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Birds and humans in the Holocene: the case of Qumran Cave 24 (Dead Sea, Israel)

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Abstract. Qumran Cave 24 is situated in the Jordan Rift Valley. Its prehistoric stratigraphy spans from the late Natufian to the Chalcolitic period and these deposits yielded a large quantity of archaeological materials particularly from the Pre-Pottery Neolithic levels. The preservation of organic material was in general very good, due to the dry conditions of the area, and this fact allowed the collection of rich botanical and faunal samples. The study of the bird assemblage, composed of over one thousand specimens, was very interesting for the wide range of species identified, for the frequency of some of them (e.g., the Rock Dove, *Columba livia*) and for the number and kind of human modifications detected on the bones. The results of the analysis shed some light on the modality and changes in relationship between birds and ancient populations (not considered simply as human exploitation of birds) in the southern Levant, particularly at the beginning of agriculture.

Key words: Southern Levant, birds, Neolithic**,** human behaviour.

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I. INTRODUCTION

The Palaeolithic-Neolithic transition represents one of the most interesting and complex periods in human history when subsistence strategies, mobility patterns, social characteristics and exploitation of natural resources changed dramatically. The southern Levant is generally recognized as the first area where this transition started. Despite its importance, and because of its complexity, this period still presents many unknown aspects. For example, data on the changes in avian exploitation by humans during this transition are still very limited.

The analysis of the bird sample from Qumran Cave 24, provided the possibility to increase our knowledge on avifaunal association and to contribute to the climatic reconstruction of the lower Jordan area in the considered periods. But above all, this analysis allowed the investigation of the human use of avian resources during the transition from hunting and gathering to food production. Furthermore**,** it helped in the reconstruction of mobility strategies employed by the human groups that occupied the site in the different periods. Therefore this paper is focused mainly on the evidence of variety in human exploitation of the birds at this site.

II. THE CAVE

Qumran Cave 24 is a small cave-site with an adjacent rock shelter located close to the Dead Sea, in the Jordan Valley, 285 meters below sea level (Fig. 1).

Fig. 1. The site of Qumran Cave 24 (photo by F. ALHAIQUE).

The most recent excavations have been carried out under the direction of Prof. A. GOPHER in 1997 and 1998 uncovering parts of the deposits left in the central part of the cave (Fig. 2).

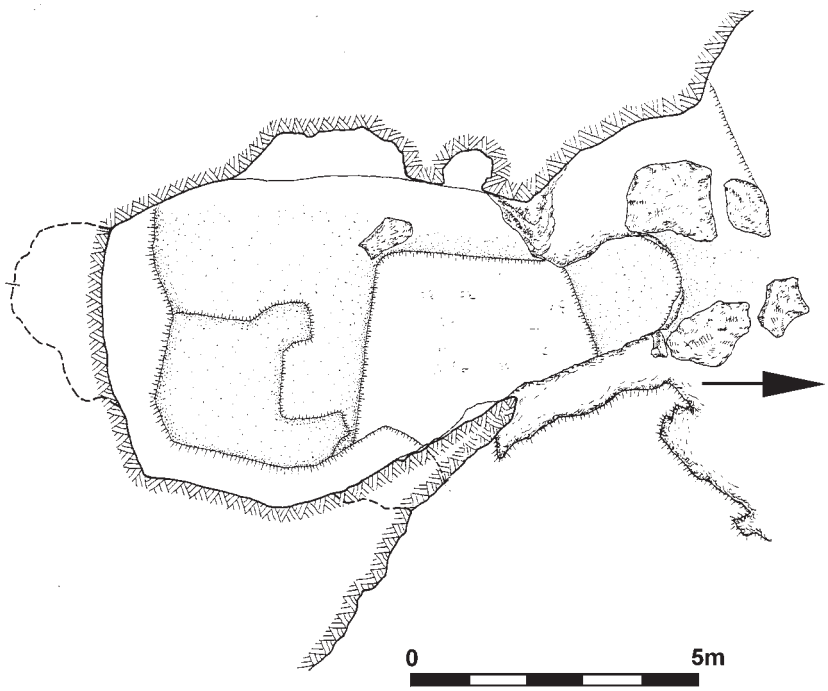

Fig. 2. Plan of the cave after the most recent excavation.

