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Middle Pleistocene birds of Hundsheim, Austria

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Abstract. Middle Pleistocene karst fissure of Hundsheim, Austria, yielded remains of 36 modern bird species. The avifauna has a boreal character. The birds preferably inhabited mixed forests and dry cold steppes.
Key-words. Aves, middle Pleistocene, Hundsheim, Austria.

INTRODUCTION

Pleistocene birds have been found in many localities of Europe, but most of them are late Pleistocene in age, while the early and middle Pleistocene record remains rather limited (Tyrberg 1998, 2008, Mlíkovský 2002a,b). A significant fossiliferous locality, generally known as Hundsheim in literature, was discovered during the mining activities in the karstic Hainburg Hills between Hainburg, Bad Deutsch-Altenburg and Hundsheim (Wessely 1961) in 1900 (Toula 1901, 1902, 1907, Wüst 1907, Freudenberg 1908, 1914) and subsequently excavated at irregular intervals until 1960. The Hundsheim fissure, which does not exist anymore, was located on southern slopes of Hainburg Hills, NW of Hundsheim, ca. 260 m a.s.l. In addition to other fossils, the fissure of Hundsheim yielded a rich micromammal fauna (Kormos 1937, Rabeder 1972, 1981), which allowed dating the excavated taphocenosis in the earliest middle Pleistocene, particularly in the biozone MQ 2A (sensu Mlíkovský 2002b), which corresponds with the biozone Q 3_1 (sensu Horáček & Ložek 1988), Tarkő substage (sensu Jánossy 1986), or MNQ-zone 22 (sensu Guérin 1982).

The birds from Hundsheim were for the first time mentioned by Freudenberg (1908, 1914; see also Toula 1907). Subsequent excavations (until 1951) yielded more avian remains, which were described by Jánossy (1974). The latter author revised also some of the avian remains formerly mentioned by Freudenberg (1914), but remarked that most of Freudenberg's material has been lost. Later, new avian remains from Hundsheim were collected in 1960 by Peter Ullrich, and a part of the Freudenberg's „lost" material has been rediscovered in the University of Wien. Below I present a revised avifaunal list of Hundsheim, based on the revision of Freudenberg's (1914) and Jánossy's (1974) mater-

ial, and on the original identification of more recently excavated remains. Bird bones described in this paper are deposited in the Department of Paleontology, University of Wien, Wien, Austria (UWPI 1889/51-88).

The sequence of families and species follows Voous (1977). Minimum numbers of individuals (MNI) were calculated according to Grayson (1984). Quaternary stratigraphy follows Mlíkovský (2002b). Measurements were taken according to Driesch (1976).

Museum abbreviations are as follows: JMP = J. Mlíkovský, Praha, Czechia (private collection, to be transferred to the NMP); NMP = National Museum, Praha, Czechia; USNM = United States National Museum, Washington, DC, USA; UWPI = Institute of Paleontology, University of Wien, Wien, Austria.

SYSTEMATIC LIST

Accipitridae

Gyps fulvus (Hablizl, 1783)

Material: proximal end of left humerus, phalanx I digiti 3; MNI = 1.

Remarks: Jánossy (1974) correctly wrote that both these bones are morphologically similar to the same elements of modern *Gyps fulvus* (which is supported by my observations), but inexplicably referred them to the extinct vulture *Gyps melitensis* Lydekker 1890, originally described from the middle Pleistocene of Malta (Lydekker 1890). *Gyps melitensis* seems to have been a Mediterranean species (Sánchez Marco 2007; see also Mlíkovský 2002a), but its records from Central Europe are invalid (Mlíkovský 1998, 2002a).

In addition, Jánossy (1974) attributed to *Gyps melitensis* an ungual phalanx, because he found it similar to the same element of *Gyps fulvus*. This specimen is non-avian in fact, belonging to a large cat, probably *Panthera* sp. (I. Horáček, pers. communication).

Aegypius monachus (Linné, 1766)

Material: proximal end of right radius, proximal end of left tarsometatarsus, phalanx I digiti 1, ungual phalanx; MNI = 1.

Remarks: Jánossy (1974) correctly mentioned that this radius fragment and both phalanges are morphologically similar to the same elements of the modern *Aegypius mochanchus* (which is supported by my observations), but inexplicably attributed them to the extinct vulture *Gyps melitensis* Lydekker, 1890 The tarsometatarsus fragment was believed by Jánossy (1974) to be similar to the same element of *Gyps fulvus*, but it differs from *Gyps* and agrees with *Aegypius* in having: (1) proximal foramen deeply excavated and with proximally sharply bordered groove, (2) tubercle for musculus tibialis antiquus narrow and distinct, (3) groove between the calcaneal ridges of hypotarsus broad, and (4) different position of the outer proximal foramen.

