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EARLY PLEISTOCENE BIRDS OF STRÁNSKÁ SKÁLA HILL, CZECH REPUBLIC: 1. MUSIL'S TALUS CONE

Jiří Mlíkovský

Institute of Ecology, Czech Academy of Sciences, Květná 8, CZ-603 65 Brno, Czech Republic; and (mailing address)
Department of Paleontology, Charles University, CZ-128 43 Praha 2, Czech Republic.

ABSTRACT: Excavations in the Musil's talus cone at Stránská Skála in the Czech Republic yielded approximately 1600 bones and bone fragments of birds. The fauna is early Pleistocene in age, and belongs to the Q2 biozone sensu Horáček and Ložek (1988). The overall estimated minimum number of individuals is 358. The avifauna consists of 51 genera and at least 68 species, belonging to 23 families. Only one extinct genus (*Plioperdix*) and 7 extinct species were identified. One species (*Corvus moravicus*) was described as new for science. Other new taxonomic conclusions are as follows. *Francolinus minor* Jánossy, 1974 was synonymized with *Plioperdix ponticus* (Tugarinov, 1940). *Francolinus capeki* Lambrecht, 1933 and *Francolinus subfrancolinus* Jánossy, 1976 were transferred in the genus *Plioperdix* Kretzoi, 1955. *Alectoris baryosefi* Tchernov, 1980 was synonymized with *Plioperdix subfrancolinus* (Jánossy, 1976).

KEY WORDS: Aves - Early Pleistocene - Stránská Skála Hill

INTRODUCTION

Early Pleistocene birds are known only from a limited number of localities in the western Palearctic. Some of them, however, yielded important collections of bones. Well known are particularly the localities West Runton in England (Harrison 1979), Voigtstedt in Germany (Jánossy 1965), Přezletice in the Czech Republic (Jánossy 1983), Hundsheim and Deutsch-Altenburg in Austria (Jánossy 1974a, 1981), Befia (formerly Püspökfürdő) in Rumania (Čapek 1917, Kretzoi 1962), and Ubeidiya in Israel (Tchernov 1968, 1980). Most important in numbers of specimens and the length of the avifaunal list, however, is the complex locality Stránská Skála in the Czech Republic.

Vertebrate finds were first reported from Stránská Skála by Josef Woldřich in 1917 (Woldřich 1917 a, b). Avian remains were originally mentioned by Čapek (1921), Kniés (1925) and Skutil and Stehlík (1939). Avifaunal lists derived from their reports were subsequently included in reviews by Musil (1965, Musil and Valoch 1968). Jánossy (1972) revised all the material and described four new species or subspecies of birds on the basis of them. Modern excavations yielded much new material which is described below.

THE LOCALITY

Stránská Skála is located in the eastern part of Brno, southern Moravia, Czech Republic (approximately 49° 11' N, 16° 36' E). It is a 1500 m long and 400 m wide hill, formed from Jurassic limestone. Its northwestern slope is built from karstified limestone cliffs, in which numerous fossiliferous fissures and caves were found. Approximately 500 m of this slope are covered by a complex talus fan. At this place, extensive excavations were made by Rudolf Musil and coworkers in 1956 – 1967 (Musil 1965, Musil and Valoch 1968), which yielded rich paleontological material, including approximately 1600 bones and bone fragments of birds.

Overall, 16 Early Pleistocene layers were discerned in the Musil's talus fan, covered by Holocene deposits. For stratigraphical description see Musil (1965, this volume) and Musil and Valoch (1968). The fauna is Late Biharian in age, i.e. it belongs in the biozone Q2 sensu Horáček and Ložek (1988). It is assumed that it covers the complete Günz/Mindel interglacial cycle (Musil 1965, Musil and Valoch 1968). Smaller glacial events could occur during that period (cf. Kukla 1978). Musil's (1965) conjecture that layers 14 – 17 represent Late Pleistocene (Würm glaciation) cannot be

supported by avian finds. They indicate that these layers are Late Biharian as well (see below).

MATERIAL AND METHODS

All the material described below was excavated by Rudolf Musil and coworkers in 1956–1967 and is deposited in the collections of the Anthropos Institute of the Moravian Museum in Brno, Czech Republic. No catalogue numbers have been given to it thus far. Bones are thus identified by cupboard number/box number (boxes marked with „AVES“).

Stratigraphy of the European Pleistocene follows Horáček and Ložek (1988), that of the Neogene follows Steininger et al. (1987). Anatomical nomenclature of Baumel et al. (1979) is used throughout the present paper. Taxonomic treatment of modern genera and species, and sequence of families are after Voous (1977). Measurements used follow suggestions of Von Den Driesch (1976). Minimum numbers of individuals were calculated according to Grayson (1984).

The following abbreviations are used in the text: cran. = cranial, dex. = right, dist. = distal, fragm. = fragmentary, MNI = minimum number of individuals, prox. = proximal, sin. = left, stern. = sternal.

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FAUNAL LIST

Podicipedidae

Podiceps griseigena (Boddaert)

Material:

- 13: cran. scapula sin. (326/39), dist. tibiotarsus dex. (300/4); MNI = 1.

Anatidae

Anser sp.

Material:

- 13: fragm. furcula (790/6), dist. humerus sin. (789/6); MNI = 1

Remarks: The material is too fragmentary to allow a closer identification.

Anas strepera Linnaeus

Material:

- 04: dist. ulna dex. (803/17); MNI = 1.

- 04a: cran. coracoid dex. (803/9); MNI = 1,

- 05: coracoid sin. (795/1), cran. coracoid sin. (796/7), prox. carpometacarpus sin. (796/1), 3 dist. carpometacarpi sin. (350/7, 795/14, 797/14), prox. femur sin. (316/6); MNI = 3.

- 06: 2 cran. coracoids dex. (316/14, 349/23), 2 cran. coracoids sin. (349/3, 315/13), prox. humerus dex. (349/9); MNI = 2.
- 08: cran. coracoid dex. (347/6), cran. scapula dex. (342/16), dist. ulna dex. (342/15); MNI = 1.
- 13: fragm. coracoid dex. (331/9), 5 cran. coracoids dex. (331/3, 331/8, 332/8, 332/24, 789/10), 6 cran. coracoids sin. (291/1, 300/2, 301/18, 325/27, 326/2, 787/24), cran. scapula dex. (790/17), 3 cran. scapulae sin. (325/16, 331/38, 787/9), dist. humerus sin. (332/20), prox. carpometacarpus dex. (332/18), 2 prox. carpometacarpi sin. (331/35, 353/8), dist. carpometacarpus sin. (332/24), dist. tibiotarsus dex. (332/18), 4 dist. tibiotarsi sin. (302/6, 331/41, 332/17, 788/12), dist. tarsometatarsus dex. (326/8), 2 dist. tarsometatarsi sin. (326/26, 787/1); MNI = 6.
- 14a: cran. coracoid sin. (299/5), dist. tibiotarsus sin. (299/7); MNI = 1.
- 15e: fragm. coracoid dex. (318/18), 2 cran. coracoids dex. (318/19, 318/26), dist. tibiotarsus dex. (324/61, 2 dist. tibiotarsi sin. (318/8, 324/17), dist. tarsometatarsus dex. (318/14); MNI = 2.
- 16: prox. carpometacarpus dex. (318/31); MNI = 1.
- Remarks: Some of the bones assigned to this species tended to be larger than those of modern *Anas strepera*, but their fragmentary state did not allow a more detailed taxonomic treatment.
- Anas querquedula* Linnaeus
- Material:
- 04: coracoid sin. (804/12), cran. coracoid sin. (804/8), cran. scapula dex. (803/19), 3 cran. scapulae sin. (803/22, 803/23, 804/9), prox. humerus sin. (804/11), dist. humerus sin. (803/23), prox. ulna dex. (316/5), dist. ulna sin. (804/4), dist. carpometacarpus sin. (316/5); MNI = 3.
- 04a: cran. coracoid dex. (803/15), fragm. humerus dex. (803/10), prox. humerus dex. (803/15), dist. humerus sin. (803/10), prox. ulna sin. (803/10), prox. carpometacarpus sin. (803/7); MNI = 2.
- 05: coracoid sin. (798/13), 4 cran. coracoids dex. (350/17, 795/10, 797/8, 797/17), 5 cran. coracoids sin. (350/17, 795/8, 795/9, 797/3, 798/1), 2 cran. scapulae dex. (350/12, 798/12), 5 cran. scapulae sin. (795/9, 797/16, 797/18, 798/4, 798/14), prox. humerus dex. (798/15), 3 prox. humeri sin. (350/14, 796/4, 801/1), 3 dist. humeri dex. (796/7, 798/20, 801/1), 5 dist. humeri sin. (350/10, 316/7, 797/20, 798/3, 801/1), ulna dex. (316/6), prox. ulna dex. (798/9), prox. ulna sin. (801/1), dist. ulna dex. (350/13), dist. ulna sin. (797/7), dist. carpometacarpus dex. (798/19); MNI = 6.
- 06: stern. coracoid sin. (316/8), 2 cran. scapulae dex. (349/3, 349/9), cran. scapula sin. (316/13), 2 dist. humeri dex. (316/13, 349/12), dist. humerus sin. (316/13), ulna dex. (316/11), dist. ulna dex. (349/12), dist. ulna sin. (349/24), dist. carpometacarpus sin. (349/9); MNI = 2.
- 08: cran. coracoid dex. (347/1), 3 cran. coracoids sin. (347/9, 348/5, 348/9), cran. scapula sin. (347/5), prox.

