer 8, V (Vistulian): carpometacarpus dex. complete, female ?; layer 8, VI: carpometacarpus dex. prox. juv.; layer 10, V (Holocene): scapula dex. prox. male ?, carpometacarpus sin. incomplete, male?, phalanx I, dig. majoris alae male?, layer 10, I: tarsometatarsus dex. complete, juv.

All these bones show typical features of the Black Grouse. Sex was determined according to the size limits given by ERBERSDOBLER (1968). In the case of juvenile bones, the determination is not sure.

Remarks: Till now the oldest fossils of the Black Grouse in Poland came from the Lower — Middle Pleniglacial of the Vistulian (BOCHEŃSKI 1974). The oldest record of the Black Grouse comes from Hungary and refers to the upper part of the Middle Pleistocene (JÁNOSSY 1976). The Eemian remains from Dziadowa Skała Cave (layers 3c and 5) indicate that the species also occurred in Poland before the Vistulian. The bones do not differ from the recent individuals.

Tetrao urogallus LINNAEUS, 1758

Material: layer 3b, VI (Eemian): humerus sin. dist. female; layer 3b, VII: femur dex. prox. male; layer 3c, VIII (Eemian): coracoideum sin. scapular part, male; layer 4, IX (Eemian): tarsometatarsus dex. shaft, male; layer 7, VI (Vistulian): humerus dex. prox. male, humerus sin. shaft, female; layer 8, V (Vistulian): ulna dex. prox.; layer 8, VI: humerus dex. prox. male; layer 10, V (Holocene): 2 coracoideum dex. scapular and dex. sternal parts, female; layer 10, VIII: 2 humera sin. prox. and dex. dist. male.

Morphology of all of these bones indicates that they belonged to *T. urogallus*. Moreover, other species of *Galliformes* can be easily ruled out because they are much smaller. Sex determination was based on measurements given by ERBERSDOBLER (1968).

Remarks: Fossil remains of *T. urogallus* from the Early Vistulian to the Holocene were often found in Poland (BOCHEŃSKI 1974, 1989). Older remains of the species were found in Hungary (JÁNOSSY 1963). All of this indicates that the bones of *T. urogallus* from Dziadowa Skała Cave — layers 3b, 3c and 4, are the oldest ones of the species in Poland.

T. urogallus appeared in Europe in the Middle Pleistocene (JÁNOSSY 1976). According to JÁNOSSY (1974), its ancestor, *Tetrao praeurogallus*, had humera

Table II

Measurements (in mm) of the humerus of fossil and recent *Tetrao urogallus*. The measurements in brackets are of damaged bones

Species	Width of distal part (ERBERSDOBLER 1968: BD)	Distal thickness
Fossil:		
Tetrao urogallus ♀ (layer 3b)	(≥20)	(≥11.4)
Recent:		
Tetrao urogallus ♀ (ERBERSDOBLER 1968) (N = 11)	16.9—20.0	—
Tetrao urogallus ♂ (ERBERSDOBLER 1968) (N = 12)	23.5—25.4	—
Tetrao urogallus ♂ A/1923/68	25.2	14.1
Tetrao praeurogallus (JÁNOSSY 1976)	22.4	12.6

and tarsometatarsi more slender than the recent *T. urogallus*. The proportions and dimensions of the tarsometatarsus from Dziadowa Skała Cave (layer 4) are the same as in the recent *T. urogallus*. On the contrary, the humerus from layer 3b belongs to a big individual of a female Capercaillie (Table II) while femur (layer 3b) and coracoideum (layer 3c) represent an extraordinarily big male (Table III nad IV). In the case of femur, proximal width is bigger than the maximum stated for the species and proximal depth reaches the maximum level (ERBERSDOBLER 1968 : BP, DP). The shaft of the bone is also stouter than in recent male Capercaillies. Shaft of the coracoideum (layer 3c) is also much thicker than in the recent *T. urogallus* (Table IV). The corresponding

Table III

Measurements (in mm) of the femur of fossil and recent *Tetrao urogallus*. The measurement in brackets is of a damaged bone

Species	BP	DP
Fossil:		
Tetrao urogallus ♂ (layer 3b)	(17.6)	24.7
Recent:		
Tetrao urogallus ♂ (ERBERSDOBLER 1968) (N = 49)	15.0—17.0	22.0—24.8
Tetrao urogallus ♀ (ERBERSDOBLER 1968) (N = 13)	11.0—12.1	15.0—19.0

