Archaeofauna 4 (1995): 7 - 26

FAVOURITE FISH DISH OF THE ROMANS IN CARTHAGE

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ABSTRACT: The paper comments on a series of fish remains retrieved from a building and a couple of cisterns of roman times in the city of Carthage. The dominance of marine species and, within them, of sea breams, basses and groupers, seems coincident with fish abundances at other sites in the Mediterranean and, on top of paleoecological connotations, discussed for the various taxa, it testifies to the existence of an affluent nucleus of inhabitants in the area.

KEYWORDS: FISH, CARTHAGE, ROMAN TIMES, FISHING, FISH CONSUMPTION

RESUMEN: En el presente trabajo se valoran los restos de peces recuperados en un edificio y unas cisternas de época romana en la ciudad de Cartago. La dominancia de especies marinas y, dentro de éstas de los espáridos, lubinas y meros, parece coincidir con hallazgos en otros puntos del mediterráneo e, independientemente de las connotaciones paleoecológicas evaluadas para cada taxón, evidencia la existencia de moradores con alta capacidad adquisitiva o, cuando menos, de posición acomodada.

PALABRAS CLAVE: PESCADO, CARTAGO, EPOCA ROMANA, PESCA, CONSUMO DE PESCADO

INTRODUCTION

"*Ceterem censeo Carthaginem esse delendam*". In 146 B.C. the Romans carried out this urging of Cato and destroyed the city. Carthage rose again from the ashes to be the capital of the Roman province of Africa until 439 A.D. when it had to be handed over to the Vandals. Although Carthage was the Vandal capital for almost 100 years there was a lingering Roman influence on the culture and everyday life clearly reflected in the monuments and finds from this period.

In our times the vestiges of the ancient Carthage faced the threat of being completely lost in the wake of constructions for the modern city. An approach to UNESCO in the early 1970s initiated the campaign "*Save Carthage*". Soon, many nations sent archaeologists to excavate and record what was left of the ancient city remarkable history.

In 1979 Swedish archaeologists started an investigation at the foot of the former acropolis. The excavations were carried out under the auspices of the Museum of Mediterranean and Near Eastern Antiquities (Medelhavsmuseet) in Stockholm and under the general direction of Dr Carl-Gustaf Styrenius with Miss Birgitta Sander as field director. The site owner had waited a long time to get permission to build on his premises so the digging had to be hurried up. Three campaigns during in all seven months uncovered the north-eastern part of the bottom floor of a Late Roman building (late 4^{th}/early 5^{th} c. A.D.) and the antique street crossing at which this building had been situated. Preliminary data from the Swedish excavations are published in Medelhavsmuseets Bulletin 14, 15 and 16 (1979, 1980, 1981).

The dating is based on in situ mosaics, finds related to the building and remains of an earlier building under the pavement of the yard. Some finds indicate that the building was still in use during the 6^{th} c. A.D. (Sander, 1981: 87).

The building (Figure 1) has two distinct parts; one with small rooms, the other with an open yard. The northern part with the small rooms has been preliminary interpreted as a minor Roman bath.

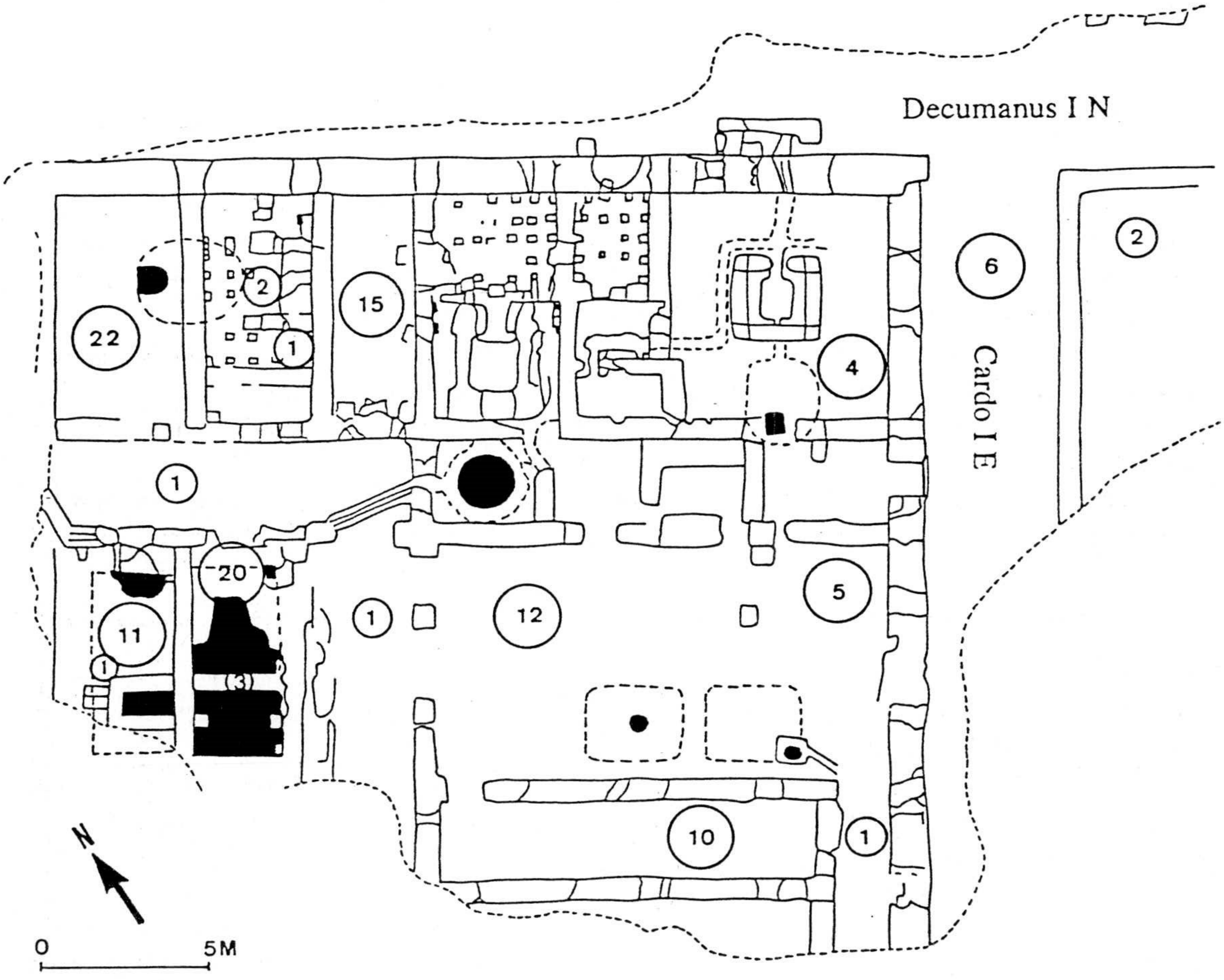

FIGURE 1. Simplified drawing of the Building from the plan of Site A after completed excavation in 1980, from Medelhavsmuseets Bulletin 16, 1980. Number of fish fragments found is indicated. (Four fragments are unaccounted for here because of unknown specific provenience).

