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Bird remains from Obłazowa – zoogeographical and evolutionary remarks

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Abstract. The majority of 112 bird taxa identified in Obłazowa Cave and Obłazowa 2 belong to the recent breeding fauna of the Carpathians. Besides these there are many species that breed in the extreme arctic as well as in the boreal zones, those with disjunct distributions in arctic and mountain areas, breeding in high mountains only, and "southern" species (breeding now mainly in southern Europe: Balkans, Mediterranean countries).

Key words: Bird remains, Obłazowa Rock, Late Pleistocene, zoogeography.

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I. INTRODUCTION

The Obłazowa Rock (49° 22'N, 20° 8'E; 670 m a.s.l.) is situated in the Sub-Tatra region, in the eastern part of the Nowotarska Dale, which separates the Tatras from another mountain ridge of the Carpathians (the Gorce). It is made of limestone and is on the western (left) bank of the Białka River Gorge. There are two localities situated near to one another with late Quaternary faunas in the Obłazowa Rock: Obłazowa Cave and Obłazowa 2. Obłazowa Cave is a small cave in the western slope of the Obłazowa Rock Its sediments come from the time interval between the earliest Vistulian (= Weichselian) and the Holocene. Many layers contain mixed sediments (especially the upper ones), or are thin and often difficult to separate. This is why the layers were lumped as a series of sediment. Rich archaeological materials are contained therein e.g. a unique boomerang made of mammoth tusk (VALDE-NOWAK et al. 1987). The locality Obłazowa 2 is a rock fissure in eastern slope of the rock, containing rich faunal remains, dating back to the Denekamp Interstadial. The bird remains were studied by TOMEK (in: NADACHOWSKI et al. 1993).

Bird remains collected during archaeological excavations in Obłazowa Cave are very rich. They consist of 4583 skeletal fragments, belonging to more than 1230 individual birds. The material analyzed comes from owl pellets, most probably those of the Eagle Owl *Bubo bubo* (LINNAEUS, 1758), and the analysis of LORENC (2001) indicates that nearly all taxa found in such materials belong to the local breeding fauna. A complete list of the taxa identified, contains at least 105 species (BOCHEŃSKI et al., in press). The material, however, was analyzed only from the ecological point of view. We described the habitat surrounding the locality during successive periods based only on the remains coming from well dated sediments. The most numerous remains were found in the layers

II-V belonging, together with the uppermost layer I, to the series F, dated generally to the Late Glacial and the Holocene.

320 specimens found in Obłazowa 2 represent at least 65 bird individuals and 35 taxa. Of these only 7 taxa were not identified in the material from Obłazowa Cave. The difference between this fauna and that identified in the layers VIII-XI (series D) of sediment in Obłazowa Cave is greater than that implies, as only 18 taxa are common to both. So, treated jointly the material coming from both localities gives a better picture of the Interpleniglaial bird fauna in the vicinity of the Obłazowa Rock

Most of the 112 bird taxa identified in both localities belong to the recent breeding fauna of the Carpathians, but besides them there are also many species which either do not breed in Central Europe today, or breed there in special habitats only, and they are the subject of the present paper. They represent four categories:

1 – "northern" species (breeding today in arctic as well as in boreal zones of the continent),

2 – species with a disjunct distribution today in arctic and mountain areas,

3 – species breeding today in high mountains only,

4 – "southern" species (now breeding mainly in southern Europe: Balkans, Mediterranean countries).

The quantitative share of those groups is given in Table I. The species not exactly identified ("cf.") are also included. Some examples of them are presented with more details and shown on maps on a background of their recent breeding areas (CRAMP 1985, 1988; CRAMP , PERRINS 1994; CRAMP, SIMMONS 1977, 1980, 1983), the distribution of the Late Quaternary finds in Europe based on TYRBERG's (1998) catalogue, and compared with the range of the ice sheet during its last transgression (MOJSKI 1993). The map published by MOJSKI (1993) does not cover northern parts of Spitsbergen and Novaya Zemlya, nor Franz Josef Land which, according to GERASIMOV and VELICHKO (1982) were also covered by ice. The points, indicating find spots places of fossils correspond to single or multiple sites if they are close to each other.

Table I

Composition of the bird fauna from Obłazowa Cave and Obłazowa 2

Present distribution (Category)	No of taxa
European widely distributed species	ca. 81
"Northern" species (arctic and boreal)	20
Disjunct distribution	4
Montane species	2
"Southern" species	5
TOTAL	ca. 112

A c k n o w l e d g m e n t. I am highly indebted to Dr. C. MOURER-CHAUVIRÉ for sending me the measurements of the Ptarmigan tarsometatarsi in her charge.

II. "NORTHERN" SPECIES

All "northern" birds breed to the north of the southern part of Poland. However, they represent various patterns of distribution as well as various breeding habitats: from tundra to boreal marshes and coniferous, birch and even mixed woods of the taiga type.

One of the species inhabiting the extreme north is the Brent Goose *Branta bernicla* (LINNAEUS, 1758). Besides the coast of Greenland, including the NE part, it breeds today on Spitsbergen and Franz-Josef Land (Fig. 1) and farther to the east on northern Asiatic peninsulas. Another representative of the genus, the Barnacle Goose *Branta leucopsis* (BECHSTEIN, 1803) has generally a similar pattern of distribution: southern coasts of Greenland, Spitsbergen and Novaya Zemlya, but since the 1970's inhabits also some Baltic islands east of the Swedish coast (TYRBERG in lit.). Both *Branta* geese nest and forage in tundra vegetation. The Late Pleistocene localities where these geese have been found in Europe are situated to the south of southern limits of the Scandinavian ice sheet of the last glaciation. This is related to the fact that not only the northern part of Europe was covered by ice, but also the insular breeding grounds of these birds.