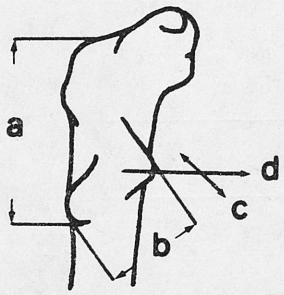

Fig. 1. The places of measurements of the coracoideum in the Capercaillie (concerns Table IV): c and d — width of the bone shaft (crosswise)

Table IV

Measurements (in mm) of the coracoideum of fossil and recent *Tetrao urogallus*. The places of measurements are shown in Fig. 1

Species	a	b	c	d
Fossil:				
Tetrao urogallus ♂ (layer 3c)	26.6	15.4	12.4	11.1
Tetrao cf. *praeurogallus* * (Kozi Grzbiet)	18.8	11.3	—	—
Recent:				
Tetrao urogallus ♂				
A/1923/68	25.5	14.7	11.3	11.2
A/2066/69	25.2	14.2	10.8	10.4

* According to Bocheński (1984)

bone fragment of *Tetrao* cf. *praeurogallus* from Kozi Grzbiet (Bocheński 1984) is also smaller and more slender. This suggests that the early form of *T. urogallus* from the Eemian Interglacial had somewhat bigger and stouter bones. Unfortunately, the present material is far too scarce to prove the hypothesis.

Gallus gallus Linnaeus, 1758.

Material: layer 8, V (Vistulian): humerus dex. prox.; layer 9, I (Holocene): humerus sin. complete, 2 femora sin. incomplete, tibiotarsus dex. prox., tarsometatarsus dex. prox.; layer 10, I (Holocene): humerus sin.prox., ulna sin. complete, femur dex. dist., 2 tibiotarsi dex. incomplete; layer 10, V: scapula dex. prox.; layer 11, V (Holocene): tibiotarsus dex. incomplete; layer 10 or 11, III (Holocene): tarsometatarsus dex. dist.

Morphology and size of these remains are typical of the Domestic Hen (Erbersdobler 1968).

Remarks: Fossils of the Domestic Hen are known in Poland from the Holocene only (BOCHEŃSKI 1989). One bone of the species in the mixed layer 8 must have got there accidentally.

Galliformes indet.

Material: layer 8, V (Vistulian): femur dex. prox. juv., tarsometatarsus dex. prox.; layer 10, I (Holocene): tibiotarsus sin. prox.; layer 11, V (Holocene): corocoideum sin. complete, juv.

These bones are so eroded and/or of juvenile birds that more accurate determination is impossible. However, some characters typical of *Galliformes* are present. The remains from layer 8 are of *Lagopus* size while the Holocene remains from layer 10 and 11 are of *Gallus* size.

Crex crex (LINNAEUS, 1758)

Material: layer 9, I (Holocene): Ulna dex. complete.

The bone is typical for *Rallidae*; the comparison with recent European species excluded the genera *Rallus*, *Porzana*, *Gallinula* and *Fulica*.

Remarks: The oldest remains of the species in Poland were found in the Upper Pleniglacial (BOCHEŃSKI 1989) so the bone from Dziadowa Skała Cave is younger.

Columba palumbus LINNAEUS, 1758

Material: layer 10/11, IV (Holocene): carpometacarpus dex. incomplete.

The bone is morphologically typical of *Columbiformes*. Its dimensions exclude smaller species from the genus (FICK 1974).

Remarks: Holocene remains of the Wood Pigeon have already been known from Poland (BOCHEŃSKI 1989).

Bubo bubo (LINNAEUS, 1758)?

Material: layer 7, VI (Vistulian): humerus dex. shaft.

Although the bone is very damaged, it still has typical features of *Strigiformes*. Its dimensions indicate a big owl and the morphology is most similar to the Eagle Owl.

Remarks: *B. bubo* was found in Poland in the Lower-Middle Pleniglacial of the Vistulian and in the Subboreal period of the Holocene (BOCHEŃSKI 1989). The bone from Dziadowa Skała Cave indicates that the bird lived in Poland also in the Upper Pleniglacial.

Strix aluco LINNAEUS, 1758

Material: layer 8, V (Vistulian): humerus dex. prox. juv., ulna dist. juv.; layer 9, I (Holocene): scapula dex. prox.; layer 11, V (Holocene): ulna sin. prox.

The remains, typical for *Strigiformes*, show characteristic features and measurements of the Tawny Owl (LANGER 1980).

Remarks: Remains of *S. aluco* in Poland are numerous and are dated from the Upper Pleniglacial to the Holocene (BOCHEŃSKI 1989).

