

# AVIAN ZOOGEOGRAPHICAL PATTERNS DURING THE QUATERNARY IN THE MEDITERRANEAN REGION AND PALEOCLIMATIC INTERPRETATION



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**SUMMARY.**—*Avian zoogeographical patterns during the Quaternary in the Mediterranean region and paleoclimatic interpretation.*

**Aims:** The main aim was to present an overview of the avian geographical distribution patterns in the Mediterranean region during the Quaternary.

**Results and Conclusions:** For this study seventy-two fossil sites located in the current Mediterranean region and in its peripheral fringe have been analysed. Most of the sites bear avian assemblages rich enough to offer an insight on the main features of local paleornithofaunas. The approach of the steady Mediterranean refugia is used to explain the avian geographical distribution drawn from the Mediterranean fossil records. As a consequence, we increase the accuracy of our knowledge on the climatic changes during this period.

**Key words:** fossil birds, Mediterranean region, Neogene, paleoclimatology, Quaternary, Refugia Theory, Steady Mediterranean Refugia approach, zoogeography.

**RESUMEN.**—*Patrones zoogeográficos de las aves durante el Cuaternario en la región mediterránea e interpretación paleoclimática.*

**Objetivos:** La intención de este trabajo es ofrecer un estudio sintético sobre los patrones de distribución geográfica de las aves durante el Cuaternario en la región Mediterránea, destacando los descubrimientos de fósiles hechos durante las últimas décadas.

**Resultados y Conclusiones:** Para este fin, se aporta la información obtenida en 72 yacimientos repartidos por toda el área de estudio. Esto constituye un total de 89 asociaciones orníticas fósiles de la región del Mediterráneo (vease el Apéndice 1). La situación geográfica de estos yacimientos se puede ver en la Figura 1, mientras que en las Tablas 1 y 2 se puede conocer la posición cronológica de los mismos, que para algunos es aproximada. La mayor parte de estos yacimientos poseen asociaciones fósiles con suficiente entidad para aportar datos fiables sobre las paleornitocenosis locales. Existen suficientes evidencias que indican que los límites geográficos de las especies de aves han cambiado varias veces durante el Cuaternario. Además, se acepta que algunos de estos cambios no han sido cuasados directamente por cambios pasados en el clima. Como se observa hoy día, se han registrado rápidos movimientos dispersivos hacia la región del Mediterráneo de especies con distribución más septentrional. Estas irrupciones no se han registrado de forma clara en el Plioceno superior ni en las primeras fases del Pleistoceno. Con los datos obtenidos a partir de estos yacimientos, se puede concluir que la composición taxonómica de las aves en la región del Mediterráneo no ha diferido, en algunas zonas y durante algunos periodos, de la que debía existir en regiones más septentrionales de Europa, pero en otras zonas las comunidades orníticas no fueron análogas a ninguna otra que encontremos en la Europa actual. Se propone un modelo explicativo para interpretar la distribución geográfica que parece indicar el registro fósil, al que se ha denominado modelo de los refugios mediterráneos estables. Como consecuencia, se obtienen algunos rasgos de los cambios climáticos que han afectado a la región mediterránea durante este periodo.

**Palabras clave:** aves fósiles, Cuaternario, Neógeno, Modelo de los Refugios Mediterráneos Estables, paleoclimatología, Región mediterránea, Teoría de los Refugios, zoogeografía.

## INTRODUCTION

The scenario of a climatically unstable late Neogene is supported on several sets of evidences. The most precise among those may be the temperature changes recorded in the ice cores of the Antarctic and Greenland, as well as

the  $\delta O^{18}/O^{16}$  record on foraminifera from the oceanic bottoms. Periglacial tilt formations and deposits of loess in medial latitudes indicate that there were phases in which the north of Eurasia and North America were covered by an ice cap on several occasions. During these stages (stadials), tempered species took refuge

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in the most southern zones of their respective areas of distribution, or even further south. At the same time, the fossil record demonstrates the blossoming of immigrant species, which were adapted to the colder conditions.

The shifts of the geographical distribution of taxa as well as biocoenoses are explained by two major theories: the Dispersal theory (Simpson, 1965; Matthew, 1915) and the Vicariance theory (Croizat *et al.*, 1974). These theories have had different methodological developments, and are usually considered as alternative approaches. The Refugia theory does not contradict the isolation of populations secondary to the fragmentation of the territory, neither the dispersal of some taxa with the subsequent arrival into new areas.

The character of refuge assigned to the Mediterranean region (MR) during the Quaternary, especially during the last glacial phase (Würm), the role it played in the phylogenetic differentiation, as well as in the current west Palearctic distribution of birds, have been the subject of a large number of studies. Many of them are summarized in Moreau (1954, 1972), Blondel (1985, 1987), Tyrberg (1991a, 1991b) and Mourer-Chauviré (1993). Related to this, some species which are assumed to have different climatic and habitat significances since they display at present disjunct geographic areas, appear together in the same levels of several Pleistocene deposits in southern Europe. This phenomenon has been referred in the literature as «mixed faunas» and «non-analogue faunas».

The Refugia theory, applied to the Quaternary, does not propose that all speciations have taken place in ecological refuges, but tries to explain many differentiation events which contributed to the development of the modern biotas (Haffer, 1982). The Mediterranean Refugia theory (MRT) (Moreau, 1954, 1972), a particular derivation from the Refugia theory, has proved to be limited in its explanatory capacity. Moreover, an uncritical actualistic notion of the «indicator species» (a species that manifests by its presence the existence of certain environmental conditions) has overcome in fact the MRT, leading to misinterpretations. The Pleistocene avian assemblages from the south of Europe are, with few exceptions, characteristic of tempered climatic conditions, similar to the actual ones. Nevertheless, when the remains of currently northern breeding or resident species,

as the Snowy Owl *Nyctea scandiaca* or the Pine Grosbeak *Pinicola enucleator*, are found in outcrops of the south of the continent, even in fossil assemblages of Mediterranean type, it continues to be interpreted as a proof of regional cool conditions in the past. Thus, the notion of «indicator species», with the meaning of «local or regional conditions indicator» leads to misinterpretation of the paleoecological and paleoclimatical implications of the avian fossil record (Sánchez Marco, 1996). In this way, the indicator value of individual taxa prevails in the literature on the ornithological community character. The increasing number of studies of European Pleistocene avian localities modifies understanding of this period. Thus, this paper proposes an alternative interpretation: the Approach of the Steady Mediterranean refugia (ASMR).

The ASMR was outlined in Sánchez Marco (1996). It leans on avian community features and, as a second step, in the individual species composition. Thus, the ASMR emphasizes the necessity of using analytical and comparative approaches to paleornithological assemblages with current ornithocoenoses (Sánchez Marco, 1999a, 1999b). Therefore, there are several ecological patterns providing the guide to finding out as much the paleoclimatic characteristics as the configuration of the landscape in the past. Some of these patterns have been studied in mammals and birds, as the habitat spectra of the community (Fleming, 1973; Evans *et al.*, 1981; Sánchez Marco, 1999a, 1999b). The phenetic behaviour spectra have been used by Sánchez Marco (1999b). The ASMR attempts to apply in concrete terms the Refugia theory to the distribution of birds in the Mediterranean region during the Quaternary. It relies on the notion and description of the role of «Northern irruptive species» (see the paragraph «Material and methods»). Its main difference with the MRT (Moreau, 1954, 1972) consists of comprising the occurrence of Mediterranean avifaunas during the whole Quaternary in the south of the Mediterranean peninsulas, even in the cool phases.

#### GEOGRAPHIC AND CLIMATIC CONDITIONS IN THE QUATERNARY

The MR is the contact area between two of the largest continental plates: the Eurosiberian



and the African ones. This condition has led to very complex geological and paleogeographical histories (Maldonado, 1985). Tectonic movements of both plates in the early Oligocene drove to a closed sea in this area. Subsequent to the desiccation of great extensions of the Mediterranean sea at the fall of the Miocene, the Messinian episode from 5.7 to 5.3 Ma (= millions of years) (see Gautier *et al.*, 1994), the opening of the strait of Gibraltar decisively transformed the regional geography, determining important biogeographical changes in mammal faunas from both the continent and the islands (Moyà-Solà *et al.*, 1999; Alcover, 2000; Azanza *et al.*, 2000). Two other major biotic events which occurred at the end of the Neogene affected the mammal faunas in the western MR: the *Equus*-elephant event (Early Villafranchian, MN 16, *ca.* 2.7 Ma) and the Galerian mammal pulse (1.0 Ma) (Azanza *et al.*, 2000). These events are in accordance with two of the three major shifts to more arid and open conditions, occurred in Africa around 2.8 Ma, 1.7 Ma and 1.0 Ma and which are recorded in marine eolian deposits (DeMenocal, 1995). The Mediterranean Sea reaches a considerable extension and its influence on the climate constitutes one of the main features of this region, since the lands around it show more or less homogeneous climatic conditions. Faunistic successions in the western Mediterranean islands as well as mass extinctions episodes are the object of some works, such as Moyà-Solà *et al.* (1999), Alcover (2000) and Seguí & Alcover (1999).

A critical date in the recent history of the global climate is 2.7 Ma. This cooling episode in the Arctic hemisphere had begun towards 3.1 Ma (Raymo *et al.*, 1989; Raymo, 1991), causing the growth of the polar cap. Previously, the temperate periods were warmer than the present one and the cold periods were warmer than some later warm interstages. Until that date, it is likely that the continents of the Northern hemisphere were free of considerable masses of ice. Coinciding with the beginning of the Matuyama, approximately 2.4 Ma ago, the first event of massive formation of icebergs in the North Atlantic is well documented. Important amounts of materials transported by icebergs were deposited in the Atlantic Ocean (Shackleton *et al.*, 1984; Raymo *et al.*, 1989). It was the beginning of the first Cenozoic glaciation in the Northern hemisphere.

The marine sediments 2.7 Ma old document accused drops of the oceanic temperatures (Raymo, 1992; Raymo *et al.*, 1989). Since then, the oscillations between tempered and cold stages have acquired greater amplitude keeping a tendency towards a major cooling. From approximately 1.5 Ma, the thermal oscillations point to a rate of increasing amplification, exceeding themselves the previous extremes as much mild as cold. Comparing the values of  $\delta^{18}\text{O}$  in oceanic sediments of the present interglacial stage with those of the last one million and a half of years, only in six occasions were reached such high temperatures. This happens in interstadials 43 (1.2 to 1.3 Ma), 35 (~ 1.1 Ma), 31 (0.9 to 1 Ma), 11 (~ 0.4 Ma), 9 (~ 0.3 Ma) and (~ 0.13 Ma). In fact, the Holocene temperatures are surpassed in the four last ones. It is interesting to note that most interglacials did not reach as high thermal values as in recent times. At the other extreme of the oscillations, the lowest temperatures of the cold episodes also take place at the end of the Pleistocene. They are concentrated from approximately 0.5 Ma, and are episodes 16 (< 0.6 Ma), 12 (~ 0.4 Ma), 6 (~ 0.15 Ma) and 2 (0.02 Ma). A series of datings by the U/Th method in marine sediment grants to the Eemian interglacial a maximum span of 10 ka (= thousands of years), and between 1 and 2 ka to the substage 5e (Slowey *et al.*, 1996). The fast and short-duration climatic changes happened during the last interglacial and in the base of the Weichselian, as showed from the oxygen isotopes analysis of ice cores from Greenland, were interpreted as «artefacts» owing to changes of state at the deepest zone of the ice cap (Adkins *et al.*, 1997). Although these climatic changes could be coincident with the above mentioned observations on the faunal changes of rodents in Central European deposits (Horáček & Ložek, 1988).

During the Würm period, the highest peaks in the Iberian Peninsula were covered by glacial sheets (Uchupi, 1988). The loess accumulations stretched out from west of France to the east, along the edge of the southern end of the last European icecap (Horáček & Ložek, 1988). Currents of polar waters descended up to a latitude of 42°N during the Quaternary cool peaks, and the Gulf Stream was turned aside towards the southwest. The Iberian Peninsula was exposed to predominant winds from the west

(Uchupi, 1988). Warmer temperatures giving rise to the present warm interstadial are noted in high latitudes 18 ka BP.

#### MATERIAL AND METHODS

The scope of this paper covers the Quaternary, although the lowest limit considered here is not the generally accepted 1.6 – 1.8 Ma (Aguirre & Pasini, 1985). The reason for this consideration is that this limit—as well as the divisions of this period—has been established on the shifts of mammal distributions (mainly in Europe) (for instance, Mein, 1976; Fahlbusch, 1976; Bruijn *et al.*, 1992; Calvo *et al.*, 1993), and these do not correspond to the changes of avian paleogeography. In this regard, **Higueruelas** (ca. 3 Ma) is the oldest locality in the MR with an association of avian taxa similar to the ones found during the Lower Pleistocene: the small passeriforms constitute an important fraction of the species assemblage; from 26 species present in **Higueruelas**, only one (new) species of *Palaeocryptonyx* seems not to go through the conventional limit of the Pleistocene; and it appears to be a *Corvus* of the *plioacaenus/antecorax* group (a typical corvid or corvids of the European Lower and Middle Pleistocene). The uppermost limit chosen for the present work is the Epipaleolithic (after the last main cool pulse).

For this study seventy-two fossil sites located in the current MR and in its peripheral fringe have been analysed. The African side of this region is still a vacuum territory for the paleornithology of the Quaternary. Where possible, fossil localities, geological layers or sedimentary complexes providing rich avian assemblages have been chosen in order that they can approach to a certain extent the paleoclimatic and paleoenvironmental conditions. This comprises a total amount of 89 avian assemblages (Appendix 1). Some of the fossil associations used in this work can be excluded as samples of paleornithocaenoses, since these constitute clear cases of associations containing the recent introduction in Europe of *Gallus* (**Bacho Kiro**, **Fontéchevade**, **Ibex**), where the mixture of layers is in no doubt. Despite this, such localities have been chosen due to the scarcity of fossil assemblages in some areas or to cover some time spans. They are only used to illus-

trate the presence of individual species. The data have been taken directly from the original works to avoid possible mistakes, with the exception of one or two cases that are pointed out. Some publications have not been considered for this paper since they contain obvious mistakes. All the authors and publications do not merit the same degree of confidence; however, the aim of this paper is not to review the published material. Some of the taxonomical identifications and the chronological attributions should be re-examined.

The geographical situation of the localities is given in the map of Figure 1. The sites have been listed in two chronological tables (Tables 1 and 2), although their respective positions are approximative for many of them.

#### *Non-Mediterranean irruptive species*

Some high dispersive species, which are nowadays distributed along northern Eurasia are recorded in Quaternary localities of MR. A case repeatedly noted in the literature is that of the Snowy Owl *Nyctea scandiaca* (Lambrecht, 1933; Brodkorb, 1971; Boev, 1998a). According to their respective current distributions, such species are considered herein as irruptive in the whole or a part of the MR during the Quaternary (Appendix 2). In Appendix 1 each irruptive species is highlighted with an asterisk when the fossil locality falls in the corresponding «area of irruption» of that species (see Appendix 2). The current ranges of the Pygmy Owl *Glaucidium passerinum* and Tengmalm's Owl *Aegolius funereus* cover approximately the northern border of the MR. When these species appear in localities near the limits of the MR, they are not considered as irruptive into it, but as punctuating the spreading of Eurosiberian climatic conditions.

#### *Non-Mediterranean low-dispersive species*

The grouses (*Lagopus* sp., *Tetrao* sp., *Lyrurus* sp., *Bonasa* sp.) are a low-dispersive group of birds whose respective geographical distributions are fairly outside the MR (Cramp, 1998). In this paper it is assumed that those species were not included in the past components of Mediterranean paleornithocaenoses

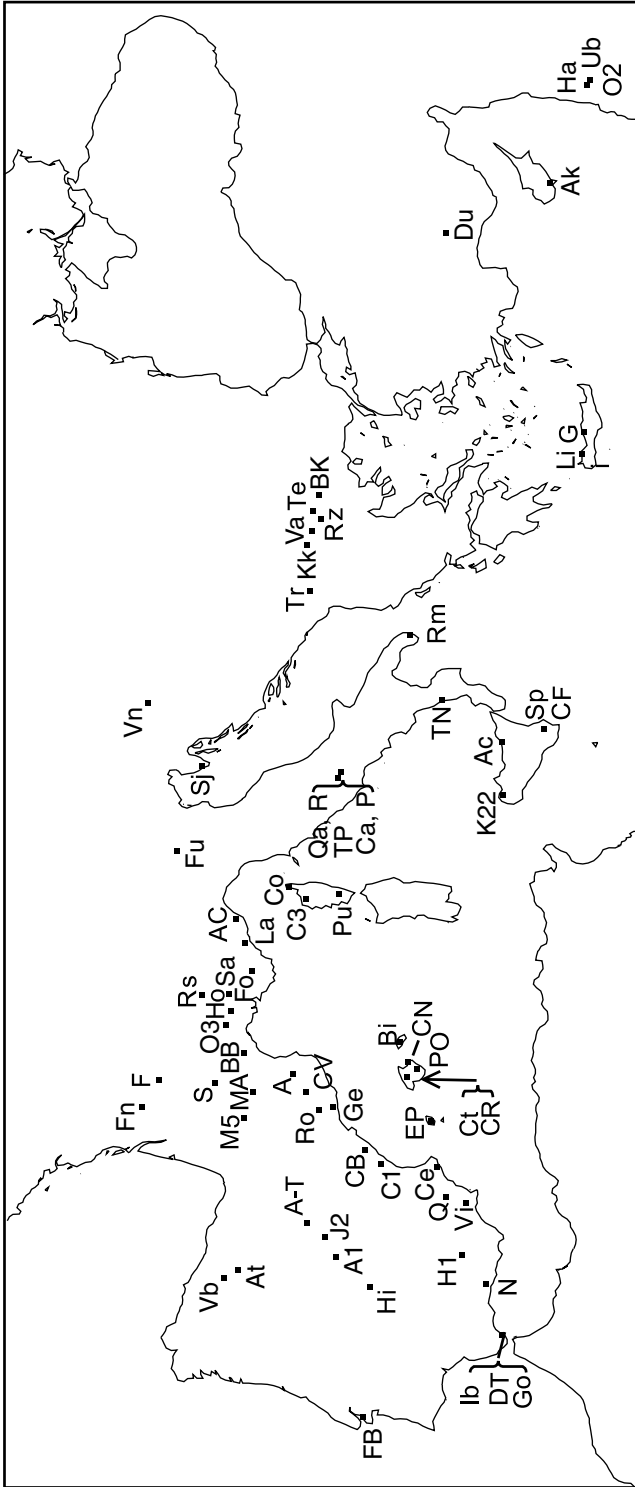


FIG. 1.—Map of a part of the Mediterranean region with the fossil localities used in the present study. Current shorelines. Abbreviations: A – Arbreda, A-T – Ambrona and Torralba, A1 – Arideos 1, AC – Arene Candide, Ae – Acquedolci, Ae – Aetokremnos, At – Atapuera complex (Elefante, Dolina, Galería), BB – Bois-des-Brousses, Bi – Bimigaus, BK – Bacho Kiro, C1 – Casablanca 1, C3 – Castiglione 3, Ca – Carnello, CB – Cau d'en Borrás, Ce – Cendres, CF – Contrada Fusco, CN – Cova Nova, Co – Coscia, CR – Ca na Reia, Ct – Canet, CV – Cingle Vermell, DT – Devil's Tower, Du – Dursunlu, EP – Es Pouàs, F – La Fage, FB – Figueira Brava, Fn – Fontchévade, Fo – Fontbrégoua, Fu – Fumane, G – Gumbes (B, C), Ge – Gégant, Go – Gorham, H1 – Huéscar 1, Ha – Hayonim, Hi – Higuerales, Ho – Hortus, Ib – Ibeix, J2 – Jarama II, K22 – K22, Kk – Kozarnika, La – Lazaret, Li – Liko, M5 – Montoussé 5, MA – Mas-d'Auzil, N – Nerja, O2 – Ohalo 2, O3 – Orgnac 3, P – Palidoro, PO – Pedrera de S'Ònix, Pu – Punta di Calcina, Q – Quibas, Qa – Quartaccio, R – Radice, Rm – Romanelli, Ro – Romani, Rs – Romains, Rz – Razhishkata, S – Salpêtre, Sa – Salpêtrière, Sj – Sandalja (I, II), Sp – Spinagallo, Te – Temnata, TN – Torre Nave, TP – Torre in Pietra, Tr – Trebački, Ub – Ubetdiya, Va – Varshets, Vb – Valdegoba, Vi – Vindija, Vn – Vindija.

[Mapa parcial de la región mediterránea con las localidades con fósiles utilizadas en este estudio. El mapa muestra la actual línea de costa. Para las abreviaturas ver arriba.]



neither. Thus, their presence in Mediterranean localities may be understood as: (a) the fossil association was deposited under non-Mediterranean conditions or (b) it is a mixture of paleornithocenes from periods with different climatic conditions. These species are underlined in Appendix 1.

### *East Mediterranean surviving species*

Appendix 3 lists the species which are nowadays distributed along the east part of the MR, but that are also recorded in fossil localities from the west part. In Appendix 1 these taxa are highlighted with an asterisk when appear in localities from the west area of the MR.

## SURVEY OF THE FOSSIL LOCALITIES

### *Last Pliocene and Early Pleistocene*

The Iberian locality of **Higuera** (MN 16) (Bruijn *et al.*, 1992) has been dated between 3.18 and 3.46 Ma (Bonadonna & Villa, 1984) and to 3.2 Ma (Aguirre & Morales, 1990). The presence of several shallow lakes, combined with regional volcanism, provided suitable environments for the preservation of a large sample of the local paleornithocenes. In the species assemblage yielded by this outcrop, the larger ecological group was constituted by aquatic birds: Slavonia Grebe *Podiceps auritus*, Black-necked Grebe *P. nigricollis*, Whooper Swan *Cygnus cygnus*, goose sp. *Anser sp.*, shelduck sp. *Tadorna sp.*, Greater Scaup *Aythya marila*, White-headed Duck *Oxyura leucocephala* and Smew *Mergus albellus*, as well as for those species also linked to aquatic environments: Grey Heron *Ardea cinerea*, Black-crowned Nightheron *Nycticorax nycticorax*, Little Bittern *Ixobrychus minutus*, Glossy Ibis *Plegadis falcinellus*, Common Sandpiper *Actitis hypoleucos* and Meadow Pipit *Anthus pratensis*.

The finding of *C. cygnus*, *A. marila* and *M. albellus* constitutes an unexpected event concerning the age and geographic situation documented by this locality. At present, they are breeding species in northern zones of Eurasia, and are rare in Iberian territory. In the case of the swan, this only appears with occasion of

hard winters (Díaz *et al.*, 1996). Contingents of these three species move during the winter, not only to Central Europe and north of France, but also to more southern latitudes, such as the Balkan Peninsula and Anatolia.