The most interesting details here are a quite well preserved heating system, a so called hypocaust, and four small swimming pools. There is also a water channel system with drains, water cisterns and a well. The yard in the southern part is bordered by corridors.

The Roman streets crossing are those of Cardo I E and Decumanus I N, streets of a width of about 3.8 and 4.4 m respectively. Both had been paved with limestone flags (Sander, 1981: 85).

A large number of bones was found and are currently being analysed by the author. On top of mammal and bird bones there were also some fish remains. Their distribution indicated a preference of three species of sea fish, which could thus have been the leftovers of the favourite fish dish of the Romans in Carthage. But it would be unwise and bound to be criticized to pin-point a preference from the little material available. To increase the data on identified fish from Carthage I enlarge my sample with those from the American excavation in 1977 of three cisterns from approximately the same period. A few other sites around the Mediterranean will also be presented for comparison.

MATERIAL

The Swedish Carthage campaigns produced 122 fish specimens with a total weight of 189.4 g. Of these, 81 fragments could be identified to genus or species level while 41 fragments, mostly spines, ribs and vertebrae, with a weight of 24.0 g had to remain unidentified. The material is well preserved and a comparatively large number of measurements could be taken.

The fragments were unevenly distributed within the building as indicated on Figure 1 but the spatial distribution will be interpreted later in connection with the analysis of the total bone material from the site. No sieving was undertaken so that all bones had to be retrieved by hand from the trenches (Sander, pers. comm.). The building was in use from late 4th/early 6th c. A.D. .

Nine taxa of sea fish could be identified, four to species level, four to genus with a suggestion of the most probable species involved and the last one only to genus level. The distribution of identified fragments is shown in Table 1.

TAXON	NF	%	W	%
Epinephelus (guaza)	23	28.4	78.8	47.7
Dicentrarchus (labrax)	29	35.8	41.1	24.8
Argyrosomus regius	3	3.7	15.3	9.3
Dentex (dentex)	1	1.2	2.6	1.6
Pagellus sp.	1	1.2	0.4	0.2
Sparus aurata	15	18.5	14.3	8.6
Sarda sarda	1	1.2	0.7	0.4
?Euthynnus alletteratus	4	5.0	10.1	6.1
Chelon labrosus	4	5.0	2.1	1.3
Total	81	100.0	165.4	100.0
Total NF unidentified	41		24.0	
Total NF recovered	122		189.4	

TABLE 1. The Swedish excavation in Carthage 1979-80. Dating: late 4th/early 6th century A.D. Number (NF) and weight (W) of identified fragments.

The American excavation of three cisterns (Wheeler, 1981: 231-237) produced 3000 fish fragments unevenly distributed. A total of at least thirteen taxa were identified. The bones were collected by wet-sieving. The collection in all was large, well preserved and could be well dated. The upper level in Cistern 1 was badly mixed but the lower level could be dated from mid to late 5th c. A.D. . This level produced 1406 fish bones. In Cistern 2 the deposits could be dated to the late 6th/early 7th c. A.D. and are likely to be entirely Byzantine. These deposits contained 1180 fish fragments. The upper level of Cistern 3 included 87 fish bones from late 5th/early 7th c. A.D. and the lower level, producing 139 fish bones, includes late 5th/early 6th c. A.D. material. For comparative purposes I will only use the well dated lower levels of Cisterns 1 and 3 and the earlier material in Cistern 2. Table 2 shows the distribution of specimens of identified taxa from the three cisterns.

TAXON Number of fragments	CISTERN 1 UL 18	 LL 93	CISTERN 2 83	CISTERN 3 UL 7	 LL 22/23
Cartilaginous fish	-		1	-	-
Squalus sp.	-		-	1	-
Conger conger	-		-	1	-
Epinephelus (guaza)	-	5	5	2	-
Dicentrarchus sp.	-	7	31	1	-
Pomatomus saltator	-	1	-	-	-
Trachurus sp.	-	2	-	-	-
Pagellus sp.	-	-	1	-	-
Pagrus pagrus	2	2	2	2	6
Sparus aurata	15	71	40	1	5
Labrus sp.	1	2	-	-	-
Symphodus (Crenilabrus) sp.	-	2	-	-	-
Mugil sp.	-	1	3	-	7
Barbus sp.	-	-	-	-	3/4
Total number of fragments identified			223/224		
Total number of fragments recovered			3000		

TABLE 2. The American excavation in Carthage 1977 of three cisterns (Wheeler, 1981). Distribution of identified specimens. UL = upper level; LL = lower level.

METHODS

The material from the Building and the Cisterns (Wheeler, 1981) are not directly comparable due to different excavation methods. The material from the Building was hand-collected. It is known that this method introduces a bias towards larger specimens with appreciable loss from smaller and/or more fragile remains. Nevertheless, even a heavily biased sample can yield some valuable information as long as we keep the biasing processes in mind.

The material from the Cisterns was collected by wet-sieving and has a mean fragment weight of less than 0.3 g compared to 1.5 g for the material from the Building.

The excavated context (Building and Antique Street Crossing) has been taken as the sampling unit (e g the Building) and the frequency of taxa of fish is analysed from the total number of fragments identified. This quantification method is easy but not ideal. Until the archaeological analysis of the excavated area is completed it seems to be a valid approach.

Another problem is that with a small sample it is also likely that the effort needed to identify as many specimens as possible will increase at the expense of manpower. To get as much information as possible out of the 122 fragments from the Building, vertebrae and even a few spines were identified. For the Cisterns, Wheeler (1981) provides information on number of vertebrae, spines and ribs but uses mostly jaw bones and other easily identified remains and only exceptionally identifies vertebrae (e.g., grey mullet). Around 66% of the fish fragments from the Building were identified compared to some 7% from the Cisterns.

Minimum number of individuals (MNI) has not been estimated on account of the few fragments scattered over the Building and Streets suspected to have been deposited during ca 200 years. Every specimen, with the probable exception of two vertebrae of sea bass, can be considered to come from a different individual.