Dendrocopos major (LINNAEUS, 1758)

Material: layer 10, V (Holocene): tarsometatarsus dex. complete.

Dendrocopos major aut *D. leucotos* (BECHSTEIN, 1803)

Material: layer 10 or 11, III (Holocene): humerus sin. dist.

Damage of the bone is so big that more accurate determination is not possible.

Remarks: *D. major* has already been known in Poland from the Holocene. Fossils of the other species, *D. leucotos*, has not been reported in Poland (BOCHEŃSKI 1989). However, the occurrence of the species in the present material is uncertain.

Corvus monedula LINNAEUS, 1758

Material: layer 7, VI (Vistulian): coracoideum sin. complete, juv., ulna dex. complete, carpometacarpus dex. complete, femur dex. dist.; layer 8, VI (Vistulian): tarsometatarsus dex. complete.

All the bones are typical for a medium size *Corvidae* species while the details indicate the Jackdaw.

Remarks: Fossils of *C. monedula* are known in Poland from the Upper Pleniglacial and the Holocene (BOCHEŃSKI 1989).

Corvidae indet.

Material: layer 7, VI (Vistulian): Scapula sin. prox. juv., humerus dex. shaft. juv., ulna dex. dist. juv.

Due to the unfinished ossification of these bones, more accurate determination is not possible. It seems, however, that these remains are of the Jackdaw size.

Sturnus vulgaris LINNAEUS, 1758

Material: layer 10, V (Holocene): sternum incomplete.

The fragment was compared with corresponding bones of other species of similar size but its shape was most similar to the Starling.

Remarks: Holocene remains of *S. vulgaris* have already been known in Poland (BOCHEŃSKI 1989).

Turdus merula LINNAEUS, 1758

Material: layer 7, VI (Vistulian): sternum; layer 8, V (Vistulian): tarsometatarsus dex. prox.; layer 10, V (Holocene): ulna dex. prox.

The bones show characteristic features of the genus *Turdus*; details and size are most similar to the Blackbird.

Remarks: Fossils of *T. merula* in Poland are dated from the Late Glacial of the Vistulian to the Holocene (BOCHEŃSKI 1989). The present remains are older; they are of the first part of the Upper Pleniglacial age.

Turdus cf. *philomelos* C. L. BREHM, 1831

Material: layer 10, V (Holocene): humerus dex. dist.

The bone belonged to a medium-size *Turdus*; its morphology is most similar to the Song Thrush.

Remarks: Fossils of *T. philomelos* were found in Poland in the Lower-Middle Pleniglacial of the Vistulian and also in Holocene deposits (BOCHEŃSKI 1989).

Turdus viscivorus LINNAEUS, 1758

Material: layer 10 or 11, III (Holocene): Ulna sin. dist.

The size of the bone rule out other species from the genus *Turdus*.

Remarks: *T. viscivorus* has been known in Poland since the Denekamp Interstadial of the Vistulian (BOCHEŃSKI 1989).

Turdus torquatus LINNAEUS, 1758 aut *T. pilaris* LINNAEUS, 1758

Material: layer 10, V (Holocene): humerus sin. incomplete; layer 11, V (Holocene): ulna sin. incomplete.

The size and the morphology of the bone is similar in these species. It seems however, that *T. torquatus* is more likely. Other species from the genus were ruled out.

Remarks: *T. torquatus* has already been reported from the Late Vistulian and Holocene deposits in Poland (BOCHEŃSKI 1989). On the contrary, no fossils of *T. pilaris* have been found in Poland till now.

Turdus sp.

Material: layer 10, V (Holocene): 2 ulnae dex. prox. and sin. prox., carpometacarpus incomplete, tarsometatarsus dex. prox.; layer 10 or 11, III (Holocene): humerus sin. incomplete.

Further determination of these bones is difficult because of their great damage.

Coccothraustes coccothraustes (LINNAEUS, 1758)

Material: layer 7, VI (Vistulian): humerus dex. complete; layer 10, V (Holocene): 2 ulnae sin. and dex. complete, tibiotarsus sin. complete.

General morphology of the bone indicates that it belonged to a big species of the family *Fringillidae*. Details point to the Hawfinch.

Remarks: Remains of *C. coccothraustes* were found in Poland in the Upper Pleniglacial of the Vistulian and in the Holocene (BOCHEŃSKI 1989). The present material is of similar age.

Passeriformes indet.

Material: layer 8, V (Vistulian): ulna sin. incomplete; layer 8, VI: humerus sin. dist. juv.; layer 10, V (Holocene): humerus dex. prox., ulna dex. complete, juv.

