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Animal bones from the Late Weichselian in Norway

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An accumulation of bones at Blomvåg on Blomøy island on the west coast of Norway, 30 km NW of Bergen, was found in 1941 2.5—3 m down in the ground. Radiological datings from the layer of the find has established that these remains of mammals (incl. reindeer), birds (incl. great auk and raven) and fish originate from about 12,700—12,200 years B.P. The concentration of animal remains here indicates the possibility of human activity at this site.

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INTRODUCTION

We have very little information about which animals lived in Norway prior to the end of the last ice-age. Traces of this fauna seem to be mostly erased or difficult to interpret. A few finds of animal remains from this period formed, until a few years ago, our only source of knowledge about the fauna during the last ice-age. Most of these were of mammoth and were made in the Gudbrandsdalen area . According to ^{14}C datings these are at least 40,000 years old (Heintz, Garnes & Nydal 1979).

The only find of exactly datable bones from the time before the height of the ice-age was excavated in 1983 at Skjonghelleren on Valderøy island 4 km from Ålesund on the northwest coast of South Norway. About 80—90 m inside the cave entrance two fossil-bearing layers were found in the clay deposits containing bones of fish, birds and mammals. From the older of these layers animal bones have been dated to about 28,000 years B.P. Grouse *Lagopus* sp. and a number of other bird species are represented in the material from this layer, and in addition arctic fox *Alopex lagopus,* otter *Lutra lutra* and lemming *Lemmus lemmus.* The fish bones belong to cod *Gadus morhua,* coalfish *Pollachius virens,* torsk *Brosme brosme* and bull rout *Myoxocephalus scorpius.* The youngest of the fossil-bearing layers in Skjonghelleren was deposited in the Younger Dryas 10,000—11,000 years B.P. and comprises among others the bones of red squirrel *Sciurus vulgaris* and blue hare *Lepus timidus* (Larsen, Mangerud, Lauritsen, Lie & Gulliksen, in press).

On Finnøy island in Rogaland in 1982, a polar bear *Ursus maritimus* skeleton was excavated in Late Weichselian marine sediments (Blystad, Thomsen, Simonsen & Lie 1983). The ^{14}C dating gave an age of 10,660 ± 80 years B.P.

The first find of a species-rich fauna prior to the end of the ice-age was made in 1941 at Blomvåg on Blomøy, an island in the archipelago about 30 km northwest of Bergen on the west coast of Norway. When these bone remains were found, one could only surmise that they belonged to the ice-age. Today we know, by means of radiological dating, that these are the remains of animals that lived during the period we call Bølling, towards the end of the ice-age. The datings give about 12,700—12,200 B.P. (Mangerud 1977). The Blomvåg find is still the only one from this period.

The find at Blomvåg was made known by Isak Undås through an article in the newspaper «Bergens Tidende» of 22 Nov. 1941. The same author published a longer paper about the find in Naturen (Undås 1942). None of these articles contained much information concerning which animal species the bones belonged to, apart from the remains of the great auk *Pinguinus impennis* having been found, and an erroneous identification of deer among the bone remains. Later the find has been reported in a short article (Lie 1979) where the most important identified species are named. Barth (1981) has mentioned it, and Hufthammer (1982) has used some of the material in her thesis.

The present paper reports the result of the species identification of the bone material that was excavated on Blomøy in 1941. It is of interest to see whether the Blomvåg find differs from recent material. Among the most crucial questions relating to this find is whether the bones represent material from a dwelling place.

There has been considerable doubt about this, and this is probably the main reason why the Blomvåg find has remained unnoticed for so long.

MATERIAL

The skeletal material was found in 1941 when a ditch was dug in order to drain the site of a new cemetery at Blomvåg. The depth of the ditch was reported to be 2.5 m (Undås 1942), but in all probability it was somewhat deeper. According to Undås (1942) who described the stratigraphical conditions, there was a top layer of humus soil, about 20 cm deep. Below this were 50 cm of beach gravel and an equally deep layer of pure sand. Under this there was a layer of moraine 1.3—1.4 m deep and then a 30—40 cm layer of mud or clay. The fossil bone material was found under all this mass, in a layer with some clayey silt about 3 m below the surface. But it appeared that the overlying layer of mud also contained bones, and in addition shells and remains of wood.