The third high Arctic breeder, the Little Auk *Alle alle* (LINNAEUS, 1758) is a typical oceanic bird. It breeds almost entirely on high-arctic islands of the North Atlantic, from east Canada (very small population), Greenland, Spitsbergen to Severnaya Zemlya and New Siberian Islands, and winters offshore mainly in low-arctic waters, but also in the boreal zone (NETTLESHIP & EVANS

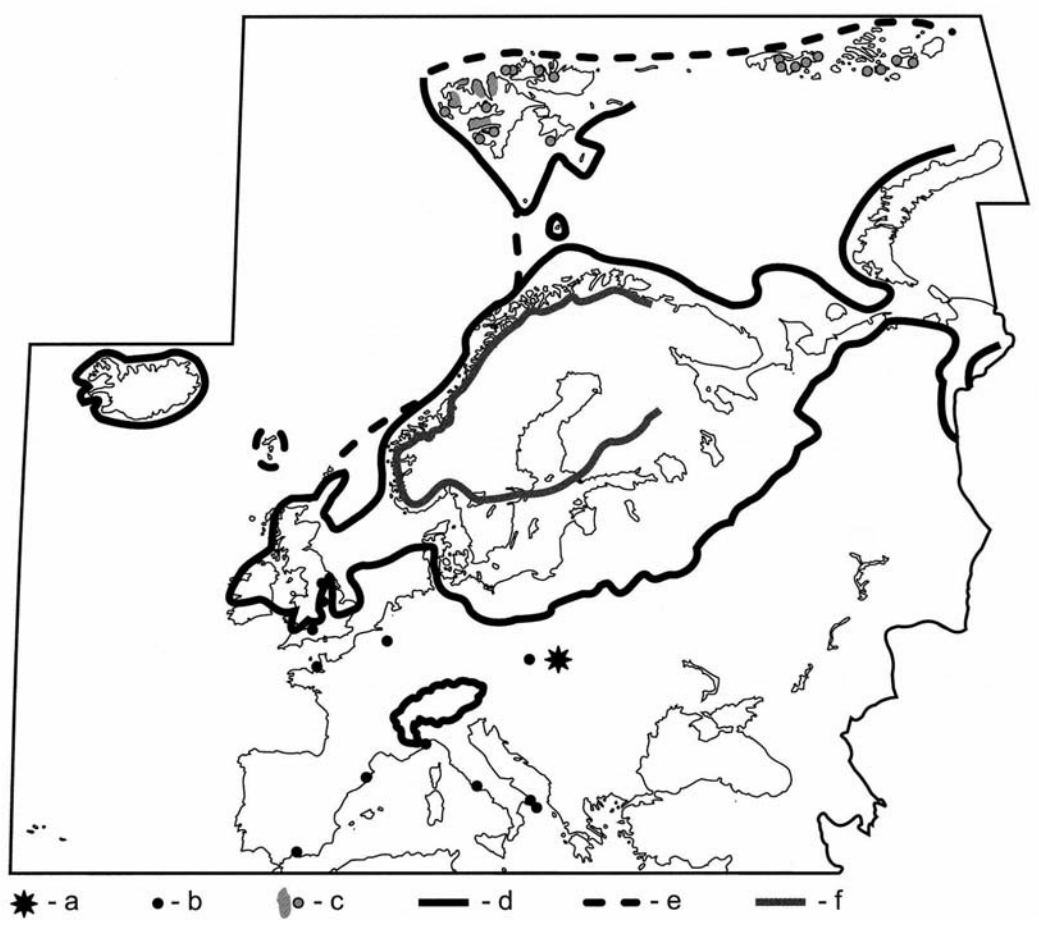

Fig. 1. Location of Obłazowa Rock where Late Vistulian remains of the Brent Goose were found, on a background of other European finds of the species and its recent breeding areas. Maximum range of the ice sheet during Upper Pleniglacial and at the beginning of the Holocene is also shown. Legend: a – location of the Obłazowa Rock, b – other European find spots, c – recent breeding area, d – maximum Vistulian range of glaciation according to MOJSKI (1993), e – range according to GERASIMOV & VELICHKO (1982), f – range of ice sheet ca 10000 years ago, according to MOJSKI (1993).

1985). Wintering in the sea takes place in January to March, and winter storms can drive the birds outside the normal range (BROWN 1985). It forages mainly on various crustaceans on the open sea. According to TYRBERG (1998) it is known from 16 Pleistocene findings in Europe; six of them are coastal records and ten, including one bone from Obłazowa, lie far from the coast (Fig. 2). Nearly all of them are dated to the Vistulian (= Weichselian), mainly to the Upper Pleniglacial and Late Glacial. The maximum range of this glaciation covered not only northern part of the continent, but also most present-day breeding islands of the Little Auk. Thus, it must have bred in more southern regions, i.e. closer to Western Europe, possibly even on West European rocky coasts, though we have not direct evidence for it since glacial coastlines are now largely submerged. Little Auk flocks, of various size, are observed from time to time far inland, when they are blown by strong oceanic gales – such birds get weak because of lack of suitable food (CRAMP 1985). The same, even more often could happen also in the past, because the breeding grounds were closer, and weak birds were easy prey for owls.

Recent breeding distributions of the Long-tailed Duck *Clangula hyemalis* (LINNAEUS, 1758) and Arctic Skua *Stercorarius parasiticus* (LINNAEUS, 1758) are not restricted to the far northern is-