**Montoussé 5**, dated to the Upper Pliocene, in the northern side of the Pyrenees, has yielded a small quantity of bird remains, including *Corvus pliocaenus* and *Palaeocryptonyx sp.* (Clot *et al.*, 1976). The fauna is characteristic of temperate conditions and of forest environments. Each of these mentioned taxa appear in two respective sites in Mallorca (Balearic Islands), *Palaeocryptonyx sp.* in **Ca na Reia** (Upper Pliocene), together with a small quantity of other taxa (Alcover, 1989), and *C. pliocaenus* in **Pedrer de S'Onix** (Plio-Pleistocene) (Mourer-Chauviré *et al.*, 1977). Moreover, this locality situated near Manacor has yielded a relatively large collection of birds (Mourer-Chauviré *et al.*, 1977; Mourer-Chauviré in Alcover *et al.*, 1981), most of them from woodland habitats, and two irruptive taxa *Cygnus cf. cygnus* and *Bucephala cf. clangula*. Further taxonomic revision of this fauna by Seguí (1996) has not changed its paleoenvironmental implications.

Although it is partially outside of the chronological framework of this paper, it is worth while mentioning *Tyto balearica*, a paleospecies of barn owl widely distributed in the West Mediterranean area throughout a notable span of time, which was classified on fossil material from three Balearic localities (**Canet**, **Pedrer de S'Onix** and **Binigaus**) dated on the Plio-Pleistocene boundary (Mourer-Chauviré *et al.*, 1980). This species was later identified in some older sites in France and Spain: **Layna** (Early Pliocene, MN 15), **Sète** (Early Pliocene, MN 15), **Balaruc II** (Late Pliocene, MN 16), **Casablanca I** (Late Pliocene, MN 17) (Mourer-Chauviré & Sánchez Marco, 1988; Mourer-Chauviré, 1995; Sánchez Marco, 1995a), **Aljezar B** (Late Miocene, MN 12) (Cheneval & Adrover, 1993), **Valdecebro 5** (Late Miocene, MN 12), **Layna** and **Moreda** (Late Pliocene, MN 16) (Sánchez Marco, 2001). This owl has been also identified in two Middle Pleistocene sites: **Castiglione 3 CG** (Mourer-Chauviré in Salotti *et al.*, 1997, Mourer-Chauviré *et al.*, 1997) and probably **Punta di Calcina** (Corsica) (Pereira *et al.*, 2001). Moreover, remains from the complex of outcrops of **Gar-**

TABLE 1



Late Pliocene and Pleistocene localities from the Mediterranean region used in the present study. 1.—Chronology ( $\times 10^6$  aBP). 2.—Magnetostratigraphy. 3.—Epochs. 4.—Lithic intervals. 5.—Major divisions after micromammals.

[Localidades de la región mediterránea del Plioceno superior y Pleistoceno utilizadas en este estudio. 1.—Cronología ( $\times 10^6$  años anteriores al presente). 2.—Magnetoestratigrafía. 3.—Épocas. 4.—Interválos líticos. 5.—Divisiones principales según micromamíferos.]

1	2	3	4	5	Localities						
.01	BRUNHES	Holocene		STEINHEIMIAN	Liko Gumbes B-C						
.0345		UPPER PLEIS.	Upper. Paleol.		Ibex						
.120			MID. PAL.		Es Pouàs Cova Nova Bacho Kiro						
.128	MIDDLE PLEISTOCENE				EmFC Sicily						
					Quartaccio Spinagallo	Lazaret	C.III Bottom LocVIII				
					Áridos 1 Galería	TG 11 TG 10A TG 10B Fontéchevade					
					Castiglione 3 (CG) Punta di Calcina						
					Ambrona - Torralba La Fage (CO)						
					Orgnac 3 (i)						
780					LOWER PLEISTOCENE		LOWER PALEOLITHIC	BIHARIAN	Hués-car 1 Dolina (TD 6)		
786										Elefante (lower layers)	
860									Jaramillo	Dursunlu	Victoria
920									MATUYAMA		
	Ubeidiya										
1.64	OLDUVAI	PLIOCENE		VILLANYAN					Ca na Reia Pedrera de S'Ònix Canet Binigaus		
1.67					Casablanca 1 (MN 17) Montoussé 5 (MN 17)						
1.79					Varshets (MN 17)						
					MN 16: Moreda Higueraelas Balaruc II						
		MN 15: Layna Sète Gargano.....									

**gano** (Early Pliocene, Southern Italy) have been attributed to this species (Mlíkovský, 1998).

**Varshets** fossil locality is a ponor situated near the homonymous town, in northwest of Bulgaria. It has been assigned to the Late Pliocene, MN 17 (Boev, 2002). Its very rich association of birds has led to a large bibliographic production (Boev 1995, 1997, 1998b, 1998c, 1999a, 1999b, 1999c, 1999d, 1999e, 2000a), summarized in Boev (2002). The specific composition of this fauna is sufficiently different from the Pleistocene ones to establish confident comparisons. There have been no findings of *Geronticus*, *Tyto balearica* or *Palaeocryptonyx*. The presence of *Lagopus* and *Tetrao* in the Balkan Peninsula is constant along the whole Quaternary.

Located in the north of the Dead Sea Rift (Israel), and near the Tiberias or Kinneret Lake, there is the site of **Ubeidiya** which is composed of more than sixty archaeological horizons of an age of *c.* 1.4 Ma. This lower Pleistocene site reveals a complex geological structure in which tectonic movements have tilted the deposits. The cultural remains are assigned to the Acheulian tradition (Bar Yosef & Goren-Inbar, 1993). As evidenced by the abundant aquatic species (Tchernov *vide* Tyrberg, 1998), the outcrop was situated close to an area of marshes and bodies of water.

**Quibas** site has an age between 1.0 and 1.3 Ma after the rodents' association. No avian wintering or northern species have been found in this outcrop. The group of taxa, where most of them are related with masses of water and parkland environments, points to moister climatic conditions than present ones (Montoya *et al.*, 1999, 2001).

The early Pleistocene site of **Victoria** is located on the southern Iberian coast. Some remains of swan (*Cygnus cf. olor*) also appear in this outcrop, which should be considered as a wintering species. Hedge Accentor *Prunella modularis* is currently a resident passeriform in mountain areas in the half north of the Iberian Peninsula, but during the winter this bird makes short displacements towards the south or to lower levels throughout its distribution. Black-headed Bunting *Emberiza melanocephala* is not resident in the western zone of the Mediterranean of today and breeds in the Balkan region and Anatolia.

The rich deposit of **Dursunlu** is placed in the eastern extreme of the MR, in the Konya basin, near Llgın (southern Anatolia), which is attributed an age between 0.9 and 1 Ma (Guleç *et al.*, 1998). Louchart *et al.* (1998) offer a list of 50 species, the immense majority of which is of aquatic habitats. The set of taxa of resident and breeding species corresponds to tempered climatic conditions, with the presence of numerous wintering birds.

The study of **Elefante** site is still incomplete. This locality belongs to the **sierra de Atapuerca** karstic infillings complex, situated in the northern plateau of the Iberian Peninsula. The lower layers contain a rodent assemblage from *ca.* 1 Ma. Bones from *Corvus antecorax* and White-tailed Eagle *Haliaeetus albicilla* are the most abundant ones (Rosas *et al.*, 2001). There are no fossil remains fairly attributable to wintering species.

There are other rich fossil localities in the Iberian Peninsula in chronological range between 1 Ma and the beginning of the Middle Pleistocene. **Huéscar 1** is a fossil locality situated in a present-day arid zone in the southern Iberian inland. The avian taxa are, with little exceptions, aquatic ones, most of them, anatids (Sánchez Marco, 1989). Two of the species that appears here, Common Scoter *Melanitta nigra* and Red-breasted Merganser *Mergus serrator*, currently are not inland wintering species (Díaz *et al.*, 1996). This behaviour is associated with periods of storms and rough weather on the coasts.

The Lower Pleistocene **Dolina** outcrop belongs also to the **Atapuerca** complex. The layer 6 (TD-6) is older than 0.8 Ma and has yielded one of the richest avian assemblages in Iberia, where open country species constitute the best represented group, followed by bushland biotope and inland water birds (Sánchez Marco, 1999b). On the other hand, resident species reach the highest values, especially those residents in the modern Eurosiberian zone of the Iberian Peninsula. Wintering and breeding taxa have a comparatively low incidence. The occurrence in TD 6 of such taxa as *Anas*, *Melanitta*, *Porzana* and *Cinclus* provides evidence for the presence of a body of water nearby, larger than the modern-day Arlanzón brook that runs about 3 km from the outcrops. In conclusion, the avian remains from this layer point to three main ecological traits: (a) the existence of



a pool, lake or slow river in (b) an open country type of habitat, and (c) that climatic conditions were similar to modern Iberian winters or that most fossils were deposited in the cave during the winter season (Sánchez Marco, 1999b).

### *Middle Pleistocene*

The site **Orgnac 3**, at Orgnac-L'Aven (France), was constituted by the fulfilling of a doline. The stratigraphic profile shows 19 layers, among them the layer i is the richest in avian remains. For this reason, as well as for the occurrence of *N. scandiaca*, the fossil assemblage from this unit has been chosen for the present study. The avian bones were studied by Mourer-Chauviré (1975a). After the rodent association, Jeannet (1974 *vide* Mourer-Chauviré, 1975a) attributed the layer i to the Mindel-Riss phase. An important fraction of the species are tree-dwelling birds, and it is also remarkable the abundance of galliforms. The rodents should indicate a temperate and dry climate (Chaline, 1972, *vide* Mourer-Chauviré, 1975a).

The Aven 1 of **La Fage** is a karstic infilling situated near Noailles town (France). It has yielded one of the largest list of species in the Middle Pleistocene, with more than 100 taxa (Mourer-Chauviré, 1975b; Mourer-Chauviré *et al.*, 2003) distributed along the whole stratigraphy (Mourer-Chauviré & Philippe, 1972). Avian remains are more abundant in the stratigraphic unit CO (Mourer-Chauviré, 1975a), a subdivision of the layer 5. The climatic conditions for this layer have been interpreted (Mourer-Chauviré, 1975b; Mourer-Chauviré *et al.*, 2003) as being slightly colder than today, but with colder and warmer periods, because terrestrial gasteropods, micro- and macromammals as well as some birds from this layer would indicate temperate climatic conditions, and, on the other hand, some other bird species are tied to cold climates.

**Ambrona** and **Torralba** are two localities 3 km apart, both related to acheulean occupations (Santonja, 1989; Santonja & Vila, 1990). The ten avian species found here are aquatic ones (Sánchez Marco, 1990, 1999c). With the exception of two rallids (*Porphyrio porphyrio* and *Fulica cf. atra*), the remaining species were identified as wintering species. Also attributable to this age and loca-

ted in the middle of Iberia is **Áridos 1**, an anthropic deposit formed in one bank of the Jarama River. The best ecological group represented here is the one tied to woodlands and forests. Likewise, there are aquatic and open country species (Mourer-Chauviré, 1980).

**Castiglione 3** is a karstic cavity in the Oletta massif (north of Corsica). The deposit **Castiglione 3 CG** is a fissure that contains a large quantity of fossil remains. It has been attributed to an age of 350 ka (Salotti *et al.*, 1997). The identification of the birds is owed to Mourer-Chauviré (*in* Salotti *et al.*, 1997). This Middle Pleistocene site records one of the last occurrences of *T. balearica*, which appears with Barn Owl *T. alba*. The major part of the collection is composed by diurnal and nocturnal raptors, with two insular paleoendemisms.

**Fontéchevade** cave is in the middle west of France, near Montbron town. The fossil assemblage corresponds to a woodland habitat type (Mourer-Chauviré, 1975a). It contains characteristic Mediterranean avian taxa as well as non-Mediterranean ones, and one or two species which occurrence could be interpreted as the result of irruptions from north Europe.

The site known as **Galería** also belongs to the **Atapuerca** complex. The three stratigraphic units containing the highest diversity of avian species are, from top to bottom: TG11, TG10A-TN7 and TG10B-TN6 (Sánchez Marco, 1995b, 1999a). These units are younger than an immediately below stalagmitic crust dated to  $317.6 \pm 60$  ka (ESR, Grün & Aguirre, 1987), and older than the crust immediately above dated to  $211 \pm 32$  ka (ESR, Falguères, 1986) and  $177.3 \pm 23$  ka (ESR, Grün & Aguirre, 1987). The filling of this cavity does not coincide chronologically with the ones of **Dolina** and **Elefante** (Made *et al.*, 2003).

The bird remains found in the TG10B-TN6 and TG10A-TN7 units, compose habitat and phenetic spectra which are characteristic of humid zones with open lands. They correspond to zones in which the fauna acquires its greater diversity in the wintering periods. Some considerable forest masses might have existed, as can be deduced from the passeriforms related to landscapes with shrubs and trees. There is no evidence to affirm that these areas, with more or less open forests, constituted one of the main elements of the surroundings. The habitat and phenetic spectra of the superior stratigraphic

unit, TG11, points to reductions of the temperature and the humidity for that period, in comparison with the condition of the underlying layers. During the corresponding time interval the bodies of water continued to determine the local communities of birds and it seems that a regression of the forests took place. One trait of the landscape recorded in the Early and Middle Pleistocene of Atapuerca could be the existence of a humid zone that extended to the foot of the mountain range of Atapuerca. This humid zone was made up of backwaters (pools or fluvial sections of slow-flowing waters) and streams. It changed in extension on several occasions and, probably, in depth. It seems that this region was a wintering area which was very important in the periods corresponding to lower layers of **Elefante** and upper ones of **Galería** (Made *et al.*, 2003).

The **Lazaret** site is a 40 m long cavity, located in the Boron mountain near Nice and 100 m from the current coastline. During the Middle Pleistocene its distance from the sea was around 500 m (Vilette, 1993). The stratigraphic unit C.III is observed in the profile at the entrance of the cave. These sediments were deposited before the formation of a stalagmitic crust dated between 125 and 70 ka BP (Falguères *et al.*, 1992). Thus, **Lazaret C.III** has been attributed to an age of 150 to 125 ka BP, OIS 6. All the species showed in Table 1, except *Cinclus cinclus*, appears in the first layers of this stratigraphic unit (Vilette, 1993: Table XII). The avian assemblage corresponds to a forest area with inland humid zones. The nearness of the sea is also noted in the fossil remains of birds. Some years before the work on the unit C.III, Mourer-Chaviré (1964, 1975a) studied two other units of this cave: Locus VIII and some layers from the bottom of the cavity. Both infillings (**Lazaret Locus VIII** and **Lazaret bottom**) are considered to have been deposited during a large span of time during the Riss interval (Mourer-Chaviré, 1975a). Thus, none of both avian associations may be understood as samples of individual avifaunas, but as a mixture of different ones. In spite of this, their taxonomical compositions and their respective representation of habitats are very similar to those of the unit C.III, although the latter encompasses a shorter interval. These three associations include typical Eurosiberian and Mediterranean taxa, particularly the corresponding

to Locus VIII and C.III. A sharp difference in this one is the appearance of several northern irruptive species as well as *H. albicilla* and Pallid Harrier *Circus macrourus*, today restricted to more eastern areas.

Therefore, either the southern coast of France suffered fluctuating climatic conditions during the cool phases of this period or there was a strip alongside the coast with a real «mixed» ornithofauna with no parallel today.

Approximately in the middle of the Italian Peninsula, **Quartaccio** quarry (Vitinia, Rome), records an assemblage from the Vitinia Formation (Bedetti, 2001). The corresponding avian list of the Appendix 1 is the result of a revision by Bedetti (2001) of previous works. Most of the species correspond to aquatic-dwelling birds. The occurrence of the Eider *Somateria molissima* should be considered as an irruptive species into this region.

The avian remains from **Spinagallo** cave, near Siracusa (southeastern Sicily), were studied by Pavia (1999). It contains a fossil association dated of about 500 ka BP (Bada *et al.*, 1991), and composed of a large list of Mediterranean taxa. The degree of isolation during the period represented by this assemblage seems to have been quite reduced.

Among the five Pleistocene faunal complexes described in Sicilian localities, one of them, **Elephas mnaidriensis Faunal Complex**, from the Middle Pleistocene, has yielded an important avian assemblage (Pavia, 2001). Three outcrops contribute to the avian collection: **K 22**, **Acquedolci** and **Contrada Fusco** —the former studied by Cassoli & Tagliacozzo (1996)—. The assemblage of birds shows the typical traits of the Mediterranean insular avifaunas (*sensu* Alcover *et al.*, 1992) but reveals a reduction of the degree of isolation (Pavia, 2001). The Goosander *Mergus merganser* seems to be a northern irruptive species.

#### Upper Pleistocene

**Torre in Pietra** locality is in the province of Rome and was studied by Cossoli (1978). The layer m, with a pre-würmian lithic industry, has a Mediterranean assemblage of birds, with a high proportion of water species.

In the north of Spain, in the area today included in the Eurosiberian region, **Valdegoba**

TABLE 2

Upper Pleistocene and Holocene localities from the Mediterranean region used in this work. 1.- Chronology ( $\times 10^3$  aBP). 2.—Epochs. 3.—Lithic intervals. 4.—Lithic types. 5.—Oxygen Isotopic Stadials.  
 [Localidades de la región mediterránea del Pleistoceno Superior y del Holoceno utilizadas en este estudio. 1.—Cronología ( $\times 10^3$  años). 2.—Épocas. 3.—Intervalos líticos. 4.—Tipos líticos. 5.—Estadíos isotópicos del  $^{18}O$ .]



1	2	3	4	5	Localities	
10	Holocene	Neolithic		1	Akrotiri Cendres Trebački Arbreda II	
		Epipaleolithic				
34.5	Upper Pleistocene	Upper Paleolithic	Magd.	2	Fontbrégoua Romanelli Razhishkata Mas-d'Azil Temnata (3a) Palidoro Šandalja I (d)	
			Solut.		Jarama II Šandalja II (E) Temnata (3d) Arbreda (Aurign.)	
			Aurig.		Ohalo 2 Vindija (E/F) Figueira Brava Fumane	
120	Upper Pleistocene	Middle Paleolithic	M O U S T E R I A N	3	Torre Nave Romaní (II) Arbreda (Moust.) Hortus	
					4	Radice Carnello Gegant (II) Gorham (K/M)
						Devil's Tower Cau d'en Borrás
128	Upper Pleistocene	Lower Paleolithic	A C H E U L E A N	5	Valdegoba Torre in Pietra (d) Coscia (shelter South)	
					Middle Pleist.	

cave whose sediments were deposited during the Mousterian period (Diez *et al.*, 1989), offers an avian association with Mediterranean as well as Eurosiberian characteristic species. Three northern irruptive species are recorded. Two more reduced assemblages, but with similar features to **Valdegoba** are the Italian localities of **Radice** valley (Biduttu *et al.*, 1967) and **Carnello** (Segre *et al.*, 1984), both situated near Sora village and with some Mousterian tools collections.

The Upper Pleistocene deposits from **Cova Nova** locality (Capdepera, Mallorca Island) have yielded a large sample of a Mediterranean insular avifauna (Florit & Alcover, 1987; Mc-Minn & Alcover, 1992). The occurrence of the Bullfinch *Pyrrhula pyrrhula* in the Balearic Islands has to be considered as a case of irruption of a northern species. Another typical Mediterranean assemblage was collected at the locality of **Es Pouàs** (Florit *et al.*, 1989). This karstic cavity, where there are no remains of irruptive taxa, is situated near Santa Agnès de Corona (Eivissa Island).

The fossil remains from **Bacho Kiro** cave were studied by Bocheński (1982). This locality from the Stara Planina region (Bulgaria) shows an assemblage characteristic of temperate to mild conditions. The presence of Ptarmigan *Lagopus mutus* would lead to assumption of some relatively cool temperatures, although this species seems to have occurred in forest zones in the Late Pleistocene (Bocheński, 1974).

**Cau d'en Borrás** is a cavity on the east coast of Spain, near Oropesa town as well as the current sea line, in spite of which the only species recorded which is connected with the sea is *Haliaeetus albicilla*. The fossil assemblage is characteristic of open Mediterranean habitats. It is important to point out that the closeness of the sea does not seem to have any consequence in the avian fossil record at the locality.

Gibraltar has a big number of karstic cavities, a lot of them with a valuable Pleistocene record. **Gorham's** cave is situated close to the south end of this small Peninsula. The fossil remains from this site were studied by Eastham (1968). Two avian assemblages are the richest: one from layers B and D attributed to Würm III (*ca.* 29 ka BP) another from layers K and U, attributed to Würm I. The former is an unbalanced sample of the corresponding local

avifauna. Most of the taxa are marine species, raptors and rock inhabitants. The assemblage from layers K and M is also of Mediterranean type but records the presence of some northern irruptive birds.

**Devil's Tower** shelter was situated—it was dismantled some time ago—near the isthmus of Gibraltar. Its faunal remains were identified by Bate (1928). The avian association is very similar to the ones mentioned for **Gorham's Cave**. Not far from here, between both localities and about 250-300 m a.s.l., there is **Ibex** cave, whose fossil association, studied by Cooper (2000) represents also a Mediterranean ornithofauna. The dates of **Ibex** cave (Rhodes *et al.*, 2000) support a Late Pleistocene age for this cavity but later than **Gorham**.

With the exception of Great Auk *Pinguinus impennis* and northern irruptive species, the taxa recorded in the Gibraltarian localities are the same ones that are currently observed at this migratory point (Finlayson, 1992).

**Gegant** cave is situated on the coast of Barcelona, in the Garraf massif. The assemblage of the layer II indicates, as in other cases, open areas with climatic conditions typical of the Mediterranean region.

**Arbreda** cave is near the Serinyà village, in a zone of the north of the Iberian Peninsula with intense processes of travertine formation and karstification (Garcia, 1995). The avian finds of this outcrop have been studied by Vilette (1983) and Garcia (1995, 1997). The largest fossil assemblages correspond to the stratigraphic units: Mousterian, Aurignacian (dated to 25,830 ± 400 aBP—years before present—) and Gravettian (dated to 20,130 ± 220 aBP) layers by Garcia (1995) and Aurignacian layers by Vilette (1983). All the assemblages are typical of the current Mediterranean region. In the Gravettian association, Garcia (1995) attributed one of the finds to *Lagopus* sp., but this fact does not determine the meaning of the whole avian association. The appearance of *P. enucleator* in the Upper Paleolithic layers of **Arbreda II** (Vilette, 1983) is important.

**Romaní** site is a rock shelter built in a travertine formation and located just in Capellades village, northeast Iberia. The stratigraphic unit II has been dated between 40-44 ka BP (Bischoff *et al.*, 1988). It contains a small sample of the corresponding ornithofauna. A noticeable feature is the occurrence of *P. enucleator*.



In the Languedoc region (south of France), the Mousterian layers from **Hortus** cave have provided a collection of fossil birds studied by Mourer-Chauviré (1972, 1975a). It is a typical Mediterranean assemblage with no record of characteristic Eurosiberian species. Ten kilometres from **Hortus** there is **Salpêtre** cave (Mourer-Chauviré, 1975a), this likewise containing Mousterian and Upper Paleolithic layers. The avian assemblage from the Mousterian layers from the latter show the occurrence of Mediterranean and Eurosiberian species, something already seen at other localities from this area. The same features can be observed in layers 1a and F1 (transition Dryas 3 – Preboreal) from **Salpêtre** cave, studied by Vilette *et al.* (1983).