- ulna sin. (348/6), dist. carpometacarpus dex. (342/14); MNI = 3.
- 09: dist. humerus dex. (341/6); MNI = 1.
- 10: cran. coracoid sin. (309/2), dist. humerus dex. (315/20); MNI = 1.
- 10a: prox. ulna dex. (340/1), dist. ulna dex. (341/9); MNI = 1.
- 11: stern. coracoid dex. (354/10), dist. humerus sin. (309/8), prox. ulna sin. (332/2), prox. carpometacarpus sin. (332/7); MNI = 1.
- 12: cran. coracoid sin. (332/15); MNI = 1.
- 13: 12 cran. coracoids dex. (300/13, 325/20, 326/13, 326/32, 326/33, 326/38, 326/41, 331/24, 331/26, 332/21, 788/1, 790/17), 9 cran. coracoids sin. (301/17, 326/28, 326/33, 326/34, 326/42, 787/22, 788/29, 789/9, 790/11), 7 cran. scapulae dex. (299/2, 300/19, 301/13, 302/7, 331/4, 331/13, 332/24), 11 cran. scapulae sin. (301/15, 308/6, 325/15, 326/18, 326/26, 331/6, 331/22, 331/41, 331/43, 788/15, 789/9), prox. humerus dex. (331/43), 2 prox. humeri sin. (787/19, 789/20), 3 dist. humeri dex. (325/25, 332/24, 353/9), 5 dist. humeri sin. (302/7, 325/1, 326/30, 354/1, 787/18), 4 prox. ulnae dex. (301/20, 302/8, 353/17, 787/18), 3 prox. ulnae sin. (787/22, 788/1, 790/2), 4 dist. ulnae dex. (300/4, 325/17, 326/40, 787/1), 6 dist. ulnae sin. (326/13, 331/11, 331/29, 331/41, 331/43, 332/13), 2 carpometacarpi dex. (300/1, 353/11), 2 carpometacarpi sin. (300/21, 301/14), 3 prox. carpometacarpi sin. (331/32, 331/43, 790/22), 2 dist. carpometacarpi dex. (331/35, 332/8), 3 dist. carpometacarpi sin. (353/4, 331/36, 353/5), dist. femur dex. (332/13), 8 dist. tibiotarsi dex. (300/29, 301/12, 331/10, 331/11, 331/39, 787/1, 787/5, 787/87), 4 dist. tarsometatarsi sin. (301/23, 302/2, 326/13, 787/5); MNI = 12.
- 14a: coracoid dex. (299/6), prox. ulna dex. (293/4); MNI = 1.
- 15a: cran. scapula dex. (292/9); MNI = 1.
- 15c: cran. coracoid dex. (292/2), carpometacarpus sin. (292/7), fragm. carpometacarpus dex. (292/3); MNI = 1.
- 15e: 3 cran. coracoids dex. (318/7, 318/21, 324/10), 3 cran. coracoids sin. (318/6, 324/8, 324/19), prox. scapula dex. (324/15), prox. scapula sin. (318/7), dist. humerus dex. (318/7), dist. ulna sin. (324/15), prox. carpometacarpus sin. (318/28), dist. carpometacarpus sin. (318/11); MNI = 3.
- 16: 2 prox. scapulae sin. (318/30, 318/34), dist. carpometacarpus dex. (318/32); MNI = 2.
- Anas clypeata* Linnaeus
Material:
- 04a: cran. scapula dex. (803/12); MNI = 1.
- 05: coracoid dex. juv. (801/1), cran. coracoid dex. (797/19), cran. coracoid sin. (798/15), stern. coracoid dex. (350/3), 2 cran. coracoids sin. (350/9, 350/21), stern. coracoid sin. (350/5), prox. scapula dex. (316/19), dist. humerus dex. (350/15), prox. ulna dex. (315/8), 2 prox. ulnae sin. (350/18, 795/13), dist. ulna dex. (798/5), dist. carpometacarpus sin. (798/16), dist. femur dex. (797/18); MNI = 2.
- 06: 2 cran. coracoids dex. (315/3, 316/16), cran. coracoid sin. (349/13), stern. coracoid dex. (315/10), cran. scapula dex. (316/12), cran. scapula sin. (349/5), dist. ulna sin. (349/1), prox. femur dex. (316/15); MNI = 2.
- 07b: cran. coracoid dex. (316/18); MNI = 1.
- 08: 2 cran. coracoids dex. (315/15, 330/3), stern. coracoid dex. (347/8), cran. scapula dex. (349/19), dist. ulna dex. (347/4), dist. carpometacarpus sin. (342/5); MNI = 2.
- 09: cran. scapula sin. (341/2); MNI = 1.
- 10: fragm. coracoid dex. (309/2), cran. scapula dex. (309/4); MNI = 1.
- 11: cran. coracoid dex. (332/9), cran. coracoid sin. (332/10), dist. tarsometatarsus sin. (309/8); MNI = 1.
- 12: cran. coracoid sin. (332/23); MNI = 1.
- 13: coracoid dex. (302/4), 3 fragm. coracoids dex. (301/5, 326/15, 789/17), 3 fragm. coracoids sin. (331/28, 785/1, 790/10), 11 cran. coracoids dex. (326/25, 326/29, 331/31, 331/38, 332/13, 354/14, 787/4, 788/4, 788/6, 788/16, 790/6), 14 cran. coracoids sin. (300/16, 302/3, 325/12, 326/23, 326/24, 326/35, 331/6, 331/7, 331/23, 331/25, 331/33, 331/35, 331/40, 787/9), stern. coracoid dex. (787/1), stern. coracoid sin. (788/6), 8 cran. scapulae dex. (326/13, 331/2, 332/19, 332/20, 788/13, 788/20, 788/23, 789/6), 8 cran. scapulae sin. (300/26, 301/5, 325/18, 331/6, 331/42, 331/43, 786/5, 789/6), dist. humerus dex. (331/4), 3 prox. ulnae dex. (353/10, 787/9, 787/15), 2 prox. ulnae sin. (325/26, 788/20), 5 dist. ulnae dex. (301/16, 326/23, 331/17, 787/5, 787/13), 3 dist. ulnae sin. (326/17, 353/9, 789/6), carpometacarpus sin. (294/6), 5 prox. carpometacarpi dex. (302/1, 332/12, 787/13, 788/27, 790/17), 5 prox. carpometacarpi sin. (326/13, 326/21, 331/1, 788/1, 789/9), 4 dist. carpometacarpi dex. (300/33, 325/22, 331/38, 788/1), 2 dist. carpometacarpi sin. (332/17, 787/27), 6 dist. tibiotarsi dex. (300/15, 300/23, 326/36, 353/5, 787/9, 788/1), 4 dist. tibiotarsi sin. (326/8, 332/19, 788/22, 788/31), tarsometatarsus sin. (300/22), tarsometatarsus sin. sad. (790/17), prox. tarsometatarsus dex. (331/27), 2 dist. tarsometatarsi dex. (301/8, 301/11), dist. tarsometatarsus sin. (332/21); MNI = 17.
- 14: prox. carpometacarpus sin. (318/3), dist. tarsometatarsus sin. (318/3); MNI = 1.
- 15c: cran. coracoid sin. (292/2), dist. carpometacarpus sin. (292/6); MNI = 1.
- 15e: cran. coracoid dex. (318/7), 2 cran. coracoids sin. (324/13, 324/16), 2 prox. scapulae dex. (318/4, 318/17), prox. ulna sin. (324/5), dist. ulna sin. (324/20), 2 prox. carpometacarpi sin. (318/16, 324/9), prox. femur dex. (324/4); MNI = 2.
- 16: cran. coracoid dex. (318/31), cran. scapula sin. (318/31); MNI = 1.
- Bucephala clangula* (Linnaeus)
Material:
- 11: prox. carpometacarpus sin. (354/15); MNI = 1.
- 13: prox. ulna sin. (325/10), prox. carpometacarpus dex. (331/18), prox. tarsometatarsus dex. (788/6); MNI = 1.

15c: dist. humerus sin. (292/4); MNI = 1.

15e: prox. carpometacarpus dex. (318/25); MNI = 1.

Remarks: Jánossy (1965) believed that Early Pleistocene Goldeneyes tended to be smaller in average than the modern ones of the species *Bucephala clangula* and that they had differently shaped tarsometatarsi. Hence, he created a new species, *Bucephala angustipes* Jánossy 1965, for them. The new material from Stránská Skála confirms that Late Biharian populations of (Common) Goldeneyes were smaller in average than the modern ones, but no shape differences could be observed. This supports the inclusion of the Biharian Goldeneyes in the modern species *Bucephala clangula* (Mlíkovský 1982).

Mergus serrator Linnaeus

Material:

13: cran. coracoid dex. (294/5); MNI = 1.

15e: cran. coracoid dex. (318/7); MNI = 1.

Mergus merganser Linnaeus

Material:

15e: cran. coracoid sin. (324/10); MNI = 1.

Mergus connectens Jánossy, 1972

Material:

13: cran. coracoid sin. (790/14); MNI = 1.

Remarks: Jánossy (1972) described this species on the basis of a large number of bones from the Absolon's 2nd Cave at Stránská Skála (MNI = 62!). I revised all the material and could confirm Jánossy's conclusions (Mlíkovský, unpub. results). It remains enigmatic, however, why this species, so abundant in one locality, was recorded only twice outside it: one humerus in the Earliest Pleistocene (Q1) of Betfia in northern Rumania (Jánossy 1972) and the coracoid reported on here.

Accipitridae

Accipiter nisus (Linnaeus)

Material:

13: prox. femur dex. (789/5), dist. tarsometatarsus sin. (331/20); MNI = 1.