Measurements were taken whenever appropriate. Three different methods had to be used and are referred to in connection with their application on various bones.

Specimens from the Building were identified with the comparative collections kindly provided by Leif Jonsson, Gothenburg and those kept at the Swedish Museum of Natural History, Stockholm.

The taxonomic nomenclature used follows Whitehead *et al.* (eds.) (1986). The nomenclature of skeletal elements is referred to Lepiksaar (1983).

ICHTHYOANALYSIS

Information on the fish identified from the Swedish excavation 1979-1980 (the Building) in particular, with a short description of ecology and economic importance is given below. Taxa identified only from the American excavation of the cisterns (Cistern 1-3) will be also presented.

Cartilaginous fish, shark or ray

There are two species of spurdog, *Squalus acanthias* Linnaeus, 1758 and *S. blainvillei* (Risso, 1826), in the Mediterranean today which are closely similar both in body form and biology. The second is smaller and the common one in Tunisia. Wheeler (1981) reports a dorsal fin spine of *Squalus* from the upper level of Cistern 3 which cannot be identified to species. An unidentifiable cartilaginous fish is present in Cistern 2.

***Conger conger* ([Artedi, 1738] Linnaeus, 1758),** conger eel

The conger eel is a strictly marine fish. It can reach a maximum length of 300 cm (Bauchot & Saldanha, 1986: 569). Conger is benthic on the shelf on rocky and sandy bottoms from 0-100 m. It is used as a food fish, although not appreciated by everybody (Davidson, 1987: 55). One fragmentary dentary of a fish ca 75-100 cm in length was identified in the mixed upper level of Cistern 3.

***Epinephelus guaza* (Linnaeus, 1758),** dusky grouper

The groupers are large or very large fishes belonging to the family Serranidae. There are four species of *Epinephelus* in the Mediterranean which could be found in Tunisian waters (Reese, 1981; Tortonese, 1986; Davidson, 1987). Most common and also the largest one is the dusky grouper *E. guaza*. It lives chiefly on rocky bottoms where it is found solitary in caves and crevices to depths from 8 to 200 m. The second most common is the white grouper, *E. aeneus* (Geoffroy Saint-Hilaire, 1817) and the third is the dogtooth grouper, *E. caninus* (Valenciennes, 1843). Both live on muddy and sandy bottoms in the southern Mediterranean. The exact distribution of *E. caninus* is not known because it has often been confused with the dusky grouper (Tortonese, 1986: 785). All groupers are appreciated as foodfishes (Tortonese, 1986: 783). The dusky grouper with a firm flesh free of bone is delicious and it may be considered as a North African speciality (Davidson, 1987: 70). The fourth species, although more common in the Aegean and eastern Mediterranean than in Tunisian waters, is the golden grouper *E. alexandrinus* (Valenciennes, 1828). The golden grouper has rather fibrous flesh (Davidson, 1987: 72) and might have been less appreciated as a food fish.

SKELETAL ELEMENTS	NUMBER OF FRAGMENTS			
	Left	Right	Undet.	Total
Dentale	2	2	-	4
Articulare	1	1	-	2
Premaxillare	2	-	-	2
Maxillare	-	-	1	1
Palatinum	-	-	1	1
Scapulae	-	-	1	1
Cleitrum	-	-	2	2
Ceratobranchiale	-	-	1	1
Pterygiophore	-	-	1	1
Precaudal vertebra	-	-	6	6
Caudal vertebra	-	-	2	2
Total identified	5	3	15	**23**

TABLE 3. The dusky grouper is represented by 23 specimens from the building.

The lack of comprehensive reference material hampers the translation of the measurements into total length of fishes. One caudal vertebra with a total body length of 14.5 mm from Kassope in Greece (Friedl, 1984: 194) is estimated to be from a fish of about 70 cm total length (TL). To judge from the measurements of the previous caudal vertebrae our specimens were somewhat larger.

No measurements have been published on the ten groupers from the Cisterns but Wheeler provides approximate weights which he bases on experience in handling whole specimens (Wheeler, 1981: 231). The fishes are from small- (about 1 kg) to medium-sized (6.8-9.1 kg) specimens.

The dusky grouper can reach a size of 150 cm standard length (SL) but are usually around 90 cm (Tortonese, 1986: 786). Considering the vertebral measurements the individuals from the Swedish excavation were not small but rather of medium-size between 60 and 100 cm SL.

	CATALOGUE NUMBER				
DENTALE	**5833.901**	**2914.901**			
Greatest length	76.8				
Inside length	44.9				
Anterior height	13.7	16.1			
ARTICULARE	**3340.902**	**5427.901**			
Greatest breadth	14.0	12.4			
PRECAUDAL VERTEBRA	**3006.901**	**4945.902**	**2911.901**	**2988.960**	**3856.901**
Gr. body length	15.6	13.2	20.1	21.3	15.6
CAUDAL VERTEBRA	**6365.901**	**3206.901**			
Gr. body length	20.6	19.4			

TABLE 4. Dusky grouper. The measurements used are defined by Morales & Rosenlund (1979). All measurements are given in mm.

***Dicentrarchus labrax* (Linnaeus, 1758)**, sea bass

There are two sea basses belonging to the moronid family (Tortonese, 1986: 793-795) to be found in Tunisian waters. They are moderate-size to large predatory fishes. The largest is the European sea bass *Dicentrarchus labrax* which can reach a maximum length of 100 cm. The spotted sea bass, *D. punctatus* (Bloch, 1792) is somewhat smaller, about 70 cm. Both species live on various kinds of bottoms along the coasts, in brackish waters and occasionally enter the lower reaches of rivers. Sea basses are excellent food fishes. According to Pliny the Romans preferred sea bass from the rivers. *D. labrax* is the most common of the two; *D. punctatus* is said to be more cunning and hard to catch (Davidson, 1987: 69).

SKELETAL ELEMENTS	NUMBER OF FRAGMENTS			
	Left	**Right**	**Undet.**	**Total**
Dentale	1	1	-	2
Articulare	1	2	-	3
Maxillare	1	-	-	1
Operculare	1	-	-	1
Interoperculare	-	-	1	1
Preoperculare	1	-	-	1
Hyomandibulare	2	-	-	2
Cleitrum	1	-	-	1
Ceratohyale	2	-	-	2
Hyale	-	1	-	1
Ceratobranchiale	-	-	1	1
Branchiostegal ray	-	-	2	2
Precaudal vertebra	-	-	3	3
Caudal vertebra	-	-	4	4
Urostyle	-	-	1	1
Dorsal fin spine	-	-	3	3
Total identified	10	4	15	**29**

TABLE 5. European sea bass is represented by 29 specimens from the Building.