In addition, Jánossy (1974) listed among the material attributed to *Gyps melitensis* a cervical vertebra, said to be similar to the vertebrae of *Gyps fulvus*. I found in his

material two such vertebrae. Both of them are generally similar to the cervical vertebrae of vultures, but differ from them in having posterior end rounded, not V-shaped.

***Accipiter nisus* (Linné, 1758)**

Material: distal end of right ulna; MNI = 1

Remarks: This ulna was not available to Jánossy (1974).

***Aquila* sp.**

Material: ungual phalanx; MNI = 1.

Falconidae

***Falco tinnunculus* Linné, 1758**

Material: distal end of left humerus, distal end of right humerus, distal end of left carpometacarpus, distal end of left tibiotarsus, distal end of right tarsometatarsus; MNI = 1.

***Falco vespertinus* Linné, 1766**

Material: fragmentary right mandibula, 2 distal ends of right tarsometatarsi; MNI = 2.

Remarks: These bones were not available to Jánossy (1974).

Phasianidae

***Bonasa bonasia* (Linné, 1758)**

Material: right humerus, proximal end of right humerus, 2 distal ends of right ulnae; MNI = 2.

Measurements: humerus: maximum length = 49.9 mm, proximal width = 14.3 mm, distal width = 10.5 mm; ulna: distal width = 7.3 mm.

Remarks: Jánossy (1974) attributed these bones to the alleged extinct hazelhen *Tetrastes* [= *Bonasa*] *praebonasia* Jánossy 1974, described by him from the middle Pleistocene (MQ 2A) locality Tarkő (layer 12) in Hungary (Jánossy 1974). However, the latter species was found to be synonymous with the modern *Bonasa bonasia* (Linné, 1758) by Mlíkovský (2002a). The hazelhen bones from Hundsheim are inseparable from the same elements of the modern *Bonasa bonasia*.

***Tetrao tetrix* Linné, 1758**

Material: distal end of right tibiotarsus, proximal end of left tarsometatarsus; MNI = 1.

Remarks: Jánossy (1974) tentatively attributed both these bones to the extinct grouse *Lyrurus* [= *Tetrao*] *partium* Kretzoi 1962, described from the early Pleistocene (MQ 1a) of Betfia 2, Romania (Kretzoi 1962). Similarly as Jánossy (1974), I was not able to find any morphological or mensural differences between the bones from Hundsheim and the same elements of the modern *Tetrao tetrix*. *Lyrurus partium* Kretzoi, 1962 is synonymous with the modern *Tetrao tetrix* (Linné, 1758) (Mlíkovský 2002a).

***Perdix perdix* (Linné, 1758)**

Material: right humerus, distal end of left radius, distal end of left femur, left tarsometatarsus; MNI = 1.

Measurements: humerus: maximum length = 45.5 mm, proximal width = 12.4 mm; radius: distal width = 5.0 mm; tarsometatarsus: maximum length = 40.7 mm, proximal width = 7.0 mm, distal width = 7.6 mm.

***Coturnix coturnix* (Linné, 1758)**

Material: 2 distal ends of left humeri; MNI = 2.

Otididae

***Otis tarda* Linné, 1758**

Material: proximal end of right radius, proximal end of left carpometacarpus; MNI = 1. A proximal part of a tarsometatarsus of this species was figured by Freudenberg (1914, pl. XX, fig. m), but already Jánossy (1974: 223) reported that it is missing from the collection.

Measurements: carpometacarpus: proximal width = 24.0 mm.

Remarks: Jánossy (1974) tentatively attributed these bones to the extinct bustard *Otis lambrechti* Kretzoi 1941, described from the earliest Pleistocene (MQ 1b) of Betfia 5, Romania (Kretzoi 1941). However, the latter species is synonymous with the modern *Otis tarda* Linné, 1758 (Mlíkovský 2002a). I found the *Otis* bones from Hundsheim inseparable from the same elements of the modern *Otis tarda*.

Scolopacidae

***Scolopax rusticola* Linné, 1758**

Material: cranial end of right coracoid; MNI = 1.

Columbidae

***Columba palumbus* Linné, 1758**

Material: distal end of left tarsometatarsus; MNI = 1.

