PLIO-PLEISTOCENE BIRD REMAINS FROM THE CARPATHIAN BASIN. V. PODICIPEDIFORMES, CICONIIFORMES, OTIDIFORMES, COLUMBIFORMES, PICIFORMES

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Arriving at the end of the revision of the hitherto discussed fossil bird remains of Pliocene and Pleistocene in our territory, we may discuss yet five orders which are represented with sporadic remains (former papers of this series: JÁNOSSY 1976a, 1976b, 1977, 1978).

I am trying now to finish the first attempt of sketching of this subject, although it seems clear to me right at the outset that it will need a lot of supplements and corrections. However, even this rough picture given of it represents a very important step in the knowledge of the origine of the ornithofauna of the Carpathian Basin and also of that of the temperate part of the whole of Europe. A short summary of the whole subject follows at the end of this paper.

Description of paleospecies

Order: *Podicipediformes*
Family: *Podicipedidae*
Genus: *Podiceps* Latham, 1787
Podiceps aff. nigricollis Linné 1758

Material: Loc. Villány—Nagyharsányhegy; leg. T. KORMOS, Lower Pleistocene, Villanyian age: Coracoideum.

This piece figures among the few remains, determined by LAMBRECHT (1916) from the so-called „Praeglacial" of the Villány Mountains. He indetified it as *„Colymbus" nigricollis*.

I compared the bone with the same anatomical unite of the species *Podiceps nigricollis* (2 exemplars) and *P. auritus* (1 ex.) of the same size category. The result of this investigation yielded the following result: the size agrees with that of the smaller specimen of *nigricollis*, the broadening of the acromion agrees more with that of *auritus*. It seems to be very probable that we have an extinct form before us, although the small number of comparative material as well as the slight differences did not make it possible for me to confirm this supposition. To make comparisons easier in the future there appear in Table 3. the comparative measurements of the coracoids of fossil and recent grebes as follows: a) length from the apex medialis to the acrocoracoid; b) width of the facies articularis caudalis (from the apex medialis to the proc. lateralis posterior).

Order: *Ciconiiformes*
Family: *Ciconiidae*
Genus: *Pelargosteon* Kretzoi, 1961
Pelargosteon tothi Kretzoi, 1961

Material: Loc. Püspökfürdő (Betfia) 2. Lower Pleistocene, Betfia Phase: distal fragment of left Ulna; dist. two-thirds of the phalanx 1 digiti 3.

Loc. Budapest—Várhegy, Fortuna street 25, Lower Layer; Coll.: D. JÁNOSSY, 1959; Middle Pleistocene, Upper Biharian, Tarkő-Phase: distal two-thirds of phalanx 1. digiti 2.

KRETZOI described (1961) a Ciconiiform relegated systematically between the storks in strickter sense and marabous. Later these remains were illustrated by JURCSÁK and KESSLER (1973) by (not quite clear) photos too.

The few fragments, enumerated above, are only convenient for the establishing of the fact that we have the remains of a stork before us, metrically nearer to a *Ciconia*, although morphologically rather to a marabou. Moreover it seems to be important to mention on this place that the distal epiphysis of the ulna do not possess a foramen pneumaticum found within the marabou *(Leptoptilus)* while it is untraceable with the *Ciconia*. The measurements of both the ulna and phalanges do not exceed the plusvariants of *Ciconia ciconia*, only the robustness of the diaphyses appearing to be more considerable. The distal width of the trochlea of the epiphysis of phalanx 1 digiti 3 measures 5.8 mm; in *Ciconia nigra* 4.5—5.4 mm (n = 4); in *C. ciconia* 5.0—5.7 mm (n = 5); in *Ephippiorhynchus senegalensis* 6.6 mm (n = 1). From the other two fragments one cannot take exact measurements although they are in the same size category.

The similar remains in the material of Voigtstedt near Weimar speak for a wide distribution of this form within temperate Europe during the Lower-Middle Pleistocene (JÁNOSSY, 1965).

Table 3.
3. táblázat

Measurements of the Coracoideum of fossil and recent Grebes
Fosszilis és recens vöcskök hollóorrcsontjának méretei

	Length* Hosszúság	Proximal width** Proximális szélesség
Villány – Nagyharsányhegy, fossil	26,0	9,5
Podiceps nigricollis 1	28,4	11,0
Podiceps nigricollis 59.8.11	27,8	10,8
Podiceps auritus 18872	28,6	11,6

* From the Crista articularis sternalis to the acromion
** Width of the Crista art. sternalis (without the Proc. lateralis)

Order: *Otidiformes*
Suborder: *Otides*
Family: *Otidae*
Genus: *Otis* Linné, 1758
Otis lambrechti Kretzoi, 1941

Material: Loc. Villány—Kalkberg (Villány 3); coll. T. Kormos; age: Lower Pleistocene, Upper Villanyian: (sp.?) dist. fragm. of Tibiotarsus.

