Man and Bird in the Palaeolithic of Western Europe

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Archaeopress Archaeology

Archaeopress Publishing Ltd
Summertown Pavilion
18-24 Middle Way
Summertown
Oxford OX2 7LG

www.archaeopress.com

ISBN 978-1-78969-909-8
ISBN 978-1-78969-910-4 (e-Pdf)

For Mike

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Preface

In putting together these chapters I have found that a study of the interaction between the avian world and that of the hunter - gatherer peoples of the Palaeolithic in Europe has been a search for pattern; pattern in avian ethology, pattern in human behaviour and how the separate patterns have intertwined from time to time. The outcomes show that during the timespan of the Palaeolithic cultures, ecological change was a constant and repetitive process and that in the study of the period, minute faunal detail was an important part of the interpretation of it.

The first three chapters are concerned with some aspects of avian ethology and the archaeological background; later chapters with the process and patterns of interaction between them. The pattern does not always come together. In the record of the Middle Palaeolithic in particular, the data from sites belonging to the Acheulean and early Neanderthal settlement is too patchy, intermittent and inconsistent to give more than a tiny glimpse of what might have been the bigger picture. As the Neanderthal populations expanded across Europe each with its own cultural markers, a pattern begins to emerge showing how resources, including birds, were exploited and put to use.

The gradual penetration into Western Europe of what we call Upper Palaeolithic cultures shortly before 40,000 Kyr BP. probably did not change the relationships greatly but the available information has suffered less erosion from time-factored forces and has remained intact in more detail. So much is now known and continuously being brought to light about the way these hunter-gatherer groups lived, used their resources even trading in them and in consequence how they socialised one group with another. Clear patterns are beginning to emerge, as a result of increasingly meticulous excavation techniques, awareness of the different ways in which tiny fragments of evidence might be interpreted and the use of advancing technology have all had a part to play in the field operations. Yet, just as important is always the research that takes place both before and after any excavation is carried out. The choice of sites selected to demonstrate the way in which avian resources were put to use and attained increasing importance in the development of hunter gatherer society has been based in part on the amount of available data and in part on personal research experience.

To a great extent, in the study of faunal remains, context may determine what material evidence will be found and what will have perished; the location and its environment may affect the phenotype and genotype of the animal species under examination in terms of size, coloration, dietary preferences, movements or breeding potential, amongst other factors. Post excavation research, as technology changes, has become crucial to the extraction of all possible information from the objects revealed. Absolute dating methods, chemical analysis, mass spectrometry, and advances in microscopic, photographic and photometric studies of all types have advanced so much over the last 50 years and are continually evolving so that the researcher may now ask questions that were beyond the reach of earlier previous generations of archaeologists. The entire process takes longer and requires a diversity of specialist expertise but usually the results may be said to justify the extra cost.

And, over time, the questions change as does the relative emphasis placed on them. Currently in the field of anatomical studies, the emphasis is on the study of taphonomy, the treatment bone remains have undergone since death, who ate them, why and how were they modified, the purpose of the modification etc. And besides, what these conclusions may have to say about that social group and its lifestyle.

One of the difficulties associated with the interpretation of bone assemblages arises from the diversity of dating methods used currently and in the past and the difficulty in reconciling the data they provide. Tyreberg had to address this problem in 1998 and it is one faced by all researchers of the Palaeolithic. How to correlate the time sequences across Mammal Neogene zones, traditional glacial and biostratigraphy sequencing in different regions of Europe, reconciling them with cultural sequences. The absolute dating methods, though they present a more precise tool for comparing one site with another have imposed another hurdle to surmount, because of necessity they use different techniques. The most useful most frequently employed and consistent of the Radiometric dating, techniques within its parameters of accuracy is probably Carbon 14. As far as possible sites have been selected that carry secure uncalibrated C14 dates, although, where applicable, the sequence of Oxygen isotope (OIS) stages and land Mammal Zones (MNQ zones) have also been referred to.

Nomenclature may also create confusion not only in the changes in the scientific designations of birds

but also for cultural sequencing. In the 1950's glacial phases continued to be referred to under the names of the Alpine sequence, while these fluctuations are now recognised as having regional variations and the task is to reconcile the local sequences with the evidence of ecology and cultural change.

By the start of the 21st century, the search for the evidence left by Early Man had already had a over 150 years of history of exploration behind it and some of the early excavations have needed to be revisited and the data revised, using the residue of what was left behind by the earlier archaeologists, left behind for their re-assessment. Added to which, at the time some of the objects, documenting the discoveries recovered by these pioneers were presented as gifts to friends and colleagues. When these objects of antiquity were given to a national or local museum they have normally been conserved. But too frequently individual pieces were given to private collectors and have been difficult to trace. At the time small bones were regarded as of lesser importance. The remains of microfauna or of the birds was seldom considered of sufficient value to be studied or retained.

Nevertheless, it is on the foundations laid by these pioneers that all recent research is founded. Without such scholarly leadership from researchers and antiquarians of the past, the present level of knowledge would be a great deal poorer. Each of us has their heroes who have taught or inspired them. Among my personal heroes I count independent thinkers like Dorothea Bate, André Leroi Gourhan, the Abbé Henri Breuil and some recent researchers. I am also hugely grateful my tutor, John Waechter, at the Institute of Archaeology in London who when told, as he was handing me his bird bone collection from Gorham's cave, Gibraltar for study, that although birds were quite a thing of mine, my knowledge of anatomy was sketchy, he replied that it would be greatly improved by the time *you have dealt with this lot.* Deal with it I did and carried on.

Despite the wonderful co-operation of museum staff and the use of their collections, the priority was to prepare an avian skeletal reference collection for personal use, despite the demands it made on the tolerance and patience of family, friends and sympathetic organisations. Most specimens were collected in the field, where by experience one learnt that dried, skinned and eviscerated corpses, wrapped in newspaper, not polythene travelled better and attracted less official attention than fresh ones; and that insects, especially hornets were exceedingly efficient flensing operators if allowed to work on specimens hung out on a line, provided that line and attachments were wire, otherwise eager ants would devour the strings and their nest would require excavation to retrieve the fragmented specimen next morning. Happily, only one bird, a dunlin that had lost a wing was ever deliberately killed but it was under attack from gulls at the time without any chance of survival.

I have depended to a large extent on other researchers in ornithology and Palaeolithic archaeology. In the main most of these are referred to in the text but there has been particular dependence on the nine volumes of Cramp and Cramp and Simmons work in the *Handbook of birds in Europe, the Middle East and north Africa; Birds of the Western Palaearctic,* (1977-1994) for most of the ornithological data and on Tyreberg's site lists in *Pleistocene birds of the Palaearctic* (1998). For Anatomical detail and nomenclature, Baumel ed. (1979) has everything to recommend it and the volumes produced by the Institut fur Palaeoanatomie, domestikatione forschung und Geschichte der Tiermedizin of the University of Munich, directed bt Dr Boessneck, with Angela Von Dreisch (1976) *A Guide to the measurement of animal bones* can be useful.

But time and research move on, new techniques are becoming available all the time in answer to the increasing number of questions that are asked about animal and human behaviour, their chemistry, origins and development. And the means of seeking answers to these questions are being discovered all the time, usually emerging out of the requirements in other areas of research. Photographic techniques, photogrammetry and the electron microscope, the fields of biochemistry and materials research are being adapted for service in archaeology. Each new tool opens up the possibility of more precise information, though each has its advantages and limitations. In the end, any results depend on subjective judgement and the imaginative scope to ask the questions in the first place and explore the possible solutions, even if the answer is likely to be negative.

Chapter 1

Some aspects of bird life during the Palaeolithic of western Europe

Some of the aspects of avian ethology as they are related to Palaeolithic hunter-gatherer settlers are revealed in the fossil record that has been recovered from occupation sites and caves in western Europe and have something to say about the life of the birds themselves during the Upper Pleistocene. Conversely while an avian presence may provide some information regarding the environment of hunter-gatherer peoples, its absence may be a reflection of ecological or other issues of human priorities. Yet an even more important situation relevant to the issues raised by current climate change is that even though there were long periods when the European climate deteriorated to a point where it could not support a number of species whose niche requirements demanded temperate or Mediterranean conditions to survive, these came back fairly rapidly as the temperature rose again and restored the ecology to match their needs. The situation never became one of extinction due to catastrophic external forces, as perhaps happened during the Cretaceous, but an internal fluctuation subject to later restoration.

In his introduction to the comprehensive lists of the *Pleistocene birds of the Palaearctic, a Catalogue, 1998* Tyreberg takes the starting point of the Palaeolithic as around 1.64 MA BP, a date that follows after the Olduvai geomagnetic event. The point at which birds began to be exploited as a resource for hunter-gatherer peoples in western Europe appears to be around 500,000 Years BP, during the early Middle Palaeolithic, from which time there begins to be some clear evidence of human and avian inter-action rather than possibly random juxta positioning of bones or scavenging on the kills of other predators. The discovery of assemblages of animal and avian bone makes it possible to attempt a partial reconstruction of the changing environment and ecology of the locality. Useful data for this is preferentially obtained from the stable sequences in cave or open air settlements. Material from river terraces or shorelines is less useful, since it has frequently been re-deposited and therefore the date and context is more doubtful.

The effect of climate fluctuation on bird populations was profound. Habitats, for both summer and winter visitors to western Europe, breeding behaviour and distribution areas were all dependent on the niche requirements of individual species that were subject to changes in the environment. Some of the ecological changes brought about by climatic fluctuation, may be traced in the evidence of species distribution as derived from the archaeological record. Migration patterns undoubtedly changed, as noted by Moreau in 1972, who listed many of the passerines as having disappeared from the European list in times of glacial advance. Food availability is a major factor in defining the suitability of a habitat to support a varied bird fauna, A diverse avifauna in a particular context may therefore indicate a rich variety in the local ecology since across the spectrum birds will relate to every other taxon present, either in the sense of being broadly sympatric or in a prey/predator relationship.

The data is complicated, as noted by Tyreberg, by the different dating methods used. Not only do many older excavation publications rely on cultural chronology but the various means of absolute dating are not always consistent or standardised. Where recent C14 dates are available, these have been used as being within the range of probability. The record is also biased and incomplete. Whereas large mammals have always been a priority in considering the human environment, the significance of birds, micro-mammals and other species in the ambient fauna and flora was not fully recognised by the early excavators and the evidence was not always retained.

Seasonal movement patterns

The following tables show the species and contexts of the bird species recorded as present in dateable excavated cave deposits in western Europe. The sites where each one has been recorded are broadly and somewhat arbitrarily grouped into the major Palaeolithic cultural and climatic sequences. It attempts to give a broad picture, based on Djindjian, F., Koslowski, J., and Otte, M. 1999. There may be local discrepancies in the lists, and some noteworthy sites have been omitted since some of the determinations may require revision.

The species listed in Table 1 shows many of those species identified by R.E. Moreau in 1972 as unlikely to be able to survive in western Europe during a glacial advance.

Of particular significance is the small number of deposits dated to the Last Glacial maximum from which bird remains have been recovered, that confirm Moreau's

Species	250 – 40 Kyr BP Mousterian	40 – 28 Kyr BP transition to Upper palaeolithic Aurignacian	28 – 22 Kyr BP transition to Gravettian, deteriorating climate	22 – 17 Kyr BP Local Solutrean Last Glacial maximum	17 – 10 Kyr BP Magdalenian sequence, ice retreating	10 Kyr to recent Mesolithic <
Coturnix coturnix	A. Olha, Pyr Atlant. Aurensan Hte Pyr. B. de Gigny Jura. Valdegoba Burgos C.N. de Bellus Jativa	B. de Gigny Jura	B. de Gigny Jura Le Flageolet Dord.	A. des Pecheurs, Ardêche.	Aurensan Hte Pyr. Cauna de Belvis Hte Pyr. Bois du Cantet Hte Pyr.	B. de Gigny Jura Baume des Grottes Isère. B. des Gonvillars Hte Saône
Burhinus oedicnemus					La Madeleine, Dord. A. Dufaure Landes	
Otus scops	Combe Grenal, Dord Pech de L'Aze. Dordogne		A, Pataud Dord. A. des Pecheurs Ard. Arbreda Gerona	Bois de Brousse Herault	Cauna de Belvis Aude Laroche II Herault	Pont d'Ambon Dord Salpêtre Herault
Apus melba	Hortus Herault C.N. de Bellus Jativa Devil's Tower Gib.	C. de Zafarraya Malaga			G. des Romains Ain Cingle Vemell Barcelona	Balme des Grottes Isère
Apus pallidus		Es Poussas, Eivissa				Es Poussas, Eivissa
Merops apiaster	Combe Grenal Dordogne					Salpêtre Herault
Cuculus canorus					G. d'Eyzies Dord. Abr. de Campalou Drôme	
Corracias garrulus	Arbreda Gerona				Trou Violet Ariège Gr. dela Madonna Calabria	C. Genovesi sicily G. Polesini Lazio Es Poussas Eivissa
Hirundo daurica	Balauzière Gard G. Simard Charente Hortus Herault Pech de l'Aze Dord. Salpêtre Herault			A. du Blot Hte Loire Jaurens Corrèze	Cauna de Belvis Aude Gr. des Romains Ain	G. St Pierre Hte Savoie
Luscinia megarhyncos						C. de Nerja Malaga
Phoenicurus phoenicurus	Fontechevade Charente			A. du Blot hte Loire	A. Lafaye Tarn et Garonne	

Table 1. Some examples of the records of Summer visitors to western Europe during the Upper Palaeolithic with reference to Tyreberg 1998 and Moreau 1972.

Species	250 – 40 Kyr BP Mousterian	40 – 28 Kyr BP transition to Upper palaeolithic Aurignacian	28 – 22 Kyr BP transition to Gravettian, deteriorating climate	22 – 17 Kyr BP Local Solutrean Last Glacial maximum	17 – 10 Kyr BP Magdalenian sequence, ice retreating	10 Kyr to recent Mesolithic <
Monticola saxatilis	Aurensan Hte Pyr.				B. Loire Hte Pyr. Boids du Cantet Hte Pyr.	
Monticola solitarius	Combe Grenal Dord. C.N. de Bellus Jativa	Gatzarria Pyr. Atlant Zafarrya Malaga			Cingle Vermell Barcelona C. de Nerja Malaga	
Acrocephalus paludicola					A. des Romains Ain	
Acrocephalu palustris					A. de Rochdune Doubs	
Acrocephalus scirpaceus					Erralla Guipuzcoa	
Acrocephalus arudinaceus					A. du Calvaire Htee Pyr.	
Hippolais icterina	Combe Grenal, Dord					
Sylvia hortensis	Combe Grenal Dord					Gr. St Pierre Savoie
Ficedula hypolleuca	Salpêtre Herault Hortus Herault				G. des Romains Ain	
Lanius collurio	Combe Grenal Dord					
Lanius minor		Es Poussas, Eivissa				
Lanius excubitor		Es Poussas, Eivissa				
Lanius senator		Es Poussas, Eivissa				Salpêtre Herault

Table 1. Continued.

hypothesis. Warblers, Flycatchers and Shrikes, all of whom depend to a considerable extent on insect life, are totally absent from the selected sites. Nevertheless, as the climate warmed and the ice retreated during the final stages of the Last Glaciation, the majority of these species, many of whom depend to some degree on airborne insect life, returned to recolonise southwest Europe, re-entering via the Mediterranean regions in the south and east. This resurgence was interrupted relatively briefly by the stages of renewed cold, known as Dryas 1, 2 and 3.

The extended timespan of Mousterian development presents a more confused picture when taken as a whole but the changes become locally clearer as individual sites are studied in detail or re-examined in the light of recent revisions. Sites like Pontnewydd in north Wales (Aldhouse Green *et al.* 2012), or the current investigations into the sequence of occupations in Gorham's cave on Gibraltar. Or, the sequence at Combe Grenal in the south of the Dordogne where there appears to have been an influx of small passerine summer migrants arriving during a temperate phase towards the end of OIS 5a; species that included a beeeater, *Merops apiaster,* blue rock thrush, *Monticola solitarius* icterine and garden warblers, *Hippolais icterina* and *Sylvia borin,* with a red backed shrike, *Lanius collurio*, that with the excavations at Pech de l'Aze revealed the presence of a red rumped swallow, *Hirundo daurica*, all summer migrants into warm temperate zones (Mourer Chauviré 1975).

An examination of the fossil record would therefore appear to confirm Moreau's prediction that the ecology of Europe to the north of the Garonne and west of the Rhone was not able to support many of these small migrants during times of glacial advance.

Table 2
Apart from cave sites along the Cantabrian littoral, where the inshore waters remained at a considerable depth even during glacial maxima, the majority of sites are close to the Mediterranean shores of Iberia and Italy, where sea levels fell considerably during cold phases and shorelines extended as much as 30 kilometres. A lower mean sea level during the Last Glacial Maximum may go some way towards providing a reason for the absence of seabirds in the record of any site except Arene Candide, Savona, Italy, situated above the deep waters of the Ligurian coast.

Once the climate had begun to ease and sea levels to rise, seabird populations began to increase in these coastal locations of the Mediterranean and Cantabria.

Table 3
Table 3 aims to show the winter movements of northerly breeding wildfowl over the same time span. At the present day, many fresh and brackish water wildfowl breed in northern and arctic regions, moving southwards in Winter. There is little evidence for the breeding locations during the Palaeolithic but it appears evident that during periods of prevailing glacial advance the wintering zones of many species extended southwards of the current limits. So that *Cygnus columbianus bewickii*, the Bewick swan remains were identified in a Mousterian level at Carnello, near Soria on the river Liri in Lazio province of Italy at a latitude of 41.43^{0}N. It was also present at Dufaure, one of the rock shelters in the Pastou cliffs beside the Gave d'Oleron, France at a latitude of 43.33^{0}N, in a Magdalenian level, dated to Dryas II (12,200-11,000 BP). There are also records of identifications in the UK and Ireland but some of the dating is a little uncertain.

Finds of Whooper swan, *Cygnus cygnus* have been found to be more widely distributed in Europe, both within possible present day wintering areas and further south to regions not currently thought to be within their range. The identified sites in France where they were present during the Mousterian occupation seem to be mainly confined to southern and eastern parts of the country: at Balauzière in Gard, Ramandils in the Aude and in a dated deposit at the Baume de Gigny in the Jura carrying dates between 45,000 ans 32,000 BP. In Italy the whooper swan was recovered in association with Mousterian at the Grotta della Cava di Sezze Romano in the province of Lazio (Cassoli 1980) and at Grottoni in the Abruzzo (Giustizia 1979).

There are no certain records of either species of these swans between the end of the Mousterian in France until the beginning of the Magdalenian, although there is an undated record of bone(s) from the Grande Grotte at Arcy sur Cure in Lambrecht 1833 and Milne Edwards 1867-71 (quoted by Mourer Chauviré 1979).

The presence of whooper swan in the southwest of France and the Mediterranean seems to have become more frequent as climatic conditions began to ameliorate at the end of the Last Glaciation. Deposits at Arene Candide on the Ligurian coast of Italy contained a long sequence of 'Tardigravettian occupations dated to around 11,000 BP, each with remains of Whooper swan (Cassoli 1980) and there was a possible discovery of a bone in the Grotta Romanelli as far south as the province of Puglia on the Adriatic coast (Cassoli and Tagliacozzi 1994).

In the Pyrenean region of France, there were finds of whooper swan in Magdalenian contexts in the caves of Massat in Ariège (Clot and Mourer Chauviré 1986) Gourdan in Haute Garonne (Ibid) and in the Atlantic Pyrenees among the debris left behind by clandestine diggings into late Magdalenian deposits at the Grotte de Bourrouilla at Arancou (Eastham in Chauchat 1999).

Species	250 – 40 Kyr BP Mousterian	40 – 28 Kyr BP Transition to Upper Palaeolithic, Aurignacian	28 – 22 Kyr BP Climatic shift, transition to Gravettian	22 – 17 Kyr BP Last Glacial Maximum local Solutrian	17 – 10 Kyr BP Ice in retreat Magdalenian sequence	10 Kyr BP to recent Holocene Mesolithic to present
Calonectris diomedia	Devil's tower Gib. A. Olha Pyr. Atlantic C. Genovesi, Sicily	Es Poussas, Eivissa			C. de Nerja Malaga C. Genovesi Sicily	C. de Nerja Malaga C. Genovesi, Sicily G. della Madonna, Calabria
Puffinus gravis					C. de Nerja Malaga	C. de Nerja Malaga
Puffinus griseus						C. de Nerja Malaga
Puffinus yelkouan					Gorham's cave, Gib.	
Puffinus puffinus	C. Genovesi, Sicily				C. de Nerja Malaga	C. de Nerja, Malaga Sewell's, cave Gib.
Sula bassana	Archi Cave, Calabria				C. de Nerja, Malaga C. de Torre, Guipuxcoa	
Phalocrocorax carbo				Arene Candide, Lig.	G. Romanelly, Italy	
Phalocrocorax aristotelis	Gorham's cave, Gib. C.N. de Bellus, Jativa			Arene Candid, Lig.	C. de Nerja, Malaga Gorham's, cave Gib. Gr. de Colombi, Lig. C.N. Negra de Bellus, Valencia	
Larus ridibundus	Gorham's cave, Gib.	Castillo, Santander Ekain, Guipuzcoa		Arene Candide, Lig.		
Larus canus			Brillenhohle, Baden Wurtemberg		C. de Nerja, Malaga G. des Romains, Ain La C olombière, Ain	Bois du Cantet, Hte Pyrenees
Larus fuscus	Gorham's cave, Gib.	Gorham's cave, Gib. Devil's tower, Gib.			G. des Romains, Ain La Colombière	
Larus argentatus	Tournal, Aude	Gorham's cave, Gib.				
Larus marinus		Casillo, Santander			Nerja, Malaga Arene Candide, Lig.	

Table 2. Some pelagic species recovered from Palaeolithic occupation sites in western Europe.

Species	250 – 40 Kyr BP Mousterian	40 – 28 Kyr BP Transition to Upper Palaeolithic, Aurignacian	28 – 22 Kyr BP Climatic shift, transition to Gravettian	22 – 17 Kyr BP Last Glacial Maximum local Solutrian	17 – 10 Kyr BP Ice in retreat Magdalenian sequence	10 Kyr BP to recent Holocene Mesolithic to present
Rissa tridactyla					A. Gay, Ain G. St. Pierre I, Savoie G. de Lourdes, Hte Garonne. G. Romanelli, Puglia. G. dei Fanciuli, Lig. C. de Ermittia, Guipuzcoa	
Sterna sandvicensis		Devil's tower, Gib.				
Sterna hirundo	A. Olha, Pyr. Atlantic	Castillo, Santander				
Sterna paradisea				Arene Candide, Lig.	A. Gay Ain. Gare de Couze, Dord.	
Uria aalge				Arene Candide, Lig.		
Alca torda				Arene Candide, Lig.		
Pinguinis impennis	Gorham's cave, Gib.				Arene Candide, Lig.	
Alle alle	B. de Gigny, Jura				Bois du Cantet, Htes Pyr.	
Fratercula arctica		Gorham's cave, Gib.		Arene Candide, Lig.		

Table 2. Continued.

Species	250 – 40 Kyr BP Mousterian	40 – 28 Kyr BP Upper Palaeolithic Aurignacian	28 – 22 Kyr BP Transition to Gravettian, climate cooler	22 – 17 Kyr BP Local Solutrean cultures. Last Glacial maximum	17 – 10 Kyr BP Magdalenian sequence Ice retreating	10 Kyr to recent Mesolithic < Holocene
Gavia stellata					Gr. Romanelli, Puglia Petersfels Baden Wurtemberg	
Gavia arctica					Gr. Romanelli, Puglia Isturitz, Pyr. Atlantic/immer?	
Gavia immer					Dufaure, Landes	
Cygnus columbianus	Carnello Lazio Italy Pontnewydd Clwyd Wales				Dufaure, Landes	
Cygnus cygnus	Carnello, Lazio. G. del C di Sezze. di Romano, Lazio Grottone, Abruzzo. Balauzière, Gard Ramandils Aude B. de Gigny Jura				Arene Candide Liguria Gr. Romanelli, Puglia Gourdan Hte Garonne. Gr. des Romains, Ain La Madeleine, Dord. Rond do Barry, Hte Loire. Rmandils Hte Loire	G.della Madonna, Calabria
Anser fabalis				Brillenhohle B. Wutemberg.	Kleine Scheuer, B. Wurtemberg.	
Anser brachyrhynchus	Pech de l'Aze, Dord.	Gr. des Fées, Allier.			Gr. Gazelle Aude. G. Romanelli, Puglia. Little Hoyle S.Wales	
Anser erythropus					Gr. Romanelli, Puglia. Little Hoyle S. Wales	G. Polesini Lazio
Anser albifrons					Arene Candide Liguria Gr. Romanelli, Puglia Little Hoyle S. Wales	C. Genovesi Sicily
Anser anser	Soulabé, Ariège. Aurensan Sup. Hte Pyrenees	Pair non Pair, Gironde			Abr. Dufaure, Landes. Gr. Romanelli Puglia. Gr. de Gouerris Hte Garonne. Rond-du-Barry, Haute Loire. Urtiaga, Guipuzcoa. Little Hoyle S. Wales	Santimamine, Viscaya
Branta leucopsis	La Cotte de St Brelade Jersey			Liitle Hoyle S. Wales	Urtiaga, Guipuzcoa Little Hoyle S. Wales	

Table 3. Some of the freshwater waterfowl species recorded as wintering outside their recent range in western Europe on Palaeolithic sites.

Species	250 – 40 Kyr BP Mousterian	40 – 28 Kyr BP Upper Palaeolithic Aurignacian	28 – 22 Kyr BP Transition to Gravettian, climate cooler	22 – 17 Kyr BP Local Solutrean cultures. Last Glacial maximum	17 – 10 Kyr BP Magdalenian sequence Ice retreating	10 Kyr to recent Mesolithic < Holocene
Branta bernicla	G. de Giganti, Puglia La Cotte de St Brelade Jersey	Arbreda, Gerona.			C. de Nerja, Malaga. G. Romanelli, Puglia.	
Tadorna tadorna			Isturitz, Pyr. Atlantic.	Aitzbitarte IV, Guipuzcoa.	Hoyle's Mouth S. Wales	
Anas querquedula	G. del Principe, Liguria Grottone, Abruzzo.	Arbreda, Gerona.		Volcan, Valencia	La Riera, Asturias	La Riera, Asturias
Netta rufina	Gorham's cave, Gib.			Volcan, Valencia	Arene Candide, Liguria	G. della Madonna, Calabria
Aythya nyroca	Balazuc, Ardeche. Gorham's cave, Bib.				Aurensan Inf, Htes Pyr. Bois de Brousses, Herault Nerja, Malaga	A. de Campalou, Drôme
Aythya marila					Kniegrotte, Thuringen	
Clangula hyemalis				B. de Gigny, Jura	Berroberia, Navarre Gr. Romanelli, Puglia Gr. des Romains, Ain G. de Lourdes, Hte Garonne Abri Gaiy Ain	La Crouzade, Aude
Melanitta nigra	Abri Olha, Pyr. Atlant B. de Gigny, Jura				G. de Lourdes. Hte Garonne Gr. des Romains, Ain Arene Candide, Liguria	Nerja, Malaga
Melanitta fusca	Gorham's cave, Gib.	Castillo, Santander Isturitz, Pyr. Atlantic			Gr. Romanelli, Puglia	
Mergus albellus	Carnello, Lazio			La Colombière, Ain	Aurensan Inf, Htes Pyr.	
Mergus serrator	Devil's Tower, Gib. Aurensan, Sup. Htes Pyr.	Isturitz, Pyr. Atlantic			Freydiéres, Drôme Arene Candide, Liguria	Gr. de Gouerris, Htes Garonne Gr. des Harpons Htes Garonne
Mergus merganser	Gr. Simard, Charente Soulabé, Ariege	Pair non Pair, Gironde	Aitzbitarte IV, Guipuzcoa		Gr. de la Vache, Airège Gr. de L'Homme mort, Htes Pyr. Rond du Barry, Hte Loire	

Table 3. Continued.

Further north in Aquitaine at La Madeleine in the Dordogne Delpech (1975) identified whooper swan. There were also finds dated to around 12,000 years BP recorded at Rond du Barry, in the Haute Loire, and around 11,000 at the Grotte des Romains, Ain. a date very similar to that at Gough's Cave, Somerset in England for the presence of the species in those deposits (Harrison 1980).

Most of the Anser species of geese whose bones have been identified in Palaeolithic occupation sites in Western Europe breed at the present day in the far north: *A.fabalis* and *A.brachyrhyncos* in Iceland and Greenland. *A.albifrons* breeds in the tundra of northern Russia and Novaya Zemla while *A. erythropus*, selects sites on the margins of open and wooded tundra, their range extending across arctic and northern Fennoscandia. *A. anser*, however breeds mainly in boreal and temperate zones in wetland habitats. The wintering grounds of all these species involve movement southwards to a greater or lesser extent, some to western Europe, other populations, like the bean goose and the whitefront geese towards the Mediterranean and eastern Europe.

The Branta species of geese are also present during the span of the Palaeolithic in Europe. Both breed in the high arctic, *B. leucopsis*, barnacle goose in Iceland and Novaya Zemla, *B. bernicla*, brent goose mainly in Iceland and Spitzbergen, Autumn and winter movements are currently towards the South and West, to the shores of western Europe and Britain in the case of barnacle geese, whereas the brents also settle in parts of eastern England. In Palaeolithic deposits in Britain barnacle goose was found in the Cotte de Saint Brelade on Jersey and at Pontnewydd cave, Clwyd in Mousterian contexts. Later, as the ice retreated during the final phases of the Last Glaciation bones of barnacle geese were recovered at both Hoyle's Mouth and Little Hoyle, caves in the Ritec Valley, Pembrokeshire, South Wales and also at Urtiaga in Guipuzcoa province of the Cantabrian region of Spain. A C14 dating for one of the Little Hoyle bones gave a date around 19,320 ± 120 years BP (OxA33902 NC95), a date just prior to the Last Glacial Maximum, indicating that west Wales may have been a periodic stop off on the Autumn migration, one that may have been anticipated by the hunter-gatherers camping there. The bones at Urtiaga were more compatible in date with the later deposits at Little Hoyle at 10,280 ± 190 BP (CSIC64).

The Brent goose also was present in Jersey in both the Mousterian and subsequent levels. On the European continent bones were recovered from a Mousterian context at the Grotta di Giganti in Puglia and in the early Aurignacian levels of the cave of Arbreda in Gerona province. Towards the end of the Last Glaciation remains were found as far South as Nerja in Malaga and the Grotta Romanelli.

By comparison with winter dispersals at the present day this pattern of the distribution during the colder periods of the latter part of the Pleistocene would appear to confirm that there was a southerly shift in the wintering grounds of both swans and geese at those times of glacial advance; and further, that this shift appeared less marked in the west, especially in Britain. On the sites in southern Aquitaine wintering populations of some wildfowl species would seem to have been displaced southwards by up to 500 kilometres. A change that may have had some small impact on the seasonal diets of hunter-gatherer peoples in those areas.

Both the range of sites and the species featured in the foregoing tables have been selected because the dating of the bones and their stratigraphic context in the archaeological sequence are relatively precise. The data appears to be consistent and indicates a certain pattern in bird/Hunter-Gatherer contact between around 250 Kyr BP and the early Holocene. Based on these records the pattern of distribution across the somewhat generalise climatic fluctuations is generally consistent. They show a diversity of species on a fairly extensive range of sites during the extended timespan of the Mousterian, reducing between 40 Kyr and 17 Kyr BP, and thereafter on the increase once more. This may be a genuine reflection of climate and human behaviour, although, especially on earlier excavations it may have been a consequence in a few cases of the collection bias of the excavator.

Some examples of avian diet as it informs the regional ecology

Another aspect relevant to the interpretation of bird assemblages during the Palaeolithic is the study of the variety and particularity of avian diet and the requirements and preferences of individual species as a tool to go some way towards a reconstruction of the ecology of a hunter-gatherer site at a point in time. Such reconstructions depend on assumption that the diet of individual species, has remained broadly the same over time and it is possible to trace its known food intake as it changes during an annual cycle, to build a picture of the ecology of that species in the archaeological context in which it was found by using the records of pollen and other faunal data for that site.

A look at the likely feeding behaviour (based on Cramp Vol. I 1977) of the wildfowl recovered from the Neanderthal occupation site of Pontnewydd, near St Asaph, north Wales, implies that the range of the plant and animal life taken as food by wildfowl at the present day, was also available, at least in part, to those species of geese and duck whose bones were found in at the cave. Their presence would seem to indicate the probability that a sufficient quantity of some at least of

Plant species	*Anser anser*	*Anser brachyrhyncoc*	*Anser albifrons*	*Branta leucopsis*	*Branta bernicla*	*Aythya fuligula*	*Melanitta nigra*	*Mergus albellus*
Salix glauca, Bluish willow		S	S					
S trianda, Almond willow	A							
S.herbacea, Dwarf willow				S/A	Spr			
Equisetum, Horsetail	S	S/A	S/A	A/W				
Selaginella sp., Club moss		S	S					
Oxyria digna, Mountain sortrel		S	S	S	S			
Polygonum viviparum, Bistort	S	S/W	S/W	S/W				
Chenopodiae, Goosefoot	S							
Stellaria sp., Chickweed	S	W	W					
Salicornia, Marsh samphire				Spr	W/Spr			
Cerastium sp., Mouse ear		S/A	S/A	S	S			
Ranunculus sp., Buttercup family				S/W	S/W			
Capsella bursa pastoris, Shepherd's purse	S							
S.saxiifrage, Saxifrage	S	S/A	S/A	S	S			
Apium nodiflora, Fool's watercress				W				
Potentilla palustris, Cinquefoil	S							
Dryas octopetala, Mountain avens				S				
Trifolium sp., Clover family	S			A/W				
Veronica sp., Speedwell	S							
Platago maritima, Sea plantain				W				
Triglochin maritima, Sea arrow grass				A/Spr	W			
Armeria maritime, Thrift				A/W				
Aster trifolium, Sea aster				W/Spr	W			
Sonchus sp., Sow thistle family	S							
Taxacum sp., Dandelion family	S							
Potamogatonaceae, Pondweeds	S					W/S	S	W/Occ
Zostera sp., Eel grass family				W	W/Spr			W/Occ
Ruppia maritima, Tassel weed						W/S		W/Occ
Lemnaceae, Duckweeds	S							W/Occ
Sparganaceae, Burr weed	S/A		S					
Bolboschoenus maritima, Sedge	S/W							
Cyperaceae eriophorum, Cottongrass		S	A		S			

Table 4. Plant species known to be taken by the Wildfowl species represented in the Mousterian deposits at Pontnewydd cave. A. platyrhyncos, Mallard is omnivorous and omitted from this list (after Cramp Vol. I. 1977)
(**Spr**. Taken in Spring; **S.** Takin in Summer; **A.** Taken in Autumn; **W,** Taken in Winter; **Occ**. Taken occasionally).

Plant species	*Anser anser*	*Anser brachyrhyncoc*	*Anser albifrons*	*Branta leucopsis*	*Branta bernicla*	*Aythya fuligula*	*Melanitta nigra*	*Mergus albellus*
Carex, Sedges	**W**	**A**						
Scirpus, Club rush	**S/W**					**W**		
Eleocharis palustris, Spike rush						**W**		
Phalaris sp., Reed grass	**S/W**		**S**					
Leersia, Cut grass	**S**							
Festuca sp., Fescue	**S**	**S**		**W**	**W**			
Phragmites communis, Reed	**S**							
Pulchinella maritima, Sea poa				**W**	**W/Spr**	**Spr**		
Glyceria sp., Water grasses	**S**			**W**				
Poa sp., Poa	**S**	**W**	**W**	**W**				
Triticum sp., Wheat	**W**	**W**						
Hordeum seccanum, Barley	**W**	**W**	**W**					
Agropyron repens, Couch grass	**W**		**W**					
Avena sp., Oats	**W**	**W**	**W**					
Phleum sp., Cat's tail grass	**S**	**W**						
Lollium sp., Rye grass	**S**	**W**		**A/W**				
Agrostis stolonifera, Fiorin				**A/W**				
Juncus gerardii, Mud rush				**A/W**				
Algae: Fucus. Cladophora, Enteromorpha, Viva				**S/W**	**S/W**			

Table 4. Continued.

these items were present and available to sustain the birds during the period of Hunter-gatherer occupation.

Tetraornidae the grouse family and other game species provide a further example of a group of birds all with similar dietary requirements, while each normally occupies a separate habitat zone within a restricted yet distinct environment, their diets overlap and yet the foraging zones are fairly separate. During the phases of the Last Glaciation, this family has been shown to include the most heavily predated by both humans and other animals, with the result that their bones are often the most numerous in the avifaunal assemblages.

On some sites and the site of the Upper Cave at Buhlen, Kr.Waldeck-Frankenberg in Hessen, Germany is a good example, the bones of several species of the group form the largest element of the avifauna. The grouse and related species at Buhlen include six of these game species: capercaillie, black grouse, willow grouse, ptarmigan, partridge and snipe. The bones of a number of raptors were also present at Buhlen and their agency in the mortality of the game birds cannot be ruled out. Nevertheless, the assemblage demonstrates the complexity of the habitats around the site.

The hazel grouse *Bonasia bonasia*, not present at Buhlen favours a habitat in damp forest clearings up to 2,000 m. OSL Palaeolithic records of it are mainly restricted to eastern Europe in East Germany, Austria, through to Hungary, Romania and the Balkans.

The blackcock, *Tetrao tetrix*, preferentially occupies a niche transitional between open heath and light forest in the subarctic and boreal climate zones. At the present day it is found in the Alps and highland areas up to 2,500 metres above sea level. It is not strong on the wing unlike the more bulky capercaillie *Tetrao urogallus*, a bird of arboreal habit often in conifer forests that feeds in the canopy.

Species	*Aythya fuligula*	*Melanitta nigra*	*Mergus albellus*	*Mergus mergsnser*
Mollusca, freshwater				
Deissena polymorpha	**W**			
Hydrobia jenkinsi	**W**			
Pisidium sp.	**W/S**			
Anodonta sp.	**W**	**All**		
Lymnea sp.	**W/S**	**All**		
Unio sp.	**S**			
Valvata sp.	**S**			
Viviparus duboisiana	**S**			
Marine				
Mytilis edulis	**W**	**All**		
Cardium sp.	**W**	**All**		
Littorina sp.	**W**	**All**		
Hydrobia sp.	**W**	**All**		
Mya sp.		**All**		
Spisula sp.		**All**		
Nassa sp.		**All**		
Crustacea, freshwater				
Gammarus sp.	**S/All**			**S**
Asellus sp.	**S/All**			
Marine				
Idonta sp.		**All**		
Isopodiae sp.		**All**		
Carcinus sp.		**All**		
Invertebrate, *Annelidae*		**All**		
Insect				
Phruygmea sp.	**S**	**S**		
Hydropsyche augustiponis	**S**			
Chironimidae		**S**		
Fish				
Anguilla Anguilla, Eel			**All**	**All**
Clypea harenga, Herring			**All**	**All**
Salmo salar, Salmon			**All**	**All**
Salmo trutta, Trout			**All**	**All**
Thyamalis thyamalis, Grayling				**All**

Table 5. Mollusca, Crustacea, invertebrates and fish known to be taken by Wildfowl species whose remains are recorded in the Mousterian deposits at Pontnewydd Cave (after Cramp Vol. I. 1977) (**S.** Taken in Summer; **W.** Taken in Winter; **All** Taken at all seasons).

Species	*Aythya fuligula*	*Melanitta nigra*	*Mergus albellus*	*Mergus mergsnser*
Esox Lucius, Pike			**All**	**All**
Abramis brama, Bream				**All**
Albumus albumus, Bleak			**All**	
Barbus barbus, Barbel				**All**
Gobio gobio, Gudgeon			**All**	
Leuciscus leuciscus, Dace				**All**
Phoxinus phoxinus, Minnow		**W/S**	**All**	**All**
Rutilus rutilus, Roach			**All**	
Scardinus erythrophthalmus, Rudd				**All**
Cobitidae, Loach				**All**
Gadus morhua, Cod				**All**
Lota lota, Burbot			**All**	
Zoarces viviparous, Blenny			**All**	
Gasterostidae, Stickleback		**W/S**	**All**	
Perca fluviatalis, Perch				**All**
Cottus gobbio, Bullhead				**All**
Ammoditidae, Sand eel			**All**	
Pleuronectes platessa, Plaice			**All**	**All**

Table 5. Continued.

By contrast, the habitat of the willow grouse, *Lagopus lagopus,* extends from the arctic into boreal or even temperate zones, into open habitats of treeless tundra, moor, heath, marsh and even wetlands and feeding mainly on shoots leaves and berries. The feeding pattern of the ptarmigan, *L. mutus* is similar but, since it tends to occupy the higher altitudes and latitudes, its consumption habit varies with availability. The skeletal remains of both species are found in abundance on occupation sites of the Last Glaciation, especially in Montane regions, but it is not always clear what animal predated them, since both species were a favoured food of many carnivorous mammal and some raptorial bird species, including, the ground nesting snowy owl, *Nyctea scandiaca*.

For most species in the grouse family plant food is the dietary staple and protein secondary. Invertebrate foods being mostly fed to broods of very young chicks. Between the species the habitat in montane regions tends to be separated by altitude. Ptarmigan take the higher slopes, willow grouse the lower, blackcock in the clearings on the margins of forested areas, with capercaillie often feeding in the canopy, while the lower margins of grasses and low scrub belong to the partridges and snipe in wetlands around, at Buhlen an ancient lakebed.

Raptorial birds. Amongst the wide range of raptorial species, a considerable diversity of prey is taken. There is the honey buzzard for whom the staple food are the bees and wasps of the family of *Hymenoptera;* the scavenging predators of kites and vultures, the marsh-hunting *Circus aeruginosus,* taking snakes along with numbers of waterfowl, songbirds and voles, or the mainly aerial hunting family of hawks, *Accipitridae*, capable of taking prey up to the size of capercaillie and hare, or the eagles of whom the *Aquila chrysaetos,* golden eagle has been known to take animals as large as red deer but is relatively omnivorous in relation to live prey. There are also the fishing eagles like the osprey *Pandion haliaetus,* that subsists entirely on fish or the fishing eagles, in Europe, *Haliaeetus albicilla,* or that is known to forage on other species besides fish, and the falcons, *falconidae*, that vary their hunting between a mixed mammalian and an avian diet according to size, from the Gyrfalcon, *F. rusticolus,* to the kestrel, *F. tinnunculus*, or the mainly insect diet

Plant material	*Bonasia bonasia*	*L.lagopus*	*Lagopus mutus*	*Tetrao tetrix*	*T.urogallus*
Juniperus, Juniper				* S/A	
Salix, Willow species	* W/Spr	* All	*All		
Populus, Popular	* W/Spr	* S			
Betula, Birch species	*W/Spr	* W/All	*All	* All	
Corylus, Hazel	*W/Spr				
Pinus, Pine species	* W/Spr			* All	* W
Picea, Spruce	W/Spr*				* W
Abies, Fir	*W/Spr				* Spr/S/A
Larix, Larch	* W/Spr				
Alnus, Alder	* W/Spr				
Corylus, Hazel	* All				
Tilia, Lime	Spr/S*				
Vaccinium myrtilis, Bilberry	Spr/S*	* Spr	* Spr/S	* Spr/S	* S
V. uglinosum, Whortleberry	Spr/S*	* Spr/S	* Spr/S	* Spr/S	* S
Vitis idaea, Cowberry	Spr/S*	*Spr/S	* Spr/S	* Spr/S	
Empetrum nigrum, Crowberry	Spr/S*	*Spr/S	* Spr/S	* Spr/S	* S
Calluna vulgaris, Heather		*All	* All		
Errica, Heath species	*All				
Andromeda polifolia, Bog rosemary		*S/A	* A/W		* S
Polygonum, Bistort species	*	*Spr/S	* Spr	* S	
Filipendula ulmaria, Meadowsweet	Spr/S*				
Rubus Bramble family	******				* S
Malus, Sorbus Pyrus, Apple, Pear and sorbus family	***				
Sambucus, Elder species	*				
Oxalis, woodsorrel species	*				
Equisetum, Horsetails		*Occ			* S
Dryas octopetala, Mountian *avens*			* Spr		
Carex, sedges				* A	* All

Table 6, A range of plant foodstuffs taken by Tetraornidae at different times of year (**Spr**. Taken in Spring; **S.** Takin in Summer; **A.** Taken in Autumn; **W,** Taken in Winter; **All**. Taken at all seasons; **Occ**. Taken occasionally).

of the lesser kestrel, red footed or eleanora's falcon, *F.naumanni, F.vespertinus, F.eleanora.*

Sea birds. Marine species have similarly varied diets that depend very much on distribution and behaviour patterns of their prey, that alters in proportion to the length of time during the year is spent entirely at sea. Skuas, *Stercorariidae*, for instance are entirely pelagic outside the breeding season as are the auks, *Alcidae* and the shearwaters, *Procellaridae* and *Sulidae,* gannet. gulls, *Laridae,* are more variable, breeding on sea cliffs and coasts from the Arctic to the Mediterranean but most remain on coastal waters or large lakes or fiver deltas outside the breeding season. Marine species are recorded from Upper Pleistocene sites around the coasts of western Europe but not in significant numbers and the probability is that some were carried ashore by storms or even predated by other species. The inshore

Species	*Bonasia bonasia*	*L.lagopus*	*Lagopus mutus*	*Tetrao tetrix*	*T.urogallus*
Coleoptera, Beetles	*		Chicks		Chicks
Diptera, Flies	*	* Spr/S	Chicks		
Lepidotera, Butterflies & moths	Occ *				Chicks
Orthoptera, Grasshoppers	Occ *				Chicks
Arachnidae, Small spiders	*			Chicks	Chicks
Hymenoptera, Ants				Chicks	Chicks

Table 7. Some of the invertebrates taken seasonally by Tertraornidae
(**Spr**. Taken in Spring; **S.** Takin in Summer; **Occ**. Taken occasionally; **Chicks.** Fed to neonatal young).

distribution of some western European gulls in Winter appears to have increased in recent centuries, an increase that some authorities believe is the result of the growth in the systematic disposal of human waste from population conurbations, like sewage plants and landfill sites.

Finds of skeletal remains of marine birds from previous centuries and prehistoric sites are relatively rare and the probability is that some were carried ashore by storms or even predated by other species. At the present day however, in some species the normal pelagic pattern of out of seasonal behaviour has recently modified and they are frequently seen inland on cultivated land.

Many gulls tend to be predatory, scavenging and opportunistic. For instance, greater black backed gulls *Larus marinus* are notorious for killing manx shearwaters, *Puffinus puffinus* as they come ashore to feed their young, safely hidden down rabbit burrows and most will take eggs and young from the nests of neighbours or other species.

Man as predator

Very few species of birds have escaped predation by human populations. Wildfowl, game birds, waders, raptorial birds and scavengers, corvids and passerines have been hunted for meat, bone, feather and eggs, sometimes to actual extinction as in the case and to a he great auk, *Alca impennis*, in 1844. On the other hand, in Britain, for instance, the limits placed on the seasonal culls of the gannet *Sula bassanus* populations and the replacement of gannet oil by industrial products largely derived from coal tar have promoted a huge increase in population of that species and the industrial practices of the fishing industry have seen a similar increase in fulmars, *Fulmaris glacialis.* Neither species is commonly recovered in Palaeolithic settlements. A certain number do occur in coastal regions in prehistoric times but were not it would appear hunted systematically, as they have been in more recent times as much for the qualities of the oil they produce as for their flesh or plumage. Other marine birds have likewise been subjected to predation by human populations and sometimes to actual extinction, as in the case of the great auk, Alca impennis, finally killed in 1844 by seamen desperate for fresh meat. At the present time human activity may be driving many other species the same way.

Despite systematic culling of the existing species of wildfowl, seabirds and game species by humans and other carnivorous animals, they have so far escaped from extinction at the hands of the large numbers of potential animal predators. Partly they have continued to thrive on account of producing large clutches of eggs and hatching sizeable broods of young but also been saved from human hunters by the invention of firearms that has imposed a much lower limit on the numbers that could be taken at one time in comparison with the traditional means of trapping, decoy or netting. Legal measures of protection have also played their part, initially to preserve the birds for the use of landowners and in recent times for the protection of the avian community as a matter of ecological conservation.

The snowy owl, a case study. In the fluctuating climatic and environmental conditions of the last glaciation distribution, behaviour and feeding patterns of some species appear to to have been markedly different to that observed at the present day. A particular case is the subject of a study in Chapter (8): of the snowy owl *Nyctea scandiaca* and the quantity of bones of individuals recorded on a number of sites in the Aquitaine region of France towards the end of the Last Glaciation and in association with late Magdalenian culture. The research carried out on this species by Potapov and Sale (2012) has produced a huge amount of detailed data about the current distribution, feeding snd breeding behaviours across its entire Palaearctic range. Their findings taken in conjunction with the research into the ethology of snowy owls as summarised in Cramp 1985 gives a clear account of their natural history during recent times. Nevertheless, the patterns of behaviour prior to the environment changes that followed the retreat of the ice and the effect of increasing human populations on

Species	250 – 40 Kyr BP Mousterian	40 – 28 Kyr BP Upper Palaeolithic Aurignacian	28 – 22 Kyr BP Transition to Gravettian, climate cooler	22 – 17 Kyr BP Local Solutrean cultures, Last Glacial Maximum	17 – 10 Kyr BP Magdalenian culture sequence. Ice retreating	10 Kyr BP to recent Mesolithic and Holocene prehistory
Loxia curcirostra, common crossbill	Fontechevade Charente Certova Dira Moravia Balcáka Moravia	Installósko Bukk Sandalja II Croatia	Arene Candide Lig.	Pilissanto I Hungary Arene Candide Lig. Herma Otto Bukk Sandalja II Croatia	G de Massat Ariege Puskaporos Bukk Karstein Westphalia Kleine Scheuer B. Wurtemberg Pilissántó I Hungary	
Loxia leucoptera, two barred crossbill				Arene Candide Lig.		
Loxia pytyosittacus, parrot billed crossbill			Salpêtrière Gard Riparo di Fumane Verona			
Pinicola enucleaata, pine grosbeak		Abri des Pecheurs Ardèche	Arbreda II Gerona	Arene Candide Lig.	Arene Candide Lig. Nisloch	

Table 8. The presence of Crossbills and Pine grosbeak on Palaeolithic sites in western, central and Mediterranean Europe (after Tyreberg 1998).

the landscape are a great deal less certain; a consideration that may apply besides to other animal species. Recent breeding success in arctic populations depends on the abundance or otherwise of the lemmings in a specific region, including in Europe arctic, wood and Norway lemming, *Dicrostonyx torquatus, Myopus schisticolor* and *Lemmus lemmus* that in good years form up to 90% of the food intake (Mikkola 1983). In seasons when the supply of lemmings is low it is replaced by other small mammals and birds (Potapova and Sale 2012).

The faunal records of the excavated sites of late glacial date in Aquitaine where the remains of snowy owls were found to be most abundant show a complete absence of any species of lemming among the spectrum of small rodents. The case study of the snowy owls at the Grotte de Bourrouilla, Arancou, Pyrénées Atlantiques (Chapter 8) shows that the rodent population was dominates by Microtus voles, including the root vole, associated today with northern climates, some mice and the occasional dormouse (*Glis glis*).

Crossbills. Some groups among the passerines are extremely specialist feeders and in this respect become indicators of the presence of particular elements within the local biotope. Among them are the European crossbills. The three species recorded from Upper Palaeolithic contexts in Europe are the Common, the two-barred and the parrot-billed, *Loxia curvirostra, L. leucoptera* and *L. pytyopsittacus,* and pine grosbeak, *Pinicola enucleata* often appearing in association. The current distribution of these species tends to be limited to Fennoscandia. Russia and Eastern Europe and extends as far south as Spain and eastern France, with occasional occurrences in the southern Britain and the Netherlands. At the present day their diet is based on the seeds of conifers supplemented by the seeds and fruits and seeds of other species, larch, *Larix,* birch, *Betula,* poplar and alder, *Populus, Alnus* and juniper, *juniperus,* with bogs, *Hemiptera* and invertebrates. Table 8 shows a number of sites in Italy, Hungary, Croatia, Mallorca and France during relatively favourable climatic periods, giving a specific indication of the surrounding vegetation. The Common crossbill was also identified as from a Mousterian context at Pinhole

Cave in Derbyshire (Bramwell 1960) but there is some confusion over the stratigraphy, of individual layers of the excavation and the species determinations at that site (Tyreberg 1998).

Birds and men in a shared environment

Hominid, Human, Hunter- gatherer social groups are all part of the animal world and participate in similar natural hazards and advantages as other species even with the development of urban societies. In Prehistoric times they remained part of the animal food chain and shared their lives and accommodation with other species, sometimes to the advantage of all.

The, mainly winter, residences of caves and rock shelters, occupied by the hunter-gatherer settlers also provided shelter for colonies of cliff roosting birds and hibernating mammals. The most frequent avian lodgers in western Europe tend to be choughs, red-billed and yellow-billed, *Pyrrhocorax pyrrhocorax* and *P.graculus* and *Columbidae*, species of doves. The ubiquitous nature of these species across Europe and Asia during the Palaeolithic means that their bones have regularly been recovered in considerable quantities in association with Hunter-Gatherer occupations throughout western Europe and not infrequently besides in levels, without, it was thought, any recognisable signs of Hominid interventions. However some recent research has changed this conclusion, and shown that microscopic examination has revealed significant cut and scratch marks on the bone surfaces and it is now thought that these species were exploited for food on some sites and may even have been used as a staple in times of hardship.

Dove population has remained a strong element, since they have replaced a rocky cliff and cave environment for a home in a high rise built environment in urban areas. Choughs populations, on the other hand, have declined in recent centuries. The alpine, yellow-billed chough, Pyrrhocorax graculus, has declined throughout its range and is now confined to a few montane regions in Europe, while the red-billed is restricted mainly to Iberia and Mediterranean locations with relict populations in the western extremities of Europe. While in Malaga and Granada provinces of Spain large mixed flocks of both species may still be seen feeding on the open prairie. Yet, compared with the situation during the Last Glaciation, the current decline in the demographic seems dramatic (Eastham 2001).

The avifauna on an individual site may furnish a partial picture of bird life present at the time, yet the evidence may be misleading. At the Late Glacial site of Hoyle's mouth, in Pembrokeshire south Wales, a fissure was found to contain successive layers of small passerine bones that by their fresh appearance seemed to be more recent than the material from other contexts. The obvious conclusion was that these birds arrived naturally via the fissure. At Creag nan Amph, Highland, Scotland, the intrusive element was a Capercaillie with 1.5 mm shot holes in the wing, clearly a runner from a grouse shoot. A third example came from the cave of Pontnewydd in Clwyd, north Wales, where, amongst the New Entrance avian material, currently stored in the Boyd Dawkins collection in Buxton Museum, was the tarsometatarsus of a male peacock, *Pavo cristata.* The cave itself, on Williams Wynn prperty had a 19th century summer house attached to its entrance. On the hill above the cave Plas y Cefn was the mansion of a considerable estate and it is possible that at one time its terraces were graced by a colony of peacocks and this one fell prey to the local fox, who left the residue of his meal buried in the cave. It pays to be cautious in the interpretation of bone assemblages.

Chapter 2

Birds of the Middle Palaeolithic in Britain and western Europe

Many of the earliest signs of Hominid presence in western Europe were initially found as waterworn stone tools, like handaxes, flaked flint and bone in the gravel deposits of ancient river terraces. In Europe the names given to sites where discoveries of early hominid evidence were made during the 19th and 20th centuries gave their names to the human species and artefact types, names like Heidelberg, Swanscombe, Atapuerca, and Mauer came into the vocabulary of prehistorians.

In Britain, one of the early sites was at Westbury-sub-Mendip in Somerset, where a quantity of avian and mammal bone material was recovered. The excavation revealed no clear evidence of hominid predation of other animal species, (Andrews, Cook, Currant and Stringer 1999). The more recently examined site of Amey's Eartham quarries at Boxgrove in Sussex was dated to OIS stage 13 of around 500,000 years BP (Roberts and Parfitt 1990). The mammalian fauna, like that of Westbury-sub Mendip site and that of Ostend in Norfolk, included interglacial indicators, animals that later became extinct during the Anglian/Elsterian cold phase and did not re-appear in the subsequent Hoxnian/ Holsterian inter-glacial deposits either at Barnfield pit, Swanscombe, Clacton or Hoxne. The avifauna, at Boxgrove was extensive, despite some problems in the identification of the smaller passerine species because of the variable, often poor, conservation of the sample. Bird remains from the Forest Bed series at East Runton and the Freshwater Beds at West Runton, Norfolk belong to approximately the same period as Boxgrove (Harrison 1979, 1985).

The majority of the 19 avian species recovered from Boxgrove Quarry 1 were aquatic birds. The bones were found in many levels within the sedimentary units but the largest numbers were concentrated in those units where there were indications of ancient ponding and stretches of open water, with little surface vegetation. In Quarry 2, bird remains were found in the same levels, but gave indications of a different habitat, probably presenting a grassland habitat with a vegetation density that offered a niche more hospitable to passerine species.

The identifications for Quarry I included: whooper swan, grey lag goose, mallard, wigeon, garganey, teal, tufted duck, goldeneye, partridge, moorhen, snipe or plover, black-headed gull, kittiwake, great auk, tawny owl, swift, robin, dunnock and starling. The presence of great auk. *Pimguinis impennis,* in the discovery of a single damaged humerus may be considered as anomalous in this context (Harrison and Stewart 1999). Although bones of this large auk occur with relative frequency on sites of Middle Palaeolithic date, its recovery at Boxgrove is the earliest known record of this species. There was also a kittiwake, *Rissa tridactyla,* and the only known find in the west from this period of a black headed gull, *Larus ridibundus.* However, in Eastern Europe Janossy in1983 recorded a probable find at the open site of Presletice in Bohemia and at the cave site of Stranska Skala in Moravia, in association with Cromerian and Biharian artefacts (Janossy 1972). In southern Europe at the cave of Spinagallo in Sicily dated to around 50,000 years BP, bones of black headed gull were also in evidence (Pavia 1999). In Spain, at the site of Ambrona and Torralba it was associated with the Biharian and Acheulean tools (Sanchez 1990).

The subsequent Elsterian, or Anglian cold phase was followed by a temperate/warm period known as the Holsterian or Hoxnian when the valleys of south east Britain were once more occupied by hominid groups, whose sites were recorded in east Anglia at Hoxne and Clacton and in particular in the Thames valley sequence. Barnfield pit at Swanscombe revealed a quantity of avian remains in the Lower Loam and Middle gravels, dated by thermo-luminescence to ca. 360-420 Kyr BP and 326 ± 99 -54 Kyr BP. Again, in this assemblage, the dominant species were the waterfowl, geese, both *Anser* and *Branta* with *Anatidae,* species, that including long tailed duck, scoter and goosande. But with them were recorded osprey, woodpigeon, garden warbler, and a finch, (Harrison 1979; Stewart 1982).

More or less contemporary with Swanscombe were the continental sites like Atapuerca, near Burgos in Spain, (Sanchez Marco 1987, 1995). And in France, by contrast, the contemporary sites of Pech de L'Aze II, Dordogne and Orgnac III, Ardèche, both contained an avifauna dominated by partridge, grouse and raptorial species rather than aquatic birds (Mourer Chauviré 1975) whereas in Germany at the open site of Bilsingsleben in Upper Saxony, Fischer (1991) found both wildfowl and a white-tailed fishing eagle.