Strigidae

***Glaucidium passerinum* (Linné, 1758)**

Material: left tarsometatarsus; MNI = 1.

***Strix aluco* (Linné, 1758)**

Material: distal end of right carpometacarpus; MNI = 1.

Remarks: Jánossy (1974) attributed this bone to the alleged fossil species *Strix intermedia* Jánossy, 1972, described by him from the middle Pleistocene (MQ 2A) locality Tarkő, Hungary (Jánossy 1972). *Strix intermedia* Jánossy, 1972 was synonymized with the modern *Strix aluco* (Linné, 1758) by Mlíkovský (2002a; see also Mlíkovský 2003).

Apodidae

***Apus apus* (Linné, 1758)**

Material: 2 left coracoids, right humerus, 5 left ulnae, 2 right ulnae, right carpometacarpus, proximal end of right carpometacarpus, distal end of left tibiotarsus; MNI = 5.

Measurements: humerus: maximum length = 12.4 mm.

Remarks: Jánossy (1974) described on the basis of the 13 bones and bone fragments listed above a new subspecies *Apus apus palapus* Jánossy 1974, without selecting a holotype or illustrating any of the bones. Mlíkovský (2002a: 207) designed the humerus UWPI 1889/63 as the lectotype of *Apus apus palapus* and placed *Apus apus palapus* Jánossy, 1974 in the synonymy of the modern *Apus apus* (Linné, 1758). Jánossy (1974) believed that the humerus of *palapus* is more slender than the humeri of the modern *Apus apus*, being of the same length, but having distal width less than is that in modern Swifts. Nevertheless, my examination of the lectotype showed that the humerus is slightly abraded, which diminished its distal width by ca. 0.2-0.3 mm. Taking this into account, the measurements of the lectotypical humerus fall within the cluster of data for the modern *Apus apus* swifts, as presented by Jánossy (1974, fig. 2).

Meropidae

***Merops apiaster* Linné, 1758**

Material: right humerus; MNI = 1.

Measurements: maximum length = 31.1 mm.

Upupidae

***Upupa epops* Linné, 1758**

Material: right coracoid, proximal end of left ulna; MNI = 1.

Remarks: Jánossy (1974) erected on the basis of the coracoid (UWPI 1889/65) a new hoopoe species *Upupa phoeniculides,* particularly because it differed markedly from modern Hoopoes in the shape of the ossified bridge between tuberculum craniale and processus scapularis, which was not smooth and narrow, but ragged and rectangular in the fossil. I examined this character in coracoids of ca. 10 European Hoopoes and could confirm Jánossy‘s (1974) observation. However modern *Upupa epops* from Egypt, Syria, Israel, China, Thailand, Zimbabwe and South Africa (ca. 20 specimens examined in JMP, NMP and USNM) all posses the ossified bridge of the same type as does the fossil from Hundsheim. Hence, the osteological difference, upon which Jánossy (1974) based this species, is attributable to intraspecific variation. *Upupa phoeniculides* Jánossy 1974 was thus synonymized with the modern *Upupa epops* Linné 1758 by Mlíkovský (2002a).

Picidae

***Dendrocopos major* (Linné, 1758)**

Material: distal end of left carpometacarpus, distal end of left tarsometatarsus; MNI = 1.

Remarks: Jánossy (1974) created on the basis of these two bones from Hundsheim, and an almost complete tarsometatarsus from the similarly old locality Tarkő, Hungary, a new subspecies *Dendrocopos major submajor* Jánossy 1974, which he later elevated to a species rank (Jánossy 1980). Mlíkovský (2002a) synonymized *Dendrocopos major submajor* Jánossy, 1974 with the modern *Picoides* [= *Dendrocopos* sensu Voous 1977] *major* (Linné, 1758). The diagnosis of the subspecies was based by Jánossy (1974) on three main points, which are rewritten and discussed below:

(1) The tarsometatarsus from Tarkő is morphologically identical to the same element of *Dendrocopos major*, but is longer (Jánossy 1974: 234). The length of this specimen (not examined by me) is either 24.5 mm (Jánossy 1974: 234) or 24.4 mm (Jánossy 1980: 25, 1981: 382). This by ca. 6 % less than the longest tarsometatarsus of *Dendrocopos major* measured by Jánossy (1981; 26 mm, n = 12). Hence, Jánossy (1981) himself eliminated this character.