Compared to measurements given for length of vertebral centra and estimated length of fishes from Kassope (Friedl, 1984: 124) and Fikirtepe in Turkey (Boessneck & von den Driesch, 1979: 55) the above fishes seem to have been of a total length of between 50 and 70 cm. Wheeler (1981) estimated the weight of the sea basses in Cistern 1 and 2. There were 27 small individuals of an approximate weight of 0.9 - 2.3 kg and 11 bigger ones with a weight of ca 2.3 -4.5 kg. For Cistern 3 only length estimates are given for three individuals, 40 cm, 50 cm and 75 cm of length respectively. The larger two are indicated to be *D. labrax*.

	CATALOGUE NUMBER			
DENTALE	**3884.902**			
Anterior height	5.8			
ARTICULARE	**4029.902**	**4181.902**	**2969.901**	
Greatest length	34.8			
Greatest height	24.5	17.9		
Gr. medio-lateral br.art. surface	7.8	5.0	10.4	
OPERCULARE	**3004.902**			
Gr. dorsi-ventral br. art. surface	3.9			
MAXILLARE	**3591.902**			
Greatest length	40.8			
CERATOHYALE	**5881.901**			
Greatest length	34.8			
HYALE	**2988.963**			
Greatest length	71.8			
PRECAUDAL VERTEBRA	**3726.908**	**2914.905**	**2914.906**	
Body length	16.7	13.4	16.1	
CAUDAL VERTEBRA	**4412.923**	**4029.904**	**4029.905**	**2915.903**
Body length	20.0	14.2	14.0	11.8

TABLE 6. European sea bass. The measurements used are defined by Morales & Rosenlund (1979). All measurements are given in mm.

***Pomatomus saltator* (Linnaeus, 1766)**, bluefish

The bluefish (family Pomatomidae) is a pelagic, swift and migratory fish which can reach a length of 110 cm but usually is 40-60 cm SL. It is of commercial importance today. Only one specimen was found in the lower level of cistern 1 (Wheeler, 1981: 232).

Trachurus sp., scad or horse-mackerel

There are three species of scad (family Carangidae) to be found in Tunisian waters, *T. mediterraneus* (Steindachner, 1868), *T. picturatus* (T.E. Bowdich, 1825) and *T. trachurus* (Linnaeus, 1758). They are preliminary benthopelagic species living at 20 to 500 m depth. Large schools can at times be found at the surface. The maximum length is about 60 cm fork length but a more usual size is around 30 cm (Smith-Vaniz, 1986: 841-843). The only carangid of economic importance today is *T. trachurus* (Reese, 1981: 240). Scad was found with one specimen in the lower level of Cistern 1 (Wheeler, 1981: 232).

***Argyrosomus regius* (Asso, 1801)**, meagre

The meagre belongs to the sciaenids and is a large fish with an elongate body. It reaches a maximum length of 200 cm but is commonly not more than 50 cm. The meagre inhabits the inshore and shelf waters both close to the surface and at the bottom down to 200 m. It also enters estuaries and costal lagoons and congregates inshore to spawn. The species is distributed along the coasts of the entire Mediterranean (Chao, 1986: 867). The sciaenid fishes like the meagre (*A. regius*), the brown meagre (*Sciaena umbra*) and the shi drum (*Umbrina cirrosa*) are also noted for their large otoliths and the capability of producing a characteristic noise with the help of a sizeable air bladder (Davidson, 1987: 96).

The meagre has a white flesh, and is an excellent food fish, much like the grouper.

Argyrosomus regius is represented by three specimens from the Building. There is the distal part of a left dentary of considerable size, the distal part of an equally large maxillary and a precaudal vertebra with a body length of 14 mm. There is reason to believe that the fish fragments are from three individuals since the findspots are very far apart.

There are few reports on finds of *A. regius* but Boessneck & von den Driesch (1979) feel prone to assign four sciaenid bones from neolithic Fikirtepe to the meagre.

SPARIDAE, Sea bream family

The sparid family is a large one. At least 21 species are occuring in the Mediterranean. Most sea breams are excellent food fishes and of commercial importance today (Bauchot & Hureau, 1986: 883).

***Dentex* sp.**, dentex

There are four species of *Dentex* found in Tunisian waters. All but one, the large-eye dentex, can be up to 100 cm SL, but are usually smaller, 35-60 cm. They inhabit inshore waters on substrates of various kinds down to about 200-300 m. The common dentex *Dentex (Dentex) dentex* (Linnaeus, 1758) is a fine food fish.

One caudal vertebra with a body length of 17.1 mm was identified from the Building.

***Pagellus* sp.**, bream and pandora

At least three species of the genus *Pagellus* can be found in the Gulf of Tunis. They are usually around 25 cm of length, the red sea bream, *P. bogaraveo* (Brünnich, 1768) reaching a little larger. They are littoral species living over different tipes of bottoms down to ca 200 m. All *Pagellus* species make quite good food, grilled whole or used in fish soups depending on size.

One caudal vertebra with a centrum length of 10.4 mm was identified from the Building. Wheeler identifies one right dentary from a small individual of *Pagellus* sp. (Wheeler, 1981: 233).

***Pagrus pagrus* (Linnaeus, 1758),** couch's sea bream

This species is common in the Gulf of Tunis. It inhabits the shelf and continental slope down to about 250 m. The size can be up to 75 cm but usually is around 30-35 cm. Jaw bones of the species are easily identified. It is quite a good-tasting fish, but rarely fished in Tunisia today (Reese, 1986: 238).

Ten specimens were identified by Wheeler from Cisterns 1-3. They come from small to medium-sized *P. pagrus*.

***Sparus aurata* Linnaeus, 1758**, gilt-head sea bream

This beautiful species, once sacred to the goddess Aphrodite, is also an excellent food fish, widely regarded as the best of the sparids. It can grow up to 70 cm long but is usually between 30-35 cm. The gilt-head sea bream lives solitary on sandy bottoms along the coast down to ca 150 m and also enters brackish waters. It is common throughout the Mediterranean. The dentition is characteristic and allows an easy identification at species level and the jaw bones are also found to preserve well in archaeological sites. Thus, it is not surprising that *Sparus aurata* is a very common species identified from sites around the area.