A second ditch was dug later, 12 m west of the first. This disclosed the same stratigraphical conditions, and here also were found bones in the above mentioned layer of clayey silt. Above this layer of silt there lay some erratic blocks which had to be blasted. One block was 10 m long.

The fossil bones of vertebrates were found here about 2.5—3 m below the surface and about 12 m above sea level (high water mark). The bones of whale and other mammals and of birds and fish were collected. The remains of lichen and pieces of spruce, grey alder, willow and yew were found and also some species of molluscs. This latter part of the material will not be dealt with here, only bones of vertebrates.

METHODS

The specific identification of the bones was performed on the basis of comparison with recent forms. It may be supposed that this should give reasonable certainty in identification of the species. However, one experiences problems when one attempts to differentiate between closely related species within the genera *Somateria* and *Uria*. We do not of course know whether the similarities that exist between species of these genera at the present day were the same during the ice-age, but the material does not suggest that the species have changed significantly.

No sexual determination of the bones has been made. The measured sizes (length and breadth) were measured according to von den Driesch (1976). The material has been compared with recent material, and a t-test and an F-test have been applied with 5% level of significance. The recent material was collected in Norway or along the coast of Norway during the last ten years.

Table. 1. Species of mammals found in the Blomvåg material.

Rangifer tarandus (reindeer)	
Os hyoideum	1 fragment
Astragalus left	1 whole
Metatarsus left	8 fragments
Pagophilus groenlandicus (harp seal)	
Tibia adult	1 whole
Femur juv.	1 fragment
Metacarpus	3 fragments
Balaena mysticetus(?) (bowhead)	
108 fragments of bones from the entire skeleton	

RESULTS

The species determination is given in the tables. The major part of the material as regards number of bone fragments derives from birds. As regards weight, the mammal bones predominate, while a few bones are from fish.

Mammals (Table 1)

Whale: During excavation one gained the distinct impression that all the 108 whale bones belonged to the same individual. No formal determination of the species has been made. But one may conclude that it is from one of the larger baleen whale species, probably the Greenland right whale or the bowhead *Balaena mysticetus*. Confirmation (or a formal identification) of this supposition is difficult in lack of skeletons of recent bowheads for comparison. All the bones have fused epiphyses, thus appearing to originate from a fully grown individual.



Fig. 1. Vertebra, presumably of bowhead (greenland right whale) from Blomvåg.



Fig. 2. Reindeer bones from Blomvåg. Seven small fragments and a big one from metatarsus, probably split by man. At right an ankle bone and a tongue bone.

Seal: Three bones of seals were found in the material. Two of them are of harp seal *Pagophilus groenlandicus:* a fragment of shin bone (tibia) of a fully grown, relatively small individual, and a thigh bone (femur) of a juvenile. A metacarpal bone of seal is probably also from harp seal, a juvenile of unknown sex.

Rangifer tarandus (Reindeer): Three bones of this species are represented: a tongue bone (hyoid), left ankle bone (astragalus), and 8 fragments of left metatarsal bones all interconnecting. The bones gave the impression of having originated from one or at most three fully grown and possibly relatively old individuals. It (or they) seem also to have been relatively large compared to present day size of the species. The sex is unidentifiable. All the measurements are clearly greater than those known from corresponding measurements of recent and subfossil material in Norway (Lie 1972, 1974). The astragalus and fragments of the metatarsus were found near each other, while the hyoid was some way off.

Birds (Table 2)

Fulmarus glacialis: The bone (ulna) seems to have belonged to a relatively large individual, but the measurements lie within the range of variation of present day fulmar. If specimens of this species were the same size during Bølling as they are today, this may be the bone of a male, as present day males are larger than females.

Table 2. These species of birds are represented in the Blomvåg material.