(2) The tarsometatarsus fragment from Hundsheim is from an even larger specimen (Jánossy 1974: 234). I examined this fragment, which is not meaningfully measurable, and could not find any differences from the same element of modern *Dendrocopos major*.

(3) The carpometacarpus from Hundsheim has shaft robust as in the modern *Dendrocopos leucotos* Bechstein, 1803, but the relation between the distal width and length of the carpometacarpus falls within the variability of the same element of *Dendrocopos major*. This is inexplicable, because proximal part of the bone (ca. 1.5-2.0 mm) is missing, and measuring the length of the bone is thus impossible. Comparisons of the carpometacarpus from Hundsheim with the same elements of modern *Dendrocopos major* showed that there is no difference between them in size or shape.

Jánossy (1976, 1980) attributed a proximal humerus fragment from Tarkő to *submajor*, showing at the same time, that it does *not* differ from the same element of the modern *Dendrocopos major*, its proximal width being 9.8 mm in the fossil, and 9.7-10.7 mm in Recent specimens (n = 10). In addition, Jánossy (1981) attributed to *submajor* a tarsometatarsus from the early Pleistocene (MQ 1a) of Deutsch-Altenburg, Austria. This tarsometatarsus is inseparable from the same element of the modern *Dendrocopos major* (Mlíkovský 1997).

***Dendrocopos medius* (Linné, 1758)**

Material: left carpometacarpus; MNI = 1.

Hirundinidae

***Hirundo rustica* Linné, 1758**

Material: 10 left and 4 right humeri, proximal ends of one left and 7 right humeri, distal ends of one left and 3 right humeri; MNI = 14. Tentatively referred are 3 coracoids, 15 ulnae, 6 carpometacarpi, 1 ulna, and 1 tarsometatarsus.

Turdidae

***Erithacus rubecula* (Linné, 1758)**

Material: left humerus; MNI = 1.

Remarks: This humerus was not available to Jánossy (1974).

***Luscinia svecica* (Linné, 1758)**

Material: proximal end of right humerus; MNI =1.

Remarks: This humerus was not available to Jánossy (1974).

***Phoenicurus phoenicurus* (Linné, 1758)**

Material: left humerus, anterior part of coracoid (according to Jánossy 1974).

Remarks: Jánossy (1974) assigned to this species left humerus and cranial fragment of coracoid. However, I did not found the tube with these remains in the collection. I was thus not able to check the species identity of these bones and, consequently, I prefer to delete the species from the faunal list of Hundsheim.

***Oenanthe* cf. *oenanthe* (Linné, 1758)**

Material: left humerus; MNI = 1.

Remarks: Several species of the genus *Oenanthe* Vieillot, 1816 of this size class, which cannot be discerned osteologically, live in the southern Palearctic now, but only one of them, *Oenanthe oenanthe*, reaches northern parts of this region (Panov 1974, Hagemeier & Blair 1997, Snow & Perrins 1998).

***Turdus* sp. (large species)**

Material: left humerus, proximal ends of a left and a right humerus, distal ends of one left and 2 right humeri; MNI = 3.

Remarks: These humeri fall in the size class of the modern European species *Turdus viscivorus*/*pilaris*/*torquatus*. Some of them were listed by Jánossy (1974) as „*Turdus* sp. I".

***Turdus* sp. (medium sized species)**

Material: 2 left humeri, proximal end of right humerus, distal ends of 4 right humeri; MNI = 4.

Remarks: These humeri fall in the size class of the modern European species *Turdus merula*/*philomelos*. Some of them were included by Jánossy (1974) in his „*Turdus* sp. I", and some in his „*Turdus* sp. II", which he erroneously believed to be of *Turdus iliacus* size. *Turdus* humeri of the size of *Turdus iliacus* (smaller than "medium sized" species) were not recorded in Hundsheim.

Sylviidae

***Phylloscopus* sp.**

Material: right humerus (broken); MNI = 1.

Muscicapidae

***Muscicapa striata* (Pallas, 1764)**

Material: proximal end of right humerus; MNI = 1.

***Ficedula parva* (Bechstein, 1794)**

Material: mandibula, left humerus; MNI = 1.

Remarks: These bones were not available to Jánossy (1974).

Paridae

***Parus* sp. A**

Material: proximal end of right humerus; MNI = 1.

Remarks: This humerus is smaller than the same element of the modern *Parus major* Linné, 1758 and *Parus lugubris* Temminck, 1820, the largest of western Palearctic tits, but larger than that of all other tits of this region, with the possible exception of Parus cinctus. It cannot be properly identified at the species level. Jánossy (1974) tentatively identified this humerus as that of *Parus major*, which cannot be accepted because of the size difference.