Archaeologically, Qumran Cave 24 is a multi-layered site. The deposit possibly started accumulating some time at the very end of the Natufian, on top of an old Lake Lisan beach that left its signs in the cave in the form of a pebble layer with plant remains typical of lake-shores (e.g. drift wood). The latest periods present at the cave are mainly Hellenistic (excavated in the framework of an earlier research project), while the layers analysed in the present work span from the Natufian to the Chalcolithic period. The uncalibrated ^{14}C dates suggest a range from ca. 10,100 to ca. 5,500 years B.P. Since no dates are available from the lowermost parts of the stratigraphy, the archaeological sequence is probably from ca. 11,000 – 10,500 and ending ca. 6,000-5,500 years B.P. It must be underlined that there are gaps between the occupations that are clearly seen in the stratigraphic sequence and in the variable density of archaeological finds. These include flint tools and ornamental items in each layer, together with ground-stone tools and beads in the Pre Pottery Neolithic A (PPNA) layer, stone encircled hearths in the Pre Pottery Neolithic B (PPNB) (the best represented period in the deposit), pottery sherds and vessels and stone-built hearths in the Pottery Neolithic (PN) (mainly of the Wadi Raba culture), stone-built installations, pottery and art items in the Chalcolithic.

The dry climatic conditions of the area allowed good preservation of organic material present in the deposit. All the excavated soil was sieved (using 2 mm mesh) allowing an almost complete recovery of the remains, therefore the faunal samples are also quite large. The characteristics of the faunal association and the plant remains recovered indicate a damp climate during the first phase of Natufian and especially the Pre Pottery Neolithic in the area of the site, as already pointed out by DARMON (1996). These changes are also correlated with the development of Lake Lisan, and are probably linked to the warming that occurred at the beginning of Holocene.

The faunal analysis, the study of archaeological finds and the fact that there are gaps in the deposit indicate that the site was not occupied continuously. Moreover, the occupations were generally short, as suggested by the limited number of human artifacts found in each layer. It may have been a seasonal site, and at least for the Pottery Neolithic and the Chalcolithic periods (and maybe even during parts of the PPNB) it may have been used by herders on their seasonal movement. Based on the presence of gazelle and ibex foetal bones, the occupation probably occurred during the late winter/early spring. Such a model of seasonal permanence with animals in this low, relatively warm region is well known historically and persists up to the present day. Anyway, it must be said that the wild fauna in the sample dominates over domestic animals in almost all archaeological layers.

III. CHARACTERISTICS OF THE SAMPLE, ANALYSIS OF DATA AND INTERPRETATION OF RESULTS

The avian sample from inside the cave is composed of 1043 identified remains (CRAMP & SIMMONS 1977, 1980, 1993; PAZ 1987); 37 species belonging to 9 main orders were determined (Table I). Fig. 3 shows the percentage distribution of individuals for each order in the PPNB because it is the largest sample and may represent the whole assemblage. Furthermore, this period is crucial in the development of an economy based on food production, especially as regards animal resources.

There is a striking lack of homogeneity in the distribution of bird remains in the various parts of the deposit. As already mentioned, the largest assemblages are from the two Pre Pottery Neolithic strata A and B.

The best represented orders in the sample, as expected, are Passeriformes, in particular some corvids (for example *Corvus corone* and *Corvus monedula*) and Columbiformes, (in particular *Columba livia*), as these two orders include typical rocky species; however, nocturnal and diurnal raptors (Falconiformes and Strigiformes) as well as typical water birds, such as Anseriformes and Gruiformes are also present.

Table I

List of the species identified in the sample of Qumran Cave 24, with NISP and MNI values. NAT – Natufian; PPNA – Pre Pottery Neolithic A; PPNB – Pre Pottery Neolithic B; PN – Pottery Neolithic; CHAL – Chalcolithic