Species	Level 4a/b	Level 4c	Level 4d	Gully fill	Level 5a	Level 6	E/W Runton	Ostend
Phalocrocorax carbo							*	
Cygnus cf cygnus, cf. whooper sean	*							
Cygnus columbianus, Bewick's swan							*	
Anser sp., goose sp.			*					
Anas platyrhyncos, mallard		*		*	*	*	*	
A.penelope, wigeon			*					
A.querquedula, garganey					*			
A.crecca, teal	*						*	
Netta rufina, red crested pochard							*	*
Aythya fuligula, tufted duck			*				*	*
Aythya ferina, pochard							*	
Bucephala clangula, goldeneye		*					*	
Melanitta nigra, scoter								*
Somateria gravipes?, eider							*	
Mergus albellus, smew							*	
Mergus serrator, redbreasted merganser							*	
Perdix perdix, grey partridge					*			
Galinula chloropus, moorhen						*	*	
Tringa ochropus, green sandpiper							*	
Scolopax/Charadrius, plover/woodcock		*						
Larus ridibundus, black headed gull			*					
Rissa tridactyla, kittiwake		*						
Pinguinis impennis, great auk		*						
Bubo bubo, eagle owl								*
Strix aluco, tawny owl						*		
Apus apus, swift		*						
Cf. Erithacus rubecula, robin						*		
Turdus cf. merula, blackbird							*	
Turdus philomelos, song thrush							*	
Turdus iliacus, redwing							*	
Sitta europea, nuthatch							*	
Sturnus vulgaris, starling		*					*	
Garrulus glandarius, jay							*	
Prunella modularis, dunnock		*						

Table 1. Summary of the birds recorded at Eartham quarry 1 and 2 at Boxgrove Sussex, after Harrison and Stewart 1999, as compared with E and W Runton and Ostend, Norfolk, after Harrison.

The Middle Palaeolithic

Technological developments in the manufacture of the stone toolkit were taking place throughout this period, with flake and core industries using stone, flint and organic materials of bone, ivory and antler and undoubtedly wood extending the hunting and domestic toolkit available to hominid societies. Each social group of Neanderthals having its own specialised set that was probably adapted to seasonal needs and to the local ecology. At the same time, as the number of known occupation sites increased, there appeared to be clearer evidence that these hunter-gatherer people actively hunted birds, often on a seasonal basis, although a proportion of the remains recovered may have been deposited by other agencies and other scavenging animals.

The Mousterian in Britain: Pontnewydd, Clwyd, north Wales

Dated to between 230,000 and 186,000 years BP, early remains of *Homo neanderthalis* in Britain were found in a cave in Clwyd, north Wales. Although a number of caves in the valleys of the rivers Clwyd and Elwy had been extensively explored, only at Pontnewydd was there substantive evidence of regular hominid occupation. Over the years, the caves of Cefn and Pontnewydd had a long history of tourism ever since the 18th century, a trend followed by exploration and excavation These nineteenth century workings hampered excavators who later took on task of interpreting the sequence, the team who further examined the cave between 1978 and 1995 under the direction of Dr Stephen Aldhouse Green.

The early occupation level corresponds with Oxygen Isotope stage 7, around 230 years BP, a relatively temperate phase, that probably provided a mainly open grassland landscape for the large ungulates and carnivorous mammals that were recovered from the Lower Breccia. This early occupation was interrupted between the years 180,000 BP and 40,000 years BP. Then, later Neanderthal settlers came to the cave during the Devensian period and in turn left behind further evidence of their occupation.

The sedimentary sequence consisted largely of debris flows caused by flooding, interspersed with layers of calcite or flowstone, that gave a date to the Lower Breccia using Thermo-luminescence. The later, Upper Mousterian level gave a number of dates using AMS radio-carbon of between 41,000 years BP and 21,000 years BP, although the date of most of the samples lay between 38 and 25,000 years BP. The remaining layers of Late Glacial and Holocene deposits of sand and clay contained little significant bone.

The position of the site, on a south facing slope, some 80 metres above the present level of the Elwy valley is in a position that tends to be characteristic of Mousterian cave sites, situated at the intersection of separate habitat zones. The Denbigh moors to the northwest gave access to upland resources and the Elwy valley provided a route towards the Vale of Clwyd and the marshlands and inter-tidal flats around the present Liverpool bay. Aquatic species were an important element in all levels. The diversity of geese and duck species are typical of estuarine marsh, inter-tidal flats and inshore waters. At the present day the mouth of the river Clwyd is over 9 kilometres from the cave in direct line and considerably further along the valley bottom (Map 1 Eastham 2012).

It is possible that the wildfowl were taken into the cave by other carnivores besides hominids. Remains of wolf, red fox, and felines were found in the Upper and the Lower Breccias and it was suggested by Scot (2012) that perhaps the geese and ducks were the prey of carnivorous mammals other than man, At the present day, in a European agricultural setting the maximum recorded home range for the red fox lies between 4 and 7 square kilometres. In the sparser landscape of Canada it rises to 9 kilometres square (Trewella, W.J., Harris, S., Macalister, F.E. 1988). Yet it was not possible to identify any carnivore tooth marks or signs of gnawing on the existing avian bone.

It would appear that the migratory wildfowl were following very much the same movement and lifestyle patterns at Pontnewydd as at the present day: migrating southwards for the winter and back to breeding grounds in spring. Their seasonal behaviour made them a dependable resource for a predators for a number months in the year.

By contrast to the valley and wetland habitats, the upland area, rising above the cave provided a habitat for raptors, grouse, ptarmigan and wheatear. Around the entrance of the cave, the debris from hominid occupation would attract scavengers seeking carrion, insect eaters and resident species like columbids corvids or hirundids occupying the cavities in the cliff face, and living alongside the hominids or other mammalian residents. The avifauna from the Lower Breccia contained a jackdaw, buzzard, eagle and an insectivorous wheatear. However, it is still a little uncertain whether the wildfowl were taken by hominids or animal predators but, on balance, it seems probable that most were taken by the hominid, hunter-gatherers.

Pontnewydd is just one of a number of sites along the western periphery of Europe that were occupied by Neanderthal hunter gatherers at different times. Coygan Cave, near Laugharne in South Wales, now destroyed by quarrying, and dated to around 50,000

Species	Lower breccia	Upper breccia	Upper Clay & sand	Boyd Dawkins
Cygnus columbianus, Bewick's swan				1
Anser anser, grey lag goose		3		
A, brachyrhyncos/albifrons, Pink footed/ white fronted goose		1		
Branta leucopsis, Barnacle goose		1		
Branta bernicla, Brent goose	2	2		
Anas platyrhyncos, Mallard	1			1
Cf. Aythya fuligula, Tufted duck			1	
Melanitta nigra, Common scoter	2			
Mergus albellus, Smew		1		
Mergus merganser, Goosander	1			
Cf. Buteo sp., Buzzard				1
Cf. Aquila sp., Eagle	1			
Falco tinnunculus, Kestrel		1		
Tetrao urogallus, Capercaillie				1
Oenanthe oenanthe, Wheatear	2	1		
Cf. Corvus sp., Jackdaw/magpie	1			
Carduelis chloris/cannabinna, Greenfinch/linnet		1		
Coccothraustes coccothraustes, Hawfinch		1		

Table 2. The Avifauna at Pontnewydd cave, Clwyd.

years BP (Currant and Jacobi 1977) contained some evidence of hyena predation on hominid remains but no avifauna. On the other hand, King Arthurs Cave in the Wye valley, Herefordshire contained a diversity of bird species but little context, other than it was broadly Devensian (Bate 1901; Newton 1924; C.J.O. Harrison 1980, 1987).

The Creswell Crags, Derbyshire, cave of Pinhole contained a long sequence of Mousterian occupations. Oxford AMS radiocarbon dates for the sequence gave a span from 37,800 ± 600 years BP to 31,300 ± 550 BP, based on samples of hyena, reindeer and bird bone. There was a long list of birds recorded by Bramwell (1960) but both the validity of the original stratigraphy and some of these determinations have recently been questioned. On the evidence from the Somerset cave of Soldier's Hole in the Mendips, some doubts also are attached to the stratigraphy and some of the identifications. The radio carbon dating for the Mousterian layers in Soldier's Hole from reindeer bone gave results between 41,700 ± 3,500 and 29,300 ± 1100 years Bp.

However, excavations by C.B.M. McBurney 1961-1978 at the cave of La Cotte de St Brelade, on the island of Jersey, one of a number of Middle Palaeolithic sites around the present coastline of Armorica (Callow and Cornford 1986). It revealed an avifauna that bears close comparison with that from the Upper Breccia of Pontnewydd. Hominid teeth were also recovered, and are considered similar to the Pontnewydd teeth (Stringer 2015). Equally comparable was the industrial facies, a Mousterian based on a Levallois flake technique. Table 3 shows a comparison between the bird species identifications at these sites and shows a certain disparity in the diversity of material and the importance of aquatic and moorland species in the food chain. Studies from other sites in northern Europe indicate a close comparison with the findings from Somerset and Jersey. Some of the small passerine species noted at Creswell match those identified from Pontnewydd but others, like the North American rose breasted grosbeak might be worth further study. The diversity of thrush species at Pinhole cave is also worth noting.

Neanderthal sites in Western Europe

On the continent of Northern Europe, a number of sites overlap in date with those in Britain. Some revealed long sequences of occupation from a number of periods, especially the examples from France and

Species	Pinhole Cave	Soldier's Hole	La Cotte de St Brelade
Gavia arctica, Black throated diver	*		
Ardea cinerea, Grey heron	*		
Cygnus columbianus, Bewick's swan	*	*C.cygnus*	
Anser anser, Grey lag goose	*		
Anser brachyrhyncos, Pink footed goose	*	*A.albifrons*	*
Branta leucopsis, Barnacle goose			*
Branta bernicla, Brent goose	*		*
Tadorna ferruginea, Ruddy shelduck	*?		
Anas penelope, Wigeon	*		
Anas platyrhyncos, Mallard	*		
Anas querquedula, Garganey	*		
Aythya fuligula, Tufted duck	*		
Melanitta nigra, Common scoter	*		
Mergus merganser, Goosander	*		
Haliaeetus albicilla, White tailed eagle		*	
Falco tinnunculus, Kestrel	*		*
Lagopus mutus, Ptarmigan	*	*?	*
Lagopus lagopus, Red grouse	*	*?	
Tetrao tetrix, Black grouse	*		*sp
Perdix perdix, Grey partridge	*		
Gallinula chloropus, Moorhen		*	*
Anthropoides virgo, Demoiselle crane	*?		
Calidris canutus, Knot	*		
Arenaria interpres, Turnstone	*		
Numenius arquata, Curlew	*		
Gallinago gallinago, Snipe	*		
Larus canus, Common gull	*	*	
Pinguinis impennis, Great auk			*
Columba palumbus, Woodpigeon	*		
Streptopelia turtur, Turtle dove	*?	*C. cf oenas	
Tyto alba, Barn owl	*		
Asio flammeus, Short eared owl	*		
Apus melba, Alpine swift	*?		
Alcedo athis, Kingfisher	*		
Dendrocopos minor, Lesser spotted woodpecker	*		
Alauda arvensis, Skylark	*		

Table 3. Mousterian avifaunas noted from excavations at Pinhole cave Derbyshire, Soldier's Hole Somerset and La Cotte de St Brelade, Jersey. After Bramwell, Harrison and Callow and Cornford.

Species	Pinhole Cave	Soldier's Hole	La Cotte de St Brelade
Erithacus rubecula, Robin	*		
Cinclus cinclus, Dipper			*
Phoenicurus phoenicurius, Redstart	*		
Oenanthe oenanthe, Wheatear	*		
Turdus merula/torquatus, Blackbird/ring ouzel	*		
T.pilaris, Fieldfare	*		
T.iliacus, Redwing	*		
T.philomelos, Song thrush	*		
T.viviscivorus, Mistle thrush	*	*	
Sturnus vulgaris, Starling	*		
Pica pica, Magpie	*		
Loxia curvirostra, Crossbill	*		
Milaria calandra, Corn bunting	*		
Pheucticus ludovicianus, Rose breasted grosbeak	*?		

Table 3. Continued.

Cantabria, others tend to be restricted to the Middle Palaeolithic layers only. One example, a cave site in Belgium, illustrates a species distribution pattern that is typical of many north European sites and also of a few sites in Britain.

Marie Jeanne Cave Namur, Belgium

This cave in the Belgian province of Namur contained two levels of Mousterian occupation dating from either side of an interstadial phase. The earlier, Level 4, was assigned to a relatively cool period and the later, Level 3, to the more temperate interstadial of around 75,000 years BP. However, the bird populations in both levels are extremely similar and show a marked dominance of aquatic species, but also some evidence of upland species. (Ballmann 1973, 1980).

Buhlen Upper cave, Kr. Waldeck-Frankenberg, Hessen

The pattern of species distribution noted in the Marie Jeanne cave proved to be markedly similar to the remains found in the upper cave at Buhlen in Hessen, Germany. The cave of Buhlen is situated in the Eder valley that is a tributary of the Fulda River some 300 kilometres east of Namur in West Germany. The avifauna from the Upper cave at Buhlen was examined in relation to the contemporary landfall around the site. At the present day, the Fulda joins the river Weser just north of the town of Kassel creating an access corridor to the North Sea for man and animals. The site was originally excavated during the 1960's (Bosinski and Kulick 1973). The lithic industry was associated with the Keilmesser culture with a blade technology. The faunal material from the Upper cave was studied in detail later (Joris and Eastham 1998). Chronologically, the material from the Upper Cave belongs to the GISP stages 22 to 15, that dates it to between 85,000 – 20,000 years BP but the bulk of the avian remains belong to the two early phases of occupation 85,000 years to 60,000 years BP. This correlates well with the studies of the large mammals and the small mammals (Lehmann 1969). It is also quite close to the pattern seen in the Namur material.

Some 27 bird species were present in the assemblage from the two main levels of Middle Palaeolithic, Levels II and III at Buhlen. There was also a quantity of avian eggshell in both levels, though the bulk of the eggshell fragments were in level II. Characteristically, the range of species brought to the cave reflects the two main habitat zones exploited by its inhabitants in the search for useful edible items. There is no water in close proximity to Buhlen at the present day but it would appear that because of tectonic disturbance at the time of the Level III occupation, there formed a substantial lake and wetland below the site providing a niche for the wildfowl: swan, geese and ducks, as well as the snipe and partridge in the low vegetation along the lower slope.

Whilst different species of aquatic birds from the lake and surrounding wetland were present: Bewick's swan, geese and a few dabbling ducks, these were restricted to these lower sediments along with

Species	III d.	c.	b.	Totals	I-II			Totals
Cygnus columbianus, Bewick's swan		1		1				
Anser sp., Goose		2		2				
Anser cf. fabalis, bean goose		3		3				
Anser cf. erythropus, Lesser white fronted goose		1		1				
Anas sp., Duck		1		1				
Anas crecca, Teal		2		2		1		1
Anas platyrhyncos, Mallard	2	5		7		1		1
Mergus serrator, Red breasted merganser		1		1				
Aquila pomarine, Lesser spotted eagle		1		1				
Accipiter gentilis, Goshawk		1		1				
Falco tinnunculus, Kestrel		1		i				
Tetrao urogallus, Capercaillie		6	1	7				
Tetrao tetrix, Blackcock	1	20	10	31	1	1		**2**
Lagopus lagopus, Willow grouse	2	8	10	20	13	7	1	21
Lagopus mutus, Ptarmigan					7	1		8
Perdix perdix, Grey partridge	1	1	1	3	1	2		3
Gallinago gallinago, Snipe						1	1	2
Bubo bubo, european Eagle owl		1		1		1		1
Columba livia, Rock dove		1		1		1		1
Lullula arborea, Wood lark								
Turdus sp., Thrush		1		1				
Turdus viviscivorus, Mistle thrush		1		1				
Pyrrhocorax pyrrhocorax, Red billed chough						1		1
Corvus corone, Carrion crow		1		1		1		1

Table 4. Mousterian avifauna from excavations at Buhlen Upper cave.

the few remains of raptors. Passerine species, and others were found sporadically distributed through all levels. Numerically dominant throughout were the Galliformes. The most common in all levels was the willow grouse from the middle slopes of the surrounding hills in a habitat of mainly low growing, ericaceous vegetation. Black grouse would have been taken on the lower slopes of light open tree cover, closest to the settlement. Ptarmigan, resident on the sparsely covered upper slopes were more rarely taken and their bones were recovered only from the upper levels of the occupation. The considerable quantities of avian eggshell, this, although it was not identified as to species, indicates that the cave was occupied at least during the spring and, on account of the presence of the swan and geese, during the early months of the year.

The question of predation by other carnivorous mammals arises on this site as on others. Present on site, besides the eagle owl, were *Vulpes,* red fox, *Alopex lagopus*, arctic fox and *Cuon alpinus*, the eastern wild dog, any of whom were likely to have taken birds or carcases left exposed. Such might account for the very small numbers in the record of skeletal elements from wildfowl in contrast to the almost complete range of grouse bones.

Neanderthal sites in France

The cave of Buhlen is set in a system of valleys cutting through land that lies between 500 and 1,000 metres above sea level. Some 600 kilometres to the South in north east France, the Cave of the Baume de Gigny on the Suran river, a tributary of the Saone is situated in a

not dissimilar context. Set among deep wooded valleys topped by the surrounding hills it contained successive levels of occupation of Mousterian, from ca. 60,000 years BP to around, 33-31,000 years BP. This occupation continued through a series of Upper Palaeolithic settlement terminating with an Epi-Palaeolithic layer, dated to between 12,000 years BP and 13,000 years BP.

The bird fauna (Mourer Chauviré 1975, 1980 and 1989) was distributed variably level by level but, dominated throughout by the remains of grouse and other game species and wading birds, yet aquatic species of ducks, dabbling and diving *Anas,* and *Aythya* were also common. In Level XV, there was some evidence of whooper swan in a single posterior phalange, possibly utilised as a pendant, and in the preceding deposits of Level XVI, perhaps representing the warmer conditions of the Julien Interstadial, a crane bone was identified.

As at Buhlen, owls were present at the Baume de Gigny, including eagle and snowy owl, owls that may have taken some of the rodents, smaller game and passerine birds. It is also interesting that both snowy owl, at the present day a peri-arctic and tundra species and red-rumped swallow, *Hirundo daurica* that breeds mainly in Mediterranean and warm temperate zones, were both identified in Level VI that is dated to the onset of the of the Weichselian/Devensian Glaciation.

In general, the equal distribution of aquatic and moorland resources that characterises some of the northern Neanderthal sites in Britain and parts of Europe is not as common in all the regions of France, even in locations that would appear at the present day to be adjacent to both types of habitat. In many collections game species like grouse and partridge are usually found to be dominant in terms of numbers and the migratory waterfowl are less frequent and even on sites where they were present were relatively few in number. If this feature is interpreted according to our understanding of present-day migration behaviours, the reason could be that there were few hospitable staging venues on the mainland of central France between breeding and wintering locations sites.

If this holds true for the Baume de Gigny, it would seem also to apply to a number of other sites in other regions of France. The avifaunal record of sites like La Fage in Correze, (Mourer Chauviré 1975), Fontéchevade in Charente (Berlioz 1959; Mourer Chauviré 1975) or at the Grotte de Lazaret, Alpes Maritimes (Bouchud 1969; Mourer Chauvire 1975; Vilette 1993), all indicate that the bones of wildfowl are of lesser importance than game birds In addition, there is uncertainty about how far predation by raptorial birds and carnivorous mammals other than hominids may have been responsible for their demise At the Grotte de Lazaret, for instance, raptorial birds appeared in all levels: eagles and falcons and a diversity of owl species each of them prone to take other birds as prey.

Fontéchevade outside Montbron on a tributary of the Charente River, dated to MNQ25, around 117 Ka BP is an early example of Middle Palaeolithic occupation, excavated in 1958. It contained a mixed fauna typical of the late interglacial phase between the Eemian and the onset of colder climate in the Weichselian (Berlioz 1959 and Mourer Chauviré 1975). The lithic industry was described as Tayacian and the mammalian fauna mainly warm temperate, characterised by Merck's rhinoceros and a species of fallow deer. The avifauna included a number of dabbling ducks, with merganser, buzzard, and a diversity of game species accompanied by a variety of small passerines: larks and pipit, thrushes, finches, starlings, corvids and oriole.

The long timespan of the Middle Palaeolithic cultures and the Mousterian occupation in Europe gave rise to a considerable development in the tool types represented in the deposits. There has been a great deal of discussion on this subject at local and international level, as summarised by Rolland (Man March 1981 V16-1) The models he uses to explain lithic variability in terms of resource and environmental change are relevant but do not entirely explain the changes in fauna. An association was made between temperate periods with forest growth across the landscape associated with a development of notched scrapers as an element of the toolkit. Then as the climate deteriorated again to a colder climate with open grassland replacing some of the denser afforestation and, the tool kit reverted to the form described as 'Mousterien Typique' and is associated with a mammalian fauna dominated by the horse.

Such a transition was well demonstrated by the archaeological and faunal sequence at Combe Grenal, excavated by F. Bordes 1953-1965. Levels 56-39 belong to the first glacial phase of the Weichselian, IS 5a during which there were very few bird remains: namely, an eagle, a falcon, black grouse and grey partridge. The lithics were mainly described as typical Mousterian. Towards the end of this cold period more temperate conditions appeared to prevail. A more diverse avifauna appeared, including a nutcracker and blue rock thrush and the human occupants were using notched scrapers as an element of their toolkit. This trend towards a warmer avifauna became a feature of level, 'sous 38,' with evidence of many warm temperate species, including bee eaters, spotted woodpeckers, crag martins, and a shrike, with a number of warblers and a rock sparrow. Some of these species may have been drawn to the vicinity of the caves by flies and maggots developing among the domestic debris. The further onset of cold conditions, interspersed by brief intervals of an amelioration of climate was demonstrated in

Species	Baume de Gigny III	Baume de Gigny II	Fontechevade Lgl.	Fontechevade Igl	Combe Grenal Level 'sous38'	Pech de l'Aze I	Pech de l'Aze II
Podiceps auritus, Slavonian grebe							
Cygnus cygnus, Whooper swan		*					
Anser brachyrhyncos, Pink footed goose						*	
Anas penelope, Wigeon				*			
Anas platyrhyncos, Mallard	*	*		*			
Anas querquedula, Teal	*						
Mergus merganser, Goosander				*			
Buteo buteo, Buzzard			*	*			
Halaeetus albicilla, White tailed eagle							*
Aquila chrysaetos, Golden eagle		*				*	*
Accipiter nisus, Sparrowhawk						*	*
Falco vespertinus, Red footed falcon		*					
Falco tinnuculus, Kestrel	*					*	*
Falco subbuteo, Hobby	*	*					*
Falco naummanni, Lesser kestrel							*
Lagopus lagopus, Willow grouse	*	*	*				
Lagopus mutus, Ptarmigan	*	*		*			
Tetrao tetrix, Black grouse	*	*	*			*	*
Tetrao urogallus, Capercaillie		*		*			
Alectoris Barbara, Barbary partridge			*	*			
Perdix perdix, Grey partridge		*	*	*		*	*
Coturnix coturnix, Quail		*		*	*		*
Crex crex, Corncrake					*		
Rallus aquaticus, Water rail							*
Grus grus, Crane		*					
Calidris cf. canutus, cf. Knot						*	
Limosa limosa, Bar tailed godwit		*					
Tringa erythropus, Spotted sandpiper	*	*					
Scolopax rusticola, Woodcock			*	*			
Gallinago gallinago, Snipe	*						
Alle alle, Little auk		*					
Columba cf, oenas livia, Stock/rock dove		*					
Asio flammeus, Short-eared owl	*				Aegolius funereus *		
Otus scops, Scops owl					*		
Asio otus, Long-eared owl	*						

Table 5. A comparison between bird faunas from Mousterian levels La Baume de Gigny, Fontechevade, Combe Grenal and Pech de l'Aze. (After Berlioz 1959 and Mourer Chauviré 1975).

Species	Baume de Gigny III	Baume de Gigny II	Fontechevade Lgl.	Fontechevade Igl	Combe Grenal Level 'sous38'	Pech de l'Aze I	Pech de l'Aze II
Bubo bubo, Eagle owl		*					
Nyctea scandiaca, Snowy owl	*	*					
Asio otus, Long-eared owl	*						
Asio flammeus, Short-eared owl	*						
Aegoleus funereus, Tengmal's owl							
Apus apus, Swift					*		
Merops apiaster, Beeeater							
Jynx torquila, Wryneck					*		
Picus canis, Grey headed woodpecker			*	*			
Dendrocopus major, Great spotted woodpecker					*		
Dendrocopus medius, Middle spotted woodpecker					*		
Galerida cristata?/Alauda arvensis, Crested lark/ Skylark		*	Alauda sp. *		Alauda arvensis? *	Alauda arvensis	
Calandrella brachydactyla, Short toed lark							*
Ptyonoprogne rupestris, Crag martin				*	*		
Hirundo daurica, Red-rumped swallow	*					*	
Hirundo rustica, Swallow					*		
Delichon urbica, House martin					*		
Anthus cf.spinoletta, Water pipit			*	*		*	
Cinclus cinclus, Dipper	*	*				*	
Prunella collaris, Alpine accentor			*	*			
Oenanthe oenanthe, Northern wheatear	*	*					
Erithacus rubecula, Robin				*			
Phoenicurus phoenicurus, Redstart			*	*			
Turdus sp., Thrush sp.				*	*T. merula* * *T. viviscivorus* *	* * *T.iliacus* *	
Acrocephalus palustris, Marsh warbler					*		
Hippolais icterina, Icterine warbler					*		
Sylvia borin, Garden warbler					*		
Sylvia atricapilla, Blackcap					*		
Phylloscopus bonelli, Bonelli's warbler					*		
Parus major, Great tit					*		
Sitta europaea, Nuthatch					*		
Lanius excubitor, Great grey shrike			*	*	L. collurio *		

Table 5. Continued.

Species	Baume de Gigny III	Baume de Gigny II	Fontechevade Lgl.	Fontechevade Igl	Combe Grenal Level 'sous38'	Pech de l'Aze I	Pech de l'Aze II
Oriolus oriolus, Golden oriole				*			
Garrulus glandarius, Jay		*			*		
Pica pica, Magpie	*	*		*			*
Pyrrhocorax graculus, Alpine chough	*	*				*	*
Pyrrhocorax pyrrhocorax, Chough	*			*			*
Corvus monedula, Jackdaw		*					
Corvus corone, Crow		*		*			
Corvus corax, Raven		*				*	
Sturnus sp./roseus, Starling/rose coloured starling							
Passer domesticus, House sparrow					*		
Montefringilla nivalis, Snow finch					*		*
Fringilla coelebs, Chaffinch					*		
Carduelis flammea, Redpoll							
Coccothraustes coccothraustes, Hawfinch					*	*	

Table 5. Continued.

a reduction in species diversity through the climate phases of IS 4 and 3, with black vulture, grouse, chough and snow finch (Mourer Chauviré 1975). The aspect of tool making varied in line with changes in climate and local ecological development.

Excavations of the Mousterian levels at Pech de l'Aze II and I corresponds approximately in date with the two main phases of the last Glaciation at Combe Grenal and occasionally, some of the avifaunal evidence is a little mixed.

The Pyrenees and Cantabria

The Pyrenean region from Herault and Ariège in the east to the Atlantic Pyrenees in the west and extending westward along the coastal strip and inland into the cordillera Cantabrica encompasses numerous sites containing remains of Middle Palaeolithic occupation of Mousterian type. Almost all of them represent an early part of a sequence that was overlaid by a series of Upper Palaeolithic occupation levels, that continued until the final stages of the last Glaciation.

Two major Mousterian sites in Hérault define different aspects of the avian environment over the period (Mourer Chauviré 1975; Mourer Chauviré and Villette 1983). The cave of Salpêtre at Pompignan some 30 kilometres north of Montpellier opens towards the north, while Hortus at Valflaunes 10 kilometres to the south faces south. In both caves, there was some bias among the bird population towards warm temperate Mediterranean species and at the cave of Hortus there were mainly species whose niche preferences are for cliff and rocky habitats, whereas at Salpêtre a few birds are referred to as 'cold species', a large proportion of the species are those adapted to a forest habitat. Nevertheless, the red rumped swallow is present on both sites, although only in level VII of Salpêtre cave, along with evidence of a cuckoo. It was noted of level VII that both barbary and rock partridge were identified along with the northern grey partridge.

In Ariège, the site of Soulabé, a rock shelter had an outer platform whose deposits contained mainly Holocene material and behind it opened two gallery passages. Most of the Mousterian material was excavated from the lower, 'Galerie profonde'. The pattern of avifauna divides approximately into raptorial species including vultures, eagles and falcons and owls as one element and game species, grouse, partridge and quail, passerines and corvids as another. Among the passerines, Thrushes were important as was the montane snow finch, and the scarlet rosefinch, confined at the present day to Eastern Europe, yet the largest number of bones in the assemblage were those of alpine choughs, living in the surrounding cliffs and probably providing a resident larder for the human occupants of the cave.

At the western end of the Pyrenees, the Abri Olha at Cambo les Bains on the river Nive, the bird remains were first studied by Passemard in 1923, who observed that the mammalian fauna from the lower levels was

largely temperate but in the upper level included more cold species. The avian bone findings have been revised more recently by Elorza (1990) who dated the assemblage to the second phase of the Weichselian. Whether the seabirds, cory's shearwater, herring gull or common tern and scoter died natural deaths or were imported onto the site, they demonstrate the proximity of the sea. The scoter, sandpiper, plover and dunlin may be regarded as cold elements. They are at the present-day northern breeders, mainly in the arctic or Fennoscandia, arriving on the shoreline of northern Europe and the Mediterranean during the winter.

Well known Mousterian sites along the Cantabrian coast are infrequent and tend to form the foundation layer for an extended series of later occupations of upper Palaeolithic development. This was the case at Amalda in Guipuzcoa where a relatively early Mousterian use of the cave was overlaid by a sequence of 'perigordian' (Gravettian) levels, C14 dated between 27,000 and 19,000 years BP This was followed by a Solutrean between 17,000 – 16,000 years BP. A similarly extended sequence was also recognised at El Castillo in Santander province. There a possible Acheulean deposit lay below the Mousterian that was succeeded by a full sequence of Aurignacian, later a middle Magdalenian and the bird remains found at the adjacent cave of Hornos de la Pena were similar. However, on both sites the avifauna was of a temperate nature and differed little from that which might be encountered at the present day along the Cantabrian littoral.

Inland, in the region of Burgos, the Mousterian of the Cueva de Valdegoba revealed little variation from this pattern apart from the presence of black vulture that is also common at the present day, and may be seen on the edge of the uplands and mountain range that separates Cantabria from Central Spain, soaring on the thermals above the coastal plains.

Site/Species	Hortus	Sapêtre	Soulabé	Gatzarria	Olha	Amalda	Valdegoba
Calonectrix diomedia, Cory's shearwater					*		
Anas platyrhyncos, Mallard					*	*	* *Anas sp.*
Melanitta nigra, Scoter					*		
Mergus merganser, Goosander			*				
Gypaetus barbatus, Lammergeir			*?				
Gyps fulvus, Griffon vulture	*?						
Buteo cf. rufinus, Rough legged buzzaed					*		
Accipiter nisus, Sparrowhawk		*					
Haliaeetus albicilla, White tailed eagle			*				
Aquila chrysaetos, Golden eagle			*			*	
Falco vespertinus, Red-footed falcon			*				
Falco tinnunculus, Kestrel	*	*	*		*		*
Falco peregrinus, Peregrine falcon	*		*				
Falco columbarius, Merlin		*					
Lagopus mutus, Ptarmigan		*		*			
Tetrao tetrix, Black grouse		*					
Alectoris graeca, Rock partridge	*				*		* *Alecrtoris sp.*
Alectoris barbara, Barbary partridge	*						
Perdix perdix, Grey partridge	*	*	*	*	*		
Coturnix coturnix, Quail		*		*	*		*
Charadrius cf, morinellus, Dotterel		* cf					

Table 6. Mousterian avifaunas from Herault, the Pyrenees, and Cantabria (after Mourer Chauviré Clot, Elorza and Eastham).

Site/Species	Hortus	Sapêtre	Soulabé	Gatzarria	Olha	Amalda	Valdegoba
Calidris alina/C, minuta/C. ferruginea, Dunlin?/ Sandpiper sp.					* *		
Scolopax rusticola, Woodcock		*					
Larus argentatus, Herring gull					*		
Sterna hirundo, Common tern					*		
Columba livia, Rock dove	*		*				
Columba palumbus, Woodpigeon	*						* *Columba sp.*
Cuculus canorus, Cuckoo		*					
Asio flammeus, Short eared owl	*	*					
Asio otus, Long eared owl					*		
Otus scops, Scops owl	*	*					
Athene noctua, Little owl		*					*
Asio flammeus, Short eared owl	*	*					
Asio otus, Long eared owl					*		
Picus viridis/canus, Green/grey headed woodpecker	*						
Dendrocopus major, Great spooted woodpecker		*					
Dendrocopus medius, Middle spotted woodpecker		*					
Galerida cristata, Crested lark		*		*		*	
Alauda arvensis, Skylark				*			
Riparia riparia, Sand martin	*						
Ptyonoprogne rupestris, Crag martin	*			*			
Hirundo rustica, Swallow			*				
Hirundo daurica, Red-rumped swallow	*	*					
Delichon urbica, House martin			*				
Anthus trivialis, Tree pipit	*						
Motacilla alba, Pied wagtail	*			*			
Cinclus cinclus, Dipper				*	*		
Saxicola rubetra, Whinchat		*					
Monticola cf. solitarius, Blue rock thrush				*			
Turdus merula/torquatus, Blackbird/Ring ouzel		*	*		*		*Turdus sp.*
Turdus pilaris, Fieldfare			*				
Turdus iliacus, Redwing			*				
Turdus philomelos, Song thrush				*		*	
Turdus viviscivorus, Mistle thrush	*	*	*			*	
Ficedula hypoleuca, Pied flycatcher	*						
Garrulus glandarius, Jay		*		*	*		

Table 6. Continued.

Site/Species	Hortus	Sapêtre	Soulabé	Gatzarria	Olha	Amalda	Valdegoba
Nucifraga caryoctes, Nutcracker	*						
Pica pica, Magpie		*					
Pyrrhocorax graculus, Alpine chough	*	*	*	*	*		*
Pyrrhocorax pyrrhocorax, Red billed chough	*	*	*	*			*
Corvus monedula, Jackdaw			*				
Corvus corone, Carrion crow	*				*	*	
Corvus corax, Raven				*	*	*	
Sturnus vulgaris, Starling	*		*				
Passer cf. domesticus, Sparrow					*		
Petronia petronia, Rock sparrow	*						
Montifringilla nivalis, Snow finch		*	*				
Coccothraustes coccothraustes, Hawfinch	*	*					
Milaria calandra, Corn bunting						*	
Carpodaceus erythrinus, Scarlet rosefinch			*				

Table 6. Continued.

Mousterian sites in eastern and southern Spain

The Mousterian occupation of the eastern part of the Iberian Peninsula extended from Catalonia in the north to Malaga on the southern coast. The geology of Spain determines in part the distribution of identifiable Palaeolithic cave sites, since, while igneous and metamorphic rocks are concentrated in the west, where preservation of bone is poor, those in the east and along the Mediterranean coast are largely limestone. The climate at the present day is dryer because cut off from Atlantic influences by the high central sierras, the Iberic mountains to the north and the Cordillera Baetica in the south. However, fluctuations associated with glacial advance and retreat further north resulted in semi-pluviose conditions in some localities of south eastern Spain.

In Barcelona province the Abric Romani was associated with a Mousterian industry dated by Uranium/Thorium to between 39,000 – 60,000 years BP (Vaquero and Carbonell 2000), and the Cueva del Toll both of which contained a few bird bones with a fairly indeterminate temperate Mediterranean bias (Villalta 1964). The sites with the most important series of Mousterian occupations were situated further south in Alicante and on Gibraltar.

Cova Negra de Bellus

This cave is situated on the west bank of the river Albaida, some three kilometres south of the modern town of Jativa. It is one of a number of caves and solution holes in the Estret des Aigles that cuts through the cretaceous massif of the Sierra Grosso for around three kilometres. A number of these, the Cova de Petxina upstream of Cova Negra and the Covas del Tunel and Samit downstream were all found to contain Mousterian industry.

Excavations were conducted at Cova Negra from 1928, first by Vines (1928, 1942) and Ballester between 1929 and 1933, then in the 1950's by Fletcher and Jordá and in the 1980's by Valentin Villaverde Bonilla (1984). Villaverde defined the stratigraphy of the site, establishing that industrial Levels XIV – X belonged to the first phase of the Weichselian Glaciation; with an interglacial period in level IX that was succeeded by Weichselian 2 in industrial levels XVIII – I. Prior to the onset of cooler conditions the river would appear to have broken its banks and deposited fluviatile clays in the cave. This was followed by a relatively short period of warm followed dryer conditions before the onset of the next cool period.

The mammal record for Cova Negra (M. Perez Ripoll 1977), shows that during the early cold sequence the fauna was dominated by horse and red deer, with smaller numbers of Spanish ibex, and increasing numbers of lagomorphs. There was little change during the intervening interstadial. The later cold phase was marked by the appearance of rhinoceros, both *Dicherorhynus kitchbergensis* and *hemitoechus,* yet at the same time there were cattle, *Bos primigenius*, and pig, *Sus*

scrofa, indicating the development of afforestation and a decline in the lagomorph population. Pollen studies indicated that although there was a dominance of pine, deciduous tress continued to form a percentage of the vegetation cover. It would appear that the characteristic plants of the low growing, native Matorral as it is seen at the present day were absent.

Throughout the sequence of Mousterian levels, there was a considerable quantity of avian bones. Most numerous are those species whose preferred habitat niches and roosting sites are normally in the cliffs and rocks surrounding the cave environment as permanent residents. Amongst them were the doves, swifts, choughs and other corvids, rock thrushes, peregrine falcon and some owls. Ducks were present in different levels, the mallard throughout and others like pochard, teal and pintail during the cool periods. The finds also included a diversity of insectivorous birds that would have thrived on the proliferation of the insect life feeding on any rotting human debris from the cave; insectivorous species that might include the lesser kestrel, the swifts, roller, wheatear, rock thrushes and wagtail. When scavengers, like magpie, carrion crow and raven are added to the list, it therefore becomes less certain whether the interpretation of the avian assemblage at Cova Negra and some other sites were entirely due to strong anthropogenic intervention or whether a high proportion of the remains represent a reflection of animal predation.

One species of particular interest is the shag, discovered in the interstadial level IX, the warm interstadial phase. The specimen is represented by a coracoid, distinguished from the cormorant by its smaller size, and it is a species that is rarely found in inland locations. The shag is currently a pelagic bird, avoiding fresh and even brackish waters and Cova Negra is situated some 40 kilometres from the sea in the direct line at the present day, to which may be added up to a further 30 kilometres during the Palaeolithic in times of lower sea level. Since it seems less than probable that the ethology of the species may have changed so radically, this evidence may suggest that hominid activity could have carried it from the shore, back to the cave. (Eastham 1986).

The owls at Cova Negra are also unusual indicating that there may have been a somewhat different distribution pattern than at present.

The pygmy owl in Level XIII, for instance, is presently a species of taiga and montane forest and is found at around 1000 metres in the Alps and currently considered to be an inhabitant of Fennoscandia and countries bordering the Baltic sea and Russia, feeding largely on small mice and voles. The slightly larger Tengmalm's owl has a very similar distribution and habitat preference, although its current range extends into eastern France and the Balkan states. The presence of these owl species at Cova Negra may indicate a more south westerly distribution range during cold phases. If so, the shift persisted into the post Glacial period, since a pygmy owl was recorded in the Dryas III level of around 9,900 years BP at Salpêtre cave in Herault (Mourer Chauviré 1975; Vilette 1983).

In all levels at Cova Negra de Bellus, the tawny owl was found to be generally larger than recent specimens. Larger specimens appeared in the middle and later levels of the excavation. A much larger specimen was found in the find of a humerus in the interstadial level material and a tibiotarsus in Level III. The dimensions of these elements fall well outside the range of recent female tawny owl specimens and maybe compared most closely with samples identified at the Czech site of Stranska Skala by Janossy (1972), dated to MNQ21 and in France at the Grotte de l'Escale de St Esteve Janson in Bouches du Rhone by Mourer Chauviré (1975), a site dated to MNQ22. This determination has since been questioned (Mlikovsky 2002). Certainly, raptors tend to vary considerably in size, occasionally resulting in local sub-species. Among the owl bones from the Grotte de l'Escale Janson were identified not only the *Strix intermedia* but also a large eagle owl, *Bubo bubo Davidii*. However the much later date for Cova Negra makes the determination of a separate species unlikely.

Seasonal change appears to have had relatively little impact on the ecology of the Albaida valley that with the open environment of the surrounding area provided for a number of separate niche requirements from the lightly wooded scrub lands of the slopes and the open grassland on the hills, to the steep cliffs of the gorge, and the low-lying river bank with its the colonies of columbids, corvids, hirundids and smaller passerines colonising the rocky cliff and outcrops, supplying a resident larder to supplement the aquatic resources and the game species to other residents. The bone remains deposited within the cave, demonstrate a concentration across central areas and preponderance of carpel bones from the wing and distal sections of lower limb bones.

As already indicated, Cova Negra de Bellus was not by any means the sole site of importance containing Middle Palaeolithic occupation debris in this region of eastern Spain, or even in the valley of the Albaida river. Yet, although some work on the avifauna was done for the Cueva del Toll, Barcelona whose main importance is on account of the pollen studies carried out by Donner and Kurten in the 1950's; that traced the way forest faunas advanced as the interglacial phase of Weichselian I/II gave way to more humid conditions and tree cover increased. The recorded bird fauna at the La Cueva del Toll is limited but the presence of

Species/Level	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV
Phalocrocorax aristotelis, Shag														
Anas penelope, Wigeon							1		1	4				
Anas crecca, Teal						1		3		1	1			
Anas platyrhyncos, Mallard	2		3				1	6	4	5	4	4		
Anas acuta, Pintail											1			
Anas querquedula, Garganey					2			1						
Accipiter gentilis, Goshawk					1		1	1						
Accipiter nisus, Sparrowhawk			1			1								
Aquila sp., Eagle sp.									1					
Falco tinnunculus, Kestrel	1			1	1				3	3	2			
Alectoris rufa, Red legged partridge	4	2	13	5	9	7	7	24	37	14	16	12	5	1
Coturnix coturnix, Quail										1	1			
Gallinago gallinago, Snipe							1							
Scolopax rusticola, Woodcock							1							
Columba livia, Rcck dove	35	9	43	58	73	39	26	154	193	110	43	93	5	19
Columba palumbus, Woodpigeon									1					
Columba sp., Dove sp.	3			2				2						
Tyto alba, Barn owl		1												
Otus scops, Scops owl									1				1	
Bubo bubo, Eagle owl					1									
Glaucidium passerinum, pigmy owl													2	
Athene noctua, Little owl								4	1			1		
Aegolius funereus, Tengmal's owl									1					
Strix Cf. intermedia, Tawny owl sp.			1							1				
Strix aluco, Tawny owl			1						1			1		
Apus apus, Swift														1
Apus melba, Alpine swift	5	2	2	3	2	5	8	42	44	12	7	8	5	2
Coracius garrulus, Roller									1					
Melanocorypha calandra, Calandra lark				1										
Motacilla alba, Pied wagtail									1					
0enanthe oenanthe, Wheatear									1					
Monticola saxatilis, Rock thrush									1					
Monticola solitarius, Blue rock thrush				12	1	1	3	2	2	1		1		
Turdus merula, Blackbird	1				1			1	2	2				
Turdus philomelos, Song thrush							1		3			1	1	

Table 7. Cova Negra de Bellus; the distribution of bird bones by level, with the numbers of bones of each species recovered. Levels XIV – X represents the stages of the cold period of Weuchselian I and levels IX – I represent the stages of Weichselian II (Ripoll and Valverde).

Species/Level	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV
Turdus viviscivorus, Mistle thrush		2	2		1	2	1	3	4			1	1	
Lanius senator, Red backed shrike								1						
Oriolus oriolus, Golden oriole									1					
Garrulus glandarius, Jay							2	6	3		1			
Pica pica, Magpie	1													
Pyrrhocorax alpinus, Alpine chough	14	1	7	14	11	13		37	58	13	5	20	7	
Pyrrhocorax pyrrhocorax, Red-billed chough	8		4	10	6		6							
Corvus corax, Raven			8	14		6		1						
Milaria calandra, Corn bunting					1									

Table 7. Continued.

tawny owl *Strix aluco* and nightingale, confirm there was developing some level of afforestation (Vilette 1983).

Few sites apart from the Cova de la Forade in Valencia, (Aparicio, San Valero and Martinez 1979) contained any extensive quantities of bird bone. One of the most potentially prolific areas for Mousterian occupation would appear to have been in the vicinity of Alcoy and Concentaina, sites associated with the rivers Polop, Barchell, Agri and Serpis. La Cueva del Salt del Barchell is one of these. Situated above a fall of 100 metres as the Barchell drops to meet the river Polop, the cave lies at the point to which the river and its marshy pools below intersect with an upland area of mixed vegetation, so that the bird remains reflect both habitats, divided between aquatic wildfowl of the wetland and red legged partridge of the upland, there were choughs roosting in the cliffs and a number of passerines, making use of the stands of trees around the cave entrance including thrushes and a single bone of green woodpecker. Totally absent from the small sample studied was any evidence of raptors, eagles, falcons or owls (Eastham unpublished data). The industrial facies was generally described as 'typical Mousterian', with a strong Levallois element similar to that at La Petzina, while the mammalian fauna was dominated by horse and Spanish Ibex (Valverde 1984).

Southern Spain

Zilhao (2000) in his study of the Mousterian sites in Portugal commented on the late dates for the final Mousterian in Southern Spain in comparison with the north. The dividing line appears to have followed the course of the Ebro River, from the Cantabrian mountains, through Zaragoza, to its delta near Tortosa. This hypothesis does not apparently exclude the presence of earlier complexes of Mousterian settlement in south eastern Spain as has been noted but is used to explain the late continuation of Middle Palaeolithic Neanderthal sites in the south of Spain and on the coast of Portugal.

Gibraltar

The rock of Gibraltar is home to a series of caves, famous in the annals of Palaeolithic study ever since the discovery of the Gibraltar Neanderthal skull in Forbes Quarry in 1858. A child's skull was recovered during the excavations at Devil's Tower in 1926 by Dorothy Garrod and an extensive avifauna was identified there by Dorothea Bate (Garrod *et al.* 1928). It was in 1945 that John Waechter began work in Gorham's cave (1947-1954). In 1994 further research began on a number of the caves including Gorham's, Ibex and Vanguard to clarify and extend the findings of earlier excavations and to revise some of the previous conclusions regarding the stratigraphy of the Mousterian. In effect, this research found that Middle Palaeolithic occupation continued from around 50,000 years BP onwards in Gorham's and other sites in the Iberian south and lasted longer than thought previously, only coming to an end at around 30,000 years BP, with the final Mousterian deposits dated to around 32,000 years BP. At Vanguard cave AMS and radiocarbon dates indicate a complete sequence of Middle Palaeolithic continuing to at least 40,000 years BP.

The Mammalian faunas differed marginally from site to site and for the assemblages held in the British Museum Natural History some contexts are a slightly uncertain (Currant 2000) but there appears have been a strong emphasis on small rodents, mustelids and carnivores with wild pig, horse, red deer, aurochs and ibex and narrow nosed rhinoceros, recorded at Genista cave, Gorham's a cave and Devil's Tower. Hyaena was evident on all sites and gnawing signs were recorded on the bones of a number of species.

Recent dating for the final Mousterian in southern Spain was by no means confined to the sites on the rock of Gibraltar, but few have recorded bird faunas. At the Cueva de la Boquete de Zafarraya, Malaga some of the material belongs to an early phase and may date to the latter part of OIS 5, and can be compared with the lowest levels in Gorham's cave (levels Q, R, and S in Waechter's sequence), while 0IS 3 is more usual for the majority of sites in the region. The more recent material at Zafarraya is thought to belong to around 30,000 years BP in line with the end of the Neanderthal presence in the Gibraltar caves. A comparison between these sites indicates the diversity of species recovered and reveals the different groupings between the cliff dwellers, the sea birds, the resident passerines and those species, like the partridge, that flocked together in the vegetated areas, or the wildfowl and waders from the wetlands to the northeast of the Rock or from Algeciras Bay. The table below lists the birds from the Mousterian levels in Gorham's cave (Waechter, Stringer, Barton and Finlayson Contexts 19-24).

Species	Gorham's Cave	Devil's tower	Zafarraya
Calonectris diomedia, Cory's shearwater		*	
P. puffinus yelkouan, Shearwater		*	
Gavia stellata, Red throated diver	2		
Phalocrocorax carbo, Cormorant		*	
Phalocrocorax aristotelis, Shag	7	*	
Ardea cf. purpurea, cf. Purple heron	1		
Ciconia ciconia, White stork	2		
Tadorna ferruginea, Ruddy shelduck	1		
Anas platyrhyncos, Mallard	2		
Netta rufina, Red crested pochard	2		
Aythya nyroca, Ferruginous duck	1		
Aythya fuligula, Tufted duck	3		
Clangula hyemalis, Long-tailed duck	3		
Melanitta fusca, Velvet scoter	1	*	
Mergus cf. serrator, Red-breasted merganser		*	
Milvus milvus, Red kite	30		
Haliaeetus albicilla, White-tailed eagle	1	*	
Neophron percnopterus, Egyptian vulture			*
Gyps fulvus, Griffon vulture	12	*	*
Hieraaetus fasciatus, Bonelli's eagle		*	
Hieraaetus pennatus, Booted eagle		*	
Falco naumanni, Lesser Kesrel		*	
Falco tinnunculus, Kestrel	1	*	*
Falco peregrinus, Peregrine falcon	1	*	
Falco subbuteo, Hobby		*	
Falco Eleanora, Eleanora's falcon			
Alectoris graeca, Rock partridge	3	*	
Alectoris rufa, Red-legged partridge	14	*?	*

Table 8. Mousterian avifauna from Gibraltar and Zafarraya after Cooper and Eastham 1967; Bate 1928; Cooper and Eastham 1988.

Species	Gorham's Cave	Devil's tower	Zafarraya
Alectoris barbara, Barbary partridge			
Fulica atra, Coot	3		
Anthropoides virgo, Demoiselle crane	1		
Haematopus ostralegus, Oystercatcher	3		*
Vanellus vanellus, Lapwing			*
Larus ridibundus, Black-headed gull	1		
Larus fuscus, Lesser Black-backed gull	2	*	
Sterna sandvicensis, Sandwich tern		*?	
Pinguinnis impennis, Great auk	2	*	
Alle alle, Little auk	1	*	
Uria aalge, Guillemot		*	
Columba livia, Rock dove	102	*	
Columba, oenas, Stock dove		*	
Columba palumbus, Wood pigeon		*	
Nyctea scandiac, Snowy owl	2		
Strix sp., Strix owl	2		
Apus melba, Alpine swift		*	
Picus viridis, Green woodpecker		*	
Ptyonoprogne rupestris, Crag martin			*
Monticola solitarius, Blue rock thrush			*
Turdus sp., Thrush/blackbird		*/*	
Turdus viviscivorus, Mistle thrush		*	
Pyrrhocorax alpinus, Alpine chough	8	*	*
Pyrrhocorax pyrrhocorax, Red billed chough	31	*	*
Corvus corone, Carrion crow	7		
Corvus corax, Raven	6		*
Fringilla coelebs, Chaffinch		*	

Table 8. Continued.

At Gorham's Cave and Devil's Tower, there is some uncertainty as to whether the marine species belong as part of the stratified assemblage, or were blown in from the shore. The shearwater may have been killed and eaten by gulls and it is possible that individual great auks or cormorants were taken as they were engaged in surreptitiously poaching from a fisherman's catch. There are recent records of great auk landing on inshore fishing craft (Irby 1895).

The presence of migratory wildfowl provides some seasonal indications. It is evident that all the wildfowl in both Gorham's and at Devil's tower would have been winter migrants typical of coastal waters and shoreline feeders. The diversity of raptorial birds is particularly impressive from Devil's Tower, while the record of snowy owl in Gorham's cave may account for the high proportion of bones of doves but there has been some discussion for a time about the validity of its determination.

Mousterian sites in Italy

Like the Iberian Peninsula, Italy is rich in Middle Palaeolithic and Neanderthal sites with extensive avifauna. For instance, the site of Torre in Pietra in

Lazio, may be compared with Atapuerca in Spain, Orgnac III, Lunel Vielle in France or Swanscombe in Britain Like those sites it contained a considerable variety of wildfowl.

However, not all early sites of Middle Palaeolithic date containing avifaunas are associated with Neanderthal hominid occupation. For some, the main interest is paleontological. Nevertheless, the lower levels of the Grotta Del Principe did contain evidence of hominid occupation that approximated in date to the sequence of occupations at Cova Negra de Bellus or the Cueva del Toll. At a later time, the Riparo di Fumane, in the Lessini hills north of Verona had an upper series of Mousterian layers with C14 dates of 40,000 ± 3,000 years BP, followed by a transitional and a later Aurignacian occupation that was dated to 31/32,000 years BP. These dates compare with similar dates for the transition to Upper Palaeolithic at Gorham's cave and other southern Spanish sites. In Italy, it appears that the range of bird species was more extensive in the Aurignacian layers than during the Mousterian, a period that appears to be characterised by raptors and game birds, including black grouse, *Tetrao tetrix* (Cassoli and Tagliacozzo 1992).

On the Ligurian coast in north western Italy, the most important site of Mousterian settlement, was the Grotta del Principe at Grimaldi. First studied by Boule in 1910 and subsequently by Del Campana (1928), Wolf (1938) and Mourer Chauviré (1975), it is a classic for the period. The avifauna is complex and diverse with strong elements of aquatic wetland, raptorial and game species besides an unusual range of passerine species.

In central Italy, most of the Mousterian sites concentrated in the region of Lazio, appear to belong to the period of OIS 4 with dates around 43-55,000 Ka BP, yet there are sites associated with evidence of Mousterian occupation in every province from Liguria to Puglia and Calabria. Good examples are the Mousterian open occupation sites on the old lake beds of Sora outside Frosinone in Lazio province. The industry is a fine example of Mousterian of Levallois facies. Two sites separated by some three kilometres were all that remained of the eroded lake beds, the sites of Carnello and Valle Radice. The mammalian fauna of both sites indicated a predominantly open forest environment around the lake beds, that featured the bones of beaver *Castor fiber* as the most frequent among the mammalian remains and the birds included a variety of waterfowl, many arriving on winter migration, besides game species, including the occasional capercaillie.

Further south, the Torre Nave, situated near the Grotta Romanelli on the Calabrian coast also contained a range of wetland birds and game species besides a diversity of passerine birds in a context of typical Mousterian. Of particular interest was the identification in 1972 by Cassoli of sandgrouse bones from caves in Puglia in both Mousterian and upper Palaeolithic contexts. Sand grouse (*Pteroclidae*) are typical of dry zones, adapted to desert conditions. Humeri of *Pterocles orientalis*, Black bellied and *P.alchata,* pintailed sandgrouse were found in the Upper Palaeolithic deposits of the Grotta Romanelli and the Grotta del la Madonna and *P.orientalis* at the Grotta di Torre Nave in Mousterian levels. At the present-day distribution is restricted to southern Spain, North Africa, Turkey and the Asian steppes, with some pockets of population in Cyprus and the Middle East. They are migratory and depend on small seeds of low growing plants and bushes, consequently, their presence has implications for the interpretation of the contemporary ecology of the locality.

These are only a few examples of the abundant Mousterian and Middle Palaeolithic deposits in inland Italy but those mentioned may be taken to affirm the richness of its fossil record for the period.

The extended timespan during which Neanderthal hominids were present and active in Western Europe from around 500,000 years BP and continuing in parts of Mediterranean Europe until 30,000 years ago renders the task of making a coherent story of interpreting the problems and discrepancies in the story of their use and exploitation of birds a difficult one. Certain sites have been selected in this chapter in the attempt to illustrate a general trend in the way this resource was used, exploited by hominids probably but also by other animal groups and, more importantly providing unrivalled information about relating to the general or particular ecological niche.

To sum up: the pattern of Neanderthal use and hunting of birds shows a concentration on wildfowl and wetland species, of the regional patterns of game species from grouse to partridge and quail and to some extent on species occupying an adjacent niche to the human habitat. The presence of other groups may be seen to fluctuate with time, location and environment.

Current assessments of the evidence, appear to indicate that the Neanderthal culture, way of life and style of resource management continued in southwest Europe for considerably longer than further north and that the exploitation of birds continued at the same level, while in other parts, the transition to Upper Palaeolithic industries is marked by a general reduction in the quantity and diversity of bird remains to be found in occupation levels, either because the bird population was much reduced as a result of a deteriorating climate, or perhaps because of a social change in resource management.

Species	G. del Principe I	G. del Principe I/II	G. del Principe I	Torre in Pietra	Rip. de Fumane	Frosinone Sora	Torre Nave
Phalocrocorax carbo, Cormorant				*			
Botauris stellaris, Bittern				*			
Ixobrychus minutus, Little bittern				*			
Cygnus columbianus Bewickii, Bewick's swan						*	
Cygnus Cygnus, Whooper swan				*			
Anser fabalis, Bean goose				*			
Anser albifrons, White fronted goose				*			
Anas penelope, Wigeon				*			
Anas platyrhyncos, Mallard	*		*	*		*	*
Anas acuta, Pintail				*		*	
Anas querquedula, Garganey	*						
Anas clypeata, Shoveler							
Aythya nyroca, Ferruginous duck				*			
Aythya fuligula, Tufted duck	*						
Bucephala clangula, Golden eye	*						
Milvus milvus, Red kite	*						
Gyps fulvus, Griffon vulture	*						
Aegypius monachus, Black vulture	*						
Circus macrourus, Pallid harrier	*		*				
Circus pygargus, Montague's Harrier					*		
Accipiter gentilis, Goshawk	*						
Haliaeetus albicilla, White tailed eagle	*						
Aquilla chrysaetos, Golden eagle	*	*	*		*	*	
Pandion haliaetus, Osprey				*			
Falco tinnunculus, Kestrel	*		*		*		*
Falco vespertinus, Red footed falcon	*?				*		*
Falco columbarius, Merlin					*		
Falco subbuteo, Hobby							*
Lagopus mutus, Ptarmigan	*				*		
Tetrao tetrix, Black grouse	*				*	*	
Tertrao urogallus, Capercaillie						*	
Alectoris graeca, Rock partridge	*	*	*	*	*		*
Alectoris Barbara, Barbary partidge	*		*				
Perdix perdix, Grey partridge	*		*	*	*	*	*
Coturnix coturnix, Quail	*		*	*			*

Table 9. Avian distribution in Italy: Grotta Del Principe (after Mourer Chauviré 1975) Torre in Pietra (after Cassoli 1978), Ripari de Fumane (after Cassoli and Tagliacozzo 1994), Frosinone lake beds (after Segre, Biddittu and Cassoli 1984), and Torre Nave (after Cassoli 1980).

Species	G. del Principe I	G. del Principe I/II	G. del Principe I	Torre in Pietra	Rip. de Fumane	Frosinone Sora	Torre Nave
Porzana porzana, Spotted crake			*				
Crex crex, Corn crake			*	*	*		*
Gallinula Chloropus, Moorhen			*				
Tetrax tetrax, Little bustard							*
Recurvirostra avosetta, Avocet					*		
Vanellus vanellus	*						
Tringa cf. nebularia, Greenshank			*				
Gallinago media, Great snipe	*						
Pterocles orientalis, Black bellied sandgrouse							*
Columba livia, Rock dove	*	*	*				
Columba palumbus, Wood pigeon			*				*
Tyto alba, Barn owl	*						
Otus scops, Scops owl	*						
Bubo bubo, Eagle owl	*	*	*				
Surnia ullula, Hawl owl						*	
Athene noctua, Little owl							*
Strix aluco, Tawny owl	*						
Asio flammeus, Short eared owl			*				
Apus apus, Swift		*	*				
Picus viridis, Green woodpecker							*
Dendrocopus major, Great spotted woodpecker	*						
Alauda arvensis, Skylark				*			
Hirundo rustica, Swallow			*				*
Hirundo daurica, Red rumped swallow			*				
Bombicilla garrulus, Waxwing		*					
Prunella collaris, Alpine accentor			*				
Turdus merula, Blackbird			*				
Turdus pilaris, Fieldfare				*			
Turdus iliacus, Redwing			*	*			
Turdus philomelos, Song thrush							*
Turdus viviscivorus, Mistlethrush					*		
Aegithalos caudatus, Long tailed tit?			*				
Oriolus oriolus, Golden oriole					*		
Garrulus glandarius, Jay			*				*
Nucifraga caryocatates, Nutcracker	*	*					
Pica pica, Magpie	*				*		

Table 9. Continued.