	Fulmarus glacialis	*Puffinus puffinus*	*Somateria mollissima*	*S. spectabilis*	*Melanitta nigra*	*M. fusca*	*Clangula hyemalis*	*Larus argentatus*	*L. marinus*	*Rissa tridactyla*	*Alca torda*	*Uria aalge*	*U. lomvia*	*Cepphus grylle*	*Pinguinus impennis*	*Corvus corax*	Total
Praemaxillare			1														1
Mandibula			5														5
Furcula			1												1		2
Coracoid			2	2	1		1	1			1	2		1			11
Scapula			3	1			2					2				1	9
Sternum		2		1								1					4
Humerus			11	13		1	1				2	4	3		2		37
Radius			3	1													4
Ulna	1		7	2	2				1		1	3					17
Carpometacarpus			7	1						2		1					11
Femur			2												1		3
Tibiotarsus						1						1					2
Tarsometatarsus			1	2													3
Sacrales			1														1
Costae			2														2
Total	1	2	46	23	3	2	4	1	1	2	4	14	3	1	4	1	112

Somateria mollissima: Some of the material was measurable but most was very fragmented. Most of the measurements lie well within the range of corresponding recent measurements, but the length of two carpometacarpi lies outside, and the average value is greater than the corresponding one for recent material ($p<0.05$).

Somateria spectabilis: Some measurements of the sizes of humerus, ulna, coracoid and tarso-metatarsus were made, but none show differences from recent material.

Melanitta fusca: Humerus (distal breadth) and tibiotarsus (greatest breadth, diag. prox.) were measured. The measurements correspond to those of recent material.

Melanitta nigra: The length of the ulna (GL) shows no difference from recent material, but the distal diameter (Dd) seems to be larger than the average for recent material. The basis for comparison is however poor and inadequate.

Uria aalge: The humerus is clearly shorter than that of recent individuals of *Uria a. aalge* ($p<0.05$). The measurements of the other bones lie within the range of variation of recent material.

Uria lomvia: Two fragments of humerus were measured and are clearly broader than the corresponding measurements of recent material (females: $p<0.01$, males: $p<0.002$). The other measurements lie within recent data.

Alca torda: The coracoid seems to be clearly longer and broader than that of recent *Alca torda torda* ($p<0.01$). A fragment of humerus lies within the range of recent humerus for both males and females.

Pinguinus impennis: An entire humerus shows greater dorsoventral breadth at the upper arm (corpus humeri) than the corresponding breadth in great auk material from Varanger (Olsen 1967, Hufthammer 1982). Otherwise the great auk bones do not differ from other material of the species from southern Norway. The great auk material from Varanger differs from the rest of the Norwegian great auk material in several respects.

The remains of the other bird species have non-measurable bone fragments. Wing bones are best represented in this material with 69 fragments, while only 8 originate from the rear limbs (cf. Table 3).

Bones from the rear limbs are greatly under-represented relative to wing bones. But this seems to be a rule in ground finds of skeletal material. However there are no Norwegian ground finds where the difference between the number of wing bones and of rear limb bones is as great as in the Blomvåg find, which is also the oldest. This gives reason to believe that there can be a difference in resistance to decomposition which leads to this effect. The bones of birds from two randomly chosen finds of different age are listed, together with that from Blomvåg (Table 3), in which it will be seen that bones from the rear limbs are obviously under-represented. Clearly the ratio between numbers of wing bones and rear limb bones is dependent on the age of the find. It is therefore reasonable to suppose that the rear limb bones decompose more quickly than the wing bones.

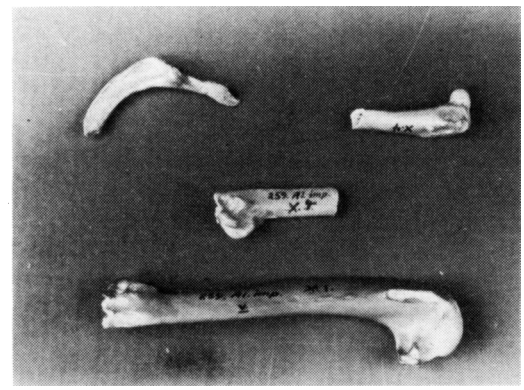


Fig. 3. Bones of great auk from Blomvåg. Lowest: a whole humerus and a piece of a second. Uppermost right: a piece of femur; left: a clavicle bone.

Fish (Table 4)

The fish bones are from specimens of medium size. Those of cod however, are from a specimen weighing 10—15 kg, with a length of 100—120 cm. Coalfish *Pollachius virens* and plaice *Pleuronectes*

Table 3. Number of wing bones and rear limb bones of birds from three localities.