Loc. Püspökfürdő (Betfia) 3 (?!); coll. T. Kormos (?); (age?): diaphysis of Tarsometatarsus.

Loc. Betfia (Püspökfürdő) 5.; coll. M. Kretzoi, 1941; age: Uppermost Lower Pleistocene, Betfia Phase: two middle (mt_3) trochleae of the Tarsometatarsus, phalanx 1. digiti 4 pedis.

Loc. Nagyharsányhegy 3.; coll. D. Jánossy, 1975; age the same: fragm. of a Quadratum.

Loc. Osztramos 2., coll. D. Jánossy, 1969; age the same: phalanx 1 digiti 4 pedis.

The bustards stand osteologically so isolated among birds that there is no doubt about the generical determination. The considerable sexual dimorphism is very conspicuous and is like that in the recent species: the Villány- and Osztramos 2-materials, according to their measurements, originate from hens, the Püspökfürdő—Betfia and Nagyharsány-hegy remains, however, from cocks. [In the Middle Pleistocene Material of Hundsheim (Austria) I found the bones of a cock and a hen together; see Jánossy, 1974] (measurements see table 4—5.).

Table 4.
4. táblázat

Measurements of the phalanx 1., digiti 4. of fossil and recent Bustards
Fosszilis és recens túzokok újjperecének (phalanx 1., digiti 4.) méretei

	Length Hosszúság	Distal width Disztális szélesség
Ostramos 2. Lower Middle Pleistocene	16,0	5,4
Betfia 5. Lower Middle Pleistocene	23,0	7,2
Budapest – Hilton, Upper Middle Pleistocene	20,5	7,4
Otis tarda, recent ♂ No. 1	23,0	7,0
O. tarda, recent ♂ C. 64.1	22,0	6,7
O. tarda, recent ♀ 1976	16,2	5,4
O. tarda, recent ♀ 58,42	17,0	5,0

The taxonomical independence was shown at first by the proportions, different from the recent tarsometatarsus (Kretzoi, 1941). The massivness of the middle trochleae speak rather for an animal with the stronger feet in average, that observed with the recent species (measurements see table 6.).

Table 5
5. táblázat

Measurements of the distal epiphysis of the tibiotarsus of fossil and recent Bustards
Fosszilis és recens túzokok sípcsontja (tibiotarsus) disztális végének méretei

	Distal width Díszt. szélesség	Thickness A díszt. szélesség of the inner belső és trochlea of distal epiphysis trochlea-jának vastagsága	outer külső
Villány – Kalkberg, Lower Pleistocene	15.5	16.8	15.8
Otis tarda ♀, subfossil*	16.0	–	16.2
Otis tarda, recent „72" ♀	17.8	19.0	16.7
O. tarda, recent C.58.42 ♀	15.5	18.2	16.5
O. tarda, recent „1978" ♀	16.7	19.2	17.0
O. tarda ♂, subfossil 1*	21.0	25.0	21.0
O. tarda ♂, subfossil 1, 54.3.823**	18.8	22.4	19.6
O. tarda ♂, recent No. 1	19.8	23.4	20.3
O. tarda ♂, recent C.6H. 1	21.0	24.4	22.0

* From the Neolithic Site near Kermanshah
** Middle Age: Turkeve – Móric, 15—16th Century

The distal end of tibiotarsus in the Villáby-material spreads out rather more than with the recent material. This fragment is in any case not convenient for deciding the problem, whether this geologically considerably older form does in fact differ from the *Otis lambrechti* or not.

Table 6.
6. táblázat

Measurements of the middle trochleae of the Tarsometatarsi of fossil and recent Bustards (width of the middle trochlea of Tarsometatarsus)
Fosszilis és recens túzokok lábközépcsontja (tarsometatarsus) középső trochleájának szélessége

Betfia 5., fossil specimen 1.	10.7
Betfia 5., fossil specimen 2.	10.0
Otis tarda ♂, recent No.1	10.4
O. tarda ♂, recent C.64.1	9.9
O. tarda ♀, recent 58.42	7.4
O. tarda ♀, recent 76	7.6
O. tarda ♀, recent „1978" 12.10	7.4

Otis tarda — group

Material: Loc. Budapest—Várhegy—Hilton; coll. E. KROLOPP, 1974; age: Late Middle Pleistocene, Castellum-Phase: cranical fragm. of the Scapula, phal. 2 digiti 2 alae (anterior), prox. fragm. of Tarsometatarsus, phalanx 1 digiti 4 pedis (posterior). I am dealing in this place therefore with this modest material because according to the measurements (see table 4.) the phalanx 1 digiti 4 differs by its stouter and shorter form more from the recent material, than from the Lower Pleistocene finds. If it is proved later in the future that this originates not from an aberrant individual, we shall have to come to the conclusion that the Middle Pleistocene bustads possessed feet with shorter digits.