Species	G. del Principe I	G. del Principe I/II	G. del Principe I	Torre in Pietra	Rip. de Fumane	Frosinone Sora	Torre Nave
Pyrrhorax graculus, Alpine chough	*		*			*	*
P. pyrrhocorax (primigenius), Chough	*		*			*	*
Corus corone, Carrion/hooded crow			*		*		
Corvus corax, Raven	*		*		*		
Fringilla coelebs, Chaffinch		*	*				
Coccothraustes coccothraustes, Hawfinch	*	*					
Carduelis chloris, Greenfinch			*				
Carduelis flammeus, Redpoll		*					

Table 9. Continued.

Chapter 3

The Upper Palaeolithic in western Europe

Compared with rate of change in Hominid technology during the Middle Palaeolithic, the speed of innovation during the Upper Palaeolithic appears rapid. This was in part a response to relatively rapid climatic fluctuations. The changes in climate and in the cultural markers of social development between 40,000 years BP and 10,000 years BP, when the ice finally retreated from Western Europe happened relatively quickly. The changes in the environment also impacted on the diversity of avian behaviour and resulted in differences in the human exploitation of the resources available.

The years between 40,000 years BP and 28,000 years BP coincided with a major interglacial period of generally temperate climate. From 28,000 to 22,000 years BP there was a gradual deterioration of climate. It was a time of increasing cold, with periods of drought giving rise to the spread of windblown soils or loess.

The period of maximum glaciation occurred between the years 22,000 and 17,000 BP interspersed by short humid phases and from 17,000 years until about 13,500 BP there was a slow improvement to an environment that remained generally rather cold and dry with further deposition of loess.

From 13,500 to 10,000 BP the final stages of this last glacial phase, the climate underwent a series of alternating fluctuations, defined as, Dryas I, II and III, cold stages, interspersed with warmer phases Lascaux, Bølling and Allerød. The date of 10,000 years BP has been taken as marking the final retreat of the ice from Western Europe, the end of the Pleistocene and the beginning of the Holocene.

In general, Upper Palaeolithic occupations have been named after sites where they were first recognised, during initial excavations that took place during the second half of the nineteenth and early twentieth centuries. Flint tool types and bone implements, as used by groups of mobile hunter-gatherer communities were classified according to the methods of manufacture and use. Their sequence in the excavation providing a chronology for an increasingly complex set of cultural developments. The manufacture and use of the stone tool equipment was based on the skill of taking fine blades from a nucleus of flint or chert that could then be worked into the required shape. Similarly, the use of bone to supply hunting, domestic and ornamental requirements became increasingly important and complex.

Sequences were worked out beginning with a transition period, the Chatelperronian, that was dated initially to around 38,000 BP, a cultural stage that is restricted in distribution. The early Aurignacian first appeared around 38,000 and continued in various forms and locations until about 24,000 years BP. However these dates are being continuously revised as new material comes to light. The early Gravettian appears to start between 29,000 and 26,000 years BP, flourishing between 26,000 and 23,000 years BP. Until relatively recently, the term Perigordian applied to an aspect of early Upper Palaeolithic roughly contemporary with the Aurignacian but it is now regarded a variant of a comparable technology and has been subsumed into the Aurignacian generic (Djindjian and Koslowski 1999).

At around 22,000 years BP with the onset of the Last Glaciation, the climate deteriorated and some parts of northern Europe became uninhabitable for most human populations. The Gravettian hunters tended to move in a southerly direction away from the advancing ice and groups, and becoming isolated from one another, began to develop local tool patterns. Contemporary with the development of the Gravettian there arose, mainly in the southern region, a flint working facies of fine retouch across all surfaces that became known as the Solutrean after the site of Solutré, near Maçon and developed through various stages from 21,500 years BP to about 18,500 years BP (Djindjian and Koslowski 1999).

Between 17,000 BP and 12,000 years BP, Hunter-Gatherer cultures took on an aspect that was named after the site of La Madeleine on the Vezère River, north of Les Eyzies. The Abbé Breuil divided the sequence into six stages, according to the types of bone tools. The Magdalenian became widespread across Western Europe, especially in the foothills of the Pyrenees and the Cordillera Cantabrica of northern Spain. It is particularly associated with some of the finest portable and parietal art, as outlined in Chapters 4 and 5.

The Aurignacian

The period during which Aurignacian industries flourished was climatically variable, beginning with a transitional temperate phase known as the Cottés interstadial, 38,000-35,000 years BP, it became rapidly colder, Sites in Schwabia, like Hohlefels, Geissenklosterle or Vogelherd produced both flutes and some of the finest sculptural figurines of the Aurignacian period but have little contemporary evidence of avian bone. A number

of developments in the stone and bone tools define the stages of the cultures bearing the title Aurignacian, with a dating sequence that plots the timescale within which it was active in various geographical areas of the continent.

In the absence of any significant bird presence in the Baden-Wurttemberg caves, the nearest comparisons are probably with sites further east associated with the river systems feeding into the middle Danube. A site that was found to be rich in avian remains from the early phase of Upper Palaeolithic was the cave of Instállósko in the Bükk region of the Carpathian basin of Hungary. The early occupation at this site slightly predates those in Baden-Wurtemburg, with C14 dates of over 44,000 years BP at the base of a sequence of Aurignacian occupation and 39,700 ± 900 years BP at the top. The bird population, studied by Jannosy (1955, 1980 and 1986) is fairly similar throughout but with an increase over time in passerines favouring pine forests in a climate that was becoming cooler. In total numbers of individual bones, these assemblages are dominated by members of the grouse family and illustrate the vertical separation of habitats in a similar way to the site at Buhlen during the Middle Palaeolithic. The passerine birds include a number of thrushes and of corvids. It seems that none of the sites in this group had a large population of raptorial birds.

Across the modern border, in Croatia, a group of sites were found, among them, the cave of Vindija contained an extensive series of human occupations, beginning with the Acheulian and Mousterian use of the site and very little avian association. This was followed by a long sequence of Aurignacian between 33/34,000 and 26/27,000 years BP, with a shorter Mesolithic occupation to follow. Here the most frequent bird species were large colonies of dabbling and diving ducks and a diversity of grouse, with pheasant partridge and a number of marshland species. As at Instállósko a waxwing, was recovered here a likely winter visitor in both places.

The site of Sandalja II in Istria belongs to a later phase of the Aurignacian between 23,570 ± 180 BP and 22,340 ± 170 BP as found in levels E, F and G/H. There was no particular species bias in the assemblage, crane and bustards were noted, suggesting that there was open grassland available on the coastal plain and gulls were present from the Adriatic and yet the presence of crossbill suggests a level of pine forestation (Malez-Bacic 1974). The sequence of Gravettian levels that followed the Aurignacian levels, beginning about 20,750 ± 450 years BP and continuing into quite late until 12,302 ± 100 years BP were rich in avian species, indicating an element of woodland within a basically open environment.

On the other side of the Adriatic in Verona province, at the Riparo di Fumane the sequence of Mousterian occupation was overlaid by a series of Aurignacian levels, with a series of C14 dates for the lower level A2-1, from 36,500 ± 600 BP to 31,900 ± 500 years BP (A1). Above this basal level of Aurignacian there was no major change in the C14 dating of the sequence from layers D 7, 6, 3, or D1, where the cultural sequence became overlaid by Gravettian and epi-Gravettian industries. Neither was there a marked difference in the pattern of avian ecology between each occupation layer. There were a number of larger raptors, like the golden eagle, and the rough legged buzzard, either of which could have been responsible for some of kills of marsh birds and black grouse, although recent records indicate that this buzzard currently prefers to feed on small mammals outside the breeding season. The main predators of small mammals, and passerine birds would have been the Montague's harrier, and some of the smaller falcons. The long-eared owl, found in most of the Aurignacian sites, favours roosts in trees. (Cassoli and Tagliacozzo 1992, 1994). A comparison between the avifauna of sample sites in central Europe and the eastern part of Italy is shown in Table 1.

Species	**Instállósko**	**Vindija**	**Sandalja II**	**Fumane**
Podiceps auritus, Slavonian grebe			***E**	
Ardeola sp., Small heron/egret		***** F-E		
Cygnus cygnus, Whooper swan			***** F	
Anas platyrhyncos, Mallard	***** A1 3	***** G F-E		***D1**
Anas acuta, Pintail		***** F-E		
Anas crecca, Teal		***** F-E		
Anas querquedula, Garganey		***** F-E		

Table 1. A comparison of bird faunas on a sample of Aurignacian sites in Hungary, Croatia and Italy.
Notes on stratigraphy and C14 dating BP: Instállósko – A1 = Aurignacian 1, 39,700 ± 900 – 44,300 ± 1900 A2=Aurignacian 2 30,900 t0 ± 31,540 ± 600 BP, Aurignacian 2/3. Vindija – older Aurignacian G1 G2 33,850 ± 520; Younger Aurignacian D.E. and F, 26,970 BP. Sandalja II – Aurignacian E,F.G 27,800 ± 800 to 22,660 ± 460. Fumane – A3, A-1, D7-D1-36,500 ± 600 – 32,300 ± 400 BP.

Species	Instállósko	Vindija	Sandalja II	Fumane
Aythya fuligula, Tufted duck		* F-E F		
Aythya nyroca, Ferruginous duck		* F-E		
Aythya ferina, Pochard		* F-E		
Mergus merganser, Goosander		* F-E		
Buteo lagopus, Rough legged buzzard			* G. B. buteo	*
Circus pygargus, Montague's harrier			* G. C. cyanus	* D1
Accipiter gentilis, Goshawk		* E-F G2		
Buteo buteo, Buzzard		* E-F		
Aquila chrysaetos, Golden eagle				*
Falco vespertinus, Red footed falcon	*A1 3		* E	*
Falco tinnunculus, Kestrel	* A2 3		*	*
Falco subbuteo, Hobby		* EF	* E F G	*
Falco columbarius, Merlin				*
Falco rusticolus, Gyr falcon		* EF		
Tetrao urogallus, Capercaillie	*	* EF G2	* E F	
Tetrao tetrix, Blackcock	*A1	* EF G	* E	*
Bonasia bonasia, Hazel grouse			* F	
Lagopus mutus, Ptarmigan	*	* EF G2		* A12
Lagopus lagopus, Willow grouse	*	* EF G		
Alectoris graeca, Rock partridge		* EF G2		
Perdix perdix, Grey partridge	* A1			
Phasianus colchicus, Pheasant		* EFG		
Gallinula chloropus, Moorhen		*EF G2		
Rallus aquaticus, Water rail		* EF G2		*
Porzana porzana, Spotted crake	* A1 2			
Coturnix coturnix, Quail			* E F	*
Crex crex, Corn crake	* A2			*
Grus grus, Crane			* E	
Otis tarda, Great bustard			* E G H	
Tetrax tetrax, Lttle bustard			* E E-F	
Recurvirostra avosetta, Avocet		* EF		
Charadrius sp., Plover	* A2			
Vanellus vanellus, Lapwing		* EFG2	* E	*A1-2
Actitis hypoleucos, Common sandpiper				*D6/7
Tringa glareola, Wood sandpiper				* D6
Scolopax rusticola, Woodcock		* EF G2	* E	* A2-1 D1
Gallinago gallinago, Snipe		* EF		

Table 1. Continued.

Species	Instállósko	Vindija	Sandalja II	Fumane
Larus minutus, Little gull		* EF	* L.ridibundus	
Columba oenas, Stock dove			* E F C.livia	* A2-1
Tyto alba, Barn owl		* EF	* E	
Nyctea scandiaca, Snowy owl *Bubo bubo,* Eagle owl	* A1 /B, bubo	* EF * EF	 * E	*D1d
Surnia ulula, Hawk owl	*			
Strix aluco, Tawny owl				* A1 D3
Asio flammeus, Short eared owl	* A1	* EF G2	* E	
Asio otus, Long eared owl		* EF G2		*
Strix aluco, Tawny owl		* EF		
*Aegolius funereus, T*engmal's owl	*A2			* D1d
Apus apus, Swift	* A2			
Dendrocopus leucotos, White backed woodpecker	* A1 2 D. major	* EF D. major	* **E F** D. medius * **E**D. minor	*A1-2
Lullula arborea, Woodlark				* A1-2
Galerida cristata, Crested lark			* E G	
Eremophila alpestris, Shore lark				* D7-6
Ptyonoprogne rupestris, Crag martin				* A2-1 D1
Hirundo rustica, Swallow	* A1	* EF G2		
Motacilla alba, Pied wagtail			* E	
Bombicilla garrulus, Waxwing	* A1	* G2		
Turdus merula, Blackbird		* G2	* H T.torquatus	
Turdus pilaris, Fieldfare	* A2			* A2-1
Turdus iliacus/philomelos, Redwing/Song thrush	* A1			
Turdus viviscivorus, Mistle thrush		* EF		
Sylvia borin Garden, Warbler	*	* G2		*
Lanius excubitor, Great grey shrike		* EF	* F	
Sturnus sp., Starling	* A2	* EF vulgaris		
Oriolus oriolus, Golden oriole		* G2	* E F	
Garrulus glandarius, Jay	* A2 3	* EF G2	* E G	
Nucifraga caryocatactes, Nutcracker	*A2 3	* EF G2	* EF	* A2-1 A3 D6-3
Pica pica, Magpie	* A1 2			
Pyrrhocorax graculus, Alpine chough	* A2	* EF	* E	*
Pyrrhocorax pyrrhocorax, Red billed chough		* EF G2	* E	
Corvus monedula, Jackdaw	* A2	* EF G2		*
Montifringilla nivalis, Snow finch				*
Coccothraustes coccothraustes, Hawfinch	* ?			

Table 1. Continued.

Species	Instállósko	Vindija	Sandalja II	Fumane
Pyrrhula pyrrhula, Bullfinch			* F	* A3 D7-6
Pinola enucleator, Pine grosbeak	*? A1 2			
Loxia curvirostra, Crossbill	* ? A2 3		* H	* D1 D7-6
Loxia pytyopsittacus, Parrot crossbill				* A2-1

Table 1. Continued.

Aurignacian settlement in the west: France and Spain

The two most northerly sites associated with the Upper Palaeolithic transition in France are the Grotte des Fées at Chatelperron, Allier (Mourer Chauviré 1974), the type site, and a short way north of this the Grotte du Renne at Arcy sur Cure in the Yonne. The Grotte des Fées was excavated originally between 1867-72 and practically emptied of archaeological material but a revision in 1951 by H. Deporte recovered a certain amount of avian bone, representing a few wildfowl and raptorial species, some grouse and partridge and passerine species. The species identified from the Grotte du Renne at Arcy sur Cure were restricted to three fragments of golden eagle, and the remains of perhaps two ravens, with evidence of a willow grouse, alpine accentor, and a crag martin, (Mourer Chauviré 2002).

The evidence for the utilization of birds as a resource for human exploitation is poor at this period. The extensive Aurignacian and Perigordian occupation at the Abri Pataud in Les Eyzies between 32,000 and 21,000 years BP gives no indication of any fowling activities, despite the presence of both griffon and bearded vultures in the upper level. The wing bones of either species could have been adapted to a variety of uses, as was demonstrated, for instance, by the Geissenklosterle flute. With the remains of vultures were a few blackcock or partridge, (Bouchud in Movius 1975). Nearby at Bezenac, the site of Le Flageolet contained a more diverse avian assemblage, studied by Delpech (1975). The earlier occupation between 33,000 ± 180 years BP and 27,000 ± 1,000 years BP, in Levels VIII - IX was originally defined as Aurignacian to be followed by a series of Gravettian living floors. Its location beside the Dordogne river meant that there was a majority of wildfowl, and wading birds, which were probably winter visitors to the locality. It is interesting to note a rare presence of a bittern that seems indicative of a wetland marsh beside the river.

There was an extended series of Aurignacian occupations at la Ferrassie, in the commune of Savignac de Miramont north of Le Bugue (Delpech 1983; Mourer Chauviré 1984). Archaeologically, the sequence encompasses a lengthy series of Aurignacian cultures and ecologically demonstrates the fluctuations in climate occurring over the period, between 31-33,000 years BP, and the transition to the Gravettian after 26,000 years BP. The climate in the early stages began temperate but rapidly became colder, with fluctuating levels of humidity. During this time the avian ecology reflected a change in climate. Few birds were recorded apart from wading species, like common sandpiper and dotterel, from the marsh around the stream bed. Grouse, partridge, rock sparrow, and a number of the species of larks and thrushes were present on the slopes and higher ground. A surprising recovery in Levels I, 2 and H was a calandra lark, a bird that is currently regarded as a resident of steppe country in the southern parts of Europe. Such an occurrence may be considered as possible evidence of high summer temperatures relative to winter values, as is the case in Fennoscandia at the present day or, it might just indicate that the locality provided some kind of climatic refuge within a predominately cold region. Later in the sequence bird diversity and numbers declined. The earlier prevalence at both Le Flageolet and La Ferrassie of marshland bird species suggests that the ecology alongside the river and the ponded areas along the stream at La Ferrassie was a reflection of the findings by Vita Finzi (1974) of the periodic infill and erosion of the valley sediments of the Dordogne and Vezère rivers.

Aurignacian and Gravettian settlement in southern Languedoc, Catalonia and Cantabria

There is more extensive evidence of avian presence in Aurignacian occupation levels on sites further south, in the Vivarais and the eastern part of Languedoc**,** along the Mediterranean coast of Spain and in the west along the coastal strip of Cantabria from the province of Guipuzcoa to Oviedo.

A considerable assemblage of avian material from sediment layers dated to the Aurignacian settlement at the cave site of Salpêtrière near the Pont du Gard at Remoulins were studied by Vilette (1983). The two main levels of Aurignacian are CG5-SLC14, at 28,180 ± 1,000, years BP and level 30A and 30Ab, dated to the end of the Aurignacian at 19,600 ± 440 – 20,630 ± 770 years BP. The earlier of the two occupation levels was rich in waterfowl, wading and marshland species, with a

Species	Flageolet I, Levels Aurig. 33kyr	Gravet. 24Kyr	Abri Pataud Levels Aurig.	Gravet.	La Ferrassie Levels Aurig.	Gravet. Font robert
Botauris stellaris, Bittern	*					
Anas platyrhyncos, Mallard	*					
Aythya fuligula, Tufted duck	*					
Gypaetus barbatus, Lammergeier				*		
Aegypius monachus, Black vulture			*			
Gyps fulvus, Giffon vulture				*		
Falco tinnunculus, Kestrel	*	*			*	
Falco columbarius, Merlin	*					
Tetrax tetrix, Blackcock					*	
Lagopus mutus, Ptarmigan				*	*	
Lagopus Grouse/*L. lagopus,* Willow grouse		*			*	*
Alectoris graeca, Red legged partridge						
Perdix perdix, Grey partridge	*	*	*		*	*
Coturnix corturnix, Quail	*				*	
Tetrax tetrax, Little bustard			*			
Charadrius morinellus, Doterell					*	
Pluvialis squatarola, Grey plover					*	
Vanellus vanellus, Lapwing	*	*				
Calidris alpine, Dunlin					*	
Calidris canutus, Knot					*	
Calidris sp., Sandpiper sp.	*					
Actitis hypoleucos, Common sandpiper					*	
Tringa erythropus, Spotted redshank	*					
Tringa nebularia, Greenshank	*					
Gallinago gallinago, Snipe					* *G.media*	
Larus sp., Gull sp.		*				
Columba oenas, Stock dove				*		
Nyctea scandiaca, Snowy owl		*				
Otus scops, Scops owl				*		
Athene noctua, Little owl		*				
Alauda arvensis, Skuylark	*	*				
Lullula arborea, Woodlark		*			*	*
Galerida cristata, Crested lark					*	*
Calandrella brachydactyla, Short toed lark					*	

Table 2. Bird faunas from Le Flageolet I, after (Delpech 1975, 1983), L'Abri Pataud, after (Bouchud 1975) and La Ferrassie, after (Delpech 1975, 1983; Mourer Chauviré 1984).

Species	Flageolet I, Levels		Abri Pataud Levels		La Ferrassie Levels	
	Aurig. 33kyr	Gravet. 24Kyr	Aurig.	Gravet.	Aurig.	Gravet. Font robert
Melanocorypha calandra, Calandra lark					*	
Ptyonoprogne rupestris, Crag martin					*	
Hirundo sp., Hirundid	*					
Delichon urbica, House martin					*	*
Cinclus cinclus, Dipper					*	*
Anthus spinoletta, Water pipit			*			
Motacilla sp., Wagtail sp.			*			
Turdus merula, Blackbird	*	*			*	
Turdus philomelos, Song thrush	*					
Turdus iliacus, Redwing		*				
Turdus viviscivorus, Mistle thrush	*			*		
Turdus pilaris, Feldfare	*				*	*
Corvus monedula, Jackdaw	*	*	*			
Corvus corax, Raven	*	*		*	*	*
Pyrrhocorax graculus, Alpine chough	*	*	*	*		
Pyrrhocorax sp., Chough	*	*				
Petronia petronia, Rock sparrow					*	*
Carduelis flammea, Linnet					*	
Emberiza citronella, Yellowhammer					*	

Table 2. Continued.

number of species of grouse and game birds. Among the passerines were larks, a dipper, and the resident doves and alpine choughs. The later Aurignacian occupation only differed in that there was a considerable reduction in the number of waterfowl but marsh land species were again important. Some like the dotterel breed at the present day in the arctic tundra. In the same context was the large billed parrot crossbill, native of pine trees and the snow bunting. The presence of crossbills in both these levels indicate an open environment with stands of pines. The temperatures were fairly cool, in the later stage becoming colder with the onset of the Last Glaciation. A single Solutrean level dated to around 18,000 years BP overlaid the Aurignacian series and was followed by a long sequence of Salpêtrien, a transitional culture associated with the Magdalenian -that lasted through to 13,000 years BP. These later stages were marked by a steady decline in avian remains as elsewhere.

Across in Gerona province, the cave of Arbreda, near Serinya was found to contain an Aurignacian occupation associated with an assemblage of bird fauna that has more in common with the later phase at Salpêtrière than with the earlier, the indications were that the environment was predominantly open and cold (Soler 1975; Vilette 1983). Waterfowl are well represented, with slavonian grebe and brent goose, both species that frequently favour coastal habitats and, in the case of the grebe currently breeds in the boreal climatic zone of Russia and the shores of the Baltic, The brent goose is a high arctic breeder, migrating to coastal locations of western Europe in Winter. Other waterfowl teal, wigeon and most especially the garganey move south outside the breeding season. On the slopes above both the southern red legged partridge, and the grey partridge were present, with dotterel and pine grosbeak so that there would appear to be a degree of ecological uniformity to the Aurignacian levels on these sites. As at Salpêtrière, the Aurignacian is overlaid by Gravettian and Solutrean, with a similar reduction in species diversity.

Along the coast of Cantabria in Santander Province of the Iberian Peninsula, the cave of Castillo on the Monte Viesgo revealed a number of levels containing Aurignacian 'G' industries and avian remains (Cabrera

1984). Amongst them, apart from a snow bunting identified from the lower part of the section, there were no specifically cold climate elements. The proximity of the coast is evident in the number of pelagic and shoreline wading species. Overlying the 'G' Aurignacian were three stages of a later Aurignacian, defined from the technology as 'Alpha' and 'Beta.' Aurignacian but with little change in the fauna. It is worth noting that there are very few large raptorial species amongst the archaeology of sites along the coastal strip of Cantabria. This contrasts with inland sites and mountain settlements where vultures and large raptorial species abound, even at the present day.

Excavations began on the site of Amalda in the valley of the Azolara, a tributary of the Rio Urola in Guipuxcoa Province under the direction of Altuna, Marriezkurrena and Baldeon in 1979. They found a series of levels with Solutrean in Level IV (Altuna, Baldeon and Marriezkurrena 1984). Throughout the sequence the mammalian fauna was dominated by the chamois with red deer and ibex. The mammal and the avian record show that the climate was broadly equable and temperate. The earlier Aurignacian settlement, C14 dated to 27,400 ± 1,000 years BP contained some bird remains but these were restricted to a few falcons, owls, thrushes, corvids and a corn bunting. The later, Solutrean occupation was very similar, lasting nearly 2000 years from 19,000 ± 340 to 17,000 ± 390 years BP, that roughly coincided with the Last Glacial maximum, the animal ecology shows minimal change. There is considerable similarity between sites in Guipuzcoa at this period. Aitzbitarte, less than ten kilometres to the northeast of Amalda lies nearer to the coast but revealed a comparable bird bone assemblage in both Aurignacian and Solutrean levels.

Species	Salpêtrière Levels 30Ab	Salpêtrière Levels CG5SL	Arbreda Levels 23-28	Castillo Levels G/D	Castillo Levels A/B	Amalda Levels V	Amalda Levels VI
Podiceps auritus/nigricollis, Slavonian/black necked grebe			*				
Branta bernicla, Brent goose			*		*		
Anas penelope, Wigeon				*			
Anas platyrhyncos, Mallard	*	*	*	* Anas sp.	*	*	
Anas clypeata, Shoveler	*			*			
Anas crecca, Teal				*			
Anas querquedula, Garganey			*				
Aythya fuligula, Tufted duck	*		* A.nyroca				
Melanitta fusca, Velvet scoter				*			
Aquila sp., Eagle					*		
Accipiter gentilis, Goshawk						*	
Falco tinnunculus, Kestrel			*	*		*	
Falco subbuteo, Hobby		*	* cf.				
Falco naumannii, Lesser kestrel			*				
Falco peregrinus, Peregrine						*	
Tetrao tetrix, Blackcock		*					
Lagopus mutus, Ptarmigan				*	*		
Lagopus Grouse/*L. lagopus,* Willow grouse	*	* *L.lagopus*	*				
Bonasa bonasia, Hazel grouse				*	*		
Alectoris graeca, Red legged partridge			*				
Perdix perdix, Grey partridge	*	*	*	*		*	
Coturnix corturnix, Quail		*	*				

Table 3. Bird faunas from sites in Languedoc, Catalonia and Guipuzcoa: Salpêtrière and Arbreda (after Vilette 1983), Castillo (after Cabrera 1984), Amalda (after Eastham 1990).

Species	Salpêtrière Levels 30Ab	Salpêtrière Levels CG5SL	Arbreda Levels 23-28	Castillo Levels G/D	Castillo Levels A/B	Amalda Levels V	Amalda Levels VI
Charadrius hiaticula, Ringed plover		*					
Charadrius morinellus, Doterell		*	*				
Pluvialis apricaria, Golden plover	*						
Pluvialis squatarola, Grey plover				*			
Vanellus vanellus, Lapwing				*			
Calidris alpina, Dunlin				*			
Calidris canutus, Knot				*			
Numenius arquata, Whimbrel		*					
Limosa limosa, Black tailed godwit			*				
Lymnocryptes minimus, Jack snipe		*					
Larus ridibundus, Black headed gull				*			
Larus canus, Common gull				*			
Larus marinus, Greater black backed gull				*			
Sterna hirundo, Common tern				*			
Alle alle, Little auk				*			
Columba livia/oenas, Rock/Stock dove	* *	*	*	*			
Columba palumbus, Wood pigeon			*				
Asio flammeus, Short eared owl			*	*	*		
Asio otus, Long eared owl	*			*		*	
Bubo bubo, Eagle owl				*		*	
Strix aluco, Tawny owl				*			
Athene noctua, Little owl			*				
Lullula arborea, Woodlark	*	*					
Galerida cristata, Crested lark	*	*	* cf.				
Hirundo rustica, Swallow	*						
Cinclus cinclus, Dipper	*	*		*			
Turdus merula, Blackbird	* cf.		* T.torquatus			*	
Turdus viviscivorus, Mistle thrush	*					*	
Turdus pilaris, Fieldfare				*?			
Sturnus vulgaris, Starling				*			
Garrulus glandarius, Jay						*	
Pyrrhocorax graculus, Apine chough			*				
Pyrrhocorax pyrrhocorax, Chough			*	*	*		
Corvus monedula, Jackdaw			*	*	*		
Corvus corax, Raven			*	*	*	*	

Table 3. Continued.

Species	Salpêtrière Levels 30Ab CG5SL	Arbreda Levels 23-28	Castillo Levels G/D A/B	Amalda Levels V VI
Petronia petronia, Rock sparrow	*			
Coccothraustes coccothraustes, Hawfinch	*		*	
Carduelis flammea, Linnet				
Loxia pityopsittacus, Parrot crossbill	*	*		
Milaria calandra, Corn bunting			*	*
Plectrophenax nivalis, Snow bunting	*		*	

Table 3. Continued.

The late transition to Upper Palaeolithic technology in the south east of the Iberian peninsula would appear to have resulted in relatively few settlements that demonstrate the transition stages between the end of the Mousterian and the later Upper Palaeolithic technologies. The cave of Mallaetes in Valencia (Davidson 1980, 1989) is one and Gorham's cave, Gibraltar, is another. The first was not found to contain an abundance of bird remains: mallard, partridge, rock dove, little owl and choughs, were all typical of a lowland site in that region, at almost any period, although dated to 30,570 ± 560 years BP. The Gibraltar sequence is just as much a reflection of the locality, as it was during the Mousterian occupation, but the slight rise in sea level at 27,000 BP influenced the proportion of seabird species in the assemblages. Table 4 shows the pattern on the two sites.

Species	Mallaetes	Gorham's Cave
Puffinus puffinus, Manx shearwater		*
Phalocrocorax aristotelis, Shag		*
Anas platyrhyncos, Mallard	*	
Milvus milvus, Red kite		*
Gyps fulvus, Griffon vulture		*
Haliaeetus albicilla, White tailed eagle		*
Falco tinnunculus, Kestrel		*
Falco peregrinus, Peregrine falcon		*
Alectoris rufa, Red legged partridge	*	*
Larus argentatus, Herring gull		*
Larus fuscus lesser, Black backed gull		*
Columba livia, Rock dove	*	*
Bubo bubo, Eagle owl		*
Hirunda rustica, Swallow		*
Athene noctua, Little owl	*	
Sturnus vulgaris/unicolor, Starling/Spotless starling		*
Pyrrhocorax graculus, Alpine chough	*	*
Pyrrhocorax pyrrhocorax, Red billed chough	*	*
Corvus monedula, Jackdaw		*
Corvus corone, Carrion crow		*
Fringilla coelebs, Chaffinch		*

Table 4. Aurignacian avifaunas from Mallaetes (after Eastham 1980) and Gorham's cave (after Eastham 1964).

The Gravettian

As already noted, from around 26,000 years BP, in parallel with the later Aurignacian, different groups of people, identified from certain features in flint technology merged with the existing populations creating local variants that were based around those favoured habitable areas of western Europe that remained free of the advancing ice. Throughout this development, there appears to have been a marked decline in bird species on account of the deterioration of climate and the availability of larger arctic tundra mammals, reindeer and horse in particular. The Gravettian technology was extremely widespread across the continent of Europe, including Russia. It was associated with the classic forms of Font Robert points, (pointes à cran), or Noailles burins. In the Upper Danube and further east a long sequence of Gravettian occupation was marked by the considerable level of artistic achievement in the small sculptured figures, found on sites such as the settlements of Willendorf and Kostienki. In western Europe artistic expression may be seen in the parietal images in caves such as Pech Merle or Gargas. Some of the interments of human bodies were found to demonstrate elaborate customs for the burial of some social groups and status in dress and the ceremonial use of iron ochre pigment. Evidence of such ceremony was apparent on sites as far apart as the burial of youth a at Paviland cave in South Wales, or the burials at Dolni Vestonice and Predmosti in Moravia.

Solutrean and Badegoulian

Between around 22,000- and 16,000-years BP, large parts of northern Europe were inhospitable for people and for many animal species and the major centres of human occupation became concentrated within the southerly landmasses around the Mediterranean and in coastal regions of Italy and Greece. In these regions, the industrial complex of the same period, known as Epi-Gravettian, became widespread and in central and eastern Europe local variations have taken on the names of Sagvarian and Moldovan (Djinjian, Koslowski and Otte 1999). Bird movement patterns also became limited to those areas that were not covered by ice or reduced to sub-arctic prairie, and regions where the summer mean temperature became sufficient to fulfil their niche requirements.

Where ecological factors created barriers between occupied zones, the effect on the human communities was to create separate cultural developments. In France and Spain in the West, there developed cultural enclaves that were known as the Solutrean and Badegoiulian industrial facies. The Solutrean, named after Solutré in Saone et Loire, is defined at its height by very beautiful bifacial retouch of foliate points and arrowheads, across the entire surface, tools that sometimes carry very little sign of heavy use. The Badegoulian tools are less elaborate, the retouch was restricted to the edge of the implement.

Although there are Solutrean levels at Laugerie Haute and other sites in the Dordogne, it is only in the south that there were any notable bird faunas. Among the sites studied by Vilette (1983) were a number from the eastern end of the Pyrenees and in Catalonia. At Salpétrière, where a local Salpétrien followed the Aurignacian, the occupation was quite late and the birds few. At Bois de Brousse in in Languedoc near Aniane on the Herault river, there were a diversity of birds. The presence of a number of wading species that at the present day only breed in the arctic and spend the winter months in the south existed in company with ducks such as pochard and grouse, an avifaunal spectrum that gives a slightly un-Mediterranean slant to the scene. The dipper, was there close to the fast-flowing stream of the Herault river and the presence of local residents like corvids and crag martins indicate some similarity with the pattern during the later Aurignacian settlement. Further south at Arbreda in Gerona province, the Solutrean level contained few species apart from a mallard and both the red legged and grey partridge. The important site of Reclau-Viver, also in Gerona province had inconclusive or incomplete records of any avian population.

In Valencia province the Badegoulean settlement in the cave of Parpallo contained even fewer bird bones than its Aurignacian neighbour Mallaetes, only Mallard and rock dove. Even amongst the large collection of engravings on stone plaques depicting animals recovered from this site, there was not a single image that might reliably be interpreted as representing a bird (Eastham in Davidson 1980; Pericot García 1942).

Sites in Cantabria, like La Riera in Santander province and Las Caldas in the province of Oviedo contained Solutrean cultural material, dated to between 18,000- and 17,000-years BP, but with very little sign that birds were targeted as a resource by the inhabitants at that period. There was no avian material recorded for the Solutrean levels in La Riera and at Las Caldas the levels of Upper Solutrean occupation contained only the bones of species resident within the local environment like the swallow, wagtail, jay, jackdaw, stonechat and corn bunting. A barn owl probably roosted within the cave and the fragments of partridge coracoids, found lying adjacent to one another could have been deposited by the owl. The seasonal indications based on avian behaviour suggest that their presence at Las Caldas, was most likely to have been between the months of March and September, (Eastham in Corchon Rodrigues 2017).

In Italy, few sites have any significant records for the exploitation of birds as a resource, apart from the 'Tardi-Gravettian' site of Arene Candide on the Ligurian coast. The C14 dates assigned this level to between 19,400 ± 210 years BP and 18,560 ± 210 years BP (Cassoli 1980, 1992). Through thirteen levels of 'ancient Epi-Gravettian' at Arene Candide there was a remarkable assemblage of raptorial species, seabirds, grouse, and other game species, with doves and owls. There was snowy owl, some Mediterranean lark species and thrushes, in common with other sites in the region, the Epi- Gravettian persisted at Arene Candide beyond the final years of the Last Glaciation into the Holocene, Post-Glacial era. The Table 5, below elides some of the data from separate levels within the Epi-Gravettian.

Species	**Bois de Brousse** Herault Solutrean	**Arbreda I** Gerona 17,720 – 20,130 BP	**Las Caldas** Oviedo 17,000 – 18,000 BP	**Arene Candide** Liguria 19,400 – 18,560 BP
Podiceps auritus, Slavonian grebe		*P.cristatus/ grisegena* *		*
Calonectris diomedea, Cory's shearwater				*
Anas platyrhyncos, Mallard	*	*		*
Anas crecca, Teal		Anas sp. * *		*
Anas penelope, Wigeon				*
Aythya ferina, Pochard	*			
Aythya nyroca, Ferruginous duck	*			
Melanitta nigra, Common scoter				*
Mergus albellus, Smew				*
Buteo lagopus, Rough-legged buzzard				*
Circus cyaneus, Hen harrier				*
Aquila chrysaetos, Golden eagle				*
Falco vespertinus, Red-footed falcon		*		*
Falco tinnunculus, Kestrel	*	* *		* *
Falco naumanni, Lesser kestrel		*		
Falco eleanorae, Eleanor's falcon				*
Lagopus mutus, Ptarmigan	*			* *
Lagopus lagopus, Willow grouse	*	Lagopus sp. *		* *
Tetrao tetrix, Black grouse				* *
Alectoris rufa, Red-legged partridge		*		
Alectoris graeca, Rock partridge		* A. sp. * *A. barbara* *		* *
Perdix perdix, Grey partridge	*	*	*	* *
Coturnix coturnix, Quail		* *		* *
Crex crex, Corncrake				*
Porzana porzana, Spotted crake		*		
Rallus aquaticus, Water rail				*

Table 5. A comparison of bird faunas from Gravettian and Solutrean sites in Languedoc, Valencia, Oviedo and Liguria (after Vilette 1983; Eastham 2017; Cardini 1946 and Cassoli 1980).

Species	**Bois de Brousse** Herault Solutrean	**Arbreda I** Gerona 17,720 – 20,130 BP	**Las Caldas** Oviedo 17,000 – 18,000 BP	**Arene Candide** Liguria 19,400 – 18,560 BP	
Grus grus, Crane		*			
Tetrix tetrax, Little bustard		*			
Burhinus oedicnemus, Stone curlew		*			
Pluvialis squatarola, Grey/golden plover	*/apricaria			*	
Calidris canutus, Knot/Temminck's stint	* temminkii			*	
Philomachus pugnax, Ruff	*				
Tringa totanus, Redshank				*	
Tringa glareola, Wood sandpiper				*	
Actitis hypoleucos, Common sandpiper	*				
Scolopax rusticola, Woodcock	*				
Gallingo sp., Snipe	*cf. media	G.gallinago *		*	
Stercoraria pomarinus, Pomarine skua				*	
Sterna paradisea, Arctic tern				*	
Uria aalge, Guillemot				*	
Fratercula arctica, Puffin				*	
Columba palumbus, Wood pigeon				*	
Columba livia, Rock dove				*	*
Columba oenas, Stock dove				*	*
Columba sp., Dove sp.	*	*			
Tyto alba cf., Barn owl			*		
Asio flammeus, Short-eared owl				*	
Asio otus, Long eared owl				*	
Nyctea scandiaca, Snowy owl	*			*	*
Surnia ulula, Hawk owl				*	
Strix aluco, Tawny owl		*		*	*
Strix nebulosi, Great grey owl				*	
Aegolius funereus, Tengmal's owl					
Otus scops, Scops owl	*				
Athene noctua, Little owl				*	
Picus canus, Grey-headed woodpecker				*	*
Lullula arborea, Woodlark					*
Melanocorypha calandra, Calandra lark					*
Eremophila alpestris, Shore lark				*	*
Ptyonoprogne rupesrtis, Crag martin	*			*	*
Hirundo rustica, Swallow			*		

Table 5. Continued.

Species	**Bois de Brousse** Herault Solutrean	**Arbreda I** Gerona 17,720 – 20,130 BP	**Las Caldas** Oviedo 17,000 – 18,000 BP	**Arene Candide** Liguria 19,400 – 18,560 BP
Motacilla alba cf., Pied wagtail			*	
Cinclus cinclus, Dipper	*			*
Prunella collaris, Alpine accentor				* *
Saxicola torquata, Stonechat				
Turdus merula, Blackbird	*			
Zoothera dauma, White's thrush			*	*
Turdus pilaris, Fieldfare				* *
Turdus viviscivorus, Mistle thrush	*			* *
Garrulua glandarius, Jay			*	
Pica pica, Magpie		*	*	*
Pyrrhocorax graculus, Alpine chough	*	* *		* *
Pyrrhocorax pyrrhocorax, Chough	*	* *		* *
Corvus monedula, Jackdaw		* *	*	*
Corvus corax, Raven	*			*
Corvus corone/frugilegus, Crow/rook	*	*		
*Petronia petronia, R*ock sparrow				* *
Montefringilla nivalis, Snow finch				* *
Fringilla coelebs, Chaffinch				*
Carduelis chloris, Greenfinch				* *
Pyrrhula pyrrhula, Bullfinch				* *
Carduelis cannabina, Linnet				*
Pinicola enucleator, Pine grosbeak				* *
Loxia pytyopsittacus, Parrot grosbeak				*
Loxia curvirostra, Crossbill				* *

Table 5. Continued.

A comparison between the avifaunal patterns recorded from selected sites in different locations in southwest Europe, draws attention to the part played by the local ecology in the support of habitat niche. The cave of Bois de Brousse, lies beside the Hérault gorges, at the present day this is a region of temperate forest, but, during the Solutrean, there was less forest cover, it was colder, and included open expanses of freshwater providing a habitat for duck and a range of wading species and on the marshy areas, tussocks for roosting snowy owl. At the Grotte Gazel, Salleles Cabarde in the department of Aude, most of the birds from the Middle Magdalenian were grouse or partridge.

Further south, the cave of Arbreda, near Serinya in Gerona province was set during the Gravettian in a dryer and more open situation. At a height of 300 metres above the river Flavia, it provided a niche for a number of species of partridge, crake, bustard and stone curlew, yet at the same time there was sufficient tree cover to support a tawny owl. During a later period of the Solutrean occupation a crane was also present.

In northwest Spain, in Oviedo province, the ecological influence was entirely Atlantic and the small number of bird elements recovered from Solutrean levels at Las Caldas cave reflects the relatively temperate nature of the local ecology.

On the Mediterranean coast, the abundance and diversity of bird bone from the Ligurian site of Arene Candide in the Epi and Tardi-Gravettian levels

provides an astonishing picture of a cave situated in the centre of a rich diversity of avian habitats. The table gives a comparison between two levels of Tardi-Gravettian Level M3 C14 dated to 11,910 years BP and Epi- Gravettian Level P1 with a date of 18,560 years BP. It also reveals a marked difference in the surrounding ecology along the Ligurian coast compared with other settlements in the selection. It was fortunate in having not only a strong influence of the marine environment but also evidence of a reed covered marshland occupied amongst other wetland birds by the bittern. Raptorial species are well represented as well as a wide range of grouse from capercaillie and ptarmigan and other game species to corncrake and bustard indicating that the hunting range covered all altitudes in the hill behind. Pine forest and open areas of low vegetation are indicated by the presence of crossbills, larks, migrant thrushes and finches. The Ligurian coastal strip was evidently rich in habitat diversity.

The Magdalenian in south west Europe

The cultural sequence known as the Magdalenian was initially established over the south west of Europe. It has been recognised since 1869, acquiring its name from the cave site of La Madeleine on the river Vezère, upstream of Les Eyzies. The climate, following the temperate phase of the Lascaux oscillation became considerably colder and animal populations had to adapt to this with the onset of Dryas I. The proliferation of sites across west and south west Europe and their relative density appears to indicate a marked increase in the human occupation and considerable social interaction would have been inevitable within local areas like the Dordogne, the Aveyron and, Ariège valleys and the western Pyrenees This becomes particularly marked towards the end of the Magdalenian. The industrial facies by which the stages of the Magdalenian are classified are based to a very large extent on bone implement technology.

The Abbé Breuil classified the sequence of the Magdalenian into six phases, based upon technological criteria, beginning with the currently named Badegoulian. Djindjian, Koslowski and Otte in 1999 simplified this sequence into an early, middle and later stages based on a series of C14 dates of the relevant sites.

In Aquitaine some of the dates for sites in the valleys of the Vezère and the Dordogne, the Lot and the Aveyron indicate that there were clusters of an early Magdalenian occupation of these areas between 16,000 and 15,000 years BP and similar dates were obtained for sites in the Cantabrian region of Spain, although the presence of an early Magdalenian occupation dated to 17,000 years BP was recognised at Urtiaga in Guipuzcoa, with an avifauna largely composed of raptorial species, with grouse, partridge, a bustard and the resident species of rock dove and choughs (Eastham in Altuna 1985). Few sites of the early period in Aquitaine contained any indication that birds represented a significant resource either for food or other comodities.

The middle Magdalenian sites in both France and Spain are fairly consistent in date between 15,000 years BP and 14,000 years BP and. with the gradual amelioration of climate the Magdalenian cultural influence was moving northwards from Cantabria, the Pyrenees, Languedoc and the province of Aquitaine into central France; to sites like the Grotte de la Garenne at St Marcel, in the department of Indre. It was dated to 14,270 ± 270 years BP. There was also a penetration of the Magdalenian eastwards into the Jura in eastern France and south Germany. This consistency gives a clear pattern for the avian ecology of Western Europe at the time. The Grotte de la Garenne was an important cultural site and shows how bone was used to make a variety of equipment. It revealed, for instance, a range of bone mounts for weapons, described as 'navettes' and has a fine set of reindeer engravings on an ulna of a male crane. Unfortunately, there are no records of other avian species from the same level. Contemporary occupations at Croze du Suran, St Martin du Mont, at the Grotte Grappin, Arlay, Ain and the Crot du Charnier at Solutré in Saöne et Loire all indicate the spread of cultural development even in the absence of avifauna.

The most complete records of avian remains at the period are from Languedoc, northern Spain and the Atlantic Pyrenees. On the western coastal region of the Landes, the Middle Magdalenian at the Abri Dufaure and the other settlements along the Pastou cliff near Sordes L'Abbaye. Despite its wetland situation beside the Gave d'Oleron the settlements at these sites appear to have contained a very limited avifauna as compared with a later sequence. Bones of grouse and small passerine birds were recovered but the only evidence of the adjacent wetland was the presence of a number of snowy owls.

Upper Magdalenian

The period of the Upper Magdalenian showed a considerable expansion in the number and density of known occupation sites, often in regional groupings. There appears to have been a level of interchange from one to another within a local area or even further afield, as might be required for the sourcing of particular goods or raw materials. It would seem from the material culture that separate groups shared a degree of cultural affinity, suggesting a degree of uniformity in social structure that made it acceptable for Hunter-Gatherer communities to interact, exchange ideas and resources in aggregation venues where there were groups of settlements.

Species	Bois de Brousse	Gr. Gazel	Aytzbitarte IV	Abri Dufaure	Le Mas d'Azil
Anser brachyrhynchus, Pink footed goose		*			
Anas platyrhyncos, Mallard			*		*
Anas crecca, Teal					*
Aythya ferina, Pochard					*
Aythya nyroca, Ferruginous duck	*				
Gypaetus barbatus, Lammergeier			*		
Aegypius monachus, Black vulture					*
Falco tinnunculus, Kestrel			*		*
Lagopus mutus, Ptarmigan		*	*		*
Lagopus lagopus, Willow grouse		*		*	*
Perdix perdix, Grey partridge		*	*		*
Pluvialis sp., Plover sp.	*				
Actitis hypoleucos, Sandpiper	*				
Larus cf. canus, Common gull *cf.*					*
Columba oenas, Stock dove		*	*		*
Columba sp., Dove	*				*
Bubo bubo, Eagle owl				*	*
Nyctea scandiaca, Snowy owl	*			*	*
Strix aluco, Tawny owl			*		
Alauda arvensis, Skylark					
Lullula arborea, Wood lark			*	*	
Ptyonoprogne rupestris, Crag martin	*				
Cinclus cinclus, Dipper		*			
Turdus merula cf., Blackbird	*				
Turdus iliacus, Redwing				*	
Turdus viviscivorus, Mistle thrush	*				* cf.
Phylloscopus trochilus/collybita, Willow warbler/Chiffchaff				*	
Cf, Parus major, Great tit		*			
Lanius cf. excubitor, Great grey shrike					*
Sturnus vulgaris, Starling					*
Garrulus glandarius, Jay		*	*		
Pyrrhocorax graculus, Alpine chough	*	*	*		*
Pyrrhocorax pyrrhocorax, Chough		*	*	*	
Corvus corax, Raven	*	*		*	*
Montifringilla nivalis, Snow finch				*	

Table 6. A comparison between Middle Magdalenian bird faunas from the Bois de Brousse and Grotte Gazel (after Vilette 1983) Aitzbitare IV (Eastham 1985), Abri Dufaure (after Eastham in Straus 1995) and Le Maz d'Azil (after Vilette 1983).

Species	Bois de Brousse	Gr. Gazel	Aytzbitarte IV	Abri Dufaure	Le Mas d'Azil
Milaria calandra, Corn bunting			*		
Emberize melanocephala, Black headed bunting			*		

Table 6. Continued.

The Magdalenian toolkit, including equipment for hunting and domestic life, shows a steady increase and elaboration in the modification of bone to make implements. Bone had been in use throughout the succession of Upper Palaeolithic societies but during the Magdalenian the designs of weapons of the chase like spear heads, spear throwers, harpoons, fish hooks, domestic equipment and elaborately decorated items for personal ornament or ceremony became refined to a degree that makes it almost possible to distinguish the hand of the individual makers. Some items are objects of great beauty. Bird bone, plumage and imagery appears to have played a part in the production of hunting and domestic equipment and played an important role in the social interactions of the time.

Magdalenian fowling appears to have become increasingly selective, often targeting species for purposes other than food and tool making. The provision of meat is easily fulfilled from other sources, although wildfowl provide a rich source of lipids. Their water-resistant plumage provides good insulation; and, besides warmth, feather may also furnish ideal material for personal ornament. It may be assumed that large raptorial species were exploited for both plumage and their straight tubular bones. Some of the uses of which are explored in the chapters on avian resources and fowling.

Clearly there is a considerable diversity in uses of avian resources by Magdalenian Hunter-gatherer groups. And it is equally clear that in certain, unfavourable regions that there were insufficient numbers of the species that were normally hunted for birds to be regarded as a useful resource. In Metropolitan France, for instance, on the open-air site of Pincevant, Seine et Marne, with C14 dates around 12,600 years BP, during the maximum of the Dryas II cold phase, the faunal assemblage was 98% reindeer with a total of only four fragments of avian bone, two of which could be identified as shag and two fragments probably of a vulture.

To the north of the Seine, the Rhineland sites of Andernach and Gönnersdorf and the south German sites of Hohlerfels and Petersfels, dated to between 12,440, and 13,240 years BP contained remains of birds and at Gönnersdorf the inhabitants spent some of their leisure time drawing pictures on stone plaques, among them engravings of birds from the locality (Bosinski 1979 and 1987). Beside the engraved images the faunal list demonstrates a considerable exploitation of the local wildfowl showing the importance of location in procurement strategies.

The most intensive exploitation of avian resources during the later Magdalenian settlement appears from the record to been in the regions just to the north of the passes through the mountains of the Pyrenees. Sites like La Vache in Ariège, at the eastern end, contained, apart from the quantity of decorated bird bone, extremely large numbers of grouse bones and a selection of raptors and vultures including both eagle and snowy owl and a small number of waterfowl and stork (Koby 1957; Clottes *et al.* 2003). At a lower altitude in Ariège at the contemporary site of the Grotte de Massat contained besides its parietal engraving of a waterfowl, bones of whooper swan, and Mallard, species that were also found amongst the debris of the late Magdalenian at the Grotte de Gouẽrris in Haute Garonne (Clot and Mourer Chauviré 1986). Towards the Atlantic end of the Pyrenees, The Abri Dufaure, the Salles de St Martin, the Grande Salle at Isturitz and the Grotte de Bourrouilla at Arancou, on a tributary of the Bidouze river, all contained increased numbers of wildfowl including swans, geese, ducks, divers and mergansers. It was unfortunate for Chauchat who undertook the first part of the excavations from 1991 that much of the later Magdalenian material at Arancou had been disturbed by clandestine excavation but the context was clear and the fairly extensive avifauna compared closely with adjacent sites. A comparable increase in the numbers of waterfowl was observed in the final Magdalenian at Urtiaga in Guipuzcoa in Cantabria. The evidence on these sites confirms, with findings from elsewhere that there was at that period a shift southwards in the main wintering refuges for many species of waterfowl. At the present-day divers, grebes, swans and geese and some species of ducks and mergansers that breed in the arctic or tundra move south in the Autumn. The same migratory movement during glacial periods brought these bird populations further south by a considerable distance, so that species that presently gather in Winter on the coasts and marsh lands of Denmark, Netherlands and Britain are recovered on sites in southern France, and parts of Spain and the Mediterranean.

Another notable feature of some sites between the Dordogne and the Pyrenees, was evidence of what appears to have been a systematic cull of snowy owls.

The evidence from at least one of these sites, the Grotte de Bourrouilla at Arancou in the Atlantic Pyrenees points to a specific purpose for the cull, that will be the subject of a case study in a later chapter.

On the Mediterranean coast of Spain, two caves in particular offer a glimpse into the hunter – gatherer use of available avifaunal resources during the final stages of the Magdalenian, Matutano, near Vilafamés in the province of Castellón (Eastham in Olària 1999) and the Cueva de Nerja near Malaga. At Matutano there was a strong emphasis on game species. Red legged partridge bones dominated the assemblage in the same way as grouse were the most important food item on Pyrenean sites. Yet these were not the only game. The open grasslands with scattered stands of juniper, pine and oak of created an excellent environment for both great and little bustards in level 1. Among the avian predators recovered in excavation were red kite, bearded vulture, golden and imperial eagles. The birds occupying the environs of the cave were doves and members of the columbid and corvid families.

The cliff side environment of Nerja in Malaga province was somewhat different. The cave looks across the Mediterranean towards the Atlas Mountains and was occupied almost continuously from the Magdalenian through to the Chalcolithic. Mammalian, fish and bird remains were recovered from all levels (Boesneck and Von Dreisch 1980; Eastham in Jorda Pardo 1986). The bird remains from the Magdalenian levels 14-16 included a number of marine and aquatic birds, with eagle, harrier and falcons and a variety of small passerines, while the blue rock thrush was present during the Epi-Palaeolithic period. Of particular interest is the continued presence of sooty shearwater, gannet and great auk, all marine species, whose bones had previously been recovered from the Mousterian levels of both Devil's tower, Sewell's cave and Gorham's cave on the rock of Gibraltar.

The species recorded on sites in southern Aquitaine, reflect not only an expanding niche for seasonal passerines but emphasise ecological differences between sites: The different types of habitat

Species	Petersfels	Dufaure	Bourrouilla	Isturitz	Matutano	Nerja
Gavia stellate, Red throated diver	*	G.immer *				
Tachybaptus ruficollis, Little grebe			*			
Puffinus griseus, Sooty shearwater						*
Sula bassana, Gannet						*
Anser fabalis, Bean goose		*				
Anser anser, Grey lag goose		*				
Anser sp., Goose	*	*				*
Anas penelope, W*igeon*		*				
Anas platyrhyncos, Mallard	*	*	*	*		*
Anas acuta, Pintail	*					
Anas clypeata, Shoveler	*					
Anas crecca, Teal		*				*
Anas querquedula, Garganey			*			
Netta rufina, Red-crested pochard			*			
Aythya fuligula, Tufted duck	*					*A.nyroca* *
Mergus serrator, Red-breated merganser			*	*M.merganser* *		
Milvus milvus, Red kite					*	
Gypaetus barbatus, Lammergeier				*	*	
Accipiter gentilis, Goshawk				*		*/aquila*

Table 7. A selection of late Magdalenian avian assemblages from sites in Western Europe: Petersfels after Mourer Chauviré *et al.* 1983; Dufaure after Eastham 1985; Bourrouilla after Eastham 2000; Isturitz after Bouchud 1952; Matutano after Eastham 1999; Nerja after Eastham 1986.

Species	Petersfels	Dufaure	Bourrouilla	Isturitz	Matutano	Nerja
Buteo buteo, Buzzard	*	*	*	*Buteo sp.*		
Haliaeetus albicilla, White tailed eagle	*					
Aquila chrysaetos, Golden eagle		*	*Aquila sp.* *	*		
Aquila rapax, Tawny eagle	*			*Aquila sp.* *	*A. heliacal* *	
Circaetus gallicus, Short-toed eagle			*			*
Falco timmunculus, Kestrel		*				
Falco subbuteo, Hobby				*		*
Falco eleanora, Eleanora's falcon				*?		
Falco peregrinus, Peregrine		*	*			*
Lagopus mutus, Ptarmigan	*		*	*		
Lagopus lagopus, Willow grouse	*	*		*		
Tetrao tetrix, Black grouse	*		*	*		
Tetrao urogallus, Capercaillie	*			*		
Bonasia bonasia, Hazel hen					*	
Alectoris rufa, Red-legged partrige					*	*
Alectoris graeca, Rock partridge					*	
Perdix perdix, Grey partridge	*		*	*		
Coturnix coturnix, Quail			*			*
Grus grus, Common crane	*					
Otis tarda, Great bustard					*	
Tetrax tetrax, Little bustard					*	
Burhinus oedicnemus, Stone curlew		*				
Philomachus pugnax, Ruff	*					
Tringa totanus, Redshank		*				
Lymnocryptes minimus, Jack snipe	*					
Haematopus ostralegus, Oystercatcher	*		*			
Larus ridibundus, Black-headed gull						*
Larus canus, Common gull			*	*L. sp.* *		
Uria aalge, Guillemot						*
Fratercula arctica cf., Puffin			*			
Alca impennis, Great auk						*
Columba oenas, Stock dove				*		
Columba livia, Rock dove					*	*
Bubo bubo, Eagle owl		*		*B.bubo sp.**		
Nyctea scandiaca, Snowy owl		*	*	*		
Surnia ulula, Hawk owl				*		
Athene noctua, Little owl					*	

Table 7. Continued.

Species	Petersfels	Dufaure	Bourrouilla	Isturitz	Matutano	Nerja
Dendrocopus minor, Lesser spotted woodpecker			*			
Alauda arvensis, Skylark			*			
Lullula arborea, Woodlark			*			
Ptyonoprogne rupestris, Crag marin			*			
Hirundo rustica, Swallow			*			*
Luscinia megarhyncos, Nightingale						*
Phoenicurus phoenicurus, Redstart			*			
Saxicola rubetra, Stonechat			*			
Oenanthe cf. leucura, Black wheatear						*
Monticola solitaries, Blue rock thrush						*
Turdus merula, Blackbird			*	*	*	*
Turdus iliacus, Redwing			*			
Turdus philomelos, Song thrush			*			
Turdus pilaris, Fieldfare	*					
Turdus viviscivorus, Mistle thrush	*		*			
Musicapa striata, Spotted flycatcher			*			
Parus major, Great tit			*			
Lanius excubitor, Great grey shrike						*
Garrulus glandarius, Jay			*			
Pyrrhocorax graculus, Alpine chough	*			*	*	
Pyrrhocorax pyrrhocorax, Chough					*	
Corvus corone, Carrion crow						
Corvus corax, Raven	*		*	*	*	
Coccothraustes coccothraustes, Hawtinch			*			*
Carduelis cannabina, Linnet			*			

Table 7. Continued.

surroundings between Dufaure, situated alongside the Gave d'Oleron, the Grotte de Bourrouilla in scrub land at some elevation above the Bidouze river, at the cave of Isturitz on relatively high ground above the valley of the Arberoue as against that of the Mediterranean sites are very marked. At each, the local ecology had an influenced the avian community. The aquatic species at the Abri Dufaure, situated alongside the Gave d'Oleron, were not given such prominence at Bourrouillia and were even less frequent at the more upland site of Isturitz. What was a common feature of all these sites including those in the north, was that grouse and partridge species remained of considerable importance as a greater or lesser proportion of the food birds taken at each site. On the Mediterranean site of Matutano their place was taken by bustards inhabiting the higher ground, with the red-legged partridge. Another constant in wetland areas were the wild fowl and these two groups fulfilled many of the avian food and plumage requirements during the final Palaeolithic settlement of Western Europe. Inevitably, caves like Nerja, and the Gibraltar or Ligurian caves, overlooking the Mediterranean, contained a number of seabirds. Some may have been brought in by the weather but others like the gannet and the auks were undoubtedly selected for food and other resources. In addition, the larger birds of prey were exploited for both bone and plumage rather than primarily for consumption. The evidence is clear, that while mammalian resources normally supplied Hunter-Gatherer communities with

basic needs of food and protection, avian communities also played a specific role in their everyday life.

The early Mesolithic

As the ice retreated at the end of the Last Glaciation, many of the larger herbivores and carnivorous mammals gradually disappeared from many regions of western Europe, or retreated northwards, some like the reindeer to arctic and tundra climatic zones. It was already evident in southern Aquitaine, at the sites of the Abri Dufaure and the Grotte de Bourrouiilla that the reindeer in the Pyrenees were on the decline and being gradually replaced by roe and red deer and later by fallow deer. With the advance of afforestation across central regions the herds of bison declined and the numbers of browsing cattle, the Aurochs, increased in number. Everywhere as temperate conditions prevailed there was an increase in smaller game, Lagomorphs increased in number, grouse became less common in lowland areas and the wintering wildfowl also retreated further to the north European countries of Britain and the Low countries. The Human population gradually adapted to these changes, group sizes seem to have been reduced, and spread into what were often very temporary, settlements across lowland and upland regions. The poverty of flint resources in some regions resulted in the production of small flint blades and microliths that could be mounted to form composite implements. Exchange and trading patterns of scarce mineral resources, that had begun gradually to be established during the later stages of the Upper Palaeolithic, expanded. But these adaptations took time and effort and resulted in the reduction of aggregate cultural activities. The paintings and figurative engravings characteristic of the later Upper Palaeolithic became reduced to painted and abstract marks on stone plaques and pebbles.