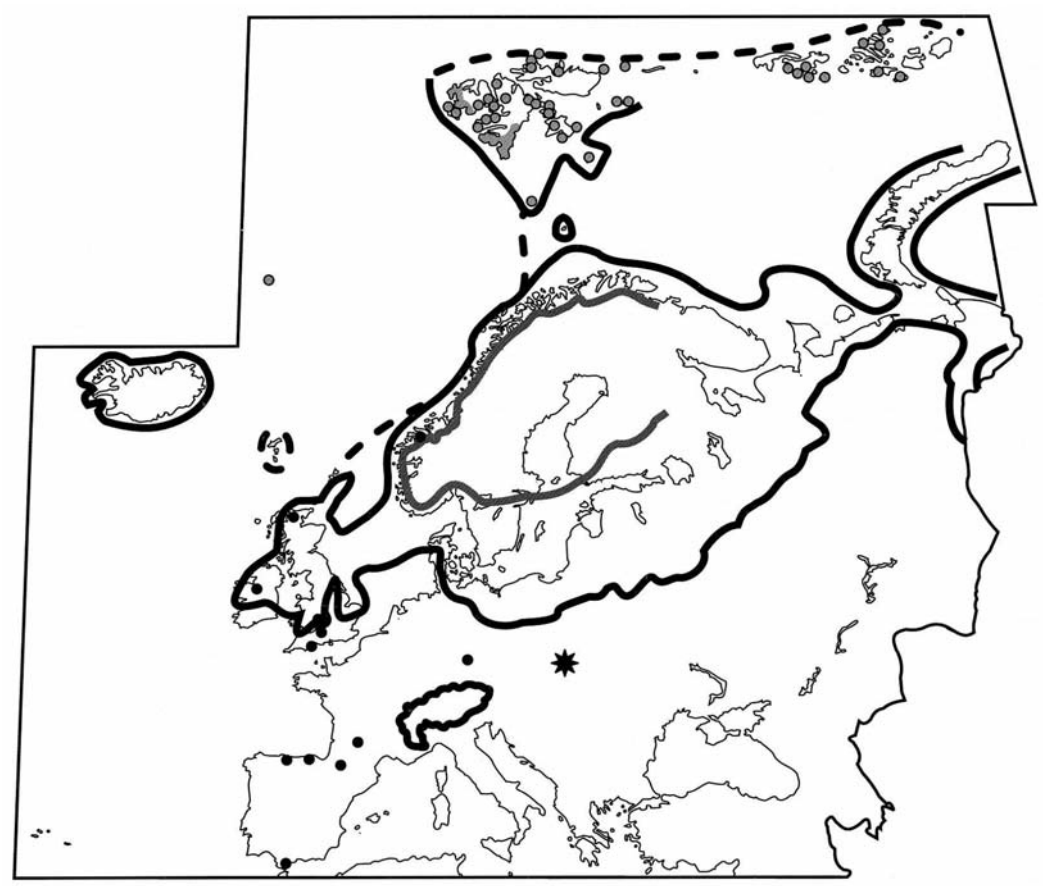

Fig. 2. Location of Obłazowa Rock where Late Vistulian remains of the Little Auk were found, on the background of other European finds of the species and its recent breeding areas. Explanations as in Fig. 1.

lands, since they also breed in northern parts of the continent. However, the width of continental belts inhabited by them are different: that of the former species is much wider (Fig. 3).

Besides the above mentioned species, the remains of some other birds of northern distribution were found in Obłazowa. The most numerous of the remains are those of the Willow Grouse *Lagopus lagopus* (LINNAEUS, 1758), found in all levels of the sediment. Less numerous and usually restricted to particular levels of the sediment are some other species. Most of these come from the Late Glacial and are uncommon or even rare in European fossil faunas. They include the Wigeon *Anas penelope* LINNAEUS, 1758, Common Scoter *Melanitta nigra* (LINNAEUS, 1758), Goosander *Mergus merganser* LINNAEUS, 1758, Gyrfalcon *Falco rusticolus* LINNAEUS, 1758, Merlin *F.* cf. *columbarius* LINNAEUS, 1758, several plovers and other waders, i.e. Grey and Golden Plovers *Pluvialis squatarola* (LINNAEUS, 1758) and *P. apricaria* (LINNAEUS, 1758), as well as Turnstone *Arenaria interpres* (LINNAEUS, 1758), Spotted Redshank *Tringa erythropus* (PALLAS, 1764), Wood Sandpiper *T. glareola* LINNAEUS, 1758, Ruff *Philomachus pugnax* (LINNAEUS, 1758), Great Snipe *Gallinago media* (LATHAM, 1787) and Whimbrel *Numenius phaeopus* (LINNAEUS, 1758), and also Waxwing *Bombycilla garrulus* (LINNAEUS, 1758). They represent various breeding habitats: from tundra and boreal marshes to coniferous and birch woods. Some of them, like the Wood Sandpiper,