SKELETAL ELEMENTS	NUMBER OF FRAGMENTS			
	Left	**Right**	**Undet.**	**Total**
Dentale	3	-	-	3
Premaxillare	1	4	-	5
Maxillare	3	-	-	3
Tooth	-	-	1	1
Articulare	1	-	-	1
Supracleitrum	-	-	1	1
Ceratohyale	1	-	-	1
Total identified	9	4	2	**15**

TABLE 7. The gilt-head sea bream is represented by 15 specimens from the Building.

Wheeler (1981) altogether identifies 116 specimens as belonging to *Sparus aurata*, all but three being either dentary or premaxillary bones. He uses measurements of dentary length and premaxillary length and height to analyse the size of the individuals represented. The estimated fork length and total weight is then used to distribute the material in size groups. Since he is presenting only the frequency distribution and not the measurements and lengths of the recent reference specimens it is not possible to use his method for our material.

	CATALOGUE NUMBER				
DENTALE	**2922.901**	**4029.901**	**2988.967**		
B & D 1	31.2	17.2	19.2		
B & D 2	10.0	4.9	8.1		
W Dl	20.2	21.9			
PREMAXILLARE	**4790.901**	**2914.902**	**2898.901**	**5974.901**	**300.003**
B & D 1	26.6	ca 35 est.	27.9	20.0	
B & D 2	10.0	14.1	9.9	4.2	
W Pml	29.3	37.9	30.9	22.9	
W Pmh					23.1
MAXILLARE	**5242.902**	**4826.901**	**3884.904**		
M & R Gr.l	> 51	38.2	23.3		
M & R Gr.h	30.6				
CERATOHYALE	**3005.902**				
M & R Gr.l	25.1				
M & R Gr.h	17.2				

TABLE 8. Gilt head sea bream. The measurements used are defined by Boessneck & von den Driesch (B & D) (1979) and Wheeler (W) (1981) for dentale and premaxillare and by Morales & Rosenlund (M & R) (1979) for all other elements.

Boessneck & von den Driesch (1979) have used other measurements to estimate the length of gilt-heads found at the Neolithic site of Fikirtepe and also presented the reference measurements. This method proved useful for my material.

The measurements used are:

B&D 1 = the maximum length of the dental arcade, measured on the buccal side.

B&D 2 = the length of the largest molaroid tooth, the measuring points are on the outer rim of the tooth socket.

The measurement of the length of the dental arcade is multiplied by a factor 14.1 for premaxillary and 15.4 for dentary, as inferred from the relation between total length and length of the specific bone.

If the estimated sizes from the three finds are compared it can be seen that the few specimens from the Building show a size distribution broadly in agreement with the pattern shown in the cistern material. The gilt-heads from Fikirtepe, on the other hand, indicate the catch of larger individuals, some even of the known maximum size for the species.

	SIZE CLASSES (cm)					
	< 20	20-30	30-40	40-50	50-60	60-70
Carthage, the Building						
Premaxilare		1	2	1		
Dentale		2		1		
Carthage, Cisterns 1-3						
Premaxilare	5	39	5	1		
Dentale	5	23	13	2		
Fikirtepe						
Premaxilare			2	13	13	7
Dentale			1	8	13	7

TABLE 9. Estimated length of gilt-head sea breams.

LABRIDAE, wrasses

There are quite a number of species of wrasses (Quignard & Pras, 1986: 919-942) present in the Mediterranean. They are brilliant coloured fishes, mainly coastal. Most species belong to the genera, *Labrus* or *Symphodus*. Wrasses are mostly used for fish soup. Four specimens of wrasse were identified in the lower level of Cistern 1 but also one lower pharyngeal bone of a specimen of ca 45 cm length from the disturbed upper layer of the same cistern.

SCOMBRIDAE

***Sarda sarda* (Bloch, 1793),** bonito

The Atlantic bonito is a migratory species, often schooling near the surface of inshore waters. Spawning occurs from May to July in the Mediterranean. The bonito can be up to 90 cm fork length for a weight of 5 kg, but more commonly reaches only 50 cm and around 2 kg.

One scombrid caudal vertebra with a body length of 12.3 mm from the Building could be assigned to this species.

TUNA and LITTLE TUNNY

There are two species of tuna, the bluefin tuna, *Thunnus thynnus* (Linnaeus, 1785) and the albacore, *Thunnus alalunga* (Bonnaterre, 1788). Both are very large, migratory and schooling fishes of the high seas but move closer to the shores to spawn. They are caught in large numbers in special tuna traps during their breeding migrations. The tuna fishery in the Mediterranean is obviously of great antiquity, tuna traps being used already in neolithic times.

Euthynnus alletteratus (Rafinesque, 1810) is not as large as the tuna, reaching usually 85 cm and about 7 kg weight. It is epipelagic in coastal waters, schooling but less migratory than the large tunas.

There are four caudal vertebrae, three with a measurable body length of 18.5 mm, 15.2 mm and 15 mm respectively, identified as scombrids. The small size suggests the little tunny but a positive identification is not possible because of inadequate reference material. No scombrids were found in the Cisterns.

MUGILIDAE, grey mullet

There are six species of grey mullet to be found in Tunisisan waters. They are medium-sized fishes (25-100 cm) and usually school in costal waters, entering lagoons, estuaries and rivers for feeding on minute plants, invertebrates and debris. The mullet is of considerable economic importance (Ben-Tuvia, 1986: 1197-1204).

In the Building four specimens of thick-lipped grey mullet *Chelon labrosus* (Risso, 1826) representing four individuals have been identified.

SKELETAL ELEMENTS	NUMBER OF FRAGMENTS	
	Left	**Right**
Operculare	1	2
Hyale	1	

TABLE 10. Identified specimens of *Chelon labrosus*.

	CATALOGUE NUMBER		
OPERCULARE	**4266.901**	**2953.901**	**2988.966**
Gr. dorso-ventral heigth art. surface	5.8	7.5	6.5
HYALE	**4601.902**		
Greatest length	31.1		

TABLE 11. Thick-lipped grey mullet. Measurements: According to Morales & Rosenlund (1979) (in mm).

Wheeler (1981) identified mullets in all Cisterns. The size of the vertebral centra found in the lower level of cistern 3 suggests that a large species like *Chelon labrosus* or *Mugil cephalus* Linnaeus, 1758 was present (Reese, 1981: 240).

***Barbus* sp.**, barbel

The presence of pharyngeal bones of barbel in Cistern 3 indicates freshwater fishery, which is of interest in view of the richness of the marine fauna compared to the depauperate freshwater fish fauna of the region (Wheeler, 1981: 237).