Chapter 4

The bird catcher, fowling techniques down the ages

The previous chapters have considered some of the behaviour patterns and niche requirement of men and birds in relation to regional ecology, dispersal, migration, diet and predation. Where relative frequencies are published, it is possible to see clearly which bird families were most frequently taken by hominids and other predators. Certain genera or families of birds regularly appear with greater frequency than others. On sites occupied by Hunter-Gatherer groups the bias towards these groups of birds remained similar throughout the phases of both Middle and Upper Palaeolithic cultures. The most frequent avian groups found on settlement cave sites are the game birds, and the aquatic species, with thrushes and those species sympatric with man in the cave environments, like doves and corvids.

The material evidence for the means by which the birds were captured at this period is sparse and it is only by tracing back through the ages, the various strategies employed in fowling prior to the use of firearms that it is possible to equate the fossil evidence with more recent devices. Methods described in the historic, pictorial and literary record and some recent practice may indicate how such basic methods would have been available to and applied in prehistoric hunter-gatherer societies in Europe, gaining only in sophistication over time. The evidence suggests that since so many of the species targeted for consumption or other applications during historic times were also those taken by their stone age predecessors it is, therefore, more than probable that the means of capture were similar.

It may reasonably be claimed that it was the introduction of firearms and above all of the sporting rifle that saved a large section of Europe's lesser wildfowl and other game from extinction. Traditional methods of trapping, netting, decoying, drugging and the whole repertory of means used to gather food down the ages were more efficient than the shotgun. By Medieval times, conflict had arisen between the needs of food gatherers and the sporting demands of landowners. This became a matter for legislation that turned independent fowlers and small game hunters, trying to feed their dependents, into poachers, subject to punitive retribution.

This chapter sets out to trace some of the traditional techniques for the taking of birds for the pot and to look back through the historical and archaeological record in order to compare them with what is known about Hunter-Gatherer activities during the Palaeolithic of western Europe. What evidence we have indicates that the remains of avian species most frequently recovered from the Palaeolithic cave sites correspond fairly exactly to those targeted by the medieval fowlers, many of whose methods are likely to have been available to their prehistoric counterparts.

Literary and artistic sources give an insight into the history and the methods employed in the art of fowling and, at the same time, the archaeology provides information about the results.

The availability of manuals describing the hunting and methods for the taking of game increased with the spread of the printed word and the growth of the rich and landed classes. In Britain, typically, Richard Blome's *Gentleman's recreation* (1686) and Nicholas Cox's (1721) work on the same subject come at the end of a long line of sporting manuals produced all over Europe for the education of the gentry in the etiquette and art of all aspects of sport. The complete list is a long one but includes Gervase Markham 1621, *Hunger's Prevention or, the Whole Arte of Fowling,* as among the best known.

In previous centuries, Medieval literary sources tended also to be aimed at the upper echelons of society. Gaston Phoebus, Conte de Foix and Vicomte de Béarn (1331-1391) in his *Livre de Chasse* wrote entirely about the nature and the taking of mammalian game and the training of dogs, a volume that was translated into English under the title of *Master of Game* by Edward Duke of York whilst a crown prisoner in Pevensey Castle (1406-1413). Hunting with hawks, falconry, was a particularly aristocratic sport as described in the poem *Le Roman de Deduis* by Gace de la Vigne or by Alfonso XI of Castllle (1312-1349) in the *Libro de Monteria;* Although, as was made clear in *The Boke of St Albans* of 1388, ascribed to Dame Juliana Berners, there was a strict hierarchy in the ownership of different species of hunting birds, just as there was in the orders of game permitted to each rank of society.

Such divisions were well established, mainly for the protection of the hunting rights of the rulers and their courts. The Anglo-Saxon king Edgar (959-975) passed laws regarding the punishment for trespass on these rights and his successor Cnut was credited with the

Constitutiones de foresta, though this document more probably belongs to the reign of Henry II (1154-1189). The punishment for any serious infringement of these laws was imprisonment, usually for a year and a day and/or a fine. In Wales, according to the laws of Hwyel Dda (942-949), all punishments for the wrongful taking of game took the form of fines, usually payable in kind.

Throughout the medieval world hunting, hawking, fowling and fishing were some of the pleasures of life in the countryside for those who could afford it and, Gaston Phoebus of Foix notes that:

> He never saw a man that loved the work and pleasure of hounds and hawks that had not many good qualities in him; for that comes to him of great nobleness and gentleness of heart, whatsoever estate the man may be, whether he be a great lord or a little one, or a poor man or a rich one.

The Duke of York in *The Master of Game,* his translation of Alfonzo XI is even more emphatic about the character building qualities of hunting: For

> Idleness leads to evil imaginings and lust. I will prove how a good hunter may not be idle and in dreaming may not have any evil imaginations or, afterwards any evil works.....Wherefore I counsel to all manner of folk- what estate or condition that they be that they love hunting and the pleasure of hunting beasts of one kind or another or hawking.

Yet, as Alfonso XI stipulated the arts of hunting had a serious training purpose besides recreation:

> A knight should always engage in anything to do with arms and chivalry and, if he cannot do so in war, he should do so in activities that resemble war.

These attitudes to the character building functions of sporting discipline were fine for the ruling classes. To a certain extent Frederick II, Holy Roman Emporer, King of Sicily, King of Italy and King of Jerusalem, warrior and crusader, (1194-1250) might be thought to be the epitome of the type. Yet his treatise on hunting with hawks, *De Arte de Venandi cum Avibus* is a scientific work, using Aristotelian principles to examine the subject and showing respect for observational research to understand animal behaviour. Whereas the earlier classical natural historian Pliny the Elder tended to accept popular hearsay and legend regarding the ethology of particular species, like that of swallows living under the mud during the winter, Frederick was more sceptical and on being informed that Barnacle geese were hatched out of shellfish living on rotten timber, he is credited with sending an envoy into the Arctic to verify or deny the belief. He held that a real understanding of natural history and avian and animal behaviour was a priority for both scholarship and hunting success.

It was this knowledge of the habits and behaviour, of the haunts and requirements of the prey that was emphasised in the manuals as an initial requirement for hunting success. Writing much later in the 17th century Richard Blome in his book on *The Gentleman's Recreation* described fowling as

> an art for the taking of all manner of fowl, either by enticement or else by enchantment, as calls, intoxicating baits, or the like, or else by guns, nets, engines, traps, setting dogs etc.

he adds that:

> it is easy to ensnare any creature or fowl, if their nature is fully understood and what they delight in either for food or exercise.

These 'Enchantments' were explained by both Blome and Cox, writing about the same subject. They included all manner of disguise like the stalking horse or an artificial bush, behind which the hunter would wait for the bird to come within range. By the 17th century, the hand gun was in use, but, prior to that the bow and arrow, sling or bolas stone or the throwing stick were the weapons of choice, just as they had been at least since Neolithic times Another kind of enticement might be found in the various types of mimic calls using whistles and other devices to deceive the birds. It is possible to imagine that the drawing of an upright skin-clad figure, with a bow in his mouth, on the wall of the cave of Les Trois Frères at Montesquieu Avantes in

Figure 1. Whistle that imitates the calls of ducks, from Segovia 2005.

Ariège might have been engaged in such a disguise as a hunting strategy. Certainly, some of the bone flutes and whistles recovered from different Upper Palaeolithic sites would have been capable of producing sounds in imitation of bird calls.

The 'Intoxicating baits' prepared from specific plant poisons, that leave the flesh untainted are described in some detail by Blome and other authors and were widely known, since one such recipe was recorded by an unknown, Carnarvonshire, country squire, Edward Davies in his unpublished commonplace book of 1725. Nux vomica or Gall nut, hemlock and the lees of wine appear to have been the main ingredients in most recipes The concoction rapidly rendered wildfowl and other birds sufficiently senseless to be gathered up, There remains no archaeological evidence for the use of intoxicating drugs for this purpose, yet classical and Egyptian records indicate that a considerable understanding of the properties of plants and other natural ingredients was current from early in prehistory and the knowledge persisted into recent practice as the aforesaid Edward Davies gives us:

> A direction to take all sorts of fowls and birds such as crows and so forth: take such seeds as the fowls or birds are wont to feed on and lay it soaking in the mother of wine mixed with cicute water (water hemlock), when well soaked throw it in the places where the birds or fowls feed and they'll be presently drunk and loose in their senses and you may take them in your hand.

Another effective method was to use an adhesive preparation capable of fixing the birds to a twig or other object. Recipes for preparing bird lime were given and quoted by both Cox and Blome. Holly bark was to be taken from the tree in June, boiled in water until the green bark could be separated from the sapwood. The concoction was then rotted under a layer of hemlock, dock and other green weeds until soft enough to pound into a paste in a mortar and washed a second time. After being allowed to stand for several days and any rising scum removed, the paste was potted and stored until needed. It was then heated with a quantity of goose or capon grease, that varied in proportion to the size of the intended prey. When cool, it was applied to coat sticks, blades of grass or corn so that any bird that came in contact was stuck fast.

This preparation, frequently referred to as bird lime in classical literature sometimes included the berry of mistletoe, whose adhesive qualities were certainly sufficiently powerful to ensnare thrushes and small birds for the table. Yet it was claimed in general that birdlime was effective for taking a great diversity of species of different weights and sizes from geese and ducks to wading birds on the marshes, passerines, or larks and other ground feeding birds that might be caught up on the limed tips of the grasses. It was even possible to entangle the legs of waterfowl on sticks concealed under water and driven into the muddy banks of ponds and rivers.

Cox elaborates of the use of limed grasses or ears of corn:

> Go into the field adjacent to your house and carry a bag of chaff and threshed ears and scatter these together 20 yards wide. Then take the limed ears and stick them up and down, with the ears leaning or at the end touching the ground. Then retire from the place and traverse the grounds all round about, the birds being disturbed in their haunts fly thither and, picking at the ears of corn and finding that they stick upon then, they straightway mount up from the earth and in their flight the birdlimed straws lay under their wings and falling are not able to disengage themselves from the straws, and so, are easily taken.

There has been no material evidence for the use of birdlime found so far in prehistoric settlements of any period, although, once prepared, the materials might be held in storage for seasonal use. Nevertheless, during periods of temperate climatic conditions, the ingredients were readily available and it is reasonable to suppose that hunter-gatherer people possessed a considerable understanding of the plant and animal life around them and the expertise to exploit it. Furthermore, a flock of birds coming to land at a certain place and being transfixed on the spot might be made to appear as though it some special power had caused it to happen. Such might have been ascribed to the Lord God's intervention on behalf of the Israelites in the desert (Exodus 16: 4) and the descent of a flock of quail be described as lifesaving manna.

Figure 2. Multiple noose for trapping thrushes and small birds, from Blome 1686.

However, the most common tools of the bird catcher were the net, the throwing stick and the snare in a diversity of forms. Springs, lines, pitfalls and horse hair nooses were effective in catching many different bird species.

Nooses were sometimes used singly on their own for game or wildfowl or as multiples on a circular frame as illustrated in a mosaic at Thydrus near el Djem in Tunisia.

Figure 3. Thrushes caught in a noose, Mosaic in the Musée du Bardo, El Djem, Tunisia. Photo: R.G.A. Wilson Vancouver.

But throughout, the net in different forms and applications remained the most productive device, whose designs had remained virtually unchanged since its use was first depicted on Egyptian tomb paintings.

Essentially all nets are variations on the flat, spread net, that may be used vertically or dragged across the ground to put up and trap land surface nesting or roosting species.

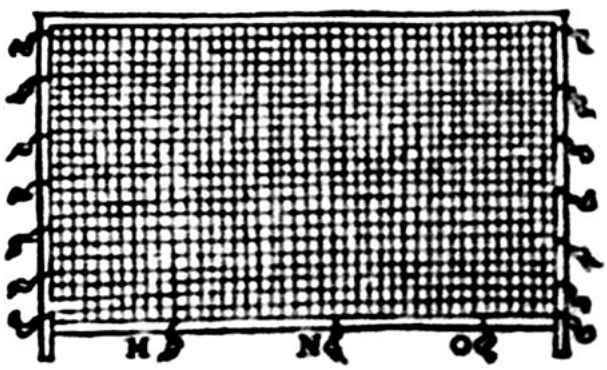


Figure 4. Basic flat net to drop down from the vertical or drag along the ground, from Blome 1686.

Flat nets, set vertically, in woodland drives, or cockshuts, were the most effective way of catching woodcock, *Scolopax rusticola.* George Owen, writing in his *Description of Penbrokshire* of 1603 gives an account of taking woodcock in the nearby woods with nets at

> cocke shoote tyme, which is the twylight after the breaking of the day and before the closing of the night.

Often, they took several birds at a time, up to twenty-eight in an evening and, it was said that a hundred or six score had been taken in a single twenty-four hours. By comparison, the entry in the game book at Holkham Hall in Norfolk noting that on 20th November 1829, William Chantrey, the sculptor, 'killed at one shot two woodcock' looks insignificant but at the time was held to be something of a record achievement of marksmanship, using a shotgun.

A clap net was used to take small birds either in the air or on the ground.

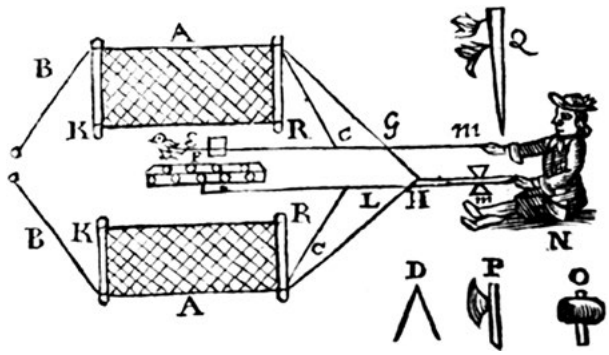


Figure 5. Clap net, from Blome 1686.

Vertical nets had a further use in the pursuit of waterfowl, according to Cox and Blome. In this context they were known as 'Bramble or coot nets'. These were set across the stream and linked by a cord. As the cord was drawn up, the birds between became trapped, a method also used for both pheasants and partridges.

In open ground, a net or even a single line might be dragged between beaters across a stretch of ground to locate partridge or flush out the birds and locate the nests and eggs of other ground nesting species (Chapman and Buck 1893).

Tunnel nets were used to draw birds into a net following a trail of grain and a larger form of this type of net was known to be effective for catching wildfowl in considerable numbers during the Autumn and Winter months. The original design was for a simple net or pipe into which duck might be led by following a dog or call ducks as a decoy and such pipes were developed into elaborate structures in Holland, Ireland and the fen country, especially from the sixteenth century

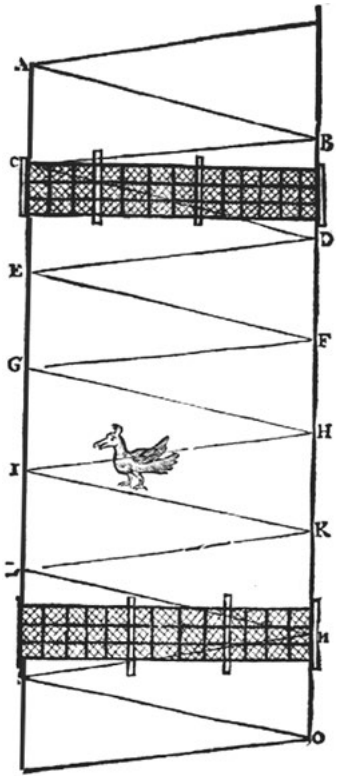


Figure 6. Coot net for catching small wildfowl, from Blome 1686.

and continued to be used on estates or commercially until well into the twentieth. An important element to the success of the duck decoy was the piper dog, that, like the fox, the natural enemy of wildfowl, was both an attraction and an object of menace to be kept under surveillance. In order to do so, just as in the Medieval fable of the geese and the preaching fox, the birds followed the piper dog into the trap (Kear 1990; Marchington 1980). Although decoy tunnels were particularly effective in localities where migratory birds congregated, they had an adverse effect on population numbers when used to poach resident stock during the moult, until the practice was made illegal.

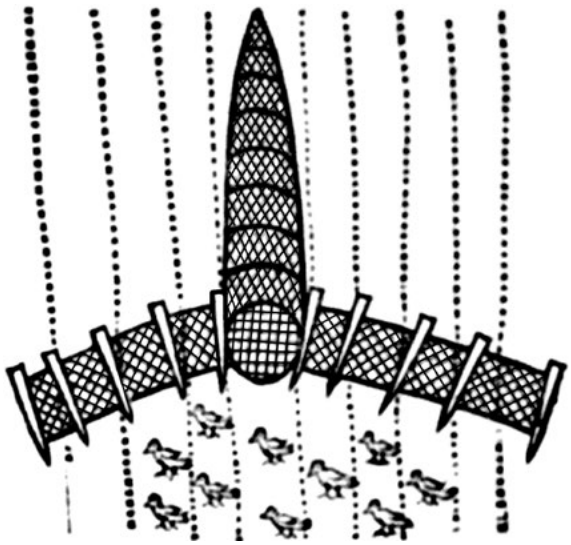


Figure 7. Tunnel nets for drawing wildfowl into a trap, either led by a dog or by being driven, from Blome 1686.

That birds naturally react with both fear and aggression towards the presence of a predator has also traditionally been used by fowlers as a means of taking them.

Passerine species will flock to mob a stationary raptor. Blome recounts and illustrates the way in which a horned or eagle owl *Bubo bubo* might be tethered to a perch and manipulated to attract the attention of smaller species. Once gathered, the net erected behind the perch could be lowered and the desired small birds like thrushes or larks would be caught in its mesh. Clearly owls were considered the most attractive of decoys, though other raptorial species might be used.

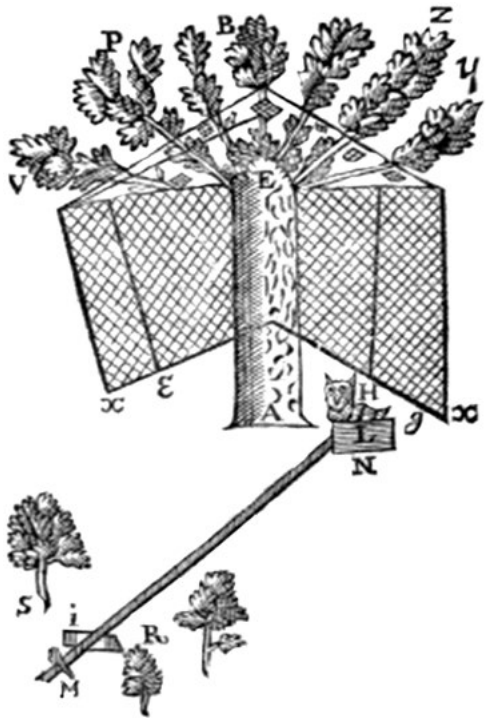


Figure 8. An owl decoy trap, from Blome 1686.

A fourteenth century carved misericord in Gloucester Cathedral depicts a scene of small birds surrounding and abusing an owl. Symbolically, this is supposed to signify the persecution of the Jews.

Figure 9. Misericord at Gloucester Cathedral depicting an owl being mobbed by small birds. Photo: Eastham.

Dated to the third century AD, at El Djem in Tunisia, a mosaic depicts a similar scene but the owl is taken to represent the culture of Rome and the mob of thrushes, the jealousy of the outsider. Yet both woodcarver and mosaicist create an image of a natural phenomenon that they may have witnessed.

Figure 10. Mosaic in the Musée d'el Djem, Tunisia, showing an owl being attacked by thrushes. Photo: R.J.A. Wilson, Vancouver.

Despite their significance for the classical world, owls are not frequently portrayed in the art of the Upper Palaeolithic. Two notable exceptions are the probable eagle owl among the Aurignacian images in Chauvet cave and the Magdalenian snowy owl in the cave Les Trois Frères. This engraving in the Tréfond shows two owls in the characteristically horizontal pose of *Nyctea scandiaca* and between the two a third outline, perhaps a young bird, whilst around their heads are a number of engraved marks that might be interpreted as indicating smaller species on the attack. It is also necessary to consider the reason for the large number of owl bones, a high proportion of them worked, recovered from a number of Late Upper Palaeolithic sites in the Aquitaine region of France. One of the standard answers is to suggest that consumption of their flesh was part of ritual ceremony. Were this a viable explanation. It would be in sharp contrast and countermands one of the biblical laws of Moses that forbade the eating of any raptor or a number of species of fowl and declared them 'unclean', along with a variety of other species traditionally considered palatable (Leviticus 11 v. 13-20; Deuteronomy 14 v.12-18).

If owls might be used to act as decoys to attract birds like thrushes and larks, long esteemed by gourmets for their sweet flesh, it was hawks and falcons that were valued for their prowess in hunting. Although falconry did not feature as one of the gentry sports in western Europe until the Middle Ages, it had been a tradition in the east since at least the third millennium BC. In Egypt, the sky God, Horus, carried the head of a falcon and is represented by its image in the texts but there does not seem to any illustration of the sort of hawking in the tomb paintings yet hawking was important on the plains of Mesopotamia.

Partly because of the cost, falconry in the Middle ages was largely a gentry sport for people with time and money to spend. It was never an economic pursuit. *The Boke of St Albans* of 1486, famously listed. Not without humour, the rightful order of ownership for each species of hawk or falcon, a designation that was synonymous with the medieval perception of the natural order of mankind. Apart from eagles and vultures, whose ownership was the prerogative of princes, despite the knowledge that they were not of great practical use in the chase, the manuals describe nine species of accipiter and falcon and their performance in the field (Hands 1975). In aristocratic households' high prices were paid for young birds and the falconer was among the highest paid of the servants. According to Welsh law, attributed to the 'King of all Wales' Hywel Dda, who died in 949. The rank of falconer was one of high status in the royal household, fourth in rank behind the captain of the household, the priest and the steward, receiving from the monarch and his spouse woollen and fresh deer skin and linen clothing in Spring and Autumn. Sufficient, food and drink for his thirst and candle wax were supplied to him by the court. The lodgings assigned to him were separated from the noise and smoke of the great hall to avoid disturbing the birds and in the field, the falconer received service of the king in looking after his horse at the kill. The cost of a trained falcon often exceeded the cost of a horse and literary sources show that the sport of falconry was still held in high esteem well into the nineteenth century (Salvin and Brodrick 1855).

Since falconry and the hunting with hounds remained the sport of the rich, it needed to be preserved from the depredations made by their social inferiors, intent on putting food on the table using the most efficient means available. Concern for the preservation of game of every sort was a continuing issue for the British crown even from Anglo-Saxon times. The various laws and statutes were listed by William Nelson, among others, in 1724. Edgar, who died in 975, appointed officers to preserve all the game of the table in his woods and Canute at Winchester in 1013 is credited with a series of Forest Laws. When William I arrived, his actions were even more devastating to the country folk. To protect his New Forest, he laid waste some 36 small towns and villages and his successors Henry I and Richard I inflicted blindness or emasculation on anyone guilty of breaking the forest laws. Edward III issued a series of statutes prohibiting the unlawful taking or stealing of hawks.

Under the Tudor and Stewart monarchs the statutes became increasingly specific, covering the taking of eggs of goshawk, lanner falcon or swan. Henry VII, gave protection to osprey, any wildfowl, crane, bittern or heron (Statute 11 and 19) demanding that certain species of hawks, if they were taken unlawfully be forfeit to the king. Henry VIII effectively created a closed season for the taking of wildfowl between 31 May and 31 August and under Statute 25 it became illegal to take the eggs of wildfowl, crane, bustard, bittern, spoonbill or heron between 31 March and 30th June. James I in his protection policy for the conservation of pheasants banned the taking of eggs and the keeping or use of nets to take deer, birds or fish. Punishment for offenders was either a month of imprisonment or a £40s fine, a sum that was subsequently distributed amongst the poor of the neighbourhood of the offence.

Some of the legislation may have been concerned with the conservation of stocks and the protection of wild life but a great deal was motivated by the fear that the trapping devices used by the poor tenant farmers and labourers in the countryside to feed their families were so efficient as to deprive the gentry of their sport.

The legislation and the limits it imposed upon the use of traditional devices turned many skilled fowlers into poachers, who, if they were caught came up before the local magistrate, who was perhaps also his landlord. Theirs was the burden of assigning punishment and a number of volumes were published as guides to these largely amateur lawgivers These books of Common and Statute law such as Washington 1704 or Nelson 1724 were:

> Very useful for Justices of the peace, coroners, Sheriffs, clerks of the Assizes and of the peace and of all others concerned with these matters.

Cox and Blome in their turn claimed that the classical world had no use either for falconry or fowling. It is true that neither Plato nor his pupil Aristotle valued the arts of hunting other than as an adjunct to the training of youth in the arts of war or as a necessary part of the pastoral life (Aristotle Politics 1:3). Zenophon 6th century BC, in the same vein, compares the skills required in hunting the hare to the subterfuges required for the acquisition of friends, and his work on hunting is mainly concerned with the training of hounds, though he does discuss the various types of nets. By contrast Aristotle, and, later, in Roman literature, Pliny the elder, whose work on the natural history of birds was detailed and intensive, as shown in his *History of Animals,* concentrates on descriptions of the qualities and behaviour, anatomy and behaviour of the entire animal kingdom, including man. He makes no mention of hunting, trapping or fowling. Much more explicit is the imagery used in the works of the epic poets and playwright of Greece and Rome and a recent comprehensive study of classical art and literature has shown the importance of birds both in the society of the ancient world and the imagery used in writing (Mynott 2018). It is the epic poems in particular which demonstrate through imagery that hunting with hawk, hound and snares was a well understood part of Greek life. There are references also to shooting eagles using the bow and arrow. Homer, composing in the 8th century BC and capturing dramatic scenes of action in his narrative reverts repeatedly to hunting imagery or to hawks and eagles descending on their prey in his account of Odysseus' return home. In Penelope's dream in the *Odyssey*, the eagle descends on her flock of geese but, more significantly for the denouement of the story, Telemachus, her son is reassured by this that his father will return and bring order to his house:

> Just as the eagle swooped down from the crags
> where it was born and bred, just as it snatched could touch the ground
> the goose fattened up for the kill inside the house,
> so, after many trials and roving long and hard,
> Odyssseus will descend on his house and take revenge. (Bk 15 line 194-198).

As Odysseus returns, father and son discovering each other again and weep:

> They cried out, shrilling cries, pulsing sharper
> Than birds of prey, - eagles, vultures with hooked claws –
> When farmers plunder their nests of young too young to fly. (Bk 16 line 246-248).

This passage appears to assume in the use of such a metaphor a familiarity with the practice of taking raptor chicks from the nest for training.

Odysseus returns home and rids himself of the suitors who have been plaguing Penelope. He punishes the women who had connived against his return in a fashion that appears brutal but is recognisable as a standard fowling practice illustrated by Blome for catching thrushes. In this case it is a man size version of the horse hair noose.

> With that, taking a cable used on a dark prowed ship
> he coiled it over the roundhouse, lashed it fast to a tall column
> hoisting it up so no toes could touch the ground.
> Then, as doves or thrushes beating their spread wings
> against some snare rigged up in thickets – flying in for a cosy nest but a grisly bed receives them-
> so, the women's heads were trapped in a line,
> nooses yanked their heads up one by one
> so, all might die a pitiful ghastly death...

> they kicked up heels for a little not for long. (Bk 22 line 491-499).

In the world of classical literature even the gods in their insistence on participating in human affairs, do so in the likeness of birds of prey:

> Then off he sped with the speed of a darting hawk
> that soaring up from a sheer rock face, hovering high,
> swoops at the plain to harry larks and swallows. (*Iliad* Bk 13 line 77-79).

A similar style of heroic imagery is used by Vergil in the *Aenead* during the 1st century BC; whilst in the *Georgics* he introduces a practical commentary on seasonal tasks and weather lore, explaining how Winter is the time to set snares for cranes and how to predict the weather by observing the behaviour of the birds. He emphasises always the need for close observation as part of a fowler's skill.

A later Latin author, Longus, towards the end of the 2nd century AD re-writes the love story of *Daphnis and Chloe.* He sets it on the island of Lesbos, embellishing the tale with a degree of humour and details taken from daily life. In Book II, a party of youths on holiday from Methymna, row out to the island to snare geese, duck and bustard. They interrupt a meeting of the lovers and when his goats eat their makeshift mooring line, they beat up Daphnis. The following winter, since the lovesick Daphnis is forbidden access to Chloe, he assumes that the winter activity of trapping birds would act as an appropriate alibi and sets snares and twigs coated with birdlime around the cottage in which she is confined. Thrushes, pigeons and starlings descend on the twigs in large numbers and are taken, and, by a happy accident Daphnis gets to see his girl as well.

The excavation reports of the Roman period indicate that both in town and country there was a considerable reliance on the rearing of farmed stock of domestic fowls and geese and in more important households ostrich, flamingo, crane or peacock were hunted or reared for the table. By the 3rd and 4th centuries, smaller passerine remains appear in the rubbish pits and middens, including all the species mentioned in the tale of Daphnis and Chloe. A villa at St Giovanni de Ruoti in Basilicata, Italy revealed marked changes over time, between the 1st and 6th centuries AD. Initially, mainly domestically reared birds arrived in the kitchens ready prepared, with heads and feet and wing tips removed. By the second half of the 5th century, both feet and wing tips are included amongst the considerable midden deposits and with them a very wide variety of wild species, that would have been trapped or snared as the original building decayed and the natural vegetational ecology re-asserted itself (Eastham in Mackinnon; Small and Buck eds 2002).

The late 3rd century version of M. Gabbius Apicius' advice on cookery, aimed at the gourmet rather than the peasant end of the market, includes recipes for all types of wildfowl and game species as well as the thrushes and turtledove.

In the documents that come down to us from the early civilisations of the Middle East, the hunting of wild birds is recorded somewhat diversely. In Egyptian tomb paintings, the practice of hunting and wildfowling in the marshes does not seem to have been greatly affected by divisions of class, except in the number of attendants and servants facilitating the sport. Hunting and fishing trips into the Nile marshes seem to have been undertaken by the pharaoh and his officials equally, although the manual work of netting birds or fish is not shown as the work of the junior officials themselves. Senior court officials, their servants and master craftsmen all participated in exploiting the riches of the marshland and its waters.

Egyptian tomb decoration from every dynastic period show in some detail the methods used for culling wildfowl and other animals along the valley of the Nile. The tombs to the west of the pyramid of Cheops and north of that of Chephren in the great cemetery of Gizeh were built for senior civil servants and officials of the kings of the III-VIth Dynasties. Some of the images they contain show the importance of fowling and hunting on the marshes in the lives of the executive classes. The mastaba cemetery G6000 was begun during the reign of Cheops and has been dated variously to within the 3rd millennium BC by successive archaeologists. Fairly recently, it was re-recorded by the Department of Ancient Egyptian, Nubian and Eastern art of the Museum of Fine Arts, Boston (K.R. Weeks 1994).

The tomb of Iymery, estates steward to the king of Upper and Lower Egypt, mastaba G6020, as always emphasises the importance of providing for the after-life. The first chamber depicts the provisioning of the deceased. The offerings shown in procession along the east wall feature geese, probably grey lag, *Anser anser,* since they were regularly netted and kept in captivity or perhaps domesticated. In the fourth register of the west wall a man leads two common cranes, *Grus grus,* followed by a demoiselle crane. *Anthropoides virgo.* From the text it is learnt that each represents 1000 cranes.

Pictures of cranes are not unusual in the tombs. There are a number at Saqqara from the Vth and VIth dynasties. It would seem that they were netted, kept as a flock and sometimes force fed (Houlihan 1986).

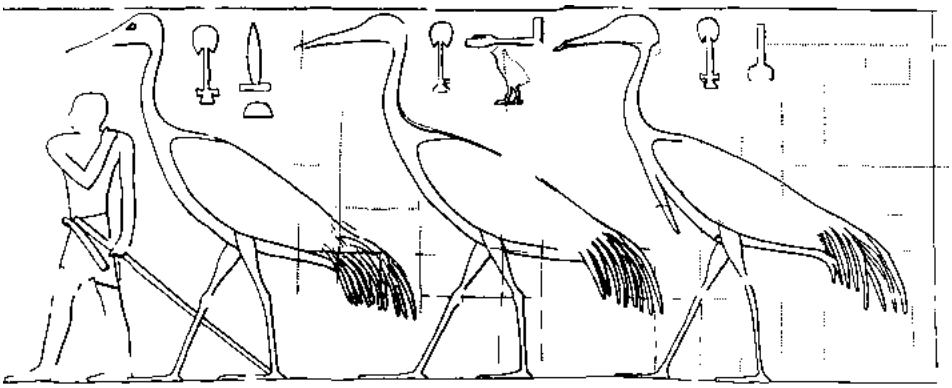


Figure 11. The tomb of Ymery first chamber painting of cranes, drawing after K.R. Weeks 1994.

The distribution of the common crane at the present day is restricted to the delta and the upper Nile, while the demoiselle is seldom seen within Egypt, although large numbers over-winter in the Sudan. That so many cranes, wildfowl and mammalian species were able to be held, fed and maintained in captivity in dynastic Egypt may have something to say about the fecundity and surplus production of the Nile valley that arrived in the hands of the ruling classes and may partly explain the overall decrease in the population of these species since medieval times (Cramp ed. 1982).

Scenes of daily life are the subject of the second chamber in the tomb of Iymery, either within the household, out on the fields or the marshes. Cattle are butchered, ducks are plucked and set to cook and entertainment provided for the steward.

At Saqqara, the VIth Dynasty tomb of Hesi, Vizier to Kings Pepi and Teti depict in detail the way that quail and partridge are taken with nets in the field (Kanawati and Abder-Raziq 1999). The middle register of the architrave above the portico contains a rare scene of men harvesting barley; as they cut the stalks, the birds appear in the stubble and are quickly caught in a net stretched across the line of reapers.

On the south portico of Hesi's tomb, over the heads of the fishermen in a boat gliding through the papyrus stems and amongst the papyrus birds fly around or roost in the umbels. Houlihan (ibis 1986) recognised pied kingfishers, *Cerule rudis*, an egret on the nest, a pair of Egyptian geese, *Alopochen aegyptica,* defending their nestlings from a mongoose and a purple gallinule, *Pophyrio porphyrio.* Overhead, above the papyrus thicket, birds take to the air in symmetrical rows, one above the other: lapwing, *Vanellus vanellus,* glossy ibis. *Plegadis facinellus,* kingfisher, *Alcedo athis,* hoopoe, *Upupa epops,* and turtle dove, *Streptopelia turtur* are readily identifiable. The tomb owner, Hesi, with his wife, join in the hunt while attendants supply them with throwing sticks, spears and bags.

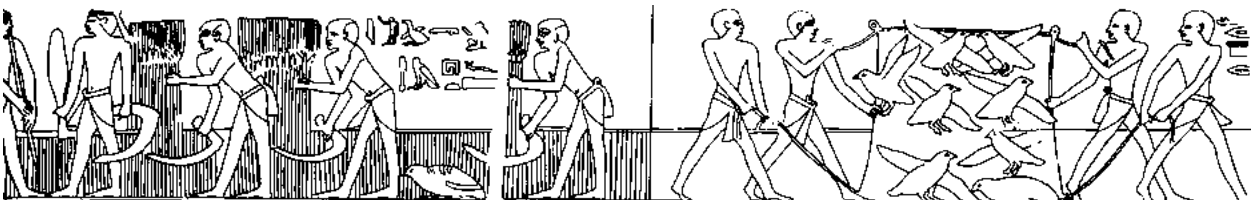


Figure 12. Painting of harvesting barley in the tomb of Hesi, Saqqara and taking partridges in a net, a device that almost exactly matches that illustrated by Blome in 1686 AD.

Figure 13. Tomb of Hesi and his wife fowling in the marshes, drawing after Kanawati and Abder-Raziq 1999.

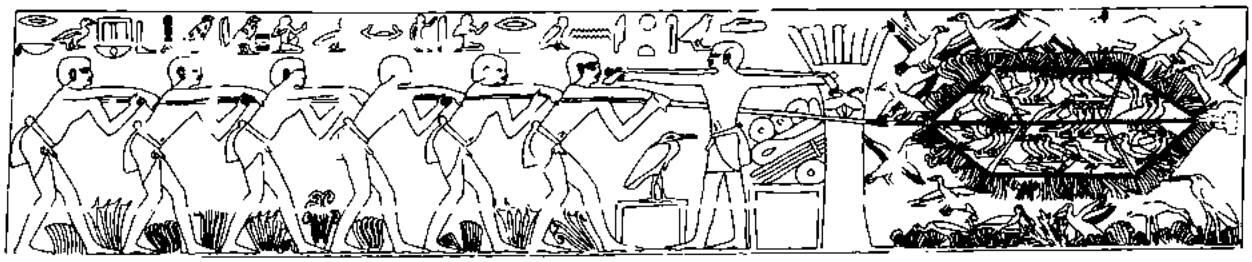


Figure 14. The tomb of Hesi, Saqqara, hunting with a clap net, drawing after Kanawati and Abder-Raziq 1999.

In the net Egyptian geese are crowded together, while outside a spoonbill, *Platalea leucorodia,* a bittern, *Botauris stellaris Nycticorax,* a night heron, *Nycticorax nycticorax* and a lapwing, *Vanellus vanellus,* observe proceedings. A line of six men stand holding the rope, ready to close the net on the orders of the overseer, at whose feet perches another bittern or night heron, apparently oblivious of the ongoing struggle before it.

Figure 15. Hunting in the marshes in the tomb of Nacht, Thebes. Photo: Eastham.

Yet a further variation on the use of nets to catch birds in a tree is shown on second register of the west wall of the same chamber. The tree is described as a sycamore fig housing a flock of golden orioles, *Oriolus oriolus.* The net is triangular in shape and the birds are enticed by imitation calls to entangle themselves in its mesh, with a single hoopoe caught with them. In the adjacent panels are scenes of spring traps being set to catch birds on the ground and captive geese being fed.

The conventions governing the themes of tomb decoration were persistent and continued with little change throughout the dynasties of the Middle kingdom between 1994-1781 BC. The XII dynasty tomb chapel of Ukh-Hotp, Nomarch of Upper Egypt shows ducks being taken with a net and men on a rope to haul it in in a manner that is almost identical to the scene in the tomb of Hesi at Saqqara (A.M. Blackman 1915).

These effective traditional practices remain. The tomb of Nacht, built during the XVIII dynasty at Thebes on the slopes of Sheikh abd'I-Qurna, probably during the reign of Thutmose IV, 1402-1392 BC (Abdel Ghaffar Shedid and Matthias Seidel). Despite certain changes in cultural thought over time, the concept and practice of fowling remained the same. Nacht and his wife hunted in the marshes among the papyrus stems using similar weapons to take the same range of species as before and their servants caught flocks of wild fowl in the same type of net and harvesting duties and household activities continued to be performed using the same equipment as during the IVth dynasty.

The tombs here described, selected from over a considerable span of time, represent a tiny sample from the corpus of Egyptian funerary art. Each of these documents shows the Nile marshes and the agricultural land along its flood plain as an unfailing resource for its inhabitants; its fecundity symbolises the continuity of life for the deceased and his genetic descendants. A belief in its continuing abundance is expressed, perhaps, in the unchanging nature of the equipment required for hunting or agriculture. In the three tomb complexes described, spears, throwing sticks, different types of net and, in the tomb of Hesi, bows and arrows with sickle shaped points were the only weapons needed for hunting game in the marshes. Houlihan in 1986 identified 72 bird species in the tombs in Egypt from the size of ostrich down to swallow, mostly shown as pictorial images but with some sculptural representations and a few mummified

specimens. The identification of species is entirely clear from the drawings and the understanding of avian 'Jizz' quite obvious from the images and even in the textual hieroglyphics that it speaks of a people living very close to their natural environment. The ecological fecundity of the land became like a symbol and a guarantee for the perpetuation of the human descent and the maintenance of world order against the forces of chaos (Shedid and Seidel 1996).

The concept that the fecundity of the land takes care of you provided you take care of the land is still part of the traditional thinking of the Kundjeyhmi speaking peoples of Arnhem land, Northern Australia. It is an important element in the way they like to live and is expressed in the paintings and in their laws for living. Bill Neidjie, a native from the East Alligator river area, puts into words the sense of identity with the land that nurtures his people and their hunter-gatherer past:

> We brought up like all animal and bird
> because eagle e fly round or might be jabiru,[1]
> might be brolga[2] might be goose.
> Goose[3] good eating. You got to eat goose
> because goose e breed up again
> soon as wet, e got to make egg....good eating.
> Or goanna or long-neck turtle....
> Brought up because for us to eat.
> Long-neck turtle you got to eat
> but e get plenty again, e breed up more.
> Geese[3]...e can eat two hundred but e'll come.
> E breed up here, egg...
> another plain, another plain, another plain.
> You might get thousand and thousand goose
> ([1] stork, [2] crane, [3] magpie goose).

In Mesopotamia, as in Egypt throughout a similar span of time from the Early dynastic to the Babylonian and the Hittite empires, of Asia Minor the attitude towards birds appears to have been linked to ideas about hieratical order, like the order of society in general. Eagles and winged beasts are used as heraldic symbols of power: eagles are shown on cylinder seals and in architectural decoration in single and double headed forms. Other species may have carried a diversity of meanings.

A sculpted stele from Lilith, dated to the late 2nd or early 3rd millennium BC, depicts pairs of barn owls, *Tyto alba,* as bringers of death, part of the reason perhaps why they were declared unclean in the Pentateuch books of Deuteronomy and Leviticus in the Jewish Bible. Early on in the Neolithic of modern Turkey, Death and its rituals were also significant themes on the walls of Catal Huyuk, in the 7th millenium BC, where the images of vultures mirror the practice of exposing the dead on platforms away from the settlement (Mellaart 1965). Yet birds were also hunted for the pot on the open plains and in the marshes. Images of ostriches, *Struthio camelus,* appear on late Assyrian cylinder seals, a species that is now extinct in Egypt but *S.c.syriacus* was common in the region around Kuwait during the 19th century and as late as 1914 and also in Arabia as far north as 33.5°N. Layard on his journeys through Assyria, Armenia and Kurdistan in 1853 records that the desert Arabs of the Sinjar regularly set their falcons after the Houbara bustard, *Chlamydotis undulata.* The engravings on the cylinder seals might denote either of these species.

Excavation of a tell site on the southern alluvial plains of Mesopotamia revealed the 3rd millennium BC city of Abu Salabikh. Here there was evidence of regular wildfowling in the marshes and along the canals linking the site to the Euphrates river (Postgate 1980; Eastham in Postgate and Matthews 1994) During this period one of the burials on the site was of a young child buried with his goshawk, *Accipiter gentilis* in the same grave, a dual interment that would appear to demonstrate the importance of the art of falconry to both marsh and desert dweller from a very early age. The hunting with hawks was certainly part of the means of subsistence but ownership of a falcon would also have been a mark of status.

In his travels in the Near East, Layard notes the value placed upon hawks and how they are prized by the Persians and Kurds alike for the taking of specific prey and how they used them to demonstrate the prowess of the bird and skills of its handler. He sees for himself the close bond between man and bird when one day Suttum, his Bedouin guide, releases his falcon Hattab at a bustard. Hattab is attacked by a kite and disappears. As he weeps for his friend, Suttum exclaims, 'Hattab was not a bird, he was a brother'.

As food production in the forms of pastoralism and agriculture moved out of the fertile crescent and spread during the Neolithic and Bronze Ages. The settlements in and around Catalhöyuk, a Neolithic urban site situated on the edge of the marshland of an ancient lake bed, dating from the middle of the eighth millennium BC. Excavation showed that the most frequent species among the mammalian fauna in all sectors were the sheep and goats, thought to have been domesticates, whereas the other mammals were considered to have been hunted in the wild.

Of the 225 birds identified bird bones from the excavations led by Ian Hodder 1995-1999, the majority were wetland species, ranging from grebes ducks and cormorants to game species and raptors and the surrounding wetlands included sufficient deep water zones for both diving and dabbling species. The presence of imperial and golden eagle may be associated with the flocks of sheep and goats. We may suppose a situation

similar to that which existed in the 1970's in the Sierra de Ronda in Spain, where, at the small holding of La Pileta (home of the decorated Palaeolithic cave), the flocks were watched and small dogs gave vociferous warning whenever an eagle was perceived quartering the ground above the animals. At which point all the men emerged with rifles, or perhaps, in the case of Catalhöyük, with the sling stones kept on the roofs, or, armed with bows and arrows, either to scare or kill the invader. The same use of the sling or even bolas stones might have served to catch bustards that were also present in the sample (Hodder ed. 2005).

A comparative study of fowling in the lowlands of south-east Romania and the great Hungarian plain during the Chalcolithic and early Neolithic periods was conducted by Erika Gáll on domesticated and wild mammals excavated on sites belonging to the Gumelnitza (A and B cultures) between 1993-2005, even though some communities were almost exclusively dependent on fishing. Close to the Danube and its tributaries, the region was rich in aquatic and marshland bird life such as the fishing eagle, whereas the tell sites away from the watercourses contained more steppe species. Domestic mammals formed the greater part of the meat consumption, but fowling was more important than hunting wild mammals. The diversity of species and the numbers are much greater during the Chalcolithic deposits of the successive phases of the Gumelnitza culture, beginning around 4000 years BC, than during the Neolithic phase with its origin in the region during the late 7th millennium. Among the aquatic species, remains the grey lag geese *Anser anser* were the most frequent but frequent also was a wide variety of diurnal birds of prey, from buzzards and vultures to eagles, including fishing eagles, *Haliaeetus albicilla,* and osprey, *Pandion haliaetus,* hawks a harrier and a range of grassland steppe species like bustard, stork and crane. In Romania, the Neolithic diet was based either on the culling of domesticates or on large quantities of fish.

To the west on the great Hungarian plain, in contrast to the early Neolithic of Romania, on the sites along the river Tisza, birds of all taxa were exploited in considerable numbers and fish remains were rare, but there was at the same time a considerable dependence on domestic mammals. Yet, during the Chalcolithic, birds were virtually absent. Fowling methods throughout almost certainly included a variety of traps and nets as did fishing. Weights for the nets were recovered on the settlement sites. Throwing sticks, spears and bows may have been used, also bolas stones have been recovered and would have been used to bring down the long-legged plains dwelling storks, cranes and bustards.

Farming settlement patterns gradually spread into northern Europe and one of the best preserved from 3,180-2,500 years BC is Skara Brae on the Bay of Skail, Mainland Orkney. Seasonal fowling was a welcome addition to subsistence agriculture and pastoralism. Situated at present on the shores of the bay of Skail (Eastham unpublished data). The means of catching the birds depended very much on their habitat. Cliff nesting gulls, gannet, petrels and cormorants would be caught in nooses and their necks broken, or clubbed and thrown down onto the shore below (Martin 1740; Munro 1549). Aquatic species, divers, grebes, goose, swan, freshwater and coastal ducks and ground nesting birds like plovers, snipe and woodcock could be caught in nets. The intensive use of all available raw materials may be seen in the secondary use of bone. In one example, number of humeri of great skua and a gannet were clearly worked into tools, recognisable today as spids designed for splicing and net making from twine and rope. This ties in with the use of whale rib in roof trusses and demonstrates a similar lack of waste in these communities living as much on the edge as the Hunter Gatherer communities. Such seasonal exploitation of seabird resources was common to the occupation sites of Orkney and the Scottish mainland. Serjeantson (1988) in comparing Neolithic patterns of seabird exploitation on coastal sites in the north of Scotland was able to show that gannets predominated. Certainly, the oil they produced remained a highly valued commodity until the mid-19th century, when it was replaced by coal tar derivatives.

In addition to the bones at Skara Brae, quantities of eggshell were recovered from the midden deposits. The inner surface of avian eggshell presents a pattern of mammillary knobs or cones and pores when examined under a scanning electron microscope, SEM. The resultant images subjected to an artificial neural network software, courtesy of Aberystwyth University, achieved a high probability of identification for some 18 species of bird eggs that had been collected for consumption on the site (Ap Gwyn and Eastham 1998; Eastham and ap Gwyn 1997).

With the amelioration of the climate and the fluctuating retreat of the ice at the end of the Last Glaciation, the Late Glacial cultures of the Magdalenian shifted northwards and broke up into a succession of regional groupngs, known collectively as Mesolithic They were summarised by G.D. Clark in 1948. As the populations of reindeer and herds of large grassland mammals declined with the increase in forest cover, settlements became seasonally more mobile and are often recognised only by the pattern of flint scatter left behind by each regional group. The Hamburgian in Germany, during the final years of the Last Glaciation belonged mainly to the climatic regression of Dryas II; the Maglemosian, exploited the postglacial fauna of Demark and parts of the low countries. Each, Clark claimed, represented its own ecological and temporal

niche in the systematic culling some of the migrant wildfowl or grouse and capercaillie. His excavations of the early Maglemosian site of Star Carr in east Yorkshire revealed much about the species taken by different fowling methods during the Mesolithic: showing how, just as on Neolithic site at Skara Brae, seabirds were important during the Summer and ptarmigan in Winter and how such fowling methods were common to many of these groups of Hunter-Gatherer settlers along the coast from Denmark to places on the Morbihan in Brittany.

There have been few finds of the period that may be directly linked to business of catching birds but objects have been found that suggest that they were in use. For example, baskets and fish traps, dated to 8,000 BP were recovered from the wetland settlement of Noyons sur Seine (Mordant and Mordant 1992); the Mesolithic site of Friesack in north Germany was occupied by people whose culture resembled the Maglemosian from the Pre-boreal into the Atlantic phases, from around 9,500 – 8,200/7,000 years BP, and making nets and ropes from bast (Gramsch 1992). The conservation of these organic materials depends on local conditions but the body of evidence is growing that extensive use was being made of plant fibres and other organic materials to create ropes and fine netting at this time. Throwing sticks, not dissimilar to those shown in Egyptian tombs were found in the context of the Danish Maglemosian and at Star Carr in east Yorkshire and arrows, in association with avian bone were recorded on late Palaeolithic and Mesolithic sites. At Meiendorf, the Hamburgian site in Schleswig-Holstein, the pelvis and sternum of both ptarmigan and crane appeared to have been penetrated by arrows (Rust 1937).

The transition between the old stone age and the Mesolithic was precipitated by an accelerated retreat of the ice and the onset of warmer and wetter Boreal conditions in northern and western Europe with its consequences for the lives and distribution patterns of men and animals. Back in the sequence of Upper Palaeolithic occupations, the patterns of fowling in the western regions of Europe seem to have been remarkably consistent within the parameters of particular habitat zones, seasonal pressures, and the local ecology in the vicinity of the particular site.

The Tables in Chapters 2 and 3 on the Middle and Upper Palaeolithic, that indicate selected sites that represent each phase show that essentially the species count was found to have been dominated by aquatic and game birds. Over the long period of the Middle Palaeolithic, Neanderthal occupation of western Europe, there is considerably less certainty about any systematic use of wildfowling as part of subsistence hunting than could be inferred from the evidence on later sites, as shown in the preceding studies.

With the gradual phasing in of Upper Palaeolithic occupation a definite pattern of exploitation and method becomes clearer. Inland preferred targets were normally swans, geese or ducks: on the coast they would be likely to include pelagic or shoreline birds including a variety of waders. Game birds, especially a number of species of grouse were recovered in quantity, particularly during winter occupations or in montane regions. On many sites, the bones of different species of *Tetraornidae* were represented in very large numbers indeed. With them were the partridges, quail and plovers of the grassland and undergrowth. The difference appeared in the dry steppe country of the south and east where bustards, cranes, storks and even ostrich were the preferred game species. Within these groups, almost all sites were found to have the remains of a diversity of predatory birds, from vultures scavenging around the remains scattered in occupation areas, to eagles, hawks and falcons looking for prey and a few of the owls, a roosting in the caves or in pursuit of vermin but more frequently hunted and carried onto the occupation site. More variable was the number of and variety of passerines and other small species. The frequency of summer visitors to Europe that fluctuated during periods of glacial advance, even though many remained present at least in southern Europe.

Although it is clear that numbers of birds were taken by the Hunter-Gatherer peoples of the Upper Palaeolithic, it is uncertain what were their fowling techniques. Assumptions are being made in the current chapter that the means used were the precursors of the long tradition that is employed by people all over the world to provide for their needs from natural resources, without waste or superfluity. Nets, that feature prominently in later cultures were undoubtedly part of their technology, manufactured from all kinds of natural fibres of plant, animal gut or hair as required.

Upper Palaeolithic imagery may provide a number of indications regarding the methods used. Nets were essential for taking both birds and fish and small mammals and the use of them would help to explain the random flocks of small migrant passerines taken at various times on different sites, along with more targeted species in clap nets, hand nets or with hand held clubs. As shown in the Egyptian tomb paintings and as the late Medieval texts demonstrated, wildfowl are readily gathered in nets and wintering coveys of grouse resting in the shelter of dwarf willow scrub are eminently vulnerable to being, trapped underneath nets lowered from an upright position, or drawn over the surface. Evidence for the use of nets, snares and other devices exists only by implication from an interpretation of signs engraved on cave walls or on portable objects and such interpretant may be wide of the mark. In 1968 Leroi Gourhan published an

extensive analysis of the signs he had recorded in his notebooks. Quadrilinear shapes, divided by internal crossing or vertical lines appeared frequently in association with animal figures throughout the Upper Palaeolithic sequence in both Aquitaine and Cantabria. Many examples of these quadrilinear figures have been regarded as representing pits to trap large mammals on the move, others, described as 'tectiforms' indicating open air dwellings but it is worth considering that the similarity of some of the drawings of traps used by the Medieval bird catcher. Other possible evidence of weapons that may have been used for hunting birds were the arrow and spear shapes that proliferate in the imagery of both portable and parietal art and yet again an association with fowling is generally absent.

Some good examples of the Magdalenian use of linear designs appear in the caves of Lascaux above Montignac and the little sanctuary of Gabillou in the valley of the Isle river. Lascaux contains a very large number of signs associated with the mammalian friezes, the most obvious painted in black or polychrome. Yet there are large numbers of engraved marks that are more difficult to read. Usually the painted shapes are shown as quadrilinear shapes crossed by further square patterns of 2 x 3 lines. The normal interpretation of them is that they represent traps and it is possible that these took the form of nets that could be moved around as required. Another enigmatic sign is the slightly curving black cross in front of the black horse that shares the panel with the great black bull in the axial gallery at Lascaux. From its position it might be compared with the tackle to carry bolas stone slings as used on the plains of eastern Europe and the Middle east to trap ostrich, bustard, crane or other long legged avian species, and even in recent times in south America.

This same type of symbol drawn with six points was also found in the first section of the cave of Gabillou and a simple cross drawing in section 3 (Gaussen 1964) and throughout, associated with animals in all sections. There are crossed quadrilinear engravings, with varying numbers of squares, some fairly convincing as representing nets. In section 2, a quite different design of a line of 63 vertical engraved strokes, suggestive of a barricade that might be thought to represent the line of a decoy fence or corral, provided it were not a record of a kill tally. In this same section, a further enigmatic engraving in the form of a rake might have some connection with a device to trap animals. Besides large numbers of horse, deer, bison, bovid, ibex, and some felines and bear among the engraved figures, Gabillou contains two birds, both with large beaks and upright stance These and the canid, possibly wolf, the hare and a possible the wild cat, all smaller animals that might be captured using finer nets.

Lascaux and Gabillou are just two decorated caves in the corpus of sites and it must be said that such a suggested interpretation of parietal designs in terms of nets does not match with any authoritative view. Leroi Gourdan explained a large proportion of the signs in terms of male and female symbols including those that resembled spear throwers or arrows in shape and Laming Emperaire treated many geometric forms recorded in French and north Spanish caves as 'tectiforms', hut elevations, whereas, if we take the approach of a fowler they could be compared to the plan drawings of netting systems described at the beginning of this chapter. The only certainty is that at the present time it is only possible to infer or guess at the significance of the symbols abstracted from cave walls and portable objects. Interpretation of intention in the absence of further documents becomes a process of speculation.

Other established fowling techniques used through the ages include decoys, forms of disguise and the use mimicry, whistles and calling pipes that are known from the caches at the Grotte d'Isturitz and elsewhere to have all been available as part of the bird catcher's armoury. Of natural vegetable toxins nothing is known to date yet in all recorded gatherer communities, the fund of understanding that differentiate what is good or bad to eat, what is medicinal or alters consciousness in the world of plants exceeds that of the generality of modern urban society. Here again in the absence of evidence it may occasionally be legitimate to use a little imagination in reconstructing a way of life.

Unfortunately, for present understanding, the means of procurement were ephemeral and the material documents have not generally been preserved. They may only be inferred from the skeletal remains that are still intact and furnish a major part of the record of the daily life of Hunter gatherers of the past.

Chapter 5

Bird images in the parietal art of Palaeolithic France and Spain

Relatively few bird images have been found on the walls of decorated caves or rock surfaces in Western Europe by comparison with the abundance of mammalian representations. Those that may be interpreted as belonging to a particular avian genus are most usually restricted to a limited range of species; aquatics, game birds and raptorial species are predominant, with the occasional passerine. The depiction of an actual species was not perhaps the primary intention of the artist and certainly it is not always entirely clear from the visible marks on the cave wall, or by viewing them in the expectation of seeing definitive speciation, the modern spectator may be posing the wrong question and one that can no longer be answered from the marks on the walls. The purpose would appear to be to portray a type of avian form and its role in the cultural or practical life of hunter-gatherer community of the time.

There appear to have been regional differences in the frequency of bird depictions, which may be associated either with the distribution of Hunter-Gatherer sites or with the migration patterns of birds in passage. Avian engravings are far more common in the Pyrenean region and in Aquitaine than further north. To date, the indeterminate outline near the entrance to the Grotte de Gouy, Seine Maritime and the probable figures at Creswell, Derbyshire, are the only parietal images of birds known, north of the Loire. Images of birds on cave walls in the Dordogne are mainly restricted to the possible outline of a head in the Abri du Poisson in the Gorges d'Enfer and another outline near the entrance of Gabillou at Soursac on the Isle river and the figures in the Puits at Lascaux, outside Montignac, that includes the fallen man with the 'bird headed the staff' that is most probably narrative – a representation imaging a representation.