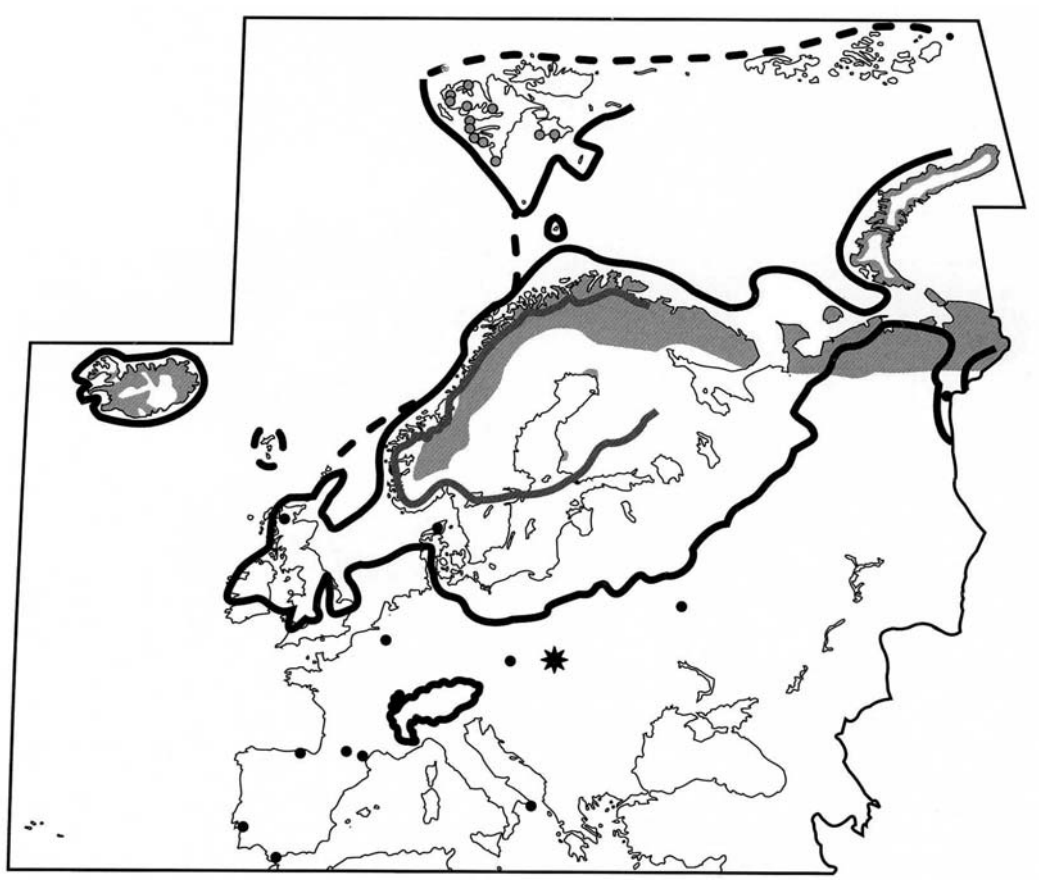

Fig. 3. Location of Obłazowa Rock where Vistulian remains of the Long-tailed Duck were found, on the background of other European finds of the species and its recent breeding areas. Explanations as in Fig. 1.

breed in small numbers in the north of Poland (Fig. 4), but not in the southern part of the country (TOMIAŁOJĆ 1990).

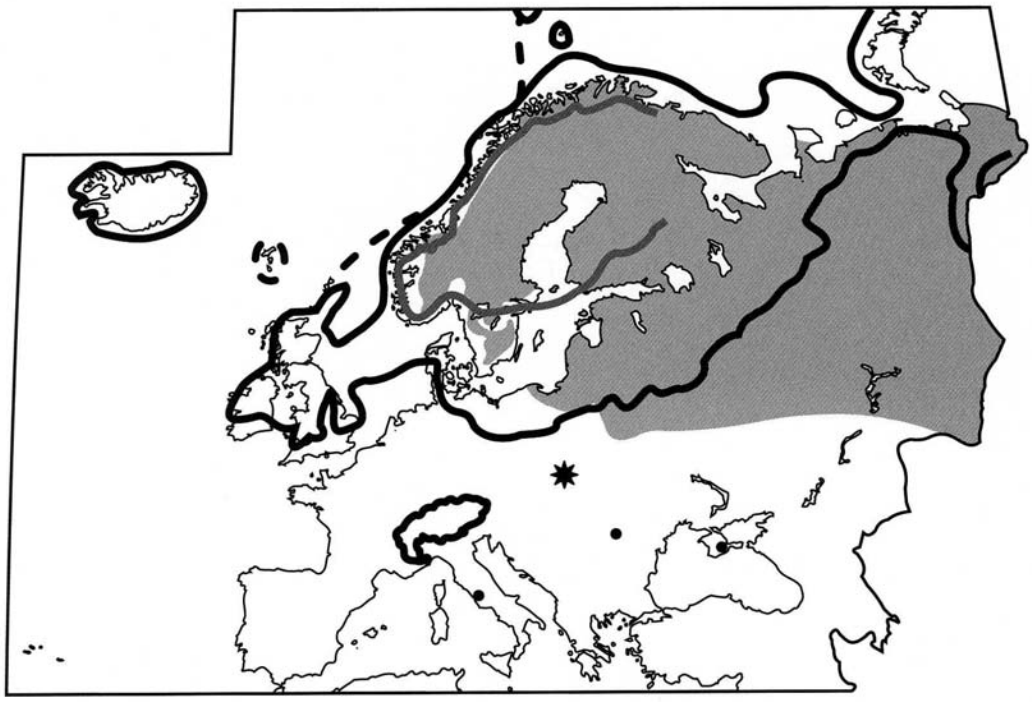

Fig. 4. Location of Obłazowa Rock where Vistulian remains of the Wood Sandpiper were found, on the background of other European finds of the species and its recent breeding areas. Explanations as in Fig. 1.

III. SPECIES OF DISJUNCT DISTRIBUTION

The Ptarmigan *Lagopus mutus* (MONTIN, 1776), breeding, besides northern areas, in the Alps and Pyrenees is an example of a bird with a disjunct recent distribution in Europe. Its remains outnumber those of other species – both in terms of numbers of remains and of the minimum number of individuals – and Obłazowa Cave is the only Polish locality in which the Willow Grouse is less numerous. This is similar to the situation in some south European localities, like Istállóskö in Hungary (JÁNOSSY 1954). Fig. 5 shows only the localities dated back to the Late Glacial and possibly the Holocene. Generally they are distributed to the south of the maximum range of the Vistulian Glaciation, and only three localities cross this line slightly, but they come from the Late Glacial and do not cross the line of the glacial range at the beginning of the Holocene. It indicates that the recent northern distribution in Scandinavia (and Scotland) is younger than ten thousand years. The same is true in the case of the Alpine glaciation: the map shows the approximate maximum glacier range during the Upper Pleniglacial, which later on was more restricted. Remains of the Ptarmigan were found in Obłazowa not only in the Pleistocene layers but also in the uppermost layer I accumulated most probably, at least in part, in the Holocene. It shows that the Ptarmigan could survive in the Carpathians and Sub-Tatra region longer than shown by TYRBERG (1995).