Otis kalmani Jánossy, 1972

Material: Loc. Püspökfürdő (Betfia) 2.; coll. T. KORMOS; Uppermost Lower Pleistocene, Betfia-Phase: three fragm. of Coracoidei (among them the most complete is the left one, Inv. Nr. Ob 4845, the type of the species); two dist. fr. of Tibiotarsi.

Loc. Villány—Nagyharsányhegy; coll. T. KORMOS; age: Lower Pleistocene, Upper Villanyian: (broken) dist. fragm. of Tarsometatarsus, phalanx 1 digiti 3 pedis (posterior).

The systematical position of the cervical vertebra, determined by W. ČAPEK on the basis of comparative material of *Otis tarda* as *Otis tetrax* seems to be uncertain.

I gave a detailed description and comparisons with different recent species in the course of the description of the new form (JÁNOSSY, 1972). I do not wish to repeat it at this place. However, the same problem has to be mentioned as with at the former species: the taxonomical position of the older (Villanyian) material must remain an open question. The phalanx 1. digiti 3 is in this material in any case considerably slender than it is with the recent species: the length/distal width measuring 15/3.4 mm by contrast with 13.2/3.7 mm with the latter one.

Otis tetrax — group

Material: Loc. Budapest—Várhegy—Hilton; coll. E. KROLOPP, 1974; age: Late Middle Pleistocene, Castellum-Phase: ulnare, phalanx 1. digiti 2 pedis, phal. 1 dig. 4 pedis and dist. fragm. of the same of a semiad. specimen, phalanx 4 digiti 4 pedis.

Just as I did in the case of the large bustard from the same locality I am now going to give the list of the remains of the small species at this place and not in the „list of neospecies", because the proportions of phalanges are likewise aberrant. The length/distal width of phal. 1 dig. 2 pedis in the fossil form measures 10.8/2.6 mm, in the recent one 11.0/2.4 mm. The same measurements are at the phalanx 1. digiti 4 pedis 9.3/3.0 mm, by contrast with 9.0/2.7 mm in the recent one.

Order: *Columbiformes*
Family: *Columbidae*
Genus: *Columba* Linné, 1758
Columba aff. palumbus Linné, 1758

Material: Loc. Villány—Nagyharsányhegy; coll. T. KORMOS age: Lower Pleistocene, Upper Villányian: dist. fragm. of Humerus.

The bone-fragment, with its distal width of 12.4 mm, shows in its condyles seemingly very insignificant differences from the recent comparative material, the systematical value of which will come to light in the future. It is only convenient for establishing the presence of this large pigeon — at present confined to Europe — as early as in the Lower Pleistocene in our territory.

Order: *Piciformes*
Suborder: *Pici*
Family: *Picidae*
Genus: *Picus* Linné, 1758
Picus aff. viridis Linné, 1758

Material: Loc. Rockshelter Tarkő, Layer 4; coll. D. JÁNOSSY, 1960; age: Lower Middle Pleistocene, Tarkő-Phase; pygostyl; Loc. Villány—Somssichhegy 2; Layer 5; coll. D. JÁNOSSY, 1978; age: nearly the same (geologically somewhat older): phalanx 1 dig. 2 anterior and posterior.

As it is well known, what constitutes the most important „climbing-organ" of woodpeckers i. e. the tail and consequently its supporting point, the pygostyl, anatomically very specialized. The same stands for the anterior and posterior phalanges too. Our remains agree, from among the European forms by their size with the bone of the green woodpecker *(Picus viridis)*.

These fossils are from zoogeographical and phylogenetical points of view very important, supplying the first proof of the presence of the ancestor of this specifically European Piciform in the Uppermost Lower Pleistocene viz. Lowest Middle Pleistocene of our continent (see JÁNOSSY, 1976). The remains from Tarkő and Villány together show that this form was widespread in the whole Carpathian Basin at that time.

Genus: *Dendrocopos* Koch, 1816
Dendrocopos submajor Jánossy, 1974

Material: Loc. Rockshelter Tarkő; Layer 4 (data as above) proximal fragm. of the Humerus. Layer 11: proximally broken Tarsometatarsus.

As it was analized in detail in previous papers (JÁNOSSY, 1974, 1976) our remains stand morphologically as well as metrically nearest to the bones of the Great Spotted Woodpecker *(Dendrocopos major)*, although very pronounced allometrical differences exist. These differences are proved chiefly by contemporaneous or nearly contemporaneous material seen by the author abroad which are older also geologically than the Hungarian remains (Austria, France), which fact speaks for the specific rank of this taxon, former described as a subspecies.