**Coscia** localities are situated in the north end of Corsica Island. Two fossil avian deposits are distinguished (Bonifay *et al.*, 1998): **Coscia (rock shelter South)**, from the early Würm, and **Coscia cave**, ca. 60 ka BP. Both avian assemblages are typical of western Mediterranean islands. In the shelter South record there is evidence of irruption of northern species.

Cassoli (*in* Bulgarelli, 1972) identified the fossil birds from **Torre Nave** cave. This site is situated on the southern coast of the Italian Peninsula, in Cosenza. Unexpectedly, there are not any marine species in the avian assemblage. Nor northern irruptive species are.

Near the village of Remoulins, not far from Nîmes (southern France), is **Salpêtrière** shelter. The stratigraphic complex CG5-SLC4 (corresponding to layer 14a) has yielded the richest avian association of this site. It has been attributed to the early Aurignacian and dated of  $28,180 \pm 1,000$  aBP (Vilette, 1983). The presence of aquatic species is explained by the closeness of the Gordon River, but the record of low dispersive Eurosiberian species as well as northern irruptive birds, together with the absence of typical Mediterranean taxa points to Eurosiberian paleoenvironmental conditions.

**Fumane** rock shelter is located in the region of Veneto, north Italy, close to the Alps range. Therefore, it is outside of the Mediterranean region. The avian remains were studied by Cassoli and Tagliacozzo (Bartolomei *et al.*, 1992; Cassoli & Tagliacozzo, 1994). The Mousterian collection is very scarce, but the Aurignacian one constitutes a relatively good sample of the local avifauna. It is characteristic of the Euro-

siberian region with presence of some irruptive species from north Europe.

At the west end of the Mediterranean region, **Figueira Brava** cave (Mourer-Chauviré & Antunes, 1991, 2000) is situated south of Lisbon, on the coast of the Setubal Peninsula. The composition of its Mousterian assemblage is highly influenced by the closeness of the site to the sea. The avian local fauna was of Mediterranean type with a high proportion of aquatic taxa, two of them might be considered as northern irruptive species.

Boev (1994) studied the avian remains from **Temnata** cave, near Karlukovo village, and situated in the middle west of Bulgaria. The largest avian assemblage comes from the layer 3d, dated of  $28,900 \pm 1,100$  aBP. It is not a very rich layer in fossil birds, but the corresponding association of taxa would fit better with a Mediterranean avifauna. On the other hand, the layer 3a, dated of  $13,600 \pm 200$  aBP, contained an avian assemblage characteristic of Eurosiberian conditions. None of these assemblages record the occurrence of northern irruptive species.

**Šandalja I** and **Šandalja II** caves are situated on the northern coast of Croatia. Their avian remains have been the subject of some works by Malez (*vide* Tyrberg, 1998). The layer d of the former has been attributed to the Gravettian lithic period (Würm 3) whereas the layer E of the latter to the Aurignacian (with a date of  $23,540 \pm 180$  aBP). Both fossil assemblages are characteristic of woodland habitats, although the presence of *Lagopus* in **Šandalja I** could be understood as an indicator of a cooler phase, in spite of there not being any record of any northern irruptive taxa in such a large variety of aquatic habitat species. The same author (Malez *vide* Tyrberg, 1998) has studied the birds from **Vindija** cave, situated in the north of the country. Its largest assemblage is dated at ca. 26,970 aBP (Würm 3) and corresponds to the layer E + F, which is attributed to the Aurignacian. Thus, the above-mentioned assemblages from these three Croatian sites are chronologically very close one another. Moreover, the paleoenvironmental features implicated by these local associations are practically the same.

The locality of **Ohalo 2**, in the Galilee region (Israel), has a rich record from the Early Epipaleolithic (Simmons & Nadel *vide* Tyrberg,

1998), dated of about 19,400 aBP. The assemblage corresponds to a typical eastern Mediterranean avifauna, but there are six northern irruptive species recorded.

The avian remains from **Bois-des-Brousses** shelter were studied by Vilette (1983). This locality is close to the Hérault River, 25 km from Montpellier. The layer 2B (attributed to the Solutrean) contains a non-Mediterranean fossil assemblage and the uncertain presence of a northern irruptive species (cf. Great Snipe *Gallinago media*).

In the middle of the Iberian Peninsula, the rock shelter named **Jarama II** has yielded an avian assemblage attributed to the Early Magdalenian phase (Jordá, 1993; Adán *et al.*, 1995) which is clearly of non-Mediterranean type, although there is no record of irruptive species from north Europe.

**Castiglione 3 PL** is an Upper Pleistocene karstic infilling rich in avian remains in the above-mentioned **Castiglione 3** complex. Sediments from PL fissure are dated of about 15 ka BP (Salotti *et al.*, 2000). The corresponding avian assemblage is, as for the CG fissure, also typical of Mediterranean islands, with the exception of the presence of *Alectoris*.

**Palidoro** quarry is situated near Rome. It yielded a reduced avian association, which was attributed to the Upper Paleolithic period (Cassoli, 1977). The taxonomical composition of this association is of Mediterranean type.

**Romains** cave at Pierre-Châtel, near Virignin village (French Alps), is not today—and probably never was—in the Mediterranean region. Its Magdalenian avian association (Desbrosse & Mourer-Chauviré, 1973; Mourer-Chauviré, 1975a) is consequently characteristic of a woodland habitat under a fresh climate. The high percentage of aquatic species is explained by the nearness of the Rhone River to the cave. The Snowy Owl appears in the record of this cavity.

Dimitrijević *et al.* (2000) have studied the Epigravettian rock shelter of **Trebački**. This locality is near Berane village, in Yugoslavia. The avian assemblage is characteristic of the Eurosiberian region. There is also the record of *P. enucleator*.

The fossil birds from **Nerja** locality—a cave situated near the homonymous village, in the south of Spain, approximately 1 km from the current sea line (Jordá, 1986)—have been the

subject of several works. The most informative assemblages correspond respectively to: Epipaleolithic (Boessneck and Driesch, 1980; Hernández Carrasquilla, 1995; Tyrberg & Hernández Carrasquilla, 1995), Magdalenian (Eastham, 1986) and Upper Paleolithic layers (Hernández Carrasquilla, 1995). The aquatic species constitute the largest group in every assemblage, being the small passeriforms absent or not identified.

**Kozarnika** cave is located near the town of Bologradchik, north-west Bulgaria. The avian finds were collected in the cultural layers III and IV, which have been attributed to the Gravettian (26 to 19 ka BP; Boev, 2001). The fossil material was accumulated into the cavity by nocturnal raptors, most probably by *Bubo bubo* (Boev, 2001). The association of birds shows a large representation of Eurosiberian species. It implies woodland or forest habitats with no Mediterranean conditions. The Snowy Owl appears as an irruptive immigrant.

**Arene Candide** is one of the richest Pleistocene avian localities of Europe. The fossil birds from this cave, situated in the Ligurian coast of Italy, were studied by Cassoli (1980). Sediments from the Upper Paleolithic, with a thickness about 3.8 m, show an avian assemblage with twelve northern irruptive species, as well as typical low dispersive Eurosiberian and Mediterranean taxa. This fact may be the result of a mixture of layers—or avifaunas—or, on the contrary, to represent the reality during the Upper Pleistocene in this area.

The site of **Mas-d'Azil** consists of a large cave situated in the French Pyrenees, 30 km from Foix town. The avian finds, studied by Vilette (1983), come from the cavity named «galerie rive droite». All the fossils were collected in the Magdalenian layers (13,400 ± 1,000 and 13,200 ± 110 aBP) (Vilette, 1983). As it can be expected by the geographical situation of the locality, the avian taxa imply a non-Mediterranean climate. The Snowy Owl is recorded together with the Eagle Owl. The same author (Vilette, 1983) studied the birds from **Cingle Vermell**, a shelter located near Vilanova de Sau village, northern Iberia. The avian assemblage of the Tardiglacial layers (dated to 11,620 ± 140 aBP) is characteristic of Mediterranean conditions.

**Razhishkata** cave situated near Lakatnik station, Sofia district (Bulgaria), has a fossil



record from the end of the Pleistocene and probably of the transition to the Holocene (Boev, 2000b). The avian assemblage contains low dispersive species linked to a woodland habitat under Eurosiberian conditions.

The richest avian association of the final Upper Pleistocene was recovered from **Romanelli** cave (south of the Italian Peninsula), with two series of dates:  $11,930 \pm 520$  and  $9,050 \pm 100$  aBP (Cassoli & Tagliacozzo, 1997) and also  $10,640 \pm 100$  and  $9,980 \pm 100$  aBP, all of them for the formation *Terre brune* (upper part of the stratigraphical profile; Tagliacozzo & Gala, 2000). A large amount of water species, with clear evidences of human exploitation of anseriforms (Tagliacozzo & Gala, 2002), and raptors are recorded here, and some irruptive taxa among them.

**Cendres** cave is in the eastern coast of Spain, near Teulada village. It has yielded an unbalanced sample of the avian paleornithocenoses, identified by Villaverde *et al.* (1997), from the end of Magdalenian. The authors point out the possible presence of the irruptive Brent Goose *Branta bernicla*.

**Hayonim** cave, situated in the Galilee region of Israel, has some very rich collections of fossil birds related to Natufian period. The layer B, dated of 10.7 to 12.4 ka BP and studied by Tchernov (*vide* Tyrberg, 1998) as well as the sample studied by Pichon (*vide* Tyrberg, 1998) provide an exceptional insight to the local avifauna in this period. It is characteristic of the eastern part of the Mediterranean region and it is worthwhile mentioning that no northern irruptive species have been found in this very large fossil record, unlike those seen in **Ohalo 2**, the other Galilean locality.

**Fontbrégoua** locality is a large cavity situated near Salernes village, about 60 km from Toulon, France. The most important avian collection come from the Epipaleolithic layer (50 to 53), with an infradate of  $8,400 \pm 110$  (layer 54) and  $7,600 \pm 100$  aBP (layers 50 and 51; Vilette, 1983). The very rich fossil assemblage of birds is characteristic of a zone under Mediterranean conditions, with a predominant woodland habitat. Eurosiberian indicator species are not recorded.

Mourer-Chauviré (1999) studied the Early Holocene fossil bird collection from **Akrotiri** locality. In spite of its modern age, these avian remains are the oldest known from Cyprus. The

small assemblage represents an insular Mediterranean ornithofauna with no occurrence of northern species.

Among the localities from Crete studied by Weesie (1988), **Liko** is the richest one by far. **Liko** cave is near Likotenaria village, on the northwest coast of Crete, in a cliff, a few metres above sea level. The fossil assemblage is a wide sample of an eastern Mediterranean avifauna, with insular endemisms, species of eastern distribution and one or two northern irruptive taxa (Tengalm's Owl *Aegolius funereus* and cf. *Pyrhula pyrrhula*). Two other cavities situated not far from here, **Gumbes B** and **Gumbes C**, situated also on the north coast of the island, offer two more reduced assemblages with no irruptive species.

## RESULTS

The cooling episodes in the northern hemisphere recorded until now have been noted before in high latitudes rather than in low ones. Thus, the temperatures fell in Greenland and Iceland around 250 and 150 years, respectively, before those in Europe (Dansgaard *et al.*, 1975; Burton, 1995). It is probable that short-term climatic deteriorations were noted only in high latitudes, having no consequences in the climatic conditions in middle latitudes, although it may be assumed that some of such events should lead to movements of birds southwards up to refugia in the MR.

Table 3 shows that the first record of irruptive species from the north of Eurasia in the MR occurs near 1 Ma (**Victoria** and **Dursunlu**), in approximate coincidence with the Galerian mammal pulse. From this time up to the end of the Middle Pleistocene, at least, the inner part of the northern Iberian Peninsula had tempered conditions of Eurosiberian type (**Valdegoba**, **Elefante**, **Dolina** and **Galeria**). On the contrary, the eastern part held a Mediterranean climate during the all of the Pleistocene, with the exception of occasional enlargements of the Eurosiberian area near the Pyrenees (Gravettian layers from **Arbreda**). Therefore, the climate in Iberia was in general fresher and considerably moister than it is today.

The irruption of northern species in the MR is constantly recorded in the uppermost layers of the Lower Pleistocene (**Huésca 1** and layer

TABLE 3

List of localities arranged by the presence of irruptive Eurosiberian species and the group of grouses, Pygmy owl and Tengmalm's owl (see Appendix 2). Localities from islands and Middle East are underlined.

[Lista de localidades ordenadas por la presencia de la irrupción de especies Eurosiberianas y el grupo de los tetraónidos, Mochuelo Alpino y Boreal (ver Apéndice 2). Las localidades correspondientes a islas o aquellas del Oriente Medio están subrayadas.]

Localities with irruptive Eurosiberian species [Localidades con especies Eurosiberianas irruptivas]		Localities with no irruptive Eurosiberian species [Localidades sin especies Eurosiberianas irruptivas]	
Presence of grouses-Pygmy-Tengmalm's owls' group [Presencia de tetraónidos, Mochuelo Alpino y Boreal]	No presence of grouses-Pygmy-Tengmalm's owls' group [No presencia de tetraónidos, Mochuelo Alpino y Boreal]	Presence of grouses-Pygmy-Tengmalm's owls' group [Presencia de tetraónidos, Mochuelo Alpino y Boreal]	No presence of grouses-Pygmy-Tengmalm's owls' group [No presencia de tetraónidos, Mochuelo Alpino y Boreal]
Arbreda (Gravet.)	Ambrona-Torralba	Bacho Kiro	<u>Akrotiri</u>
Arene Candide	Arbreda (Aurign.)	Elefante	Arbreda (Mouster.)
Bois-des-Brousses	Arbreda II	Jarama II	Áridos 1
Carnello	<u>Coscia</u> (South)	Lazaret (bottom)	<u>Ca na Reia</u>
La Fage (CO)	<u>Coscia</u> (cave)	Radice	Casablanca 1
Fontéchevade	<u>Cova Nova</u>	Razhishkata	<u>Castiglione 3</u> (CG)
Fumane	Dolina	Şalpêtre	<u>Castiglione 3</u> (PL)
Kozarnika	Dursunlu	Şandalja I (d)	Cau d'en Borrás
Lazaret (loc. VIII)	<u>EmFC Sicily</u>	Şandalja II (E)	Cendres
Lazaret (C III)	Figueira Brava	Temnata (3a)	Cingle Vermell
Mas-d'Azil	Galería (TG 10B)	Varshets	Devil's Tower
Orgnac 3 (i)	Galería (TG 10A)	Vindija	<u>Es Pouàs</u>
Romains	Gorham (K-M)		Fontbrégoua
Salpêtrière	Higueruelas		Galería (TG 11)
Trebački	Húscar 1		Gegant
Valdegoba	Ibex		Gorham (B-D)
	<u>Liko</u>		<u>Gumbes B</u>
	Nerja (Epipaleolit.)		<u>Gumbes C</u>
	Nerja (Upper Pal.)		<u>Hayonim</u>
	<u>Ohalo 2</u>		Hortus
	<u>Pedreira de S'Ònix</u>		Montoussé 5
	Quartaccio		Nerja (Magdalen.)
	Romanelli		Palidoro
	Romaní (II)		Quibas
	<u>Spinagallo</u>		Temnata (3d)
	Victoria		Torre Nave
			Torre in Pietra (d)
			<u>Ubeidiya</u> (II-23)

6 from **Dolina**) and during the Middle Pleistocene, with the exception of CG sediments from **Castiglione 3** (Corsica) and **Áridos 1** (in the middle of Iberia). The MR seems to have disappeared during this time from the south of France, and to be restricted to south half of the western peninsulas and the islands. We lack data for this period from the east of the MR.

The Mousterian period spread out the Eemian and a large part of the Würmian phases

(OIS 3-5). Thus, these follows a succession of shifts in the climatic conditions in the northern hemisphere. The respective positions of some of the localities from this span of time on the chronological Table 2 are particularly uncertain. Some northern irruptions are clearly recorded (**Valdegoba**, layers K and M from **Gorham**, and **Carnello**) and it seems also that the paleornithocaenoses from the middle of Italy were quite different from those from the south.



During the Upper Paleolithic the Eurosiberian area extended to inner Iberia (**Jarama II**), southern France (**Bois-des-Brousses** and **Salpêtrière**), northern Italy (**Arene Candide** and **Fumane**), Adriatic coast (**Šandalja I** and **Šandalja II**) and northern of Balkan Peninsula (layer 3a from **Temnata**, **Trebački**, **Kozarnika** and **Razhishkata**).

## CONCLUSIONS

The Mediterranean extension during the Quaternary reached out more to the western part than to the east, as happens at present. It seems that the Mediterranean conditions never reached the territory of current Bulgaria, although the fossil locations of that area are situated at lower latitudes than the locations from the south of France and many from Italy and Iberia. Some northern irruptive species, but the group of grouse and Pygmy and Tengmalm's Owls, appear on islands (**Coscia**, **Cova Nova**, **Sicily Faunal Complex**, **Liko**, **Pedrera de S'Onix**) and in the Middle East (**Ohalo 2**). The reason for their absence it is not the geographical barrier of the Mediterranean sea (at least for owls), neither the reduced time span of cool phases, but the unsuitable climatic conditions for these species.

There are sufficient data to assume that the geographical boundaries of avian species have changed several times during the Quaternary. Moreover, it may be accepted that some of these changes were not caused directly by climatic circumstances. As can be observed today, increasing individuals of some northern species lead to quick dispersal movements southwards. It is likely that icecap regressions created suitable conditions for demographic explosions, and some of such events could increase the size of populations to magnitudes unmatched by historic observations.

Some of the fossil locations in the south of France and northern Italy (**Arene Candide**, **Bois-des-Brousses**, **La Fage**, **Fontéchevade**, **Lazaret**, **Mas-d'Azil**, **Orgnac 3**, **Romains** and **Salpêtrière**) point to several displacements of characteristic Eurosiberian low dispersive taxa to the MR during the cool phases, following the shifts of climatic and environmental conditions southwards (Table 3). The large record of the genus *Loxia* (a group of birds specialized

in feeding on seed-cones) in southern France and northern Italian localities (Tyrberg, 1991b; see Table 1), implies the existence of at least some phases, particularly during the Upper Pleistocene, with climatic conditions moist enough to permit the spreading of conifer (most probably of pine) forests. The Mediterranean islands, as well as Iberia and the south of the Italian Peninsula, were excluded from this phenomenon and maintained a rather steady paleoecological condition.

There is a very scarce fossil record of irruptive species in the MR during upper Pliocene and early lower Pleistocene. During this span of time, cold pulses only became apparent in the arrival of wintering species into the MR. This fact is unknown until this date, and is firstly observed at **Higueruelas**, which may be considered as the first known avian fossil site of the Quaternary in the Iberian Peninsula. From the Middle Pleistocene onwards, the succession of stadials and interstadials in Europe caused two patterns of avian distribution: a) north and central Europe were severely affected by climatic changes and extensions of the ice cap, which probably led to habitat destruction and latitudinal displacements following distributions in east-west belts (Made, 1992), and (b) the MR—at times, only a part of its current extension—supported a Mediterranean ornithofauna during the whole of this time.

In Quaternary fossil localities from the MR no ornithocaenoses have been found with the same taxonomic composition as those existing at present time in northern Eurasia. A number of outcrops that encompass the fossil record of a great part of the Pleistocene points to the irruption of species from northern Europe into the Mediterranean avifaunas. This fact does not imply that the climatic conditions in the Mediterranean region were similar to those in the north of the continent. On the north face of the Mediterranean Sea tempered conditions stayed more or less constant throughout all the Pleistocene. In the south of Europe, not only the Mediterranean region acted like a refuge from the end of the Lower Pleistocene onwards for species that in the interstages occupied more northern territories, but also did so in other zones adjacent to the south of Europe. During the coldest periods MR diminished, although the southern halves of Italy and Iberia, as well as the eastern coast of the latter, were always do-

minated by Mediterranean faunas. Some species currently characteristic of the MR shared the same habitats in a part of northern Iberia, southern France, northern Italy and most of the Balkan Peninsula with species today typical of the Eurosiberian region of Europe.

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The scientific activity of **Antonio Sánchez** is focussed on the paleornithology, in particular, on the taxonomy, distribution and ecology of Tertiary and Quaternary birds from the Iberian Peninsula, as well as on the climatic changes during the Quaternary. Recently, he has also begun to work in the Canary Islands. He is a member of some archeo-paleontological and neontological teams.

## APPENDIX 1

Lists of fossil taxa from Mediterranean localities of the Quaternary. The localities are arranged in alphabetical order. Irruptive species for each locality, following the criterium of area of irruption (Appendix 2), are in bold. The group of Pygmy-Tengmalm's owl-grouses (see «areas of irruption» in Appendix 2) is underlined. \* = nowadays survivors in the east part of the region when recorded in the west area. ? = uncertain identification.

[Lista de especies fósiles de las localidades del Mediterráneo en el Cuaternario. Las localidades están ordenadas alfabéticamente. Especies irruptivas para cada localidad, según el criterio del Apéndice 2 se marcan en negrita. El grupo de los tetraónidos, Mochuelo Alpino y Boreal (ver Apéndice 2) están subrayados. \* = supervivientes hoy día en la parte este de la región, cuando fueron registrados en la parte oeste. ? = Identificación dudosa.]