Damage of the bones and unifinished ossification unable further determination.

Aves indet.

Material: layer 7/8, III (Vistulian): synsacrum incomplete, 2 tibiotars sin. shafts; layer 8, V (Vistulian): ulna sin. dist. juv.; layer 8, VI: tibiotarsus sin. shaft.

Condition of the bones makes any determination impossible. They probably belonged to five different individuals of *Lagopus — Gallus* size.

IV. GENERAL COMMENTS

Layers 3b, 3c, 4 and 5 (i.e. of the Eemian age) contained very few bone fragments. On the contrary, the Holocene layers (9, 10, 10/11 and 11) contained ca. 40% of all remains.

One species, *Tetrao urogallus*, was found in 6 out of 9 layers containing bird remains and may be thus considered the predominant species. Remains of *Lagopus lagopus* and *Gallus gallus* outnumber these of *T. urogallus* but they are restricted to a few layers only and MNI calculated from them is smaller (Table I). Each of the remaining species is represented only by a few bones.

According to CHMIELEWSKI (personal comment) a hole in the south wall of Dziadowa Skała Cave could be open during the formation of layer 7 and 8. In this case remains of the Upper Pleniglacial age (layers 7 and 8) found in trench VI could be an admixture from other layers.

The occurrence of *T. urogallus* in the deposits of layer 3b indicates that such forests as taiga must have covered the nearby area. Little more, if any, can be said about the remaining Eemian layers 3c, 4 and 5. Apart from *T. urogallus* only *Lyrurus tetrix* was found in this material. Its occurrence may suggest that apart from forests also such open areas as wet meadows, heathlands or marshes were present in the area.

During the formation of layer 7 some kinds of forest covered the territory (*T. urogallus*, *B. bubo*, *C. coccothraustes*). The occurrence of *Falco tinnunculus* may also suggest the existence of open areas while *C. monedula* may be associated with rocks or with old trees with hollows. The bone of *Anas* cf. *penelope* indicates that some kind of fresh water reservoirs could be found there as well.

Similar kind of environment must have prevailed during the formation of layer 8. The group of birds derived from these sediments (*T. urogallus*, *T. bonasia*, *L. tetrix*, *S. aluco*) indicates the existence of some forest habitats. The bone of *Anser* cf. *anser* may be connected either with shallow water reservoirs or with open areas (meadows).

The Holocene layers 9, 10 and 11 of Dziadowa Skała Cave are more differentiated. Apart from forest species such as *L. tetrix* or *T. urogallus* also one grassland species, *Crex crex*, was found in layer 9. Its appearance indicates that the climate was already temperate. *Gallus gallus*, a species associated with man, appeared for the first time in the Holocene and its remains prevailed over the remains of other species at that time.

It is worth mentioning that during the formation of all layers containing bird remains, forests or at least clumps of trees must have grown in the nearby area of Dziadowa Skała Cave. These results coincide with the results obtained by BOCHEŃSKI (1974) and ŚRODOŃ (1972).

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STRESZCZENIE

Jaskinia w Dziadowej Skale znajduje się w północnej części Wyżyny Krakowsko-Częstochowskiej, niedaleko Podlesic. W jej osadach stwierdzono szczątki kopalnych ptaków należących do co najmniej 20 gatunków (tabela I). Niewątpliwie najciekawszym odkryciem było stwierdzenie szczątków głuszca i cietrzewia w warstwach datowanych na interglacjał eemski. W obu przypadkach jest to pierwsze w pełni udokumentowane występowanie tych gatun-

ków w tym okresie. Szczątki cietrzewia nie różniły się rozmiarami od kości współczesnych, 3 różne kości głuszca natomiast były wyraźnie większe i masywniejsze niż odpowiadające im kości ptaków współczesnych (tabela II, III i IV; rys. 1). Sugerowałoby to, że głuszec żyjący w interglacjale eemskim był nieco większy od obecnego.

Występowanie takich gatunków jak głuszec, puchacz czy grubodziób w warstwie 7 oraz głuszec, jarząbek, cietrzew i puszczyk w warstwie 8, dowodzi istnienia lasów w czasie ich tworzenia się, mimo iż pochodzą one z zimnego okresu (górny pleniglacjał ostatniego zlodowacenia). Potwierdza to wnioski wysuwane przez Bocheńskiego (1974) o istnieniu lasów, przynajmniej na południowych stokach dolin, w ciągu całego zlodowacenia Wisły.

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