In the material listed above, the fragment of the humerus stands very near to that of the recent species mentioned. Its proximal width measures 9.8 mm. The same measurement is found with the recent *Dendrocopos major* 9.7—10.7 mm (n = 10), in *D. syriacus* 9.8—10.0 mm (n = 3, with a considerably slender diaphysis); *D. medius* 8.9 mm (n = 2); *D. leucotos:* 10.9—11.8 mm (n = 3); *Picoides tridactylus:* 10.0 mm (n = 2, which is morphologically different).

More important are the dimensions of the Tarsometatarsus, the robustness of which differs absolutely from all European species enumerated above. The length of the fossil remain measures 24.4 mm, the width of the diaphysis at the middle 1.8 mm. Such a robustness cannot be observed either with the *D. major* (at the plus-variant of the collection; length: 26.0 mm, width of the diaphysis 1.7 mm), or with the *D. leucotos* (length 32.4 mm, width of diaph. 1.6 mm). These measurements speak in themselves for an absolute allometrical difference between the recent and the fossil species.

Dendrocopos praemedius Jánossy, 1974

Material: Loc. Villány—Kalkberg (Villány 3); coll. T. Kormos; age: Lower Pleistocene, Villanyian stage: right complete Carpometacarpus.

To avoid unnecessary repetitions I may allude to the detailed description of the species and the comparison with related forms (Jánossy, 1974).

Dendrocopos cf. medius Linné

Material: Loc. Püspökfürdő (Betfia) 2; coll. T. Kormos; age: Uppermost Lower Pleistocene, Betfia-Phase: ventral fragm. of a Coracoid, dist. fr. of Humerus, Ungual Phalanx (det.: W. Čapek, Brno).

I did not find any difference in size or morphology from the recent material.

Genus: *Jynx* Linné, 1758
Jynx cf. torquilla Linné, 1758

Material: Loc. Püspökfürdő (Betfia) 2; coll. T. Kormos; age: Uppermost Lower Pleistocene, Betfia-Phase: proximally and distally broken Tarsometatarsus (det.: W. Čapek, Brno).

Comparing the fragment with my recent comparative material I find that the generic relegation seems to be unambiguous due to the traces of coossificated mt_1 and the whole shape of the bone differing from typical woodpeckers. However the tarsometatarsus seems to be somewhat shorter and robuster than with the recent piece and we can suppose, therefore, some allometrical differences between them. To prove the correctness of this supposition we shall need, of course, more material both fossil and recent.

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List of neospecies of the members of orders not discussed in previous papers of this Series

Remains not included in the lists by Lambrecht, 1933 and Brodkorb, 1964–71. Holocene remains not noted otherwise: Bökönyi—Jánossy, 1965; Pleistocene remains without citations: Collection of the Natural History Museum, Budapest.

Gaviiformes
Gavia arctica Linné

Holocene, Neolithic: Kőtelek (unpublished).

Podicipediformes
Podiceps ruficollis Pallas

Holocene, Neolithic: Maroslele—Pana.

Podiceps cristatus Linné

Holocene, Neolithic: Maroslele—Pana; Middle Age, 15—17. Century: Gyula, Vár.

Pelecaniformes
Pelecanus cf. onocrotalus Linné

Holocene, Neolithic: Maroslele – Pana; Bronze Age: Békés—Városerdő and peatbog of Zalaszentistván.

Phalacrocorax carbo Linné

Holocene, Bronze Age: Tiszalúc—Dankadomb.

Ciconiiformes
Ardea cinerea Linné

Holocene, Neolithic: Maroslele—Pana.

Ardea cf. purpurea Linné

Holocene, Neolithic: Polgár—Csőszhalom.

Egretta alba Linné

Holocene, Neolithic: Maroslele—Pana; Middle Age: Esztergom—Alsósziget.

Ciconia ciconia Linné

„Holocene" Lambrecht Cave
Holocene, Roman Age: Tác—Fövénypuszta; — Middle Age, 15—16. Century: Turkeve—Móricz.

Ciconia cf. nigra Linné

Holocene, Early Neolithic: Szajol—Felsőföld (unpublished). — Bronze Age: Tiszalúc—Dankadomb.

Otidiformes
Otis tarda Linné

Besides the above described Middle Pleistocene remains: Budapest—Várhegy—Hilton.
Prewurmian: Lambrecht Cave, Layers IV. and V.
Holocene, Neolithic: Szajol—Felsőföld (unpublished); Nósza—Gyöngypart near Ludas—Puszta (=Ludos), Palic—Subotica, Jugoslawia (KRETZOI, 1962). — Bronze Age: Tószeg—Laposhalom; Nitriansky Hrádok = Kisvárad, Érsekújvár (Nové Zámky, ČSSR, AMBROŠ, 1957); Middle Age: 15—16. Century: Turkeve—Móricz.

Otis tetrax Linné

Besides the above described Middle Pleistocene remains: Budapest—Várhegy—Hilton.
Lower Würmian: Subalyuk
Holocene, Roman Age: Tác—Fövénypuszta.