Falconidae

Falco tinnunculus Linnaeus

Material:

04: prox. ulna sin. (804/11), dist. tibiotarsus dex. (804/7); MNI = 1.

05: dist. ulna dex. (795/1); MNI = 1.

06: dist. tibiotarsus sin. (315/2); MNI = 1.

13: 2 cran. coracoids sin. (353/2, 790/9), dist. humerus dex. (790/20), dist. humerus sin. (785/3), prox. ulna sin. (300/10), 2 dist. ulnae dex. (325/23, 788/11), dist. ulna dex. sad. (301/12), 10 dist. ulnae sin. (294/3, 301/15, 325/23, 331/8[2x], 331/15, 331/24, 787/13, 88/8, 789/18), prox. carpometacarpus dex. (353/3), 2 prox. carpometacarpi sin. (331/15, 788/33), 2 dist. carpometacarpi sin. (787/14, 790/7), prox. tibiotarsus dex. (325/23), prox. tibiotarsus sin. (331/8), 2 dist. tibiotarsi dex. (355/2, 788/17), 2 dist. tibiotarsi sin. (331/2, 331/12),

2 prox. tarsometatarsi dex. (787/17, 788/14), prox. tarsometatarsus sin. (789/5), prox. tarsometatarsus sin. sad. (788/13); MNI = 10.

15a: fragm. coracoid sin. sad. (293/3); MNI = 1.

15e: 3 dist. ulnae sin. (318/8, 318/18, 324/9); MNI = 3.

16: dist. tibiotarsus sin. (318/33); MNI = 1.

Falco subbuteo Linnaeus

Material:

05: dist. ulna dex. (797/2); MNI = 1.

06: dist. carpometacarpus dex. (315/10); MNI = 1.

13: cran. coracoid sin. (788/19), dist. ulna dex. (326/43); MNI = 1.

14: dist. ulna sin. (318/3); MNI = 1.

Falco peregrinus Linnaeus

Material:

04: stern. coracoid dex. (803/20); MNI = 1.

08: dist. ulna dex. (348/1); MNI = 1.

11: dist. tarsometatarsus dex. sad. (332/10); MNI = 1.

13: cran. scapula dex. (786/1), dist. tarsometatarsus dex. (786/4), dist. tarsometatarsus dex. juv. (788/13); MNI = 2.

14a: dist. humerus dex. (339/2); MNI = 1.

Tetraonidae

Bonasa bonasia (Linnaeus)

Material:

08: stern. coracoid dex. (347/3); MNI = 1.

09: cran. coracoid dex. (341/7); MNI = 1.

13: dist. humerus sin. (788/20); MNI = 1.

Tetrao urogallus Linnaeus

Material:

11: prox. tarsometatarsus dex. (354/16); MNI = 1.

13: cran. coracoid dex. (790/5); MNI = 1.

Remarks: Size of the fragments indicates that both are from female Capercaillies.

Tetrao tetrix Linnaeus

Material:

04: dist. carpometacarpus sin. (804/3), dist. femur sin. (804/7); MNI = 1.

04a: cran. coracoid dex. (803/12), dist. ulna dex. (803/6), dist. ulna sin. (803/1); MNI = 1.

05: 3 cran. coracoids dex. (350/1, 350/22, 801/1), cran. coracoid sin. (350/1), stern. coracoid dex. (350/22), dist. humerus dex. (801/1), dist. humerus sin. (350/22), ulna dex. juv. (350/16), 2 dist. ulnae dex. (350/19, 350/22), 4 prox. carpometacarpi dex. (350/13, 350/19, 795/4, 797/15), 2 prox. carpometacarpi sin. (350/22, 801/1), prox. tibiotarsus sin. (801/1), dist. tibiotarsus dex. (350/7), tarsometatarsus sin. juv. (350/16), prox. tarsometatarsus sin. (797/12); MNI = 4.

06: 2 coracoids sin. (316/13, 349/1), cran. coracoid dex. (316/12), cran. coracoid sin. (349/5), stern. coracoid sin. (349/9), prox. humerus sin. (316/1), 2 dist. humeri dex. (316/10, 316/15), 2 dist. humeri sin. (349/14, 316/1), 3 prox. ulnae dex. (316/13, 316/15, 349/6), 2 prox. ulnae sin. (316/11, 349/12), 2 dist. ulnae dex. (316/12, 349/15),

- 2 dist. ulnae sin. (316/11, 349/8), fragm. carpometacarpus dex. (316/13), 2 prox. carpometacarpi sin. (349/1, 349/10), dist. carpometacarpus dex. (349/18); MNI = 3.
 07: dist. humerus sin. (316/2); MNI = 1.
 07b: prox. ulna dex. (316/4), prox. carpometacarpus dex. (316/3), prox. femur dex. (316/3), prox. tibiotarsus sin. (316/17), dist. tarsometatarsus dex. (316/3); MNI = 1.
 08: 3 cran. coracoids dex. (315/19, 330/2, 349/16), ulna sin. (347/9), dist. ulna dex. (330/2), dist. ulna sin. (349/19), 2 prox. carpometacarpi dex. (330/4, 347/9), prox. carpometacarpus sin. (315/19), dist. carpometacarpus dex. (342/1), 2 dist. tarsometatarsi sin. (315/19, 348/2); MNI = 3.
 10: prox. ulna dex. (309/2); MNI = 1.
 11: cran. coracoid sin. (332/11), prox. humerus sin. (354/16), prox. ulna sin. (354/16), 2 dist. ulnae sin. (354/16, 354/17), tarsometatarsus sin. (354/16), prox. tarsometatarsus dex. (354/11); MNI = 2.
 13: cran. coracoid dex. (789/6), 5 cran. coracoids sin. (326/10, 331/20, 353/6, 787/16, 787/26), 2 cran. scapulae sin. (325/4, 789/8), prox. humerus dex. (790/15), 2 dist. humeri dex. (789/2, 790/12), dist. humerus sin. (789/6), prox. ulna sin. (326/7), 2 dist. ulnae dex. (331/40, 790/4), dist. ulna sin. (300/13), fragm. carpometacarpus sin. (787/14), prox. carpometacarpus dex. (789/9), 6 prox. carpometacarpi sin. (325/3, 326/11, 326/26, 331/28, 331/32, 788/1), 4 dist. carpometacarpi sin. (325/3, 326/26, 331/15, 331/32), phalanx I digiti majoris dex. (308/1), dist. tibiotarsus dex. (788/24), 3 prax. tarso-metatarsi dex. (293/2, 353/1, 790/5), prox. tarso-metatarsus sin. (353/13), dist. tarsometatarsus dex. (300/25), 2 dist. tarsometatarsi sin. (355/2, 353/3); MNI = 7.
 14: cran. coracoid dex. (318/3); MNI = 1.
 14c: dist. tarsometatarsus dex. (291/6); MNI = 1.
 15c: dist. tibiotarsus dex. (292/1); MNI = 1.
 15e: cran. coracoid dex. (318/24), cran. coracoid sin. (318/19), dist. ulna sin. (318/14), prox. carpometacarpus dex. (318/26), prox. carpometacarpus sin. (324/18), dist. carpometacarpus sin. (318/12); MNI = 1.

Remarks: The abundant material reported on here does not differ morphologically from the same bones of the modern Black Grouse. Jánossy (1972) argued that the bones of Black Grouses from the other sites at Stránská Skála are generally more slender than those of the modern Black Grouse and assigned them to the extinct grouse species *Tetrao partium* Kretzoi, 1962, described from the Earliest Pleistocene (Q1) of Betfia in northern Rumania. My revision of Jánossy's material (Mlíkovský, unpub. results) could not confirm his observations. I conclude from this data, that Late Biharian (Q2) Black Grouses were taxonomically not different from *Tetrao tetrix*. On the other hand, the Early Biharian species *Tetrao partium* Kretzoi, 1962 may well be valid. Although I was not able to study the type material of this species from Betfia, I examined several bones of the *Tetrao tetrix* complex from the early Biharian (Q1) of Zabia Skala in southern Poland (Mlíkovský, unpub. observa-

tions). They clearly differed in morphological details from the proper *Tetrao tetrix* from the late Biharian onwards.

Phasianidae

Perdix perdix (Linnaeus)

Material:

- 05: dist. tarsometatarsus sin. (801/1); MNI = 1.
 06: dist. carpometacarpus dex. (316/11), prox. tarso-metatarsus sin. (315/13); MNI = 1.
 Remarks: Kretzoi (1962) described a new partridge *Perdix jurecsaki* from the early Biharian (Q1) of Betfia in NW Rumania. Jánossy (1972) revised the species and concluded that it is inseparable from the modern *Perdix perdix* (see also Jánossy 1974a, 1981). The bones reported on here support Jánossy's conclusions.