<b>Akrotiri</b> (Early Holocene) (Mourer-Chauviré, 1999)	<i>Podiceps nigricollis</i> <i>Puffinus puffinus</i> <i>Phalacrocorax aristotelis</i> <i>Anser anser s. fabalis</i> <i>Anser</i> sp.	<i>Anas crecca</i> cf. <i>Circus</i> sp. <i>Rallus aquaticus</i> <i>Otis tarda</i> <i>Columba livia s. oenas</i> <i>Asio flammeus</i>	<i>Athene noctua</i> <i>Turdus iliacus s. philomelos</i> <i>Corvus corone s. frugilegus</i> small Passeriformes
<b>Ambrona &amp; Torralba</b> (Sánchez Marco, 1990, 1999c)	<i>Anser anser</i> <i>Tadorna ferruginea</i> <i>Anas strepera</i> <i>Anas</i> cf. <i>acuta</i>	<i>Mergus serrator</i> <b><i>M. merganser</i></b> <i>Porphyrio porphyrio</i> <i>Fulica</i> cf. <i>atra</i>	<i>Vanellus vanellus</i>

<b>Arbreda</b> (Mousterian layers) (García, 1995)	<i>Anser s. Branta</i> <i>Anas platyrhynchos</i> <i>Anas sp.</i> <i>Accipiter gentilis</i> <i>Falco naumanni</i> <i>Falco tinnunculus</i> <i>Falco vespertinus</i> <i>Falco subbuteo</i> <i>Alectoris graeca</i> <i>Alectoris rufa</i>	<i>Perdix perdix</i> <i>Coturnix coturnix</i> <i>Porzana porzana</i> <i>Calidris canutus</i> <i>Chlidonias nigra</i> <i>Columba livia</i> <i>C. oenas</i> <i>Athene noctua</i> cf. <i>Caprimulgus sp.</i>	<i>Coracias garrulus</i> <i>Picus viridis</i> <i>Turdus viscivorus</i> <i>Pyrrhcorax pyrrhcorax</i> <i>P. graculus</i> <i>Corvus monedula</i> <i>C. corone</i> small Passeriformes
<b>Arbreda</b> (Aurignacian layers) (García, 1995)	<i>Anser s. Branta</i> <i>Anas platyrhynchos</i> <i>Aquila cf. chrysaetos</i> <i>Falco naumanni</i> <i>F. tinnunculus</i> <i>F. vespertinus</i> <i>F. columbarius</i> <i>F. subbuteo</i> <i>Alectoris graeca</i> <i>A. rufa</i> <i>A. barbara</i> <i>Perdix perdix</i> <i>Coturnix coturnix</i>	<i>Rallus aquaticus</i> <i>Porzana porzana</i> <i>Grus grus</i> <i>Tetrax tetrax</i> cf. <i>Charadrius vociferus</i> <i>Gallinago gallinago</i> <b>G. media</b> <i>Larus cf. melanocephalus</i> <i>Larus cf. melanocephalus</i> <i>Columba livia s. oenas</i> <i>C. oenas</i>	<i>C. palumbus</i> <i>Otus scops</i> <i>Bubo bubo</i> <i>Athene noctua</i> <i>Turdus viscivorus</i> <i>Garrulus glandarius</i> <i>Pica pica</i> <i>Pyrrhcorax pyrrhcorax</i> <i>P. graculus</i> <i>Corvus monedula</i> small Passeriformes
<b>Arbreda</b> (layers 23-28, Aurignacian) (Vilette, 1983)	<i>Podiceps auritus s. nigricollis</i> <b><i>Branta bernicla</i></b> <i>Anas crecca</i> <i>Anas platyrhynchos</i> <i>Anas querquedula</i> cf. <i>Falco subbuteo</i>	<i>Alectoris graeca</i> <i>Perdix perdix</i> <i>Coturnix coturnix</i> <i>Eudromias morinellus</i> cf. <i>Limosa limosa</i> <i>Columba oenas</i> <i>Athene noctua</i>	<i>Asio flammeus</i> cf. <i>Galerida cristata</i> <i>Pyrrhcorax pyrrhcorax</i> <i>P. graculus</i> <i>Corvus corax</i>
<b>Arbreda</b> (Gravettian layers) (García, 1995)	<i>Anas sp.</i> <i>Anas platyrhynchos</i> <i>Falco naumanni</i> <i>F. tinnunculus</i> <i>F. vespertinus</i> <i>F. subbuteo</i> <i>Lagopus sp.</i> <i>Alectoris graeca s. rufa</i>	<i>A. barbara</i> <i>Perdix perdix</i> <i>Coturnix coturnix</i> <i>Porzana porzana</i> <i>Otis tarda</i> <i>Tetrax tetrax</i> <i>Burhinus oedicnemus</i> <i>Gallinago media</i>	<i>Columba livia s. oenas</i> <i>Strix aluco</i> <i>Pica pica</i> <i>Pyrrhcorax pyrrhcorax</i> <i>P. graculus</i> <i>Corvus monedula</i> <i>C. frugilegus s. corone</i> small Passeriformes
<b>Arbreda II</b> (Upper Paleolithic layers) (Vilette, 1983)	<i>Falco tinnunculus</i> <i>Alectoris graeca</i> <i>Coturnix coturnix</i> <i>Asio flammeus</i>	<i>Turdus torquatus</i> cf. <i>T. merula</i> <b><i>Picicola enucleator</i></b>	<i>Pyrrhcorax pyrrhcorax</i> <i>P. graculus</i>
<b>Arene Candide</b> (Upper Paleolithic layers) (Cassoli, 1980)	<i>Podiceps auritus</i> <i>Puffinus puffinus</i> <i>Calonectris diomedea</i> <i>Phalacrocorax aristotelis</i> <b><i>Cygnus cygnus</i></b> <b><i>Branta bernicla</i></b> <i>Anas platyrhynchos</i> <i>A. crecca</i> <i>A. penelope</i> <i>Melanitta nigra</i> <i>Bucephala clangula</i> <b><i>Mergus albellus</i></b> <b><i>M. merganser</i></b> <i>M. serrator</i> <i>Accipiter gentilis</i> <b><i>Buteo lagopus</i></b> <i>Aquila chrysaetos</i> <i>Circus cyaneus</i> <i>C. pygargus</i> <i>C. aeruginosus</i> <i>Pandion haliaetus</i>	<i>Crex crex</i> <i>Tringa totanus</i> <i>T. glareola</i> <i>Gallinago sp.</i> <i>Calidris canutus</i> <i>Calidris canutus</i> <i>Calidris canutus</i> <i>Eudromias morinellus</i> <i>C. alexandrinus</i> <i>Stercorarius pomarinus</i> <i>Sterna paradisaea</i> <i>Uria aalge</i> <i>Alca torda</i> <i>Fratercula arctica</i> <i>Columba livia</i> <i>C. oenas</i> <i>C. palumbus</i> cf. <i>Cuculus canorus</i> <b><i>Nyctea scandiaca</i></b> <b><i>Surnia ulula</i></b> <i>Athene noctua</i>	<i>Anthus trivialis</i> <i>Cinclus cinclus</i> <i>Prunella collaris</i> <i>Zoothera dauma</i> <i>Turdus viscivorus</i> <i>T. pilaris</i> <i>T. torquatus</i> <i>Plectrophenax nivalis</i> <i>Fringilla coelebs</i> <i>Carduelis chloris</i> <i>C. carduelis</i> <i>C. flammea</i> <i>Acanthis cannabina</i> <b><i>Picicola enucleator</i></b> <b><i>Loxia pytyopsittacus</i></b> <i>L. curvirostra</i> <b><i>L. leucoptera</i></b> <i>Pyrrhula pyrrhula</i> <i>Coccothraustes coccothraustes</i> <i>Montifringilla nivalis</i> <i>Petronia petronia</i>



	<p>cf. <i>Falco rusticolus</i>  <i>F. eleonora</i>  <i>F. vespertinus</i>  <i>F. tinnunculus</i>  <i>Tetrao tetrix</i>  <u><i>Lagopus lagopus</i></u>  <u><i>L. mutus</i></u>  <i>Alectoris graeca</i>  <i>Perdix perdix</i>  <i>Coturnix coturnix</i>  <i>Rallus aquaticus</i></p>	<p><i>Strix aluco</i>  cf. <i>S. aluco</i>  <i>Asio otus</i>  <i>A. flammeus</i>  <u><i>Aegolius funereus</i></u>  <i>Apus apus</i>  <i>Picus canus</i>  <i>Melanocorypha</i> sp.  <b><i>Eremophila alpestris</i></b>  <i>Lullula arborea</i>  <i>Ptyonoprogne rupestris</i></p>	<p><i>Sturnus vulgaris</i>  <i>Pica pica</i>  <i>Nucifraga caryocatactes</i>  <i>Pyrhcorax pyrrhcorax</i>  <i>P. graculus</i>  <i>Corvus monedula</i>  <i>C. corax</i></p>
<b>Áridos 1</b> (Mourer-Chauviré, 1980)	<p><i>Anas platyrhynchos</i>  <i>A. crecca</i>  <i>A. clypeata</i>  <i>Accipiter nisus</i>  <i>Alectoris graeca - rufa</i>  <i>Perdix palaeoperdix</i>  <i>Porzana porzana</i></p>	<p><i>Columba oenas</i>  <i>C. palumbus</i>  <i>Strix aluco</i>  <i>Upupa epops</i>  <i>Picus viridis</i>  <i>Dendrocopos major</i>  <i>Galerida cristata</i></p>	<p><i>Hirundo rustica</i>  <i>Turdus pilaris</i>  <i>T. iliacus</i>  <i>Parus cristatus</i>  <i>Coccothraustes coccothraustes</i>  <i>Corvus monedula</i></p>
<b>Bacho Kiro</b> (Bocheński, 1982)	<p><i>Anas platyrhynchos</i>  <i>Aquila chrysaetos</i>  <i>Circus aeruginosus</i>  <u><i>Lagopus mutus</i></u>  <i>Alectoris graeca</i>  <i>Perdix perdix</i>  <i>Coturnix coturnix</i>  <i>Gallus gallus</i>  <i>Rallus aquaticus</i></p>	<p><i>Porzana porzana</i>  <i>Gallinula chloropus</i>  cf. <i>Bubo bubo</i>  cf. <i>Ptyonoprogne rupestris</i>  <i>Delichon urbica</i>  cf. <i>Lullula arborea</i>  <i>Alauda arvensis</i></p>	<p>cf. <i>Anthus campestris</i>  <i>Loxia curvirostra</i>  cf. <i>Turdus philomelos</i>  <i>Pyrhcorax pyrrhcorax</i>  <i>P. graculus</i>  <i>Corvus monedula</i>  <i>C. corax</i></p>
<b>Bois-des-Brousses</b> (Solutrean layers) (Vilette, 1983)	<p><i>Anas platyrhynchos</i>  <i>Aythya ferina</i>  <i>Falco tinnunculus</i>  <u><i>Lagopus lagopus</i></u>  <u><i>Lagopus sp.</i></u>  <i>Perdix perdix</i></p>	<p>cf. <b><i>Gallinago media</i></b>  <i>Scolopax rusticola</i>  cf. <i>Calidris temminckii</i>  <i>Philomachus pugnax</i>  <i>Columba sp.</i>  <i>Otus scops</i></p>	<p><i>Ptyonoprogne rupestris</i>  <i>Cinclus cinclus</i>  <i>Pyrhcorax graculus</i>  cf. <i>Corvus corone</i></p>
<b>Ca na Reia</b> (Alcover, 1989)	<p><i>Puffinus nestori</i>  cf. <i>Buteo</i> sp.</p>	<p><i>Palaeocryptonyx</i> sp.  <i>Columba livia s. oenas</i></p>	<p><i>Athene</i> cf. <i>veta</i>  small Passeriformes</p>
<b>Carnello</b> (Segre <i>et al.</i> , 1984)	<p><b><i>Cygnus cygnus</i></b>  <b><i>C. columbianus</i></b>  <i>Anser fabalis</i></p>	<p><i>Anas platyrhynchos</i>  <i>A acuta</i>  <i>A penelope</i></p>	<p><u><i>Tetrao tetrix</i></u>  <i>Alectoris graeca</i>  <i>Strix aluco</i></p>
<b>Casablanca 1</b> (Sánchez Marco 1995b, 1999d)	<p><i>Geronticus eremita</i>  <i>Gypaetus barbatus</i>  <i>Tyto balearica</i></p>	<p><i>Pterocles orientalis</i>  <i>Pyrhcorax s. Corvus monedula</i></p>	<p><i>Corvus corone</i></p>
<b>Castiglione 3</b> (fissure CG) (Salotti <i>et al.</i> , 1997; Mourer-Chauviré <i>et al.</i> , 1997)	<p><i>Aquila chrysaetos</i>  <i>Buteo</i> cf. <i>buteo</i>  <i>B. rufinus</i>  <i>Accipiter nisus</i>  <i>A. gentilis</i></p>	<p><i>Porzana porzana</i>  <i>Columba livia</i>  <i>Bubo insularis</i>  <i>Otus</i> sp.  <i>Athene angelis</i></p>	<p><i>Tyto balearica</i>  <i>T. alba</i>  <i>Pyrhcorax graculus</i>  small Passeriformes</p>
<b>Castiglione 3</b> (fissure PL) (Salotti <i>et al.</i> , 2000)	<p><i>Gyps melitensis</i>  <i>Aquila n. sp.</i>  <i>Bubo insularis</i>  <i>Athene angelis</i>  <i>Gypaetus barbatus</i>  <i>Falco tinnunculus</i>  <i>Alectoris</i> sp.</p>	<p><i>Columba livia s. oenas</i>  <i>Tyto alba</i>  <i>Lullula arborea</i>  <i>Muscicapa striata</i>  <i>Turdus</i> spp.  <i>Loxia curvirostra</i></p>	<p><i>Emberiza</i> sp.  <i>Pica pica</i>  <i>Pyrhcorax pyrrhcorax</i>  <i>P. graculus</i>  <i>Corvus monedula</i></p>
<b>Cau d'en Borrás</b> (Sánchez Marco, <i>new identifications</i> )	<p><i>Tadorna tadorna</i>  <i>Anas penelope</i>  <i>Haliaeetus albicilla</i>*  cf. <i>Aegipyyus monachus</i>  <i>Aquila chrysaetos</i>  <i>Falco naumanni</i>  <i>F. tinnunculus</i></p>	<p><i>Alectoris rufa</i>  <i>Columba livia s. oenas</i>  <i>Bubo bubo</i>  <i>Athene noctua</i>  <i>Apus melba</i>  <i>Anthus spinoletta</i>  <i>Oenanthe oenanthe</i>  <i>Turdus philomelos</i></p>	<p><i>T. cf. viscivorus</i>  <i>Pica pica</i>  <i>Pyrhcorax pyrrhcorax</i>  <i>P. graculus</i>  <i>Corvus monedula</i>  <i>C. corone</i></p>

<b>Cendres</b> (Upper Magdalenian) (Villaverde <i>et al.</i> , 1997)	<i>Anser s. Branta</i> cf. <b><i>Branta bernicla</i></b> <i>Aquila chrysaetos</i> <i>Accipiter nisus</i> <i>Falco tinnunculus</i> <i>F. naumanni</i> <i>Alectoris rufa</i> <i>Coturnix coturnix</i> <i>Calidris ferruginea</i>	<i>Haematopus ostralegus</i> <i>Columba livia s. oenas</i> <i>Bubo bubo</i> <i>Athene noctua</i> <i>Apus apus</i> <i>Lullula arborea</i> <i>Turdus sp.</i> cf. <i>Turdus viscivorus</i>	cf. <i>T. merula</i> <i>Sylvia sp.</i> <i>Pica pica</i> <i>Pyrhcorax pyrrhcorax</i> <i>P. graculus</i> <i>Corvus monedula</i> <i>C. corone</i>
<b>Cingle Vermell</b> (Tardiglacial layers) (Vilette, 1983)	<i>Anser cf. anser</i> <i>Falco tinnunculus</i> <i>Alectoris barbara</i> <i>Perdix perdix</i> <i>Coturnix coturnix</i> <i>Columba livia</i>	<i>Apus apus</i> <i>A. melba</i> <i>Melanocorypha calandra</i> <i>Monticola saxatilis</i> <i>Turdus torquatus</i>	<i>T. iliacus</i> <i>T. viscivorus</i> <i>Pyrhcorax pyrrhcorax</i> <i>Corvus monedula</i>
<b>Coscia</b> (shelter South) (Bonifay <i>et al.</i> , 1998)	<i>Calonectris diomedea</i> <i>Anser erythropus*</i> <i>Anas cf. platyrhynchos</i> <i>A. crecca</i> <i>A. cf. penelope</i> <i>Anatidae indet.</i> <i>Gyps melitensis</i> <i>Buteo buteo</i> <b><i>B. lagopus</i></b> <i>Accipiter nisus</i> <i>A. gentilis</i> <i>Milvus sp.</i> <i>Haliaeetus albicilla*</i> <i>Circus cf. cyaneus</i> <i>Falco peregrinus</i> <i>F. subbuteo</i> <i>F. naumanni</i> <i>F. tinnunculus</i> <i>Falco sp.</i> <i>Coturnix coturnix</i> <i>Porzana porzana</i> <i>P. pusilla</i>	<i>P. parva</i> <i>Crex crex</i> <i>Gallinula chloropus</i> <i>Tetrax tetrax</i> <i>Gallinago gallinago</i> <b><i>G. media</i></b> <i>Scolopax rusticola</i> <i>Tringa erythropus</i> <i>Fratercula arctica</i> <i>Columba livia</i> <i>C. palumbus</i> <i>Bubo insularis</i> <i>Asio otus</i> <i>Otus scops</i> <i>Caprimulgus europaeus</i> <i>Apus melba</i> <i>Merops apiaster</i> <i>Coracias garrulus</i> <i>Dendrocopos major</i> cf. <i>Galerida cristata</i> <i>Hirundo cf. rustica</i>	<i>Anthus cf. spinoletta</i> <i>Motacilla sp.</i> <i>Lanius collurio</i> <i>L. cf. meridionalis</i> <i>L. minor</i> <i>Saxicola sp.</i> <i>Luscinia cf. megarhynchos</i> <i>Turdus spp.</i> <i>Sylvia atricapilla</i> <i>Emberiza citrinella</i> <i>Fringilla sp.</i> <i>Coccothraustes coccothraustes</i> <i>Sturnus sp.</i> <i>Oriolus oriolus</i> <i>Pyrhcorax pyrrhcorax</i> <i>Corvus corone s. frugilegus</i> <i>Corvus corax</i>
<b>Coscia</b> (cave) (Bonifay <i>et al.</i> , 1998)	<i>Tachybaptus ruficollis</i> <i>Anas platyrhynchos</i> <i>A. platyrhynchos s. acuta</i> <i>A. crecca</i> <i>Anas spp.</i> <i>Gyps melitensis</i> <i>Accipiter nisus</i> <i>Haliaeetus albicilla*</i> <i>Falco biarmicus</i> <i>F. naumanni</i> <i>F. tinnunculus</i>	<i>Coturnix coturnix</i> <i>Crex crex</i> <i>Tetrax tetrax</i> cf. <i>Pluvialis squatarola</i> <i>Gallinago gallinago</i> <i>Scolopax rusticola</i> <i>Columba cf. livia</i> <i>C. palumbus</i> <i>Bubo insularis</i> <i>Apus melba</i> <i>Coracias garrulus</i>	<i>Alauda arvensis</i> <i>Turdus sp.</i> <i>Coccothraustes coccothraustes</i> <i>Prunella collaris</i> <i>Sturnus sp.</i> <i>Pyrhcorax pyrrhcorax</i> <i>Corvus monedula</i> <i>C. corone</i> small Passeriformes
<b>Cova Nova</b> (Upper Pleistocene) (Florit & Alcover, 1987)	<i>Phalacrocorax aristotelis</i> <i>Anas crecca</i> <i>Aquila chrysaetos</i> <i>Falco eleonorae</i> <i>F. tinnunculus</i> <i>Scolopax rusticola</i> <i>Columba livia</i> <i>Apus melba</i> <i>Upupa epops</i>	<i>Melanocorypha calandra</i> <i>Hirundo rupestris</i> <i>Lanius minor</i> <i>L. excubitor</i> <i>Prunella collaris</i> <i>Turdus iliacus s. philomelos</i> <i>T. merula</i> <i>T. viscivorus</i>	<i>Emberiza cia s. hortulana</i> <i>Loxia curvirostra</i> <b><i>Pyrhula pyrrhula</i></b> <i>Pyrhcorax pyrrhcorax</i> <i>P. graculus</i> <i>Corvus corone</i>
<b>Cova Nova</b> (addenda) (Upper Pleistocene) (McMinn & Alcover, 1992)	<i>Calonectris diomedea</i> <i>Accipiter nissus</i> <i>Falco cf. naumanni</i>	<i>Alca torda</i> <i>Tyto alba</i> <i>Prunella modularis</i>	<i>Erithacus rubecula</i> <i>Montifringilla nivalis</i> <i>Fringilla sp.</i>
<b>Devil's Tower</b> (Bate, 1928)	<i>Calonectris diomedea</i> <i>Puffinus puffinus</i> <i>Phalacrocorax (?) carbo</i>	<i>F. eleonorae</i> <i>F. tinnunculus</i> <i>F. subbuteo</i>	<i>C. palumbus</i> <i>Apus melba</i> <i>Picus viridis</i>



	<i>P. aristotelis</i> <i>Melanitta fusca</i> <i>Mergus cf. serrator</i> <i>Haliaeetus albicilla*</i> <i>Gyps fulvus</i> <i>Hieraetus fasciatus</i> <i>Hieraetus pennatus</i> <i>Falco (?) naumanni</i>	<i>F. peregrinus</i> <i>Alectoris (?) barbara</i> <i>Larus fuscus</i> <i>Sterna (?) sandvicensis</i> <i>Pinguinus impennis</i> <i>Uria aalge</i> <i>Columba livia</i> <i>C. oenas</i>	<i>Hirundo rustica</i> <i>Turdus cf. merula</i> <i>T. viscivorus</i> <i>Turdus sp.</i> <i>Fringilla coelebs</i> <i>Passer sp.</i> <i>Pyrhhorcorax pyrrhcorax</i> <i>P. graculus</i>
<b>Dolina</b> (layer TD6) (Sánchez Marco, 1999b, new identifications)	<i>Anas crecca</i> <i>Melanitta fusca</i> <i>Falco naumanni</i> <i>Perdix palaeoperdix</i> <i>Coturnix coturnix</i> <i>Porzana pusilla</i> <i>Porzana sp.</i> <i>Limosa limosa</i> <i>Eudromias morinellus</i> <i>Scolopax rusticola</i> <i>Columba livia s. oenas</i> <i>Melanocorypha calandra</i>	<i>Calandrella</i> cf. <i>brachydactyla</i> <i>Galerida cristata</i> <i>Lullula arborea</i> <i>Alauda arvensis</i> <b><i>Eremophila alpestris</i></b> <i>Hirundo rustica</i> <i>Ptyonoprogne rupestris</i> <i>Motacilla flava</i> <i>Anthus pratensis</i> <i>Cinclus cinclus</i>	<i>Prunella collaris</i> <i>P. modularis</i> <i>Turdus merula</i> <i>Turdus iliacus</i> <i>Turdus philomelos</i> <i>Sylvia hortensis</i> <i>Muscicapa striata</i> <i>Emberiza citrinella</i> <i>Fringilla coelebs</i> <i>Sturnus sp.</i> <i>Corvus antecorax</i>
<b>Dursunlu</b> (Louchart <i>et al.</i> , 1998)	<i>Tachybaptus ruficollis</i> <i>Podiceps cristatus</i> <i>P. nigricollis</i> <i>Phalacrocorax cf. carbo</i> <i>Bubulcus ibis</i> <i>Ardeola ralloides</i> <i>Nycticorax nycticorax</i> <i>Ardeidae indet.</i> <i>Platalea leucorodia</i> <i>Cygnus sp.</i> <i>Anser anser</i> <i>A. cf. erythropus</i> <i>Tadorna ferruginea</i> <i>Tadorna sp.</i> <i>Anas platyrhynchos</i> <i>A. peneloppe</i>	<i>A. crecca</i> <i>A. acuta</i> <i>A. querquedula</i> <i>A. aff. clypeata</i> <i>Marmaronetta angustirostris</i> <i>Aythya ferina</i> <i>A. nyroca</i> <i>A. fuligula</i> <i>Aythya sp.</i> <b><i>Somateria sp.</i></b> <i>Bucephala sp.</i> <i>Mergus albellus</i> <b><i>M. merganser</i></b> <i>Oxyura leucocephala</i> <i>Accipitridae indet.</i> <i>Perdix palaeoperdix</i>	<i>Rallus aquaticus</i> <i>Crex crex</i> <i>Porzana porzana</i> <i>Gallinula chloropus</i> <i>Fulica atra</i> <i>Rallidae indet.</i> <i>Tetrax tetrax</i> <i>Otididae indet.</i> <i>Gallinago gallinago</i> <i>Limosa limosa</i> <i>Tringa nebularia</i> <i>Scolopacidae indet.</i> <i>Larus canus</i> <i>Larus sp.</i> <i>Turdus cf. pilaris</i> <i>Fringillidae indet.</i>
<b>Elefante</b> (Rosas <i>et al.</i> , 2001; Sánchez Marco, new identifications)	<i>Anas sp.</i> <i>Haliaeetus albicilla*</i> <i>Falco cf. tinnunculus</i> <u><i>Lagopus mutus</i></u> <i>Perdix palaeoperdix</i> <i>Coturnix coturnix</i> <i>Vanellus vanellus</i>	<i>Lymnocyptes minimus</i> <i>Columba livia s. oenas</i> <i>Phoenicurus ochruros</i> <i>Turdus spp.</i> <i>Acanthis flammea</i> <i>Carduelis carduelis</i>	<i>C. chloris</i> <i>Pyrhhorcorax pyrrhcorax</i> <i>Corvus corax s. frugilegus</i> <i>C. antecorax</i>
<b>Elephas mnaidriensis</b> <b>Faunal Complex of Sicily</b> <b>(K 22, Acquadolci and</b> <b>Contrada Fusco)</b> (Pavia, 2001)	<i>Tachybaptus ruficollis</i> <i>Podiceps cristatus</i> <i>P. auritus</i> <i>Phalacrocorax carbo</i> <i>Pelecanus crispus</i> <i>Ixobrychus minutus</i> <i>Botaurus stellaris</i> <i>Egretta garzetta</i> <i>Ardea cinerea</i> <i>Plegadis falcinellus</i> <i>Cygnus falconeri</i> <i>Anser sp.</i> <i>Branta sp.</i> <i>Tadorna tadorna</i> <i>Anas crecca s. querquedula</i> <i>A. platyrhynchos</i> <i>A. clypeata</i>	<i>Anas sp.</i> <i>Aythya sp.</i> <b><i>Mergus merganser</i></b> <i>Oxyura leucocephala</i> <i>Buteo buteo</i> <i>Gyps melitensis</i> <i>Accipiter gentilis</i> <i>A. nisus</i> <i>Aquila sp.</i> <i>Pandion haliaetus</i> <i>Falco columbarius</i> <i>Coturnix coturnix</i> <i>Fulica atra</i> <i>Grus grus</i> <i>G. cf. melitensis</i> <i>Tetrax tetrax</i> <i>Otis tarda</i> <i>Limosa limosa s. lap ponica</i>	<i>Numenius phaeopus</i> <i>Scolopax rusticola</i> <i>Tringa sp.</i> <i>Pterocles orientalis</i> <i>Columba livia s. oenas</i> <i>Bubo bubo</i> <i>Strix aluco</i> <i>Athene noctua</i> <i>Apus melba</i> <i>Coracias garrulus</i> <i>Anthus sp.</i> <i>Erithacus rubecula</i> <i>Turdus sp.</i> <i>Sylvia sp.</i> <i>Sturnus unicolor s. vulgaris</i> <i>Corvus corone</i>
<b>Es Pouàs</b> (Upper Pleistocene)	<i>Colonectris diomedea</i> <i>Puffinus puffinus</i>	<i>Grus primigenia</i> <i>Otis tarda</i>	<i>Alauda arvensis</i> <i>Hirundo sp.</i>