Columbiformes
Columba cf. oenas Linné

? Middle Würmian: Rockshelter of Hollókő (Bükk Mountains).

Columba palumbus Linné

Lower Würmian: Lambrecht Cave, Layer V.
Upper Würmian: Baits Cave, Jankovich Cave, Szelim Cave Layer B.
Holocene: Petényi Cave Layers H_2 and Hallstadt; Rockshelter Uppony; — Roman Age: Tác—Fövénypuszta; — Middle Age, 14—17. Century: Visegrád—Palota and Alsóvár.

Coraciiformes
Upupa epops Linné

Holocene, 17—18. Century: Visegrád—Alsóvár.

Piciformes
Picus viridis Linné

Holocene: Lambrecht Cave.

Picus canus Linné

Lower Würmian: Lambrecht Cave, Layer V.
Upper Würmian: Petényi Cave, Layer P_1.

Dendrocopos major Linné

Middle Würmian: Istállóskő Cave, Lower Layer.
Upper Würmian: Szelim Cave, Layer B; Petényi Cave Layer P_1; Jankovich-Cave.
Holocene: Rockshelter Rejtek, Layer 10; Lambrecht Cave.

Dendrocopos leucotos Bechstein

Holocene: Petényi Cave Layer H_4.

Conclusions (to part I – V.)

Thumbing in the ornithological literature, we find a puzzling series of different works which have been dealing with the origine of the European avifauna, hitherto only nearly on a speculative basis, extrapolated chiefly from the recent distributional relations. A fundamental importace has been contributed within this series to the theories of „refuges" which are located in the southeastern and southwestern parts of Europe or Southern Asia. Especially the Carpathian Basin has been discussed as a refuge (NAGY, 1926; SALOMONSEN, 1930; STEGMANN, 1932; STEINBACHER, 1948; MOREAU, 1954; FARKAS, 1967; DE LATTIN, 1967 etc.).

The fundamental mistake in all these hypotheses, — as the later investigations chiefly in this series of papers have proved, has been the neglecting of the evolutionary conception. Even these days we can met with the over-simplification of the Pleistocene itself and the over-estimation of the longevity of species. As we could establish during the elaboration of the fossil bird material of the Carpathian Basin, most of the recent species originate from the (perhaps later) Middle Pleistocene and even from the Upper Pleistocene as well.

In this respect the refuge-hypothesis makes sense especially in some cases in the Upper Pleistocene. A species which had withdrawn to Southern territories returns in several cases to the North as an evolved new form or, in other cases, it does not return to the North at all! Otherwise the ecological demands of the osteologically seemingly same form may change in time. „Boreal" forms were living in the Lower Pleistocene together with „mediterranean" ones and the relations change from species to species. The evolution of birds is just as an immense network as that of the mammals. Last but not least the „Pleistocene" was a much longer period than it had been estimated before and the changes of glacials and interglacials are similarly much more tinged than they were thought earlier. The influence of regional and local tectonical movements also play a considerable role in these events, a fact that was former overlooked.

We have to consider the origine of the ornithofauna of Europe from this point of view.

Summarizing our up-to-date knowledge in this subject consciously disregarding any glacial theories, which may change from year to year anyway, — which summary is built only on the fine stratigraphy, based on the evolution of life, we can tell the following:

The avifauna of our continent has grown gradually in keeping with emp-overishment of the Tertiary assemblage and with the enrichment of today's northern Asiatic, later boreal elements. This was by no means a mechanical alternation of „cold" and „warm", glacial and interglacial faunas!

During the Lower-Middle Pliocene are just as with the mammal-fauna some Indomalayan — Oriental relations can be observed. The best indicators of these transitional periods are the Galliforms. In the Lower Pliocene times the members of the whole extinct genus *Palaeortyx* were predominant — with only some relations to recent Indomalayan chickenlike forms — accompanied in the South and South-East of our Continent by the members of *Gallus*. Other Oriental-Ethiopical elements, as the Eurylaimidae (BALLMANN, 1969) or Turdoididae (see in part IV. of this Series) support this picture.

The main sketch of the recent European avifauna was ready as early as in the Upper Pliocene.

The first invaders of northern Eurasia were the Tetraonids of the Eurasian type of the Tetrao-Group in the Upper Pliocene. The European type of francolins *(Lambrechtia)* originated—according to our recent knowledge—seemingly from an evolutional side branch of the *Palaeortyx* group.