Coturnix coturnix (Linnaeus)

Material:

- 04a: fragm. sternum (803/12); MNI = 1.
 06: prox. carpometacarpus dex. (316/13); MNI = 1.
 08: 2 cran. coracoids sin. (347/2, 348/3), prox. tarso-metatarsus dex. (342/11), dist. tarsometatarsus sin. (342/17); MNI = 2.
 09: dist. humerus sin. (341/12), dist. tibiotarsus dex. (341/8); MNI = 1.
 10a: dist. humerus dex. (341/3); MNI = 1.
 11: prox. femur dex. (332/3); MNI = 1.
 13: fragm. coracoid sin. (788/2), cran. coracoid dex. (788/29), 4 cran. coracoids sin. (326/9, 331/14, 331/22, 787/11), 3 cran. scapulae sin. (300/17, 332/18, 789/8), 3 prox. humeri dex. (300/33, 308/7, 790/21), prox. humerus sin. (301/22), 2 dist. humeri dex. (353/16, 788/15), dist. humerus sin. (787/16), prox. ulna sin. (332/16), dist. ulna dex. (787/3), 4 dist. ulnae sin. (300/9, 300/28, 787/8, 787/23), carpometacarpus dex. (302/9), 3 prox. carpometacarpi dex. (300/33, 331/31, 787/27), 3 prox. carpometacarpi sin. (301/9, 301/19, 326/13), prox. femur sin. (790/18), 2 dist. femora sin. (325/5, 331/19), 3 dist. tibiotarsi dex. (326/6, 788/5, 789/1), 2 dist. tibiotarsi sin. (325/13, 788/5), dist. tarsometatarsus sin. (354/3); MNI = 5.
 14c: dist. humerus sin. (291/4); MNI = 1.
 15a: dist. humerus sin. (292/4); MNI = 1.
 15e: 2 cran. coracoids sin. (318/8, 324/16), 2 dist. humeri dex. (324/11, 324/16), dist. humerus sin. (318/23); MNI = 2.
 16: dist. humerus dex. (318/32); MNI = 1.

Plioperdix ponticus (Tugarinov, 1940)

Ammoperdix ponticus Tugarinov, 1940
Pliogallus coturnoides Tugarinov, 1940
Plioperdix coturnoides: Kretzoi, 1955 (new combination).
Francolinus minor Jánossy, 1974b
Plioperdix ponticus: Kuročkin, 1985 (new combination).
 Material:
 06: prox. tarsometatarsus dex. (316/11); MNI = 1.
 08: prox. tarsometatarsus sin. (348/5); MNI = 1.
 11: dist. tibiotarsus dex. (354/7); MNI = 1.
 13: 2 dist. tarsometatarsi sin. (294/4, 326/9); MNI = 2.

Remarks: Kuročkin (1985) and Bocheński and Kuročkin (1987) showed that *Ammoperdix ponticus* Tugarinov, 1940 and *Pliogallus coturnoides* Tugarinov, 1940, described from the Middle Pliocene of Odessa in Ukraine, were in fact a single species, which should bear the name *Plioperdix ponticus* (Tugarinov 1940). They showed also that the species was closely related to quails of the genus *Coturnix*.

When I studied the alleged francolins from Stránská Skála, I observed that they are no francolins, but quails in fact. Lambrecht's (1933) description of their remains from the Early Pleistocene (Q1) of Betfia as francolins is inexplicable. In view of the fact, that these alleged francolins from the Pliocene and Early Pleistocene differed from true francolins in important morphological details (e.g. in lacking spur on tarsometatarsus), in occurring in habitats and climates strange for true francolins (see Mlíkovský 1992), and in being distributed only outside the 20th century Soviet Empire (while *Plioperdix* lived only within this Empire!), it is less understandable why subsequent students of their remains (Jánossy 1972, 1974b, 1976, 1981) made no real attempts at reconsideration of their affinities. My revision showed, that three species of the genus *Plioperdix* can be discerned in the material from the Pliocene and Early Pleistocene of Europe and Asia, which differed mainly in size (Tab. 1).

Francolinus minor Jánossy 1974b, described from the middle Pliocene (MN 15) of Weze in southern Poland, falls within the size limits of *Plioperdix ponticus* Tugarinov, 1940. Because no morphological differences are apparent, I synonymize here *Francolinus minor* Jánossy 1974b with *Ammoperdix* (= *Plioperdix*) *ponticus* Tugarinov, 1940. The subspecies *Francolinus capeki wenzensis* Jánossy 1974b, described on a large series of syntypes from the Middle Pliocene of Weze in Poland, is based on a mixture of bones belonging to *Plioperdix ponticus* and *Plioperdix capeki*. The species is thus known from the Middle Pliocene (MN 15) to the Early Pleistocene (Q2) from a number of localities in Ukraine and Moldavia (Dubrovo and Kapelist 1979, Bocheński and Kuročkin 1987), from Weze and Rebielice Królewskie in Poland (Jánossy 1974b as *Francolinus minor* and in part as *Francolinus capeki wenzensis*), from Stránská Skála in the Czech Republic (this paper), and from Beregovaja in Buryatia (Kuročkin 1985).

Plioperdix capeki (Lambrecht, 1933)

Francolinus capeki Lambrecht, 1933

Plioperdix capeki: Mlíkovský, this paper (new combination).

Material:

- 13: cran. coracoid dex. (331/38), cran. coracoid sin. (788/16), prox. humerus dex. (788/3), prox. ulna sin. (787/22), dist. tarsometatarsus dex. (788/35); MNI = 1.

Remarks: I studied all the remains of this species excavated from Stránská Skála (not only those reported on in this paper), which convincingly show that the species had nothing in common with francolins, but that it is referable to the genus *Plioperdix*. Particularly characteristic are the very deep fossa pneumotricipitalis on humerus, and flattened

ulna. *Plioperdix capeki* was larger than *Plioperdix ponticus*, but smaller than *Plioperdix subfrancolinus* (Tab. 1).

The species is known from the Middle Pliocene (MN 15) to the Early Pleistocene (Q2) from Betfia in Rumania (Lambrecht 1933), Osztramos 2 and 8 in Hungary (Jánossy 1976), Deutsch-Altenburg 4B in Austria (Jánossy 1981), Stránská Skála and Koněprusy in Czechoslovakia (Jánossy 1972, this paper), and Sackdilling in Germany (Lambrecht 1933).

Plioperdix subfrancolinus (Jánossy, 1976)

Francolinus subfrancolinus Jánossy, 1976

Alectoris baryosefi Tchernov, 1980

Plioperdix subfrancolinus: Mlíkovský, this paper (new combination).

Material:

- 10: dist. carpometacarpus dex. (309/6); MNI = 1.
13: cran. coracoid sin. (300/7), prox. ulna sin. (291/2), carpometacarpus sin. (301/20); MNI = 1.
16: dist. carpometacarpus sin. (318/31); MNI = 1.

Remarks: This species was described as *Francolinus subfrancolinus* from the Late Pliocene (MN 17) of Villány 3 in Hungary (Jánossy 1976). The species is valid, because it is larger than *Plioperdix capeki* (Tab. 1), but similarly as other Plio-Pleistocene „francolins“ of Europe belongs in the quail genus *Plioperdix*.

Alectoris baryosefi Tchernov, 1980 was described on the basis of a carpometacarpus from the Early Pleistocene (Q2) of 'Ubeidiya in Israel. Its detailed description and figure show that it differs from the modern genus *Alectoris*, as properly described by Tchernov (1980) and agrees in morphology and size with *Francolinus* (= *Plioperdix*) *subfrancolinus* Jánossy, 1976. I therefore synonymize here the former with the latter species. The fragmentary distal end of tarsometatarsus from 'Ubeidiya, identified by Tchernov (1980) as „*Francolinus* sp.“ agrees in size with *Plioperdix subfrancolinus* and belongs possibly in this species as well.

Plioperdix subfrancolinus is thus known from the late Pliocene (MN 17) to the Early Pleistocene (Q2) of Villány 3 in Hungary (Jánossy 1976), 'Ubeidiya in Israel (Tchernov 1980 as *Alectoris baryosefi* and ?*Francolinus* sp.), and Stránská Skála in the Czech Republic (this paper).

Rallidae

Rallus aquaticus Linnaeus

Material:

- 08: dist. humerus dex. (342/7), prox. carpometacarpus dex. (342/16); MNI = 1.

Porzana sp.

Material:

- 15e: coracoid dex. (324/9); MNI = 1.

Remarks: This coracoid is larger than the same element of the modern *Porzana porzana* (Linnaeus). This indicates that it represents a new species. However, I hesitate to describe it here in absence of more comparative material. Internal length of the coracoid is 19.6 mm, maximum length 19.9 mm.

Crex crex (Linnaeus)

Material:

08: cran. coracoid dex. (342/13); MNI = 1.

11: cran. coracoid sin. (332/11); MNI = 1.

13: humerus sin. (790/3), prox. humerus sin. (302/6), dist. humerus sin. juv. (326/6), dist. tibiotarsus dex. (789/16); MNI = 2.

Gallinula gigantea Tchernov, 1980

Material:

10a: cran. coracoid sin. (341/11); MNI = 1.

11: prox. carpometacarpus sin. (354/2); MNI = 1.

13: cran. coracoid sin. (326/30), dist. humerus sin. sad. (788/13); MNI = 2.

Remarks: *Gallinula gigantea* was described by Tchernov (1980) from the Early Pleistocene (Q2) of 'Ubeidiya in Israel. The remains assigned here to this species support its validity. Tchernov (1968) described from 'Ubeidiya a new coot species, *Fulica stekelesi*. The type of this species, symphysial part of a furcula, does not resemble the coot furculas at all, and the species should be revised. Tchernov (1980) assigned to *Fulica stekelesi* several further bone fragments from 'Ubeidiya (two of which he incorrectly termed „lectotypes“). They fall in the size class of *Gallinula gigantea* and should be probably referred to that species. *Gallinula gigantea* is thus far known only from the Early Pleistocene (Q2) of 'Ubeidiya in Israel (Tchernov 1980) and Stránská Skála in Czech Republic (this paper).

Fulica atra Linnaeus

Material:

04a: prox. carpometacarpus dex. (803/14); MNI = 1.

05: prox. carpometacarpus sin. (350/4); MNI = 1.

10b: prox. carpometacarpus sin. (340/4), dist. carpometacarpus dex. (340/7); MNI = 1.