The large number of remains including the very diagnostic tarsometatarsus, allows some comparisons. First of all, the length of the tarsometatarsus increases over time – the arithmetic means

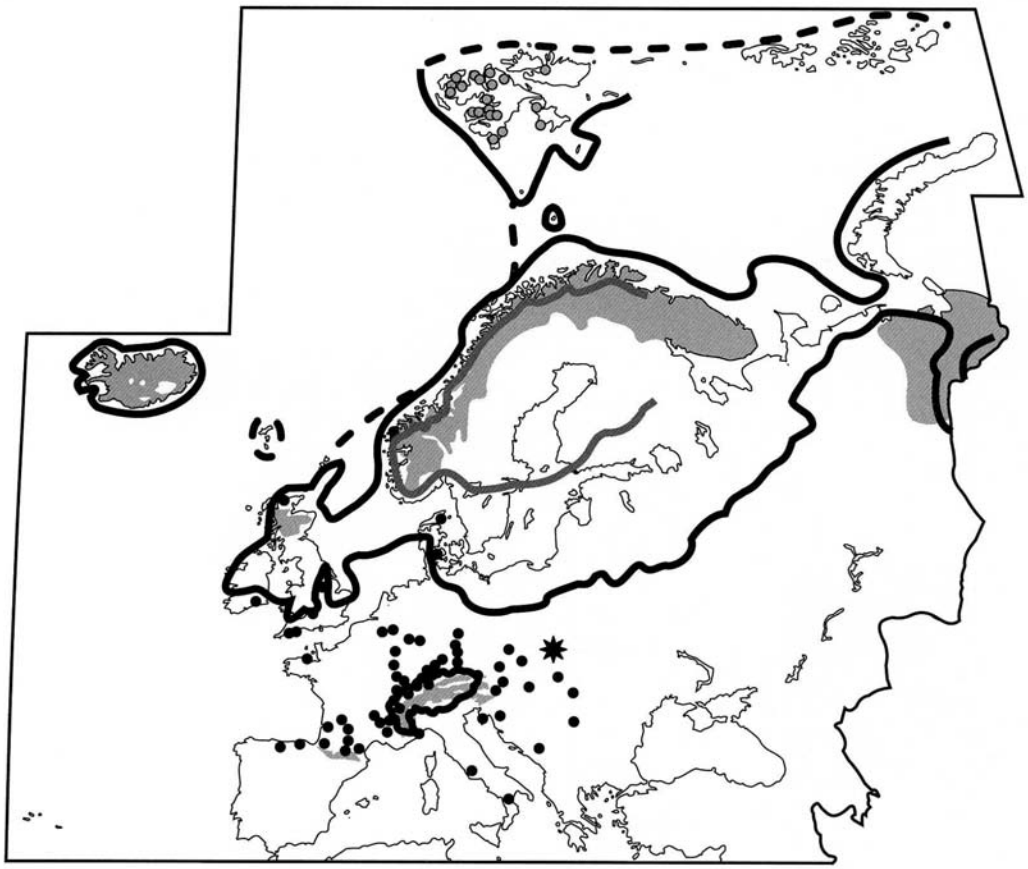

Fig. 5. Location of Obłazowa Rock where remains of the Ptarmigan were found, on the background of other European Late Vistulian finds of the species and its recent breeding areas. Explanations as in Fig. 1.

calculated for bone series coming from successive periods range from 31.65 mm in the deepest layers XX-XXI (series A-B) dated to the earliest glacial, to 32.63 in layer I (series F) accumulated at least in part in the Holocene (Table II). Such small but systematic differences, together with the dispersion of measurements from particular layers (Fig. 6) may indicate that samples coming from particular layers (series) are mixed, because the length of the tarsometatarsus in the Ptarmigan grows in time (BOCHEŃSKI 1974). The mean length value for the Late Glacial from Obłazowa is 32.03 mm. This value is similar to the results obtained from two Austrian caves of the same age (BOCHEŃSKI & TOMEK 1994), and about a millimeter smaller than in the recent population inhabiting the Alps. However, tarsometatarsi from layer I of Obłazowa Cave are longer; some of them reach more than 34 mm (Fig. 6), which makes them similar to the recent Alpine population (KRAFT 1972). It may indicate that the elongation of legs in Central European populations took place during the last ten thousands years.

The Shore Lark *Eremophila alpestris* (LINNAEUS, 1758) is another bird with a disjunct recent distribution in high latitudes and at high altitudes, including populations in the Balkans, Caucasus