DISCUSSION

Three kinds of fish seem to have been favoured by the inhabitants of Carthage with the evidence at hand. These are the sea breams, sea basses and groupers. Sea breams were retrieved from all levels in the Cisterns and all over the Building. The lower level of Cistern 1+3 is dominated by the finds of sparids which constitute 72.4% of the identified fragments (Table 12) (65% is represented by *Sparus aurata*, the gilt-head). Cistern 2 contained 51.8% sparids, the most common species being again the gilt-head. There is a comparatively large number of sparids from the Building as well. Here too the gilt-head is the most common, constituting 18.5% of the total number of identified fragments. Coach's sea bream *P. pagrus* is misssing in the Building.

TAXON	C1 + C3 LOWER LEVEL N 116 %	C2 N 83 %	B N 81 %
Cartilaginous fish	1.2	-	-
Epinephelus sp.	4.3	6.0	28.4
Dicentrarchus sp.	6.9	37.4	35.8
Pomatomus saltator	0.9	-	-
Trachurus sp.	1.7	-	-
Argyrosomus regius	-	-	3.7
Dentex (dentex)	-	-	1.2
Pagellus sp.	-	1.2	1.2
Pagrus pagrus	6.9	2.4	-
Sparus aurata	65.5	48.2	18.5
Labrus sp.	1.7	-	-
Symphodus sp.	1.7	-	-
Sarda sarda	-	-	1.2
?Euthynnus alletteratus	-	-	5.0
Chelon labrosus	-	-	5.0
Mugil sp.	6.9	3.6	-
Barbus sp.	3.5	-	-
	100.0	100.0	100.0

TABLE 12. Relative frequency of fish taxa based on identified specimens from the Cisterns 1977 (Wheeler) and the Building 1979-1980 (Larje). Dating: C1 + C3 mid 5th/early 6th c.A.D.; C2 late 6th/early 7th c.A.D.; B late 4th/6th c.A.D.

The most common fish in the Building is the sea bass, *Dicentrarchus labrax*, accounting for 35.8% of the finds which equals the distribution of sea bass in Cistern 2 (37.4% as opposed to the low occurrence (6.9%) in Cistern 1+3). The third most common species is the grouper, at least in the Building where 28.4% of remains are assigned to this species.

The differences of abundance of the three most common species between the Cisterns and the Building is seen in Figure 2. The gilt-head is far more abundant in the Cisterns than in the Building - where sea bass and grouper dominate. There is also a difference between the Cisterns shown as a declining number of gilt-head and an increasing number of sea bass in the earlier, Byzantine Cistern 2.

With the limited material at hand one must ask if these differences are real or not. One source of error is the different approach to identification of skeletal elements other than skull bones and jaws. Even if vertebrae and spines are omitted from the Building counts to make the data more comparable, however, the differences are still obvious (dotted line in Building bar in Figure 2).

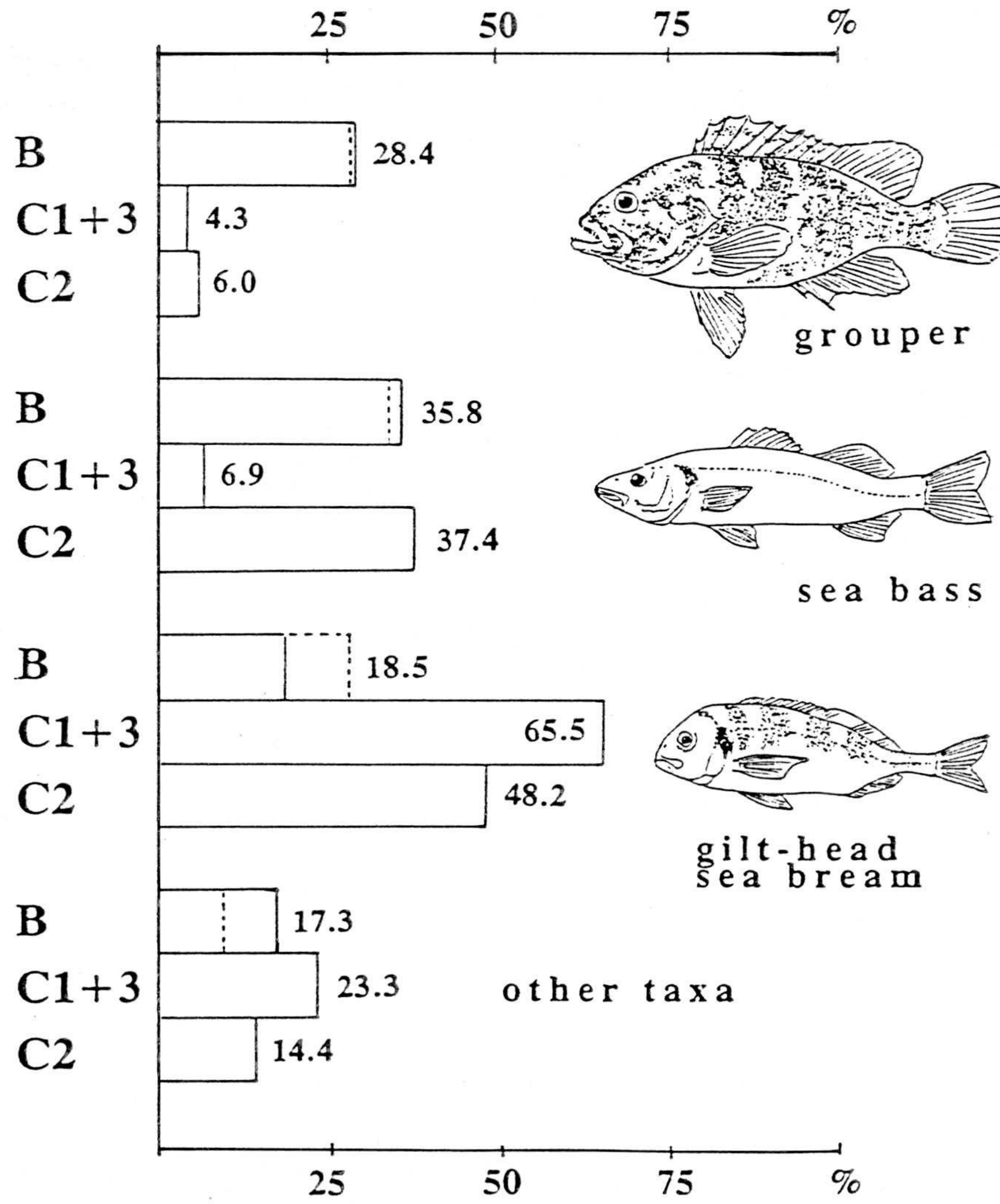

FIGURE 2. Relative distribution of fish taxa from Roman excavations in Carthage. **B** = The Building (late 4th/6th c. A.D.). **C1+3** = Cistern 1 and 3 (mid 5th/early 7th c. A.D.). **C2** = Cistern 2 (late 6th/early 7th c. A.D.).