A typical example for the „collision" of „tropical-mediterranean" Tertiary relicts with the first „glacial" elements, regarded as invaders from the North-East is represented by the Lowest Pleistocene bird fauna from Rebielice, Poland: the first group represents two species of the Francolinus *(Lambrechtia)* and a recently mediterranean-oriental-ethiopian raptor *(Hieraetus sp.)*, the relatives of which were present in the European Tertiary too. The second ones are the ptarmigans *(Lagopus sp.)* and some other later „northern" forms (as *Asio „flammeus"* etc.). The first intrusion of these arctic elements into the bird fauna from the east as far west as the recent territory of France, may be observed *(Lagopus)* together with Lemmus, Les Valerots. Contemporaneously, the complex nature of the problem is best shown by the fact, that some forms known later as typical „northern" taiga forms are present with extinct forerunners in a paradox form in the Submediterranean area in the Upper Pliocene viz. Lower Pleistocene of the Southeast of our Continent (*Aegolius*, *Glaucidium*, *Surnia*, *Tetrao macropus* and *conjugens*, perhaps some Passeriforms in Southern Hungary, Mountains Villány).

The Tertiary relicts persist well into the Middle Pleistocene (not only *Francolinus*, but *Merops*, *Upupa*, *Coracias* etc.) in the temperate-submediterranean territory of Europe and they vanish only with the next larger cold continental wave in Europe at the threshold of the Middle Pleistocene. The next observable intrusion of boreal and continental forest-forms up to the recent French territory moreover as far as the Pyrenees (the *Lagopus* as mentioned above in Les Valerots and *Tetrastes praebonasia* in Montoussé 3, determinations of the author, see also CLOT—CHALINE—CHAUVIRÉ etc. 1976) took place in the lower part of the Middle Pleistocene.

Fresh investigations have shown that there were mostly now extinct forms present at that time (perhaps common ancestors of recent species, as *Mergus connectens* → *M. merganser* and *serrator*, *Strix intermedia* → *Str. aluco* and *uralensis*, *Lagopus atavus* → *L. lagopus* and *mutus;* perhaps the common ancestor of *Asio flammeus* and *otus* etc.).

We have hitherto have only few allusions to the splitting of two recent forms (twin species, „Zwillinge") that seem to have taken place earlier than the Middle Pleistocene (e. g. *Picus canus* in Stranská Skála and *Picus viridis* geologically contemporaneously in Tarkő, and Villány—Somssich-Hill, Northern and Southern Hungary).

As we have seen, we have only one actual date about the geological age of isolation of boreal and alpine forms: the first appearence of *Lagopus mutus* in the late Middle Pleistocene, geologically contemporaneously in Germany (Hunas) and also in Hungary (Süttő 6). Other species with disjunct areas, as *Charadrius morinellus* were present with ancient (presumably extinct) forms from the Lowest and Middle Pleistocene — in the recently temperate Europe (Rebielice, Stránská Skála), but the alpine and boreal forms do not differ osteologically. Some clearly extinct forms in the uppermost Middle or lower Upper Pleistocene (e. g. *Falco atavus* Chauviré, La Fage „Riss", or *Gyps*

melitensis Lydekker, Lambrecht Cave) speak for a very late splitting of some of the recent species.

We have hitherto very few data about the Lower Middle Pleistocene bird faunas of the Mediterranean. Beside the Ghar Dalam material of Malta known to us nearly a century now (LYDEKKER, 1890), a new and unambiguously Middle Pleistocene bird fauna from Petralona, Greece, has become known (KRETZOI, 1977) which among banal forms the ancient form of the recent members of *Hieraetus* and *Alectoris* contains Tertiary relicts, which after the Lowest Pleistocene (*Hieraetus*, Ręblelice) during the Pleistocene never reached the recently temperate Europe. The evolutionary trends were, therefore, the same in the Mediterranean as in our regions during the adequate time span. We have hitherto no data, suggesting that these forms would left their „refuges" during any interglacials.

The new revision shed some fresh light upon the changes of the bird faunas of the Upper Pleistocene of Europe. This is connected chiefly with the stratigraphy of this period becoming ever finer.

On the threshold of the Last (Würm) Glaciation the bird fauna was characterised by a richer material of birds of prey that at any time later (Lambrecht- and Subalyuk Caves in Hungary, Pestera Curata in Rumania). Among this Falconiformes are some really „southern" forms, e. g. *Pernis apivorus*, a prey specialist (insect eater), which after the Würm returned to our territory again (the earliest forms of the Honey Buzzard, this osteologically very specialized bird are known from the sporadic finds of the Middle Pleistocene of the Stránská Skála, JÁNOSSY, 1972). Moreover, the redetermined bone of the Imperial Eagle *(Aquila heliaca)* from Cotêncher (unpublished, revision of the author) gives a nice proof of the wide distribution of this form in the whole of Europe at that time and explains the disjunct area of the relict Spanish subspecies of today. Finally, we may register one (of the) intrusion(s) of the Great Bustard to Western Europe in the Upper Middle Pleistocene too (with the finds of Budapest—Hilton, Hunas and La Fage).