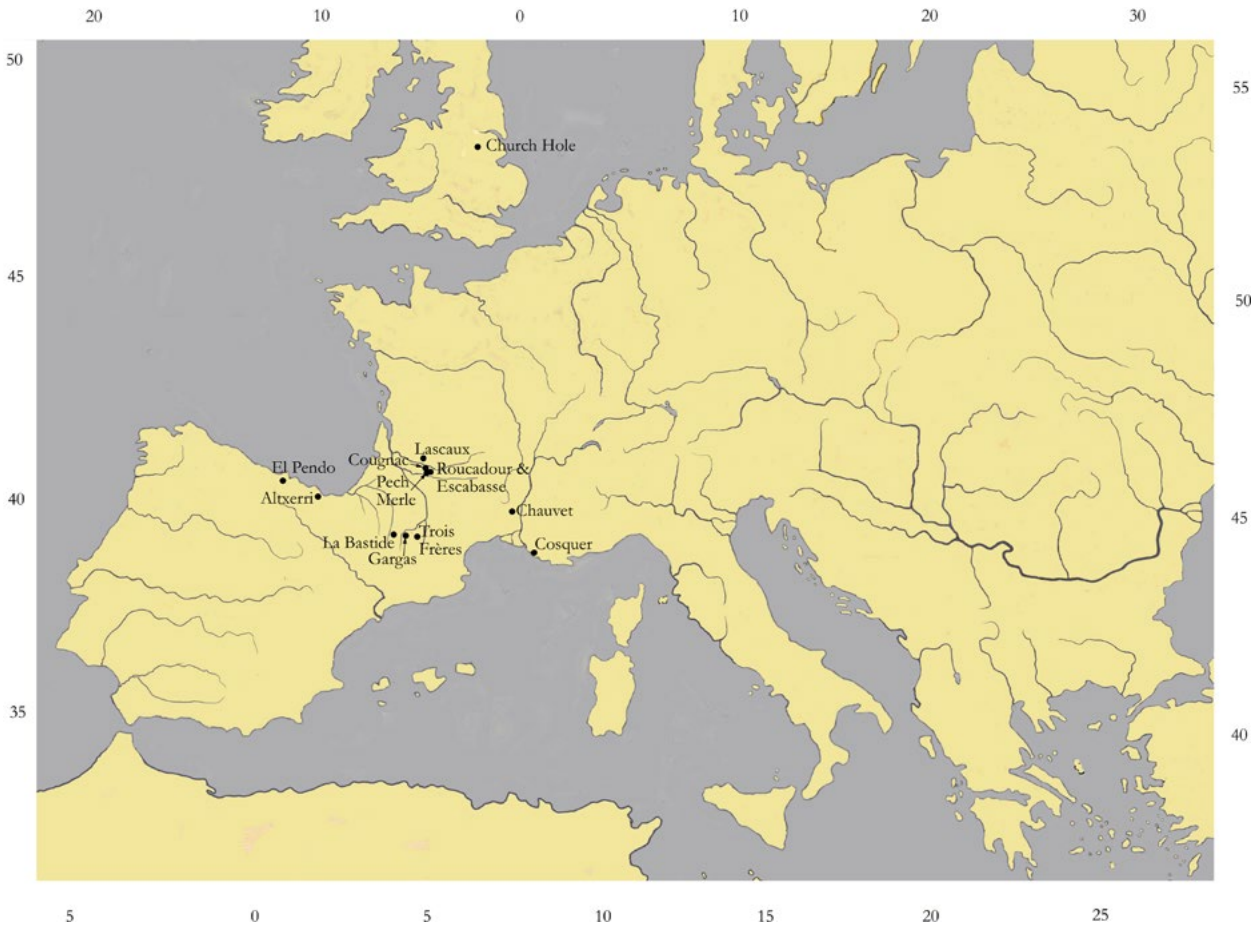


Figure 1. Map showing sites referred to in the text.

In Quercy and along the valley of the Lot and its tributaries there appears to have been quite another approach to avian forms shown either as a part of a figure, usually a head attached to a composite animal shape as at Roucadour, or, perhaps in the linear signs, fairly convincingly described as 'aviformes' as they appear at Cougnac and Pech Merle.

The decoration of cave walls in Europe seems to have begun soon after first settlement by modern humans prior to 30,000 years BP In the West, some of the earliest known examples of cave art were found in the Mediterranean region of southern France.

Regional evidence of birds in cave art: the southern and Mediterranean region

Two caves in this region have been dated to the early part of the Upper Palaeolithic; Chauvet Cave, Vallon Pont d'Arc, Ardèche, is accessed at the present day from a platform in the side of the Ardêche gorge close to the Pont d'Arc The have been dated to between 29,000 years, and 31,000 years BP (Chauvet, J.-M., Deschamps, E.B., Hilaire, C. 1995; Clottes, J. 2001) and Geneste, J.-M. *et al.* 2005) Two images that may be interpreted as avian have been recognised in Chauvet. Engraved into the clay surface on the collapsed ceiling vault in the Salle Hilaire is a very fine image of an owl, *Bubo bubo,* or just possibly long eared owl, *Asio otus.* It stands in an upright position as though perched on a branch, represented by the void of the empty space beneath; it is depicted as facing the viewer, with ear tufts erect, with the 'eyebrow markings', beak and the form of the closed wings and plumage clearly delineated. The positioning of an owl above a dark space may perhaps represent an effective and deliberate use of illusion to simulate perching on a branch of a tree.

Figure 2. Chauvet cave, Horned owl drawn in the clay in the Salle Hilaire. Photo: courtesy J. Clottes.

It is an illusion that also appears in the cave of Les Trois Frères at Montesquieu Avantes in Ariège where the snowy owl images in the Salle des Chouettes were made at a considerably later date during the Magdalenian, but again placed above a void as if it were a branch.

The second image is less easily understood and has been classified among the 'signs'. Described in the literature as the 'papillons'/'insectes', the painted outline of a creature with 'wings' outstretched apparently hovering in space in the Salle des Panneaux rouges.

Figure 3. The 'Papillon' at Chauvet cave. Photo: courtesy J. Clottes.

The outline is rather faint but positioned on a rocky pendant in the passage way, the image gives the impression of a bird being suspended in air, as though it were using air thermals rising from the Ardêche river to hover above the valley, searching for carrion. At the present day Bonelli's eagles, *Hieraatus fasciatus* hover in just this way over the Ardêche valley. The impression of soaring above the viewer is strong. There is insufficient detail in the depictions to propose assigning them to a single species or even genus of bird or even butterfly, were the original designation to be believed, however tentatively. Yet the silhouette suggests an object at a considerable distance above the spectator. Most raptorial species hover at great heights above the ground. Buzzards, eagles and vultures all use thermals to rise up and view their prey from on high. Among them, the vultures attain enormous heights, from which they descend on their objectives at amazing speed. There is also some evidence that hominids sometimes made use of the kills of animal predators, particularly during the Middle Palaeolithic and very possibly later. This figure has been assigned

to the Aurignacian phase of the use of Chauvet and it is conceivable that vulture flight patterns were observed in order to lead the hunter-gatherers on a relatively easy search for fresh carrion. The vulture species most frequently identified on Late Pleistocene assemblages in Western Europe are the griffon, black vultures and the Lammergeier, the *Gyps fulvus, Aegypius monachus* and *Gypaetus barbatus* (Tyreberg 1998). Such an interpretation does not eliminate the alternative reading of these marks as 'signs', yet it may significantly add a further dimension to it.

Cosquer Cave, Massif of Marseille, Provence

Known as the 'Cave beneath the sea', Cosquer at the present day is inundated for around half of its extent with access only by boat and through an under-water syphon. It is therefore not surprising that there are a number of sea creatures among the animals engraved and painted on the walls of the cave. Carbon isotope dating of the parietal images gives a range of dates between 28,000 and 18,000 years BP. In amongst a predominance of large land mammals: horse, bovids deer and caprids, a number of fish, nine seals, a group of three seabirds were portrayed. The drawing of these figures appears more schematised than that of the land animals. The character of the seal is defined as a globular body, flippers and extended whiskers for the head. The black paintings of the birds also show globular bodies with reduced flipper-like wings extending out from below a well-defined neck, topped with a strongly beaked head. The problem of hind limbs is resolved by giving the creatures rather ill-defined mammalian style legs. The panel of the birds forms a single group in sector 204 of the main cave. In the literature they are described as 'Pingouins' and they clearly belong to the Auk family (Clottes, J., Courtin, J., Vanrell, L. 2005). There is every reason to suppose that the images may refer to great auks, *Pinguinis impennis,* that were relatively common in the Mediterranean during the Palaeolithic.

Figure 4. Great auk figures at Cosquer cave.
Photo: courtesy J. Clottes.

Carbon samples from the same context as the auk paintings gave a date of 26,360 ± 160 years BP. Pictorially, the Cosquer auks are not alone. A similar image of great auks was found in Cantabria, at the cave of El Pendo in Santander province. These have been identified as belonging to the later period of the Magdalenian use of that cave. The bird as delineated at Cosquer could be considered as non- specific; with its short wings apparently moving in the water, it might be assigned to any member of the auk family, guillemot, razorbill or even puffin.

A recent map of the known distribution range of the great auk shows it as an entirely Holarctic species. The archaeological record would suggest that in this drawing a great auk was the likely intention, in view of their large size as a useful food bird and as a source of lipids. At the time when the last known great auks were consumed by sailors on 4th June 1844 off Iceland, the breeding range was restricted to stations bordering the North Atlantic, yet in prehistoric times remains on sites from Florida to the western Mediterranean are on record. Bones of the species have been noted in European cave sites: in Ireland at Ballinamintra cave, county Waterford and at Blomvag in Norway in deposits of probable Holocene date. In Cantabria bones were found among the Magdalenian material of the cave of Urtiaga in Guipuzcoa province of northern Spain. On the Mediterranean coast in an Epi-palaeolithic layer, there were bone remains at Nerja cave in Malaga province in southern Spain and in Dryas III levels at Grotta Romanelli in Puglia in Italy and in a 'Tardigravettian' layer of Arene Candide in Liguria, Italy. Middle Palaeolithic sites with great auk bones have been recovered from a number of Mediterranean excavations, from both Devil's Tower and Gorham's Cave on Gibraltar, in Calabria at Archi cave as well as sites on the Atlantic coast in the Gruta da Figueira Brava in Portugal and in the Cotte de St Brelade on the island of Jersey to the North. Yet, despite its relatively widespread prehistoric distribution, images of this large meaty bird seldom appear even in caves close to the coast maritime contexts, with the other known identifiable example in Cantabria.

The Pyrenees and Cantabria

To date Chauvet and Cosquer are the only caves containing known Palaeolithic parietal images of birds in the Rhone-Alps region of France. However, the situation along the Pyrenean chain is markedly different. At the eastern end, at Fournols Haute Campôme in Herault there were discovered some partial outlines that have been tentatively determined as avian (Sacchi 1988). The one showing a beak formation ascribed to a vulture and the second was compared to a little grebe, *Tachybaptus ruficollis,* on the basis of its short beak and rounded head profile. Vultures may be predictable but grebes are very

rare in the Palaeolithic record of Europe. Two possible recoveries have been recorded by Vilette (1983) in his study of the avifaunal remains of the excavated sites of that region: a probable *Podiceps auritus/nigricollis,* black necked or Slavonian grebe at the site of Arbreda across the border in the province of Gerona and also at Leucate in the department of Aude. Both these species differ in conformation from the little grebe, being larger and with longer necks and different head profiles.

Although there are comparatively few bird images known from the parietal art of this region yet excavation has revealed that occupation sites to the north of the Pyrenees were rich in decorative carvings on animal bone and stone either depicting figurative images or more frequently, non-figurative and sub-geometric motifs. Yet even on portable objects, the range of species and the numbers of bird engravings was limited as compared with the abundance of mammal pictures (Chapter 6). Certain examples among both the parietal images and the carved and engraved objects give the impression of groups of birds moving through the mountains on migration at predictable seasons of the year. More often than not the direction of movement was westwards along the north side of the higher peaks to take advantage of the more accessible route at the western end in the gap between the Pyrenees and the 'Cordillera Cantabrica'. Certainly, the avifaunal record of some sites reflects a winter migration pattern of waterfowl, in particular. The parietal material is not definitive but in some of the caves there is a bias towards a portrayal of aquatic species.

The cave of Les Trois Frères, Montesquieu Avantes in Ariège, property of the Bégouen family, contains a number of engravings that have been recognised as avian in different galleries within the cave complex that was visited and used by Palaeolithic hunters over a long period of time. Much of the art in Les Trois Frères itself is associated with the Middle Magdalenian and C14 dating from bone found beneath brecchia in the Chapelle de Lionne gave dates of 14,060 ± 100 years BP GifA-99,550 (17,509-16,842 cal.).

The adjoining passages of the Grotte d'Enlène reveal a mainly Gravettian occupation with a C14 date of 27,980 ± 480 years BP. Although infrequent, the depiction of avian species along the range of the Pyrenees and Cantabria tend to be more clearly decipherable to the modern eye than some of those to be seen in the Quercy region to the north and are more likely to be determinable as at least as to genus. Such a generalisation is not without exceptions though it would seem to apply to a majority of the known images.

Amongst the bird drawings, the most enigmatic image in Les Trois Frères is in the Chapelle de la Lionne that is thought to represent a large corvid perhaps a raven *Corvus corax*. Engravings in two locations have been described as representing the snowy owl *Nyctea scandiaca*. The best known of owl figures is in the Galerie des Chouettes, drawn on an overhanging rock lintel between this passage and the Salle de Gours. The engraving shows two birds apparently seated above a dark space that reads as though it were the branch of a tree. Between them is a small shape that may represent a young bird and above the group are patterns of lightly engraved marks that are not normally subjected to interpretation. The two larger birds are in a crouching posture, unlike the erect stance of the Chauvet owl, a posture characteristic of the snowy owl, whose habitat and behaviour differs considerably from the arboreal or perching species of the family. At the present day their habitat depends on open spaces of marshlands on the edges of tundra. The winter habitat lies within the timberline and it makes roosts and nests on raised hummocks (Potapova and Sale 2012). The placing of this group of images fronting the viewer and yet slightly crouched matches the photographic record in recent studies of actual owls of the same species. The rather indistinct marks that appear around the heads of the two adult birds are difficult to decipher but in a fanciful sense it might be suggested that they represent the cloud of small birds gathering to mob the owls.

Figure 5. Snowy owl engraving at les Trois Frères. Photo: courtesy R. Bégouen.

A medieval misericord in Gloucester Cathedral shows just such an episode, where both the Gloucester carving and a 3rd century mosaic from the 3rd Century Roman Town of El Djem in Tunisia illustrate the use of owls to deliberately attract small birds, whose defensive response is to attack the supposed predator in self-defence.

A second drawing seen also as a snowy owl was traced by the Abbé Breuil in the Galerie de l'Hémione in 1958 (his chair may still be seen in the gallery, where he left it). Although the indeterminate drawing of the hind limbs of this bird image shows them overlong, its general shape and position is sufficiently similar to the group in the Tréfond of the Galerie des Chouettes to justify a specific comparison. It is interesting that

in the same gallery a grouse femur was also found, since grouse, particularly willow grouse and ptarmigan *Lagopus lagopus* and *L.mutus* are a regular winter food of these owls in their natural habitat.

Elsewhere in the galleries of Les Trois Frères are drawings of two further bird species: In the 'Couloir du Faisan', between the Sanctuary and the 'Salle de Gours' on a surface polished smooth by the passage of bears is a finely executed engraving of the so-called 'pheasant'.

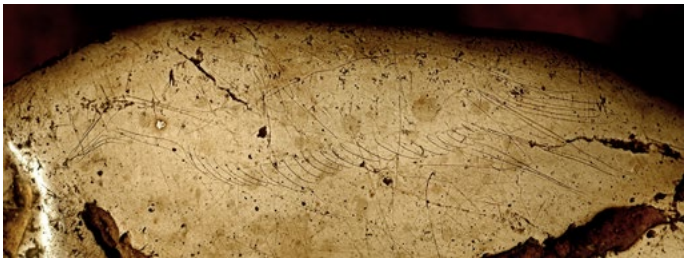


Figure 6. Engraving of the 'faisan'.
Photo: courtesy of R. Bégouen.

Identification of this bird has been open to discussion. It is clearly a bird in display mode but the characteristics are somewhat mixed. Referred to as a pheasant, its beak is considerably longer and sharper that of either grouse, partridge or pheasant and more comparable with the common crane or a wader with a sharp bill.

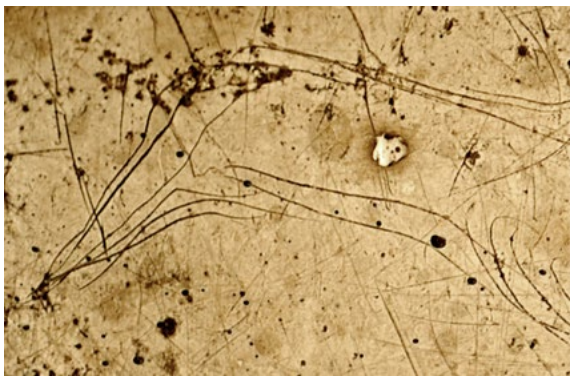


Figure 7. Les Trois Frères, detail of head and of neck 'Phaisan'. Photo: courtesy R. Bégouen.

The raised wattles or feathers on the back of the head are like those the black cock, *Tetrao tetrix* on display, and the tail feathers appear to echo the form of a wader in crouching position if we assume that the long legs have descended into the mass of the rock. There are no well attested records of *Phasianus colchicus* in Western Europe during the Last Glaciation. Consequently, on close examination, the drawing is deceptively complex. Engravings of avian forms with long legs and necks are relatively frequent in figurative engravings on portable objects of the period and this figure on the walls of les Trois Frères is a fine example.

Figure 8. Les Trois Frères, 'Phaisan' Detail of tail feathers. Photo: courtesy R. Bégouen.

In addition to these, among the engravings on the bear-polished panels of the Salle de Foyer, beyond the Salle de L'Hémione and uncovered between 1985 and 1990, was found a very accurate engraving of another wader, perhaps a crane, if the head feathers, long legs and enlarged knee joints are taken into account. And, with no obvious association with the birds are the four 'signes' engraved beside the head of a feline in the Galerie de l'Hemione. As traced by Breuil in 1958, they take the form of crescents and are bisected by a double line filled with lines of inverted Vs. Described as a 'tectiforms' they nevertheless recall the kite shaped linear forms that occur in the Quercy caves of Pech-merle and Cougnac as though they could be a shorthand way or sign of giving expression to the presence of scavengers hovering as though there might be a potential for pickings among the human debris below.

Le Portel Loubens Ariège

Situated around 35 kilometres to the east of the cave of Les Trois Frères, not far from the summit of the Pas du Portel, the small number of images on the wall of Gallery 1 in the cave of Le Portel includes one small figure, amongst a preponderance of painted bison, that may legitimately be supposed to trace the outline of a bird. Recorded in 1955 by Breuil and Jeannel, this simple outline compares closely with the profiles of the three snowy owls in the Tréfond at Les Trois Frères in both stance and shape but reference has also been made to its similarity to some of the 'mask/ghost' images that are frequent in the compositions of Magdalenian date. Nevertheless, the way the black-painted figure is positioned and the vestiges of marks around the back, belly and tail of the creature suggest something closely akin to a possible snowy owl. However, Leroi Gourhan (1968) was chary of making a firm determination not only because there were so few known avian portrayals in the parietal art of western Europe but also because these outlines, sometimes with marks for eyes and

possibly nose/beak appear in a number of parietal sequences in both Quercy and the Dordogne and are sometimes compared to the masks used for ceremonial costume in more recent societies.

Montespan, Haute Garonne

The cave of Montespan, in which a small stream flows through a number of galleries, re-emerging from underground at Ganties is best known for its clay modelled figures but in the Salle Ganties there is a single somewhat indeterminate engraving of a bird, supposedly swimming, with its head out of the water (Trombe and Duduc 1947), Crémades (1993) classified this image in a group of possible birds of indeterminable genus, yet it would seem to have aquatic associations like others within the Pyrenean group.

Gargas, Haute Garonne

Moving westward into the upper Garonne catchment, the cave of Gargas, at Aventignan lies not far from its junction with the river Neste. Amid the maze of line drawings on the left wall of the chamber known as the Camarin were identified two engravings of birds. It was noted by Barrière in 1976 that all the drawings in the Camarin at Gargas were executed with the left hand. One of the bird engravings identified has a heavy body, long curved neck and extended beak and is recognisable as a species of large water bird, probably a swan.

Figure 9a. Aquatic bird at Gargas, after Barrière 1976.

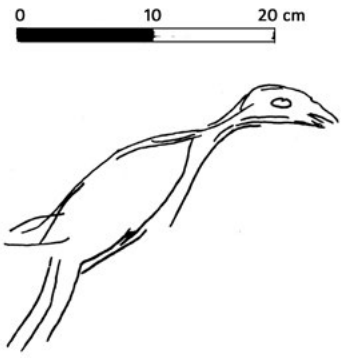


Figure 9b. Passerine engraving at Gargas, after Barrière 1976.

Figure 9b was described by Breuil (1952) as a game bird that may, alternatively, be read as a species of passerine, possibly a jay, *Garrulus glandarius,*, or, more exotically perhaps, the way the markings are drawn, it could conceivably be interpreted as a roller, *Coracias garrulus,* an interpretation that is in reality less than likely since the bone record shows finds of this species only in the Azilian deposits of the Trou Violet in Ariège (Barrière 1976). A much more probable interpretation to the recent observer might be to liken it to a Jay, *Garrulus glandarius*, a member of the crow family that is currently abundant in the tree covered zones of Aquitaine and the Pyrenees. Between them these two rock drawings appear to reflect an interest in an aquatic species that may be good to eat or to exploit as a source of fats, bone, feather or for insulation, and a passerine species, whose ethology was perhaps integral to the seasonal cycle of the surrounding countryside.

La Bastide, Haute Pyrenees

The prehistoric sector of this long cave complex close to the main stream of the Neste river, has been known and explored since the 1860's and it was Norbert Casteret in 1932 who alerted Comte Henri Bégouen to the importance of the engravings. Subsequent visitors, principally in 1955, did irreparable damage to the figures rendering those in the Salle des Felins very difficult to decipher given the friable nature of the limestone. Jaques Omnes' publication of 1982 gives a very fair impression of what may be seen of the parietal art and the engraved plaquettes of schist recovered by Casteret and Simmonet during their excavations around the hearths in sector II some 100 metres from the entrance. Bone from the excavations in the Foyer gave a C14 date of 14,260 ± 440 years BP Lys 1405, a date consistent with the Magdalenian attribution to the engravings. In sector VI at the far end of the cave is a small figure with a long neck and short, broad beak that has been identified as a goose. Only the head, neck and part of the back were represented but a line of quite pronounced engraving bisects the figure midway up the span of the neck. The line appears to be secondary to the burin marks delineating the bird outline and might, among other possibilities, be interpreted as a water level were the image intended as a unit. It is recorded

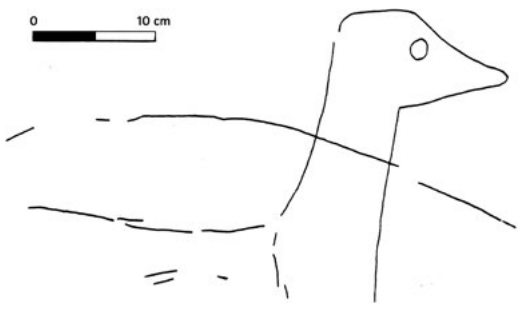


Figure 10. La Bastide, engraving of a goose, Omnes 1982.

(Omnes 1982) as being a left-handed drawing, unlike most of the other decipherable images in the cave.

The western end of the French Pyrenees, the Pyrenees Atlantiques is rich in cave occupations of the Magdalenian periods and in faunal remains of all kinds but very little evidence of parietal art despite a quantity of engraved bone in the occupation sequences. The situation changes across the modern border in the cave sanctuaries along the foothills of the Cantabrian chain from Guipuzcoa westwards to Asturias, although there is very little reference to bird species, amongst a proliferation of mammalian depictions. Two sites only in Santander province have any direct reference to avian forms:

Altxerri, near Orio, Guipuzcoa

In the cave of Altxerri on the right-hand wall of a small side gallery, there is an engraving of a bovid with a fat figure perched apparently on its back.

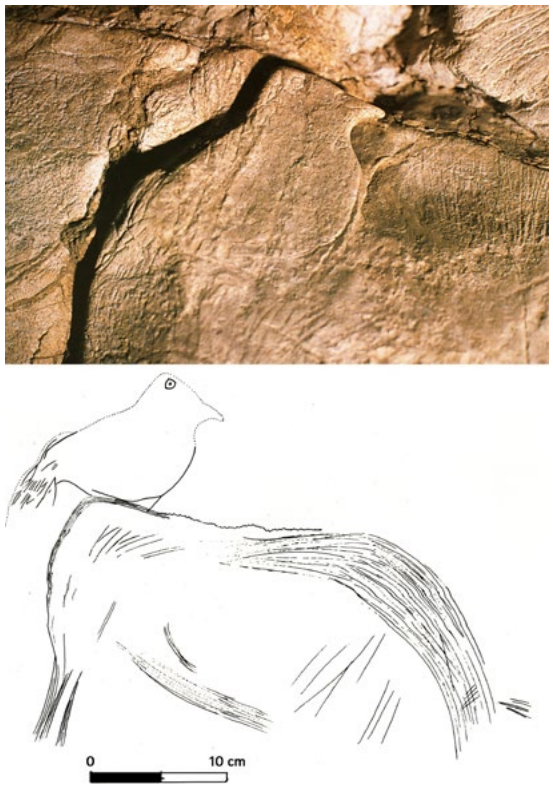


Figure 11. Bird picking insects from the rump of a bovid. Drawing after Appellaniz. Photo: courtesy J. Altuna.

Altuna and Appellaniz in 1976 interpreted the drawing as a bird but made no further comment. The photograph taken subsequently by Dr Jesus Altuna shows that while the quadruped is an engraved outline, the profile of the bird is in low relief using the outline of the rock surface to emphasise the solidity of the image. It was further noted by Crémades in 1993 in an article on the theme of birds in parietal art but he regarded the image as indeterminable as to species. Nevertheless, its perch on the hind quarters of a bovid provides some clue as to its function if not its species. In the mobiliary art this motif features fairly frequently and is a theme on Magdalenian spear throwers; birds apparently picking insects from the rumps of herbivorous animals, often, as at Enlène and Bedheilac, the patient is an ibex. At the present day the same service may be performed by egrets in southern Europe or by corvids or starlings in the north. It may be supposed from the short beak that this well-nourished creature might be a crow. Faunal remains of the common starling *Sturnus vulgaris* were in evidence among the birds from caves in the area, notably Aitzbitarte IV, Ekain and Erralla and across in Santander province at El Castillo. The bird bones recovered at Altxerri itself were almost exclusively made up of choughs bones *Pyrrhocorax sp.* This is a subject that is of some importance in daily life at the time. In a society that depended to a considerable extent on skins for shelter, clothing and protective cover of all kinds, damaged skins were highly undesirable and the activity of birds that helped to control the insects that might penetrate the hides and spoil them was worthy of note.

El Pendo

This cave in the commune of Carmargo, some 15 kilometres south-west of Santander, contained a long sequence of much excavated Middle to Upper Palaeolithic occupation. In the final gallery at the end of the cave are two birds that have been identified as great auk, *Pinguinnis impennis* (Figure 12). It is one of 105 panels of engravings in El Pendo. A drawing was made by the Abbé Breuil in 1908, who suggested that one of the birds might be vulture but a later drawing of the panel by Michael Eastham in 1968 found that there was no obvious distinction between the conformation of the two birds that are poised on the rock facing in opposite directions, the one in front of the other.

Unlike the auks in Cosquer, these birds are stationary as though on a rocky perch above the sea, with wings folded, whereas the Cosquer figures appear to be moving their short wings as though swimming.

Chufin

Some 30 kilometres to the west of El Pendo, the cave of Chufin, situated outside the hamlet of Riclones near the Rio Nansa, may also contain an image of some kind of wading bird, but the dating is uncertain (Almagro Gorbea 1975; Cabrero 1977) The description implies that a degree of fantasy has entered into the depiction and there has been no specific determination.

Other bird associations in the rich art of Cantabria do not appear to be evident from the published material, except that the Abbé Glory (1965) claimed a type of

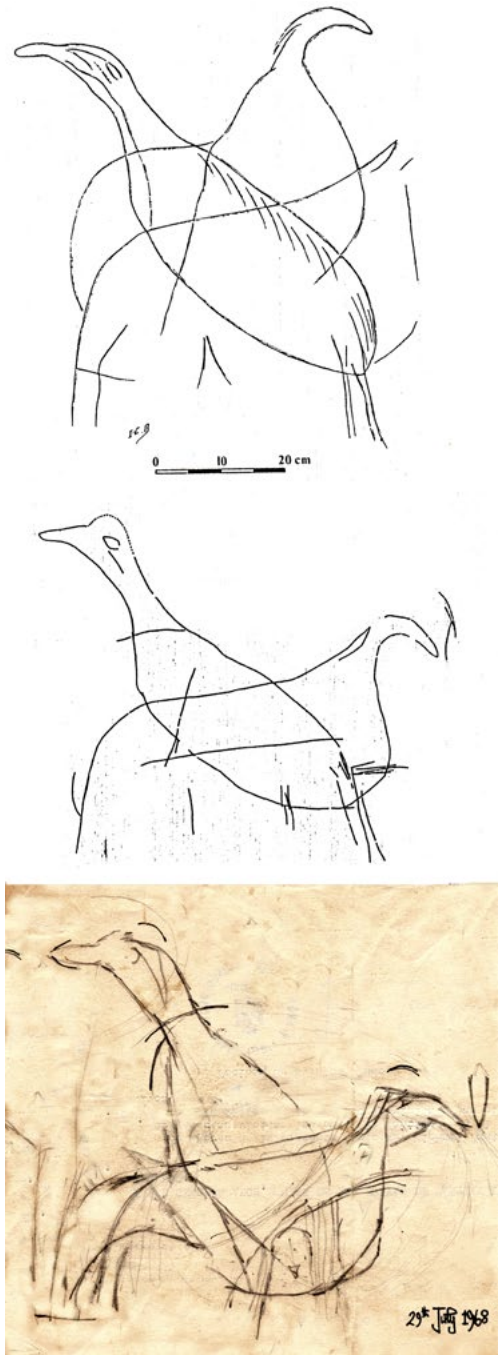


Figure 12. Drawings by H. Breuil 1908, I. Barandiaran 1980, and Eastham 1968 of the auks at El Pendo.

galliform in the cave of La Pasiega at Puente Viesgo. There are also some curious distortions to other figures, especially the anthropomorphs. This feature was highlighted by Lamming-Emperaire (1962) with regard to composite creatures and noted in particular the bird headed man/men engraved on the ceiling at Altamira which she compared with the Man/bird figures at Pech-Merle and Cougnac, though these last seem less similar. The bird headed theme extends to sites further south in the Iberian region as well as in Aquitaine. Just as Lamming-Emperaire compared the Altamira figure with this drawing, so Lorblanchet compares the

Figure 13. Lascaux, bird headed man and staff. Photo: CNP N. Aujoulat.

image of the man with the 'bird-headed man' and his staff in the Puits at Lascaux. Each image might imply a storyline, a concept that used to be thought to be outside the scope of Palaeolithic parietal art.

Southern Spain

In Malaga and neighbouring provinces there are a number of important decorated caves like Nerja and La Pileta near Benaojan in the Ronda or Nino in Albacete but bird images have not been discovered in any of them. The only depiction that may equate with an avian species is a small figure of the head of a bird with an exaggeratedly extended beak in the cave of Ardales. Bahn compares it with the long beak and rounded small head of one of the deeply engraved, enigmatic profiles in Church Hole, Creswell, Derbyshire. There is some doubt as to whether these outlines refer to avian subjects at all. But equally, the Ardales engraving has certain similarities to a cormorant *Phalocrocorax carbo/ aristotelis* or Gannet, *Sula bassanus*. Bones of both species have been recovered along this coast.

Aquitaine: sites in southwest France

The catchment of the Lot valley and region of Quercy

In the catchment of the Lot and the Aveyron, during the whole span of the Upper Palaeolithic the use of caves and rock shelters for both habitation and other activities was extensive. The paintings of the decorated caves of Quercy have undergone many years of intensive study, initially by Canon Lemozi, followed by the Abbé Glory and during the second half of the twentieth century by Michel Lorblanchet and his colleagues. In some senses the parietal art of these sanctuaries appears to present a different pictorial vocabulary from that of the Pyrenees and Cantabrian caves. Image making in

some of the decorated caves in the region belongs to a phase that pre-dates the Magdalenian to which most of the Pyrenean sanctuaries are ascribed. Pech-Merle, for example, seems to have been frequented and in use between 28,000 and 22,000 BP and belongs to the Gravettian as does Cougnac; while other caves in the Lot region and on the Aveyron contain images from the Magdalenian.

Pech-Merle, Cabrerets, Lot

Some of the elements that characterise the Quercy group as Gravettian and distinguish them from the Magdalenian are defined by Michel Lorblanchet (2010) as the reduction of forms to their salient features and the use of composite animal figures. Both of these features are evident in the depiction of bird shapes. At Pech-Merle, of which there is a concentration surrounding the 'Homme Blessé' in the corner of the Salle Préhistorique. The wounded man himself is shown in reduced form and it is possible to question whether the shafts around his body are actually penetrating it or whether he is preparing to launch them for the kill. In either case the angular signs hovering about him may be thought to represent raptorial birds waiting for the moment when the victim falls to the ground and they can exploit the kill.

Figure 14. Cougnac, outlines suggesting the profiles of flying birds, with the wounded man. Photo: courtesy M. Lorblanchet.

Cougnac, Commune de Payrignac, Lot

Around 40 kilometres to the north of Pech-Merle, at Cougnac outside the small town of Gourdan, a similar reductive method was used on bird-shaped signs. There is a panel of 10 complete and incomplete winged, semi-geometric shapes very similar to the shapes at Pech Merle. Dissociated from these, at the far side of the main frieze, is another humanoid figure apparently pierced by staves, drawn in black inside the cranium of the outline of a red mammoth, a separation that may deny any of the possible connection between the two that might be attached to the Pech-Merle design. In Cougnac, the panel of the 'aviformes' is seen along a gallery some 15 metres in length, with both engraved and black painted shapes, some complete and others only partial outlines on the same theme. These signs have simply been described in the literature as being bird-like in shape. Yet, only a limited number of species conform to a profile of sharply turned back wing tips against the direction of flight when riding the air. Kites and falcons among the raptorial species may be seen as having such a profile when about to swoop. Less probable in terms of their Palaeolithic range but forming a similar outline in flight are many of the gull species, yet, at that period gulls tended to be exclusively pelagic throughout the year. It is most likely if these outlines do refer directly to birds on the wing, that they expressed a generic rather than a specific perception. Other wavy signs that might be likened to these schematic interpretations appear at the smaller, Gravettian sanctuary, of the Grotte du Cuzoul des Brasconies at Blars in the Lot, on a panel in association with a painted outline of a horse. Lorblanchet (2010) compared them to the 'tectiforms' at Castillo, Altamira, La Pasiega and Ardales in Spain.

Roucadour, Themines, Lot (Lorblanchet *et al.* 2009)

Quite another ambiguity associated with bird/mammalian imagery is demonstrated in the parietal art of Roucadour.

Ambiguity associated with bird/animal imagery is not uncommon in the parietal art of Quercy and is a characteristic of Roucadour cave, in the Lot. The initial cave tracings by Abbé Glory in 1965-6 were followed by Michel Lorblanchet and his team between 2002 and 2007. Using more recent techniques, they recovered a more complete record of 12 panels and the full corpus of the designs within them.

Panel IV contains the bird headed quadrupeds. A number of the drawings represent horses that have strong arched necks similar to the necks of medieval war horses and the Lippizaners of the Spanish riding school. Like the horses in other panels in the cave, they all tend to have narrow heads like the Arab horses, even before any deliberate distortion. This is particularly marked in the outlines of at least two of the horses that are described as being "à tête de canard.

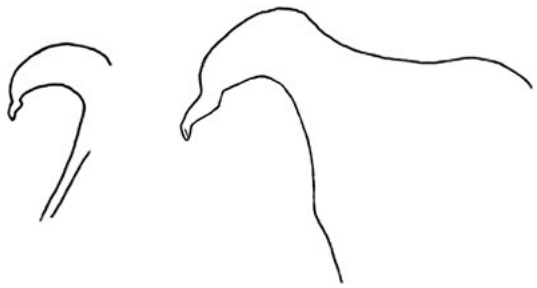


Figure 15. Roucadour, engraving of duck headed horse. Drawing: courtesy M. Lorblanchet.

In strictly anatomical terms, this feature is considerably elongated for a mallard, *Anas platyrhyncos*, though it might be compared with a shoveler, *Anas clypeata.* It might more nearly, in the context of the long, arched neck be compare to a swan *Cygnus* perhaps the mute swan, *C. olor*, on account of the possible indications of a knob on the beak and the graceful arch to the neck. The zoological comparisons remain inevitably obscure, though the features that they emphasise may be important in another sense. It seems possible that the references may have a different kind of figurative meaning encapsulated in the drawings of these bird-headed quadrupeds.

It is possible to consider that they express comments upon the nature of an individual animal that is figurative in a metaphorical sense. They may be an attempt to demonstrate certain qualities or characteristic behaviours among particular animals. It might, for instance describe the call of a horse with a noticeably staccato neigh like the alarm call of a duck. It might refer to a particular gait or action, if the animal splayed out its hooves to either side when at the trot and appeared clumsy, almost waddling like a duck, goose or swan on land, or even, it might suggest a certain gracefulness of conformation.

In the same way, the grouse headed animal, whose body appears as part deer, part horse might contain a multiplicity of behavioural references.

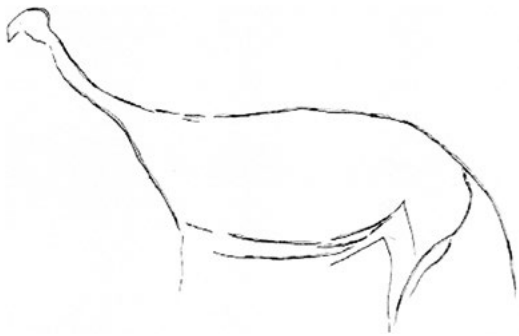


Figure 16. Roucadour, bird headed quadruped.
Drawing: courtesy M. Lorblanchet.

Anatomically, the drawing could be intended to represent either the black cock or the capercaillie, T*etrao urogallus*, in display mode though the probable, local ecology of the time makes the former more likely. Grouse, in particular the black cock, *Tetrao tetrix,* during the mating season or 'lek' put on a very showy display to attract a hen bird. The voice of the male at this time includes hissing and a bubbling call**,** while the female emits a kind of nasal whinny. Their movement too is characteristically explosive when taking to the air in alarm but, once in flight, appears to glide smoothly over long distances. Such action and behaviour might be thought to apply also to the movements of a particular quadruped when excited or disturbed, or give a mimetic sense of a type of call.

It may appear that this is taking an imaginative concept a great deal too far, yet highly visual imagery may be found in the earliest known literature, like the epic of Gilgamesh dating at least from the third millennium BC and in written texts from the second millennium. For an example, in the allegory of the forest journey Shamash appoints help from the elements:

> 'The north wind, the whirlwind, the storm and the icy wind, the tempest and the scorching
> wind. Like vipers, like dragons, like a scorching fire, like the serpent that freezes the heart,
> a destroying flood and the lightening's fork, such were they and Gilgamesh rejoiced'.
> (Sandars Translation 1960)

In the ensuing battle the enemy, Humbaba is 'as a raging wild bull'.

Some 1500 years later, Homer is even more prolific in his imagery. His dawns are always 'rosy fingered', or 'rose red fingered' and more extensive picture language emerges to illustrate the storyline. Such a picture is created in the description of the punishment meted out to Penelope's treacherous women attendants.

Supposing that something like such a comparison may hold a possible clue to an acceptable interpretation of some of the analogies made between animal species by the hunter-gatherer draughtsmen of Roucadour, it reveals something of their intimate understanding of the local ecology and introduces an element of caricature into their making of parietal imagery.

Escabasses, Causses de Gramat

This cave in the same commune as Roucadour contains a number of painted images of horses and caprids, signs and partially eroded figures. At the end of the Galerie Canet there is an engraving of a duck, probably a mallard *Anas platyrhyncos* with its beak wide open. It is drawn in an extremely realistic manner, unlike the composite figurations at Roucadour, only 2 kilometres away.

Dordogne and Charente catchments

Despite the rich heritage of figurative carving on bone implements and ornament from the very large number of sites of human occupation during the entire timespan of the Middle and Upper Palaeolithic settlement of this region, there is extremely little evidence of bird imagery on cave walls. There is a drawing copied from an engraving on the walls of the Grotte de Saint-Cirq of a duck or goose (No 54) by Lya

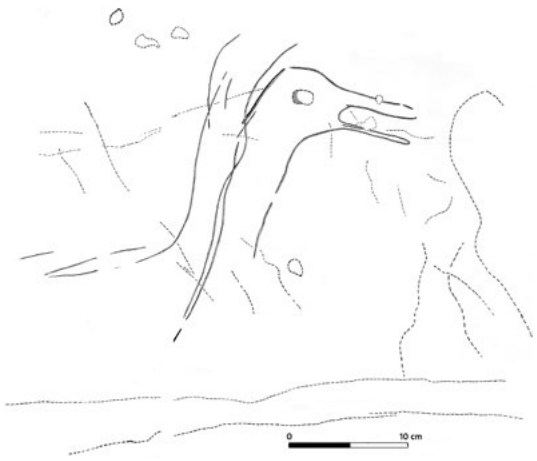


Figure 17. Duck engraving at the cave of Escabasses. Tracing courtesy M. Lorblanchet.

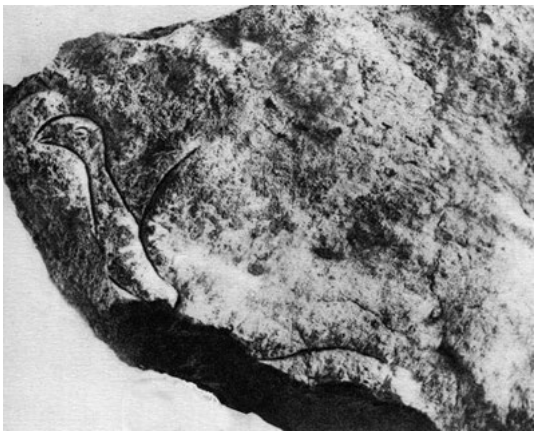


Figure 18. Roc de Sers, Low relief carving of a grouse.

Dams in 1980, but there seems to be no photographic confirmation.

Le Gabillou, Soursac, in the valley of the Isle, contains a large number of images engraved into an extremely fragile rock surface. Tracings of these were made by Dr Gaussen during the 1960's. On the right-hand wall near the entrance he found an engraving that might be classified as bird. It has a large head, indications of a crest and of legs that might suggest a passerine species Crémades (1993) places the drawing in the indeterminable category, with possibly some justification.

Loire Catchment

Roc de Sers, Vienne

The recording of the site by Martin (1932) found a single sculpture of a bird forming part of the frieze of bovids, horses and ibex. Although some of the blocks making up this continuous panel had fallen from their original position, the bird figure had remained in situ. The low relief shows the outline of the head and body with the wing drawn back as though taking off into flight, a precisely typical posture of a member of the grouse family when disturbed. The drawing of the head confirms the impression that the figure may be intended as a grouse.

Seine catchment

The most northerly known example in France of Palaeolithic parietal art, the Grotte de Gouy, near the port Saint Ouen, Seine Maritime was studied extensively between 1973 and 1989 and it has been believed that a complex of engravings cut into the chalk near the entrance included a long-necked bird. The extraction of a bird shape from the tracing is difficult to read, partly because the head is somewhat equine in shape. However, the outline of a blunt ended right wing, downcast left wing and forward thrust legs can be extrapolated from the lines overlying them. Some studies have revised this reading and the faint lines with an alternative interpretation resolving the series of superimpositions thought to represent feminine figures, signs and horses (Martin 1989). The treatment of all the engravings of horse and bovid is unusual, employing many parallel lines to create texture and by comparison with other sites in Aquitaine has been dated to the very end of the Magdalenian, with possible Azilian affinities. It is an image very difficult to access and remains open to the individual interpretation of the viewer.

The engravings of mammals in the Grotte du Cheval at Arcy sur Cure on a tributary of the Yonne, south of Auxerre, are drawn with greater definition but do not feature any figures that have been interpreted as avian.

Britain

Church Hole Cave, Creswell Crags, Nottinghamshire

Although flint artefacts from a number of occupation phases and a few pieces of bone supporting engravings of Upper Palaeolithic levels had been excavated from the caves in Creswell Gorge from the 1870's, it was not until 2003 that some very fine parietal images were discovered in Church Hole cave (Bahn and Pettit 2009). Two sets of outlines have been compared to those with birdlike qualities. The first, CH1-8 shows a series of lozenge shapes that it was concluded are much closer to some of the classic signs for the female form than to anything avian. The second outline CH17, (Figure 19) has been likened to the head and part of the head and neck of an ibis, a determination. that apart from the fact that it seems unlikely on environmental grounds, may not be a valid reading of the image, given the dates following the Last Glacial maximum for this period of the use of Church Hole: flowstone below the images, U series 14,400 ± 160-170 and 10,900 ± 120 years

Figure 19. Church Hole cave, Derbyshire, engraved bird. Photo: Alun Bull at English Heritage and Creswell Heritage Trust.

BP; radiocarbon 12,200 ± 100 years BP OxA-3717 and 12,250 ± 90 years BP on antler. Two alternate readings of this low relief engraving present themselves: that it may represent something like a freestanding antler tine and besides, 19th century changes to floor level of the cave may have obliterated some of the original drawing.

Discussion

Such a small corpus of images of birds in the parietal art of the Upper Palaeolithic of France and Spain makes it very difficult, to draw any general conclusions. There are some variations of concept in the imagery, between the metaphorical implications of the Quercy depictions and the more or less 'naturalistic' of some of the Pyrenean and Cantabrian cave art, yet even in the case of the latter, the drawing appears more abstracted than that of the majority of mammalian figures. The seasonal behaviour of migratory birds, the impression that 'one day they are there: the next, they are gone', certainly confused the early medieval world and might have played some part in the enigmatic way in which they were perceived during the Palaeolithic.

In a hunter-gatherer world birds were most probably considered primarily for their usefulness and in terms of how their behaviour related to human need in much the same way as other aspects of the animal world were understood. It was their understanding of the seasonal habits, movements and general ethology of the natural world around them that rendered it possible for these groups of people to make full use of them for their material needs. This may be seen in the preponderance of figurative images that appear to represent aquatic and game bird species. However, this seems to be only hinted at in the parietal art and there seems at the same time to be a further dimension in the art, and one that reaches beyond the physical. It seen in the visual metaphors of the signs, the bird headed beasts and the composite and fantastic animal forms that appear to represent a world beyond. Yet, in so interpreting these marks, we may be imposing our recent perceptions onto the Hunter-gatherer and in doing so failing to perceive their real intention.

Chapter 6

Bird images in Palaeolithic portable art

Decoration of bone and stone objects seems to be an essential part of life for Hunter-Gatherer peoples of the Upper Palaeolithic, especially in the most favourable regions of Europe. Like the decoration of cave walls, the majority of such finds appear to belong mainly to those areas of the highest population density suggesting that social contact stimulated decorative production and relatively easy living conditions allowed time for some leisure activities. Finds of ornamented objects are less frequent in localities where living was harder and communities more restricted, or lacked outside contacts. Additionally, differences in post-depositional conditions may have been more or less suitable for the conservation of the objects, of which a selection are illustrated here.

Decoration and imagery on avian bone

In general, decoration as it was applied to bird bone tends to take the form of abstract, geometric or sub-geometric shapes more frequently than figurative images. Figurative designs are found engraved on avian elements but are more commonly applied to mammalian bone, antler or ivory, or stone supports.

In the search for themes in the images applied to these different types of support, it would appear that in western Europe, as far as current evidence goes, there are no examples of bird shapes engraved onto avian bone. Bird outlines appear on sections of mammal bone, ivory, antler and stone plaques and pebbles but not apparently on bones from birds. There may be cultural reasons for this but at present they are somewhat obscure.

There is considerable disparity in the local distribution of engraved avian bone on different sites. Even in situations where suitable bone was present from species that were often worked elsewhere, no bone was found to have been engraved, whilst from other

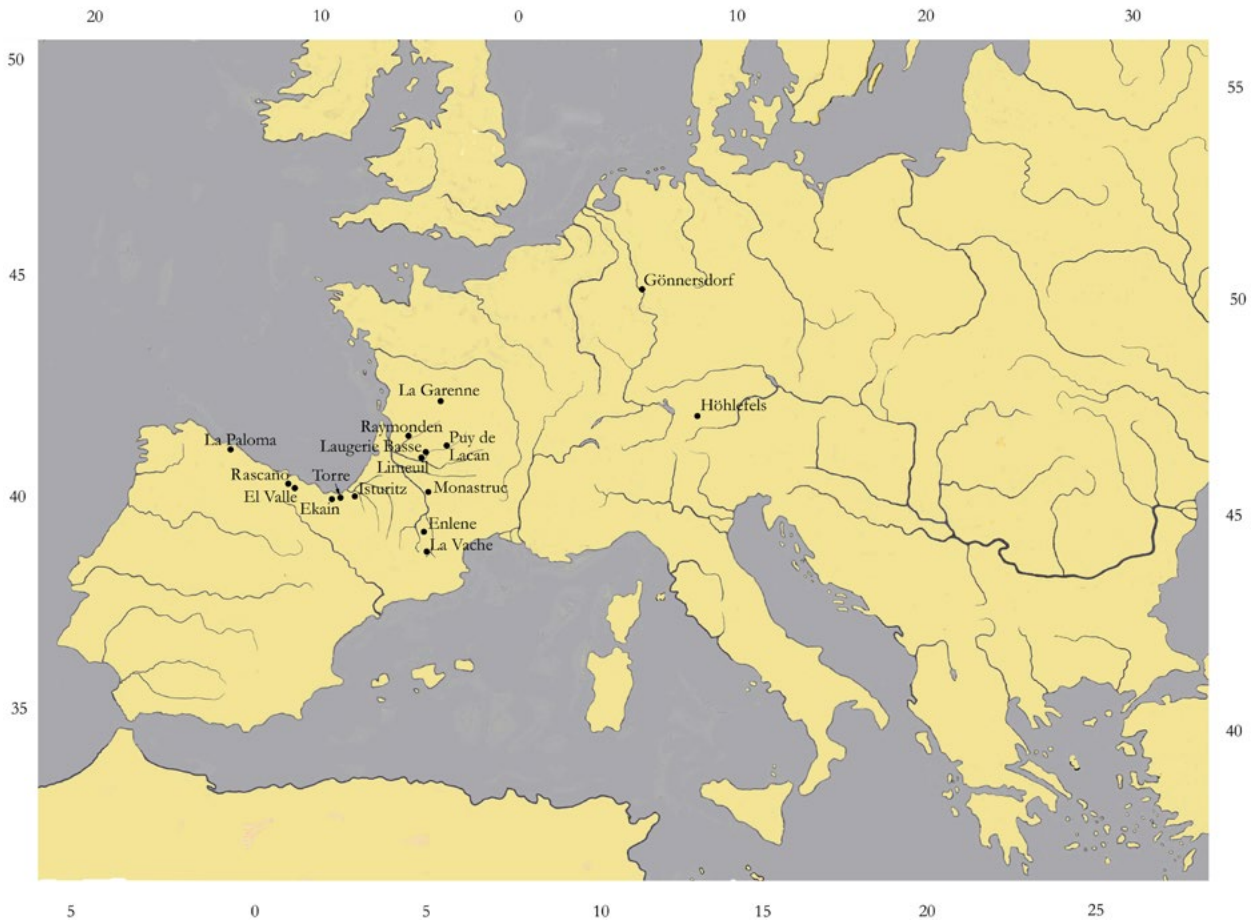


Figure 1. Map showing the approximate location of sites discussed in the text.

deposits a notable percentage of the assemblage was found carrying designs of some kind. Yet, despite these local variations, some kind of deliberate, decorative or non-functional decorative marks, figurative and non-figurative were applied to bird and mammal bone during every phase of the Upper Palaeolithic (Sieveking 1987).

Portable art of the early Upper Palaeolithic

The earliest dates for examples of the decorative arts and sculpture are recognised as belonging to sites in the north and east of Europe. Burial and other finds from sites on the Russian plain, like Sungir in the Volga valley or Kostienki on the Dnieper or the Siberian sites around the Ob, Yenisei and Angara river catchments demonstrate a considerable interest in personal decoration with plaques and figurines of carved mammoth ivory. Some thirteen of these from Mal'ta layer 6, in the Russian province of Irkutz, represent aquatic species of bird. Two of them are duck-like and swimming and others have wings and necks outstretched in flight, and are thought to represent swans or geese (Cook 2013). Unfortunately, their location falls outside our target region and these figurines are not illustrated in the current chapter.

On the basis of recent movement patterns, arctic breeding species of ducks geese and swans should have arrived in their breeding habitats before the end of May, when the neighbourhood would be noisy with the calls of the diversity of ducks, geese and swans on their way to breeding stations. Among them might be a number of dabbling ducks, including wigeon, teal, mallard, pintail and shoveler, probably accompanied by tufted duck, scaup, and scoters, long-tailed duck and golden eye. Fewer species of geese actually breed in this part of the tundra except for the eastern race of the bean goose but both the white fronted geese and the lesser white fronts may be passage migrants through the region on their way to breeding grounds further north. The large whooper swan currently breeds near the lakes, rivers and estuaries of this part of Siberia, and some of this eastern population may winter on the shores of the Caspian and the Ural seas, unlike the Bewick's swan, whose breeding habitat is along the coastal strip south of the Barents and Kara seas and on Nova Zemla. The pattern of their autumn migration generally takes them in a south westerly direction either towards the Black sea or through Fennoscandia to wintering sites in Western Europe.

The mammoth-ivory carvings with their emphatically lengthened outstretched necks have affinities with the geese but compare much more closely with the outline of swans in flight and, most probably with the local populations of the whooper swans, whose return in spring must have been eagerly anticipated by the early Upper Palaeolithic inhabitants. Not only announcing a seasonal arrival but also bringing a new supply of vital resources.

Further West, at Höhlefels in Baden Wurtemberg a carved figure of an aquatic bird in flight repeats the theme of seasonal migration as it might be experienced by the inhabitants of Mal'ta.

Figure 2. Ivory figures of an aquatic bird in flight from Hohlefels in Swabia. Photo: N. Conard, University of Tubingen Museum.

Western Europe

A number of museums hold collections of complete or fragmentary bird bones carrying diverse, engraved marks from all periods of the Upper Palaeolithic. The British Museum, for example, has samples of Magdalenian engraved bone in the Christy, de Lastic and Peccadeau Collections, that include specimens from French cave sites: La Madeleine in the Vezère valley, and Courbet and Monastruc in the Aveyron (Sieveking 1987).

In France, major collections of Palaeolithic portable art are held in a number of national museums like the Musèe des Antiquités Nationales in St Germain en Laye, MAN; the Musée National de Préhistoire in Les Eyzies, MNP; the museum in Perigueux, MAAP; University departments like Toulouse and Bordeaux and many of the departmental museums, as well as some that remain in private institutions. The Piette collection, given by Édouard Piette to the MAN at the beginning of the 20th century mainly represents finds from famous sites in the region of the Midi-Pyrénées and contains magnificent examples of engraved and sculpted tools and objects in bone, antler and ivory utilising mammalian and some avian elements. The ornamentation comprising both figurative and non-figurative motifs decorate a diversity of supports, stone as well as bone and, in the case of Le Mas d'Azil painted as well as engraved. A volume devoted to this collection was finally published by the museum in 1964 (Chollot 1964).

Decorated bone in regional areas of France and Spain

The Midi Pyrenees and the Cordillera Cantabria

The sites along the chain of the North side of the Pyrenees and the Cantabrian coastal demonstrate the

regional nature of Magdalenian culture, consequent on the mobile lifestyle of the inhabitants, so that the same themes and techniques of carvings and engravings were repeated in settlements usually in clusters spaced at some distance one from another. According to current understanding of these settlement clusters, there would appear to have been a concentration on the Ariège and along the upper Garonne valley, extending into the Hautes Pyrénées. There was another group at the western end that extended along the Cantabrian coast. Between each cluster, within and even beyond the group, there would appear to have been some level of exchange of ideas.

La Vache, Ariège. Collection MAN

A recent and comprehensive study was undertaken of the Magdalenian occupation of the Grotte de la Vache, Ariège and its material culture, held at MAN at St Germain en Laye.

Situated on the left bank of the Vicdessos river, a tributary of the Ariège, and opposite the cave of Niaux, La Vache was investigated in successive excavations from 1866 under the direction of Dr Félix Garrigou and between 1941 until 1964 when Romain Robert completed his exploration of the Salle Monique. It was finally published by MAN in 2003 (Clottes and Delporte eds. 2003). Four levels of Upper Magdalenian were recognised, although the stratification has been considered a little arbitrary, as noted by Clottes and Delporte in their introduction (ibid p. 8-10). C14 dates were obtained for both levels, couches 2 and 4 in 1957 from the Groningen laboratory: Couche 2. 12,540 ± 105 years BP (GRO 2025), Couche 4. 12,850 ± 60 years BP (GRO 2026).

Columbia University in the same year achieved a date of 11,650 years BP, a finding that tied in more closely with the assessment of the palynology record, (A. Leroi Gourhan and S. Thiébault 2003), placing the occupation within Dryas II.

La Vache contained a remarkable assemblage of objects, including decorated pebbles, animal bone and antler tools, for hunting and domestic equipment: sagaies, chisels, polishers, needles and pendants for personal adornment. There was besides an unusual proportion of decorated tubular long bones of birds, totalling 102 pieces. Some were recovered almost complete and others in segments. They were variously found either among the remains from early excavations in the Salle Garigou or in the sections opened by Romain Robert in the Salle Monique. Any determination of avian species from which the bones derive is a little uncertain. Most appear to be wing bones, long and straight and many of them comparable to those of raptors; there are a number that may be identified as waterfowl and one almost complete ulna from a large wading bird. One curved, engraved ulna had been taken from a species of grouse, probably ptarmigan.

The lists of avifaunal species for the site as a whole that were identified by (Koby in 1957) differ slightly from the more recent study by Pailhaugue, though consistent with the determinations given for some of the decorated specimens. The total number for the bird remains in the Salle Monique amounted to 54,724, of which 52,627 belonged to members of the grouse family with the grey partridge, the next in numerical importance. Raptorial and aquatic birds represented a very small proportion of the identified unmarked fauna, yet were a significant element of the worked and engraved bone. As part of her doctoral thesis of 2000 Laroulandie studied the scrape marks on the grouse bones, mainly Ptarmigan, recovered during excavation of the Salle Monique. Almost all of the undecorated material had scrape or burn marks that were indicative to her of preparation for consumption.

The main concentrations of worked material appear to have been recovered from the level described as Couche 4 in the Salle Monique but it was noted that the bone was very much broken. Some pieces showed signs of prolonged use and some matching sections were scattered across locations some six or more metres apart. It was noted that signs of use and wear was a characteristic of almost all the decorated bone, both mammalian and avian. It raised the possibility that the nearly 600 engraved items distributed across the chamber might have been deliberately broken, perhaps because their useful life as tools or ceremonial objects was finished or, perhaps, because the power and efficacy had gone from these pieces and they therefore needed to be destroyed. Therefore destruction was deemed to have taken place in antiquity rather than during the process of excavation. The pattern of breakage appears to have been the same for both avian and mammalian bone.

A not dissimilar situation was proposed by Vanduver and Soffer (1990 and Cook 2013) to have operated at Dolni Vestonice, Predmosti, Pavlov and Petrkovice and used as an explanation for the apparently deliberate smashing of the loess formed ceramic animals destroyed during the firing process; suggesting that it formed part of a performance ceremony. The Dolni Vestonice figures have been dated to the early part of the Upper Palaeolithic sequence, more or less coincident with the Swabian Aurignacian sites and the parietal paintings in Chauvet, whereas the La Vache material belongs to the later stages of the Magdalenian, so that if the sacrificial intention was real it was something that persisted over an extensive period of time.

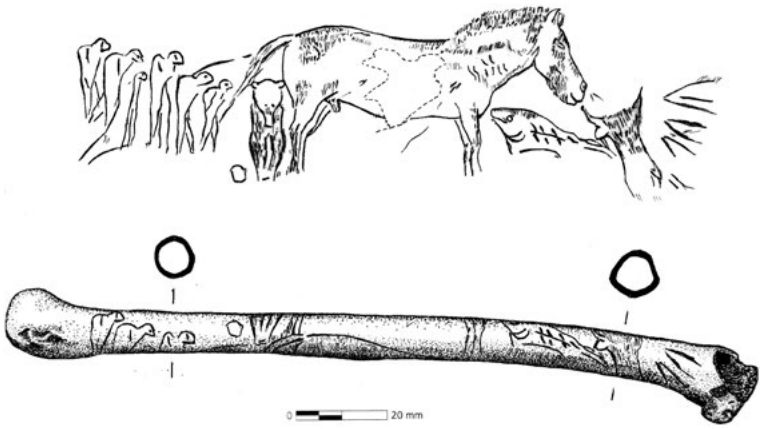


Figure 3. La Vache, Initiation scene MAN 83. 349 Clottes and Delporte 2003.

An example of the pattern of the dispersion of matching fragments is evident in the story of the bird ulna, depicting what is described as 'the Initiation scene'.

The engraving was applied to the ulna of a raptor, whose morphology and dimensions appear very similar to those of snowy owl. Sections of this piece were found separately in Carrés 3/4 and 95, some seven metres apart. Fitted together they represent a complex scene of a stallion with a bear standing upright beneath his tail and a group of fish, one shown as a salmonid under his nose. A further shape that may be the tail of a fish but was identified by the Abbé Breuil as a young bovid. Behind the horse is a line of six figures, assumed to represent men but whose stance gives them an appearance similar to meercats. Such a series of engravings on a single bone might be deemed to carry a message or story of some significance but nevertheless it would seem to have been broken up in antiquity.