(Florit <i>et al.</i> , 1989)	<i>Phalacrocorax aristotelis</i> <i>Anser</i> sp. <i>Falco eleonora</i> <i>F. tinnunculus</i> <i>Coturnix coturnix</i>	<i>Columba livia</i> <i>Otus scops</i> <i>Asio flammeus</i> Strigidae n. sp. <i>Apus apus</i>	<i>Lanius minor</i> <i>Turdus</i> spp. <i>Pyrhcorax pyrrhcorax</i> <i>Corvus antecorax</i>
<b>Es Pouàs</b> (addendum) (Upper Pleistocene) (Alcover & McMinn, 1992)	<i>Haliaeetus albicilla</i> *		
<b>La Fage</b> (layer CO) (Mourer-Chauviré, 1975a)	<i>Anas platyrhynchos</i> <i>A. crecca</i> <i>Aegypius monachus</i> <i>Aquila chrysaetos</i> <i>Buteo buteo</i> <i>Accipiter nisus</i> <i>Circus macrourus</i> * <i>Falco subbuteo</i> <i>F. columbarius</i> <i>F. naumanni</i> <i>F. tinnunculus</i> <i>Lagopus lagopus</i> <i>L. mutus</i> <i>Tetrao urogallus</i> <i>T. tetrix</i> <i>Alectoris graeca</i> <i>Perdix palaeoperdix</i> <i>Coturnix coturnix</i> <i>Rallus aquaticus</i> <i>Porzana porzana</i> <i>Crex crex</i> <i>Otis tarda</i> <i>O. tetrax</i> <i>Vanellus vanellus</i> <i>Pluvialis apricaria</i> <i>P. squatarola</i>	<i>Eudromias morinellus</i> <i>Limnocyptes minimus</i> <i>Scolopax rusticola</i> <i>Tringa stagnatilis</i> <i>Calidris alpina</i> <i>Phalaropus fulicarius</i> <i>Glareola pratincola</i> ? <i>Alle alle</i> <i>Columba livia</i> <i>C. oenas</i> <i>C. palumbus</i> <i>Cuculus canorus</i> <b><i>Nyctea scandiaca</i></b> <i>Asio flammeus</i> <i>Aegolius funereus</i> ? <i>Picus viridis</i> <i>Dendrocopos major</i> <i>D. minor</i> <i>Calandrella brachydactyla</i> <i>Galerida cristata</i> <i>Lullula arborea</i> <i>Alauda arvensis</i> <i>Ptyonoprogne rupestris</i> <i>Hirundo rustica</i>	<i>H. daurica</i> <i>Anthus campestris</i> <i>A. trivialis</i> <i>A. spinoletta</i> <i>Motacilla flava</i> <i>Cinclus cinclus</i> <i>Saxicola rubetra</i> <i>Monticola saxatilis</i> <i>Luscinia luscinia</i> * <i>Turdus pilaris</i> <i>T. merula</i> <i>T. viscivorus</i> <i>Emberiza calandra</i> <i>E. citrinella</i> <b><i>Plectrophenax nivalis</i></b> <i>Acanthis cannabina</i> <i>Carduelis flammea</i> <i>Serinus citrinella</i> ? <i>Petronia petronia</i> <i>Montifringilla nivalis</i> <i>Pica pica</i> <i>Pyrhcorax pyrrhcorax</i> <i>P. graculu</i> <i>Corvus monedula</i> <i>Corvus antecorax</i>
<b>Férrassie</b> (Mourer-Chauviré, 1984)	<i>Anas crecca</i> <i>Aegypius monachus</i> <i>Aquila chrysaetos</i> <i>Falco tinnunculus</i> <i>Lagopus mutus</i> <i>Lagopus</i> sp. <i>Tetrao tetrix</i> <i>Perdix perdix</i> <i>Coturnix coturnix</i> <i>Pluvialis squatarola</i> <i>Eudromias morinellus</i>	<i>Gallinago media</i> <i>Tringa hypoleucos</i> <i>Calidris canutus</i> <i>C. alpina</i> <i>Callandrella brachydactyla</i> <i>Melanocorypha calandra</i> <i>Galerida cristata</i> <i>Lullula arborea</i> <i>Ptyonoprogne rupestris</i>	<i>Delichon urbica</i> <i>Cinclus cinclus</i> <i>Turdus pilaris</i> <i>T. merula</i> <i>Emberiza citrinella</i> <i>Carduelis flammea</i> <i>Petronia petronia</i> <i>Pyrhcorax graculus</i> <i>Corvus corax</i>
<b>Figueira Brava</b> (Mourer-Chauviré & Antunes, 1991, 2000)	<i>Gavia stellata</i> <i>Podiceps nigricollis</i> <i>Puffinus hopleae</i> <i>Sula bassana</i> <i>Anas platyrhynchos</i> <i>Melanitta nigra</i> <b><i>M. fusca</i></b> <b><i>Clangula hyemalis</i></b> <i>Aquila chrysaetos</i>	<i>Hieraaetus fasciatus</i> <i>Accipiter nisus</i> <i>Milvus migrans</i> <i>Falco</i> cf. <i>tinnunculus</i> <i>Alectoris rufa</i> <i>Grus primigenia</i> <i>Scolopax rusticola</i> <i>Numenius phaeopus</i> <i>Calidris canutus</i>	<i>Larus fuscus</i> <i>Pinguinus impennis</i> <i>Columba palumbus</i> <i>Bubo bubo</i> <i>Athene noctua</i> <i>Pyrhcorax pyrrhcorax</i>
<b>Fontbrégoua</b> (Epipaleolithic) (Vilette, 1983)	<i>Accipiter nisus</i> <i>Alectoris</i> cf. <i>rufa</i> <i>Coturnix coturnix</i> <i>Rallus aquaticus</i> <i>Porzana porzana</i> cf. <i>Gallinago gallinago</i> <i>Columba oenas</i> <i>C. palumbus</i> <i>Cuculus canorus</i>	<i>Hirundo rustica</i> <i>H. daurica</i> <i>Anthus pratensis</i> <i>Motacilla flava</i> <i>M. alba</i> <i>Lanius collurio</i> <i>L. senator</i> <i>Prunella modularis</i> <i>Saxicola rubetra</i>	<i>S. cantillans</i> <i>S. melanocephala</i> <i>Phylloscopus collybita</i> <i>P. bonelli</i> <i>Regulus</i> sp. <i>Ficedula hypoleuca</i> <i>Parus caeruleus</i> <i>P. major</i> cf. <i>Sitta europaea</i>



	<i>Otus scops</i> <i>Strix aluco</i> <i>Caprimulgus europaeus</i> <i>Apus cf. pallidus</i> <i>Merops apiaster</i> <i>Coracias garrulus</i> <i>Upupa epops</i> <i>Picus viridis</i> <i>Dendrocopos major</i> <i>D. medius</i> <i>Galerida cristata</i> <i>Ptyonoprogne rupestris</i>	<i>Oenanthe hispanica</i> <i>Monticola solitarius</i> <i>Phoenicurus phoenicurus</i> <i>Erithacus rubecula</i> <i>Turdus pilaris</i> <i>T. merula</i> <i>T. philomelos</i> <i>T. viscivorus</i> <i>Acrocephalus palustris</i> <i>Hippolais polyglota</i> <i>Sylvia risoria</i> <i>S. hortensis</i> <i>S. atricapilla</i>	<i>Emberiza citrinella</i> <i>E. hortulana</i> <i>Fringilla coelebs</i> <i>Acanthis cannabina</i> <i>Carduelis spinus</i> <i>Serinus serinus</i> <i>Pyrrhula pyrrhula</i> <i>Coccothraustes coccothraustes</i> <i>Garrulus glandarius</i> <i>Pyrrhocorax pyrrhocorax</i> <i>P. graculus</i>
<b>Fontéchevade</b> (Mourer-Chauviré, 1975a)	<i>Anas platyrhynchos</i> <i>Anas crecca</i> <i>Anas penelope</i> <b><i>Mergus merganser</i></b> <i>Mergus merganser s. serrator</i> <i>Buteo buteo</i> <b><i>Buteo cf. lagopus</i></b> <u><i>Lagopus cf. mutus</i></u> <u><i>Tetrao tetrix</i></u> <u><i>Tetrao urogallus</i></u> <i>Alectoris barbara</i> <i>Perdix perdix</i>	<i>Coturnix coturnix</i> <i>Gallus gallus</i> (?) <i>Crex crex</i> <i>Scolopax rusticola</i> <i>Picus canus</i> <i>Ptyonoprogne rupestris</i> <i>Anthus cf. spinoletta</i> <i>Lanius excubitor</i> <i>Prunella collaris</i> <i>Phoenicurus phoenicurus</i>	<i>Erithacus rubecula</i> <i>Turdus sp.</i> <i>Carduelis carduelis</i> <i>Acanthis cannabina</i> <i>Loxia curvirostra</i> <i>Pyrrhula pyrrhula</i> <i>Sturnus vulgaris s. unicolor</i> <i>Sturnus roseus</i> <i>Oriolus oriolus</i> <i>Pica pica</i> <i>Corvus corone</i>
<b>Fumane</b> (Aurignacian layers) (Bartolomei <i>et al.</i> , 1992; Cassoli & Tagliacozzo, 1994)	<i>Anas platyrhynchos</i> <i>A. querquedula</i> <b><i>Buteo lagopus</i></b> <i>Aquila chrysaetos</i> <i>Circus pygargus</i> <i>Falco vespertinus</i> <i>F. tinnunculus</i> <i>F. subbuteo</i> <i>F. columbarius</i> <u><i>Tetrao tetrix</i></u> <u><i>Lagopus mutus</i></u> <i>Perdix perdix</i> <i>Coturnix coturnix</i> <i>Rallus aquaticus</i>	<i>Crex crex</i> <i>Tringa hypoleuca</i> <i>T. glareola</i> <i>Scolopax rusticola</i> <i>Vanellus vanellus</i> <i>Columba oenas</i> <b><i>Nyctea scandiaca</i></b> <i>Strix aluco</i> <i>Asio otus</i> <i>Dendrocopos leucotos</i> <b><i>Eremophila alpestris</i></b> <i>Lullula arborea</i> <i>Ptyonoprogne rupestris</i>	<i>Turdus viscivorus</i> <i>T. pilaris</i> <i>Achantis cannabina</i> <i>Loxia pytyopsittacus</i> <i>L. curvirostra</i> <i>Pyrrhula pyrrhula</i> <i>Montifringilla nivalis</i> <i>Pica pica</i> <i>Garrulus glandarius</i> <i>Nucifraga caryocatactes</i> <i>Pyrrhocorax graculus</i> <i>Corvus monedula</i>
<b>Galería</b> (layer TG10B) (Sánchez Marco, 1999a)	<i>Falco naumanni</i> <i>F. tinnunculus</i> <i>Perdix perdix</i> <i>Coturnix coturnix</i> <i>Rallus aquaticus</i> <i>Himantopus himantopus</i> <i>Glareola pratincola</i> <i>Eudromias morinellus</i> <i>Tringa erythropus</i>	<i>T. totanus</i> <i>Actitis hypoleucos</i> <i>Gallinago gallinago</i> <b><i>G. media</i></b> <i>Calidris alpina</i> <i>Columba livia s. oenas</i> <i>C. palumbus</i> <b><i>Eremophila alpestris</i></b> <i>Galerida cristata</i> <i>Lullula arborea</i>	<i>Alauda arvensis</i> <i>Prunella collaris</i> <i>Oenanthe oenanthe</i> <i>E. citrinella</i> <i>Pyrrhocorax pyrrhocorax</i> <i>P. graculus</i> <i>Corvus monedula</i> <i>C. antecorax</i>
<b>Galería</b> (layer TG10A) (Sánchez Marco, 1999a, new identifications)	<i>Anas platyrhynchos</i> <i>Aegypius monachus</i> <i>Falco naumanni</i> <i>F. tinnunculus</i> <i>Perdix perdix</i> <i>Coturnix coturnix</i> <i>Otis tetrax</i> <i>Eudromias morinellus</i> <i>Pluvialis apricaria</i>	<i>Actitis hypoleucos</i> <i>Calidris alba</i> <i>Gallinago gallinago</i> <b><i>G. media</i></b> <i>Columba livia s. oenas</i> <i>Cuculus canorus</i> <i>Athene noctua</i> <i>Alauda arvensis</i> <i>Oenanthe oenanthe</i>	<i>Ficedula hypoleuca</i> <i>Carduelis chloris</i> <b><i>Pinicola enucleator</i></b> <i>Pyrrhocorax pyrrhocorax</i> <i>P. graculus</i> <i>Corvus antecorax</i>
<b>Galería</b> (layer TG11) (Sánchez Marco, 1987a, 1987b, 1995a)	<i>Anas crecca</i> <i>A. platyrhynchos</i> <i>A. cf. querquedula</i> <i>Falco tinnunculus</i> <i>Perdix palaeoperdix</i>	<i>Tringa erythropus</i> <i>T. totanus</i> <b><i>Gallinago media</i></b> <i>G. gallinago</i> <i>Calidris alpina</i>	<i>T. pilaris s. viscivorus</i> <i>T. viscivorus</i> <i>Emberiza citrinella</i> <i>Fringilla coelebs</i> <i>Sturnus sp.</i>

	<i>Coturnix coturnix</i> <i>Porzana cf. pusilla</i> <i>Otis tarda</i> <i>Vanellus vanellus</i> <i>Pluvialis apricaria</i> <i>Limosa limosa</i>	<i>Sterna albifrons</i> <i>Columba livia s. oenas</i> <i>Galerida cristata</i> <i>Lullula arborea</i> <i>Alauda arvensis</i> <i>Turdus merula</i>	<i>Pica pica</i> <i>Pyrhcorax pyrrhcorax</i> <i>P. graculus</i> <i>Corvus monedula</i> <i>C. antecorax</i>
<b>Gegant</b> (layer II) (Sánchez Marco, new identifications)	<i>Puffinus puffinus</i> <i>Accipiter nisus</i> <i>Alectoris rufa</i> <i>Coturnix coturnix</i> <i>Columba livia s. oenas</i> <i>Tyto alba</i> <i>Athene noctua</i>	<i>Strix aluco</i> <i>Anthus spinoletta</i> <i>Turdus viscivorus</i> <i>Emberiza calandra</i> <i>Fringilla coelebs</i> <i>Carduelis chloris</i> <i>Coccothraustes</i> <i>coccothraustes</i>	<i>Pyrhcorax pyrrhcorax</i> <i>P. graculus</i> <i>Corvus monedula</i> <i>Corvus corone</i>
<b>Gorham</b> (layers B and D) (Eastham, 1968)	<i>Puffinus yelkouan</i> <i>Phalacrocorax aristotelis</i> <i>Milvus milvus</i> <i>Haliaeetus albicilla*</i> <i>Gyps fulvus</i> <i>Falco tinnunculus</i> <i>F. peregrinus</i> <i>Alectoris rufa</i>	<i>Charadrius cf. dubius</i> <i>Himantopus ? himantopus</i> <i>Larus fuscus</i> <i>L. argentatus</i> <i>Fratercula arctica</i> <i>Columba livia</i> <i>Bubo bubo</i>	<i>Hirundo rustica</i> <i>Fringilla coelebs</i> <i>Sturnus sp.</i> <i>Pyrhcorax pyrrhcorax</i> <i>P. graculus</i> <i>Corvus monedula</i> <i>C. corone</i>
<b>Gorham</b> (layers K and M) (Eastham, 1968)	<i>Gavia stellata</i> <i>Phalacrocorax aristotelis</i> <i>Ardea purpurea ?</i> <i>Tadorna ferruginea</i> <i>Netta rufina</i> <i>Aythya nyroca</i> <i>A. fuligula</i> <i>Clangula hyemalis</i> <i>Melanitta fusca</i> <i>Milvus milvus</i>	<i>Gyps fulvus</i> <i>Hieraetus fasciatus</i> <i>Falco tinnunculus</i> <i>Alectoris rufa</i> <i>Anthropoides virgo ?</i> <i>Fulica atra</i> <i>Haematopus ostralegus</i> <i>Larus ridibundus</i> <i>L. fuscus</i> <i>Pinguinus impennis</i>	<i>Alle alle</i> <i>Columba livia</i> <i>Nyctea scandiaca</i> <i>Strix cf. aluco</i> <i>Pyrhcorax pyrrhcorax</i> <i>P. graculus</i> <i>Corvus monedula</i> <i>C. corone</i> <i>C. corax</i>
<b>Gumbes B</b> (Weesie, 1988)	<i>Falco tinnunculus</i> <i>Fulica atra</i> <i>Columba livia</i> <i>C. livia s. oenas</i>	<i>C. palumbus</i> <i>Tyto alba</i> <i>Athene cretensis</i> <i>Asio flammeus</i>	<i>Turdus sp.</i> <i>Garrulus glandarius</i> <i>Corvus monedula</i> <i>C. corax</i>
<b>Gumbes C</b> (Weesie, 1988)	<i>Columba oenas</i> <i>C. livia s. oenas</i> <i>Otus scops</i>	<i>Athene cretensis</i> <i>Asio flammeus</i> <i>Dendrocopos leucotos</i>	<i>Garrulus glandarius</i> <i>Corvus monedula</i>
<b>Hayonim</b> (Natufian layers) Tchernov ( <i>vide</i> Tyrberg, 1998)	<i>Anser sp.</i> <i>Anas platyrhynchos</i> <i>Aquila pomarina</i> <i>Milvus migrans</i> <i>Buteo buteo</i> <i>Falco tinnunculus</i> <i>F. peregrinus</i> <i>Accipiter nisus</i> <i>A. cf. gentilis</i> <i>Gyps fulvus</i> <i>Alectoris chukar</i> <i>Coturnix coturnix</i> <i>Phasianus colchicus</i> <i>Crex crex</i> <i>Gallinula chloropus</i> <i>Columba livia</i> <i>C. palumbus</i> <i>Streptopelia sp.</i> <i>Athene noctua</i> <i>Otus scops</i> <i>Tyto alba</i> <i>Asio sp.</i> <i>Apus affinis</i>	<i>Upupa epops</i> <i>Alcedo atthis</i> <i>Alauda arvensis</i> <i>Melanocorypha calandra</i> <i>Galerida cristata</i> <i>Motacilla cinerea</i> <i>Hirundo daurica</i> <i>H. rustica</i> <i>Hirundo sp.</i> <i>Miliaria calandra</i> <i>Regulus sp.</i> <i>Turdus merula</i> <i>T. philomelos</i> <i>Monticola sp.</i> <i>Oenanthe spp.</i> <i>Phoenicurus sp.</i> <i>Saxicola torquata</i> <i>Erithacus rubecula</i> <i>Luscinia megarhynchos</i> <i>L. svecica</i> <i>Luscinia sp.</i>	<i>Sylvia hortensis</i> <i>S. melanocephala</i> <i>Sylvia sp.</i> <i>Phylloscopus sp.</i> <i>Nectarinia osea</i> <i>Lanius senator</i> <i>Passer domesticus</i> <i>Petronia petronia</i> <i>Carduelis carduelis</i> <i>C. spinus</i> <i>C. chloris</i> <i>Coccothraustes coccothraustes</i> <i>Loxia curvirostra</i> <i>Serinus serinus</i> <i>Emberiza caesia</i> <i>Garrulus glandarius</i> <i>Sturnus vulgaris</i> <i>Sturnus sp.</i> <i>Pica pica</i> <i>Pyrhcorax pyrrhcorax</i> <i>Corvus monedula</i>



**Hayonim**

(Natufian layers)

Pichon (*vide* Tyrberg, 1998)