Taxa	Successive cultural layers					
	NAT.	PPNA/PPNB	PPNB	PPN/PN	PN	CHAL.
1	2	3	4	5	6	7
Podicipediformes:						
Podiceps nigricollis BREHM, 1831	1\1					
Anseriformes:						
Anseriformes indet.			7			1\1
Anser sp.	1\1	7	19\?			1\1
Anser anser (LINNAEUS, 1758)			4\2			9\2
Anser albifrons (SCOPOLI, 1769)		1\1	4\1			
Anser fabalis (LATHAM, 1787)						
Anas sp.			1			
Anas platyrhynchos LINNAEUS, 1758		2\1	4\1			1\1
Falconiformes:						
Falconiformes indet.			2			
Milvus migrans (BODDAERT, 1783)		7\1	6\1			
Buteo sp.		1	3			
Buteo rufinus (CRETZSCHMAR, 1827)		1\1	7\2			
Buteo buteo (LINNAEUS, 1758)		1\1	1\1			1\1
Aquila chrysaetos (LINNAEUS, 1758)			1\1			
Aquila pomarina C. L. BREHM, 1831		2\1	1\1			
Gyps sp.		1				
Falco sp.			1			
Galliformes:						
Galliformes indet.			1			1
Alectoris chukar (J. E. GRAY, 1830)		2\1	10\4			2\1
Ammoperdix heji (TEMMINCK, 1825)		1\1	1			
Coturnix coturnix (LINNAEUS, 1758)			4\1			
Gruiformes:						
Rallidae indet.		1				
Fulica atra LINNAEUS, 1758			2\1			
Rallus acquaticus LINNAEUS, 1758			1\1			
Porzana porzana (LINNAEUS, 1766)			2\1	1\1		
Grus grus (LINNAEUS, 1758)		4\1	14\1			
Charadriiformes:						
Scolpax rusticola LINNAEUS, 1758			2\1			
Columbiformes:						
Columbiformes indet.	1					
Columba sp.			12			
Columba livia GMELIN, 1789	17\3	62\15	498\96	2\1	7\2	11\2
Columba palumbus LINNAEUS, 1758			1\1		1\1	
Streptotelia sp.						1

Table I cont.

1	2	3	4	5	6	7
Strigiformes:						
Athene noctua (SCOPOLI, 1769)		2\1				
Asio sp.			1			
Asio otus (LINNAEUS, 1758)			1\1			
Passeriformes:						
Passeriformes indet.	2		16	1		2
Alauda arvensis LINNAEUS, 1758		1\1	6\2			
Hirundo rustica LINNAEUS, 1758		1\1	17\3			
Motacilla sp.			2			
Oenanthe sp.			1	1		
Turdus sp.			1			
Turdus merula LINNAEUS, 1758			3\2		2\1	3\2
Sylvia sp.				1	2\1	
Lanius sp.			2			
Corvidae	1	1	4			
Garrulus glandarius (LINNAEUS, 1758)	1	1\1	12\1			
Corvus sp.	1	6	17		1	
Corvus corone LINNAEUS, 1758	9\2	9\2	65\4		1\1	
Corvus monedula LINNAEUS, 1758	3\1	7\1	10\2			
Corvus frugilegus LINNAEUS, 1758			2\1			
Corvus ruficollis LESSON, 1831		1\1	3\1			1\1
Corvus corax LINNAEUS, 1758		1\1	3\1			
Corvus rhipidurus HARTERT, 1918			2\1			
Sturnus vulgaris LINNAEUS, 1758	1	3\1	21\2		1\1	
Passer sp.			1			
Passer domesticus (LINNAEUS, 1758)			3\1		3\2	
Fringillidae			2			
Fringilla coelebs LINNAEUS, 1758			10\2			
Carduelis chloris (LINNAEUS, 1758)			1\1			
TOTAL	38\8	126\34	824\149	6\2	18\9	34\12

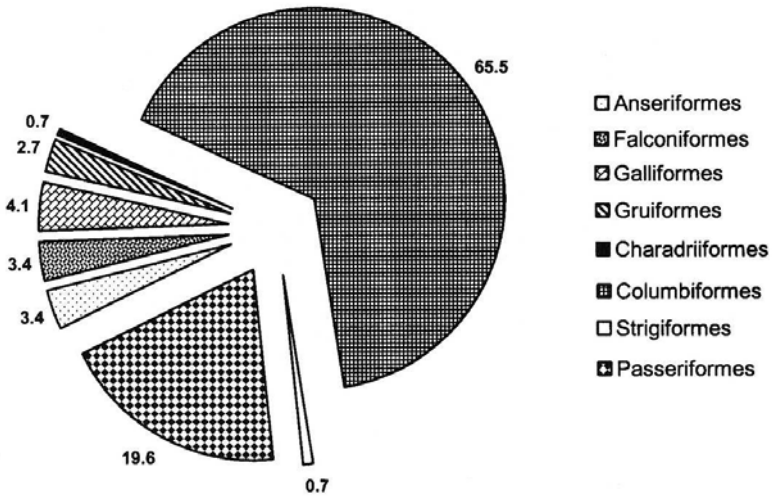

Fig. 3. Diagram showing the percentage of the remains for each order identified in the PPNB sample of Qumran Cave 24.