However, the conditions to be observed at the assestment of the relations are very individual, e. g. the Tertiary relict form. *Strix intermedia* was present at the threshold of the Middle Pleistocene both in the Mediterranean (Southern France, Saint Estéve Janson, CHAUVIRÉ, 1975) and in the recently temperate Europe (Stránská Skála, Tarkő, Hundsheim, JÁNOSSY, 1977), although one of its descendants, — *Strix aluco*, was, — according to our up-to-date knowledge, — quite confined up to the Holocene to the Mediterranean (BOULE, 1919; CHAUVIRÉ, 1975; MALEZ, 1975), and reached only after the Last Glaciation (Würm) as North as Scandinavia. Instead there appeared unexpectedly as a breeding species at the end of the Last Interglacial in the Submediterranean part of the Carpathian Basin the Great Grey Owl *(Strix nebulosa)*, today an exclusively northern taiga species! (Curata, JÁNOSSY 1977). This fact is just as surprising, as the occurence of *Nyctea* in the Middle Pleistocene in the mediterranen of France without any traces of arctic conditions (CHAUVIRÉ, 1975). Beside this, there appears now the form of Strix uralensis at first in the Würm of the North of our territory.

The changes in the ecological demands clearly shown by the recognition that, in the stratigraphical series of our territory worked out thorougly by now, it is clearly outlined that the first cold wave of the Last Glacial (Würm)

is indicated by the first appearance of lemming, although accompanied only by the Black Grouses (Tokod, Gencsapáti in Hungary).

The Middle Würm may be characterised by the first appearence of the ptarmigans in this period, but without the lemming. At last during the Upper Würm there were lemmings living together with the Lagopus species too. Lagopus was wide spread at that time in the South too (not only down to the Pyrenees, as has hitherto been believed, but also down to Southern Hercegovina in Yugoslavia, MALEZ, 1972).

It was an important additional observation that for the time span of the whole of the Last Glacial we do not have to count with treeless periods in the present temperate (and more or less oceanic) belt of our continent, a fact that we can follow from the permanent presence of woodpeckers in all the (oceanic) temperate European richer Würm bird faunas (see JÁNOSSY, 1974 etc.).

As we have seen in the previous papers and also in this one, the latest result of this revision may be the fact that we can follow with absolute exactitude the evolutionary lines of some individual species, a concept entirely missing with previous authors (e.g. MOREAU, 1954, p. 420). The nicest picture is offered by the Tetraonids, with the lineages Tetroa macropus → praeurogallus → urogallus etc. We have seen above similar series with some ducks *(Mergus)*, owls *(Strix)* and also other groups.

The most considerable gap in this nice picture is the lack of such evolutionary lines with the Passeriformes, due to their osteological homogenity. This is all the more regrettable, because the Passerines compose the largest amount of Pleistocene birds and most of the evolutionary speculations are only based on the recent members of them.

At last it should be mentioned at this place, that the latest revision of the Pliocene and the Pleistocene avifaunas has brought also one interesting datum about the migration of birds. I found in the very rich fossil bird material of Stranská Skála more than seven hundred bones of the extinct species *Mergus connectens*. All of the bones originate from adult specimens. Considering the fact, that with all other species which are represented by at least a hundred pieces of finds I found in all cases some juvenile exemplars. I see in this observation the first proof for the phenomenon of bird migration as far as back as to the Middle Pleistocene.

It is clear that with the quick progress of scientific work from year to year the picture given above will change soon. In spite of this fact it seemed to be not unnecessary to fix our up-to-date knowledge in this theme, — based, I think, for the first time in literature only on concrete facts.

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Further citations see in part I—IV. of this series.

Plio-pleisztocén madármaradványok a Kárpát-medencéből. V. Podicipediformes, Ciconiiformes, Otidiformes, Columbiformes, Piciformes

Dr. Jánossy Dénes

Jelen dolgozatban öt madárrend fosszilis és szubfosszilis maradványai kerültek tárgyalásra, melyek nagyrészt szórványleleteknek tekinthetők.

A Villányi-hegység alsópleisztocén lelőhelyéről (Villány 3) került elő a feketenyakú vöcsök ősi alakja *(Podiceps cf. nigricollis* L.*)*.

Európa középső pleisztocénjében széltében elterjedt volt egy termetre gólya alakú faj, amely csonttanilag a mai gólyák és marabuk bélyegeit egyesíti magában (*Pelargosteon tothi* Kretzoi).

Az Európában messzemenően őshonos túzokok (leleteik már az eocénből ismertek: Geiseltal, Halle a. S.) kis és nagy termetű fejlődési ága a Kárpát-medencében már az alsópleisztocéntől kezdve jelen van. A reznek ősi alakjainak *(Otis kalmani* Jánossy) jelenléte az alsópleisztocéntől (Villány—Nagyharsányhegy, Püspökfürdő—Betfia 2) a fiatalabb középső pleisztocénen át (Budapest—Várhegy—„Hilton" lelőhely) a felsőpleisztocénig (Subalyuk, utóbbi már az O. tetrax-szal azonos) leletekkel jól bizonyítható. Ugyanez a helyzet a túzok őseivel is (*Otis lambrechti* Kretzoi: Villány—Püspökfürdő, Nagyharsányhegy, Osztramos 2 lelőhelyekről, *Otis cf. tarda* Budapest—Várhegy—„Hilton" és Lambrecht-barlang lelőhelyről). Szubfosszilis maradványok mindkét túzokfaj állandó jelenlétét bizonyítják területükön (csiszolt kőkor, bronzkor, rámaikor, középkor). A reznek és a túzok szétválása már legalábbis a pliocéntől tételezhető fel.