Can the dissimilarities be explained as a result of different excavation techniques (i.e., sparid bones left unnoticed by the hurried Swedish excavation team)? Gilt-heads from the Cisterns ranged in estimated fork length between 150-500 mm with a maximum in 200-300 mm the size range (Wheeler, 1981: 236). The gilt-heads from the Building are estimated to be of a size between 200-500 mm (Table 9). (There is a slight difference in length estimation methods used. Wheeler (1981) refers to fork length whereas Boessneck & von den Driesch (1985) use total length, but this can only create a very minor problem given other biases involved). Jaw bones of gilt-head are very significant and other smaller fish fragments were in fact retrieved.

Wheeler (1981) regrets the lack of a comprehensive collection of comparative skeletal material. Jaw bones of *Sparus aurata* as well as *Pagrus pagrus* are so peculiar that they allow an easy identification at species level. This fact could give the sparids an advantage over taxa of more difficult identification. I am nevertheless prone to agree with Wheeler (1981: 235) that the picture of the faunal assemblage would probably not be altered even if vertebral centra and more bones from the head skeleton were identified.

There are other sites around the Mediterranean with identified fish remains, covering a period from the Neolithic to 850 A.D. (Figure 3). The distribution of grouper, sea bass and sea bream in those sites are shown in Figure 4.

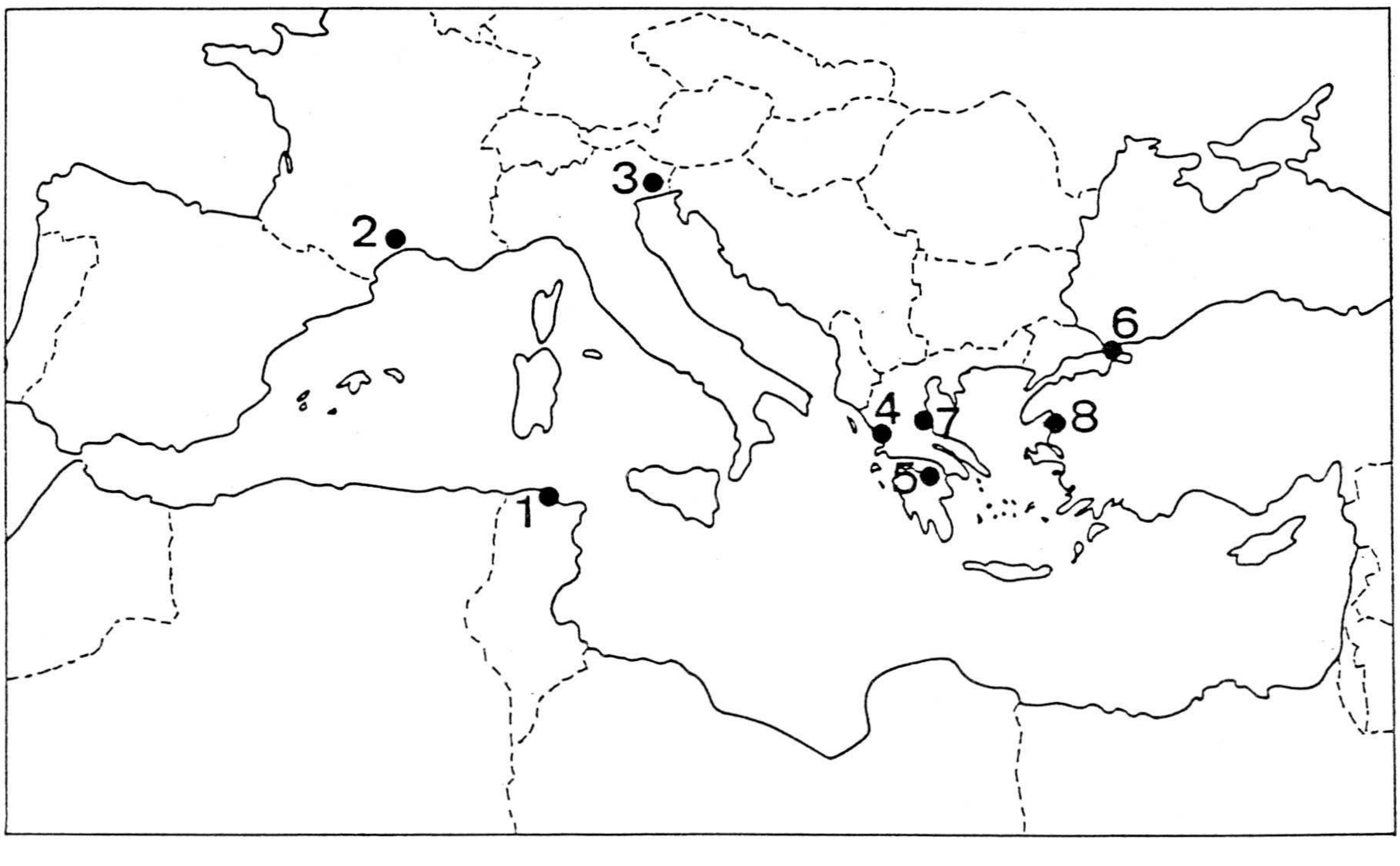

FIGURE 3. Location of sites mentioned in the text. **1.** Carthage (Building late 4^{th}/early 6^{th} c. A.D., Cisterns late 4^{th}/early 7^{th} c. A.D.). **2.** Lattes ($3^{rd}/1^{st}$ c. B.C.). **3.** Invillino-Ibligo (ca 100-850 A.D.). **4.** Kassope (ca 400-100 B.C.) **5.** Corinth ($1^{st}/2^{nd}$ c. A.D.). **6.** Fikirtepe (early Neolithic). **7.** Magula Pevkakia (late Neolithic). **8.** Pergamon (ca 350 B.C. to 500 A.D.).