Out of the entire assemblage of 102 decorated tubular bone pieces from La Vache identified as bird bone, 15 may be read as figurative in that they depicted recognisable animal shapes or parts of animals. The remaining 87 appear to be non – figurative. There are few images of birds actually depicted on the avian supports, most of the birds appear to have been engraved on pieces of mammalian bone.

Apart from the absence of birds, the themes of the images on the bird bone do not differ markedly from those in the larger corpus of engraved mammalian segments. The animals engraved are mainly those that were common in the locality at the time; horse, ibex, deer, fish with some carnivores and a number of indeterminate creatures. One set of images might appear to be odd in the physical context of a cave in the valley of the Vicdessos. The support is the ulna of a large raptor, with the dimensions of some species of eagle. The well-drawn engraving shows a pair of salmonids/ seals followed by a shoal of small fish depicted in a more abstract form than the animals they pursue. They are described in the literature as Salmonids, that is the most probable interpretation but the treatment of the heads does not fit with any definition of a salmon and nor does it compare with other salmon engravings in the same collection.

Since it is unlikely that seals would have been able to penetrate as far upstream into the relatively narrow valley, the engraver may have abstracted the idea for the image from recent memory.

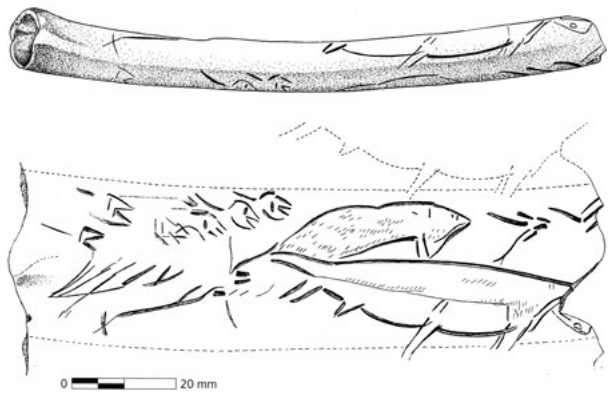


Figure 4. La Vache, Seals/salmon and fishes MAN 88 12.

The non-figurative marks on both mammal and bird bone show considerable variability; from simple hatching, notching, transverse or oblique lines to elaborate patterns with a high degree of geometric precision. The La Vache assemblage is fairly representative of the range of patterns used on other sites during the Magdalenian cultural sequence of the Midi-Pyrenees region and were repeated on a number of the pieces recovered in La Vache. The designs include the full range of notches, chevrons, transverse dots, longitudinal and oblique lines, hatching, feather or arrow shapes, or meanders in any combination, sometimes on a single face or around the entire surface of the bone. The same motifs were applied to both avian and mammalian bone. In many instances, however, the incomplete nature of an individual design tends to inhibit the interpretation of the marks as they may be read at the present day.

To a twenty-first century observer, the technical and aesthetic quality of the engravings on both mammalian and avian bone varies considerably throughout the La Vache assemblage. There are marked differences in the way the burin/engraving tool is applied. Some examples present with very light, fine, even and sure lines, with indications of texture; others are deeply

excised, cutting almost through the structure of the bone. Some lines are precise, others appear random and, whereas there are pieces that show an absolute sureness of line and artistic competence, others are more clumsily managed. Assuming that the published collection from La Vache is non-selective and includes the entire assemblage of bones recovered during excavation, it would seem that the figurative or non-figurative decoration of objects was in relatively common usage and the intrinsic skill in performance appears to have been of lesser importance than the message it carried. We do not know whether the aim was to create a document, a talisman or a maker's mark, yet the distinctive ways in which the marks were made on the bones in this collection, almost suggests that it might be possible to hazard a guess as to the identity of the individual that made them.

Engraving on avian bone was restricted by the dimensions of the support, so that the bone has frequently to be rotated in order to read the composition. This is typically the case for the figurative images on avian bone from La Vache. Yet it was also the practice for many of the pieces engraved with non-figurative motifs.

The range of bird species used as supports for engraving at La Vache appears to have been restricted to those whose limb bones are sufficiently straight and robust to be successfully carved when fresh. Mons and Pigeaud (2014) analysed the worked bird bones from a series of sites in the region in order to identify the species most frequently used as supports. They studied samples from Le Mas d'Azil. La Vache and Lortet in the Pyrenees and from Torre in Guipuzcoa. The majority of supports were bones from large raptors, mainly diurnal, some were from goose and swan and occasionally from a large wading bird. The only exception was a gannet ulna from the cave of Torre in Guipuzcoa (Barandiaran, I. 1971).

Bird bone used to carry engraved decoration does not, on the extant evidence, appear to be quite as frequent on other sites in the region as at La Vache. Nevertheless, there are examples from the majority of the Pyreneen caves. Most of these carried non-figurative motifs consisting of abstract, parallel, transverse lines, zigzags or counterpoised oblique, parallel grooves or chevrons. Yet, there were besides some very finely drawn figures of deer, and caprids or ibex, quite apart from the famous collections of carved mammalian bone and antler. Most of which are conserved in MAN at St Germain en Laye; some bearing partial animal engravings and others purely abstract motifs. Over time, the caprid forms became reduced to a schematised face-on image indicating horns, ears and muzzle and the exquisite and ubiquitous horse representations were reduced to very small figures of the head.

Similarly, an exploration of the large number of occupation sites along the Cantabrian coast has revealed little evidence of the extensive use of bird bone for everyday use as tools or for decoration and finds of pieces engraved with elaborate images have been found on only a few sites. Some of this may be on account of the damp Atlantic climate in the west affecting the provinces of Oviedo and Galicia in particular that does not favour the presence of the large raptorial species that are commonly exploited elsewhere.

Among the best known of examples, from the cave of El Rascano in Santander province, is a tubular section heavily incised with grouped incisions in transverse parallel lines, dated to the Lower Magdalenian. Some of the marks are quite deeply cut, others lighter and less certain. A later and more complex image on a small proximal section of vulture ulna from La Paloma in Guipuzcoa shows the heads of two red deer hinds facing one another with open mouths, from which pours their exhaled breaths. Eyes, ears and small antlers are indicated and the short facial hair and longer coat on the throat and chest clearly differentiated (Gonzalez, C. 1987). Another, a complete left ulna, of the approximate dimensions of a black kite, *Milvus migrans,* from the cave of El Valle is more complex. The engraving shows an upper frieze of one horse following another, in front and below their feet are hatched lozenge shapes and at their tails part of the antlered head of a stag. The lower level of engraving has a stag's head seen horizontal to the plane of the horses and viewed face on with, in line towards the proximal epiphysis of the ulna, five further hatched lozenges. The motif of an animal usually ibex or deer seen head on, entirely from the front, is a recurrent one in Cantabria and also in some of the sites along the chain of the Pyrenees such as Gourdan.

The images on the gannet ulna, *Sula basana* from the cave of El Torre also in Guipuzcoa are even more enigmatic Again, there are two levels to the frieze: in the upper level, in line towards the proximal

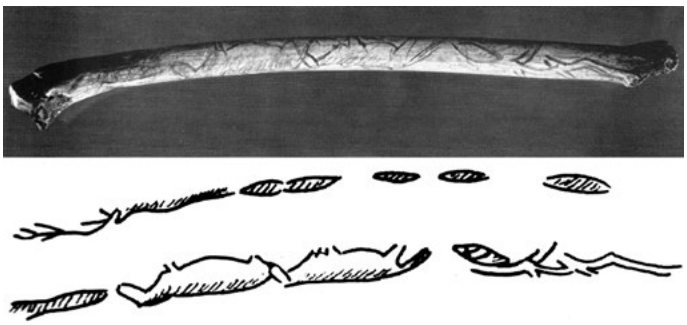


Figure 5. Engraved ulna from El Valle, Museo Provincial de Prehistoria Santander.

Figure 6. El Torre frieze, drawing: Barandiaran 1971. Photo: J. Altuna.

Figure 7. Arancou, long-necked bird engraved on avian ulna.

epiphysis of the bone is the head and forequarters of a stag, followed by the head and forequarters of a small horse and in the rear the head and body of an ibex, seen in part from the front that has indications of further sets of horns above and behind it. Both stag and horse also have marks that may represent other heads or horns to the back of them. The lower register reads in the opposite direction, towards the distal end of the bone, showing the head and neck of an aurochs with a grasshopper, or similar insect on its back, and followed by a second aurochs. Behind them, what appears to be a bearded humanoid figure extending a shaft in the direction of the animal figures. The entire piece is drawn with precision in a naturalistic manner but the iconography remains somewhat obscure.

The elaboration of decorative and figurative imagery on tubular bird bone from cave sites along the chain of the Pyrenees and the Cantabrian coastal strip has been considered here in some detail and there has appeared a certain consistency in those images dated to the Magdalenian. So far only the engraving on bird bone has been considered, without considering the importance of the application of avian derived illustration to other objects of daily or special use on other kinds of support in the same regions.

Despite a very large number of birds and a diversity of species recovered from Isturitz (Bouchud 1952) and from sites in the locality, like the complex of rock shelters, Duruthy and Dufaure at the base of the Pastou cliff, beside the Gave d'Oleron (Delpech in Arambourou 1978 and Eastham in Strauss 1995) and the Grotte de Bourrouilla at Arancou (Eastham in Chauchat 2000 and Eastham 1999), and from the cave of Isturitz to the South. Only a few bird bones appear to have been decorated, with only limited number of avian images on mammalian bone and other supports, since a major theme of the art from these sites appears to have been concentrated on the horse and carvings of horses, a theme also evident at Gourdan and Lortet.

On the other hand, there was a large ulna from the Magdalenian levels of the Grotte de Bourouilla at Arancou with a long-necked, long-legged bird engraved along it.

At Isturitz there was another very fine drawing of a grouse on a section of reindeer antler found by Passemard in the Grand Salle.

A further avian image was recovered at the Grotte de Bourrouilla, at Arancou, during excavations is an

Figure 8. Engraving of a grouse on reindeer antler from Isturitz, MAN No 74851. Photo: Eastham.

Figure 9. Bird perched on the rump of a quadruped at the Grotte de Bourrouilla. Photo: Carole Fritz CNRS.

example of a passerine bird was engraved perched on the hindquarters of a quadruped. This engraving is on a section of mammalian rib 42.9 mm in length and notched along the sides as part of a polishing tool. The style of the marks is less refined than that of the horse sculptures on other sites like those of Sordes l'Abbaye but expressively drawn.

The elaboration of decorative and figurative imagery on tubular bird bone from cave sites along the chain of the Pyrenees and the Cantabrian coastal strip has been considered here in some detail and there has emerged a certain consistency in those images dated to the Magdalenian. So far only the engraving on bird bone has been considered, without considering the importance of the application of avian derived illustration to other objects of daily or special use on other kinds of support in the same regions.

Bird designs on other supports of animal bone, antler and stone

It was noted in relation to the La Vache collection that the bird bone rarely features avian imagery. The same is not true of the engravings on deer antler or mammalian bone across the region. To take the La Vache assemblage initially, there are more specific depictions of birds, or abstract forms that might have bird associations on mammal bone plaques and objects of use than on avian bone.

The strangest of the La Vache pieces is a large section of deer antler, described in the literature as 'the sceptre'. It is piece some 210 x 20/21 mm maximum diameter and appears to have been carved for its symbolic meaning rather than as a tool. On it are carved animal heads. At the base of the section of antler, on one side is the head of a male salmon, mouth open, eye and gills incised in detail; above the fish is carved the head of a bovid, or conceivably a hind, with elongated head and neck that extends up the shaft to equate with the wing of the bird at the top. On the opposing face at the same level as the salmon, is found the head and torso of a feline and higher on the shaft of the antler another head, possibly a horse or bear. The topmost figure from both aspects is the head, neck, and within the constraints of the dimensions of the shaft, indications of the outward jut of a folded wing. Evidently the sculptor had clear intentions as to what kind of bird he represented. It is a raptor. It has some similarities with the fishing eagles, *Haliaeetus sp.* But, with its elongated neck and head is anatomically closer to a vulture, a probable species in that region; perhaps *Gyps fulvus* or possibly, *Aegypius monachus,* griffon or black vulture. It is worth noting that while the mammalian images face towards the lower, cut off end of the antler, the bird points upwards into the air that argues the possibility that the roughened base of the object was mounted on a staff when in use. Such might bring into play the suggestion made by Nougier and Robert (1976) that the sculpture symbolises water, in the fish image, earth-in the predatory-lion or bear and herbivore, deer or horse, and air, in the bird, symbolised by a species like a vulture that dominates the skies from a great height. The symbolism possibly used here might perhaps be compared with image of the 'Papillon' or vulture painting in the Salle Rouge at Chauvet. This is clearly intended as a complete sculpture in the round, representing the head perhaps of a staff or rod of office. It will be compared with the baton from the Magdalenian levels of Laugerie Basse in the Dordogne that carries a low relief figure of a crane.

In abstract mode it is possible that some of the lozenge forms on bone or antler that carry more naturalistic drawings of other animals may be read as also representing bird life in geometric form. There is this suggestion in relation to the pendant with the leaping horse from La Vache, it is a motif that is found elsewhere, as on one of the pendants from Raymonden now in Perigueux Museum, MAAP. Equally suggestive of flight is the frequent use of barbs or feather shapes. Often these may be interpreted as representing barbs or arrows and may be shown as such, especially in relation to wounded or hunted animals. Yet occasionally, as on the polisher from La Vache, MAN 83 068, feather shapes float in front of the head of a bison and above three

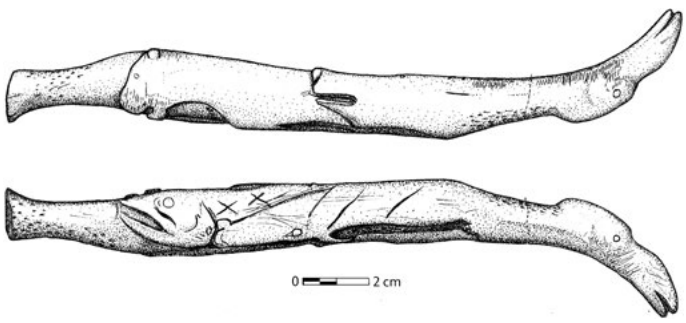


Figure 10. 'Sceptre' from La Vache, MAN 83 346.

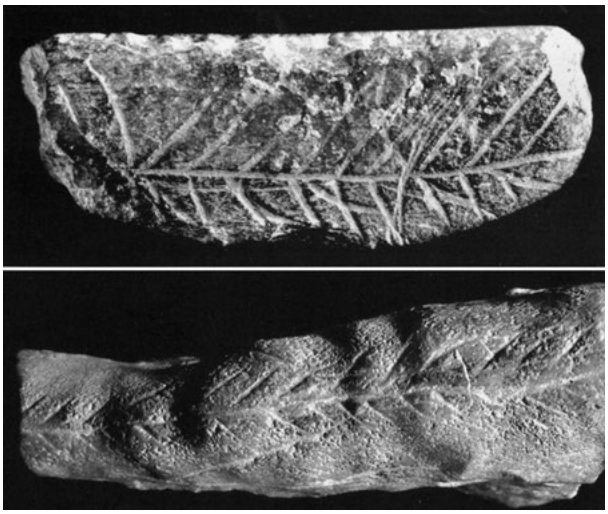


Figure 11. Limeuil and Teyjat, barbed images carved on calcite and stone.

globular figures of indeterminate shape and identity; these feather- like outlines do not seem to represent weapons.

The significance of feather images is not clear but this would appear to be another element of avian anatomy that might conceivably have been used as the inspiration for the manufacture of hunting equipment. The development of harpoon design during the period of the Magdalenian became quite elaborate, especially the typology of the barbs that attain a close similarity to the claws of avian raptors: vultures, eagles and owls and with which they grasp their prey. The excavations at La Vache and other sites in the region furnished some excellent examples of the range of harpoon types in common use (Julien 1982 and Tymula 2003). The types are divided between those with unilateral and bilateral ranks of barbs, some are widely spaced, others are more compact and thought to be either proto-Azilian, or late in the Magdalenian sequence. The barbs differ in form and the angle at which they spring from the shaft and in the way in which they are fashioned: smooth, incurved or grooved. Some have a groove or channel on the under-side others have grooves cut in the sides of the barbs, all designed to facilitate loss of blood. If there exists a parallel to be made, it might be equated with the terminal phalange of raptorial birds. All of which have powerful weapons in the shape of their claws. As a generalisation, eagle, falcon and accipiter claws tend to be relatively smooth and down curved with a grooved under side; vulture and owl claws especially digit 3, may have sharp grooves on one side. This is extremely marked in eagle and snowy owls, which are capable of taking large prey. These features become more developed with the age of the bird. The facility with which raptorial birds may be seen to grasp their prey makes it worth considering whether the similarity of bird claw to barbs is purely imitative

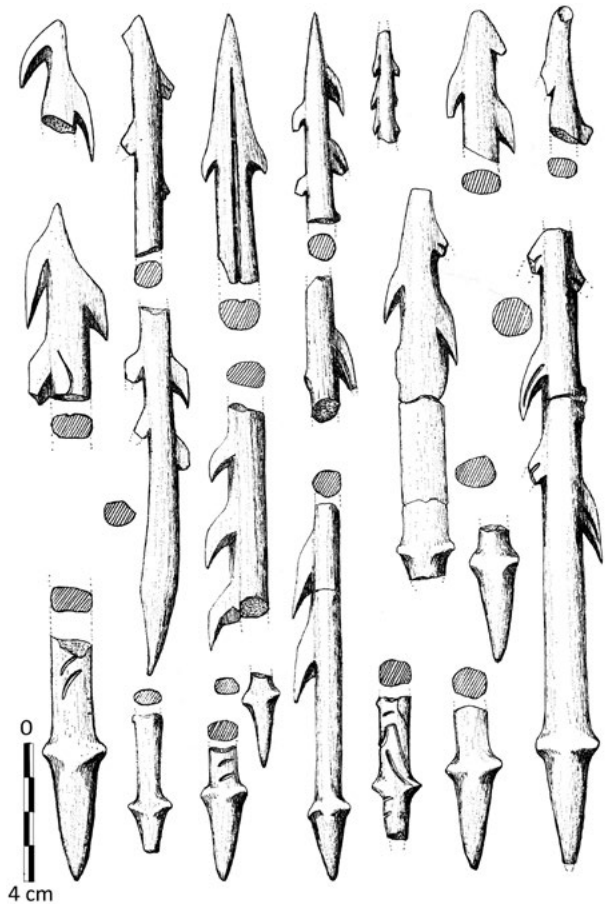


Figure 12. Harpoon designs from Duruthy after Arambourou 1978.

of an avian weapon or whether it also includes an element of metaphor.

Many articles of equipment like spear throwers use carving as a functional part of the equipment. Spear throwers from the Magdalenian appear to have a particular significance for the hunter-gatherer

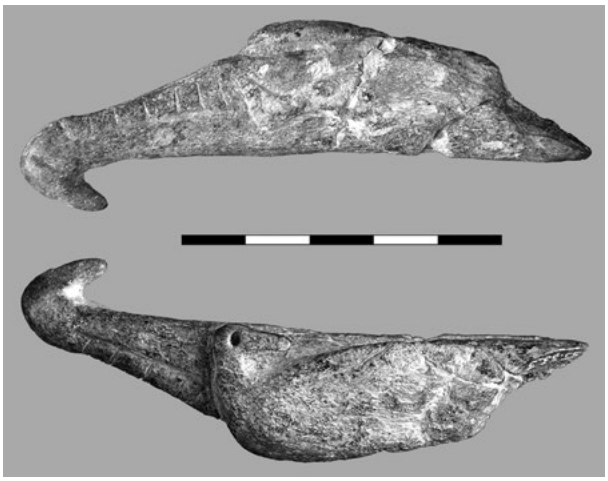


Figure 13. Spear thrower from Enlène. Musée de l'Homme 55 53 3. Photo by Romain Pigeaud and drawing: H. Breuil and Claire Belllier.

communities of the Pyrenean region. Many of them have elaborately carved animals decorating the projection usually carved with images of mammals often of ungulates in pairs or singly. One from the Middle Magdalenian at Enlène, Ariège is sculpted into the form of a pair of waterfowl, one of which forms the rest for the spear shaft (M.H.55.53.3). (Mons, L., Péan, S., Pigeaud, R. 2013).

Spear throwers carrying animal carvings, caprids, deer or bovids often have extra bosses attached to the tail, that have been interpreted as representing birds pecking at insects on the back of the animal. Such behaviour is characteristic of corvids creating a type of symbiotic relationship to a mammalian host. Other sites in the Pyrenees with similarly carved spear throwers include the caves of Bedheilac, Le Mas d'Azil and Le Portel in Ariège, the Grotte de Gazel in the Aude, Gourdan Haute Garonne and the Grande Salle in Isturitz and Saint Marcel, Pyrenees Atlantiques. One from the Mas d'Azil is of a faun with two birds perching on the tail. It is similar to that from Bedheilac yet this one is complete with three holes in the shaft used to thread leather thongs that retained it after the spear had been released.

Figure 14. Spear thrower from Le Mas d'Azil. Photo: A. Alteirac.

Some designs of birds are used in variable forms in different regions. The ungulate headed spear thrower is one example and the outstretched long-legged bird with extended beak another. In the Salle Monique of La Vache was recovered a chisel shaped tool MAN 83 363, engraved on one face the tail of a fish with the head of a ruminant and on the other the schematic outline of a bird with extended legs, well defined primary feathers, long neck and sharp beak, that might be interpreted as a crane, *Grus grus* or, less plausibly, a heron, like Figure 7 on page 95.

Figure 15. La Vache 83 363, Crane image on a bone chisel.

A comparable drawing on a mammal rib bone appeared in excavations at the Cauna de Belvis in the department of Aude within fifty kilometres of La Vache in direct line (Sacchi 1979). Both images are dated to the Upper Magdalenian and are not dissimilar, although the Cauna de Belvis draughtsman appears to have been in some confusion as to the anatomical position of the legs. These images show marked differences from a crane engraving on an antler baton found in the Middle Magdalenian deposits at Laugerie Basse. This is described as a wader 'échassier' but the conformation of the engraving strongly suggests that a crane may be intended.

Figure 16. Antler baton from Laugerie Basse, J.-J. Cleyet Merle and Madelaine, S. 1995 MNP no 620. Photo: P.H. Jugie.

It may be compared with the engravings on bone and stone at Monastruc in the Aveyron now in the British Museum.

Pieces from the Peccadeau collection in the British Museum from Monastruc present images of two birds with extended necks one on a chunk of mammalian bone) and the second engraved on a waterworn pebble. The bone fragment shows what seems to be a large bird with a heavy body, extended neck, broad square beak and well-marked eye. Oblique strokes outline the position of wing feathers. The pebble engraving shows the bird standing upright on a ground surface that is indicated by a crack on the pebble. Wing and breast plumage are clearly delineated on the body, from which the neck-or necks- rise in a series of sinuous, serpentine curves to a narrow head or heads with sharply pointed beak and oval eye (BM 637).

Reading this image, it could be interpreted quite simply as an image of a pair of cranes, or, alternatively, it may be an attempt to portray movement. Just as the multiple legs of the caprids in the cave of Colombier in the Ardêche and of the horses on limestone drawings make it appear as though the animals are running, so

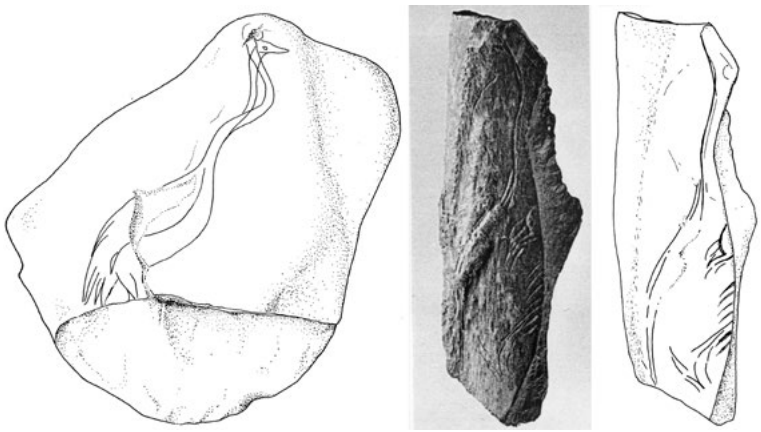


Figure 17. Bone plaque with engraving of a long necked bird and a pebble on which the birds may be seen as a pair with necks entwined BM Nos 637 and 671, after Seiveking 1987.

the twisting heads of the cranes in this image show the bird scanning its surroundings in case there is danger approaching.

Cranes are a migratory species at the present day. The western European population usually moves between northern Europe and southern Spain from early September onwards, returning to breeding areas in March and April but stormy weather may hold up their passage over the Pyrenees or through the Rhone-Alps regions for a time.

Clearly the passage of cranes migrating through the Pyrenees was recognised by the occupants of the cave of La Bastide as seen from an accurate engraving on a fragment of schist shows an image of the species.

Archaeological remains of these birds during the Upper Palaeolithic are infrequent but do occur and the pattern has been a little blurred by a failure for a time to recognise the differences inherent in the sexual dimorphism of cranes so that the bones of male cranes were thought to belong to *Grus primigenius* and only the remains of the females were recognised as the nominate species. Their passage through northern Europe and through France during the final Magdalenian may be scantily traced from a few finds recovered in a number of sites along a probable migration route. Crane bones were recovered in Schleswig Holstein at Meiendorf, a Hamburgian site of around 12,500 years BP: that is likely to have been a summer breeding site. The Rhineland settlement of Gönnersdorf may have contained some remains and there were finds of Mousterian date at Baume de Gigny in the Jura and possibly from a Magdalenian deposit dated to the Bölling at the cave of Romains in Ain. Remains of cranes probably on passage were found on sites in the Loire catchment at the site of Grotte Bois Ragot in Vienne and in the Grotte La Garenne on the Creuse. Further south, bones were found at Le Morin in the Gironde, the caves of La Madeleine and of Les Eyzies, on the Vezère in the Dordogne, Duruthy in the Landes, at the caves of Gouërris, des Harpons and Gourdan in Haute Garonne. The passage further south was evidenced by finds on Mallorca, Evissa and at the Cueva de Nerja in Malaga. Sporadic finds of crane remains of varying date have occurred along the migration routes

Figure 19. Diver carving from Ekain. Photo: J. Altuna.

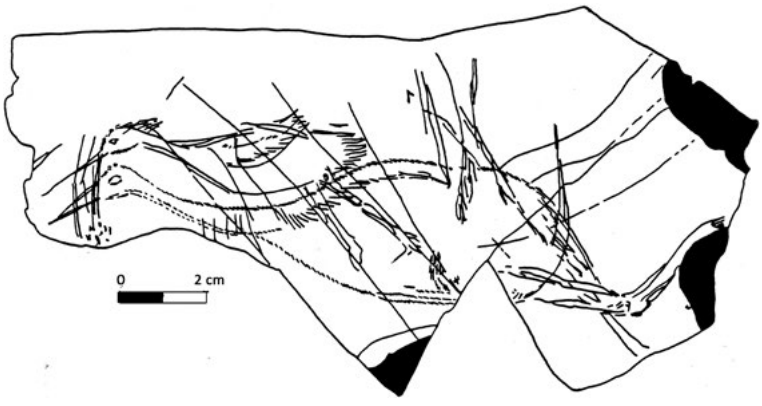


Figure 18. La Bastide crane engraving.

through Eastern Europe and around the Mediterranean towards the end of the Last Glaciation.

An example of a rare species seldom portrayed is a species of diver, *Gavia immer/arctica*. On a mammal rib bone from Ekain, Guipuzcoa, this quite small engraving, some 70.0 mm in length, creates an image of a swimming diver that is sufficiently detailed in the rendering of the plumage, that there has been some

debate as to which species is intended, great northern or black throated.

Divers or loons are equally rare in the fossil record. Some bones of black throated were recognised from the Romanellian deposits, dated to Dryas 3 at the Grotta Romanelli in Puglia, Italy. At Isturitz in the Atlantic Pyrenees it was uncertain which of the two species was present among the Magdalenian material in the Salle de St Martin, (Bouchud 1952) and at the Abri Dufaure, a short distance away on the Gave d'Oleron, great northern diver bones were found in a Magdalenian level, dated by 14C to 12,200-11,000 years BP. Of the two, it is the black throated that currently breeds the most extensively on the coasts of northern Europe, in Fennoscandia, the boreal tundra of Russia and in northwest Scotland; whereas great northern breeds in the Nearctic and subarctic zones of Iceland, and along the coasts of Greenland coast and North America. Both species winter mainly in coastal waters of the Atlantic and the North Sea as far south as southern Britain, Brittany and Iberia. The small amount of archaeological evidence we have suggests that, in general during periods of glacial advance, the winter habitats of divers like those of migratory geese, ducks and swans, tended to shift southwards by up to nearly 500 kilometres, although records exist of individual birds arriving accidentally in southern Europe and the Mediterranean coasts at the present day.

Aquitaine Region

Quercy

Compared with the use of avian bone and imagery in the Pyrenean and Cantabrian regions, the recorded evidence from sites along the valleys of the Aveyron, the Lot and the middle reaches of the Dordogne river catchments is sparse. The largest corpus of portable objects was recovered from caves along the Aveyron valley to the south and west of St Antonin le Val. A high proportion of these items were clearly designed for the ornamentation of clothing or to be worn as personal adornment in the form of pendants, necklaces, or armbands of animal teeth and shells. The valley contains a large number of cave sites but the most detailed studies have been carried out at the caves of Courbet, Fontales- now destroyed,- and the group known as the 'Abris du Chateau at Bruniquel'. (Ladier, E. and Welté, A.C.).

Dating of these objects is mixed, with a few pieces from the Aurignacian and Solutrean phases but the majority from the middle and later Magdalenian occupation of the region. Although these and other bone sections and water-rolled pebbles carry extensive engravings of animal and non-figurative origin, they feature neither avian bone nor images. Already noted at the British Museum are the engraved bird bones from the de Lastic and Peccadeau collections.

Few examples of bird illustrations have been recorded in the portable art objects recovered from the excavated sites in the northern section of Quercy, from sites situated near the rivers Dordogne and Lot. The figurative imagery appears to concentrate on mammalian subjects and a high proportion of these are engravings on to waterworn pebbles (Lorblanchet and Welté 1987).

Perigord

The Perigord region is so rich in discoveries from every cultural phase of the Upper Palaeolithic sequence that it is not surprising to find that a number of the avian bones were decorated. Many of the pieces carrying non-figurative designs are short sections of long bone, frequently cut from sections of ulna in short lengths with transverse notches decorating the length of the fragment. It has been widely assumed that these were made up into necklaces, bracelets or other items of personal decoration and as shown in museum displays they, like the pierced shells and mammal teeth used also for decoration, were recovered in all levels of excavation from early Aurignacian at La Ferrassie dated to 35,000 and 31,250 years BP (Gif 4279 and 4278) included examples from the late Aurignacian, and the Proto-Solutrean at Laugerie Haute, Fourneau de Diable and the Late Magdalenian at the Abri Cellier and from La Madeleine dated to around 12,600 BP.

Non-figurative marks are a feature of Magdalenian avian bone from the cave of Raymonden in the Commune of Chancelade on the Beauronne tributary of the Isle river. Two of the most carefully engraved were identifiable as the radius and ulna of a griffon vulture, *Gyps fulvus.* The radius, No. F361 in the MAAP collections, carried some 25 transverse lines along the margo interossa and further marks on the epiphysis.

The ulna had a series of lines curved to align with the indentation of the brachialis depression, the same theme of curved lines within an ovoid shape, a motif that was repeated on a section of diaphysis lower down the shaft.

The entire assemblage of bird fauna at Raymonden, taking into account the long history of exploration of the site, was varied, with a high proportion of snowy owls, grouse, dabbling duck and a few bones of eagle and vulture. Raymonden was not only a site rich in bird species with some good examples of worked bone but a number of personal ornaments, pendants and perforated disks are engraved with images that may be interpreted as avian forms. The engravings are well known but the interpretation differs yet they

Figure 20. Short sections of engraved avian bone used as beads for personal ornament. MNP, Les Eyzies. Photo: courtesy Ph. Jugie.

may be read as having an association with the good season.

The first is a pendant with part of the suspension hole still visible within marks indicating the outline of a fish tail, itself symbolic perhaps of a time of plenty. The dismembered limbs and body of a bison, only the head and vertebrae of the spine remaining intact, flanked on either side by rows of figures, four above the spinal column and three below, of which one appears to be attached to a branching rod and behind him a row of three further upstanding shapes. The base of the pendant is missing.

Both Leroi Gourhan (1968) and Marshack (1972) saw it as representing a ritual killing of a male bison. Leroi Gourhan described the scene:

> We see seven little fellows disposed in two rows beside a central path, which is occupied by a barbed sign; at one end, a bison's head and two legs seem to be lying on the ground as though they have been cut off. One of the men carries over his shoulder not a stick or a spear but a kind of broom. P. 134-5.

He read the spine of the beast as a symbol of masculinity and Marshack comments further on the poorly drawn

Figure 21. Engraved ulna from the site of Raymonden, MAAP no. F 469.

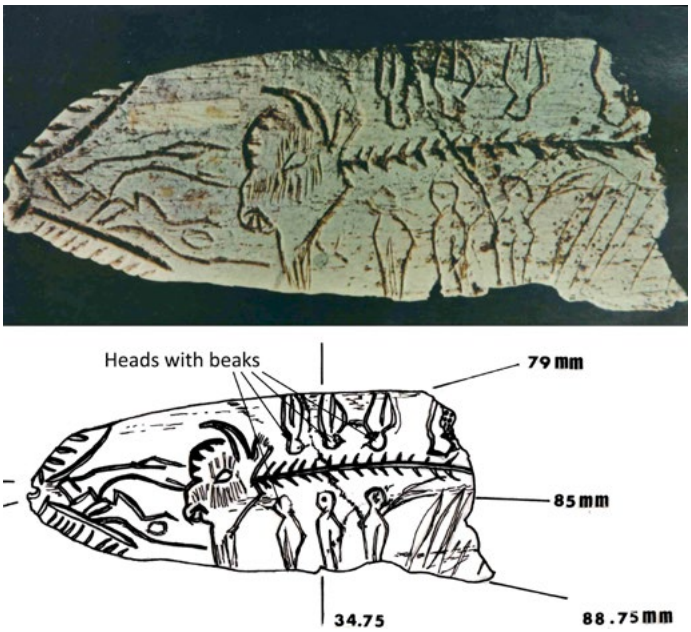


Figure 22. Raymonden Pendant. Drawing: Eastham. MAAP no. 2104.

'anonymous humanlike figures', in contrast to the naturalistic treatment of the bison. Under microscopic examination, however, these faceless figures resolved themselves into lines of creatures with rounded heads and engraved lines apparently indicating beaks.

A comparable piece is depicted on a section of mammalian rib discovered by Peyrony during excavations at Rousset in Les Eyzies. It shows the

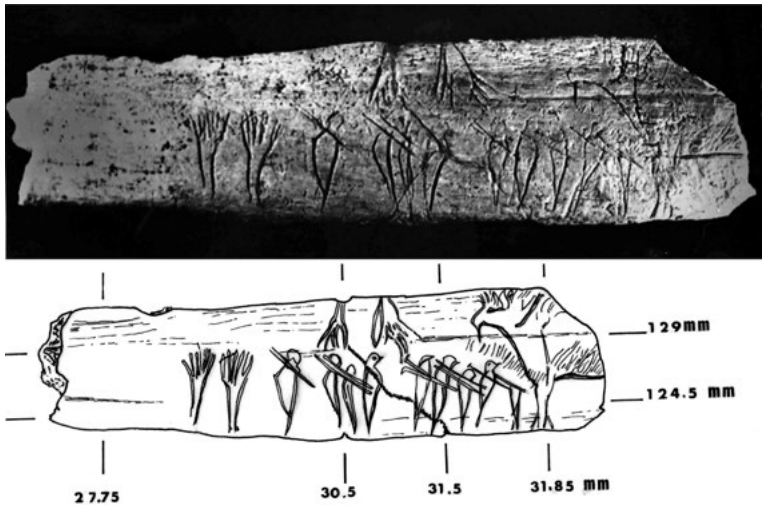


Figure 23. Drawing Eastham. Photo: PH, Jugie MNP.

forequarters of a bovid and a line of figures attached to obliquely slanted shafts or sticks and a pair of leafless trees.

This engraving was also commented upon by both Leroi Gourhan and Marshack; the former likening it to the sexual opposition between the masculinity of the hunters and the femaleness of bison and the latter as a presentation of a seasonal mythological rite of ritual killing during early Spring, linked to a concept of time and its passing. Yet again, under the microscope at the time of study, the line of figures, considered to be engravings of men armed with shafts or spears, showed centred on each face, horizontal lines that appeared to indicate beaks. These marks had at one time been partially obscured by a graphite overlay, which made a reading of either of the scenes described in the two pieces more acceptable as armed men than as perching birds, perhaps swallows, as was suggested by Eastham (1988). It is a suggestion that becomes perhaps less tenable in relation to the evolution of lozenge shapes as a motif for descriptive decoration and their use in creating abstractions of the human and other animal forms. This is evident in the figures behind the horse in the so-called 'initiation scene' (MAN 83 349) of La Vache, the bone fragment from Gourdan and possibly the development of female outlines of, for example, at Lalinde. A parallel shorthand expression may be found in the image of the leafless trees to indicate a time outside the 'good season', comparable, perhaps to the engraving from La Vache (MAN 83 068) that shows a bovid reaching its tongue out towards a row of leafless fronds. All these messages are abbreviated and as such may be capable of more than one interpretation;

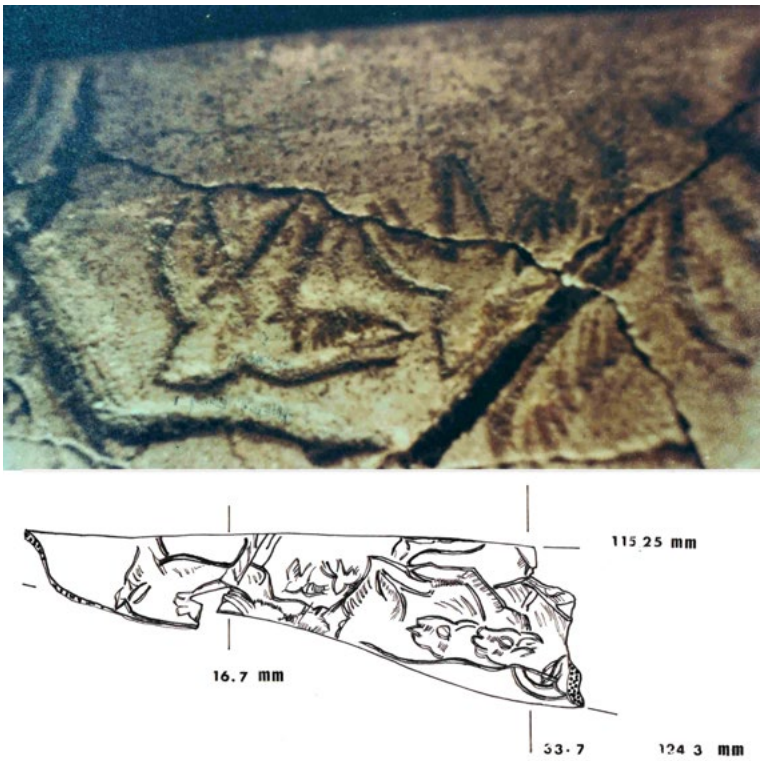


Figure 24. Caprid and bird pendant Raymonden. MAAP no. F475.

so that the figures on the Raymonden pendant and the Les Eyzies rib bone may be read not only as men but at the same time as birds or, more particularly as migrant species such as swallows with all the seasonal implications for current plenty and the incipient animal movements of an Autumn migration to come. The overlay of multiple intentions and readings is not uncommon in Upper Palaeolithic imagery either in parietal or portable art in its use of different types of support, as is also evident in the carving of the 'Sceptre' from La Vache, although sometimes it creates problems of interpretation for the reader.

A second engraved fragment from Raymonden may be considered more explicit. On a small section of bone 115.25 mm long with a large section missing, it pictures a pair of adult caprids and the heads of two kids and between the legs of the moving goats fly two small birds. They are clearly small passerines and could as easily be swallows or another insectivorous species. The detail is very fine, wings fluttering with primary feathers outlined, there is no ambivalence in the definition of this image.

Figure 25. Head of a duck at Raymonden. Photo: MAAP no. 2099.

In addition to these pieces of elaborate personal decoration, there was at Raymonden a small, carved head of a duck, it is somewhat abraded now and was probably part of a more complete piece but is worth a note to emphasise the richness of the site of Raymonden at Chancelade outside Perigeux beside the little stream of La Beauronne.

Compared with the importance given to depictions of horse, reindeer and ibex and even to carnivores and fish in the assemblages of mobile art from the region of the rivers Dordogne and Vezère, pictures representing either birds or feather designs on supports of antler, mammalian bone or stone pebbles or plaques are not only infrequent but often difficult or enigmatic to read.

One of the finest images already referred to was the baton from Laugerie Basse, Les Eyzies de Tayac (Figure 13). The perforated baton reconstructed from two pieces of antler was already noted in comparison with possibly similar pieces from further south. It portrays a long-necked bird of upright posture, ovoid body, long, spindly legs, with a sharply pointed beak (Cleyet Merle, J.-J. and Madaleine, S. 1995). It may have been used to fulfil a similar designation of status or position as the La Vache 'sceptre' antler sculpture.

The Upper Magdalenian site at Limeuil was extremely rich in engraved pebbles and limestone plaques. The theme of these is dominated by images pf reindeer stags, females and immature and horses, both static and in motion. There were also a relatively small number of ibexes, bovids and bears. One engraving on a limestone plaque, portrays a species of passerine bird, whose posture could either be upright or horizontal, depending on the aspect of the support but there is a very clear eye stripe on the head and well-marked profile of the beak. Any speculation as to the artists intention as to what species it may represent is probably self-defeating as a number of bird families, like the shrikes would fit the outline described but so would others within the passerine group.

Another interesting feature of the engravings on stone supports from Limeuil that may echo a feature observed amongst the decorated bone from La Vache. A number of the Limeuil limestone plaques and blocs

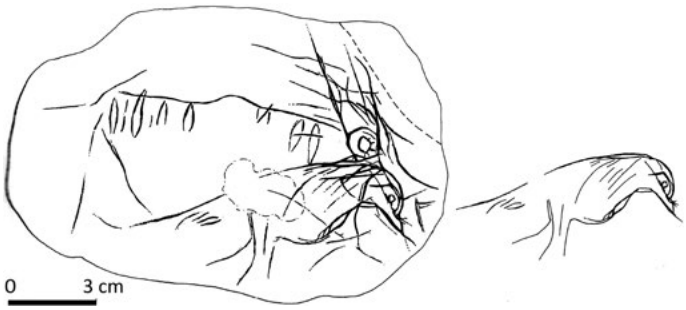


Figure 26. Passerine bird on a limestone plaque from Limeuil on the Dordogne, MAN no. 56751-55. After Capitan and Bouyssonie 1924 and Tosello 2003.

appear to have been broken deliberately and Tosello proposed that they were subjected to intense heat, from the reddening of the stones. This again correlates with the findings related to the ceramic figures from Eastern Europe.

Within the same river system of the Vezère, Dordogne and Garonne, material from the two sites of the Grotte Jolivet and the Puy de Lacan now stored in Museum at Brive la Gaillard in Corrèze, are also dated to the later phase of the Magdalenian. The collection includes a large Vulture bone from the Grotte Jolivet covered with a complex of fine engravings and a sandstone plaque currently in two sections with an unusual engraving of a series of three bison heads and forequarters, originally attached to the rump followed by the outline of a head and neck of a fourth beast below which a bird stands upright with raised head and indications of an inflated or feathered gorge.

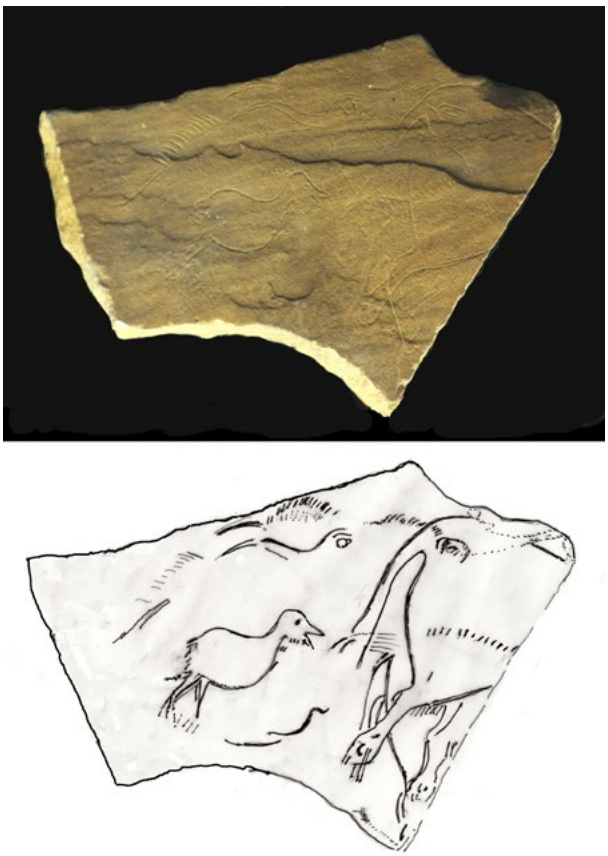


Figure 27. Sandstone plaque from Le Puy de Lacan. Photo: Musée Labenche, Brive.

Loire Catchment

The river catchment to the Loire valley, was home to a further group of occupation and art sites during the later Upper Palaeolithic. On the Vienne in the Commune de Lussac les Chateaux the Grotte de Bois Ragot contained a large avifauna although none of the bones were recorded with significant decoration (Laroulandie 2000) and on the Creuse river at St Marcel, a suburb of Argenton, the cave of La Garenne contained a significant assemblage of tools and other objects among which were a number of wing bones of crane, *Grus grus*. Held now in the Museum of Argentomagus, one of these is an ulna, elaborately decorated with a line of nine outlines of reindeer heads, with the ears picked out in detail. The lines are fine and delicately engraved. The other sections of diaphysis also show some signs of working either for use as tubes or, perhaps, for personal ornament.

La Garenne is a rich site and includes other examples of complex engraving. One of these is a fragment of pendant with elaborate, repeated images of flying birds.

La Marche, at Lussac les Chateaux offers quite a different approach. The archaeological levels include not only bone and flint but a huge collection of blocks and plaques of limestone, covered with fine engravings of animal and human forms, many of which appear to take the form of individual portraits or caricatures. La Marche is one of five caves at the base of a cliff above a small stream that flows into the Vienne just beyond the town. The occupation debris from one of these, La Grotte des Fadets contained a small amount of Solutrean with a stronger element of Middle Magdalenian, believed to be similar to that of La Marche, (Pales and Tassin de Saint Pereuse 1969). Some of the collection is housed in the Musée des Antiquites Nationales, some in the Musée de l'Homme and some were originally retained in personal collections. Vol II of the publications by the Institut de Préhistoire de l'Université de Bordeaux (1976) covers the blocks engraved with 'human' forms no. 33-64.

Most of the human figures show fecund female forms on their own or with other figures perhaps male. There are male figures usually engaged in movement and two plaquettes of heads whose detailed portraiture almost becomes caricature. An important feature of all the drawings of humans is that they are seen in profile. By contrast the image in 'observations' nos. 58 and 59 is

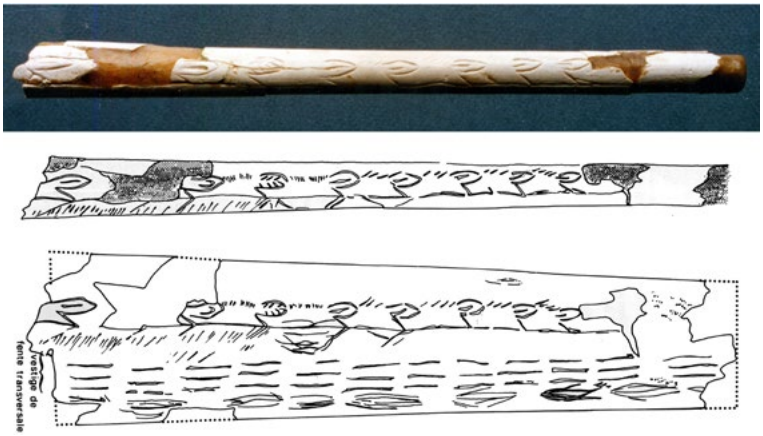


Figure 28. Crane ulna. Photo: Argentomagus Museum St Marcel.

Figure 29. La Garenne bone pendant with birds flying across the face.

shown full face and therefore differs in this essential from the rest. Both are smaller than average for this group of plaques. The image no. 58, (60 x 70 x 5 mm) represents two large circular eyes within a rounded cranium drawn with deeply incised multiple lines and centrally between the eyes a vertical deep groove drops down to meet more lightly cut lines encircling the lower part of the 'face'. Plaquette no. 59 (65 x 75 x 6 mm) shows a more complete figure but essentially the same. The rounded head and eyes are shown full-face. The eyes are set within a well-marked facial disc like the parietal drawing of an eagle owl in Chauvet cave but it lacks the characteristic horns and in ornithological terms appears closer to the tawny, barn or little owl. The use of owl qualities in metaphorical description is an enduring one, stretching even as far as the protector Goddess of ancient Athens and it is a metaphor used to define different qualities as seen in relation to the bird headed beasts at the cave of Roucadour.

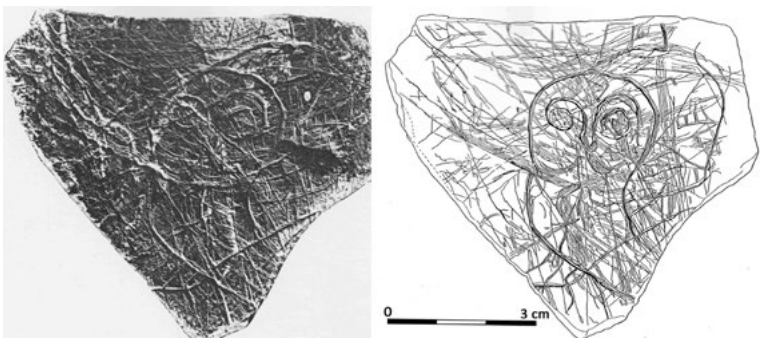


Figure 30. Owl/man la Marche. L. Pales 1969.

Rhineland

The late Magdalenian, open air settlements of Andernach and Gönnersdorf beside the river Rhine are two of the best-known discoveries in the region of the middle Rhine. Reconstructions from postholes on site have indicated that besides tepee-like structures, similar to those at the site of Pincevent, beside the river Seine, Rhineland people also occupied larger, circular huts constructed of wooden posts and skins in the manner of a modern Yurt.

A priority for the inhabitants at Gönnersdorf would therefore be the collection and treatment of hides as well as meat and the requirement for well-insulated clothing as well as food may be reflected in the bird species they collected seasonally: goose, swan and gulls from the riverbanks and grouse and ptarmigan in the surrounding expanses of heather and dwarf willow cover on the slopes.

A notable feature of the settlement at Gönnersdorf was a proliferation of engravings on schist plaques, 400 of these are drawings of human figures, usually more or less stylised female figures. However, some 200 portray, animals: horse, mammoth, rhinoceros but also wolf and a number of birds. The avian species portrayed, include some finely engraved swans geese, and wading birds.

A further selection depicts a black cock, two passerines, and a common crane.

Crane bones have been identified from other sites of comparable date as, for instance, the Hamburgian site of Meiendorf in Schleswig Holstein and the Magdalenian levels at Petersfels, these, in addition to the finds in France, Italy and eastern Europe.

One particular feature worth noting with reference to the drawings from Gönnersdorf is the evident

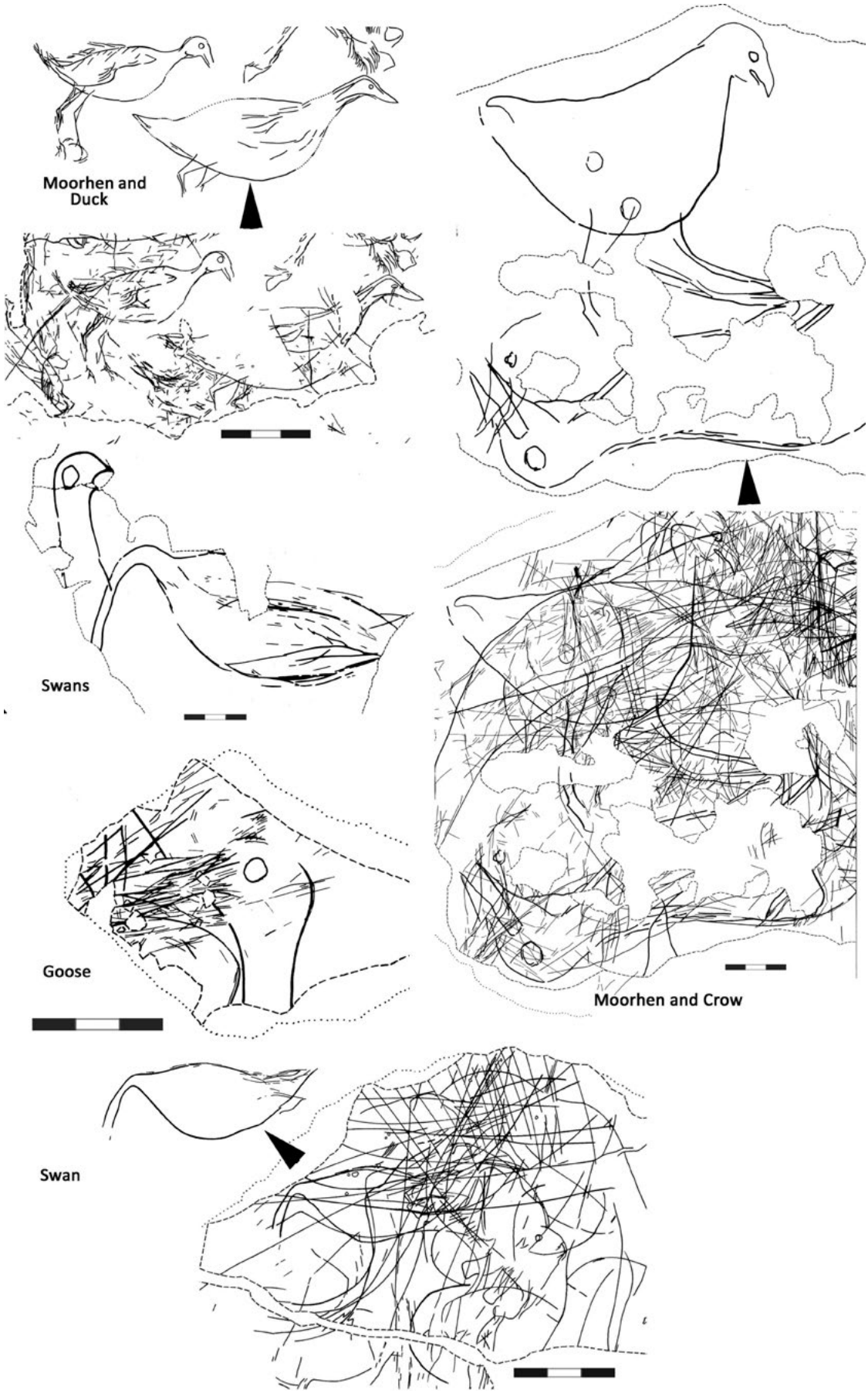


Figure 31. Gönnersdorf. A selection of aquatic birds drawn on pieces of schist, courtesy G. Bosinski.

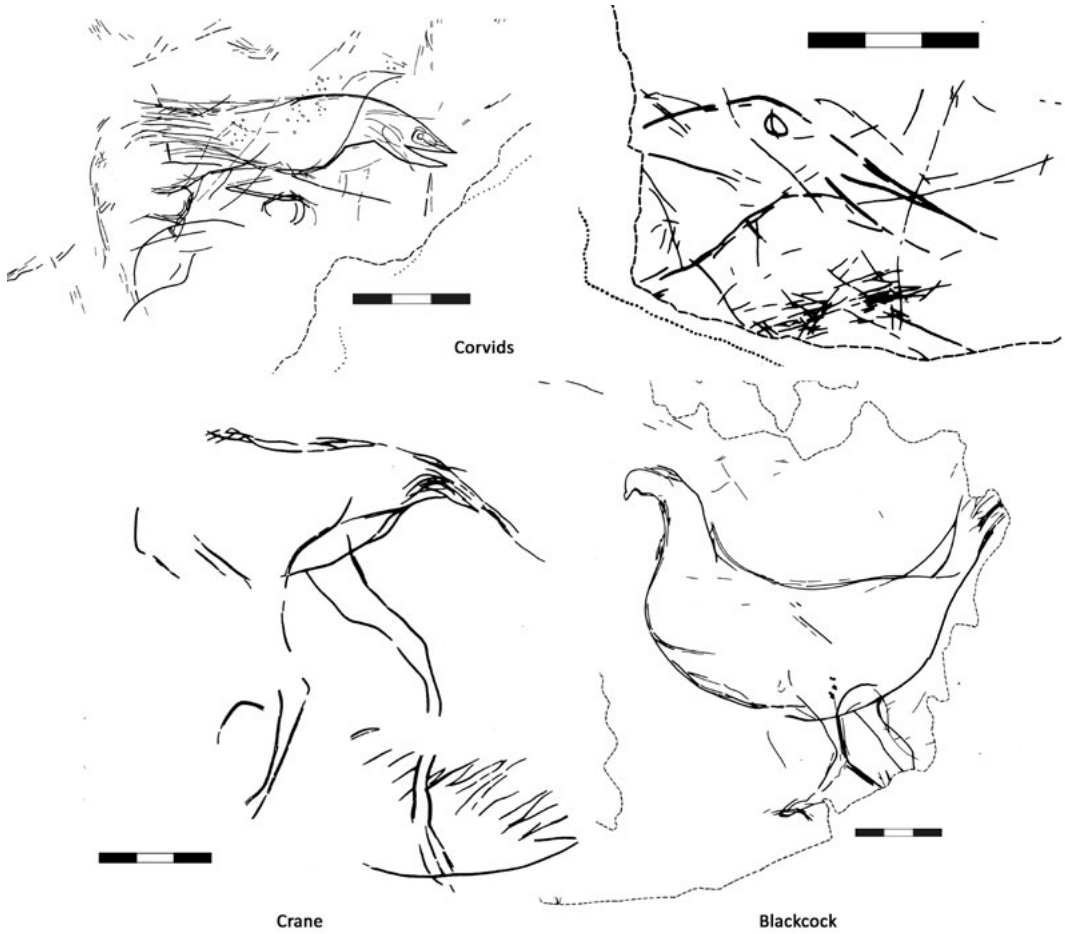


Figure 32. Corvids, Blackcock and Crane from Gönnersdorf corvids and a crane, courtesy G. Bosinski.

naturalism of the drawing and in particular of the mammoth images. Bosinski (Personal communication) suggests that the inhabitants of this late Palaeolithic settlement were familiar with the animal fauna of Doggerland, currently inundated under shallows of the North Sea, and that their knowledge of mammoths came from hunting them there and using their bones in construction of dwellings. Whereas elsewhere in southwest Europe artists were dependent on hearsay or folk memory of beasts that were no longer present in the landscape. Such an observation implies a degree of accuracy in the depiction of animal forms and may explain some curiosities in the depiction of less familiar birds and other creatures.

Conclusion

The end of the Last Glaciation and the fluctuating climate between the deteriorating climate during Dryas I, the amelioration of Bolling, followed by Dryas II, Allerød, Dryas III and the post Glacial, it might be supposed that life should have become less arduous for the populations of northern Europe. Yet, with the retreat of the ice went the larger prey animals on which the hunter-gatherer peoples depended. They became increasingly dependent on small mammals, fish mollusca and birds and the settlements of Mesolithic cultures seem to demonstrate that the reduction in the availability of high calorie subsistence foods was not only a deprivation but increased the time required for foraging and what had been a relatively leisured lifestyle was lost.