It is also important to note that, in contrast to all expectations, the Galliformes and in particular the Chukar *Alectoris chukar*, are not well represented in the sample, while in many other contemporary sites of the southern Levant this is the most frequent species. The finding of cut marks and fire traces on its remains have often provided evidence for the use of this bird as food (PICHON 1984; TCHERNOV 1994).

In Qumran Cave 24 the most frequent species, in almost all layers, is the Rock Dove that in PPNA and PPNB (see Table I) represents over 50% of the total sample, both as number of identified specimens (NISP) and minimum number of individuals (MNI).

The preservation of the bird sample is generally good - including a relatively high percentage (12%) of complete specimens. In some cases, the bones have been fractured and then reset by salt crystals.

Several traces of different origin have been detected on bird bones: root marks, carnivore gnaw marks, fire traces and cut-marks. Trace distribution varies among the different species, and modifications are particularly frequent on the most represented bird - the Rock Dove. In particular, it is interesting to note that, considering the sample as a whole, fire traces have been found mainly on Columbiformes (over 50%), while for other orders, that could also be considered good food sources, burnt bones represent only a minimal percentage (Fig. 4). Furthermore, the distribution of fire traces in the different layers of the deposit is not homogeneous. This seems to be a preliminary indication of a different level of exploitation of avian resources during the various archaeological periods (Fig. 5).

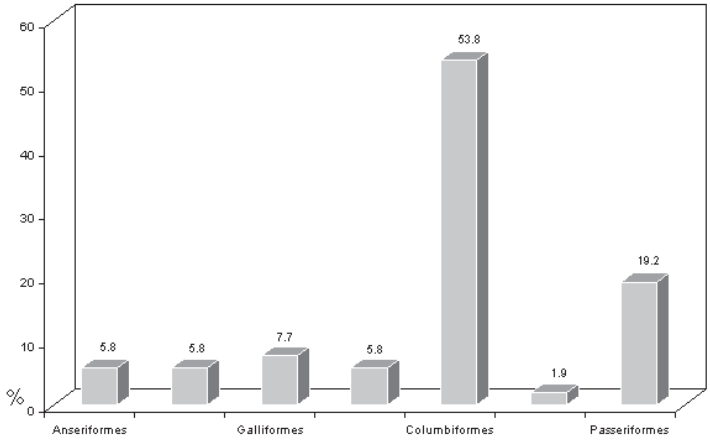

Fig. 4. Diagram showing the percentage of the remains with fire traces in the various orders in the sample of Qumran Cave 24.

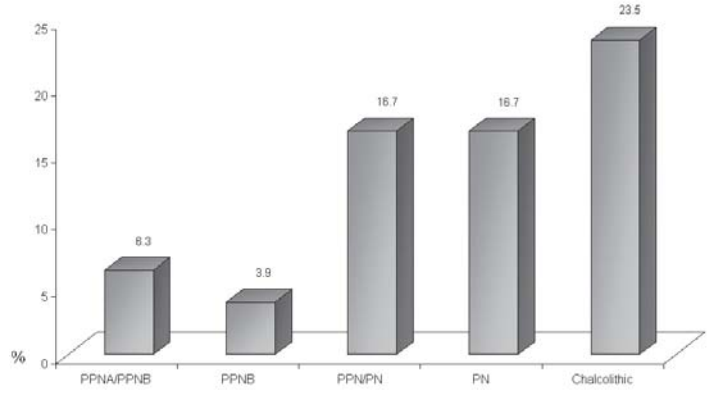

Fig. 5. Diagram showing percentage of the remains with fire traces in the different archaeological layers in Qumran Cave 24 sample.