***Parus* sp. B**

Material: proximal end of left humerus; MNI = 1.

Remarks: Jánossy (1974) identified this humerus as belonging to *Parus* cf. *palustris* Linné. However, several species of tit of this size-class inhabit the western Palearctic, that cannot be properly distinguished from each other on the basis of their humeri.

Corvidae

***Garrulus glandarius* (Linné, 1758)**

Material: distal end of left tibiotarsus; MNI = 1.

Remarks: Jánossy (1974) erroneously identified this bone fragment as belonging to *Pica pica*. A left coracoid of a subadult individual, also assigned by Jánossy (1974) to *Pica pica*, cannot be properly identified, but may belong to *Garrulus glandarius* as well.

***Pyrrhocorax graculus* (Linné, 1766)**

Material: sternal end of left coracoid, proximal ends of 2 right humeri, proximal end of right ulna, distal end of left ulna, proximal end of right tarsometatarsus, distal end of left tarsometatarsus; MNI = 2.

Remarks: Some of these bones (coracoid, 2 humeri, and an ulna) were incorrectly assigned by Jánossy (1974) to *Pica pica*, while the remaining were not available to him.

***Pyrrhocorax pyrrhocorax* (Linné, 1758)**

Material: distal end of left tibiotarsus; MNI = 1.

Remarks: This specimen was not available to Jánossy.

***Corvus corax* Linné, 1758**

Material: distal end of right humerus, distal end of right femur, left tarsometatarsus; MNI = 1.

Remarks: These bones were not available to Jánossy (1974).

Fringillidae

***Loxia curvirostra* Linné, 1758**

Material: right humerus; MNI = 1.

Remarks: This humerus was not available to Jánossy (1974).

***Coccothraustes coccothraustes* (Linné, 1758)**

Material: 2 left humeri, proximal end of right humerus; MNI = 2.

Remarks: Jánossy (1974) tentatively identified these humeri as „*Pinicola* sp.“, which is incorrect. See Mlíkovský (1997) for characters distinguishing the humeri of the genera *Coccothraustes* Brisson, 1760 and *Pinicola* Vieillot, 1808.

DISCUSSION

Taxonomy

Jánossy (1974) assigned several postcranial elements of small passerines other than humeri to the genera or even species, which seems unsubstantiated, because these bones cannot be properly identified at those levels. Due to this, I delete from the avifaunal list of Hundsheim the following species listed by Jánossy (1974): *Alauda arvensis* (based on a coracoid), *Anthus cervinus* (based on a complete and a partial tarsometatarsus), and *Motacilla* sp. (based on a partial coracoid).

Taphonomy

Most of the avian remains (60 % of species, and 39 % MNI) found in Hundsheim belong to small forest species. They were probably brought to the site by a medium-sized owl. Such an owl, *Strix aluco*, was recorded from the locality and it is a good candidate for the predator responsible for the accumulation of this part of the assemblage of avian bones found in Hundsheim. Further recorded species, particularly *Gyps fulvus, Aegypius monachus, Falco* spp.*, Apus apus, Hirundo rustica, Pyrrhocorax* spp., *Corvus corax,* and presumably also *Aquila* sp. (28 % of species, and 48 % MNI) are cliff breeders, and their remains found in the Hundsheim fissure thus possibly originated from naturally deceased individuals. The Hundsheim fissure is known to have functioned as a trap of large mammals (Daxner 1968). Their bodies could have attracted avian scavengers, particularly

Table. 1. Middle Pleistocene birds of Hundsheim.