In terms of portable art, the change is evident in the gradual falling off in the production of decorative bone objects, accompanied by a reduction in the abundance of the food supply with a consequent decline in population density, which itself may explain the decline in artistic production. Just as, at the start of the chapter, it was noted that in peripheral areas, where conditions had always been difficult, or that lacked extensive herds of large animals population density was fairly sparse in contrast to more favoured refuge areas where larger groups of people could subsist, settle and work together. With the decline of herds of large animals, foraging took more time and effort. Working in smaller groups, the individual work load increased, and the struggle for survival was consequently greater, and creative leisure was lacking. The end to the great period of artistic production that was the Magdalenian appears to have been, in part, a consequence of environmental change.

Chapter 7

Avian resources in hunter-gatherer communities

Hunter-Gatherer communities rarely waste resources and during the Palaeolithic, animal and plant materials were gathered to serve a multiplicity of purposes. They provided sustenance, shelter, clothing, fibres, tools, domestic equipment and supports for artistic expression and information about the local ecology and seasonal environment.

Birds have never been of primary economic importance in hominid societies but they can provide a source of commodities that contribute useful and interesting extras to basic subsistence, to technical effectiveness and to the comfort and cultural life of the group at the time and provide researchers of our own time with valuable information about the life of Hunter-Gatherer people of the past.

In respect of many avian groups, it is probably safe to suppose that the initial motivation for taking them was food. Yet it seems that the initial priority changed early on in the *Homo sapiens* settlement of Europe. Clearly birds were still being extensively culled for consumption and as a seasonal bonus. Never at any stage were birds of prime importance as a basic resource for human subsistence, apart from their important contribution of lipids to the diet but many other purposes were being discovered for the particular qualities of avian bone and plumage.

The earliest substantive record that humans were actually exploiting the hollow nature of avian bone for cultural purposes seems to have appeared in association with deposits of early *Homo sapiens* settlement.

The use of bird bone as part of material culture

All elements of the avian skeleton are pneumatic and hollow but it is mainly the long bones that tend to be adapted for tool making, or used for ornamental purposes. The bones of the wing, that are largely non weight bearing and are usually longer, straighter and with little internal density, proved to be the most suitable for use as implements. These tend to be the ulnae, radii and sometimes the humeri. It would appear that the requirement was for straight lengths of bone and the choice of avian species for tool making on Palaeolithic sites in Western Europe appears to have been based on this criterion. The most commonly selected groups of species appear to have included the larger raptorial species like vultures, eagle and some owls and, among wildfowl, geese and swans, although there are known exceptions to this generalisation. The differential in size parameters offered the opportunity to select for a variety of functions. The diameter of the medial cavity was important. The preparation of bone for use as containers, pipes and even for musical instruments persisted and increased over the whole period of the Upper Palaeolithic of Western Europe. Examples have been recovered from Aurignacian, Gravettian, Solutrean and in considerable quantity from all levels of Magdalenian occupation sites.

Decoration on bone tubes

On the majority of bird bone recovered from the Upper Palaeolithic, even where there is evidence of preparation and use there is little evidence of decoration. The working evidence we have is mainly directed towards making a functional implement that may be expendable. Decoration would seem to imply that an element of personal value was attached to the object and examples of this are of enormous interest but occur relatively infrequently.

Quite apart from the utilitarian usage of bird bone tubes, a few entire pieces and some quite small fragments are found to carry extensive, even complex non-figurative or even figurative decoration. This decoration would appear to represent a personalisation expressing ownership of the piece. Generally, in locations where the long bones of the wing are prepared solely for use there is little emphasis on ornament. At sites such as Le Morin, Dordogne (Gourichon 1994) and or the Grotte de Bourrouilla, Arancou, Atlantic Pyrenees, where there were large concentrations of snowy owl remains (Eastham 2000), the bones are heavily scraped, cut and showing signs of low level burn marks; all part of a systematic skinning and flensing of the bones before they were adapted to other uses but decorative motifs are rare. There is very little in the way of decoration on the avian bone from these preparation sites.

With respect to their function, hollow tubes presented possibilities for a diversity of uses. The storage and transfer of liquids is one. There is historical and ethnographic evidence for the use of bone tubes as phials and receptacles for small quantities of medicinal fluids like fulmar oil amongst the inhabitants of the western isles of Scotland in the early eighteenth

century (Martin 1716). A similar use might be found for holding perfumes and cosmetics.

The facility to transfer of liquids from one place to another is of considerable advantage and has applications in a variety of functions. Bird ulnae, once their epiphyses were removed, might function as pipettes and, in combination with other tubular sections as blowpipes.

Examples in the collections gathered from recent excavations consist of short sections of tube that may be merely the broken remains of a longer tube or as the bone became broken in use or served its purpose, the sections were re-used as ornament. Many of the examples featured in museum collections have some kind of engraved ornament. It seems to have been the practice of many excavators to relegate the undecorated fragments to the faunal determinations box to be identified, whereas the decorated material was seldom fully identified as to species. A practice that has tended to obscure any estimate of the ratio of engraved to non-engraved specimens from individual sites excavated in the past.

Tubular bone as a means of applying pigments

Paint from mineral pigments was an important commodity for the Upper Palaeolithic peoples of Europe as may be seen in the parietal art of the caves and occasionally traced on the portable figurines and engravings recovered in excavation. Lumps of iron oxide in the form of haematite and limonite or of manganese are not infrequently found, both in occupation sites and in association with decorated sections of cave walls. In some situations, the source of these minerals has been traced. At the Grotte de Lascaux, for instance, the black manganese MnO_2 and 2MnO was traced to a source near Thiviers, some 40 kilometres north of Montignac, At Lascaux also, certain blocks of iron oxide were shown to have the marks where the pigment had been scraped off to be combined with the medium with which it was to be applied (Couraud and Lamming-Emperaire 1979). The Late Magdalenian levels at the Grotte de Bourrouilla at Arancou, Atlantic Pyrenees, revealed the possible use of a bone tube to contain a red haematite solution. The ulna of a snowy owl was heavily stained red, although there was very little residue within the tube and the evidence was not entirely convincing.

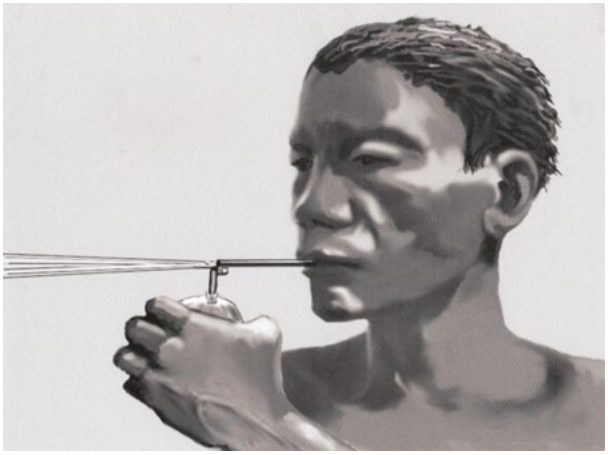


Figure 1. Applying paint using a blowpipe.

However, amongst some social groups, whether for making marks on cave walls or for personal and body ornament the use of blow pipes to apply paint and other substances to surfaces has remained widespread and effective (Figure 1).

Figure 2. The application of pigment by mouth.

It was essential that the tube be thoroughly cleaned between applications to prevent clogging. It is possible that this method was used for the application of negative hand prints or stencils, that are some of the more ancient marks in parietal art at Chauvet cave in the Ardêche, where they were executed in red ochre pigment they may have been applied with a blowpipe or have been blown on direct from the mouth of the maker. This technique was demonstrated by Michel Lorblanchet (2010) with regard to the Gravettian hand stencils at the Grotte de Peche Merle (Figure 2).

Many hand stencils are outlined in black pigment prepared from manganese that in concentrated solution is highly toxic and the danger of ingestion would suggest that the use of a tubular spray might be advisable, if not imperative. The numerous black, hand stencils at the cave of Gargas near Aventignan in the Hautes Pyrénées could have been applied using this means.

Paint may also have been blown to create marks along the cave walls. These 'punctuation' marks were applied apparently to indicate transition within the sequence of images, as at the cave of Le Portel in Ariège. And besides such rather non- committal marks, some entire sets of images, like the frieze of dappled horses in Peche Merle, are thought to have been created using by blowing pigment direct from the mouth, guided by the hand of the painter.

Tubes fashioned from bird bone may be used as containers for items other than liquids. Needles and pins from Late Magdalenian occupation sites are often very fine indeed; some of them appear to have been made from avian wing bone, of which a sample of preparatory working was recovered at the Grotte de Bourrouilla, Arancou along with a considerable number of needles, many of which were sufficiently slender for work on small mammal, bird or even prepared fish skins. A recent study has indicated that some of the pumice stones that have been found occurring on Magdalenian sites in south- west Aquitaine and used for the polishing of fine bone implements are composed of volcanic rhyolite, that appear to have been brought in by sea from islands off the Atlantic coast. It is thought that pieces of pumice stone were found to make excellent fine grindstones by the settlers on sites like Duruthy at Sordes l'Abbaye in the Landes, to put the final finish on the sharp points of sewing needles (Dachary, Plassard *et al.* 2012). One of the important factors with regard to the use of needles is that a variety of lengths and diameters were needed for different materials in order to achieve different outcomes: fine needles for soft hide garment making, coarser, longer ones for medium weight hides and larger awls for heavy hides.

Net making

As was seen in the chapter on hunting methods, nets of a variable size and strength were essential items of equipment for the hunt. Made out of vegetable fibres, animal hair or gut, they were usually threaded and knotted together using hollow tubular tools known colloquially as 'spids'. Although the affirmed use of bird bone for this purpose is scanty during the Palaeolithic period, it was certainly in use during the Neolithic. At Skara Brae on Mainland, Orkney, gannet *Sula basanus,* and skua, *Stercorarius skua* humeri were sufficiently robust to be used as 'spids' to splice the ropes required for binding the whalebone house rafters or in the manufacture of nets (Eastham unpublished data). These humeri were modified retaining the proximal epiphysis to grasp as a pad in the palm of the hand while the shaft was cut diagonally so as to lead the thread through the net or splice. In steel, spids of similar design are still to be obtained in ship's chandlers at the present day. This same type of implement appears to have been in use on Neolithic sites in the Netherlands (Van Wijngaarden Bakker 1997) and on contemporary sites in the Rouergue region of France where not bird but the tarsus bones of sheep were cut and chamfered in a comparable manner; examples of which are displayed in the Musée Fénaille in Rodez.

The fletching of arrows

Flint tipped arrows were almost certainly an essential weapon in the hunting arsenal. They appear drawn on the flanks of animals in the cave paintings. That both primary and tail feathers were used in the fletching of the weapons is occasionally discernible in the images. Fletching feathers could be supplied using the hard quill feather of corvids, pigeon or wildfowl. Swan and goose quills are traditionally regarded as ideal for this purpose as were the primaries of vultures and some eagles.

Musical instruments

Musical instruments have been in use at least since the earliest settlement of Europe by modern humans. Most of those that we can recognise as such are pipes, whistles or flutes that have been recovered from excavation. However, it is more than likely that these wind instruments were played to the resonant accompaniment of percussion, for which purpose instruments made from skins could have been the sound source but recent thinking on the subject has led towards the use of lithophones, stone blocks that have a particular resonance and, when struck create a sound that can travel over a considerable distance. It has even been suggested that the noise of the sporadic water spout in Chauvet cave, Vallon-Pont-d'Arc formed a significant element in the inspiration of the venue

for the art (Clottes pers. com.). Added to the natural phenomena the melodic sound of bone flutes, pipes and whistles of opportunity for musical composition becomes available.

Finds of musical pipes or flutes are rare but real and the examples from the early Upper Palaeolithic sites in the Swabian Jura were found in the context of the basal Aurignacian of the region.

The large Höhlefels flute, discovered in 2008, during excavations of the cave in the Ach valley, some 20 kms west of Ulm. It was manufactured from the radius 21.8 centimetrs in length and 8.0 millimetres m diameter of a griffon vulture, *Gyps fulvus*. Reconstructed from twelve pieces recovered within a small area of 10 centimetres by 20 centimetres. Conard (2009) concluded that the flute was played by blowing across the hole at the top, using the fingering of the five holes in the stem as for a flute.

The instrument was found in the Aurignacian layer III, dated by C14 to around 35,000 years BP amongst a rich deposit of flint knapping debris, worked horse and mammoth bone and the remains of reindeer, cave bear and ibex. In association with it there were hollowed out fragments of mammoth ivory also prepared as parts for two further flutes. Other Swabian instruments fashioned in bone and ivory were produced with just one hole as for the blowing of a single note and also from a context of the early Aurignacian. The process of manufacturing flutes from mammoth ivory was more complicated and time-consuming than adapting avian bone for the purpose. Two length wise strips were first hollowed out and then glued together to form a pipe and there was always the risk of fracture so that it is not surprising that in the archaeological record avian wing bones were used more frequently.

Figure 3. Hohlefels flute. Photo: N. Conard, University of Tubingen.

At Geissenklosterle in the Lone valley, a further sector of the Swabian complex of cave systems, another bird bone flute was found fashioned from a large bird ulna. This also was probably a large raptor or vulture. The surviving section has three holes and a series of notches carved across its length. Like the Höhlefels find, this flute was accompanied by the remains of others made of ivory.

Bird bone appears to have served other purposes in the Aurignacian toolkit at Geissenklosterle; another large ulna was recovered with notched decoration and the confirmed dates for these artefacts range between 36,000 – 40,000 years BP (Conard and Bolus 2003).

The dates for the Swabian Aurignacian are early by comparison with some other sites in western Europe and up until the present there have been no well authenticated musical instruments discovered in western Europe that precede the Swabian examples. In Austria, at Höhlenmalerei a three-hole flute was dated to about 25,000 BP, but there has been some disagreement over the bear cub femur from the site of Divje Babe in Slovenia that had neat circular holes that look as though they may have been made for a musical purpose. However, the context is Middle Palaeolithic, Neanderthal, from 43,000 to 84,000 years BP and the holes may have been made by animal gnawing rather than human agency. There is still some controversy regarding this discovery and the bias of scientific analysis appears to indicate that the holes, although very regularly spaced, are most likely to have been made by carnivore teeth. Currently, therefore, there is no extant evidence for the use of wind instruments to make musical sound prior to the Aurignacian (d'Errico *et al*. 1998).

The Danube – Rhine – Rhone corridor would appear to have provided an important route for the cultural penetration of Western Europe for early modern humans and the Swabian sites appear to have been in an especially favourable situation. However, pipes

and flutes have also been recovered from other Upper Palaeolithic sites across France.

Two flutes, part of the Christy Collection in the British Museum, were recovered during early excavations of rock shelters in the Dordogne. A simple two-hole instrument from Les Roches, supposing it may be complete, may well have been used as a whistle, either to warn of the approach of an animal, to maintain contact with the rest of the group, or, using the two notes, it might have been used as a bird caller or decoy to draw game birds into a net. To do this it would be necessary to block the ends of the tubes and blow across each hole to produce the separate notes or, alternatively, to attach the tube to a flexible air sac. It would have been used in a way not unlike the way duck whistles are still used to draw the birds into a trap in parts of Spain and elsewhere, although the modern versions are constructed from a metal tube and a simple leather bellows (Chapter 4, Figure 1).

The other flute from La Roque is more complex, with 4/5 holes along the shaft of a bird ulna, it could have been played very much as a recorder is played at the present day. The date is somewhat uncertain, although it was found with other material that could be dated to around 30,000 years BP. However, later medieval disturbance of the site made it difficult to define its age with exactitude.

Another flute made from an avian wing bone was recovered from the Grotte de Veyreau in the Aveyron and a collection of 22 fragments were found at Isturitz in a Gravettian context dated to 30,000 years BP.

The flute from the Veyreau cave in the Aveyron was in a deposit that was mixed with the debris of Chalcolithic funerary rites, so that it is again difficult to place in time, although in other respects it is very similar to the Upper Palaeolithic examples. Fashioned from the ulna of a vulture, either *Gyps fulvus* or *Aegypius monachus* it is fairly complete and in good condition (Fages and Mourer Chauviré 1983).

During the excavations of the Salle de Saint Martin in the caves of Isturitz in the Atlantic Pyrenees a total of 22 pieces of vulture ulna that had formed sections of flutes were discovered. The first three discoveries by E. Passemard in 1921 were originally thought to belong to the Magdalenian, an attribution revised later to the final Aurignacian. Subsequently, more pieces were added. Work on the site by R. and S. de St Périer revealed a further 16 sections, of which all but two carried perforations. Currently the collection is held in the MAN in St Germain en Laye and is considered to belong to the Gravettian. Recent C14 dating of samples gave dates between 32,000 years and 28,000 years BP (Bouisson 1990).

The beginnings of the manufacture of instruments for communicating through sound and some kind of musical notation evidently belong to the earliest phases of the settlement of Europe by modern man. The curiosity is that so relatively few examples have survived and where they do, they are sometimes found in some numbers together, as though that site might be an established meeting place or aggregation site where groups of people might have met together on occasion and where at the end of the meeting, perhaps, the instruments were cached for the next time.

This may be taking interpretation too far but it is interesting that wing bones fashioned to serve other purposes are frequently heavily personalised, perhaps by the maker with complex patterns of striations, notches and intricate decoration and even some figurative images, indicating that they were valued possessions. These have been discussed further in the section on portable art in Chapter 6. However, the flutes are seldom heavily decorated, a characteristic that could possibly suggest that they belonged to the group rather than to an individual. That numbers of these instruments were sometimes found in clusters together might lead to the supposition that they may have been regarded as belonging to the cave itself to be used in that context.

The use of bird bone to make music or simple whistles was not restricted to Europe in prehistoric times. In Henan Province in China, at the site of Jiahu in Wuyang county a cache of over 30 flutes was uncovered among the ruins of the 8,000 years old city. Made from the ulnae of cranes, *Grus sp.*. These have between 5 and 8 evenly spaced holes, the positions of which appear to have been carefully marked out before the holes were drilled. The largest flute is around 20 cms in length and 1cm in diameter and when attempts were made to play it, the notes more or less corresponded with the modern pentatonic scale (Zhang, Xlao, Lee, Yun 2004).

A similar use of wing bones is evidenced from Peru, in particular in the temple pyramid at Caral-Supe, C14 dated to 4,170 years BP. Here, a cache of some 32, heavily carved, single hole flutes were found together. Made from the bones of condor and pelican, they were thought to have been used during public gatherings in the temple amphitheatre (Solis 2004).

It may be a little fanciful to postulate a symbolic significance for the frequent selection of ulnae of birds of prey for the making of flutes by Palaeolithic and other prehistoric communities. Certainly, from a practical point of view the wing bones of raptors are conveniently straight but also the behaviour of the bird itself is distinctive in flight. Vultures and eagles and even kites and buzzards will soar to great heights above the ground, often resting on thermal

up-currents almost out of sight to the naked eye, enabled by their own acute vision to focus over great distances. It might be thought that there was something transcendental about these raptors forging a passage between earth and the realms of sky above. It is the kind of metaphor, which finds its echo in diverse belief systems in many societies through the ages and may be compared with the use of visual imagery in the depiction of individual animals as seen at the cave of Roucadour in the Lot.

Birds as a resource for clothing, for ceremony and for personal ornament

When considering how bird bones and plumage may have been put to practical daily or symbolic use as part of ceremonial, as personal decoration or as insulated clothing in hunter-gatherer society, the researcher is faced with the problem of an absence of verifiable material data. The archaeological evidence is very slight: limited to studying the methods of the preparation and decoration of the wing bones of selected bird species and the way these species are cut and scraped in order to remove the most distinctive feathers or, to create implements and other items to be incorporated into practical and ceremonial costume.

The archaeological evidence is slight because the support materials have not survived. Far too much of any interpretation of the remnants that exist depends on speculation and comparisons of the practices of relict populations living in similar environments and socially comparable groupings to those of the Palaeolithic peoples of Europe. In considering the ecological contexts, there is a wide spatial gap at present between the temperate ecologies of Western Europe and the arctic tundra; a gap that has been replaced by recent social groupings that depend on a totally different commercial economy from the systems that apply to the hunter- gatherer.

These are major problems in referring to the present-day Hunter-Gatherer societies in search of comparable practices. It may indeed be invidious to relate the values and philosophy behind the concepts of prey/ predator relationships of existing relict Hunter-Gatherer societies to the concepts held by Palaeolithic groups. Ingold (2000), for instance, distinguished between animism and totemic in the attitudes of the hunter towards his prey and towards the exploitation of the available resources. But whether there is substantive evidence to prove that such distinction has any relevance to patterns of exploitation at this period remains doubtful. In practical terms it was the way in which the flesh, skin and bone could be used that mattered and we can at present only attempt to deduct from what was left behind any concept, ritual or ceremonial that had to accompany the activity.

It would appear that at the basic level an individual of any species that was deliberately hunted in order to serve as a resource with multiple uses. A reindeer supplied flesh and blood for food, hides for warm outer clothing and shelter, bone and antler for tools, equipment and ornament while guts and ligaments had a variety of functions. Avian materials, with different qualities were also fully exploited creating little waste. During the stages of the Last Glaciation, there was a great deal of comfort to be gained from the insulation properties of the downy plumage from aquatic birds whether from marine or inland waters. The TOG value of down from aquatic species is only surpassed by that of reindeer hair and has the advantage of being light and pliable whereas reindeer skin is difficult to compress or fold.

Out of these basic requirements for survival, others are fulfilled. Just as the decoration of tools endows them and their makers with individuality, so, it may be suggested that the particular manner in which feather is utilised may have significance, even denoting something about the status, or the function of the wearer or the group to which they belong. The Yupi'k people of south west Alaska around Hooper Bay and the Kuskokwin delta were surrounded by an abundance of birds on the wetland and sea cliffs. As recorded in the American Museum of the American Indian, there was in the fashioning of garments, a kind of grading of species appropriate for clothing for different age groups and purposes. For the toughest wear, the skins of land or sea mammal were the most suitable. Clothing sewn from bird and even fish skin was used for their qualities of warmth or for their impermeable qualities in the wet.

Different cutting styles also distinguish one village group from another. Since it would be held disrespectful to the creature sacrificed for the purpose to leave to waste any part of an animal taken in the hunt, everything possible is used. Most of the birds taken among the Yup'ik for the body of the parka tended to be from marine or freshwater aquatic species, although the decoration may include a diversity of fur or feather from any available local species.

In 1988, a study sponsored by UNESCO was carried out among the Qikirtamiut Inuit of the Belcher Islands, Hudson Bay on the methods used by the women in garment construction from the skins of the eider duck, *Somateria mollissima,* and how their understanding of the birds affected the process and its product (Douglas Nakashima 2002). Like the Yup'ik of Alaska, the Qikirtamiut use mainly mammal skin, in their case caribou, for all heavy outer clothing items and utilise the abundance of duck for parkas and garments designed to give lightweight warmth combined with a high degree of suppleness and resistance to water penetration. The eider skins lack some resistance to

wear and tear as compared to the caribou but gain in insulative efficiency and decorative quality.

There are understood to be distinct categories in the qualities and uses of eider skins. They are separated by the age and sex of the bird. The skin of the adult male, with its black belly and white breast is the thickest, stiffest and most resistant to wear and most suited to the hunter. Female eider skins are less strong but supple, while juvenile skins are both supple and less bulky but more liable to tear in use. Softest of all are the head and neck feathers, used for making infant headgear. It is therefore incumbent on the hunters to distribute the skins fairly among the members of the group. A coat for an adult requires 17 skins to make the body and sleeves and a hood requires further skins. A female parka with a hood for carrying a baby or toddler has a hood lined with the waterproof skin of a diver (loon), *Gavia sp.,* to resist the effects of urine on the fabric.

The parts of individual skins are carefully graded according to the way they are used for each section of the garment and a sequence of cuts made to ensure the best use of the material for each sleeve or other part. The garment is then ready to assemble. Sewing and finishing is then done in the traditional way, using bone needles threaded with sinew and when finally completed, the decorative detail would be applied.

There is no known material evidence for this kind of manufacturing process for complex garments among the hunter gatherer groups of the Upper Palaeolithic. Clothing is rarely depicted in the imagery or on carved figurines. A few engravings carry marks that might be read as indicating clothing and some show elaborate head dresses. The excavation of the Magdalenian site at Gönnersdof, Middle Rhine in Germany, dated to the Allerød at around 10,400 years BP, revealed a large number of plaquettes of schist, bearing engravings. These appear like rapidly executed cartoons and represent known or remembered mammals and birds, among them mammoth, horse, raven, grouse and goose but, besides these, a considerable repertoire of female outlines, many of them without heads. One of these in particular, Plaquette 87, is heavily cross hatched with lines that might be taken to represent clothing. For the covering of the upper body the lines are drawn horizontally across the body. Below the waist, there appear to be vertical lines, and these are overlaid with further horizontals, indicating perhaps, a tunic overlapping a nether garment in a similar fashion to the tunics worn by the Kup'ik and Inuit people (Bosinski 1981 and 2011).

A further example from the R. de Saint-Perier (1931) excavations at Isturitz, Pyrénées Atlantiques, dated to the middle Magdalenian of the Grande Salle (MAN inv. 84772) is a bone fragment engraved with a bison on one face and a human torso looking towards a second female figure on the other aspect. Hair is indicated on the head of the lower figure and a detailed delineation of a collar and matching wrist bands may suggest clothing but it may be merely represent an article of personal ornament (Thiault and Roy 1996). In neither instance do the images suggest that feathers were used as part of the garment.

This problem has been addressed by Aldhouse Green (2000) in discussion regarding the Gravettian burial of the 'Red Lady' in Goat Hole cave at Paviland on the Gower peninsula, South Wales. From the differential colours of the ochre staining on the bones, with a clear tonal division at waist level, it was concluded that the body was ceremonially buried in garments, a tunic and pants that had been separately treated with ochre of different hues prior to the burial. He concluded that ochre was widely used in burials of the Late Aurignacian from Cro-Magnon in France to the Dolni Vestonice and Brno, two interments in the Czech republic, where perhaps it was applied as a preservative or to indicate status, since elaborate perforated shell beads, pendants or other grave goods were frequently recovered in association with the body on the eastern European sites.

However, none of these discoveries contain any evidence of feather being used. The most convincing signs that avian skin was sewn up to make clothing lies in the frequent finds of very fine, polished bone sewing needles amongst the toolkits on Magdalenian occupation floors. Many mammalian skins require a point or awl to penetrate the leather prior to the insertion of thread. When the basic garment has been cut and stitched the pelts of rodents or mustelid species, like moles or bird feather may have been added as a decorative feature to embellish it.

Needles and awls of different dimensions are frequent among the domestic toolkits found at occupation sites from the end of the Solutrean and are extremely prolific on Magdalenian sites. At the cave of La Vache, for instance, there were found large numbers of sewing needles, their length between 7 and 2.5 cms long but in thickness they measured fairly consistently between 1.5 and 2.0 mm in diameter and a few needles have been found to have been repaired after a break. There was also evidence of needle manufacture, mainly from mammal bone and some cut strips of bone in preparation to be finished as needles. At the Grotte de Bourrouilla, Arancou the needles were particularly fine and delicate, some may even have been fashioned from bird bone and could easily have been employed for sewing avian skins.

Some excellent examples of needles are illustrated by Arambourou (1978) from Duruthy at Sordes l' Abbaye.

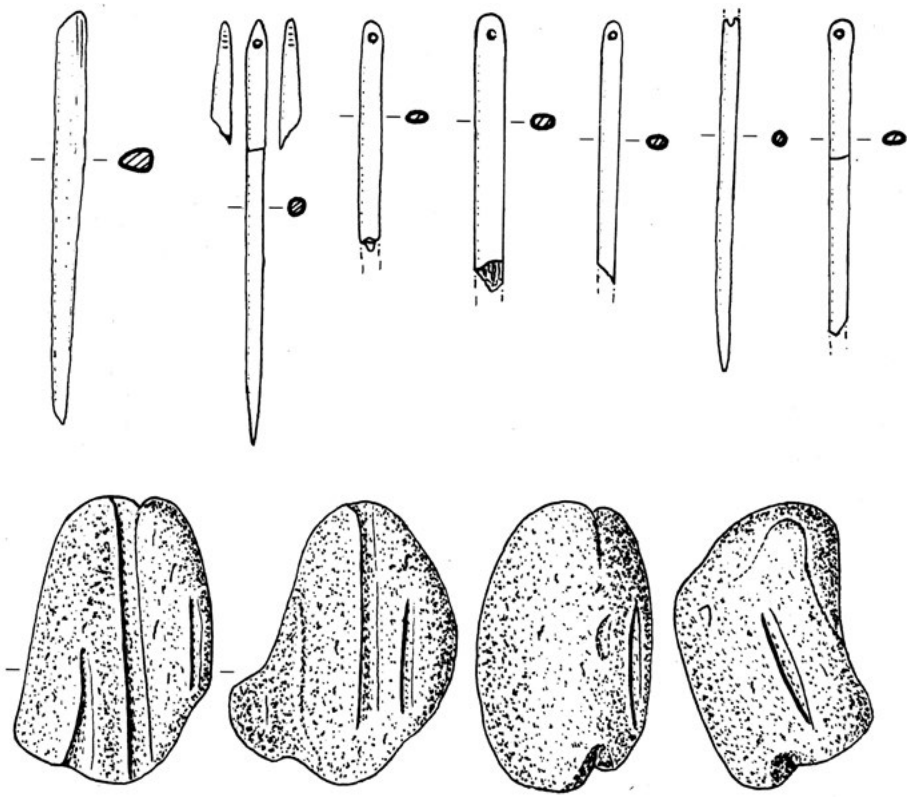


Figure 4. Bone sewing needles of varying dimensions at the Abri Duruthy, after Arambourou 1978.

Such needles, pins and other items that were either regarded as valuable in themselves or needed protection were probably kept safely from one application to the next and carried in hollow bone tubes or pouches, though finds have been made of needles that were mislaid or broken in use. Gilbert, Martin and Savage (1985) mention the use of the humerus of swan as receptacles for the safe-keeping of needles by the Eskimos of the Mackenzie Delta in recent memory. Those that were in use needed to maintain the sharpness that had been so carefully honed on stone or pumice polishers, such as those recovered from the Grotte de Bourrouilla at Arancou and at the neighbouring sites at Sordes l'Abbaye in the Atlantic Pyrenees.

In a social context it appears possible or even perhaps likely that in localities where a particular species of bird was seasonally or otherwise abundant and a cull could be made in excess of the immediate requirements of the resident community, that the surplus might be used as part of gift exchange or barter, enabling separate groups to come together as part of the sharing process. The extensive processing of snowy owls at the Grotte de Bourrouilla, and at other occupation sites in the Pyrenees, the Dordogne and northern parts of Aquitaine as discussed in chapter 8 might have something to do with such a system. It is also conceivable that, localised wintering flocks of geese and swans would attract fowlers from neighbouring sites to join together to share in the cull (Eastham 1995).

Ceremonial use of clothing decoration and masks

The preparation of different kinds of plumage and animal bone parts to create a display appears to be an integral part of ceremony, dance and the community identity, and such displays have been associated with these activities throughout societies across the globe. Even in recent history and at the present day in military contexts feathers adorn the Prince of Wales cap badge, or the white cockade of ptarmigan feather in the highland bonnet and in the social conventions of the 18th and 19th centuries that demanded ostrich plumes on the head dresses worn at court to define the role and status of the wearer.

Just as the decoration of the tools used by Hunter Gatherer people may endow both tools and their makers with individuality, so, it may be suggested that the particular manner in which feather is utilised may have significance regarding the function of the wearer or the group to which they belong.

In Alaska up in the arctic, the Yupi'k people are recorded as using the skins of snowy owls as head gear for particular purposes. An example is held in the Piciryat Cultural Centre and Museum at Bethel, Alaska. Described as a Fire Bath hat it would appear to have been constructed of two skins sewn together. Unlike the Mt Hagen feather head dresses, the skins would have been acquired locally rather than traded.

Featured amongst the exhibits in the Museum at the Smithsonian are bags made from the skins of corvids and swan's feet; along with footwear and hats from the entire skins of snowy owls, *Nyctea scandiaca,* that were used for the fire bath ceremony. Wing feathers of the snowy owl were also arranged into dance fans by insertion into the lids of coffee cans were also recorded as late as the 1970's in Toksook Bay. These artefacts may be interpreted as having essential significance in the ceremony for which they were fashioned or, may merely represent the maximum utilisation of the available resources.

Masks

Masks played an important part in defining role. Just as the masks used in Greek and Roman theatre, ethnographic records show that masks were used for ceremonial amongst very diverse social groups. They have been used to give a familiar figure an alternative persona and function in the expression of presenting a further dimension to the world.as it is known.

The historic and even the prehistoric use of masks appears to be universal. Amongst Eskimo groups in the arctic, the earliest archaeological finds have been made in excavations of the pre-Dorset and early Dorset sites in south west Greenland, dating from around 2,500 BC through to 500 BC – 800 AD. These masks have retained no organic decoration, so that the use of bird material cannot be assumed. Among the more recent examples held in museums, not only are feathers used for decoration but carvings of the water birds attached to the masks reinforce perhaps the importance of the relationship between the people and their wetland habitat.

Figure 5. Yupi'k mask, Good News Bay, Alaska.

Figure 6. Branly Mask, Louvre Museum.

Kup'ik peoples created masks to make the unseen world visible. More recent collections from Kup'ik groups from the Kuskokwim delta area, Alaska, made by A.H. Twitchell (1872-1949) are now in the National Museum of the American Indian, in the Smithsonian, Washington DC.

Another mask in the Branley Collection in the Louvre similarly indicates a close association between the avian communities and the people living in the vicinity.

Very often the masks were initially carved in wood but most have feather attachments relevant to their significance and function. Among the extant masks held in the Fenimore and Smithsonian collections, a number are associated with avian representations. Owls recur as an important theme along with carvings of water birds. One exhibit is supposed to image a sandhill crane and another the gyrfalcon. Colour, as used for the masks also has significance, red pigment indicates both blood and protection, while the colour black is always a symbol of death and white of both life and the winter season.

The Pacific Eskimos of Kodiak Island, the Konyak, also used feather in mask decoration, examples of which may be seen in the Fennimore Art Museum. However, ceremonial masks and other equipment, ornamented with the skeletal elements and plumage of birds were

not restricted to coastal communities. Inuit groups also decorate their masks with feather and the Crow Indians made medicine bundles and even shields that included large quantities of avian material in their manufacture (Gilbert, Martin and Savage 1985).

Some of the best examples of the use of specific feathers for particular ceremonies come from the southern hemisphere. The traditions of different groups vary considerably in the way feather and other body parts were used, the most obvious distinction being that some groups favour personal decoration and others, who routinely manufacture separate objects to be used as props to enhance the role of the individual taking part in the event. This dichotomy of expression may be demonstrated in the customs practised amongst the peoples of New Guinea, Melanesia and Polynesia in the Pacific.

The clans of the Mount Hagen people of the Central Mela region of New Guinea concentrate on decorating their persons for festivals and ceremonial occasions as well as for everyday activities, using a variety of combinations of face and body paint, shell, plant material and the bones and plumage of a diversity of bird species, some of them obtained from sources up to 100 kilometres away, depending on where they are best available or may be traded (A. and M. Strathern 1971). The bones, quills, plumes, feather and down of some ten different species are considered appropriate for different sets of decoration on different types of occasion. They include six different bird of paradise species: *Paradisea raggiana:minor:rudolphi, Epimachus fastosus, E. mayeri and Astrapia stephaniae;* with these a parrot, *Lorius roratus,* a cockatoo, *Probosciger aterrimus,* the cassowary, *Casuarius bennetti* and most commonly an eagle and the red paradise bird, the King of Saxony, *Pteridophora alberti* whose long colourful plumes were highly prized.

Figure 7. Kula dance feather masks. Mount Hagen, New Guinea. Photos: courtesy M. Strathern 1971 and Downing Street Museum of Archaeology and Anthropology.

Festivals are an important feature of the lives of all the Mount Hagen groups to celebrate achievements, or exchange ceremonies between groups and for these occasions the important process of personal decoration requires many helpers to prepare. A significant feature of Mount Hagen ceremonial life appears to be the absence of separate mask or image making:

> *When the Hageners wish to associate themselves with magically powerful things, such as birds, they do not construct masks, carvings or paintings of these. They actually take parts of the birds, their feathers and attach these to themselves as decoration. Nor do they attempt to represent these birds or to impersonate them in their dances. Rather, they use the bright colours of these feathers to enhance their own attractiveness.* (Strathern 1971: 176. Appendix I).

By contrast with the elaborate costumes of group and inter-group ceremonial, the funereal rites among the Mount Hagen peoples demand a total absence of ornament and mourning garb requires them to smear themselves with ash or clay.

The people of the Sepik river area, a territory quite close to Mount Hagen do not use feathers to adorn their body except for masks appropriate to the ceremony in which they are taking part. Mourning masks, in particular, appear to take on bird-like features as well as using dark feathers on the mask itself and the cloak of the performer and many of the plain, carved, wooden masks are also carved with beaks.

Other island peoples of the south pacific are known to have manufactured elaborate masks using avian imagery and feathers and some are particularly associated with mourning and funerary rites. One of these from the Kanak culture of New Caledonia, currently in the Musée d'Art et d'Archéology of Perigord in Perigueux has a complete cloak of black feathers descending over the wearer. Two further Kanak funerary masks from New Caledonia, in the

Figure 8. Female headdress for the Kula of Mount Hagen.

British Museum and the Australian Museum feature feathers, often pigeon feathers along with a quantity of human hair. Most of the surviving Museum specimens were made prior to colonisation by the French in 1853, after which the missionaries discouraged their use and the ceremonies for which they were an essential part.

The University of Gottingen collection of Hawaiian masks and accoutrements of ceremonial dress, acquired through gifts and trade during Cook's third voyage in 1778 give an important insight into a culture that had remained isolated from any external influences for some 500 years prior to its first contact with Europeans. The collection features, cloaks, helmets, and neckbands into which have been woven patterns of red and yellow feathers from specific species that were carefully gathered by bird catchers using tree sap to act as bird lime for the purpose and their making required the input of specialist skills. The red feathers being considered sacred, while the yellow, rarer feathers were associated with power. Although the clothing and helmets were made for a particular individual to give him protection and they were treasured and heritable, yet it was thought unwise for a son to wear his father's gear since it would render him vulnerable. There were also feathered images, made to provide a dwelling house for a god. Sometimes specifically associated with a war god (Kaeppler 1998).

On the other hand, the Trobriand islanders, as recorded by Malinowski in 1922, also used feather headdresses during the annual dancing season but these appear to be uniformly fashioned from pale cockatoo feathers. They appeared to make little or no symbolic distinction between species or colour. Carving seems to be reserved for the prows of canoes and ceremonial tools paraded in the *Kula.*

Parallel examples from the Palaeolithic record?

Figures wearing animal skin costume, were depicted in the parietal art of a number of caves during the Upper Palaeolithic. Two of best known are the 'Sorciers Grand et Petit' and the hunter carrying a bow or musical instrument, known as the 'Petit Sorcier', both in the cave of Les Trois Frères (the sorcerer figures from Les Trois Frères, Ariège). It is also possible that the bird-headed man and his staff in the 'puits' at Lascaux was connected to a ceremony of some kind. Bird costumes are more difficult to detect in either parietal or portable art, though the bird headed image containing animal or human features is relatively frequent. Some of the very enigmatic images on cave walls and in mobiliary imaging, that have been described as having the elements of a number of species or the curious 'phantom' figures, like those that appear in the Grotte de Cougnac, Gourdon, in the Lot, les Combarelles, Font de Gaume, or Lascaux in the Dordogne or le Portel and Les Trois Frères in Ariège could conceivably have been associated with the use of masks in ceremonial performances (Leroi Gourhan 1968 and Lorblanchet 2010).

Masks and head dresses like body paint may be used as an integral part of an individual costume or as freestanding objects they may be taken up to fill a particular role in the performance. As such, they themselves become objects of reverence or respect. They may have enabled the wearer to take on a different personality or state of consciousness in order to carry out a specific function to fulfil the demands of their social group or occasion (Clottes and Lewis Williams 1996; Lewis Williams 1997; Aldhouse Green, S. and M. 2005). Functions such as were ascribe to the role of a 'Shaman' is possibly best summarised by Piers Vitebsky (1995) in his book on the Shaman:

> *Being a shaman is probably, in fact, the oldest profession, covering the roles which in industrial societies are played by the doctor, psychotherapist, soldier, fortune teller, priest and politician.*

It may be that one might add the role of the magician to the list.

These multiple roles may be used to kill or cure. Vitebsky shows that they may bring a curse or a blessing, like the black and the white witches of European tradition. They include the possible use of trance or out of body experience, of dance, drugs and the adoption of animal features like antlers, bird heads or the curious characteristics of some of composite figures featured in the parietal and mobiliary figures of Upper Palaeolithic imagery. Yet whether these strange portrayals indicate magical rites or ceremonies remains an enigma. Adopting a certain style of dress gives the wearer a choice of role or position in society that may express the function of a working Hunter-Gatherer equipped to resist the elemental demands of that lifestyle or in another direction to take on the specialist function in the ceremonial and perhaps the spiritual life of the group.

Chapter 8

Case study: snowy owls at the Grotte de Bourrouilla at Arancou, Atlantic Pyrenees

As was noted in earlier chapters, the remains of snowy owls occur sporadically throughout the Palaeolithic record in Europe. Individuals of the species *Nyctea scandiaca* are known to have been present on sites across Europe during the late Quaternary. It was not a phenomenon exclusive to the end of the Last Glaciation in France. There are records of the species from the Middle Pleistocene onwards across western and central Europe, from Germany in the North to Gibraltar and Puglia in the South and from a rare find in Devon in the West to Binegade in Azerbaijhan in the East. There are records from European Russia as far as the Ural Mountains and in the Ukraine, dating from 18,000 years BP and the Last Glacial Maximum as has been demonstrated by O. and E. Popova (Popova and Sale 2012).

In western Europe, the earliest known recoveries were from a site dated to MNQ 20, at around 780,000 years BP, at Burgade in the Herault region of France and from the Grotte de St Esteve Janson, Bouches du Rhône, MNQ 22, where the bones belonged to juvenile birds, indicating perhaps that a breeding pair were present (Mourer Chauviré 1975). Small numbers of snowy owls have been found in excavated faunal assemblages from subsequent phases of the Palaeolithic, usually in conjunction with anthropogenic workings, although not always directly associated with them. It has been assumed that there was a gradual distribution shift towards the North and East at the end of the Last Glaciation. However, it was only at a late stage of the Magdalenian and associated with a discreet group of sites that there is evidence for the culling and processing of snowy owls on what was at that time an almost industrial scale.

During the later stages of the Magdalenian occupation of Aquitaine certain Hunter-Gatherer settlements seem to have specialised in the collection and processing of this species of owl to a much greater extent than elsewhere. A number of these sites have been studied in some detail to try and discover some reason for this specialism and this case study is based upon an analysis of the bones of over 100 individual birds from La Grotte de Bourrouilla in the village of Arancou in the Atlantic Pyrenees.

The Grotte de Bourrouilla is just one of these Late Glacial sites in south west France where recent research material from an extended period of excavation has revealed that the quantity of bones of snowy owls appears dis-proportionate in relation to the rest of the avian assemblage and that the bones may be seen to be marked by more signs of skinning, flensing, cuts and burn marks than the skeletal remains of other species in that or similar contexts. It seems to be a systematic, anthropogenic modification of the long bones in particular, that is characteristic of these sites, where large numbers of snowy owls were processed: sites like Le Morin (Gourichon 1999) Isturitz (Boucher 1952; Dufaure (Eastham 1995)), or Bois Ragot in Vienne (Laroulandie 2000). A number of answers have been offered as to the motif behind a specific cull of snowy owls and their possible function in Late Magdalenian culture.

The avifaunal ecology at Arancou

The Grotte de Bourrouilla lies at present just below the 46-metre contour in an area covered in light scrub vegetation between 200 to 300 metres to the east of a small valley. The valley gradient drops steeply for a kilometre or so to the northwest as the Lauhirasse stream descends to join the Bidouze river as it flows round the promontory of Le Cout at Larraldotte, and turns northwards again, itself to become a tributary of the Adour. To the West of the cave, the landscape is heavily wooded; to the South the land is currently relatively level pasture and cultivated land; to the East the ground rises for about two kilometres before making a slow descent into the lowlands that at the end of the Last Glaciation probably included a number of lakes, marsh and wetlands along the west bank of the Gave d'Oleron, some eleven kilometres from Arancou. The eastern banks of the Gave d'Oleron rise sharply to the Pastou cliffs, under which there were the series of Magdalenian settlements that included the abris of Le Grand Pastou, Le Petit Pastou, Duruthy, and Dufaure. These, with the associated sites of Isturitz, Erberua and Oxelhaya, some 20 kilometres to the South, form an important group at the western end of the Pyrenean chain.

At Arancou, the discovery in 1986 that a large part of the small chamber at the back of the cave had been broken into clandestinely, leaving behind a large quantity of spoil rich in faunal remains and artifacts led to a programme of systematic excavations directed initially by Claude Chauchat and subsequently by Morgane Dachary. Their work revealed a sequence of

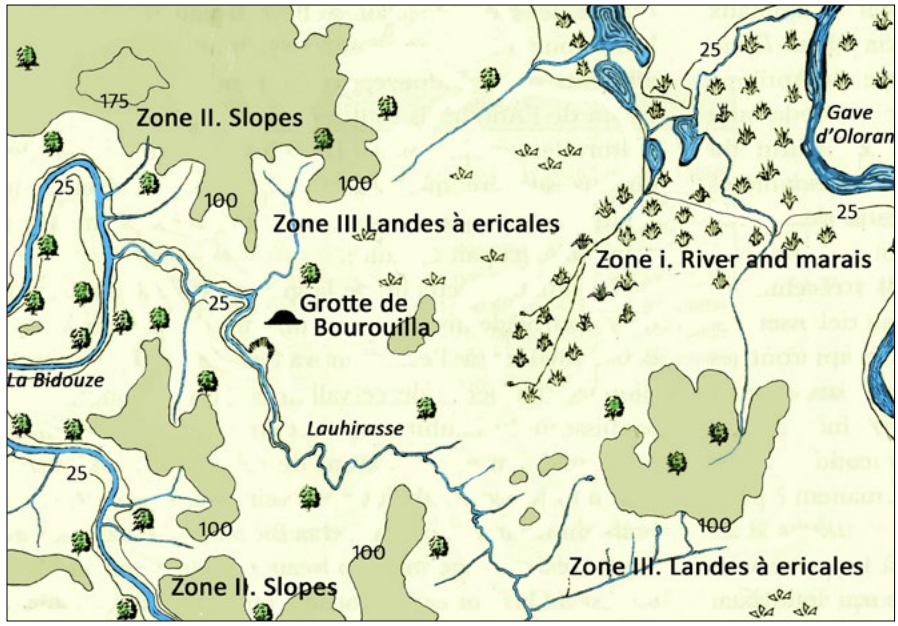


Figure 1. Location map for the Grotte de Bourrouilla, Arancou, after Eastham.

occupations beginning during the Middle Magdalenian and continuing in sequence into the Mesolithic in a very small area of the settlement. The sequence is divided into stratigraphic levels defined by the prefix US and separated into metre squares.

The sequence of Upper Magdalenian occupation at the cave contained remains from a diversity of avian species, besides the very much larger quantity of snowy owl bones. Amongst this diversity some species like chough and doves would have been indigenous to the rocky habitat of the site and the passerines, thrushes, tits, swallows, woodpecker and large corvid would have been resident nearby within the ecological mosaic of the immediate locality.

On the other hand, the few aquatic species, the ducks and swan and the game birds, mainly grouse and partridge were probably hunted and caught on the wetland and scrubland between the rivers of the Bidouze and the Gave d'Oleron at particular seasons of the year. None of the specimens in these categories that were recovered either in the 'Clandestine' spoil or the later excavations in any sector of the site carried any sign of having been modified for a purpose other than the dismemberment of the carcase for consumption. It would appear that that the provision of food and perhaps feather was a main motivation for taking these species.

From the evidence, it would appear that it was primarily the processes of deliberate cutting, scraping and sometimes burning of avian bone was applied to raptorial species at Arancou. An eagle humerus from the spoil of the 'Fouilles clandestines' had cut marks across the ventral condyle of the distal epiphysis and a more recent recovery from Carré N17 during the 2013 excavations was the proximal epiphysis of a vulture radius that had been neatly sawn across, both of which gave an indication that larger raptors might be targeted. Yet, from the numbers of snowy owls and the way their bones were modified, it would seem that they may have been culled for a particular purpose other than consumption, though it has been suggested that they were also eaten.

A further discovery at the Grotte de Bourrouilla showed that during the apparently brief Mesolithic occupation of Carré O16, US 2012, level, bones of *Buteo buteo*. The buzzard seemed to take the place of the snowy owls in that the bones were frequently found to have been modified in the same way (Dachary *et al.* 2013). It might appear as though the owl population in the region had drastically declined in the region, perhaps due to climate change and a pale plumaged strain of the variable buzzard became its cultural replacement. The very limited area from which this evidence was recovered and the relatively small number of buzzard bones make this a somewhat tenuous suggestion.

Consecutive seasons of excavation at the Grotte de Bourrouilla have begun to reveal the extent to which the exploitation of the Snowy owl was pursued. Table 1 shows the annual recovery rate of the identifiable remains of this species and attempts an estimate of the minimum numbers based on the laterality of each element. It does not take account of exact measurement compatibility; nor does it take account of all the fragments of each element that carries similar cut, scrape or burn marks and are of a size and morphology compatible with the snowy owl, because these bones have had to be categorised as indeterminate for lack of positive data, despite the likelihood that, in the absence of any comparable species, a positive identification might be probable. It does include all the elements of

Bone	Fouilles clandestins			2003 - 5			2006			2007			2009			2010			2011			2012			2013			Total left	Total right	Total uncertain	Cumulative total
	L	?	R	L	?	R	L	?	R	L	?	R	L	?	R	L	?	R	L	?	R	L	?	R	L	?	R				
Cranium						3				1	2	1														1		1	4	2	8
Quadrate	3		4	1	2	1	3		1		2											1		3				8	9	4	21
Maxilla		3			1			1			2																			7	7
Mandible	4		8	1			1	3	1	1	1	2							1	1		2		1			1	10	13	5	28
Coracoid	28		46	5	1	4				3		5	1		1				3		3	1	2	1	2		5	43	65	3	111
Scapula	16		14	2	1					2				1							1		2	1				20	16	4	40
Sternum		4			1			1			4								1		1		2			1				15	15
Furcula					1					1		1											2					1	1	3	5
Rib		1			8						5			1						1	1					3				20	20
Vertebra		28									2									2			4							41	41
Humerus	51		53	5	11	3		1	2	7	8	5	3	2	1	1	1	2	1	3		5	9	6	6	8	2	80	74	43	197
Radius	16	16	20	5	18	1	2	11	2		6	6			1				3	5	6	4	6	4	1	5	4	28	38	58	138
Ulna	25	11	30	7	8	4	4	11		10	10	5	1	2					3	7	6	3	1	3	7	3	1	59	50	46	160
Carpel	3		1		2			1			1											1	1					4	1	4	9
Carpometacarpus	27		25	1	1	1	3		3		5	1		2					1			3	2					35	30	12	77
Digit ala	2		2	1	1	1	1		2	1	1				1				1	1		1						6	6	3	15
Pelvis		7			1			1			2									1			2			1				15	15
Femur	32		26	1	3			6	1	3	4	1					1					5	1	2	5		1	46	31	15	92
Tibiotarsus	31		25	6	2	4	1	2	1	8	3	3		1	1				4	2	4	3	4	1	4	3	1	61	38	21	120
Fibula					3	1	1	2		4	5			1						3			3	1	1	1	1	6	3	18	27
Tarsometatarsus	15		20	1	1	1				1	2				1								1			1	1	17	25	5	47
Digit pes		107		1	3																									117	117
Claw		229		4	6	2		3				3		2						2						3				254	254
		943			142			73			150			23			5			69			94			72		417	373	697	1556

Table 1. Cumulative totals of snowy owl bones in level US 2007, and record of laterality.

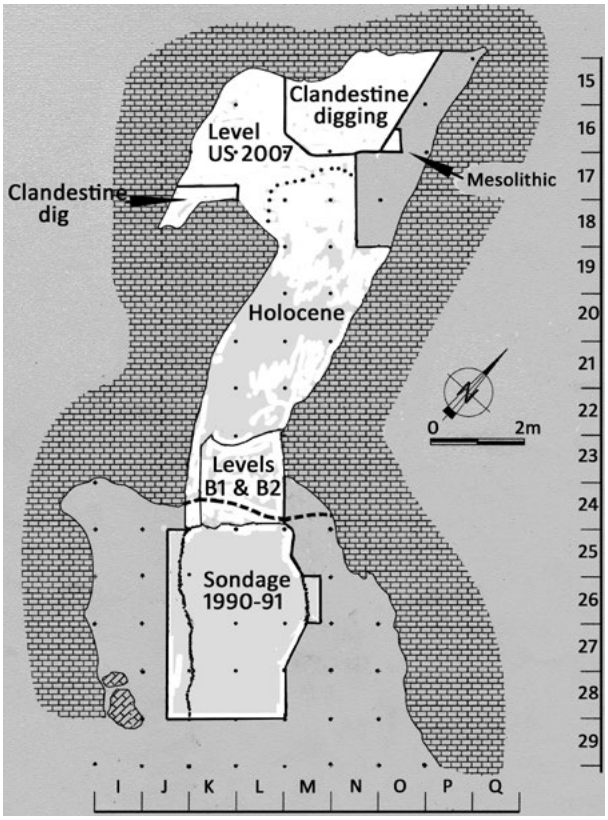


Figure 2. General plan of the cave, after Dachary and Plassard.

the axial skeleton and lists the numbers of bones for which laterality is uncertain. Unfortunately, some of the main concentrations of bone working were in the area of the clandestine operations for which the evidence was retrieved from the spoil, so that it may not be a complete record.

It would appear from the inventory that birds were brought into the inner chambers of the occupation level US2007 in their entirety. Every part of the skeleton is represented in the sample. Some bones were recovered with less frequency than others, either because of their fragile nature, or because they are difficult to distinguish in a fragmented state. There was, therefore, a recovery bias towards the major long bones and, to a lesser extent, towards those fragments with identifiable characteristics or bearing evidence of having been worked. On the basis of the numbers of bones, the most frequent were the humeri. From the balance between the numbers of left and right-handed elements, it is possible to suggest that, in total, a minimum of at least 80 to 100 individuals were involved, 53 of them from the 'Fouilles Clandestines'. The actual numbers were probably in excess of this, as noted above. Clearly the snowy owl would appear to have been collected for a particular, or perhaps, several specific purposes and, on the evidence of size differentiation between larger females and smaller male birds in the situation of inverse sexual dimorphism, it is worth noting that both males and females of the species were taken to make implements or fulfil any purpose for which they were intended.

Even though there were several layers of sediment deposition in the make-up of US 2007, indicating

Bone	Clandestine	K16	K17	L15	L16	L17	L18	M16	M17	N17	O16	Remanié grotte
Cranium						8			1	1		
Quadrate	7					7			1	1		2
Maxilla	2					3			1			
Mandible	12					7	1	1	5	3		
Coracoid	74					22	2		6	4		3
Scapula	30					2	2		2			2
Sternum	4					4	3		5			1
Furcula						2			2			
Rib						6						5
Vertebra	28					9	7		3	1		3
Humerus	104		1	1	1	29	9	1	12	7		3
Radius	54	1		7		60	4		3	11	1	10
Ulna	66	1	1	1		63	16	2	8	7		6
Carpus						4						
Carpometacarp	52		1			16	9		2	2		
Digit ala	23					8			2	1		1
Pelvis	7					2	2		2	2		1
Femur	52			1	2	15	4		5	5		2
Tibiotarsus	56					30	10	1	5	4		
Fibula			1	1		15	1					
Tarsometatars	35					7	1		1			
Digit pes	107					3	1			1		1
Claw	229					7	1	1		1		4
totals	943	2	4	11	3	312	72	6	70	51	1	44

Table 2. Grotte de Bourrouilla at Arancou: the distribution of Snowy owl bones, level US 2007, by sector.

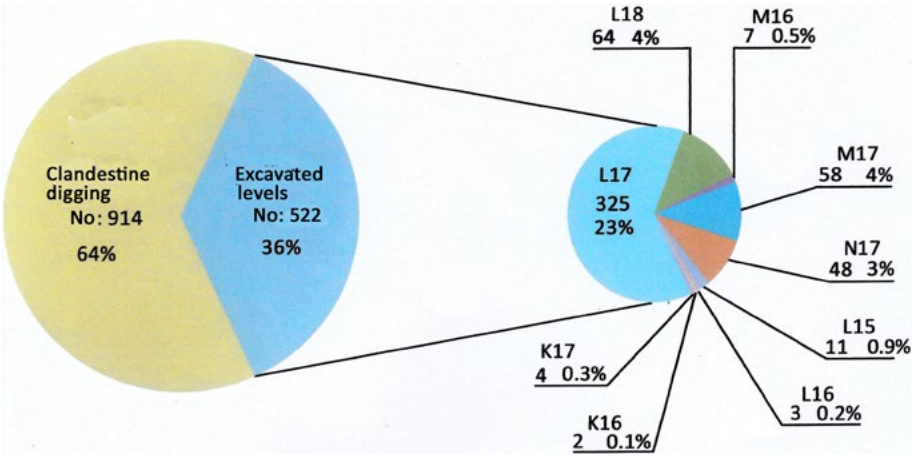
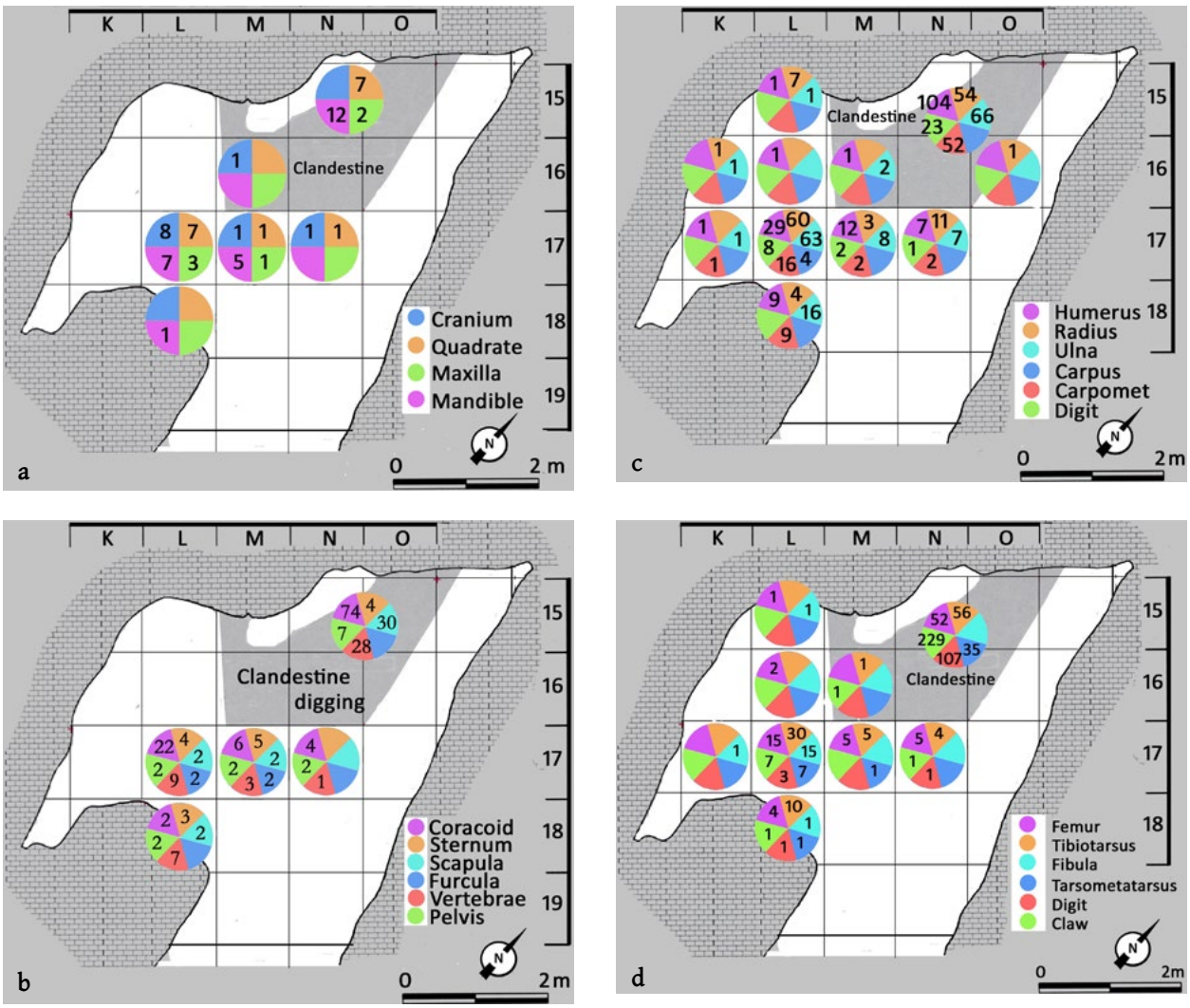


Figure 3. Distribution if snowy owl bone in excavated sectors and in the clandestine area.

that the individuals would have been brought onto the site over a period of time; the collection programme for such a large number of birds must have been deliberate, well organised and would have demanded an intense understanding of the ecology of the species. It would appear from the way in which the bones were worked that there was a particular significance attached to the use of this species in the cultural life of the group.