13: dist. carpometacarpus dex. (788/29); MNI = 1.

15e: dist. tibiotarsus dex. (318/10); MNI = 1.

*Otididae**Tetrax tetrax* (Linnaeus)

Material:

13: prox. carpometacarpus sin. (301/24); MNI = 1.

Remarks: This fragment does not differ in size or morphology from the same element of the modern *Tetrax tetrax*. This is true also for the other bustard bones from Stránská Skála (Čapek's collection), which were referred by Jánossy (1972) to *Otis (Tetrax) kalmansi* Jánossy, 1972, described from the Early Pleistocene (Q1) of Püspökfürdő (= Betfia) in Rumania. I could not examine the holotype of this species, but if it is valid at all, which is less probable, it has not been recorded from Stránská Skála yet.

*Recurvirostridae**Himantopus himantopus* (Linnaeus)

Material:

05: dist. tarsometatarsus sin. (350/16); MNI = 1.

*Charadriidae**Charadrius* sp.

06: dist. humerus dex. (316/10); MNI = 1.

13: dist. humerus dex. (331/34); MNI = 1.

Pluvialis cf. squatarola (Linnaeus)

Material:

03b: prox. humerus sin. (805/5); MNI = 1.

05: 2 dist. tibiotarsi dex. (798/2, 798/17); MNI = 2.

08: dist. tibiotarsus dex. (342/3); MNI = 1.

13: prox. humerus sin. (787/5); MNI = 1.

Vanellus vanellus (Linnaeus)

Material:

04: prox. tarsometatarsus sin. (804/1); MNI = 1.

04a: dist. tibiotarsus dex. (803/16); MNI = 1.

05: stern. coracoid dex. (315/8), stern. coracoid sin. (798/14), cran. scapula sin. (796/10), prox. humerus sin. (801/1), prox. carpometacarpus sin. (797/6); MNI = 1.

06: stern. coracoid dex. (349/22), dist. humerus dex. (349/21), dist. ulna sin. (349/5); MNI = 1.

07: dist. ulna dex. (349/11); MNI = 1.

08: dist. ulna sin. (347/9), dist. tibiotarsus sin. (342/16); MNI = 1.

10a: stern. coracoid sin. (341/9); MNI = 1.

11: cran. coracoid sin. (354/10); MNI = 1.

13: dist. humerus dex. (326/19); MNI = 1.

*Scolopacidae**Calidris* sp.

07: tarsometatarsus sin. (798/9); MNI = 1.

Philomachus pugnax (Linnaeus)

Material:

04: prox. humerus sin. (804/5); MNI = 1.

05: stern. coracoid sin. (795/11), 2 prox. humeri sin. (795/2, 798/15), tarsometatarsus dex. (350/20), dist. tarsometatarsus sin. (350/1); MNI = 2.

06: coracoid sin. (349/9), prox. humerus dex. (849/9), prox. humerus sin. (316/10); MNI = 1.

08: dist. humerus sin. (342/14); MNI = 1.

11: cran. coracoid dex. (354/5), cran. coracoid sin. (354/4); MNI = 1.

Lymnocryptes minimus (Brünnich)

Material:

07: dist. humerus sin. (349/11); MNI = 1.

14: coracoid dex. (771/1), stern. coracoid sin. (771/2); MNI = 1.

15e: cran. coracoid sin. (324/3); MNI = 1.

Gallinago gallinago (Linnaeus)

Material:

04: prox. humerus sin. (804/10), dist. humerus sin. (804/9); MNI = 1.

04a: cran. coracoid dex. (803/11), cran. coracoid sin. (803/8); MNI = 1.

05: prox. humerus dex. (798/20), 2 dist. humeri dex. (795/10, 796/11), prox. ulna dex. (795/12), dist. ulna dex. (797/10), dist. carpometacarpus dex. (316/20); MNI = 2.

06: cran. coracoid dex. (315/6); MNI = 1.

13: 2 cran. coracoids dex. (325/18, 354/6), prox. humerus dex. (788/15), prox. humerus sin. (326/6), dist. humerus sin. (300/8), dist. tibiotarsus dex. (300/6); MNI = 2.

14: coracoid dex. (771/1); MNI = 1.

Gallinago media (Latham)

Material:

05: coracoid sin. (795/9), humerus dex. (300/11), prox. humerus dex. (795/9), 3 dist. humeri sin. (315/17, 797/12, 801/1), prox. carpometacarpus dex. (797/11), dist. tibiotarsus dex. (795/6), 4 dist. tibiotarsi sin. (350/1, 795/7, 797/5, 805/6); MNI = 4.

06: carpometacarpus dex. (316/1), dist. tarsometatarsus sin. (316/13); MNI = 1.

13: cran. coracoid sin. (300/12), dist. humerus dex. (332/22), dist. tarsometatarsus dex. (331/15), dist. tarsometatarsus sin. (787/13); MNI = 1.

14: dist. ulna dex. (771/1); MNI = 1.

15e: dist. tibiotarsus dex. (318/27); MNI = 1.

Scolopax rusticola Linnaeus

Material:

04a: dist. ulna dex. (803/3); MNI = 1.

05: dist. humerus sin. (795/10), ulna sin. (798/18), prox. carpometacarpus sin. (350/2); MNI = 1.

06: cran. coracoid dex. (349/5), cran. coracoid sin. (349/10); MNI = 1.

08: dist. ulna dex. (330/2); MNI = 1.

10: cran. scapula dex. (309/1); MNI = 1.

11: cran. scapula dex. (354/16); MNI = 1.

13: cran. coracoid dex. (788/36), cran. coracoid sin. (787/11), cran. scapula sin. (787/5), dist. ulna dex. (326/23), 2 prox. ulnae sin. (299/3, 790/18), fragm. carpometacarpus dex. (331/19); MNI = 2.

15e: prox. scapula sin. (318/8), dist. ulna sin. (318/5); MNI = 1.

Limosa spp.

03b: cran. coracoid sin. (805/5); MNI = 1.

05: coracoid dex. (801/1), cran. coracoid dex. (350/16), cran. coracoid sin. (350/5), prox. humerus dex. (350/11), 2 prox. humeri sin. (350/2, 350/16); MNI = 2.

06: stern. coracoid dex. (349/24), dist. humerus sin. (349/9), prox. ulna dex. (316/11), fragm. femur sin. (349/9); MNI = 1.

08: cran. coracoid dex. (348/4), stern. coracoid sin. (349/20), 2 dist. humeri sin. (342/10, 347/1), dist. tibiotarsus dex. (342/9); MNI = 2.

10: cran. coracoid sin. (309/6); MNI = 1.

11: stern. coracoid dex. (354/8); MNI = 1.

13: 3 cran. coracoids dex. (331/3, 331/10, 331/43); MNI = 3.

Remarks: These fragments fall into two size classes, which agree with the modern *Limosa limosa* (Linnaeus) and *Limosa lapponica* (Linnaeus), respectively. Both of these species were thus probably present in Stránská Skála, but not all fragments could be identified at the species level.

Numenius phaeopus (Linnaeus)

Material:

05: dist. ulna dex. (795/15); MNI = 1.

06: coracoid dex. (315/5), stern. coracoid sin. (349/4); MNI = 1.

08: coracoid dex. (330/2), dist. carpometacarpus dex. (342/8); MNI = 1.

11: coracoid dex. (354/12); MNI = 1.

13: cran. coracoid dex. (326/23), cran. scapula dex. (308/5); MNI = 1.

15a: cran. scapula sin. (292/10); MNI = 1.

Tringa spp.

Material:

04: dist. tibiotarsus dex. (803/21); MNI = 1.

04a: prox. humerus sin. (803/3), dist. tibiotarsus dex. (803/12), dist. tibiotarsus sin. (803/8); MNI = 1.

05: cran. coracoid dex. (796/6), stern. coracoid sin. (350/16), prox. carpometacarpus dex. (796/5), dist. tibiotarsus dex. (797/4), dist. tibiotarsus sin. (350/16); MNI = 1.

06: dist. humerus sin. (316/8), prox. tarsometatarsus sin. (315/1); MNI = 1.

08: cran. coracoid dex. (348/8), prox. humerus sin. (347/4); MNI = 1.

09: dist. tibiotarsus sin. (341/12); MNI = 1.

13: carpometacarpus dex. (325/4), dist. tibiotarsus dex. (331/5), prox. tarsometatarsus dex. (786/7), prox. tarsometatarsus sin. (302/7); MNI = 1.

14: prox. tarsometatarsus dex. (771/1), dist. tarsometatarsus dex. (771/1); MNI = 1.

14a: dist. tibiotarsus dex. (339/1); MNI = 1.

Remarks: These remains are too fragmentary to be properly identified at the species level, because modern species of the genus *Tringa* differ largely by size, not by morphology of bones. Taking size into account, at least three *Tringa* species were probably present in Stránská Skála.

Laridae

Larus canus Linnaeus

Material:

05: dist. carpometacarpus sin. (350/3); MNI = 1.

Columbidae

Columba palumbus Linnaeus

Material:

15e: cran. coracoid sin. (318/7); MNI = 1.

Cuculidae

Cuculus canorus Linnaeus

Material:

06: humerus sin. (316/12); MNI = 1.

Strigidae

Athene noctua (Scopoli)

Material:

06: dist. tarsometatarsus dex. (316/12); MNI = 1.

13: dist. humerus dex. (302/9), dist. ulna sin. (326/37); MNI = 1.

15e: dist. tarsometatarsus sin. (318/10); MNI = 1.

Strix aluco Linnaeus

Material:

10b: prox. humerus sin. (340/2); MNI = 1.