	Age B.P.	Wing bones	Rear limb bones
Storbråthelleren	4000	138	75
Viste	8000	125	42
Blomvåg	12000	69	8

$\chi^2_2 = 18.18$, $p < 0.001$

Table 4. Species of fish found in the Blomvåg material.

Gadus morhua (cod)	
Articulare	2 fragments
Maxillare	1 fragment
Hypohyale	1 fragment
Parasphenoid	1 fragment
Posttemporale	1 fragment
Cleitrum	1 fragment
Pollachius virens (coalfish)	
Parasphenoid	1 fragment
Pleuronectes platessa (plaice)	
Articulare	1 fragment
Quadratum	2 fragments
Interoperculum	1 fragment
Supracleitrale	1 fragment
Radii branchiostegi	7 fragments
Vertebrae	4 fragments
Cottidae (sculpins)	
Operculum	1 fragment

platessa are also represented. A bone of sculpin has not been identified as to species; it is not of bull rout *Myoxocephalus scorpius.*

DISCUSSION

The material from Blomvåg is interesting in several ways. It undoubtedly represents a fauna which had become established in westernmost Norway about 12,500 years ago. In this respect the many species of seabirds and seal are less interesting than grouse and reindeer.

The find provides documentation that life had begun on an ice-free piece of land, and this is hardly surprising. Grouse, raven and reindeer immediately raise the question as to the kind of climate that prevailed in the Bølling period, and the extent of the ice-free land, in particular with respect to the immigration route of the reindeer. As regards this last question it is scarcely possible to have any well-founded opinion, but it is perhaps most reasonable to suppose that the route has gone north of the inland ice.

The presence of the reindeer in westernmost Norway during Bølling will certainly give new stimulus to the discussion concerning ice-free refuges. I will not raise this here, but it seems reasonable to suppose that Blomvåg represents far more than just a summer-green coastal strip which, after a short intermezzo, was covered by ice during Older Dryas. The animal life at Blomvåg about 12,500 years ago represents a continuity. Most of the identified species have a very broad ecological tolerance and are therefore poor indicators of the environment. But the two species grouse and reindeer show that the vegetation was rich enough to form the basis of their nourishment, and this nourishment must also have been available in the winter. It is probable that the animals came from other ice-free areas to Blomvåg, and when the ice again began to cover this area about 12,200 years ago, they moved to other areas that were still free of ice.

Neither as regards the question of the climate that prevailed in West Norway at this time at Blomvåg (Bølling), does the species list give real foundation for appraisal. As mentioned, reindeer and grouse have had winter foraging grounds. But the great auk is perhaps just as interesting in this connection. It is not regarded as a markedly arctic species, and in historical times it has had its most northerly known breeding grounds in Iceland. Significantly more bones of *Uria aalge* (14) than of *Uria lomvia* (3) as well as four bones of *Alca torda* (Table 2) indicate that the climate at Blomvåg can hardly have been less favourable than that in our own time along the outer coast of Finnmark.

It is tempting to speculate how a quantity of bones of several species of fish, birds and mammals can have been accumulated and thus preserved until our own time. If the list of species were less comprehensive, own could suppose that a predator had collected these remains. But it seems scarcely believable that such a comprehensive material can be remains from the meals of a predator, nor that they have been driven ashore by a storm, for example. Fish and seal would not be driven ashore, but would sink.

How the great auk bones have found their way into the remains is also an interesting question. Towards the close of its existence this bird nested only on rather inaccessible rocks. Carnivorous and especially man, were the most dangerous predators. It is supposed that the exploitation of the great auk by man was the most important reason leading to the extermination of this species (Hufthammer 1982). Taken as a whole, the combination of reindeer, seal and great auk at Blomvåg point to human beings as the most probable hunter.

The metatarsal bone of reindeer appears to have been split for the marrow by humans, and this seems to have been done in the same way as in bones of much more recent material. The marrow is regarded as a delicacy. There have also been found pieces of flint in the same layer as the bone material, and there are obvious marks of blows on them, but whether these blows have been made by humans or whether they are caused by the pressure of the ice is less certain.

However, in the valey Karidalen on the island Toftøy in the archipelago c.2 km south of Blomøy chipped flint pieces were found in 1983. A shell layer around these artefacts was dated to 12,450 ± 110 years B.P. (S. Alsaker, pers. comm.).

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