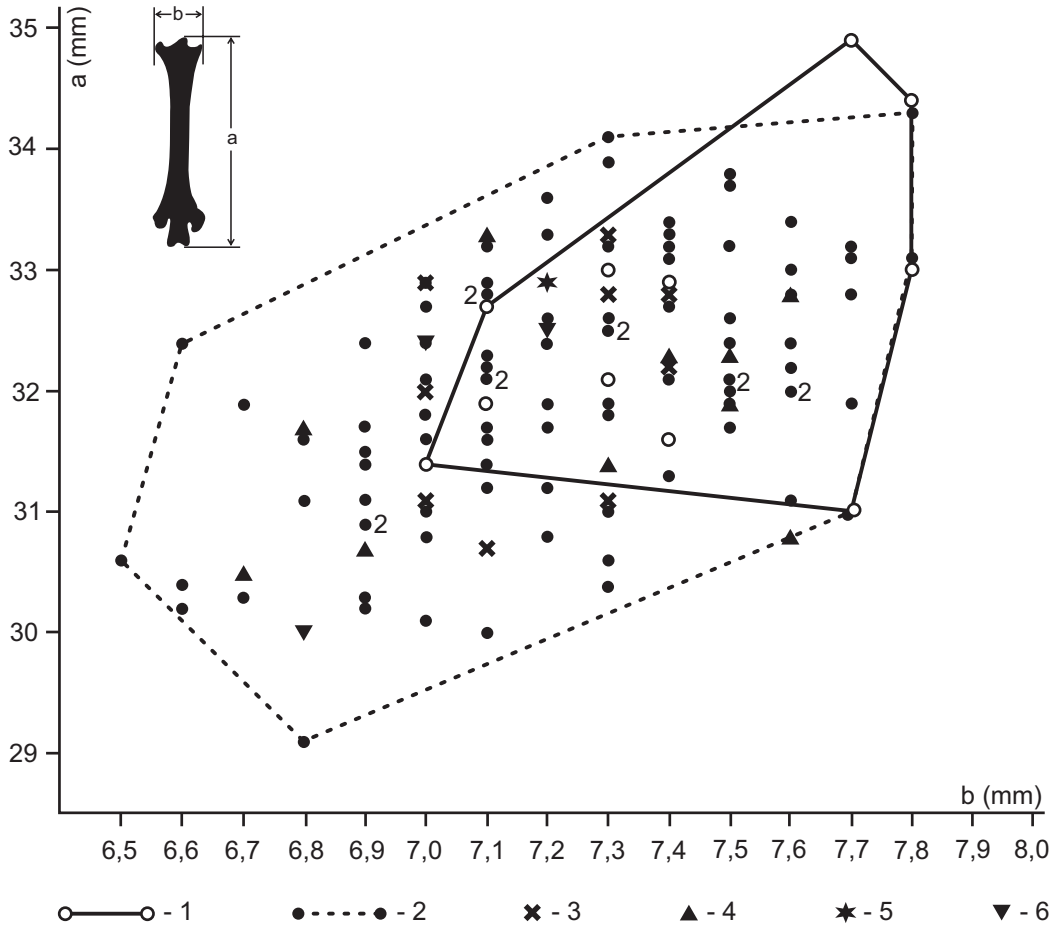

Fig. 6. The ratio of the length of the tarsometatarsus (a) to the width of the proximal articular portion (b) in fossil *Lagopus mutus* from particular layers of Obłazowa Cave: 1 – layer I, 2 – layers II-IV, 3 – layer VII, 4 – layers VIII-X, 5 – layer XVI, 6 – layer XXI.

and Asia Minor, but not in the Alps and other west European mountains (Fig. 7). It is worth mentioning that the species is noted from France from the Early and Middle Pleistocene only, and data from south Germany, Switzerland and Austria suggest that even if it inhabited the Alps, it left them as a result of their ice cap.

Two other species now having disjunct distribution and found as fossils in Obłazowa belong to the recent bird fauna of the Tatra region. They are the Nutcracker *Nucifraga caryocatactes* (LINNAEUS, 1758) and Pygmy Owl *Glaucidium passerinum* (LINNAEUS, 1758), both listed by STEGMAN (1931) among taiga species, living in the taiga belt as well as European montane forests of the taiga-type.

Table II

Ranges and arithmetic means (in mm) of the lengths of fossil tarsometatarsi of the Ptarmigan *Lagopus mutus* from sediments of Obłazowa Cave corresponding to particular periods, compared with data on the recent population living in the Alps (according to KRAFT 1972, bones measured by MOURER-CHAUVIRÉ, and own data)

Series: layers	Age	No of bones	Range	Mean length
Alps	Recent	20	32.0-35.4	33.30*
I	Holocene and/or Late Glacial	11	31.0-34.9	32.63
F: II, III, II-IV	Late Glacial	104	29.1-34.4	32.03
E: VII	Upper Pleniglacial	8	30.7-33.2	32.01
D: VIII-X	Interpleniglacial	12	30.5-34.1	32.00
A-B: XX-XXI	Earliest Glacial	4	30.0-32.5	31.65

* Mean length of tarsometatarsus in Alpine population in the Ptarmigan obtained now is smaller than published previously (BOCHEŃSKI 1974), which had been calculated on the basis of a few specimens only stored at the National Museum in Brno, now not taken into account because of the possibility of mistaken labels

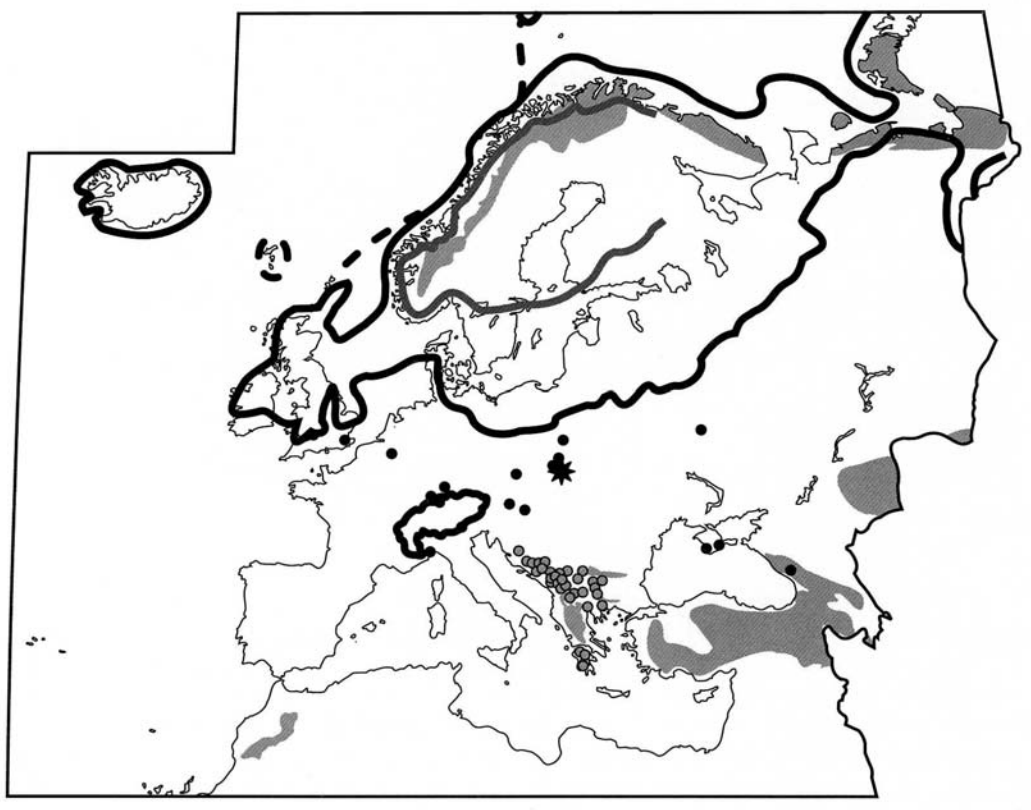

Fig. 7. Location of Obłazowa Rock where Late Vistulian remains of the Shore Lark were found, on the background of other European finds of the species and its recent breeding areas. Explanations as in Fig. 1.