This situation is very well represented by the Rock Dove, for which the percentage of burnt remains on the total NR of each layer shows that fire traces are not equally represented in the different levels of the deposit, as shown in Fig. 6. In fact, the most recent archaeological strata present a higher percentage of burnt remains, and in particular the Pottery Neolithic and Chalcolitic.

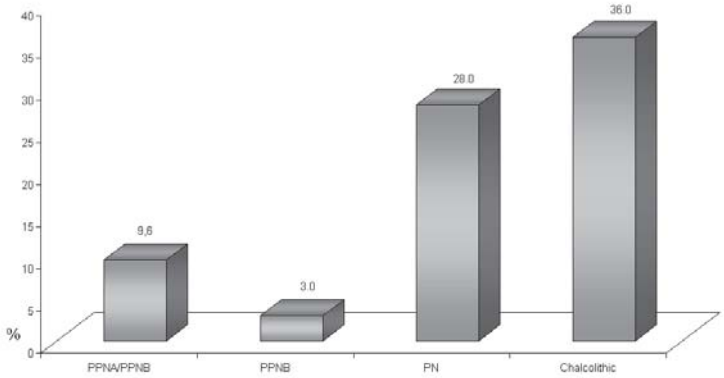

Fig. 6. Diagram showing the percentage of the remains of *C. livia* with fire traces on the total NR calculated in the different archaeological levels.

The available data allowed not only the identification of species that had probably been used by the ancient human populations living in Qumran Cave 24, but also to understand the different kinds of exploitation of avian resources.

For the most frequent species, the Rock Dove, it must be underlined that besides fire traces, several remains with cut-marks have been identified, mainly coracoids (Fig. 7). The position of these marks is in general similar to that found on bird bones from the Upper Palaeolithic site of Grotta Romanelli in Italy (TAGLIACOZZO and CASSOLI 1997), and even if they do not seem to be related to actual butchering, they are a clear indication of human intervention on *C. livia*.

Fig. 7. Coracoid of *C. livia* with cut-marks in the central body of the bone.

The large number of *C. livia* remains also allowed the analysis of the anatomical part representation for this species (Fig. 8). The results show that the most frequent elements of the skeleton are the coracoid, humerus and sternum. This fact has already been considered by MOURER-CHAUVIRÉ (1983) as a clear indication of a considerable human contribution to the accumulation of the sample. The statistical analysis of Qumran data, carried out following the method presented by ERICSON (1987) and LIVINGSTONE (1989), seems to confirm the important role that probably humans had in the accumulation of the sample; nevertheless it must be considered that the data are at least in part affected by the naturally high frequency of individuals of Rock Dove in a rocky site such as the one we are dealing with.

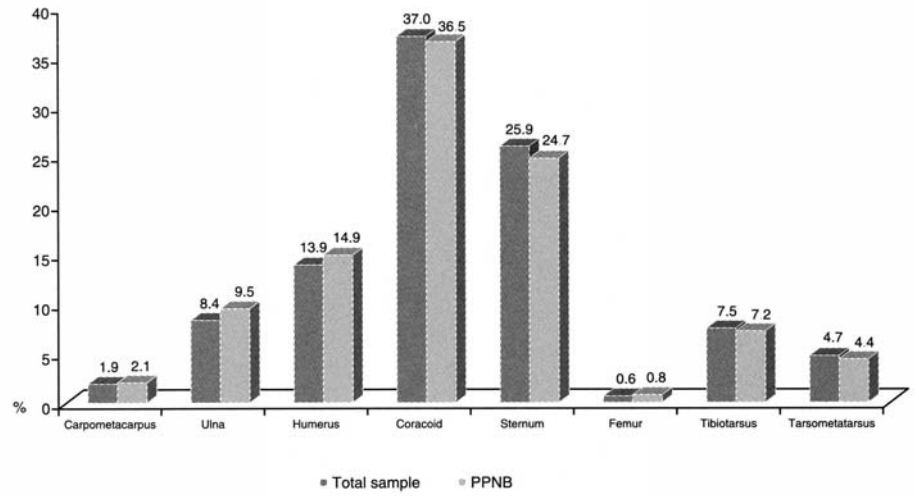

Fig. 8. Diagram showing the percentage of the main skeletal elements for the species *C. livia* in the Qumran Cave 24 total sample and for the PPNB level.