13: dist. ulna dex. (788/15); MNI = 1.

Asio flammeus (Pontoppidan)

Material:

04a: prox. tarsometatarsus dex. (803/13), dist. tarsometatarsus dex. (803/9); MNI = 1.

05: prox. tibiotarsus sin. (350/13); MNI = 1.

08: dist. tarsometatarsus sin. (342/4); MNI = 1.

12: dist. tibiotarsus sin. (332/14); MNI = 1.

13: prox. carpometacarpus sin. (789/5), 2 dist. tibiotarsi sin. (301/7, 789/12), tarsometatarsus sin. (789/14), dist. tarsometatarsus dex. (353/15), 2 dist. tarsometatarsi sin. (300/32, 787/10), dist. tarsometatarsus sin. juv. (787/7); MNI = 3.

*Apodidae**Apus apus* (Linnaeus)

Material:

03b: dist. carpometacarpus dex. (805/4); MNI = 1.

04a: prox. humerus sin. (803/3); MNI = 1.

06: prox. carpometacarpus dex. (316/17); MNI = 1.

13: coracoid sin. (301/14); MNI = 1.

*Picidae**Picus canus* Gmelin

Material:

13: dist. ulna sin. (331/2); MNI = 1.

Dendrocopos major (Linnaeus)

Material:

13: dist. humerus sin. (331/21); MNI = 1.

15e: dist. tarsometatarsus dex. (324/22); MNI = 1.

*Hirundinidae**Riparia riparia* (Linnaeus)

Material:

08: humerus dex. (330/4); MNI = 1.

Remarks: Maximum length = 13.0 mm.

Hirundo rustica Linnaeus

Material:

10a: humerus sin. (341/1); MNI = 1.

13: humerus dex. (301/10), humerus sin. (788/30), prox. humerus sin. (787/13), 3 dist. humeri dex. (300/31, 302/5, 788/26); MNI = 3.

15a: dist. humerus sin. (292/8); MNI = 1.

Remarks: Maximum lengths of three complete humeri are 14.8, 15.0, and 15.2 mm, respectively.

Delichon urbica (Linnaeus)

06: prox. humerus sin. (349/7), dist. humerus dex. (315/1); MNI = 1.

08: humerus sin. (315/16), prox. humerus sin. (342/17); MNI = 2.

09: dist. humerus dex. (341/7), dist. humerus sin. (341/5); MNI = 1.

10a: prox. humerus sin. (340/3); MNI = 1.

13: 3 humeri dex. (787/14, 787/16), 7 humeri sin. (300/1, 302/6, 325/25, 353/14, 788/17, 788/25), prox. humerus dex. (790/2), 2 prox. humeri sin. (789/11, 790/8), 4 dist. humeri dex. (787/14), dist. humerus sin. (331/30); MNI = 9.

14a: dist. humerus dex. (339/4); MNI = 1.

15e: prox. humerus sin. (324/18); MNI = 1.

*Motacillidae**Anthus* sp.

Material:

06: humerus dex. (330/1), humerus sin. (316/10); MNI = 1.

13: prox. humerus sin. (785/1); MNI = 1.

Motacilla sp.

Material:

03b: humerus dex. (805/3); MNI = 1.

*Turdidae**Turdus* sp. (large)

Material:

13: dist. humerus sin. (302/7); MNI = 1.

Turdus sp. (medium)

Material:

13: dist. humerus dex. (332/24, 790/1); MNI = 2.

*Sylviidae**Acrocephalus* sp.

Material:

05: prox. humerus dex. (796/9); MNI = 1.

Remarks: This was a large warbler, approximately of the size of the modern Great Reed Warbler *Acrocephalus arundinaceus* (Linnaeus).*Corvidae**Garrulus glandarius* (Linnaeus)

Material:

13: cran. coracoid dex. (325/24), prox. carpometacarpus dex. (299/1), dist. tibiotarsus dex. (789/9); MNI = 1.

Pica pica (Linnaeus)

Material:

08: dist. tarsometatarsus sin. (342/2); MNI = 1.

11: dist. ulna sin. (308/10); MNI = 1.

13: cran. coracoid dex. (788/24), prox. ulna dex. (300/8), dist. carpometacarpus sin. (308/2), dist. tibiotarsus dex. (301/15), 3 dist. tarsometatarsi dex. (301/6, 326/3, 787/16), 4 dist. tarsometatarsi sin. (294/2, 300/24, 788/29, 789/8); MNI = 4.

15e: prox. carpometacarpus sin. (318/7); MNI = 1.

Nucifraga caryocatactes (Linnaeus)

Material:

13: fragm. coracoid dex. (332/24), cran. coracoid dex. (331/27); MNI = 2.

Corvus pliocaenus (Portis 1889)

Numenius sp. (*Pliocaenus*) Portis, 1889

Corvus praecorax Depéret, 1892

Corvus pliocaenus: Regalia, 1902 (new combination)

Corvus betfianus Kretzoi, 1962

Material:

13: prox. femur dex. (301/14, 787/12); MNI = 2.

15e: dist. tarsometatarsus dex. (324/23); MNI = 1.

Remarks: This species was intermediate in size between the modern *Corvus corone* Linnaeus and *Corvus corax* Linnaeus. It was reported under various names (see Brodkorb 1978 for their synonymization) from the Middle Pliocene to the Middle Pleistocene (Q3) of Perpignan, Saint-Esteve-Janson, Lunel-Viel and La Fage in France (Depéret 1890, Mourer-Chauviré 1975a,b), Il Tasso in Italy (Portis 1889, Regalia 1902), Betfia in Rumania (Kretzoi 1962), and Stránská Skála in Czech Republic (this paper).

Corvus cf. *corone* Linnaeus

Material:

05: dist. tarsometatarsus dex. (350/16); MNI = 1.

13: dist. humerus sin. (301/9), dist. ulna dex. (788/18), dist. ulna dex. sad. (790/13), prox. femur sin. (353/16), dist. tarsometatarsus sin. (353/3); MNI = 2.

15e: cran. coracoid dex. (318/19), dist. ulna dex. (318/29), dist. ulna sin. (318/22); MNI = 1.

Remarks: *Corvus corone* and *Corvus frugilegus* Linnaeus are hardly separable by size or shape of their bones. However, all the bones referred here to *Corvus* cf. *corone* tended in general appearance to be more similar to this species than to *Corvus frugilegus*.

Corvus moravicus, n. sp.

Holotype: distal part of left femur; Anthropos Institute Brno, 804/2 (Fig. 1).

Material:

04: dist. femur sin. (holotype, 804/2); MNI = 1.

13: cran. coracoid dex. (326/42), cran. scapula sin. (789/7); MNI = 1.

Diagnosis: A typical *Corvus*, somewhat larger than *Corvus monedula* Linnaeus, with fossa poplitea on femur much less excavated.

Measurements: Maximum width of the distal end of holotype femur = 7.8 mm. The same dimension is 7.3–7.6 (n = 3) in modern *Corvus monedula*.

Etymology: After Moravia, the country where the holotype was found.

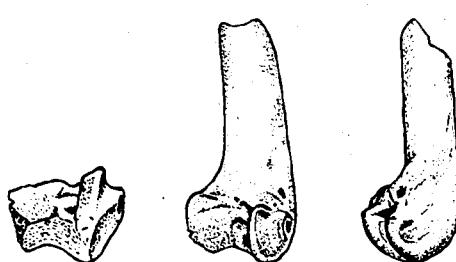


Fig. 1. *Corvus moravicus*, n. sp., Holotype, distal part of left femur, 2× enlarged.

Remarks: The species is known only from Stránská Skála thus far. It fits well in the size series of early and middle Pleistocene European *Corvus* species. Ordered from the largest to the smallest species, the series is as follows (extinct species are marked with +): *Corvus corax* > + *antecorax* > + *pliocaenus* > *corone* = *frugilegus* > + *moravicus* > *monedula*.

Corvus monedula Linnaeus

Material:

03a: dist. tibiotarsus sin. (805/2); MNI = 1.

04a: prox. humerus dex. (803/4); MNI = 1.

08: coracoid dex. (348/7), dist. humerus sin. (342/2); MNI = 1.

10: stern. coracoid sin. (309/3), dist. ulna dex. (309/4); MNI = 1.

13: coracoid dex. (788/10), 2 cran. coracoids dex. (787/2, 787/20), cran. coracoid sin. (326/20), 3 cran. scapulae dex. (300/18, 301/3, 787/13), 4 cran. scapulae sin. (293/1, 326/9, 787/20, 789/2), dist. humerus sin. (790/22), 2 prox. ulnae sin. (300/5, 789/1), 4 dist. ulnae dex. (299/4, 331/23, 332/17, 789/6), 2 dist. ulnae sin. (300/3, 788/15), dist. carpometacarpus sin. (326/14), prox. femur dex. (788/28), 2 dist. tibiotarsi sin. (326/27, 331/15); MNI = 4.

15a: dist. ulna sin. (291/3); MNI = 1.

15e: cran. coracoid dex. (324/2), 2 prox. scapulae dex. (318/7, 318/11), prox. ulna dex. (324/16), dist. ulna sin. (324/14), dist. tibiotarsus sin. (324/18); MNI = 2.

Fringillidae

Coccothraustes coccothraustes (Linnaeus)

10b: fragmentary mandible (339/3); MNI = 1.