IV. HIGH MOUNTAIN SPECIES

The Snow Finch *Montifringilla nivalis* (LINNAEUS, 1766) now inhabits the high mountains of the Palaearctic (among others the Alps, Pyrenees, Appenines, Balkans and Caucasus). Fairly numerous Late Pleistocene records are mainly concentrated around the Alps and between the Alps and the Pyrenees. The remains of the species in Obłazowa indicate that in the Late Pleistocene the Snow Finch also inhabited the Carpathians (Fig. 8), and therefore Obłazowa may be treated as a link with the eastern most known find in the Crimea.

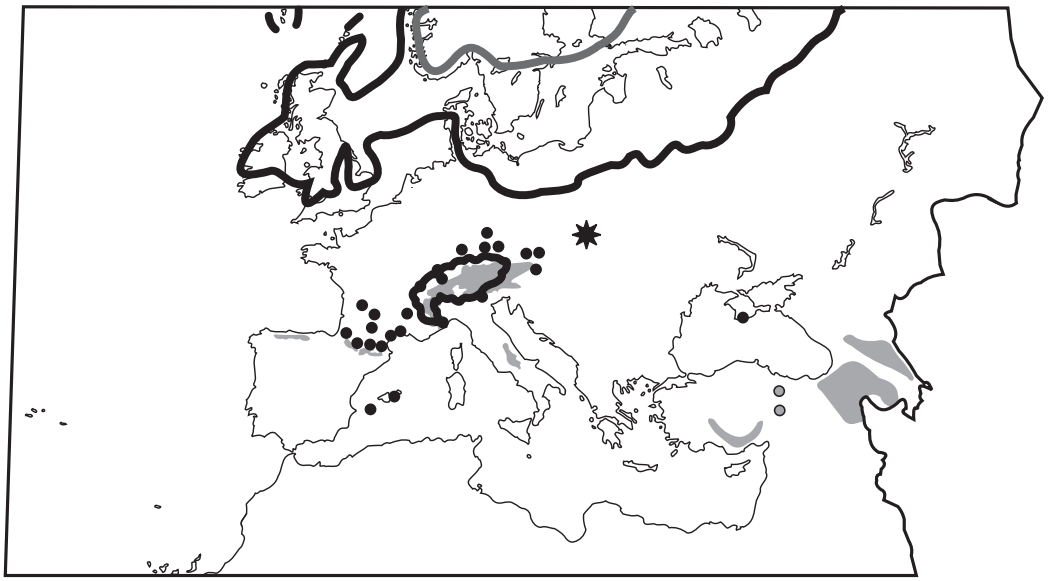

Fig. 8. Location of Obłazowa Rock where Vistulian remains of the Snow Finch were found, on the background of other European finds of the species and its recent breeding areas. Explanations as in Fig. 1.

Another typical montane bird is the Water Pipit *Anthus spinoletta* (LINNAEUS, 1758). Nowadays it lives in the Alpine meadow zone of the Tatras, but we can presume that this zone was still covered by an ice cap in the Late Glacial. This is why the species occurred at lower altitudes.

V. "SOUTHERN" SPECIES

A single bone of the Calandra Lark *Melanocorypha calandra* (LINNAEUS, 1766) was found in the sample without stratigraphy. The bird lives today in dry grass steppes in southern Europe, north Africa, and the Middle East. Its Late Pleistocene fossil records are not numerous; moreover, part of them lie within the recent breeding range or close to it (Fig. 9). Polish localities (among them Obłazowa Cave) are situated farthest from the modern breeding area, but the northernmost is Novgorod-Siversk in the north of Ukraine.

Another steppe dweller is the Great Bustard *Otis tarda* LINNAEUS, 1758. The single bone comes from sediments accumulated during the Late Glacial. The Great Bustard represents a generally similar pattern of distribution in the Western Palaearctic as the previous species although it reaches more northern insular areas in northern Germany and in historical times it bred also in southern

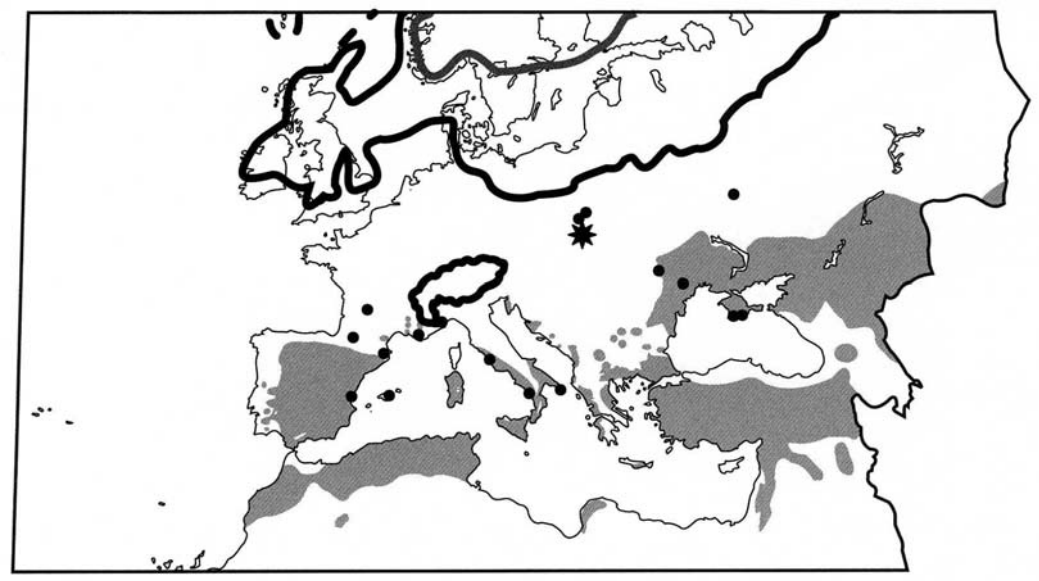

Fig. 9. Location of Obłazowa Rock where the remains of the Calandra Lark were found, on the background of other European finds of the species and its recent breeding areas. Explanations as in Fig. 1.