Species	Nr. of bones	MNI	% MNI
Gyps fulvus	2	1	1.6
Aegypius monachus	3	1	1.6
Accipiter nisus	1	1	1.6
Aquila sp.	1	1	1.6
Falco tinnunculus	5	2	3.1
Falco vespertinus	3	2	3.1
Bonasa bonasia	4	1	1.6
Tetrao tetrix	2	1	1.6
Perdix perdix	4	2	3.1
Coturnix coturnix	2	1	1.6
Otis tarda	2	1	1.6
Scolopax rusticola	1	1	1.6
Columba palumbus	1	1	1.6
Glaucidium passerinum	1	1	1.6
Strix aluco	1	1	1.6
Apus apus	13	5	7.8
Merops apiaster	1	1	1.6
Upupa epops	2	1	1.6
Dendrocopos major	2	1	1.6
Dendrocopos medius	1	1	1.6
Hirundo rustica	52	14	21.9
Erithacus rubecula	1	1	1.6
Luscinia svecica	1	1	1.6
Oenanthe cf. *oenanthe*	1	1	1.6
Turdus sp. (large species)	6	3	4.7
Turdus sp. (medium sized species)	7	4	6.3
Phylloscopus sp.	1	1	1.6
Muscicapa striata	1	1	1.6
Ficedula parva	2	1	1.6
Parus sp. A	1	1	1.6
Parus sp. B	1	1	1.6
Garrulus glandarius	1	1	1.6
Pyrrhocorax graculus	7	2	3.1
Pyrrhocorax pyrrhocorax	1	1	1.6
Corvus corax	3	1	1.6
Loxia curvirostra	1	1	1.6
Coccothraustes coccothraustes	3	2	3.1
36 species	**142**	**64**	**100**

Gyps fulvus, Aegypius monachus and *Corvus corax*. The remaining species could have been brought to the site by avian scavengers or mammalian predators. This applies particularly to the remains of the large *Otis tarda*. It should be noted that none of the bones found in Hundsheim showed any signs of osteological disorders.

Ecology

Ecologically diagnostic birds from Hundsheim fall into two basic groups. The larger group (60 % of species, and 44 % MNI) consists of species that inhabit mixed forests. Further species, particularly *Falco vespertinus, Otis tarda, Merops apiaster, Upupa epops*, and *Oenanthe oenanthe* (14 % of species, and 11 % MNI) are inhabitants of open, dry steppes. It is noteworthy, that all these species belong to the few steppe inhabitants, that currently reach high latitudes in the western Palearctic and are thus cold-tolerant. In general, the avifauna from Hundsheim is of the boreal type. Hypothetically, the Hainburg Hills were covered by mixed forests, and surrounded by dry steppes during glacial cycle G sensu Kukla (1975, 1977, 1978), i.e. biozone Q 3_1, to which the Hundsheim locality was assigned by Horáček & Ložek (1988). There is no indication in the avian assemblage from Hundsheim that tundra was present in the region of the Hainburg Hills at that time.

Zoogeography

All bird species found in Hundsheim still inhabit Central Europe (e.g. Hagemeier & Blair 1997, Snow & Perrins 1998). Considering the current distribution of modern bird species found in Hundsheim, it is notable that some of them (e.g. *Pyrrhocorax* spp., *Gyps fulvus, Aegypius monachus*) reach northern border of their distribution in European Alps, while others (e.g. *Glaucidium passerinum*) reach their southern border of distribution there. This observation may indicate that the region of the Alps in Central Europe was a place where boreal and Mediterranean avifaunal elements were in contact already in the earliest middle Pleistocene (cf. Mlíkovský 2002b).

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Appendix.Lists of avian species from Hundsheim according to previous authors

Freudenberg (1907): *Astur palumbarius*, *Tetrao tetrix*, *Hirundo* sp., *Turdus* sp.

Freudenberg (1914): *Ardea cinerea*, *Astur palumbarius*, *Perdix perdix*, *Tetrao tetrix*, *Hirundo* sp., *Turdus* sp.

Jánossy (1974): *Gyps melitensis*, *Aquila* sp., *Falco tinnunculus atavus*, *Tetrastes praebonasia*, *Lyrurus* cf. *partium*, *Perdix* cf. *perdix*, *Coturnix* cf. *coturnix*, *Otis* cf. *lambrechti*,

Scolopax cf. *rusticola*, *Columba* cf. *palumbus*, *Strix intermedia*, *Glaucidium* cf. *passerinum*, *Apus apus palapus*, *Merops* cf. *apiaster*, *Upupa phoeniculides*, *Dendrocopos major submajor*, *Dendrocopos* cf. *medius*, *Alauda* cf. *arvensis*, *Hirundo* cf. *rustica*, *Pica pica major*, *Pyrrhocorax* cf. *graculus*, *Parus* cf. *major*, *Parus* cf. *palustris*, *Turdus* sp. I (size of *pilaris-viscivorus*), Turdus sp. II (size of *iliacus*), *Phoenicurus* cf. *phoenicurus*, *Oenanthe* cf. *oenanthe*, *Motacilla* sp., *Anthus* cf. *cervinus*, *Phylloscopus* sp., *Muscicapa* sp., cf. *Pinicola* sp.