DISCUSSION

Taphonomy

Avian remains excavated from the Musil's talus fan at Stránská Skála allow some thoughts on the taphonomical processes which formed the faunal assemblage found there. Most information supplies the standardized table of bone numbers, as introduced here (Tab. 2). It contains numbers of main long bones (humerus, ulna, carpometacarpus, femur, tibiotarsus and tarsometatarsus), plus numbers of coracoids, from medium sized anseriform and galliform birds. Too small species (e.g. *Coturnix coturnix*) and too large species (e.g. *Tetrao urogallus*) are excluded. Numbers of whole and broken bones are listed separately to make the calculation of the index of bone vulnerability possible. Full explanation of this table will be given elsewhere (Mlíkovský, in preparation). An analysis of the standardized table of avian bone numbers for the Musil's talus fan at Stránská Skála (Tab. 2) follows.

Numbers of autopodial, stylopodial and zeugopodial bones are distributed rather evenly, which speaks against owls as accumulators of the taphocenosis. Wing bones are present in much higher numbers than leg bones. This indicates that an important proportion of the bones was accumulated by some raptor. The number of coracoids is

distinctly higher than that of all long bones. This may mean that some proportion of the bones was brought to the site by a fluvial process (cf. Korth 1979). Large proportion of the bones is broken, which indicates that mechanical destruction of the material followed the accumulation. Abundance of rather large birds, such as *Tetrao tetrix*, indicates that predators, which accumulated the material, had to be rather large.

Summarizing this evidence, it may be concluded that large proportion of the avian bones found in the Musil's talus fan was brought to the site by a large raptor. The finds showed that *Falco peregrinus* bred on the cliffs of Stránská Skála throughout the period of accumulation of the taphocenosis. It was thus probably this species, which was responsible for a large proportion of the taphocenosis. Further, though probably much smaller proportion of the taphocenosis could have been accumulated by smaller carnivores, such as *Canis* sp. (cf. Mellett 1974). Still further proportion of the bones might have been brought to the site by fluvial processes (cf. Korth 1979). Alternatively, high breakage of the bones found could have been caused by fluvial redeposition of prey remains after they were accumulated by predators. Finally, some of the bones found in the Musil's talus fan at Stránská Skála originated probably from birds, which bred on the cliffs and died there. This applies particularly to *Falco peregrinus*, *Falco tinnunculus*, *Apus apus*, *Corvus monedula*, *Hirundo rustica*, and *Delichon urbica*, i.e. approximately to 20% of MNI.

Ecology

The overwhelming proportion of bird species found in the Musil's talus fan was closely connected with open marshes and smaller water-bodies. Only approximately 9% of MNI required dry ground (*Perdix*, *Coturnix*, *Plioperdix*, *Tetra*) and only about 6% of MNI needed trees or shrubs for their existence (*Columba*, *Cuculus*, *Picus*, *Dendrocopos*, *Turdus* spp. and most *Corvidae*). Species requiring extensive water-bodies are almost absent (<1% of MNI; *Mergus* spp.).

This observation allows the following reconstruction of the habitat around Stránská Skála in the Late Biharian. It was probably formed by extensive marshes, spangled with pools and water-filled grooves. Trees and shrubs were only rarely present, and so were larger water-bodies. Where the land was dwelled, dry patches with sparse vegetation were present. A similar Recent ecosystem is for example the Svjatoj Nos wetlands at north-eastern lake Baikal in Buryatia (see Mlíkovský and Styblo 1992).

No development of the ecosystem around Stránská Skála during the formation of the Musil's talus fan can be detected on the basis of the avifauna found in it. There are no indications of smaller glacial events in the composition of the avian community recovered from the Musil's talus fan.

Stratigraphy

Because of absence of the data, birds were previously not used as indicators of the biostratigraphical position of

localities. However, the data accumulated during last years, allow first relevant interpretations. The presence of *Plioperdix* spp. indicates that the taphocenosis from the Musil's talus fan at Stránská Skála was not older than Pliocene (MN 14) and not younger than Early Pleistocene (Q2). This applies also to the layers 14–16, which were formerly believed to be of Late Pleistocene (Q4) age (Musil 1965). The presence of other avian taxa is less informative in this respect.

The taxonomic composition of the taphocenosis from the Musil's talus fan allows, however, some thoughts on the relation of the deposit to glaciations. The absence of *Lagopus* spp. and *Pyrrhocorax* spp., which were characteristic members of avian glacial taphocenoses since Pliocene and Early Pleistocene, respectively (Jánossy 1972, 1974b, Bocheński 1991), indicates that the taphocenosis was accumulated during a relatively warm interglacial period, not during a periglacial or even glacial. This is supported also by the abundance of *Tetrao tetrix*, and presence of such species, as *Tetrao tetrix* or *Himantopus himantopus*.

Biogeography

A surprisingly large proportion of the species recovered from the Musil's talus fan still occurs in the western Palearctic. Only few species became extinct and, of the extant species, only *Tetrao tetrix* and *Himantopus himantopus* do not normally occur in contemporary Central Europe, being limited to more southern parts of the western Palearctic (Cramp and Simmons 1980, 1983).

Extinction rates

Only 8 species, identified from the Musil's talus fan at Stránská Skála, became extinct (*Mergus connectens*, *Plioperdix ponticus*, *Plioperdix capeki*, *Plioperdix subfrancolinus*, *Porzana* sp., *Gallinula gigantea*, *Corvus pliocaenus*, and *Corvus moravicus*). They form 13% of all species and 6% of MNI. This would indicate that extinction rate of birds was rather low between Early Pleistocene (Q2) and modern times. However, there is a good reason to believe that these figures are underestimated. In many avian genera, species are identified mainly on the basis of size, because intraspecific morphological variability (visible only when large series are available for study) suppress alleged interspecific morphological differences. Of the avian genera identified here, this applies particularly to *Anas*, *Tringa*, *Dendrocopos*, and *Turdus*. Taking into account that most of the remains studied were bare bone fragments, it is evident that there was no way how to discern, for example, how many *Tringa* species were found in the Musil's talus fan, which of them were identical with modern species, and which ones are now extinct. Hence, an estimate that 20, or even 30% of avian species known from the Early Pleistocene (Q2) of Central Europe became extinct since, seems more probable.

On the other hand, there is little doubt that large part of the Late Biharian (Q2) avifauna was already formed by modern species. This contradicts theoretical predictions, that all Early Pleistocene (Q1–Q2) species of birds are now

Table 1. Measurements of Plioperdix spp. from the Plio-Pleistocene of the Palearctic. All measurements are in mm. Numbers of measured bones are given in parentheses. GL = greatest length, PW = width of the proximal end, DW = width of the distal end. The data, combined for all localities, were extracted from Jánossy (1972, 1974, 1976, 1981), Tchernov (1980), Bocheński and Kuročkin (1987), and supplemented by own measurements.

	GL	PW	DW
Humerus			
<i>P. ponticus</i>	—	—	6.7–7.1 (8)
<i>P. capeki</i>	40.0–43.4 (7)	10.8–12.2 (11)	7.7–8.6 (21)
<i>P. subfrancolinus</i>	—	—	10.6 (1)
Ulna			
<i>P. ponticus</i>	—	—	—
<i>P. capeki</i>	39.5–40.0 (2)	—	—
<i>P. subfrancolinus</i>	—	—	7.6 (1)
Carpometacarpus			
<i>P. ponticus</i>	20.1–21.2 (3)	5.6–6.0 (9)	—
<i>P. capeki</i>	23.3–24.0 (3)	6.2–7.3 (12)	4.0–4.8 (2)
<i>P. subfrancolinus</i>	27.7–29.3 (2)	8.0–9.0 (2)	5.4–6.0 (3)
Femur			
<i>P. ponticus</i>	—	7.1–7.2 (3)	5.2–6.6 (2)
<i>P. capeki</i>	—	—	7.5 (1)
<i>P. subfrancolinus</i>	—	—	—
Tibiotarsus			
<i>P. ponticus</i>	—	—	4.5–5.0 (3)
<i>P. capeki</i>	—	7.8 (1)	5.5–6.8 (15)
<i>P. subfrancolinus</i>	—	—	—
Tarsometatarsus			
<i>P. ponticus</i>	—	5.3–5.4 (2)	5.0–6.0 (7)
<i>P. capeki</i>	35.5–39.2 (5)	5.8–6.7 (3)	6.5–7.6 (16)
<i>P. subfrancolinus</i>	—	—	—

Table 2. Standardized table of avian bone numbers for the Musil's talus fan at Stránská Skála. See text for explanation.

Bone kind/number	complete	broken	total	% broken
Coracoid	8	159	167	95.2
Humerus	—	53	53	100.0
Ulna	4	82	86	95.3
Carpometacarpus	7	87	94	92.6
Femur	—	7	7	100.0
Tibiotarsus	—	34	34	100.0
Tarsometatarsus	3	38	41	92.7
Total	22	460	482	95.4

extinct (e.g. Jánossy 1972, 1987, see also Ballmann 1977). Such predictions were based on the assumption of approximately constant evolutionary rates of birds, which were expected to cause instant speciation. If this expectation, plus the relevant Brodkorb's (1971) estimation that mean durability of avian species is about 0.5 Ma, were correct, all of the Early Pleistocene birds had to be assigned to extinct species. These would become since that time either extinct or exterminated.

However, considerable doubt was cast on the constancy of evolutionary rates since several decades (e.g. Simpson 1953) and it has been well established since, that they may strongly vary (Eldredge 1976, Gould and Eldredge 1977). Hence, where the morphological and metrical differences between Early Pleistocene avian populations and the modern ones are small enough to fall within the limits of the evolutionary plasticity of modern species of birds (cf. Selander 1971, Vuilleumier 1976, Cracraft 1984), I follow Simpson (1943, 1951) in interpreting these allochronous, but roughly sympatric populations as forming a single (evolutionary) species. It is acknowledged, however, that identifying biological species on the basis of fossil remains is by far not free of conceptual and practical problems (Tintant 1980, Mlíkovský et al. 1985).