*Anser anser*  
*A. albifrons*  
*Tadorna tadorna*  
*Anas crecca*  
*A. platyrhynchos*  
*Aythya nyroca*  
*A. fuligula*  
*Pandion haliaetus*  
*Neophron percnopterus*  
*Gyps fulvus*  
*Aegypius monachus*  
*Accipiter nisus*  
*A. gentilis*  
*Buteo buteo*  
*B. rufinus*  
*Buteo sp.*  
*Aquila pomarina*  
*A. chrysaetos*  
*Falco naumanni*  
*F. tinnunculus*  
*F. subbuteo*  
*Perdix perdix*  
*Alectoris chukar*  
*Coturnix coturnix*  
*Phasianus cf. colchicus*  
*Grus grus*  
*Rallus aquaticus*  
*Crex crex*  
*Porzana porzana*  
*Fulica atra*  
*Tetrax tetrax*  
*Otis tarda*  
*Chlamydotis undulata*  
*Vanellus vanellus*

*Pterocles alchata*  
*Pterocles sp.*  
*Columba livia*  
*C. palumbus*  
*Streptopelia senegalensis*  
*Streptopelia sp.*  
*Tyto alba*  
*Asio otus*  
*Otus scops*  
*Athene noctua*  
*Strix aluco*  
*Apus affinis*  
*Alcedo atthis*  
*Merops apiaster*  
*Coracias garrulus*  
*Upupa epops*  
*Melanocorypha calandra*  
*Alauda arvensis*  
*Hirundo rustica*  
*H. daurica*  
*Motacilla cinerea*  
*M. alba*  
*Lanius senator*  
*L. nubicus*  
*Troglodytes troglodytes*  
*Nectarinia osea*  
*Saxicola torquata*  
*Oenanthe oenanthe*  
*O. hispanica*  
*Monticola solitarius*  
*Phoenicurus ochruros*  
*Erithacus rubecula*  
*Luscinia svecica*

*L. megarhynchos*  
*Turdus iliacus*  
*T. philomelos*  
*T. merula*  
*Turdus sp.*  
*Prinia gracilis*  
*Sylvia hortensis*  
*Sylvia borin*  
*Sylvia atricapilla*  
*S. melanocephala*  
*Phylloscopus collybita*  
*P. sibilatrix*  
*Phylloscopus sp.*  
*Regulus regulus*  
*Muscicapa striata*  
*Remiz pendulinus*  
*Parus major*  
*Oriolus oriolus*  
*Garrulus glandarius*  
*Miliaria calandra*  
*Emberiza caesia*  
*Fringilla coelebs*  
*Serinus pusillus*  
*Carduelis carduelis*  
*C. chloris*  
*C. spinus*  
*Loxia curvirostra*  
*Passer domesticus*  
*P. hispaniolensis*  
*Passer sp.*  
*Petronia petronia*  
*Sturnus vulgaris*  
*Sturnus sp.*  
*Pica pica*  
*Corvus monedula*  
*C. corone*

**Higueruelas**

(Sánchez Marco, new identifications)

*Podiceps auritus*  
*Podiceps nigricollis*  
*Ardea cinerea*  
*Nycticorax nycticorax*  
*Ixobrychus minutus*  
*Plegadis falcinellus*  
***Cygnus cygnus***  
*Anser sp.*  
*Tadorna sp.*  
*Marmaronetta angustirostris*

*Aythya sp.*  
*Aythya marila*  
***Mergus albellus***  
*Oxyura leucocephala*  
*Palaeocryptonyx sp.*  
*Crex crex*  
*Actitis hypoleucos*  
*Pterocles alchata*  
*Columba sp.*

*Anthus pratensis*  
*Turdus sp.*  
*Turdus iliacus s. philomelos*  
*Emberiza citrinella*  
*Passer cf. montanus*  
*Corvus monedula*  
*C. antecorax*

**Hortus**

(Mourer-Chauviré, 1972)

*Gyps fulvus*  
*Falco peregrinus*  
*F. tinnunculus*  
*Falco sp.*  
*Alectoris graeca*  
*A. barbara*  
*Perdix perdix*  
*Coturnix coturnix*  
*Scolopax rusticola*  
*Columba livia*  
*C. palumbus*  
*Athene noctua*

*Asio accipitrinus*  
*Apus melba*  
*Picus viridis ?*  
*Hirundo daurica*  
*Riparia riparia*  
*Pryonoprogne rupestris*  
*Motacilla alba*  
*Anthus trivialis*  
*Ficedula hypoleuca*  
*Turdus viscivorus*  
*Emberiza citrinella*

*Coccothraustes coccothraustes*  
*Petronia petronia*  
*Sturnus vulgaris*  
*Nucyfraga caryocatactes*  
*Pyrhocorax pyrrhocorax*  
*P. graculus*  
*Corvus monedula*  
*C. corone*

**Huéscar 1**

(Sánchez Marco, 1989, pers. obs.)

*Tachybaptus ruficollis*  
*Tadorna sp.*  
*Anas crecca*  
*A. strepera s. acuta*  
*A. querquedula*

*A. clypeata*  
 cf. *Netta rufina*  
*Aythya nyroca*  
*Aythya sp.*  
***Melanitta nigra***

*Mergus serrator*  
 cf. *Perdix sp.*  
*Coturnix coturnix*  
*Bubo bubo*

<b>Ibex</b> (Cooper, 2000)	<i>Puffinus cf. puffinus</i> <i>Sula bassana</i> <b><i>Branta cf. bernicla</i></b> <i>Haliaeetus albicilla*</i> <i>Aquila cf. chrysaetos</i> <i>Falco naumanni</i> <i>F. tinnunculus</i> <i>F. peregrinus</i> <i>Alectoris cf. rufa</i> <i>Gallus gallus</i> <i>Larus cf. cachinnans</i>	<i>Pinguinus impennis</i> <i>Columba livia s. oenas</i> <i>C. palumbus</i> <i>cf. Bubo bubo</i> <i>Apus melba</i> Alaudidae indet. <i>cf. Anthus sp.</i> <i>Prunella cf. modularis</i> <i>P. cf. collaris</i> <i>cf. Monticola solitarius</i>	<i>Turdus sp.</i> Fringillidae indet. <i>Coccothraustes s. Emberiza</i> <i>Pyrhcorax pyrrhcorax</i> <i>Corvus cf. corone</i> <i>C. corax</i>
<b>Jarama II</b> (Adan <i>et al.</i> , 1995; Sánchez Marco, <i>new identifications</i> )	<i>Anas platyrhynchos</i> <i>Netta rufina</i> <i>Aquila chrysaetos</i> <i>Buteo buteo</i> <i>Falco tinnunculus</i> <i>Lagopus mutus</i> <i>Alectoris rufa</i>	<i>Perdix perdix</i> Tringidae indet. <i>Scolopax rusticola</i> <i>Columba livia s. oenas</i> <i>Columba palumbus</i> <i>Strix aluco</i> <i>Athene noctua</i>	Alaudidae indet. <i>Emberiza citrinella</i> <i>Turdus iliacus s. philomelos</i> <i>Pyrhcorax graculus</i> <i>Corvus monedula</i>
<b>Kozarnika</b> (Boev, 2001)	<i>Anas crecca</i> <i>Falco tinnunculus</i> <i>F. vespertinus</i> <i>Tetrao tetrix</i> <i>T. urogallus</i> <i>Lagopus lagopus</i> <i>Lagopus sp.</i> <i>Bonasa bonasia</i> <i>Perdix palaeoperdix</i> <i>P. perdix</i> <i>Coturnix coturnix</i> <i>Alectoris graeca s. chukar</i> <i>Crex crex</i> <i>Gallinula chloropus</i> <i>Porzana cf. Parva</i> <i>cf. Charadrius sp.</i>	<i>Tringa totanus</i> <i>T. stagnatilis</i> <i>Tringa sp.</i> <i>Apus apus</i> <b><i>Nyctea scandiaca</i></b> <i>Aegolius funereus</i> ? <i>Athene noctua</i> <i>Eremophila alpestris</i> <i>Hirundo daurica</i> <i>Ptyonoprogne rupestris</i> <i>Riparia riparia</i> <i>Anthus trivialis</i> <i>Lanius collurio</i> <i>cf. Erithacus sp.</i> <i>Turdus merula</i> <i>T. viscivorus</i>	<i>Monticola saxatilis</i> <i>Carduelis cannabina</i> <i>Carduelis carduelis</i> <i>Coccothraustes coccothraustes</i> <i>cf. Pyrrhula pyrrhula</i> <i>Fringilla coelebs</i> <i>Loxia curvirostra</i> <i>Pyrhcorax cf. pyrrhcorax</i> <i>P. graculus</i> <i>Garrulus glandarius</i> <i>Corvus monedula</i> <i>C. corone</i> <i>Corvus sp.</i>
<b>Lazaret</b> (Locus VIII) (Mourer-Chauviré, 1975a)	<i>Nycticorax nycticorax</i> <i>Anas platyrhynchos</i> <i>Aegypius monachus</i> <i>Gypaetus barbatus</i> <i>Accipiter nisus</i> <i>A. gentilis</i> <i>Aquila chrysaetos</i> <i>Buteo buteo</i> <i>Circus cf. cyaneus</i> <i>Falco peregrinus</i> <i>F. tinnunculus</i> <i>F. subbuteo</i> <i>Tetrao tetrix</i> <i>Alectoris graeca</i> <i>A. barbara</i> <i>Perdix palaeoperdix</i> <i>Coturnix coturnix</i> <i>Rallus aquaticus</i> <i>Porzana porzana</i> <i>Crex crex</i> <i>Eudromias morinellus</i> <i>Gallinago gallinago</i> <i>Columba livia</i> <i>C. palumbus</i>	<b><i>Nyctea scandiaca</i></b> <i>Bubo bubo</i> <i>Athene noctua</i> <i>Asio flammeus</i> <i>Otus scops</i> <i>Aegolius funereus</i> <i>Strix aluco</i> <i>Caprimulgus ruficollis</i> <i>Apus apus</i> <i>A. melba</i> <i>Coracias garrulus</i> <i>Dendrocopos major</i> <i>D. leucotos</i> <i>Picoides tridactylus</i> <i>Jynx torquilla</i> <i>Lullula arborea</i> <i>Alauda arvensis</i> <i>Riparia riparia</i> <i>Ptyonoprogne rupestris</i> <i>Lanius senator</i> <i>Troglodytes troglodytes</i> <i>Prunella collaris</i>	<i>Saxicola rubetra</i> <i>Turdus merula</i> <i>T. pilaris</i> <i>T. iliacus</i> <i>T. viscivorus</i> <i>Sylvia communis</i> <i>Aegithalos caudatus</i> <i>Emberiza citrinella</i> <i>Fringilla coelebs</i> <i>Serinus serinus</i> ? <i>Coccothraustes coccothraustes</i> <i>Passer montanus</i> <i>Petronia petronia</i> <i>Montifringilla nivalis</i> <i>Sturnus vulgaris</i> <i>Garrulus glandarius</i> <i>Pica pica</i> <i>Pyrhcorax pyrrhcorax</i> <i>P. graculus</i> <i>Corvus monedula</i> <i>C. antecorax</i>
<b>Lazaret</b> (Bottom) (Mourer-Chauviré, 1975a)	<i>Accipiter nisus</i> <i>A. gentilis</i> <i>Aquila chrysaetos</i> <i>Alectoris graeca</i> <i>A. barbara</i> <i>Perdix palaeoperdix</i>	<i>Aegolius funereus</i> <i>Strix aluco</i> <i>Apus apus</i> <i>Picus viridis</i> <i>Dendrocopos major</i> <i>Galerida cristata</i>	<i>Carduelis flammea</i> <i>Coccothraustes coccothraustes</i> <i>Passer domesticus</i> <i>Petronia petronia</i> <i>Montifringilla nivalis</i> <i>Garrulus glandarius</i>



	<p><i>Coturnix coturnix</i>  <i>Porzana cf. parva</i>  <i>Scolopax rusticola</i>  <i>Numenius arquata</i>  <i>Larus fuscus</i>  <i>Columba livia</i>  <i>C. palumbus</i>  <i>Bubo bubo</i>  <i>Athene noctua</i>  <i>Otus scops</i></p>	<p><i>Hirundo rustica</i>  <i>Anthus spinoletta</i>  <i>Troglodytes troglodytes</i>  <i>Prunella modularis</i>  <i>Turdus merula</i>  <i>T. pilaris</i>  <i>T. iliacus</i>  <i>T. viscivorus</i>  <i>Fringilla coelebs</i></p>	<p><i>Pica pica</i>  <i>Pyrrhonorax pyrrhonorax</i>  <i>P. graculus</i>  <i>Corvus monedula</i>  <i>C. corone</i>  <i>C. cf. corax</i></p>
<p><b>Lazaret</b>                      (layer C III)                      (Vilette, 1993)</p>	<p><i>Anas cf. acuta</i>  <i>cf. A. clypeata</i>  <i>Aythya cf. marila</i>  <i>Bucephala clangula</i>  <i>Aegypius monachus</i>  <i>Gypaetus barbatus</i>  <i>cf. Buteo buteo</i>  <i>Aquila chrysaetos</i>  <i>cf. Hieraaetus fasciatus</i>  <i>Haliaeetus albicilla*</i>  <i>Circus cf. cyaneus</i>  <i>C. macrourus*</i>  <i>Falco subbuteo</i>  <i>F. eleonora</i>  <i>F. cf. columbarius</i>  <i>F. cf. vespertinus</i>  <i>F. tinnunculus</i>  <i>Tetrao tetrix</i>  <i>Alectoris graeca</i>  <i>Perdix paleoperdix</i>  <i>Coturnix coturnix</i>  <i>cf. Rallus aquaticus</i>  <i>Crex crex</i>  <i>Tringa stagnatilis</i>  <i>cf. Phuvialis squatarola</i>  <i>cf. Charadrius dubius</i>  <i>cf. Eudromias morinellus</i>  <i>Scolopax rusticola</i></p>	<p><i>Larus cf. canus</i>  <i>Sterna cf. hirundo</i>  <i>Chidonias hybrida</i>  <i>Uria lomvia s. aalge</i>  <i>Fratercula arctica</i>  <i>Burhinus oedinenemus</i>  <i>Columba livia</i>  <i>C. cf. oenas</i>  <i>C. palumbus</i>  <i>Cuculus canorus</i>  <i>Nyctea scandiaca</i>  <i>Bubo bubo</i>  <i>Athene noctua</i>  <i>Strix cf. aluco</i>  <i>Otus scops</i>  <i>Asio otus</i>  <i>A. flammeus</i>  <i>Aegolius funereus</i>  <i>Apus apus</i>  <i>A. melba</i>  <i>A. cf. pallidus</i>  <i>cf. Dendrocopos major</i>  <i>cf. D. medius</i>  <i>cf. D. minor</i>  <i>Galerida cristata</i>  <i>Lullula arborea</i>  <i>Alauda arvensis</i>  <i>Anthus pratensis</i>  <i>Motacilla alba</i>  <i>Cinclus cinclus</i></p>	<p><i>Oenanthe hispanica</i>  <i>Phoenicurus phoenicurus</i>  <i>Erithacus rubecula</i>  <i>Turdus viscivorus</i>  <i>T. pilaris</i>  <i>T. merula</i>  <i>T. iliacus</i>  <i>Emberiza hortulana</i>  <b>Plectrophenax nivalis</b>  <i>Fringilla coelebs</i>  <b>Pinicola enucleator</b>  <b>Loxia pytyopsittacus</b>  <b>Carpodacus erythrinus</b>  <i>Pyrrhula pyrrhula</i>  <i>Coccothraustes coccothraustes</i>  <i>Montifringilla nivalis</i>  <i>Petronia petronia</i>  <i>Sturnus vulgaris</i>  <i>Garrulus glandarius</i>  <i>Pica pica</i>  <i>Nucyfraga cariocatactes</i>  <i>Pyrrhonorax pyrrhonorax</i>  <i>P. graculus</i>  <i>Corvus monedula</i>  <i>C. corone</i>  <i>C. corax</i></p>
<p><b>Liko</b>                      (Weesie, 1988)</p>	<p><i>Phalacrocorax aristotelis</i>  <i>cf. Branta ruficollis</i>  <i>Anas penelope</i>  <i>A. querquedula</i>  <i>Haliaeetus albicilla</i>  <i>Gypaetos barbatus</i>  <i>Gyps fulvus</i>  <i>G. melitensis</i>  <i>Aegypius monachus</i>  <i>Accipiter gentilis</i>  <i>A. cf. nisus</i>  <i>Buteo buteo</i>  <i>Aquila chrysaetos</i>  <i>A. c. simurgh</i>  <i>Falco tinnunculus</i>  <i>F. subbuteo</i>  <i>F. eleonora</i>  <i>F. peregrinus</i>  <i>Coturnix coturnix</i>  <i>Porzana porzana</i>  <i>Gallinula chloropus</i></p>	<p><i>Glareola sp.</i>  <i>Calidris canutus</i>  <i>Scolopax rusticola</i>  <i>Columba livia</i>  <i>C. oenas</i>  <i>C. palumbus</i>  <i>Tyto alba</i>  <i>Otus scops</i>  <i>Ketupa zeylonensis</i>  <i>Athene cretensis</i>  <i>Asio flammeus</i>  <b>Aegolius funereus</b>  <i>Caprimulgus cf. europaeus</i>  <i>Apus cf. apus</i>  <i>A. melba</i>  <i>Dendrocopos leucotos</i>  <i>cf. Calandrella brachydactyla</i>  <i>cf. Hirundo daurica</i>  <i>Prunella collaris</i>  <i>cf. Erithacus rubecula</i></p>	<p><i>Oenanthe cf. hispanica</i>  <i>Monticola cf. solitarius</i>  <i>cf. Zosterda dauma</i>  <i>cf. Turdus iliacus</i>  <i>Turdus spp.</i>  <i>cf. Muscicapa striata</i>  <i>Fringilla sp.</i>  <i>Carduelis chloris</i>  <i>cf. Pyrrhula pyrrhula</i>  <i>Coccothraustes coccothraustes</i>  <i>cf. Emberiza calandra</i>  <i>Emberiza spp.</i>  <i>Sturnus sp.</i>  <i>Garrulus glandarius</i>  <i>Pyrrhonorax pyrrhonorax</i>  <i>P. graculus</i>  <i>Corvus monedula</i>  <i>Corvus sp.</i></p>
<p><b>Malagrotta</b>                      (Cassoli et al., 1982)</p>	<p><b>Anser brachyrhynchus</b>  <b>Branta bernicla</b>  <i>Anas platyrhynchos</i></p>	<p><i>A. acuta</i>  <i>A. penelope</i>  <i>A. querquedula</i></p>	<p><i>Calidris temminckii</i>  <i>Rallus aquaticus</i>  <i>Perdix perdix</i></p>

<b>Mas-d'Azil</b> (Magdalenian layers) (Vilette, 1983)	<i>Anas platyrhynchos</i> <i>A. crecca</i> <i>Aythya ferina</i> <i>Aegyptius monachus</i> <i>Falco tinnunculus</i> <i>Lagopus lagopus</i> <i>L. mutus</i>	<i>Perdix perdix</i> <i>Larus canus</i> <i>Columba oenas</i> <i>Columba sp.</i> <b><i>Nyctea scandiaca</i></b> <i>Bubo bubo</i> cf. <i>Lanius excubitor</i>	cf. <i>Turdus viscivorus</i> <i>Montifringilla nivalis</i> <i>Sturnus vulgaris</i> <i>Pyrrhocorax graculus</i> <i>Corvus corax</i>
<b>Montoussé 5</b> (Clot <i>et al.</i> , 1976)	<i>Palaeoecryptonyx sp.</i> cf. <i>Dendrocopos major</i> <i>Oenanthe sp.</i>	<i>Turdus cf. merula</i> <i>T. cf. viscivorus</i> <i>Ficedula sp.</i> cf. <i>Garrulus glandarius</i>	<i>Corvus cf. monedula</i> <i>C. pliocaenus</i>
<b>Nerja</b> (Magdalenian layers) (Eastham, 1986)	<i>Puffinus griseus</i> <i>Sula bassana</i> <i>Anser sp.</i> <i>Anas platyrhynchos</i> <i>A. crecca</i> <i>Aythya nyroca</i> <i>Circaetus gallicus</i>	<i>Falco tinnunculus</i> <i>Alectoris rufa</i> <i>Larus fuscus</i> <i>Uria aalge</i> <i>Pinguinus impennis</i> <i>Columba livia</i> <i>Monticola solitarius</i>	<i>Lanius excubitor</i> <i>Coccothraustes coccothraustes</i> <i>Pyrrhocorax pyrrhocorax</i> <i>P. graculus</i> <i>C. corone</i>
<b>Nerja</b> (Epipaleolithic layers) (Boesneck & Driesch, 1980)	? <i>Gavia stellata</i> <i>Calonectris diomedea</i> <i>Puffinus gravis</i> <i>P. puffinus</i> <i>Sula bassana</i> ? <i>Anser albifrons</i> <i>Tadorna tadorna</i> <i>Anas platyrhynchos</i> <i>Anas sp.</i> ? <i>Aythya ferina</i> <b><i>Melanitta nigra</i></b> <i>Milvus milvus</i>	<i>Gypaetus barbatus</i> <i>Accipiter gentilis</i> <i>Buteo buteo</i> <i>Aquila heliaca</i> <i>Alectoris rufa</i> <i>Grus grus</i> <i>Fulica atra</i> ? <i>Larus canus</i> <i>L. argentatus</i> <i>L. fuscus</i> <i>L. marinus</i> <i>Pinguinus impennis</i>	<i>Alca torda</i> <i>Uria aalge</i> <i>Columba livia</i> <i>Tyto alba</i> <i>Bubo bubo</i> <i>Athene noctua</i> <i>Sturnus sp.</i> <i>Pyrrhocorax pyrrhocorax</i> <i>Corvus corone</i> <i>C. corax</i>
<b>Nerja</b> (Upper Paleolithic layers) (Hernández Carrasquilla, 1995)	<i>Gavia stellata</i> <i>Calonectris diomedea</i> <i>Puffinus yelkouan</i> <i>P. aff. griseus</i> <i>Sula bassana</i> <i>Phalacrocorax carbo</i> <i>P. aristotelis</i> <b><i>Branta bernicla</i></b> <i>Tadorna ferruginea</i> <i>T. tadorna s. ferruginea</i>	<i>Anas clypeata</i> <i>Aythya nyroca</i> <i>A. ferina s. fuligula</i> <i>Milvus milvus</i> <i>Buteo buteo</i> <i>Alectoris rufa</i> <i>Fulica atra</i> <i>Grus grus</i> <i>Larus marinus</i> <i>L. canus</i> <i>Uria aalge</i>	<i>Alca torda</i> <i>Pinguinus impennis</i> <i>Columba livia s. oenas</i> <i>Bubo bubo</i> <i>Alauda arvensis</i> <i>Hirundo rustica</i> <i>Turdus sp.</i> <i>Pyrrhocorax pyrrhocorax</i> <i>Corvus corax</i>
<b>Nerja</b> (Epipaleolithic layers) (Hernández Carrasquilla, 1995)	<i>Sula bassana</i> <i>Phalacrocorax aristotelis</i> <i>Ardea cinerea</i>	<i>Anas platyrhynchos</i> <i>Stercorarius skua</i> <i>Larus cachimans s. argentatus s. fuscus</i>	<i>Uria aalge</i> <i>Columba livia s. oenas</i>
<b>Nerja</b> (Epipaleolithic layers) (Tyrberg & Hernández Carrasquilla, 1995)	<i>Catharacta skua</i>		
<b>Ohalo 2</b> (Simmons & Nadel, 1998)	<i>Podiceps auritus</i> <i>P. cristatus</i> <i>P. griseus</i> <i>P. nigricollis</i> <i>Tachybaptus ruficollis</i> <i>Phalacrocorax aristotelis</i> <i>P. pygmaeus</i> <i>Ardea cinerea</i> <i>A. purpurea</i> <i>Ardeola ralloides</i> <i>Egretta garzetta</i> <i>Platalea leucorodia</i> <i>Plegadis falcinellus</i>	<i>A. crecca</i> <i>A. penelope</i> <i>A. platyrhynchos</i> <i>A. querquedula</i> <i>A. strepera</i> <i>Aythya fuligula</i> <b><i>A. marila</i></b> <i>Netta rufina</i> <b><i>Mergus merganser</i></b> <i>M. serrator</i> <b><i>Melanitta fusca</i></b> <b><i>Bucephala clangula</i></b> <i>Haliaeetus albicilla*</i>	<i>F. cherrug</i> <i>Alectoris chukar</i> <i>Ammoperdix heyi</i> <i>Coturnix coturnix</i> <i>Fulica atra</i> <i>Porphyrio porphyrio</i> <i>Tetrax tetrax</i> <i>Otis tarda</i> <i>Himantopus himantopus</i> <i>Recurvirostra avosetta</i> <i>Vanellus vanellus</i> <i>Numenius phaeopus</i> <i>N. arquata</i>