Sweden (TYRBERG in lit.). Its Late Pleistocene records are fairly numerous. The second representative of the bustard family is the Little Bustard *Tetrax tetrax* (LINNAEUS, 1758) found in Obłazowa 2 in Interplenivistulian sediments.

The last two taxa were not identified to the species level, and their remains come from the Interplenivistulian sediments of Obłazowa Cave. The bone fragment identified as probably pratincole cf. *Glareola* sp. was found in sediments of series D. Two species of Western Palaearctic pratincoles have joint distribution similar to that of the Calandra Lark, however the Pleistocene records are very scanty (from France, Italy and Greece only). The other taxon is a small falcon identified as *Falco naumanni* FLEISCHER, 1818, or *Falco vespertinus* LINNAEUS, 1766. Breeding distribution of the former resembles generally that of the Calandra Lark.

VI. GENERAL COMMENTS

The vertical distribution of bird remains in successive sediment series of Obłazowa Cave compared with the data from Obłazowa 2 (as concerns the species discussed), is given in Table III. The total material from Obłazowa 2 corresponds generally with that found in sediment series D of Obłazowa Cave. Only the Little Bustard, representing "southern species", recorded in Obłazowa 2, has not been identified in Obłazowa Cave. It is interesting, that all "southern" taxa were found in the sediments dated either to the Interpleniglacial (Obłazowa Cave: series D, and Obłazowa 2) or to the Late Glacial and Holocene (Obłazowa Cave: series F). As concerns the other discussed species from Obłazowa 2, besides both *Lagopus* species, that occur in all or nearly all sediments, only the remains of the Grey Plover and the Great Snipe come from the corresponding series D, whereas the other were found in older or younger series. It is difficult to decide if this is connected with the scarcity of remains of those species, which were present in the fauna of successive periods, or is due to mixing of the material into the younger strata, as a result of prehistoric digging (VALDE-NOWAK et al. 1995).

Table III

Presence of remains of bird species, belonging to particular categories, mentioned in the text in successive series of sediments of the Obłazowa Cave and Obłazowa 2. Dating: EG – Early Glacial, LP – Lower Pleniglacial, IP – Interplenivistulian, UP – Upper Pleniglacial, LG/H – Late Glacial/Holocene

Category: species	Obłazowa Cave: sediment series & dating									Obłazowa 2
	A-B EG	A-C	C LP	C-D	D IP	D-F	E UP	E-F	F LG/H	
"Northern":										
Branta leucopsis									+	+
Branta bernicla									+	
Anas cf. penelope									+	
Clangula hyemalis									+	+
Melanitta nigra					+				+	
Mergus merganser	+				+	+			+	+
Falco rusticolus									+	
Falco cf. *columbarius*	[unstratified]									
Lagopus lagopus	+	+		+	+	+	+	+	+	+
Pluvialis apricaria	+									+
Pluvialis squatarola					+		+		+	+
Gallinago media		+			+	+			+	+
Numenius phaeopus	+								+	
Tringa erythropus									+	
Tringa glareola	+								+	
Arenaria interpres									+	
Philomachus pugnax					+				+	
Stercorarius parasiticus								+		
Alle alle									+	
Bombycilla garrulus					+					
Disjunct distribution:										
Lagopus mutus	+			+	+	+	+	+	+	+
Glaucidium passerinum									+	
Eremophila alpestris									+	
Nucifraga caryocatactes					+				+	
High mountain:										
Anthus spinoletta									+	
Montifringilla nivalis					+				+	
"Southern":										
Falco naumanni or *Falco vespertinus*					+				+	
Otis tarda									+	+
Tetrax tetrax										+
cf. *Glareola* sp.					+					
Melanocorypha calandra	[unstratified]									

The Late Glacial bird fauna of the Sub-Tatra region found in Obłazowa Cave represents the last but one step in the formation of the recent fauna. In the past there were more species in the Carpathians which nowadays are associated with high mountains. For example the Red-billed Chough *Pyrrhocorax pyrrhocorax* (LINNAEUS, 1758) was noted in the Holocene of the Tatras by TOMEK (1989). It is difficult to say exactly when such species as the Ptarmigan or the Snow Finch disappeared, but most probably it happened during the Holocene.

Generally, the Pleistocene find spots of particular species now living in northern Europe (Scandinavia) are situated to the south of the border line of the maximum transgression of the ice sheet in the Upper Pleniglacial of the last glaciation. Some of the places lie close to its frontier or just on it, and this may be connected with the poor precision of the relative dates such as "Late Pleistocene", or with the small scale of the maps. However, the Ptarmigan and the Little Auk have been found in the Norwegian locality Skjonghelleren in sediments dated to the Interpleniglacial (LARSEN 1984, LARSEN et al. 1987, cited by TYRBERG 1989). It means, they lived there before that area was covered by ice during the Upper Pleniglacial expansion. The Ptarmigan reinhabited Scandinavia after the ice receded. This immigration was accompanied by the Willow Grouse, which has, however, not yet been found from pre LGM sites in Scandinavia.

It is difficult to say if the first occupation of the high Alps by the Ptarmigan – now only living above 1600-2160 m a.s.l. (DVOŘAK et al. 1993, HARRISON 1982) – took place before the LGM, the maximum extent of the ice sheet. There is no evidence of this, although it is highly possible, as the Ptarmigan was recognized in France in the Middle Pleistocene sediments of the Massif Central (La Fage) and in the Early Wurmian layers at Gigny-sur-Suran in the Jura Mts., only separated from the Alps by the Rhone Valley (MOURER-CHAUVIRÉ 1975). In the case of the Snow Finch this seems likely because its remains have been found in the Schnurenloch (Bern Alps) at the altitude of about 1230 m.a.s.l. in Mid or Early Wurmian deposits (KOBY 1964, cited by TYRBERG 1989).

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