As could be expected, extinction rates of genera were markedly lower than those of species. Only one of the avian genera found in the Musil's talus fan became extinct (*Plioperdix*). This is approximately 2% of the genera and 2.6% of MNI. *Plioperdix* was closely related to *Coturnix*, and is known from the Early Pliocene (MN 15) to the early Pleistocene (Q2) of central and eastern Europe and the Near East (Bocheński and Kuročkin 1987, Mlíkovský, this paper), with a single extralimital record at southern lake Baikal (Kuročkin 1985, Bocheński and Kuročkin 1987). The geographical gap between these areas is probably artificial, caused by the absence of suitable Plio-Pleistocene geographically intermediate localities. With reasonable probability it can be expected that *Plioperdix* has not survived the border between the Q2/Q3 biozones, sharing this fate with a variety of other vertebrate and invertebrate taxa (cf. Horáček and Ložek 1988).

Osteological disorders

Only one of the approximately 1600 avian bone fragments from the Musil's talus fan showed a pathological modification. It was cranial part of a right scapula of *Anas clypeata*. It has two small pin-like exostoses on the facies costalis near the tuberculum coracoideum.

The incidence of pathological scapulae is thus approximately 0.8%, that of all avian bones or bone fragments approximately 0.06%. This is markedly less than previously reported for modern (Brandwood et al. 1986) and Late Quaternary (Parmalee 1977, Mlíkovský and Lukáš 1991) birds. The reasons for such a low incidence of osteological disorders in this assemblage are not clear.

Comparison of the sites at Stránská skála

Jánossy (1972) described avian remains from 11 sites of Stránská Skála, most of which were excavated by early researchers (V. Čapek, K. Absolon and J. Knies). Of them, Čapek's sites 5 and 9 and Absolon's 2nd cave yielded considerable amounts of avian remains. These three sites agree with the Musil's talus fan in that they yielded largely a marsh and water avifauna.

However, taxonomic composition of avifaunal assemblages from these sites differs markedly from that from the Musil's talus fan. An important component of all those three avifaunal assemblages were Willow Grouses *Lagopus lagopus*, which are entirely absent from the Musil's talus fan. A major component of the avifaunal assemblage from the Absolon's 2nd cave was the extinct merganser *Mergus connectens*, followed by the Sheldrake *Tadorna tadorna*. In the Musil's talus fan, *Mergus connectens* is represented by a single bone from layer 13, and *Tadorna* is entirely absent. Because the ecological interpretation of the avifaunal assemblages from the three earlier sites and from the Musil's talus fan is very similar, the differences found could have been caused by different taphonomical origin(s) of the assemblages and/or by their different age. Comments on the avian hints to the biostratigraphical position of the taphocenosis from the Musil's talus fan (see above) indicate that taphocenoses in Čapek's sites 5 and 9 and in the Absolon's 2nd cave were accumulated during glacial, or at least periglacial period(s), while the taphocenosis from the Musil's talus fan originated during an interglacial.

List of avian taxa recorded from the Musil's talus fan at Stránská Skála. For each layer, MNI's (sensu Grayson 1984) of individual taxa are given.

Layer	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Sum	%
<i>Podiceps griseigena</i>	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	0.28
<i>Anser</i> sp.	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	0.28
<i>Anas strepera</i>	—	1	3	2	—	1	—	—	—	—	6	1	2	1	17	4.74
<i>Anas querquedula</i>	—	3	6	2	—	3	1	1	1	1	12	1	5	2	38	10.58
<i>Anas clypeata</i>	—	1	2	2	1	2	1	1	1	1	17	1	3	1	34	9.47
<i>Bucephala clangula</i>	—	—	—	—	—	—	—	—	1	—	1	—	2	—	4	1.11
<i>Mergus serrator</i>	—	—	—	—	—	—	—	—	—	—	1	—	1	—	2	0.56
<i>Mergus merganser</i>	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	0.28
<i>Mergus connectens</i>	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	0.28
<i>Accipiter nisus</i>	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	0.28
<i>Falco tinnunculus</i>	—	1	1	1	—	—	—	—	—	—	10	—	4	1	18	5.01
<i>Falco subbuteo</i>	—	—	1	1	—	—	—	—	—	—	1	1	—	—	4	1.11
<i>Falco peregrinus</i>	—	1	—	—	—	1	—	—	1	—	2	1	—	—	6	1.67
<i>Bonasa bonasia</i>	—	—	—	—	—	1	1	—	—	—	1	—	—	—	3	0.84
<i>Tetrao urogallus</i>	—	—	—	—	—	—	—	—	1	—	1	—	—	—	2	0.56
<i>Tetrao tetrix</i>	—	1	4	3	1	3	—	1	2	—	7	1	2	—	25	6.96
<i>Perdix perdix</i>	—	—	1	1	—	—	—	—	—	—	—	—	—	—	2	0.56
<i>Coturnix coturnix</i>	—	1	—	1	—	2	1	1	1	—	5	1	3	1	17	4.74
<i>Plioperdix ponticus</i>	—	—	—	1	—	1	—	—	1	—	2	—	—	—	5	1.39
<i>Plioperdix capeki</i>	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	0.28
<i>Plioperdix subfrancolinus</i>	—	—	—	—	—	—	—	1	—	—	1	—	—	—	1	0.84
<i>Rallus aquaticus</i>	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1	0.28
<i>Porzana</i> sp.	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	0.28
<i>Crex crex</i>	—	—	—	—	—	1	—	—	1	—	2	—	—	—	4	1.11
<i>Gallinula gigantea</i>	—	—	—	—	—	—	—	1	1	—	2	—	—	—	4	1.11
<i>Fulica atra</i>	—	1	1	—	—	—	—	1	—	—	1	—	1	—	5	1.39
<i>Tetrax tetrax</i>	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	0.28
<i>Himantopus himantopus</i>	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1	0.28
<i>Charadrius</i> sp.	—	—	—	1	—	—	—	—	—	—	1	—	—	—	2	0.56
<i>Pluvialis squatarola</i>	1	—	2	—	—	1	—	—	—	—	1	—	—	—	5	1.39
<i>Vanellus vanellus</i>	—	1	1	1	1	1	—	1	1	—	1	—	—	—	8	2.23
<i>Calidris</i> sp.	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1	0.28
<i>Philomachus pugnax</i>	—	1	2	1	—	1	—	—	1	—	—	—	—	—	6	1.67
<i>Lymnocryptes minimus</i>	—	—	—	—	1	—	—	—	—	—	—	1	1	—	3	0.84
<i>Gallinago gallinago</i>	—	1	2	1	—	—	—	—	—	—	2	1	—	—	7	1.95
<i>Gallinago media</i>	—	—	4	1	—	—	—	—	—	—	1	1	1	—	8	2.23
<i>Scolopax rusticola</i>	—	1	1	1	—	1	—	1	1	—	2	—	1	—	9	2.51
<i>Limosa</i> spp.	1	—	2	1	—	2	—	1	1	—	3	—	—	—	11	3.06
<i>Numenius phaeopus</i>	—	—	1	1	—	1	—	—	1	—	1	—	1	—	6	1.67
<i>Tringa</i> spp.	—	2	1	1	—	1	1	—	—	—	1	1	—	—	8	2.23
<i>Larus canus</i>	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1	0.28
<i>Columba palumbus</i>	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	0.28
<i>Cuculus canorus</i>	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1	0.28
<i>Athene noctua</i>	—	—	1	—	—	—	—	—	—	—	1	—	1	—	3	0.84

Layer	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Sum	%
<i>Apus apus</i>	1	1	—	1	—	—	—	—	—	—	1	—	—	—	4	1.11
<i>Picus canus</i>	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	0.28
<i>Dendrocopos major</i>	—	—	—	—	—	—	—	—	—	—	1	—	1	—	2	0.56
<i>Riparia riparia</i>	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1	0.28
<i>Hirundo rustica</i>	—	—	—	—	—	—	—	1	—	—	3	—	—	—	4	1.11
<i>Delichon urbica</i>	—	—	—	1	—	2	1	1	—	—	9	1	1	—	16	4.46
<i>Anthus sp.</i>	—	—	—	1	—	—	—	—	—	—	1	—	—	—	2	0.56
<i>Motacilla sp.</i>	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1	0.28
<i>Turdus sp. (large)</i>	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	0.28
<i>Turdus sp. (medium)</i>	—	—	—	—	—	—	—	—	—	—	2	—	—	—	2	0.56
<i>Acrocephalus sp.</i>	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1	0.28
<i>Garrulus glandarius</i>	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	0.28
<i>Pica pica</i>	—	—	—	—	—	1	—	—	1	—	4	—	1	—	7	1.95
<i>Nucifraga caryocatactes</i>	—	—	—	—	—	—	—	—	—	—	2	—	—	—	2	0.56
<i>Corvus pliocaenus</i>	—	—	—	—	—	—	—	—	—	—	2	—	1	—	3	0.84
<i>Corvus cf. corone</i>	—	—	1	—	—	—	—	—	—	—	2	—	1	—	4	1.11
<i>Corvus moravicus</i>	—	1	—	—	—	—	—	—	—	—	1	—	—	—	2	0.56
<i>Corvus monedula</i>	1	1	—	—	—	1	—	1	—	—	4	—	3	—	11	3.06
<i>Coccothraustes coccothraustes</i>	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1	0.28
Total MNI	5	20	41	27	5	30	6	15	17	3	131	12	39	7	358	100.00

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