	<p><b>Cygnus cygnus</b>  <b>C. columbianus</b>  <i>Anser anser</i>  <i>A. albifrons</i>  <i>A. fabalis</i>  <i>Tadorna tadorna</i>  <i>Alopochen aegyptiacus</i>  <i>Anas acuta</i>  <i>A. capensis</i>  <i>A. clypeata</i></p>	<p><i>Milvus migrans</i>  <i>Circus aeruginosus</i>  <i>C. cyaneus</i>  <i>Accipiter nisus</i>  <i>A. gentilis</i>  <i>Melierax metabates</i>  <i>Buteo rufinus</i>  <i>B. buteo</i>  <i>Aquila rapax</i>  <i>Falco tinnunculus</i>  <i>F. columbarius</i>  <i>F. biarmicus</i></p>	<p><i>Arenaria interpres</i>  <i>Larus minutus</i>  <i>L. sabini</i>  <i>L. argentatus</i>  <i>Bubo bubo</i>  <i>Strix aluco s. butleri</i>  <i>Corvus monedula</i>  <i>C. corone</i>  <i>C. frugilegus</i></p>
<p><b>Orgnac 3</b>                      (layer i)                      (Mourer-Chauviré, 1975<sup>a</sup>)</p>	<p><i>Anas platyrhynchos</i>  <i>Aythya nyroca</i>  <b>A. marila</b>  <i>Accipiter nisus</i>  <i>Falco naumanni</i>  <i>F. tinnunculus</i>  <i>Lagopus</i> sp.  <u><i>Tetrao urogallus</i></u>  <u><i>T. tetrix</i></u>  <i>Alectoris graeca</i>  <i>A. barbara</i>  <i>Perdix palaeoperdix</i>  <i>Coturnix coturnix</i>  <i>Crex crex</i>  <i>Pluvialis squatarola</i>  <i>Scolopax rusticola</i>  <i>Tringa</i> cf. <i>stagnatilis</i>  <i>Columba livia</i>  <i>C. palumbus</i>  <i>Cuculus canorus</i>  <b><i>Nyctea scandiaca</i></b>  <i>Asio flammeus</i>  <i>Otus scops</i></p>	<p><u><i>Aegolius funereus</i></u>  <i>Athene noctua</i>  <i>Strix aluco</i>  <i>Caprimulgus europaeus</i>  <i>Apus melba</i>  <i>Coracias garrulus</i>  <i>Upupa epops</i>  <i>Picus viridis</i>  <i>Dendrocopos major</i>  <i>D. medius</i>  <i>Jynx torquilla</i>  <i>Melanocorypha calandra</i>  <i>Galerida cristata</i>  <i>Lullula arborea</i>  <i>Alauda arvensis</i>  <i>Ptyonoprogne rupestris</i>  <i>Motacilla alba</i>  <b><i>Bombycilla garrulus</i></b>  <i>Troglodytes troglodytes</i></p>	<p><i>Saxicola rubetra</i>  <i>Turdus merula</i>  <i>T. iliacus</i>  <i>T. viscivorus</i>  <i>Acrocephalus arundinaceus</i> ?  <i>Sylvia nisoria</i>  <i>S. atricapilla</i>  <i>S. melanocephala</i>  <i>Ficedula hypoleuca</i>  <i>Parus cristatus</i>  <i>Emberiza citrinella</i> ?  <i>E. hortulana</i> ?  <i>Carduelis chloris</i>  <i>Serinus citrinella</i>  <i>Pyrrhula pyrrhula</i>  <i>Coccothraustes coccothraustes</i>  <i>Garrulus glandarius</i>  <i>Pica pica</i>  <i>Corvus corone</i>  <i>C. antecorax</i></p>
<p><b>Palidoro</b>                      (Cassoli, 1977)</p>	<p><i>Anser fabalis</i>  <i>Falco tinnunculus</i>  <i>Perdix perdix</i>  <i>Coturnix coturnix</i>  <i>Columba livia</i></p>	<p><i>Athene noctua</i>  <i>Melanocorypha calandra</i>  <i>Alauda arvensis</i></p>	<p><i>Pyrrhocorax pyrrhocorax</i>  <i>P. graculus</i>  <i>Corvus corone</i></p>
<p><b>Pedrer de S'Ònix</b>                      (Mourer-Chauviré <i>et al.</i>, 1977)</p>	<p><i>Aegypius monachus</i>  <i>Scolopax rusticola</i>  <i>Troglodytes troglodytes</i> ?</p>	<p><i>Turdus iliacus</i>  <i>Aegithalos caudatus</i> ?  <i>Parus cristatus</i> ?</p>	<p><i>Fringilla coelebs</i>  <i>Carduelis carduelis</i>  <i>Corvus pliccaenus</i></p>
<p><b>Pedrer de S'Ònix</b>                      (Mourer-Chauviré <i>in</i> Alcover <i>et al.</i>, 1981)</p>	<p><b><i>Cygnus</i> cf. <i>cygnus</i></b>  <b><i>Bucephala</i> cf. <i>clangula</i></b>  <i>Coturnix</i> cf. <i>coturnix</i>                      cf. <i>Porzana porzana</i>  <i>Otus</i> cf. <i>scops</i>  <i>Tyto balearica</i>  <i>Dendrocopos</i> cf. <i>major</i>  <i>Melanocorypha</i> cf. <i>calandra</i></p>	<p>cf. <i>Lullula arborea</i>  <i>Sylvia</i> cf. <i>atricapilla</i>  <i>Parus</i> cf. <i>ater</i>  <i>Prunella</i> cf. <i>modularis</i>  <i>Erithacus</i> cf. <i>rubecula</i>  <i>Turdus</i> cf. <i>merula</i>  <i>T. cf. iliacus s. philomelos</i></p>	<p><i>Fringilla</i> cf. <i>coelebs</i>  <i>Carduelis</i> cf. <i>carduelis</i>  <i>Coccothraustes</i>                      cf. <i>coccothraustes</i>  <i>Pica pica</i>  <i>Pyrrhocorax</i> cf. <i>pyrrhocorax</i>  <i>Corvus pliccaenus</i></p>
<p><b>Pedrer de S'Ònix</b>                      (Seguí, 2001)</p>	<p><i>Pica mouererae</i></p>		
<p><b>Romains</b>                      (Desbrosse &amp; Mourer-Chauviré, 1973)</p>	<p><i>Podiceps auritus</i>  <i>Cygnus olor</i>  <i>C. cygnus</i>  <i>Anas platyrhynchos</i>  <i>A. crecca</i>  <i>A. strepera</i>  <i>A. acuta</i>  <i>A. querquedula</i>  <i>A. clypeata</i></p>	<p><i>Grus grus</i> ?  <i>Gallinago gallinago</i>  <i>Scolopax rusticola</i>  <i>Numenius arquata</i>  <i>N. tenuirostris</i>  <i>Tringa totanus</i>  <i>Calidris alba</i>  <i>Larus argentatus</i>  <i>L. canus</i></p>	<p><i>Hirundo daurica</i>  <i>Delichon urbica</i>  <i>Prunella collaris</i>  <i>Turdus</i> cf. <i>torquatus</i>  <i>T. merula</i>  <i>T. iliacus</i>  <i>Acrocephalus paludicola</i>  <i>Sylvia atricapilla</i>  <i>Ficedula hypoleuca</i></p>

	<i>Aythya fuligula</i> <i>Melanitta nigra</i> <i>Clangula hyemalis</i> <i>Gypaetus barbatus</i> <i>Aquila chrysaetos</i> <i>Buteo buteo</i> <i>Falco rusticolus</i> <i>F. tinnunculus</i> <u><i>Lagopus lagopus</i></u> <u><i>L. mutus</i></u> <u><i>Tetrao tetrix</i></u> <i>Perdix perdix</i>	<i>Sterna sandvicensis</i> <i>Columba livia</i> <i>Cuculus canorus</i> <i>Nyctea scandiaca</i> <i>Asio otus</i> <i>A. flammeus</i> <i>Strix aluco</i> <i>Apus apus</i> <i>A. melba</i> <i>Dryocopus martius</i> <i>Dendrocopos medius</i> <i>Lullula arborea</i>	<i>Emberiza hortulana</i> <i>Pyrrhula pyrrhula</i> <i>Coccothraustes coccothraustes</i> <i>Montifringilla nivalis</i> <i>Garrulus glandarius</i> <i>Pica pica</i> <i>Pyrrhocorax graculus</i> <i>Corvus corone</i> <i>C. corax</i>
<b>Quartaccio</b> (Bedetti, 2001)	<i>Podiceps griseigena</i> <i>Ardea purpurea</i> <i>Anser</i> sp. <i>Branta ruficollis</i>	<i>Anas platyrhynchos</i> <i>Anas clypeata</i> <b><i>Somateria molissima</i></b> <i>Mergus serrator</i>	<i>Fulica atra</i> <i>Gallinago</i> sp. <i>Sturnus vulgaris</i> <i>Pyrrhula pyrrhula</i>
<b>Quibas</b> (Montoya <i>et al.</i> , 1999, 2001; Sánchez Marco, <i>new identifications</i> )	<i>Geronticus eremita</i> <i>Gypaetus barbatus</i> <i>Coturnix coturnix</i> <i>Columba livia s. oenas</i> <i>Cuculus canorus</i> <i>Athene noctua</i>	<i>Delichon urbica</i> <i>Prunella modularis</i> <i>Anthus pratensis</i> <i>Phoenicurus ochruros</i> <i>Saxicola torquata</i> <i>S. rubetra</i>	<i>Oenanthe hispanica</i> <i>Parus major</i> <i>Carduelis chloris</i> <i>C. carduelis</i> <i>C. spinus</i> <i>Serinus serinus</i>
<b>Radice</b> (Bidduttu <i>et al.</i> , 1967)	<u><i>Tetrao urogallus</i></u> <u><i>T. tetrix</i></u> <i>Perdix perdix</i>	<i>Alectoris graeca</i> <i>Strix aluco</i> <i>Pyrrhocorax pyrrhocorax</i>	<i>P. graculus</i>
<b>Razhishkata</b> (Boev, 2000b)	<i>Anser</i> sp. <i>Anas</i> sp. <u><i>Tetrao tetrix</i></u> <i>Bonasa bonasia</i> <i>Perdix palaeoperdix</i> <i>P. perdix</i> <i>Coturnix coturnix</i> <i>Crex crex</i> <i>Tringa</i> cf. <i>stagnatilis</i> <i>Athene noctua</i> <i>Asio otus</i> <i>Apus melba</i>	<i>Melanocorypha</i> sp. <i>Anthus</i> cf. <i>trivialis</i> <i>Anthus</i> sp. <i>Parus major</i> <i>Sylvia</i> sp. <i>Ptyonoprogne rupestris</i> <i>Fringilla montifringilla</i> <i>Loxia curvirostra</i> <i>Coccothraustes</i> <i>coccothraustes</i>	<i>Carduelis chloris</i> <i>Carduelinae</i> indet. <i>Petronia petronia</i> cf. <i>Garrulus glandarius</i> <i>Pyrrhocorax pyrrhocorax</i> <i>P. graculus</i> <i>Corvus monedula</i> <i>C. corone s. frugilegus</i> <i>Corvus</i> sp.
<b>Romanelli</b> (Cassoli & Tagliacozzo, 1997)	<i>Podiceps auritus</i> <i>P. nigricollis</i> <i>Gavia arctica</i> <i>G. stellata</i> <i>Puffinus puffinus</i> <i>Pelecanus crispus</i> <i>Phalacrocorax carbo</i> <i>P. aristotelis</i> <i>Ardea cinerea</i> <i>Nycticorax nycticorax</i> <i>Cygnus cygnus</i> <i>Anser anser</i> <i>A. erythropus*</i> <i>A. albifrons</i> <i>A. fabalis</i> <b><i>A. brachyrhynchus</i></b> <i>A. caerulescens</i> <b><i>Branta bernicla</i></b> <b><i>B. leucopsis</i></b> <i>B. ruficollis</i> <i>Tadorna tadorna</i> <i>Anas platyrhynchos</i> <i>A. crecca</i> <i>A. strepera</i> <i>A. penelope</i> <i>A. acuta</i>	<i>Accipiter gentilis</i> <b><i>Buteo lagopus</i></b> <i>Aquila chrysaetos</i> <i>A. heliaca</i> <i>Haliaeetus albicilla</i> <i>Aegyptius monachus</i> <i>Gyps fulvus</i> <i>Circus cyaneus</i> <i>C. macrourus</i> <i>C. aeruginosus</i> <i>Falco peregrinus</i> <i>F. eleonora</i> <i>F. subbuteo</i> <i>F. vespertinus</i> <i>F. tinnunculus</i> <i>Alectoris graeca</i> <i>A. rufa</i> <i>Coturnix coturnix</i> <i>Crex crex</i> <i>Gallinula chloropus</i> <i>Fulica atra</i> <i>Grus grus</i> <i>G. cf. leucogeranus</i> <i>Anthropoides virgo</i> <i>Otis tetrax</i> <i>O. tarda</i>	<i>L. argentatus</i> <i>Rissa tridactyla</i> <i>Pinguinus impennis</i> <i>Columba livia</i> <i>C. oenas</i> <i>Streptopelia turtur</i> <i>Pterocles alchata</i> <i>P. orientalis</i> <i>Tyto alba</i> <i>Otus scops</i> <i>Bubo bubo</i> <i>Nyctea scandiaca</i> <i>Athene noctua</i> <i>Asio otus</i> <i>A. flammeus</i> <i>Apus apus</i> <i>Galerida cristata</i> <i>Ptyonoprogne rupestris</i> <i>Hirundo rustica</i> <i>Zoothera dauma</i> <i>Turdus viscivorus</i> <i>T. iliacus</i> <i>T. pilaris</i> <i>Loxia curvirostra</i> <i>Pyrrhula pyrrhula</i> <i>Sturnus vulgaris</i>



	<p><i>A. querquedula</i>  <i>A. clypeata</i>  <i>Netta rufina</i>  <i>Aythya ferina</i>  <i>A. nyroca</i>  <i>A. fuligula</i>  <i>Melanitta fusca</i>  <i>Bucephala clangula</i>  <i>Clangula hyemalis</i>  <i>Oxyura leucocephala</i>  <b><i>Mergus albellus</i></b>  <i>M. serrator</i></p>	<p><i>Numenius arquata</i>  <i>N. phaeopus</i>  <i>Limosa limosa</i>  <i>Scolopax rusticola</i>  <i>Philomachus pugnax</i>  <i>Vanellus vanellus</i>  <i>Pluvialis squatarola</i>  <i>P. apricaria</i>  <i>Eudromias morinellus</i>  <i>Burhinus oedicnemus</i>  <i>Larus marinus</i></p>	<p><i>Pica pica</i>  <i>Nucifraga caryocatactes</i>  <i>Pyrrhocorax pyrrhocorax</i>  <i>P. graculus</i>  <i>Corvus monedula</i>  <i>C. frugilegus</i>  <i>C. corone</i>  <i>C. corax</i></p>
<p><b>Romani</b>                      (unit II)                      (Sánchez Marco,                      new identifications)</p>	<p><i>Anas platyrhynchos</i>  <i>A. acuta</i>  <i>Buteo buteo</i>  <i>B. rufinus</i>  <i>Alectoris rufa</i>  <i>Perdix perdix</i></p>	<p><i>Columba livia s. oenas</i>  <i>Athene noctua</i>  <i>Delichon urbica</i>  <i>Hirundo rustica</i>  <i>Turdus sp.</i></p>	<p><b><i>Pinicola enucleator</i></b>  <i>Pica pica</i>  <i>Pyrrhocorax pyrrhocorax</i></p>
<p><b>Salpêtre</b>                      (Mousterian layers)                      (Mourer-Chauviré, 1975a)</p>	<p><i>Accipiter nisus</i>  <i>Falco columbarius</i>  <i>F. naumanni</i>  <i>F. tinnunculus</i>  <u><i>Lagopus lagopus</i></u>  <u><i>L. mutus</i></u>  <u><i>Lyrurus tetrix</i></u>  <i>Alectoris graeca</i>  <i>Perdix perdix</i>  <i>Coturnix coturnix</i>  <i>Eudromias cf. morinellus</i>  <i>Scolopax rusticola</i></p>	<p><i>Columba livia</i>  <i>Cuculus canorus</i>  <i>Asio flammeus</i>  <i>Otus scops</i>  <i>Athene noctua</i>  <i>Dendrocopos major</i>  <i>D. medius</i>  <i>Jynx torquilla ?</i>  <i>Galerida cristata</i>  <i>Hirundo daurica</i>  <i>Saxicola rubetra</i>  <i>Turdus merula</i></p>	<p><i>T. viscivorus</i>  <i>Emberiza citrinella</i>  <i>Serinus citrinella</i>  <i>Coccothraustes coccothraustes</i>  <i>Montifringilla nivalis</i>  <i>Garrulus glandarius</i>  <i>Pica pica</i>  <i>Pyrrhocorax pyrrhocorax</i>  <i>P. graculus</i>  <i>Corvus corax</i></p>
<p><b>Salpêtre</b>                      (Dryas 3 / Preboreal layers)                      (Vilette <i>et al.</i>, 1983)</p>	<p><b><i>Aythya fuligula</i></b>  <i>Falco subbuteo</i>  <i>F. naumanni</i>  <i>F. tinnunculus</i>  <u><i>Lagopus</i> sp.</u>  <i>Alectoris graeca s. rufa</i>  <i>Perdix perdix</i>  <i>Coturnix coturnix</i>  <i>Scolopax rusticola</i>  <i>Tringa sp.</i>  <i>Columba cf. livia</i>  <i>Cuculus canorus</i>  <i>Otus scops</i>  <i>Athene noctua</i>  <u><i>Glaucidium passerinum</i></u>  <i>Merops apiaster</i></p>	<p><i>Upupa epops</i>  <i>Dendrocopos medius</i>  <i>Jynx torquilla</i>  <i>Ptyonoprogne rupestris</i>  <i>Hirundo rustica</i>  <i>Lanius senator</i>  <i>Troglodytes troglodytes</i>  <i>Erithacus rubecula</i>  <i>Turdus pilaris</i>  <i>T. merula</i>  <i>T. iliacus s. philomelos</i>  <i>T. viscivorus</i>  <i>Acrocephalus arundinaceus</i></p>	<p><i>Acrocephalus</i> sp.  <i>Sylvia atricapilla</i>  <i>Phylloscopus</i> sp.  <i>Ficedula hypoleuca</i>  <i>Parus cristatus</i>  <i>P. ater</i>  <i>Emberiza citrinella</i>  <i>Fringilla coelebs</i>  <i>Coccothraustes coccothraustes</i>  <i>Passer domesticus</i>  <i>Pica pica</i>  <i>Nucifraga caryocatactes</i>  <i>Pyrrhocorax pyrrhocorax</i>  <i>P. graculus</i></p>
<p><b>Salpêtrière</b>                      (Aurignacian layers)                      (Vilette, 1983)</p>	<p><i>Anas platyrhynchos</i>  <i>A. clypeata</i>  <i>Aythya fuligula</i>                      cf. <i>Falco peregrinus</i>  <i>F. subbuteo</i>  <u><i>Lagopus lagopus</i></u>  <u><i>Lagopus</i> sp.</u>                      cf. <u><i>Lyrurus tetrix</i></u>  <i>Perdix perdix</i>  <i>Coturnix coturnix</i></p>	<p><i>Pluvialis apricaria</i>  <i>Charadrius hiaticula</i>  <i>Eudromias morinellus</i>  <i>Lymnocyptes minimus</i>  <i>Numenius arquata</i>  <i>Columba oenas</i>  <i>C. livia</i>  <i>Asio otus</i>  <i>Galerida cristata</i></p>	<p><i>Lullula arborea</i>  <i>Hirundo rustica</i>  <i>Cinclus cinclus</i>                      cf. <i>Turdus merula</i>  <i>T. viscivorus</i>  <i>Loxia pytyopsittacus</i>  <i>Petronia petronia</i>  <i>Plectrophenax nivalis</i>  <i>Pyrrhocorax graculus</i>  <i>Corvus corone</i></p>
<p><b>Šandalja I</b>                      (layer d)                      Malez (several publications,                      fide Tyrberg, 1998)</p>	<p><i>Tachybaptus ruficollis</i>  <i>Anser fabalis</i>  <i>Anas penelope</i>  <i>A. acuta</i>  <i>A. crecca</i>  <i>Aythya ferina</i>  <i>Aegypius monachus</i></p>	<p><i>Porzana</i> sp.  <i>Fulica atra</i>  <i>Tetrax tetrax</i>  <i>Scolopax rusticola</i>  <i>Limosa limosa</i>  <i>Larus argentatus</i>  <i>L. minutus</i></p>	<p><i>Motacilla flava</i>  <i>Bombycilla garrulus</i>  <i>Erithacus rubecula</i>  <i>Sitta europaea</i>  <i>Emberiza citrinella</i>  <i>Fringilla coelebs</i>  <i>Coccothraustes coccothraustes</i></p>