In conclusion, the evidence collected from Qumran Cave 24 shows that the Rock Dove sample has mainly been accumulated by humans who probably used this species as a food source. *C. livia* could therefore have assumed the role that in many other similar sites of the region is typical of Chukar. In this regard it is important to note that this exploitation probably changed during the different archaeological periods. The different percentage of burnt bones in the layers suggests that the exploitation of this species became usual only when the so-called "Neolithic Revolution" was well developed with the widespread production and storage of cultivated plants (especially cereals). In fact, since the Rock Dove is a granivorous species, we can reasonably hypothesize that during the early phases of the Neolithic a strict relationship between this bird species and early "farmers" started. TCHERNOV (1984) underlined this connection between *C. livia* and Neolithic populations, although he does not consider it as a real example of commensalism similar to that of *Passer domesticus*. However, this may still be an important indication of the potential of human groups to change, even in an indirect way, the faunal association around them. It shows also that this ability has been expressed since our remote past, and probably accompanied human communities throughout their history. Furthermore, this relationship could also have led to the first cases of domestication of birds. RONEN and WINTER (1998) have suggested that the preparation of cages to keep live birds existed since the Neolithic period.

Another case of the use of birds as food in the sample of Qumran Cave 24 comes from the analysis of crane remains (*Grus* sp.). In the PPNB layers, where fire traces are usually not very frequent, 14 remains of an adult crane have been found; many of them with cut marks and/or fire traces (Fig. 9). The position of traces suggests the use of this bird as food, but the fact that all the specimens belong to a single individual indicates that the exploitation of this species was only occasional, as opposed to the case of the Rock Dove. It could be considered a sort of occasional hunting probably during the winter, when this species was present in the Jordan Valley. The crane is a very interesting

species that occurs quite often on archaeological sites, up to medieval times. However, its role in human culture is still unclear and many authors on different occasions pointed out that the importance of this species seems to be generally related more to the beauty of its feathers and the possible use of the bones as raw material for tool production, than to the quality of its meat (ALBARELLA 1997; MASSETI 1997; WIJNGAARDEN-BAKKER 1997). Although there are only few crane bones, the case of Qumran Cave 24 seems to suggest the limited use of this species although only as food. There is no evidence of the use of crane bones for bone-tool or ornament production.

A different kind of bird use at Qumran Cave 24 is represented by some ulnae of corvids (Fig. 10) that present clear evidence of manufacturing. These bones are represented only by the diaphyses, since the epiphyses have been sharply cut off, probably in order to make bone tubes. In some cases deep cut-marks made to separate the extremities from the shaft are still visible. Furthermore, on the

Fig. 9. Burnt tibia of crane (*Grus* sp.) with cut-marks.

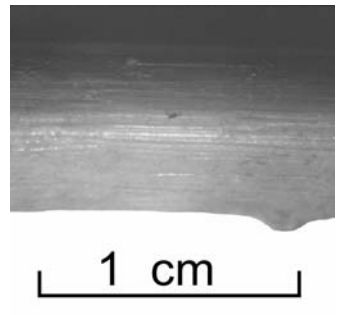

Fig. 10. Corvid ulna lacking the epiphyses, with evident striae all over its body.

body of the bone there are many striae indicating that it has been scraped in order to clean it of soft tissues and to make it smooth and polished, producing some kind artefacts. Data at our disposal do not allow us to hypothesize an intentional accumulation of all corvids by humans, but at least an intentional exploitation for tool-making of some of the corvid bones selected for their dimension and form. We have to point out that in the case of the Qumran sample corvids probably have not been the only genera used for the production of these tubes. A tarsometatarsus of Anseriformes coming from PPNB layers, with fire traces and horizontal marks located just above the distal epiphysis could have been cut off for the same reason as suggested by the corvid ulnae (Fig. 11).

Fig. 11. Distal part of tarsometatarsus of *Anser* sp. with deep horizontal cut-marks.

Bone tubes made of bird bones are not unusual in archaeological sites and were interpreted as simple tubes that could have been used for inhaling or sucking liquid or powder or as musical instruments (flutes) (FAGES and MOURER-CHAUVIRÉ 1983; WIJNGAARDEN-BAKKER 1997). However, the findings by PICHON (1984, 1994) in other southern Levant Natufian sites such as Hayonim Cave and Mallaha suggest that ulnae of Anseriformes and Falconiformes were mainly modified, while at Qumran Cave 24 the tubes could have been used to produce "bone pearls" (Fig. 12). In any case, the sample analysed provides evidence that birds were not used only as food and this was probably quite usual since the earliest phases of the Neolithic period.