The snowy owl bones are concentrated in a limited number of sectors within the inner cave. The largest sample was from the spoil pf the clandestine operation that was spread over a number of sectors, of M15 and



Figures 4, a, b, c and d plot the distribution of body parts across the cave.

Table 3. Worked bone showing cut marks, burns and scraping, C, B, and R, mainly for severing joint or removal of flesh.

Bone	Clandestine digging			Sector L17			Sector L18			Sector M17			Sector N17		
	C	B	R	C	B	R	C	B	R	C	B	R	C	B	R
Cranium															
Quadrate										2				1	
Maxilla															
Mandible									1		1			3	
Coracoid	1	3	6	1	4	3							1	1	
Scapula	2		3		2									2	1
Sternum															
Rib															
Vertebra					1									1	
Humerus	19	10	9	2	4	14			2	3	1	5	1	1	1
Radius	3		10	8	6	30		2		3		1	1	2	3
Ulna	7	1	13		1	19			6			9		1	4
Carpus															
Carpometacarpus		1				2	1							1	
Digit ala				1											
Pelvis															
Femur	1				1	1			2					3	
Tibiotarsus		2	8		1	1		2	2	1	1	1		1	1
Fibula						2									
Tarsometatarsus	15	2		1						1				1	
Digit pes		1													
Claw		1													
Totals	50	21	49	12	20	72	1	4	12	10	3	16	3	16	9

16, N15 and 16 and O15, 16 and 17. In the subsequently excavated sectors the greatest concentration of bone was found in the adjacent sectors of L17 and 18 and M17. There does not appear to be any particular distributive bias between different parts of the skeleton, apart from the paucity of foot bones in sectors other than those exploited by the clandestine excavators; in fact, the proportions seem fairly even. The overall proportion of owl remains is highest in the area covered by the 'Fouilles Clandestines', with 64% of the total, while the remaining 36% were recovered in place during excavation within the carrés indicated (Figure 1). Further analysis indicated that in all sectors, except the 'Fouilles Clandestines' the wing bones exceeded other parts of the body in number.

An analysis of the individual elements of the skeleton makes it clear that every part was present though with a distribution bias towards certain sectors.

The interpretation of this is not entirely clear but, in combination with the regular indications of bone modification, it suggests a working area that, including the clandestine diggings, would appear to cover approximately ten square metres of the surface area of the cave. In theory, this would provide sufficient space for up to five people to work on the preparation at the same time. The possibility that tasks might have been divided up anatomically and executed in separate areas has been considered but no confirmation of this was found in the way the bones were distributed across the working area between one sector and the next, with the exception of the foot bones: the tarsus, phalanges and claws, the recovery of which appears to have been largely confined to the area of clandestine diggings with only a few finds in other sectors despite there being a particularly rich deposit of owl remains in Carré L17.

Patterns of bone modification

A detailed examination of the ways in which the bones of Snowy owls were modified, revealed a remarkable consistency of treatment and practice throughout, the spoil of the 'Fouilles Clandestines' and the sequence of layers forming the occupation phase represented by US 2007. In general terms the processing included cutting and sawing, and scraping in order to remove skin and flesh and light burning, or rather scorching mainly of the joints. In the attached Table 3 (above).

Cut bones

The largest sample of cut and sawn bone came from the 'Fouilles clandestines' (Eastham 1998). In that sample, the most frequent cuts are to be found on the long bones of the wing, humerus, radius and ulna. Among the humeri, there are a considerable number that were cut through across the diaphysis or shaft and had cuts across the caput humerus presumably in order to sever the acrocoracohumerale ligament attaching the coracoid to the humerus. However, even more frequent are the signs of cut marks across the dorsal and ventral condyles of the distal epiphysis. These incisions would have severed all of the ligaments attached to each condyle, detaching the humerus and

making accessible the proximal ends of both radius and ulna. The distal ends of both these elements were similarly detached and the epiphyses removed; operations that resulted in tubes of differing diameters available for possible use, as pipettes perhaps, or for disseminating pigments or other infusions in liquid form. The only direct evidence obtained to date of the possible use of the long bones of the wing in this way was discovered not from the clandestine sample but from a section of ulna No 935, that was heavily stained with haematite residues, found in Carré L18 during the 2013 excavation season.

A particular method of disarticulation appears to have been developed for separating the humerus from the ulna and was predominately applied to the snowy owls. This has been labelled 'peeling' (Laroulandie 2000, 2005 and 2006). The process involves turning the olecranon of the ulna back through the caudal surface of the humerus, in order to separate the two bones. A more precise, although more ponderous description for the process might be to call it 'inverse disarticulation'.

As already noted, snowy owl material from the 'Fouilles clandestines' included an appreciable number of bones from the foot, the tarsus and claws that were cut. The tarsus bones show repeated cut marks across the diaphysis of the bone at the level of mid shaft (Eastham 1998: fig. 7). Out of a total of 107 phalanges and 229 claws in this sample, a number were found to have cut marks, but what they were designed for is difficult to define unless it was for decoration, that might be compared with the way that the feathered feet of grouse have been used in Scotland, mounted on brooches in recent times. Curiously, as noted in connection with the pattern of bone distribution, neither the tarsometatarsus, nor the phalanges and claws have appeared in comparable numbers from later excavations in other sectors of the site. It is a possibility that the process of using or discarding the bones of the feet was a particular activity confined to that part of the working area covered by the clandestine operations.

Burn marks

Exposure of bird bones from US 2007 to fire was quite common but relatively slight. There was no blackened or calcined bone as in the Salle du fond of the Grotte d'Enlène at Montesquieu Avantes, Ariège, where both mammal and bird remains appear to have been used as fuel for fires within the cave (Bégouen *pers. com.*). The ends of some bones, most commonly that of the coracoid and the long bones of the wing, show signs of discoloration by scorching, as though fire hardening of the muscle tissue and ligaments made it easier to extract the bones cleanly. Alternatively, it might be the type of staining that could occur in the slow roast of an earth oven, although the detritus from that would have been more probably left around the cooking location. More rarely fire treatment was applied to the femora and tibiotarsi, indicating that the process was not used uniformly on the entire carcase. Somewhat unusual was the recovery of a quadrate (No 251) from sector N17 in 2004 with a light scorch mark along its edge and from sector L17 in 2012 a left mandible also with faint marks suggesting light burn marks. But these are the only known instances of even very light signs of burning on bones of the jaw or cranium on this site.

Scratches and scrape marks

The most frequent marks to be seen on the snowy owl bones recovered at the Grotte de Bourrouilla are the scrapes and scratches resulting from skinning and flensing. These vary considerably in depth and direction and it is tempting to suggest that both depth and direction depend on the skeletal element to which the treatment was applied and the amount of work required to separate muscle and ligament tissue and from the bone. Single or double scrape marks, depending on the freshness of the burin along the axis of the bone are the most frequent. Transverse scratches and even cuts appear in relation to the muscle and ligament attachment points. Most commonly, it was the major long bones that underwent this treatment, that is, the humerus, radius and ulna from the wing and the femur and tibiotarsus of the lower limb. Less frequent, although these also occur, are scrape marks on the metacarpus and on elements of the axial skeleton like the coracoid and scapula.

In addition to the corpus of fully identified bone, many fragments show signs of having been worked. At a conservative estimate rather more than 45 fragments from the areas of systematic excavation fall into this category, most of them from Carrés L17 and M17. It is sometimes uncertain whether they were worked before being broken up, or whether they disintegrated in the process of preparation and were rejected as a result. Some examples where refits have been achieved suggest that the former was most likely but the latter scenario is just as possible. Much depends on the motive behind the working.

The ecology and behaviour of recent populations of the snowy owl

At this stage of the study of the remains and utilisation of snowy owls at Arancou, it is worth considering how far the excavated evidence may relate to recent research in to the ecology of species *Nyctea scandiaca,* its present distribution, habitats, migration and ethology and to try to discover its relevance to the lives of the hunter-gatherers of the Grotte de Bourrouilla. The main body of research into the life of the snowy owl has been carried out since 1950, the bulk of it in Russia, Siberia

Table 4. Small rodent remains on sites in Aquitaine associated with significant numbers of snowy owls.

Small rodent species From Late Glacial, Magdalenian levels on sites in Aquitaine	Gr0tte de Bourrouilla	Dufaure	Duruthy	Le Morin	Le Roc de Combe	Le Pont d'Ambon	La Gare de Couze	Combe Cullier	Ekain, guipuzcoa
Glis glis	*			*	*				
Arvicola cf. terrestris	*	*	*	*	*	*	*		*
Microtus gregalis					*				
Microtus ratticeps/oeconomus	*	*	*		*	*	*	*	*
Microtus agrestis/arvalis	*	*	*	*	*	*	*	*	*
Microtus nivalis									*
Clethrionomys glareola	*	*				*	*		
Apodemus sylvaticus	*	*		*	*	*			

and North America. This has recently been extended and synthesised by Potapova and Sale (2012) to whose work I am indebted for the detailed and comprehensive information about this species and their extensive analysis of the literature.

Diet

At the present day the breeding distribution of the snowy owl is circumpolar within the Arctic Circle. Its distribution is largely defined to the north by the presence and availability of small mammals, typically the *Lemmini,* various members of the lemming family and, to the south, by the development of shrubby vegetation, since the owl has a preference for roosting and nesting in open spaces, on hummocks or low ice pingos on bare ground within areas of bog, usually not far from water. Where the tundra vegetation is extended into higher altitudes the breeding grounds may be higher and extend further south. However, the breeding distribution is unpredictable, irruptive and erratic from year to year and is considerably dependent upon the availability of suitable prey animals.

In the west Palaearctic, records of the diet from Norway, Sweden and Finland at the present day indicate that between 85% and 98% of the snowy owl diet consists of Norway Lemming, *Lemmus lemmus,* bank vole, *Clethrionomys glareolus,* water vole, *Arvicola terrestris,* short tailed vole, *Microtus agrestis,* and root vole, *Microtus oeconomus /ratticeps*; the remainder consisting of birds and small to middle sized mammals and some frogs (Cramp 1985: 489).

At times of low lemming population or in habitats where lemmings are not readily available, the diet will shift towards other species of vole, especially the *Microtinae* and other mammals like arctic hare and fox but they will also take birds: ducks grouse, and sometimes plovers and other shore birds such as oystercatchers. In this context it is worth noting that at the Grotte de Bourrouilla there were no finds of regurgitated owl pellets. Since snowy owls do not roost or nest in caves but on the open ground, the absence of pelleted material gives further confirmation that they were not feeding or roosting in the immediate area of the cave but brought in by the hunter-gatherers who were exploiting them. Besides, at the Grotte de Bourrouilla there were no lemmings. The rodent population from the 'Fouilles clandestines' included bank vole, *Clethrionomys glareolus,* short tailed vole *Microtus arvalis*, field vole, *Microtus agrestis,* root vole *Microtus oeconomus/ratticeps*, and some mice, in particular the wood mouse, *Apodemus sylvaticus.* In the subsequent excavations in the areas of US 2007of the late Magdalenian occupation, with its abundance of snowy owl remains have not altered the micro-faunal spectrum except that *Glis glis,* the furry tailed dormouse has been added to the list.

Other sites, where snowy owl was exploited in considerable numbers demonstrate a very similar pattern of microfauna. (Table 4). The neighbouring sites along the Pastou cliff at Sordes l'Abbaye, the sites of Duruthy (Delpech 1983) and Dufaure (Eastham in Straus 1995) revealed an exactly similar range of small rodents, as did the sites of Pont d'Ambon, Gare de Couze, Le Morin on the Dordogne and Combe Cullier in the Lot. Unusually, there was also a specimen of *Glis glis*, the edible dormouse at Le Morin. At no site of this period were *Lemmus lemmus or Dicrostonyx,* the Norway or the brown lemming recorded in the south west region of France, or even in the contemporary site of Ekain in Guipuzcoa.

Territory and hunting range

Figures 5, 6 and 7. Photographs of male and female snowy owl and a detail of the head of a male bird taken at the Rocher des Aigles at Rocamadour.

Figure 5. Photograph of male snowy owl taken at the breeding station Le Rocher des Aigles, Rocamadour (photo: Eastham).

Figure 6. Photograph of female snowy owl taken at the breeding station Le Rocher des Aigles, Rocamadour (photo: Eastham).

The snowy owl is territorial in behaviour at all times of year but the size of the territory shows considerable variation according to the type and abundance of the available prey species. In circumstances where the lemming population is high and the individual voles are large, the hunting range required is reduced, but if there were a drop in numbers or were the numbers of the larger vole species to be reduced, so that the body weight of the available rodent population became inadequate and the owls needed to turn to an alternative

Figure 7. Photograph of head of snowy owl taken at the breeding station Le Rocher des Aigles, Rocamadour (photo: Eastham).

food source like grouse, the territory will be enlarged to allow for the necessary hunting adaptation with a consequence for the hunter-gatherer community.

In their present-day winter habitats, these owls are also irruptive and dispersive in both Eurasia and North America. Aggregations of birds have been found wintering in Tundra regions, especially where there are also dense populations of Willow grouse and Ptarmigan. An estimate of the owls wintering in the tundra zone in Russia has been calculated at 8-27% of the population (Priklonsky 1993). Snowy owls have reverse sexual dimorphism to a considerable degree, not only in plumage coloration, the females having darker markings but they are also some 22% larger than the males. However, both sexes may undergo huge weight losses over the winter when food resources or weather conditions are poor. They are known to lose over 50% of their total weight, which might make them vulnerable and easier to collect at the close of the winter season (Potapova and Sale 2012: 30).

Migration

In Russia and Siberia there are records of birds, wintering in or more probably on passage through the un-forested parts of the boreal zone where open areas around lakes and raised bogs provided a suitable habitat. South of the boreal forest, birds have been recorded from Britain and Ireland as far as the Ukraine, Caspian Siberia, Kazakhstan, the Northern provinces of China and Kamchatka, and even in the Hokaido province of Japan during the winter months. North America carries a much higher density of snowy owl population in winter, concentrated especially around the Great Lakes and the St Lawrence river and on the remaining prairie land south of the timberline, with its similarity to the habitat of the tundra. Curiously, many are attracted to airports, gathering there in considerable numbers during the winter, possibly, it is thought, because the

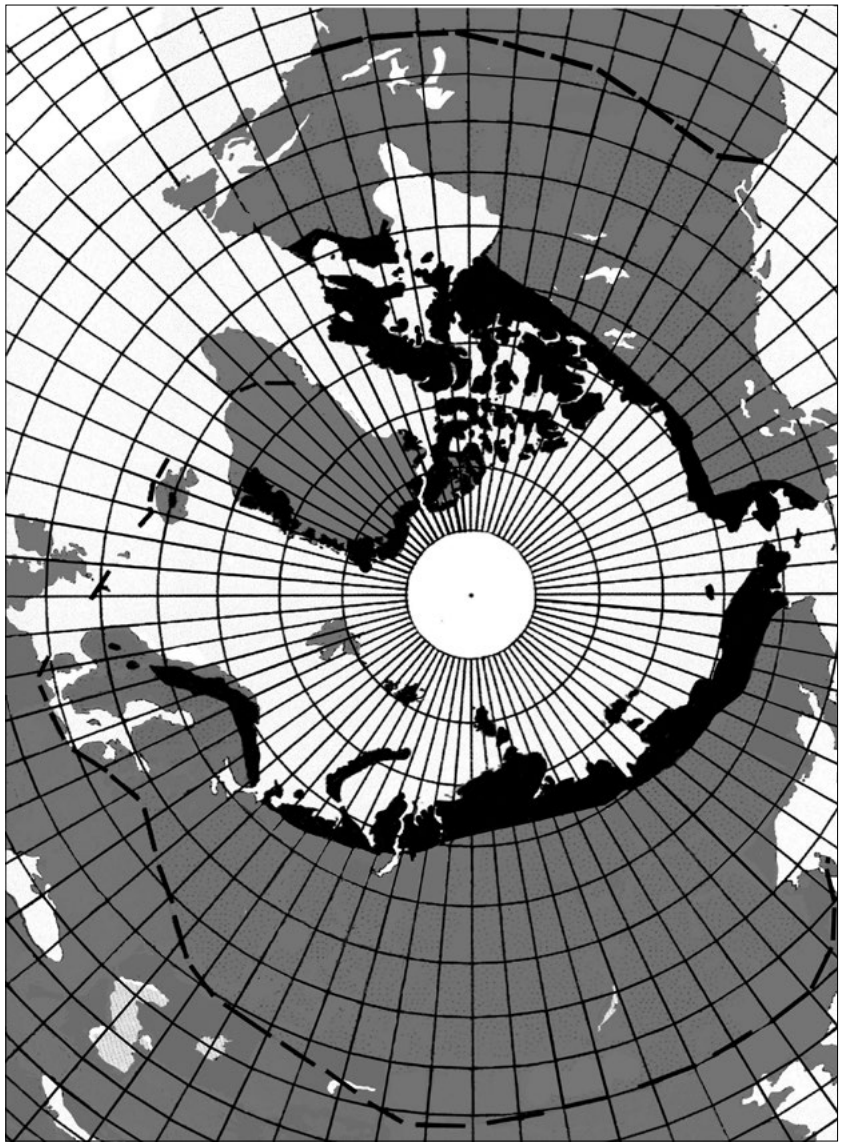


Figure 8. Circumpolar distribution of the snowy owl at the present day.

noise gives them protection from attack by eagle owls and also because the open grassland habitat is similar to the conditions of the tundra.

It is worth noting that the snowy owl has few direct predators. Clutches of eggs and chicks may be taken by arctic foxes and there are records of attacks by skuas, *Stercoraridae,* occasionally by gulls, and even by eagles or gyrfalcons. Most frequent are attacks by eagle owls, a species that is present in appreciable numbers during the final stages of the last glaciation in south west France. The Abri Dufaure is an example of Magdalenian occupation site where remains of both eagle and snowy owls were found in the same level, though whether this was related to predation at that site is uncertain.

Palaeolithic dispersal

It would appear that the snowy owl pattern of irruptive dispersal may also apply to their behaviour at the end of the Last Glaciation in Western Europe and it may help to explain the numbers that were found on sites in the region of Aquitaine. All the sites on which *Nyctea scandiaca* features as a major element in the avifauna are close to water and those in the Dordogne the Landes and Atlantic Pyrenees have access to open ground, that may be described variously as tundra–like grassland of low-growing mixed vegetation, habitats not dissimilar to those in which the species winter in eastern Europe, Poland, the Ukraine and in North America at the present day. Between Arancou and the Pastou sites there are currently considerable expanses of marsh with ponds, that would have been more extensive expanses of open water as the ice retreated. There is also access to the open heaths of the Landes that would have stretched as far as the Atlantic coast, access to which by the local Hunter-Gatherers may be confirmed by the finds of volcanic pumice washed ashore and recovered at the Grotte de Bourrouilla, (Dachary and Plassard 2013). At the Abri Dufaure there was a tibiotarsus of stone curlew,

whose present habitat of open stony ground is similar to that of the coastal areas of the Landes. Its captors might have considered the unusual appearance of this bird made it worth keeping, since the bone in question was perforated, to serve perhaps as an amulet or bead.

Seasonal factors and human activity

Assuming that the owls recorded from this time in Aquitaine were a wintering population raises a problem in that it creates some discrepancy between the avifaunal record and other seasonal evidence on the site, principally, that of the fish at Arancou of which the majority were taken during the good season indicating a main human occupation during the Summer months (Le Gall 1999). It is clear both from the finds at the Grotte de Bourrouilla and the Abris Dufaure and Duruthy that wild fowl were accustomed to wintering in the region. Remains of whooper swan, red crested pochard, and red breasted merganser, were recovered from the debris of the clandestine operations at Arancou and, more recently, further evidence of a whooper swan was found in carré L17 US 2007 (No. 2680), a coracoid with evidence of a small number of worked scrapings. At the Abri Dufaure swans, geese, greylag, bean goose, and great northern diver appear all to have been used to enliven the winter diet and probably to provide feather and down for clothing. Some 25 kilometres away in the Salle de St Martin at the cave of Isturitz, where snowy owl bones were numerous, Bouchud (1952) also identified a diver either the great northern or the black throated and both red breasted merganser and goosander. He also found capercaillie, a grouse of the uplands in northern latitudes. At Ekain in Guipuzcoa, a section of rib bone has recently been excavated, on which an accurate image of a diver, was carved. There is sufficient detail in the depiction of the plumage to engender some discussion as to whether it is a great northern or a black throated, *Gavia immer/arctica*, but there is no doubt that it is one or the other (Altuna *Pers.com*).

Such evidence has implications both for the seasonal occupation of the site and for the migratory behaviour of the birds. On the basis of faunal evidence Straus (1995) proposed a cold season occupation at the Abri Dufaure, partly on account of the birds and the wear analysis on ungulate teeth but more significantly because of the absence of *Salmonidae* and other fish by comparison with the adjacent settlement of Duruthy, where they were plentiful.

A comparison of recent winter migration patterns of wildfowl with the Magdalenian record from these sites suggests a shift of approximately 300-500 kilometres southwards in the current wintering habitats of the species concerned. There was some discussion of the fluctuation in the patterns of wildfowl dispersal in the winter season during the later phases of the Last Glaciation in Chapter 1. On these sites in Aquitaine during the Magdalenian its effect becomes evident in the fossil record. The whooper and Bewick swans currently have their main winter concentrations in the coastal areas of Norway, Britain, Ireland and the low countries. A few whooper swans are known to winter off the coast of Brittany and in the valleys of the Loire and Saône and eastwards on the Aegean coasts but are absent from south west France and Spain (Cramp 1977). The Bewick swans are even more restricted in their wintering grounds, moving mainly to western Britain and Ireland, Denmark and the Low countries. The migration pattern of the geese is similar, though the bean goose has a more continental distribution as has the red-crested pochard that is generally restricted in its range to south and east Spain, the Mediterranean and Eastern Europe and seldom appears in central or south west France. With a breeding distribution across Iceland, Fennoscandia, Germany and Russia to parts of north west Britain the red breasted merganser and goosander move to coastal locations, lakes and rivers as far south as the Loire and the Vendée in winter. Of the divers, *Gavia immer* is a nearctic breeder on lakes in Iceland, Greenland North America, moving to western coasts from Norway to Brittany and Britain in September and October. *G. arctica* is also a northern breeder in Russia, Siberia and Fennoscandia, mainly within the boreal zone and the limit of its winter range extends as far south as the coasts around the Bay of Biscay and the chilly waters along the Cantabrian coast. On this basis the avifaunal evidence appears to be in favour of an autumn or winter and early spring Magdalenian presence on these sites, in addition to a good season occupation.

Hunter-gatherer strategic intention in the exploitation of *Nyctea scandiaca*

With an average summer weight 1.5-2.2 kg, with a wingspan of 1.2-1.8 metres, the Eurasian snowy owl is the second largest of the European owl family, second only to *Bubo bubo,* the European eagle owl. Its size, combined with its arresting pale plumage and ground roosting habit make it hardly surprising that it attracted the attention of the Magdalenian hunter gatherers at the end of the Last Glaciation. Besides the classic sites in the regions of Perigord and Gascony. The chapter on avian resources explores a number of uses to which the bone and plumages of different species have been applied in the past. It would appear from the way the bones were modified that during the final stages of the Last Glaciation, the snowy owl played a considerable part in the daily lives of some of the inhabitants of southwest Aquitaine.

Snowy owls as food

Even accepting that a primary motive for hunting game is and was for food and the diversity of methods of tracking, trapping and despatching the prey have persisted over a very long period of time, it is extremely unlikely that the owls at Arancou were ever regarded as a major source of nourishment. In the harsh conditions of the arctic, people will use all available methods and resources to obtain food and there are records of Canadian fur trappers finding the birds to be good eating in the breeding season and of both Eskimos and Inuit collecting eggs for food (Potapova and Sale 2012). But this appears to be in a situation of scarcity that did not apply in the Late glacial of Aquitaine, where there appears to have been a relative abundance of red, roe deer and reindeer, although the migrating herds of the latter were already in decline. Nevertheless, consumption of the flesh, possibly as part of a ritual is widely assumed to have been a factor, even when other uses are admitted.

In their winter territories as has already been noted, deprived of their preferred prey, the owls are known at the present time to lose weight in the form of muscle mass and fat and, in extreme conditions, they even begin to re-absorb their own internal organs in order to survive, although it is unlikely that such extremes occurred frequently during the late Magdalenian. While weight loss would weaken the bird and makes it easier to catch, the destruction of muscle tissue would result in reduced palatability and nutritional value. No studies are known to have been done to determine the weight ratio of bone to flesh and feather. It is known that this species carries 10% more feather than most other bird species. Records of the comparative weights of the skeleton are somewhat sparse and inadequate but a few have been obtained:

1. Mature juvenile specimen of Canadian origin, (Pers. Coll).
   University of Alberta, Acc No. 982-8-23. Live weight: 1573.1 grams. Skeleton 120 grams.
2. British Museum NHMUK. S/1998.59.1. No data on live weight; Skeleton 117 grams.
3. British Museum NHMUK. S/1983.72.1. Captive female juvenile 76 grams.
4. British Museum NHMUK. S/2012.10.1. Captive female, no data. Live weight; Skeleton 145 grams.

Allowing for the weight of the plumage, the internal organs and the tendon and ligament structure of a healthy bird in winter, there would remain, at a guess, at little more than 400-500 grams of flesh at the most. In practical applications, the potential use of the internal organs should not be overlooked, either for consumption or for the use of the dried gut for fine netting or thread in the slender needles that have been found on the sites, in the same context as the owls.

An examination of the proportion of meat to other body parts is relevant because it relates the main areas of distribution of muscle tissue to the pattern of flensing marks on the bones from the Grotte de Bourrouilla. The breast and thighs carry the most flesh, with some muscle tissue distributed around the proximal 2/3rds of the humerus. Other parts of the wing and lower limbs are extremely lean, reduced to the mechanics of connecting tendons and the ligaments activating the joints. The same is true of the lower limb that in life is fully feathered. However, as noted above, it is mainly the parts that carry little or no flesh, the wing bones and tarsus in particular, that are intensively worked to strip the member of skin and feather. No marks have yet been found on any part of the sternum among the assemblage at Arancou. Although this absence is not uniform on all sites where snowy owls occurred in considerable numbers. The treatment suggests that whatever use was made of the fleshy tissue, there was a further, perhaps more imperative use for other parts, possibly skin and plumage, bone, or possibly all three.

The re-use of bone

To postulate precisely a particular use of either snowy owl bones or feather in the context of Magdalenian life in the Grotte de Bourrouilla at Arancou or any similar site, is perhaps hazardous. The evidence is minimal or non-existent. Nevertheless, to consider first the bones: the main elements showing intensive workings are the humerus, radius and ulna of the wing and the tarsus and phalanges of the lower limb. As has been noted above and in Table 3, the humerus is the most frequently modified bone amongst the clandestine material. It is mainly cut across the proximal extremity and distally across the fossa brachialis and dorsal and ventral condyles in order to release the bone by severing the ligaments but there is also a tendency to cut half way through the shaft in mid – diaphysis and snap the humerus in half (Eastham 1995, figs 4 and 5). It is difficult to explain this process in terms of subsequent utility, although the use of inverse disarticulation is an obvious technique for releasing the humerus from both radius and ulna.

Techniques used in working bone for secondary use

There is evidence of a single humerus being worked apparently in preparation for the removal of a long narrow segment from which to fashion a borer or needle. It was found in 2007 in Carré M17 US 2007, numbered 1873. It had parallel deep grooves along the facies cranialis and a strip of bone could have been lifted and worked into a finished tool. This method of extracting segments of bone for secondary use is

widely applied to mammalian material. The segment would have subsequently been worked and polished and the head pierced to form a finished needle of which around twenty examples were recovered during the excavations. It should be noted that there was a piece of pumice found amongst the spoil of the 'Fouilles Clandestines' that was deeply grooved as though it had been in use as a polisher for fine bone tools.

However, it is the radius and ulna that were obviously modified for secondary use. Apart from the scrape marks of skinning and scraping, a number of radii and ulnae had both epiphyses removed and in some instances the ends were filed down so that the bone became a tubular artefact, open at one or both ends. This would have provided the opportunity for the bone to be used as a pipette for transferring fluid substances or, as a storage receptacle for the same. There were only a few excavated examples at Arancou of radius or ulna where the epiphyses had been successfully removed without further damage to the bone but from every specimen of radius and some ulnae from the 'Fouille's clandestines' the epiphyses were missing and one or two showed signs of later smoothing of the cut surface. The paucity of finished 'tubes' is hardly surprising since, if they were destined for use, they would not remain on the workshop floor but be retained as a valued implement and may have been individually decorated. Amongst the engraved bone objects, a shaft of ulna was decorated with a frieze of horses heads (Roussot in Chauchat 2000). Another ulna (ARA 05 L17 no. 1074) was found with notches the full length of the diaphysis, some transverse and some in chevrons (Aurière *et al.* 2013). Both seem to indicate that they were objects of some value to their makers. The examples from Arancou are certainly bones of snowy owl and have either notches or have been cut transversely the full length of the bone. The notches that were subsequently smoothed to a polish or, indeed, carried figurative engravings.

The femur and tibiotarsus of the lower limbs at the Grotte de Bourrouilla were not regularly worked. A distal epiphysis of femur from the clandestine material was cut and neatly filed smooth, otherwise most of the femora and tibiotarsi exhibit only scrape marks, indicating skin removal. The tarsometarsus, phalanges and claws from the 'Fouilles clandestines' were recovered in quantity and the tarsus bones were heavily worked. Yet there were very few of either the tarsi or digits recovered in other sections. The distribution and working of these extremities appears to have been contained, with one exception, within the limited area of the clandestine explorations. The worked tarsometatarsi are uniformly severed across the mid-point of the diaphysis, often with multiple slashes to the dorsal surface to facilitate the bone being snapped in two. One such, recovered in 2009 from Carré M17/18 was severed in just this way, with a cut across the dorsal face and snapped in two. This is very much at variance with the findings at the cave of Le Morin, where workings on the tarsometatarsus were both longitudinal and transverse, for the removal of skin but, although the markings are very frequent and intense, there appears to have been no deliberate severance of the bone mid- shaft (Gourichon 1994). It is difficult to determine how far this difference in treatment demonstrates a difference in intention in respect of the outcome, whether decorative or functional but it is worth noting as possible evidence of regional diversity.

Plumage

Any discussion of the use of plumage must be based to a large extent on speculation, with little contemporary evidence to support any assumptions, apart from recent traditions of ethnographic practice. In some instances the very light longitudinal scrape marks on the bones, strongly suggest that removal of the skin with plumage attached was practised so that the skins might be used in their entirety; in others feather and down might be employed separately to give protection from the cold or damp. A relatively recent example of the use of snowy owl skin is a Yupi'k fire bath hat held in the Yupi'k Piciryat Cultural Center and Museum at Bethel, Alaska. Two entire skins including the wing are joined together to form a complete head covering that is quite impressive to the observer.

The Hunter-Gatherer occupants of Late Magdalenian sites were usually well furnished with bone sewing needles and the Grotte de Bourrouilla was no exception, with at least twenty sections of needles recovered from the clandestine debris and the stratified deposits of US 2007 so that it is possible to infer that garment making was undertaken. Most of these needles were broken when found and were probably discards but they varied in diameter from 1.1/5 mm upwards. Associated with them were pieces of pumice, grooved from polishing thin sections of bone. The fine gauge needles would be unsuitable for heavier hides but sufficiently sharp and strong to penetrate avian tissue and, although they are not weatherproof, the skins of snowy owls of either sex are sufficiently eye-catching and distinctive against a dark Winter landscape to stand out as attractive headgear or for other accoutrements. This use of plumage is known among arctic peoples even in relatively recent times (Gilbert, Martin and Savage 1985). It is sometimes held to endow the wearer with status and power. There are many examples in the anthropological literature of the use of feather and body parts being used in ceremonial dress in different contexts and with differing cultural connotations. An example of this acquisition of a role has been described in Chapter 7 among the people of Mount Hagen (Strathern and Strathern 1971) in New Guinea and other places and the acquisition of the necessary materials

may demand considerable effort and expense. The effort involved in the acquisition of these items may be valued in practical terms or as part of the symbolism of ceremonial practice. Hunter-Gatherer peoples generally follow strict codes of behaviour in their relations with the natural world. Their dependency is such that:

> In all living societies, humans must maintain themselves by securing energy from the environment. Although this life-sustaining process amounts only to a re-arranging of nature and transforming of materials from one state or appearance to another, humans make something of this activity (Gudeman 1986).

As noted previously, in those societies the culling of the animals may be justified because in the offering of their being to human use, there is some assurance that no part of the animal will be wasted or thrown away and therefore the life is not entirely destroyed. At the Grotte de Bourrouilla, it would appear that no part of the snowy owl that could have a function was rejected. The entire carcases of the birds were apparently brought into a well-defined area of the interior, where intensive bone working took place, over what seems a relatively short period of time. It is not possible to understand precisely the motives driving this activity from the material evidence at hand, but we do know that the Magdalenians were involved in trade or exchange of other commodities from outside their immediate communities, goods like pigments and possibly pumice, and it is just conceivable that decorative materials like particular kinds of feathers for ceremonial use were also exchanged.

To conclude; all that exists from a site like the Grotte de Bourrouilla are the physical data recovered in excavation including the bones and their evidence of modification. Even supposing that any aspect of the attitudes, customs or beliefs current or recorded for Nearctic or Forest peoples of our own era were valid for the past, it is not possible to impose parallels in behaviour on to the Late Glacial inhabitants of western Europe. Nevertheless, the variety of practices current among Hunter-Gatherer across the different continents presents a researcher with intriguing possibilities to consider.

Acknowledgements

My thanks go to Morgane Dachary and Frédéric Plassard for their help and valuable criticism in the preparation of this article and for the opportunity to study the bones from Arancou.

I should also like to offer special thanks to the staff of the Musée National de Préhistoire, Les Eyzies for their help and encouragement.

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Gavia stellate, red throated diver	**1.2 3**	3/_ _ _ _ _ _ 7 8 _ _ _ _ _ 7
Gavia arctica/immer, black throated/great northern diver	**1._2 3**	3./_2 3 _ _ _ _ _ _7
Tachybaptus ruficollis, little grebe	**3**	_ _ _ _ _ _7
Podiceps cristatus, great crested grebe	**1._2 3**	3./3 _ _ _ _5
Podiceps grisegena, red-necked grebe	**1._2 3**	3./3 _ _ _ _5
Podiceps auritus, Slavonian grebe	**2_ _ _ _ _ _ 3**	- - - -5- - - - - 1_3
Calonectrix diomedia, Cory's shearwater	**1.2 3**	2/_ _ _ _6_ _8 _ _ _ _5
Puffinus gravis, great shearwater	**1**	2
Puffinus griseus, sooty shearwater	**1 3**	2/ _ _ _ _ _ _7
Puffinus puffinus, Manx shearwater	**1**	2
Puffinus yelkouan, yelkouan shearwater	**1.2 3**	2./_ _ _ _ _ _7 8 _ _ _4
Sula bassana, gannet	**1 3**	2_ _ _ _ _ _ _ _ _ _ _ _5_ 7
Phalacrocorax carbo, cormorant	**1.2.**	2./_ _ _ _7.8 9_
Phalacrocorax aristotelis, shag	**1.2 3**	2./_ _ _ _ _.7 8 _ _ _ 4
Botauris stellaris, bittern	**1.2. 3**	2./_ _ _ _ _ _ _9. _2
Ixobrychus minutus, little bittern	**_2**	_ _ _ _ _ _ _ _9
Ardeola sp. heron sp.	**3**	1
Ardea cinerea, grey heron	**_2**	_ _ 3
Ardea purpurea, purple heron	**2.**	_ _ _ _ _ _ 7 8
Ciconia cconia, White stork	**2**	_ _ _ _ _ _ _8
Cygnus columbianus Bewickii, Bewick's swan	**1.2.**	3/1.2.3.4._ _ _8 9
Cygnus cygnus, whooper swan	**1.2. 3**	3,/1_ _ 5 _ _ 9 1_ _
Anser fabalis, bean goose	**1.2 3**	3/_ _ _4._ _ _ 9 _ _ _ _- _7
Anser brachyrhyncos, pink footed goose	**1.2. 3**	3.4./2. 3_5. _ _ _ _ _6
Anser albifrons, white fronted goose	**1.2**	3.4/_ _ _ _ _ _ 9
Anser erythropus, lesser white fronted goose	**1.2**	3./4
Anser anser, Grey lag goose	**1.2 3**	23.4./_2 3 4_ _ _ _ _ _ _ _ _7
Branta leucopsis, barnacle goose	**1.2**	3.4./2 3
Branta bernicla, brent goose	**1.2 3**	3./2.3. 3.
Tadorna tadorna, shelduck	**1.2**	3./3
Tadorna ferruginea, ruddy shelduck	**_2**	_ _ 3_ _ _ _ 7 8
Aix galericulata, mandarin	**2**	1
Anas penelope, wigeon	**-2. 3**	1-3._ 5_7_ 9 _ _ _ _5_7

Species	Chapter	Table
Anas crecca, teal	_2. 3	1_ _ 4_ 6.7 _ 1_ 3 _ _5.6.7
Anas platyrhyncos, mallard	_2. 3	123.4.5.6 7 8 9 1 23.4.5.6.7
Anas acuta, pintail	_2. 3	_ _ _ _6_7_ 9 1.
Anas querquedula, garganey	1.2. 3	3,/1.3._ 5 _ 7 _9 1_3_ _ _7
Anas clypeata, shoveler	2. 3	_ _ _ _ _ _ _9 3
Netta rufina, red crested pochard	1.2. 3	3./1_ _ _ _ _7.8.9 _ _ _ _ _ _ 7
Aythya ferina, pochard	2. 3	1 _ _ _5._ _ _ _ 1._ _ _ 5.6
Aythya nyroca, ferruginous duck	1.2. 3.	3./_ _ _ _ _ _._ 8 1_ _ _5.6 7
Aythya fuligula, tufted duck	1.2. 3	5/ 1.2.3._ _ _7.8 9 1.2.3_ _ _ 7
Clangula hyemalis, long-tailed duck	1.2	3./_ _ _ _ _ _ _8
Somateria mollissima, eider		
Bucephala clangula, barrow's golden eye	2.	1._ _ _ _ 6_ _9
Melanitta nigra, common scoter	1.2.	3./1_ 3 _ _ _ _ _ _ _ _5
Melanitta fusca, velvet scoter	1.2 3	3.5/. 2.3._5._ 8 _ _ 3
Mergus albellus, smew	1.2. 3	3./12,_ _ _ _ _9 -_ _ _ _5
Mergus serrator, red breasted merganser	1.2 3	3.5/ 1.2._4_ _ _ 8 _ _ _ _5 _7
Mergus merganser, goosander	1.2 3	3.5/_2.3 _ _5_6 7 1_ _ _ _ _7
Milvus milvus, red kite	1.2 3	/2_ _ _ _ _ 8 9 _ _ _4_ _ 7
Halaeetus albicilla, white tailed eagle	2 3	/_ _ 3 _ _5 6 _8 9 _ _ _4_ _7
Gypaetus barbatus, lammergeier	_ _3	_2_ _ _6.7
Neophron percnopterus, Egyptian vulture	_2	_ _4_ _ _ 8
Gyps fulvus, griffon vulture	_2. 3	_ _ _ _ 6 _ 8 9 _ 2_4
Aegypius monachus, black vulture	_2 3	_ _ _ _ _ _ _ _ 9 2_ _ _6
Circaetus gallicus, short toed eagle	3	_ _ _ _ _ _ 7
Circus aeruginosus, marsh harrier	_2. 3	_ _ _ _5_7.8. 2
Circus cyaneus, hen harrier	_2. 3	_ _ _ _ _ _ _8. 12_ _ 5
Circus macrurus, pallid harrier	_2	_ _ _ _ _ _ _ _9
Circus pygargus, Montagu's harrier	_2 3	_ _ _ _ _ _ _ _9 1
Accipiter gentilis, goshawk	_2. 3	/_ _ _ 4 _ _7_9 12 3
Accipiter nisus, sparrow hawk	_2	_/ _ _ _ 5 6 7_ _
Buteo buteo, buzzard	_2 3	/_ 2 _ 4_- - - 1_3_ _ _ 7
Buteo rufinus, long-legged buzzard	2 3	_ _ _ _ _6 1
Buteo lagopus, rough-legged buzzard	_2. 3	2. Sp._ _ 1.
Aquila rapax, tawny eagle	3	_ _ _ _ _ _7
Aquila pomarina, lesser spotted eagle	_2	/_ _ _ 4 _
Aquila heliaca, imperial eagle	3	_ _ _ _ _- _7
Aquila chrysaetos/sp., golden eagle	_2_ 3	/_ _ _ _5, 67sp.9 1 _ 3sp_ 5.

Species	Chapter	Table
Hieraetus pennatus, booted eagle	_2	__ _ _5_ _8
Hieraetus fasciatus, bonelli's eagle	_2.	_ _ _ 4_ _ _8
Pandion haliaetus, osprey	_2	_ _ _ _ _ _ _ _9
Falco naumanni, lesser kestrel	_2 3	_ _ _ _ _5__8 _ _ 3
Falco tinnunculus, kestrel	_2 3	_ 2 3 4 5 6 7 8 9 1 2 3.4.5.6.7
Falco vespertinus, red-footed falcon	_2. 3	_ _ _ _ 5 6 _ _ _ 9 1-3_5
Falco columbarius, merlin	_2. 3	_ _ _4.5.6_ _9 1.2.3.4.5
Falco subbuteo, hobby	_2 3	_ _ _ _5_ _ _8 9 1_ 3 _5_ 7
Falco Eleanora, Eleanora's falcon	_2 3	_ _ _ _ _ _ _8 _ _ _ _5_7
Falco rusticolus, gyrfalcon	_2. 3	1
Falco peregrinus, peregrine falcon	_2 3	_ _ _ _ _ _6_ 8 _ _ _ _4.5_7
Bonasia bonasia, hazel hen	_ _3	1_3_ _ _ 7
Lagopus lagopus, willow grouse	_2 3	_ _ 3 4 5_ _.8 1 23.4.5.6
Lagopus mutus, ptarmigan	_2 3	._3 4 5 6 _ _9 123_5.6
Tetrao tetrix, black grouse	_2. 3	_ _3.4.5 6 _ _ 9 1.2.3_5_7
Tetrao urogallus, capercaille	_2 3	_ 2 _4.5_ _ _9 _ _ _ _ _ _7
Alectoris graeca, rock partridge	1.2. 3	6./_ _ _ _ _6_ 8 9 1_3_ _ _ 7
Alectoris rufa, red legged partridge	_2. 3	_2_.4_5_ 7 8 9 _ 2 _ 4.5_7
Alectoris barbara, barbary partridge	_2 3	_ _ _ _5. 6_8 9 _ _ _ _5
Perdix perdix, grey partridge	_2 3	1 _ 3_ 5.6 _ _ 9 12.3_ 5.6.7
Phasianus colchicus	3	1
Coturnix coturnix, quail	1/2 3	1/_ _ _ _5 6 7_9 2,3_5_7
Crex crex, corncrake	2 3	___5___9 1_ _ _5
Porzana porzana, spotted crake	2 3	_ _ _ _ _ _ _9 1_ _ _5
Rallus aquaticus, water rail	2 3	_ _ _ _5 1 _ _5
Gallinula chloropus, moorhen	_2. 3	1 _ 3 _
Fulica atra, coot	_2 3	_ _ _ _ _ _ _ 8 9 1_ _ _
Grus grus, common crane	_2. 3	_ _ _ _ _5_ _ 9 1 _ _ _5 _7
Anthropoides virgo, demoiselle crane	_2 3	_ _ 3 _ _ _8 1_ _ _5
Tetrax tetrax, little bustard	_2. 3	1._3._ _ _ _ _9 12_ _ _ _7
Otis tarda, great bustard	_2. 3	1_ _ _ _ _ _ _ _ 1_ _ _ _ _7
Haematopus ostralegus, oystercatcher	_2. 3	_ _ _ _5 _ _8 1_ _ _5_7
Recurvirostra avosetta, avocet	_2 3	_ _3_ _ _ _8 9 1
Burhinus oedicnemus, stone curlew	1.2 3	1/ _ _ _ _5_7
Charadrius hiaticula, ringed plover	3	_ _ 3
Charadrius morinella, dotterel	3.	1 2.3_ _ 6Sp.
Pluvialis apricaria, golden plover	2 3	_ _ _ _ _ _ _ 8 _ _3_-_ 6Sp.

Species	Chapter	Table
Pluvialis squatarola, grey plover	_2 3	_ _ _ _ _ _8 _2.3_5
Vanellus vanellus, lapwing	_2 3	_ _ _ _ _ _ _ 8 9 123
Calidris canutus, knot	1.2 3	1, 3 _5 _ 2 3_ _5
Calidris alpine, dunlin	3	_2.3_ 5_ 7
Philomachus pugnax, ruff	_2 3	_ _ _ _ _ 2.3._5_7
Limnocryptes minimus, Jack snipe	3	_ _ 3_ _ _7
Gallinago gallinago, snipe	2 3	__ 3 4 5_7 _ 2_ _ -5
Gallinago media, great snipe	_2 3	?_ _ _ _ _ _ _ _9 2.3._5
Scolopax rusticola, woodcock	_2 3	1 _ _ _ _ 5 6 7 _9
Limosa limosa, black tailed godwit	_2	_ _ 3 _5
Numenius phaeopus, whimbrel	_2.	_ _3.
Numenius arquata, curlew	_2. 3	_ _3_ 2.3
Tringa erythropus, spotted redshank	_2 3	_ _ _ _5 _2
Tringa totanus, redshank	_2	_ _ _ _ _6
Tringa nebularia, greenshank	_2 3	_ _ _ _ _ _ _ _9 2 3_ 5
Tringa ochropus, green sandpiper	_2	1
Actitis hypoleucos, common sandpiper	3	1 2._ _5
Tringa glareola, wood sandpiper	3	1
Stercorarius pomarinarinus, pomarine skua	_ _3	_ _ _ _5
Larus minuta, little gull	1_ 3	_ _3 1
Larus ridibundus, black headed gull	1.2. 3	2./1 _3.4_6 _8 2_.3_ 5_7
Larus canus, common gull	1.2 3	_2./ _ _ _ _ _ _8 _ _ 3 _ _6.7
Larus fuscus, lesser black-backed gull	1._2 3	2./-2___ _5.6;_8 _ _ _ 45
Larus argentatus, herring gull	1.2 3	2/_ _ 3 _ _ _4
Larus marinus, black backed gull	1. 3	2/ _ _3
Rissa tridactyla, kittiwake	1.2	2/__ _ _ _ _ _ _9
Sterna sandvicensis, sandwich tern	1.	1./_ _ _ _ _ _ _8
Sterna hirundo, common tern	1.2 3	1 / _ _ _ _ _6 _3
Sterna paradise, arctic tern	3	_ _ _ _5
Uria aalge, guillemot	1.2 3	2./_ _ _ _ _8 1_5_7
Alca torda, sazorbill	3	_ _ _ _5
Pinguinis impennis, great auk	1.2 3	2.\1_3_ _ _ 8 _ _ _ _ _ _7
Alle alle, little auk	1.2. 3	2./3_5_ _8 _ _3
Fratercula arctica, puffin	1.2	2/ _ _ _ _5
Pterocles orientalis, black bellied sandgrouse	_2 3	_ _3_ _ _ _ _9 _ _ _ _ _ _7
Columba livia, rock dove	1.2 3	2/ _ _ 4 5 67 8 9_ _3.4_ _ 7
Columba oenas, stock dove	1.2 3	_/2.3_ 5_ _ 8 12 _4.5,6Sp.7

Species	Chapter	Table
Columba palumbus, woodpigeon	**2 3**	_ _ 3 _ _ 6 7 8 9 _ _3
Streptopelia turtur, turtle dove	**1.2.**	2./1_3
Cuculus canorus, cuckoo	**1.2**	1./_ _ _ _ _ 6
Tyto alba, barn owl	**_2 3**	_ _ 3 4_ _7 _9 1_ 3_5
Otus scops, scops owl	**1.2 3**	1 /_ _ _ _5 67_ 9 _ 2 _ _5.
Bubo bubo, eagle owl	**2. 3**	_ _ _ 4 5 _ 7 _ 9 1_3 _ _ 6
Nyctea scandiaca, snowy owl	**2 3**	_ _ _ _ 5._ _ 8 12_ _5 67
Surnia ulula, hawk owl	**1.2 3**	/_ _ _ _ _ _7_9 1_ _ _ 5_7
Glaucidium passerinum, Eurasian hawk owl	**2 3**	_ _ _ _ _ _7 3
Athene noctua, little owl	**1.2 3**	2./ _ _ _ _ _6 7_9 _ 2 3 4.5_7
Strix aluco, tawny owl	**_.2 3**	1 _ _ _ _ _ 7 _8 9 1_ 3_5 6
Strix intermedia cf.	**_2**	_ _ _ _ _ 7 _
Strix nebulosi, great grey owl	**3**	_ _ _ _5
Asio otus, long eared owl	**_2 3**	_ _ _ 4.5 6 1_ 3_ 5
Asio flammeus, short eared owl	**_2. 3**	_ _ 3 _ 5 6 1_3_5
Aegolius funereus, Tengmal's owl	**_2. 3**	_ -_3_5 6.7. 1_3_5
Caprimulgus caprimulgus, nightjar	**_2**	_ _3
Apus apus/pallidus, swift/pallid swift	**1.2. 3**	1/1 _ _ _5._7_9 1
Apus melba, alpine swift	**1.2 3**	1./_ _3_ _678 9 1_ _ _5
Alcedo athis, kingfisher	**_2**	/_ _ 3
Merops apiaster, Bee eater	**1.2**	1./_ _ _ _ 5
Coracias garrulous, roller	**1.2**	1/1_3.4_ _ 7
Upupa epops, hoopoe	**1**	1
Jynx torquilla, wryneck	**_2**	_ _ _ _5
Picus canus/viridis, grey/green wodprcker	**_2 3**	_ _ _ _ 5 6 _ _ 9 _ _ _5
Dendrocopus major, greater spotted woodpecker	**_2 3**	_ _ _ _5. 6_ _ _9 12.3.4.5
Dendrocopus medius, middle spotted woodpecker	**_2 3**	_ _ _ _5 6 _ _ 9 1_ _6
Dendrocopua leucotos, white-backed woodpecker	**3**	1
Dendroopus minor, lesser spotted woodpecker	**_2. 3**	1_ 3 _ _6.7_8 1 _3_ 5_7
Melanocorypha calandra, calandra lark	**3**	_ 2 _ _5_7
Calandrella brachydactyla, short-toed lark	**_2 3**	_ _ _ _5 12 3_5
Galerida cristata, crested lark	**_2. 3**	_ _3_56 _ 123_5 6 7
Lullula arborea, wood lark	**_2 3**	_ _ _4_ 12.3_ _ _7
Alauda arvensis, skylark	**_2 3**	_ _ _ _5 6_ _9 2
Eremophila alpestris, horned lark	**3**	1_ _ _5
Riparia riparia, sand martin	**_2**	_ _ _ _ _ 6
Ptyonoprogne rupestris, crag martin	**_2 3**	_ _ _ _ 5 67 8 12_ _5_7

Species	Chapter	Table
Hirundo rustica, swallow	**1.2 3**	1./_ _3_ 5 6_ _9 1_ 3.45_7
Hirundo daurica, red-rumped swallow	**1.2**	1./_ _ _ _5 6
Delichon urbica, house martin	**_2 3**	_ _ _ _5 6_ _ 9 _2
Anthus trivialis, tree pipit	**_2**	_ _3_ _ 6
Anthus spinoletta, water pipit	**1.2 3**	1./_ _ _ _ 5 -_2
Motacilla alba, white wagtail	**_2 3**	_ _ _ _ _6_7 12sp,_ _5
Bombycilla garrulous, waxwing	**_2 3**	_ _ _ _ _ _9 1
Cinclus cinclus, dipper	**_2 3**	_ _ 3 _ 5.6 _ _ 2.3_5
Prunella modularis, dunnock	**_2 3**	1 _3 1
Prunella collaris, alpine accentor	**_2 3**	_ _ _ _ 5 6_ _ 9 1_ _ _ 5
Erithacus rubecula, robin	**_2**	1_ _ _ 5
Luscinia megarrhyncos, nightingale	**1.2 3**	1./_ _ _ _ _ _8 1_ _ _ _ _7
Phoenicurus phoenicurus, redstart	**1.2. 3**	1./_ _ 3 _ _6 2;_ _5_7
Saxicola rubetra, whinchat	**_2. 3**	_ _ _ _ 6 _2_ _5._7
Oennanthe oenanthe, wheatear	**_2 3**	_ 2 3_5._7 1_3
Monticola saxatilis, rock thrush	**1.2. 3**	1./_ _ 4._ _ 7 1.2.3_ 5
Monticola solitarius, blue rock thrush	**1.2. 3**	1./ _3_ 5. 6 7 8 2.3_ _ _ 7
Zoothera dauma, white's thrush	**3.**	_ _ _ _5
Turdus torquatus/merula, ring ouzel/blackbird	**_2 3**	1 _ 3 _5. 6 7 8 9 12.3_5_7
Turdus pilaris, fieldfare	**_2 3**	_ _ 3 _ _ 6_ _ 9 1.2.3_5_7
Turdus philomelos, song thrush	**_2. 3**	1_ _3_ _ 6. 7_ 9 123.4.5 _7
Turdus iliacus, redwing	**1.2. 3**	1./ _ _3_5_ _8 9 _2_ _ _ _7
Turdus viviscivorus, mistle thrush	**_2 3**	_ _ 3 45. 6 7 8 9 1 2.3_ 5_7
Acrocephalus paludicola, aquatic warbler	**1.**	1./
Acrocephalus palustris, marsh warbler	**1.**	1./
Acrocephalus scirpaceus, reed warbler	**1.2 3**	1 . _2
Acrocephalus arudinaceous, great reed warbler	**1.**	1./
Hippolais icterina, icterine warbler	**1. 3**	1,/_ _ _ _5.6 1._ _ _ 5
Sylvia hortensis, orphean warbler	**1.**	1./
Sylvia borin, garden warbler	**_2 3**	_ _ _ _ 5 _ _ _ 9 1
Sylvia atricapilla cf., blackcap cf.	**_2. 3**	_ _3_ 5. 2.3.
Phylloscopus colybita/trochilus, chichaff/willow warbler	**3**	_ _ _ _ _6
Musicapa striata, spotted flycatcher	**3**	_ _ _ _ _ _7
Ficedula hypoleuca, pied flycatcher	**_2.**	1._ _ _ 5 6
Aegithalos caudatus, long-tailed tit	**_2 3**	_ _ _ _5__8 _ _ _ _5
Parus major, great tit	**1.2 3**	_ _ _ _ 5_ _ _ _ _ _ _ _ _6-7
Sitta europaea, nuthatch	**_2**	1_ _ _5

Species	Chapter	Table
Oriolus oriolus, golden oriole	_2 3	_ _3_5_ 7_ 9 1
Lanius collurio, red-backed shrike	1.2	1./_ _ _ _5
Lanius minor, lesser grey shrike	1.	1./
Lanius excubitor, great grey shrike	1. 3	1./_ _ _ _5 1_ _ _ _7
Lanius senator, woodchat shrike	_2	_ _ _ _ _ _7
Paradisea raggiana, minor, rudolphi etc, feathers used for ceremonial Masks New Guinea		
Garrulus glandarios, jay	_2 3	12_ _ 5.6 7_ 9 1_ 3_5_7
Pica pica, magpie	_2 3	_ _ 3 _ 5 6 7_9 1_ _ _5
Nucifraga caryocaractes, nutcracker	_2 3	_ _ _ _ _6_ _ 9 1
Pyrrhocorax graculus, alpine chough	1.2 3	1._ _ _ _ 5.6 7.8 9 12.3.45._7
Pyrrhocorax pyrrhocorax, red-billed chough	_2. 3	1_ 3 4_6-7 8 9 12.3.4.5_ 7
Corvus monedula, jackdaw	_2 3	_ _ _ _5.6 12_4.5
Corvus corone, carrion crow	2_ _ _ _ _ _ _ 3	_ _ _ _4 5 6_8 9_ _ _ _ _5_7
Corvus corax, raven	_2 3	_ _3_ 5 6 7 8 1.2.3_5_7
Sturnus vulgaris/roseus, starling	_2 3	1_ 3 _ 56_ 1..3.4
Passer domesticus, house sparrow	_2. 3	1_3_5 6 _ 1.2.
Petronia petronia, rock sparrow	_2 3	_ _ _ 4.5.6 1.2.3_5
Montifringilla nivalis, snowfinch	1.2 3	1./_ _ _ _ 5 6 1_ _ _5
Fringilla coelebs, chaffinch	1.2 3	1/ _ _ _ _5_ _ _9 _ _ _4.5
Serinus citronella, citril finch	3	2
Carduelis chloris, greenfinch	1.2. 3	12/_ _ _ _ _ _ _9 _ _ _5
Carduelis cannabina, linnet	1. 3	1 _ _ _ _ _ _7
Carduelis flammea, redpoll	1.2 3	1/ _ _ _ _5_ _ _9 2.3
Loxia leucoptera, two-barred crossbill	1.2 3	1./ _ _ _ _5. 1
Loxia curvirostra, crossbill	2. 3	1._ _3_ 5 1_ _ _5
Loxia pytyopsittacus, parrot crossbill	3	1_3_5
Carpodaceus erithinus, common rosefinch	_2	_ _ _ _ _6
Pinicola enucleator, pine crossbill	1.2. 3	1./_ _ _ _5 1_ _ _5
Pyrrhula pyrrhula, bullfinch	3	1_ _ _5
Coccothraustes coccothraustes, hawfinch	_2 3	_ 2 _ _ 5 6 _ _9 1_3_ _ _ 7
Plectrophenax nivalis, snowfinch	_ _ 3	_ _ 322
Milaria calandra, corn bunting	_2 3	_ _ 3_ _6 7 3
Emberiza citronella, yellowhammer	_2	_ _ _ _ 5 _ _ 9
Emberiza cirlus, cirl bunting	1.	1
Emberiza cia, rock bunting	1.2. 3	1./_ _ _ -5 1
Emberiza melanocephala, black-headed bunting	1.2.	1./ _ _ _ _ _6
Pheucticus ludovicianus USA, rose breasted grosbeak	2	_ _3.

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Acknowledgements

I offer most grateful thanks to the many individuals and organisations who have contributed to this publication. Particular thanks are due to Paul Bahn, Robert Begouen, Gerhardt Bosinski, Jean Clottes and others for allowing me the use of their pictures and I owe special gratitude to Jesus Altuna, Morgane Dachary and Frédéric Plassard and to Michel and Josseline Lorblanchet for permitting me to make use of their work and for their friendship and frequent hospitality. Thanks go too to the Museums and their staff for help in offering and preparing images and study space especially the Musée Nationales de Préhistoire in Les Eyzies the Musée des Antiquités Nationales in St German en laye and the Musée des Arts et Antiquités in Perigueux, Thanks also go to the staff of the National Museum of Wales, the Natural History Museum at Tring, and the British Museum.

I must also thank Michael Eastham for his help with the illustrations and his patient bullying that kept the project going and the family whose childhood was marked by fairly arduous excursions ino the field.