	<i>Accipiter nisus</i> <i>Falco vespertinus</i> <i>F. tinnunculus</i> <u><i>Lagopus lagopus</i></u> <u><i>L. mutus</i></u> <u><i>Tetrao tetrix</i></u> <i>Bonasa bonasia</i> <i>Coturnix coturnix</i> <i>Phasianus colchicus</i> <i>Rallus aquaticus</i>	<i>Sterna hirundo</i> <i>Columba livia</i> <i>Asio otus</i> <i>A. flammeus</i> <i>Dendrocopos minor</i> <i>Galerida cristata</i> <i>Hirundo rustica</i> <i>H. cf. Daurica</i> <i>Delichon urbica</i>	<i>Pyrhula pyrrhula</i> <i>Sturnus vulgaris</i> <i>Lanius collurio</i> <i>Pica pica</i> <i>Pyrhcorax graculus</i> <i>Corvus monedula</i> <i>C. corone</i> <i>C. corax</i>
<b>Šandalja II</b> (layer E) Malez (several publications, fide Tyrberg, 1998)	<i>Podiceps auritus</i> <i>Falco subbuteo</i> <i>F. vespertinus</i> <i>F. tinnunculus</i> <u><i>Tetrao tetrix</i></u> <u><i>T. urogallus</i></u> <i>Coturnix coturnix</i> <i>Grus grus</i> <i>Rallus aquaticus</i> <i>Otis tarda</i>	<i>Tetrax tetrax</i> <i>Vanellus vanellus</i> <i>Scolopax rusticola</i> <i>Larus ridibundus</i> <i>Columba livia</i> <i>Tyto alba</i> <i>Bubo bubo</i> <i>Asio flammeus</i> <i>Dendrocopos medius</i> <i>Dendrocopos minor</i>	<i>Galerida cristata</i> <i>Motacilla alba</i> <i>Garrulus glandarius</i> <i>Pica pica</i> <i>Pyrhcorax pyrrhcorax</i> <i>P. graculus</i> <i>Corvus monedula</i>
<b>Spinagallo</b> (Pavia, 1996)	<i>Geronticus eremita</i> <i>Anser erythropus*</i> <i>Branta sp.</i> <i>Anas penelope</i> <i>A. querquedula</i> <i>Marmarometta angustirostris</i> <i>Accipiter gentilis</i> <i>A. nisus</i> <i>Falco tinnunculus</i> <i>F. columbarius</i> <i>F. subbuteo</i> <i>F. eleonora</i> <i>Coturnix coturnix</i> <i>Rallus aquaticus</i> <i>Grus sp.</i> <i>Recurvirostra avosetta</i> <i>Scolopax rusticola</i> <i>Larus minutus</i> <i>L. ridibundus</i> <i>Columba livia</i> <i>C. livia s. oenas</i>	<i>C. palumbus</i> <i>Streptopelia turtur</i> <i>Cuculus canorus</i> <i>Tyto sp.</i> <i>Otus scops</i> cf. <b><i>Surnia ulula</i></b> <i>Athene sp.</i> <i>Asio otus</i> <i>Caprimulgus cf. europaeus</i> <i>Apus apus s. pallidus</i> <i>A. melba</i> <i>Picus viridis</i> <i>Dendrocopos leucotos</i> <i>Calandrella brachydactyla</i> <i>Lullula arborea</i> <i>Hirundo sp.</i> <i>Anthus sp.</i> <i>Prunella modularis</i> <i>Erithacus rubecula</i> <i>Oenanthe cf. hispanica</i>	<i>Monticola solitarius</i> <i>Turdus spp.</i> <i>Sylvia sp.</i> <i>Phylloscopus sibilatrix</i> <i>S. collybita</i> <i>Lanius senator</i> <i>Sturnus sp.</i> <i>Petronia petronia</i> <i>Fringilla coelebs</i> <i>s. montifringilla</i> <i>Serinus sp.</i> <i>Carduelis chloris</i> <i>Carduelis sp.</i> <i>Pyrhula pyrrhula</i> <i>Coccothraustes coccothraustes</i> <i>Emberiza spp.</i> <i>Pica pica</i> <i>Pyrhcorax graculus</i> <i>Corvidae indet.</i> <i>Passeriformes indet.</i>
<b>Temnata</b> (layer 3d) (Boev, 1994)	<i>Aquila pomarina</i> <i>Aegyptus monachus</i> <i>Circus cyaneus</i> <i>Falco tinnunculus</i> <i>Falco sp.</i>	<i>Alectoris graeca</i> <i>Perdix perdix</i> <i>Streptopelia sp.</i> <i>Columba oenas</i> <i>Bubo bubo</i>	<i>Alauda cf. arvensis</i> <i>Nucifraga caryocatactes</i> <i>Pica pica</i> <i>Corvus monedula</i>
<b>Temnata</b> (layer 3a) (Boev, 1994)	<i>Falco tinnunculus</i> <i>Falco cf. subbuteo</i> <i>Tetrao sp.</i> <i>Perdix perdix</i> <i>Coturnix coturnix</i> <i>Strix aluco</i>	<i>Asio otus</i> cf. <u><i>Aegolius</i></u> sp. <i>Apus apus</i> <i>Dendrocopos minor</i> <i>Turdus viscivorus</i>	<i>Pyrhula pyrrhula</i> <i>Sturnus vulgaris</i> <i>Pyrhcorax graculus</i> <i>Corvus monedula</i> <i>Corvus sp.</i>
<b>Torre Nave</b> (Cassoli in Bulgarelli, 1972)	<i>Ixobrychus minutus</i> <i>Anas platyrhynchos</i> <i>Falco subbuteo</i> <i>F. tinnunculus</i> <i>Alectoris graeca</i> <i>Perdix perdix</i> <i>Coturnix coturnix</i> <i>Otis tetrax</i> <i>Crex crex</i> <i>Columba livia</i>	<i>C. palumbus</i> <i>Pterocles orientalis</i> <i>Athene noctua</i> <i>Strix aluco</i> <i>Apus melba</i> <i>Picus viridis</i> <i>Dendrocopos medius</i> <i>Hirundo rustica</i> <i>Turdus pilaris</i> <i>T. viscivorus</i>	<i>T. philomelos</i> <i>T. merula</i> <i>Carduelis chloris</i> <i>Garrulus glandarius</i> <i>Pyrhcorax pyrrhcorax</i> <i>P. graculus</i> <i>Corvus monedula</i> <i>C. frugilegus</i> <i>C. corax</i>



<b>Torre in Pietra</b> (layer d) (Cassoli, 1978)	<i>Phalacrocorax carbo</i> <i>Botaurus stellaris</i> <i>Ixobrychus minutus</i> <i>Cygnus cygnus</i> <i>Anser fabalis</i> <i>A. albifrons</i> <i>Anas platyrhynchos</i>	<i>A. penelope</i> <i>A. acuta</i> <i>Aythya nyroca</i> <i>Pandion haliaeetus</i> <i>Alectoris graeca</i> <i>Perdix perdix</i> <i>Crex crex</i>	<i>Alauda arvensis</i> <i>Turdus pilaris</i> <i>T. iliacus</i> <i>T. merula</i> <i>Nucifraga caryocatactes</i>
<b>Trebački</b> (Epigravettian) (Dimitrijević <i>et al.</i> , 2000)	<i>Falco</i> sp. <i>Lagopus lagopus</i> <i>Tetrao tetrix</i> <i>Crex crex</i> <i>Gallinago gallinago</i> <i>Apus apus</i> <i>Galerida cristata</i> <i>Alauda arvensis</i> <i>Lullula arborea</i> <i>Hirundo rustica</i> <i>Delichon urbica</i>	<i>Lanius minor</i> <i>Turdus viscivorus</i> <i>T. merula</i> <i>T. pilaris</i> <i>T. philomelos</i> <i>T. cf. torquatus</i> <i>T. cf. iliacus</i> <i>Luscinia luscinia</i> <i>Sturnus vulgaris</i> <i>Fringilla montifringilla</i>	<i>F. cf. coelebs</i> <i>Carduelis chloris</i> <i>Pyrrhula pyrrhula</i> <i>Coccothraustes coccothraustes</i> <b><i>Pinicola enucleator</i></b> <i>Emberiza citrinella</i> <i>Passer domesticus</i> <i>Passeriformes</i> indet.
<b>Ubeidiya</b> (layer II-23) Tchernov (several publications, <i>fide</i> Tyrberg, 1998)	<i>Podiceps cristatus</i> <i>P. auritus</i> <i>Phalacrocorax africanus</i> <i>P. carbo</i> <i>Anhinga rufa</i> <i>Tadorna tadorna</i> <i>Anas crecca</i> <i>A. acuta</i> <i>A. penelope</i> <i>Aythya</i> sp. <i>Milvus pygmaeus</i> <i>Falco subbuteo</i> <i>Falco</i> sp. <i>Aquila</i> sp. <i>Alectoris baryosefi</i> <i>Francolinus</i> sp. <i>Rallus aquaticus</i>	<i>Porzana</i> spp. <i>Crex crex</i> <i>Fulica stekelesi</i> <i>Porphyrio porphyrio</i> <i>Columba livia</i> <i>Strix butleri</i> <i>Asio cf. capensis</i> <i>Ketupa zeylonensis</i> <i>Melanocorypha calandra</i> <i>M. gracilis</i> <i>Alauda jordanica</i> cf. <i>Calandrella</i> sp. <i>Motacilla alba</i> <i>M. cf. cinerea</i> <i>Saxicola cf. torquata</i> <i>Oenanthe</i> sp.	<i>Cercomela cf. melanura</i> <i>Turdus</i> sp. <i>Acrocephalus</i> sp. <i>Lanius excubitor</i> <i>Lanius</i> sp. <i>Parus</i> sp. <i>Petronia brevirostris</i> <i>Fringilla coelebs</i> <i>Carduelis cf. chloris</i> <i>Sturnus vulgaris</i> <i>Sturnus</i> sp. <i>Pica pica</i> <i>Corvus monedula</i> <i>C. corone</i> <i>C. corax</i>
<b>Valdegoba</b> (Sanchez Marco, <i>new identifications</i> )	<i>Anser fabalis</i> <i>Anas crecca</i> <i>A. platyrhynchos</i> <i>A. platyrhynchos s. acuta</i> <i>A. querquedula</i> <b><i>Somateria</i></b> sp. <i>Milvus migrans</i> <i>Gypaetus barbatus</i> <i>Gyps fulvus</i> <i>Aegyptius monachus</i> <i>Accipiter gentilis</i> <i>Buteo buteo</i> <b><i>B. lagopus</i></b> <i>Falco naumanni</i> <i>F. tinnunculus</i>	<i>F. peregrinus</i> <i>Lagopus mutus</i> <i>Tetrao tetrix</i> <i>Alectoris graeca</i> <i>Coturnix coturnix</i> <i>Otis tetrix</i> <i>Columba livia s. oenas</i> <i>C. palumbus</i> <i>Caprimulgus</i> sp. <i>Athene noctua</i> <i>Alauda arvensis</i> <i>Hirundo rustica</i> <i>Delichon urbica</i> <i>Anthus spinoletta</i> <i>Prunella collaris</i>	<i>P. modularis</i> <i>Oenanthe oenanthe</i> <i>Turdus</i> sp. <i>Muscicapa striata</i> <i>Emberiza calandra</i> <i>E. citrinella</i> <i>Acanthis cf. cannabina</i> <i>Pinicola enucleator</i> <i>Petronia petronia</i> <i>Sturnus</i> sp. <i>Pica pica</i> <i>Pyrrhonorax pyrrhonorax</i> <i>P. graculus</i>
<b>Varshets</b> (Boev, 2002)	Anatini indet. <i>Accipiter</i> sp. <i>Circus</i> sp. <i>Aquila cf. clanga</i> <i>Aquila</i> sp. <i>Hieraetus cf. fasciatus</i> <i>Hieraetus</i> sp. <i>Gyps</i> sp. <i>Buteo</i> sp. Accipitridae indet. <i>Falco cf. tinnunculus</i> <i>F. bakalovi</i> <i>Falco</i> sp. <i>Tetrao aff. partium</i>	<i>Porzana</i> sp. <i>Otis aff. khosatzkii</i> Otididae indet. <i>Actitis balcanica</i> Charadriiformes indet. <i>Apus baranensis</i> <i>Columba</i> spp. <i>Streptopelia</i> sp. <i>Athene</i> sp. <i>Anthus</i> sp. <i>Motacilla</i> sp. <i>Melanocorypha</i> sp. <i>Alauda</i> sp. <i>Lullula</i> sp.	<i>Fringilla</i> sp. <i>Loxia pateri</i> <i>Coccothraustes simeonovi</i> <i>Carduelis</i> sp. <i>Emberiza</i> sp. <i>Turdus cf. merula</i> <i>T. cf. philomelos</i> <i>T. cf. iliacus</i> <i>Turdus</i> sp. <i>Erithacus</i> sp. <i>Sturnus</i> sp. <i>Pyrrhonorax cf. pyrrhonorax</i> <i>P. cf. graculus</i> <i>Pica</i> sp.

	<i>Lagopus balcanicus</i> cf. <i>Perdix</i> sp. <i>Chauvireria balcanica</i> <i>Phasianus</i> sp. <i>Gallinula balcanica</i>	<i>Lullula arborea</i> <i>Galerida</i> spp. <i>Eremophila</i> sp. <i>Parus</i> sp. <i>Regulus bulgaricus</i> cf. <i>Muscicapa</i> sp.	<i>Corvus</i> cf. <i>monedula</i> <i>Corvus</i> sp. Corvidae indet.
<b>Victoria</b> (Sánchez Marco, new identifications)	<b><i>Cygnus</i> cf. <i>olor</i></b> <i>Tadorna tadorna</i> cf. <i>Anas crecca</i> <i>Milvus migrans</i> cf. <i>Aegypius monachus</i> <i>Buteo</i> cf. <i>buteo</i> <i>Falco peregrinus</i> <u><i>Tetrao tetrix</i></u> <i>Alectoris graeca</i> <i>Himantopus himantopus</i> <i>Syrhaptes</i> s. <i>Pterocles</i> <i>Columba livia</i> s. <i>oenas</i> <i>C. palumbus</i>	<i>Tyto alba</i> <i>Bubo bubo</i> <i>Athene noctua</i> <i>Strix aluco</i> <i>Picus viridis</i> <i>Dryocopus martius</i> <i>Calandrella</i> cf. <i>brachydactyla</i> <i>Lullula arborea</i> <i>Alauda arvensis</i> <i>Hirundo rustica</i> <i>Anthus spinoletta</i> <i>Turdus</i> sp. <i>Prunella modularis</i> <i>Sylvia hortensis</i>	<i>S.</i> cf. <i>atricapilla</i> <i>Ficedula hypoleuca</i> <i>Emberiza</i> cf. <i>citrinella</i> <i>E. melanocephala</i> <i>Carduelis carduelis</i> <i>Sturnus</i> sp. <i>Pica pica</i> <i>Pyrrhocorax pyrrhocorax</i> <i>P. graculus</i> <i>Corvus monedula</i> <i>C. frugilegus</i> s. <i>corone</i> <i>C. antecorax</i>
<b>Vindija</b> (layer E + F) Malez (several publications, fide Tyrberg, 1998)	<i>Ardeola</i> sp. <i>Anas platyrhynchos</i> <i>A. querquedula</i> <i>A. crecca</i> <i>Aythya fuligula</i> <i>A. nyroca</i> <i>A. ferina</i> <i>Mergus merganser</i> <i>Buteo buteo</i> <i>Accipiter gentilis</i> <i>Falco rusticolus</i> <i>Falco subbuteo</i> <u><i>Lagopus mutus</i></u> <u><i>L. lagopus</i></u> <u><i>Tetrao urogallus</i></u> <u><i>T. tetrix</i></u>	<i>Alectoris graeca</i> <i>Phasianus colchicus</i> <i>Gallinula chloropus</i> <i>Rallus aquaticus</i> <i>Vanellus vanellus</i> <i>Recurvirostra avosetta</i> <i>Scolopax rusticola</i> <i>Gallinago gallinago</i> <i>Larus minutus</i> <i>Tyto alba</i> <i>Bubo bubo</i> <b><i>Nyctea scandiaca</i></b> <i>Asio otus</i> <i>A. flammeus</i> <i>Strix aluco</i>	<i>Dendrocopos major</i> <i>Hirundo rustica</i> <i>Lanius excubitor</i> <i>Sylvia borin</i> <i>Sturnus vulgaris</i> <i>Nucifraga caryocatactes</i> <i>Garrulus glandarius</i> <i>Pica pica</i> <i>Corvus corone</i> <i>C. monedula</i> <i>Pyrrhocorax pyrrhocorax</i> <i>P. graculus</i>

## APPENDIX 2

Northern irruptive species in the Mediterranean region during the Quaternary. Current distributions after Cramp (1998).

[*Especies nórdicas irruptivas en la región mediterránea durante el Cuaternario. Los datos de distribución actual se han tomado de Cramp (1998).*]

Species [Especie]	Current European distribution [Distribución europea actual]	Areas of irruption [Área de irrupción]	Direction of movements [Dirección de los movimientos]
<i>Cygnus olor</i>	Resident in Europe from France east to Black sea. Wintering and resident in zones of southern Italy, Balkans and Anatolia.	Irruptive species in the islands, Iberia and part of Italy	Movements to south and west.
<i>Cygnus cygnus</i>	Winters in north and central Europe, Adriatic coast, southern Balkans, Black sea and southern Anatolia.	Irruptive species in the islands, Iberia and Italy.	Movements to south and west.
<i>Cygnus columbianus</i>	Winters in coasts of British islands, from Germany west to north France, and in inland points to Azure coast.	Irruptive in the whole Mediterranean region, except in Azure and Adriatic coasts.	Movements to south.

<i>Anser brachyrhynchus</i>	Winters in British islands and north Germany.	Irruptive in the whole Mediterranean region.	Movements to south.
<i>Branta bernicla</i>	Winters in coasts from Denmark to west France.	Irruptive in the whole Mediterranean region.	Movements to south.
<i>Branta leucopsis</i>	Winters in British islands and north Germany.	Irruptive in the whole Mediterranean region.	Movements to south.
<i>Aythya marila</i>	Winters in coasts of north Europe, Adriatic and Black sea, also in points of central Europe.	Irruptive in the whole Mediterranean region, except in Adriatic coasts.	Movements to south.
<i>Melanitta fusca</i>	Winters in Atlantic coasts of Europe, in north-west Mediterranean coasts and in Black sea.	Irruptive in the whole Mediterranean region, except in north Adriatic coast, and from north Italy west to coasts of northern half of Iberia.	Movements to south.
<i>Melanitta nigra</i>	Winters in Atlantic and Baltic coasts from Skandinavia to Mauritania, also in coasts of Iberia, south France and north Italy.	Irruptive in the islands and south Italy to east.	Movements to south and west.
<i>Bucephala clangula</i>	Winters in north Europe, inland points, Balkan peninsula, Anatolia, Azure and Adriatic coasts.	Irruptive species in the islands, Iberia and Greece.	Movements to south and west.
<i>Somateria molissima</i>	Resident and wintering in Atlantic coasts of north and central Europe.	Irruptive in the whole Mediterranean region.	Movements to south.
<i>Clangua hyemalis</i>	Winters in coasts of north, south France and north Italy.	Irruptive in the whole Mediterranean region, except in north Italy and south France.	Movements to south.
<i>Mergus merganser</i>	Winters in north Europe, inland points, Adriatic coasts, northern Balkan peninsula and points of Anatolia.	Irruptive in west Mediterranean area, islands, southern Balkanic peninsula and Anatolia.	Movements to south and west.
<i>Mergus albellus</i>	Winters in coasts of central and western Europe, inland points, Adriatic coasts, northern Balkan peninsula and points of Anatolia.	Irruptive in west Mediterranean area, islands, southern Balkanic peninsula.	Movements to south and west.
<i>Buteo lagopus</i>	Winters in north, central and east Europe, in Balkan peninsula and points of northern Anatolia.	Irruptive in west Mediterranean area, islands, southern Balkanic peninsula and Anatolia.	Movements to south and west.
<i>Gallinago media</i>	Breeds in North and Eastern Europe.	Irruptive in the whole Mediterranean region.	Movements to south and west.
<i>Nyctea scandiaca</i>	North Eurasia.	Irruptive in the whole Mediterranean region.	Movements to south.
<i>Surnia ulula</i>	Resident in northern Eurasia.	Irruptive in the whole Mediterranean region.	Movements to south.
<i>Aegolius funereus</i>	Resident in mountains and in the taiga.	Irruptive in the islands, Iberia, Italy and southern Anatolia.	Movements to south and west.
<i>Eremophila alpestris</i>	Resident in Balkan peninsula, Anatolia and Atlas. Wintering species in northern and eastern Europe.	Irruptive in islands and western Mediterranean region.	Movements to south and west.
<i>Carpodacus erythrinus</i>	Breeding in north and east Europe, in points of central Europe and Anatolia.	Irruptive in the whole Mediterranean region except in Anatolia.	Movements to south and west.



<i>Plectrophenax nivalis</i>	Winter species in north, centre and east of Europe. Also in Atlantic coasts of France and northern coasts of Iberia.	Irruptive in the whole Mediterranean region.	Movements to south.
<i>Pinicola enucleator</i>	Resident and wintering species from Scandinavia to the east.	Irruptive in the whole Mediterranean region.	Movements to south.
<i>Loxia pytyopsittacus</i>	Resident in Scandinavia and in the north of Eastern Europe.	Irruptive in the whole Mediterranean region.	Movements to south.
<i>Loxia leucoptera</i>	Resident in the taiga belt, from Eastern Europe to the east.	Irruptive in the whole Mediterranean region.	Movements to south.
<i>Pyrrhula pyrrhula</i>	Resident and wintering species in the whole of Europe, except two southern thirds of Iberia, south of Greece, south of Anatolia and in the mediterranean islands.	Irruptive in the islands and southern Iberia, Greece and Anatolia.	Movements to south.
<i>Bombycilla garrulus</i>	Winters in North, centre and east of Europe. Reaches the Balkan mountains.	Irruptive in the whole region, except in the north of the Balkanic peninsula.	Movements to south.
<i>Carduelis flammea</i>	Resident in north and central Europe. Winters from France to the east.	Irruptive in the whole Mediterranean region, except in north Iberia, France and north Italy.	Movements to south.

## APPENDIX 3

Nowadays surviving species in the east part of the Mediterranean region, with fossil record in the west Mediterranean area during the Quaternary. Current distributions after Cramp (1998).

[*Actuales especies supervivientes en la parte este de la región del Mediterráneo, con fósiles registrados en el área del oeste del Mediterráneo durante el Cuaternario. Los datos de distribución actual se han tomado de Cramp (1998).*]

Species [Especie]	Current European distribution [Distribución europea actual]	Highlighted in Appendix 1 when appeared in localities [Subrayado en el Apéndice 1 cuando apareció en alguna localidad]
<i>Anser erythropus</i>	Breeding species in north Eurasia. It winters in Balkan peninsula and coast of Black sea.	From Italy west to Iberia.
<i>Haliaeetus albicilla</i>	Resident and wintering species in north and east Europe, in zones of the Balkans and Anatolia.	From north Italy (also Corsica and Sardinia) west to Iberia.
<i>Circus macrourus</i>	Breeds north Black sea. Winters in east Mediterranean region.	From north Italy (also Corsica and Sardinia) west to Iberia.
<i>Luscinia luscinia</i>	Breeds in eastern Europe to east. Vagrant in Balkans and Anatolia.	From the west of the MR.
<i>Emberiza melanocephala</i>	Breeds in Italy, Balkan peninsula and Anatolia.	From western islands (from Corsica and Sardinia), southern France and Iberia.