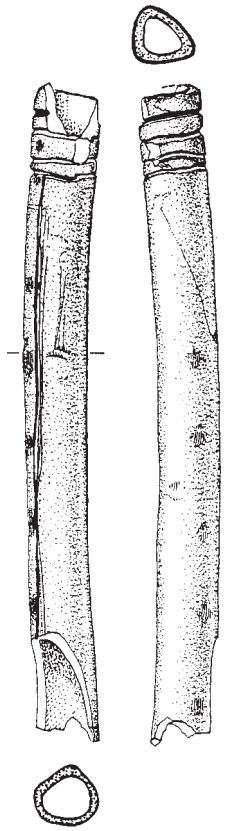

Fig. 12. Manufacturing of bony pearls from diaphyses of large bird bone (drawings from J. PICHON 1984 modified).

A further indication of human exploitation of birds not as food source, is the presence of quite a large number of remains of raptors in the sample. In particular, this part of the sample is composed almost entirely of phalanges, mainly terminal phalanges, with their characteristic claw shape (Fig. 13). Furthermore, some of these phalanges present fire traces, supporting the interpretation of a human accumulation of these bones. Such a peculiar accumulation of phalanges is not unusual and the phenomenon has also been found in other Pre-pottery Neolihtic sites in the region (TCHERNOV, personal communication). Concerning the possible use of these skeletal parts of raptors, it must be said that ethnographic studies of Bedouin populations indicate that they are used to decorate clothes and create ornaments, as well as directly as tools because of their peculiar shape. It is, therefore, reasonable to assume a similar exploitation by ancient populations of the southern Levant. Furthermore, the nature and behaviour of these birds may have had a cultural/spiritual meaning for these human groups.

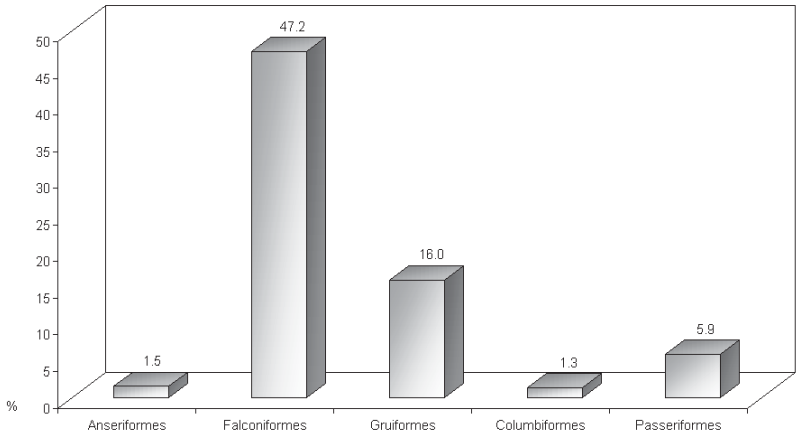

Fig. 13. Frequency of phalanges for each order identified in the Qumran Cave sample.

IV. CONCLUSIONS

The characteristics of the Qumran Cave bird sample indicate that at the beginning of the Neolithic in the southern Levant the use of birds probably became more common and varied than in the Upper and EpiPalaeolithic. In particular the kind of exploitation changed through time and gradually became more complex in the most recent archaeological periods. This fact was probably linked to general changes in human behaviour, subsistence strategies (i.e., the transition from a hunter-gatherer nomadic way of life to a farming, more sedentary economy) and had consequently an increasing impact on the faunal association in the areas inhabited by humans.

It is also interesting that, as in many other contemporary sites of the same region, there seems to have been a very clear choice of bird species for different purposes. Humans generally used the most frequent and probably the most easily hunted species of the area around the site as a food source. The choice was therefore related mainly to the environment. For the production of artefacts the selection was based on the size and probably also the morphology of the bones. The larger species of different orders, characterised by longer and less fragile bones were preferred.

The analysis of the Qumran avifaunal sample indicates the use of a large spectrum of bird species by an ancient human population, related not only to the fundamental human needs, but also to aesthetic and, maybe, spiritual ones.

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