A harkályok közül a középtarka harkály ősi alakját (*Dendrocopus praemedius* Jánossy) már az alsópleisztocénből (Villány 3), a nagy tarka harkály elődjét (*Dendrocopus submajor* Jánossy) a középső pleisztocén elejétől (Tarkő) ismerjük. Ugyancsak középső pleisztocén leletek utalnak arra, hogy a zöld- és szürkeharkály *(Picus viridis és canus)* már régebben alakult ki ennél az időpontnál.

A dolgozat második része a sorozat eddigi cikkeiben feldolgozott anyag (I—V. rész) alapján igyekszik vázolni az európai madárfauna kialakulását — első alkalommal valóban konkrét leletek segítségével. A madrátani szakirodalomban található nagyszámú munka, amelyek elméleti alapon foglalkoznak ezzel a kérdéssel (pl. SALOMONSEN, 1930; STEGMAN, 1932; STEINBACHER, 1948; MOREAU, 1954; FARKAS, 1967 stb.), a megfelelő leletek híján túlzottan leegyszerűsítve tárgyalják a kérdést. Vagy (esetleg hallgatólagosan) csak egyetlen jégkorszakot tételeznek fel, vagy hideg (glaciális) és meleg (interglaciális) faunák mechanikus váltakozását, közbeni átalakulást fel sem tételezve. Ma már tudjuk, hogy nagyszámú eljegesedési hullámmal kell számolnunk, és a későbbi hullámokban az előzőkhöz képest átalakult fajok, alfajok éltek. Ezzel kapcsolatos a „refugium-elmélet" túlértékelése, amely szerint minden glaciálisban kontinensünk déli részeibe húzódtak volna a „melegkedvelő" fajok, majd újra északra tértek volna vissza a felmelegedés idején. A leletek viszont jelenlegi ismereteink szerint amellett szónak, hogy egyes „mediterrán" fajok a pleisztocén elején valóban délre húzódtak, és onnan nem is tértek újból vissza (pl. a szirti fogoly „fajköre" *Alectoris spp.*), mások csak a középső pleisztocén hideghullámai elől tértek ki a mérsékelt övből, és csak a pleisztocén vége után jutottak oda vissza stb. (pl. macskabaglyok: *Strix intermedia, Strix aluco gyurgyalag, szalakóta ősi alakjai stb.*). Ugyanakkor a legújabb leletek alapján világos, hogy a mediterráneumban a madárfaunában ugyanolyan átalakulás, fejlődés ment végbe, mint északon. A mai északi (boreális) alakok egy része eredetileg is valóban északon jelent meg (hófajdok, *Lagopus*), más része pedig — jelenlegi ismereteink szerint — kifejezetten délen léptek fel először (mai „taiga elterjedésű" baglyok mint *Aegolius* vagy *Surnia*).

A kialakult kép tehát rendkívül sokrétű, sokszor ma még egymásnak ellentmondó. Annyi mindenesetre általánosságban leszögezhető, hogy a pleisztocén és jelenlegi madárfauna Európa harmadidőszaki állattársaságának fokozatos elszegényedése révén alakult ki, a felsőpliocénben—alsó pleisztocénben még mai dél-ázsiai rokonságú alakokkal (rigószerű *Turdoidida*-k, frankolinok stb.), később boreális elemekkel gazdagodva. A mai fajok kialakulásával legfeljebb a középső pleisztocénben, esetleg még későbbi időben számíthatunk, ezekből tehát régebbi szakaszokra visszakövetkeztetni hibás eredményre vezethet.

A sokoldalú vizsgálatok érdekes „mellékeredménye", hogy pl. a nagy tarkaharkályok leletei alapján a felsőpleisztocén erdőzóna megrajzolható (eszerint hazánk területe a pleisztocén leghidegebb szakaszaiban sem volt teljesen fás növényzet nélküli tundra!), és igen valószínű a madárvonulás kialakulása már az alsópleisztocéntől (a csehszlovákiai középső pleisztocén Stránska Skála lelőhelyen pl. kb. 700 db *Mergus* — connectens — csontlelete kizárólag adult példányoktól származik, míg minden más faj nagyobb számú leletei közt ugyanott fiatalkorú példányok vannak, ami amellett szól, hogy a bukók téli vendégek voltak ezen a területen már akkoriban is).