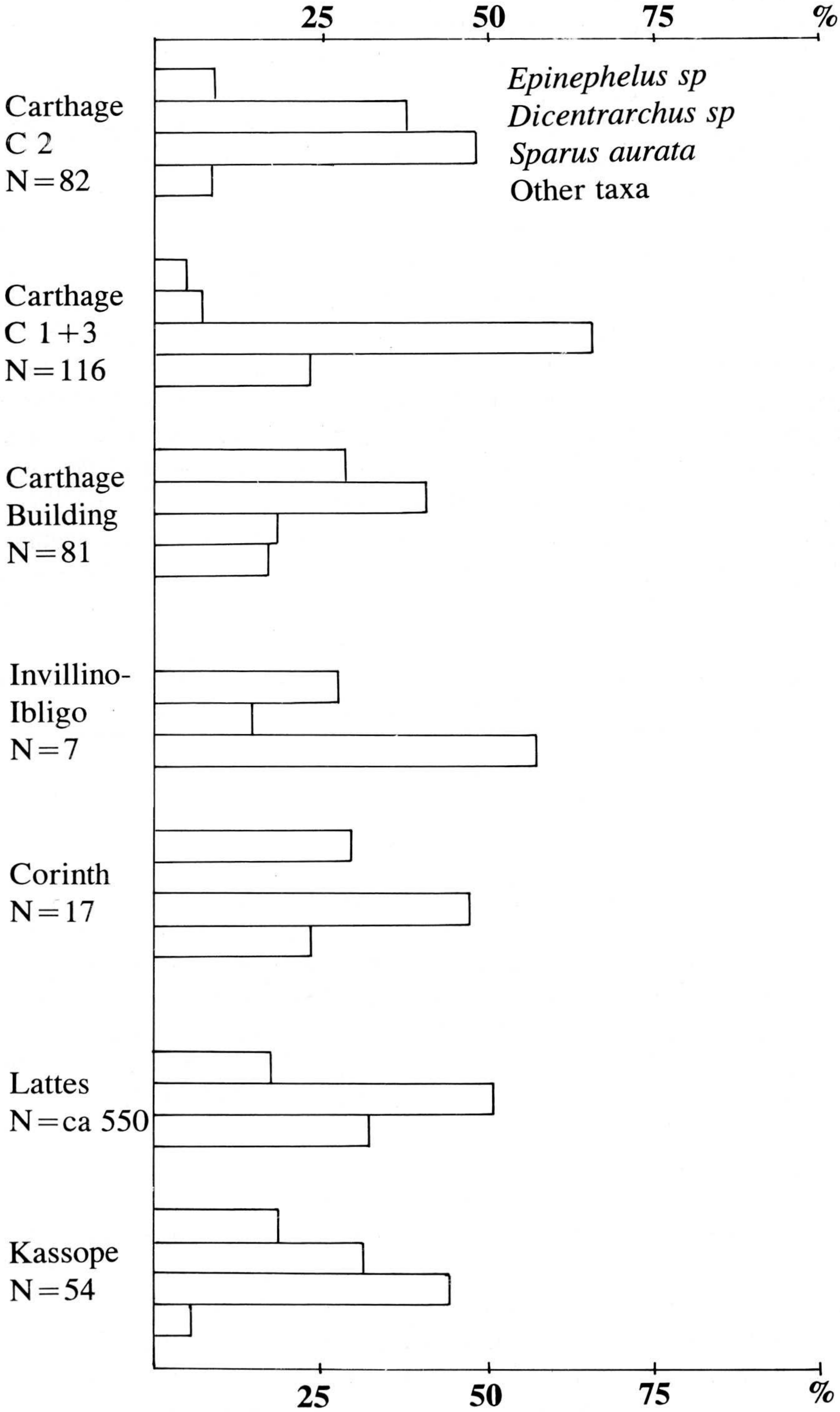

FIGURE 4. Distribution of fish taxa identified from sites around the Mediterranean, dated from ca 400 B.C. to 850 A.D. (The "bottom site" is the oldest.).

The bone material from Kassope in Greece is dated to 4^{th}-1^{st} c. B.C. Kassope was located on the Gulf of Ambrakia in the western part of the country. Very few specimens of fish are assigned to other than the above mentioned taxa (Friedl, 1984: 191-196).

Lattes in southern France, lying between Montpellier and the sea, is dated from 3^{rd} to 1^{st} c. B.C. Here ca 50% of the fish was gilt-head, ca 18% sea bass but just a few specimens could be identified as groupers. About 32% belongs to other taxa, preferably mullets, eel and sardine (Sternberg, 1989).

The few specimens from Corinth (1^{st}-2^{nd} c. A.D.) indicate the presence of gilt-head and grouper, the other taxa being meagre and bluefin tuna (Rose, 1987).

Invillino-Ibligo in Italy is an inland site dated to ca 100-850 A.D. Sea fish had to be imported. Three taxa of sea fish are identified (sea bass, gilt head and ombrine) but there are also finds of sturgeon and trout (Stark & von den Driesch, 1987).

Cisterns in Pergamon (ca 350 B.C. to 500 A.D.) had sea bass and dentex in the deposits but more abundant were specimens of cyprinids, sheat catfish (*Siluris glanis*) and pike-perch (*Stizostedion lucioperca*). The carp, *Cyprinus carpio,* was most common and might even have been cultivated (Boessneck & von den Driesch, 1985).

If one goes further back in time to take a look at Neolithic sites one finds that gilt-head is common in Fikirtepe and Magula Pevkakia where one also finds sea bass. In Fikirtepe the other taxa were mostly freshwater fish dominated by sheatfish. In Magula Pevkakia bluefin tuna was the most common catch (Lepiksaar, 1975; Boessneck & von den Driesch, 1979: 50-67).

The above mentioned fish finds are examples of little pieces of information that hopefully will multiply in the future to increase our knowledge and understanding of prehistoric fishery.

CONCLUSIONS

The marine fishes identified from Carthage represent two well differentiated ecological groupings, an inshore rocky habitat and an offshore, surface to midwater habitat (Figure 5). Our analysis allows some interpretation of fishing technology. Most of the fish were probably easy to obtain by hook and line from boats close to the shore. But there could also have been a mid-water and near surface fishing in the open sea as indicated by finds of spurdog, bluefish and little tunny. The occurence of grey mullets suggests the use of nets or some form of fixed traps, a fishery that was likely also to take sea bass, sea bream, grouper and meagre in good quantities - with less effort than high sea fishing.

The identification of at least 18 fish taxa reflects the abundance of species available over a wide area in the vicinity of Carthage, including freshwater lakes. We nevertheless know that these spectra of abundance must be taken as underrepresentations of even the amounts of taxa present in the taphocenosis due to poor retrieval methods. The ichthic diversity of sieved samples in sites such as Doña Blanca (Roselló & Morales, 1994) seems to confirm such claim.

Fish, especially sea fish, was expensive and not for ordinary people. The Roman emperor Diocletian made an attempt to stop inflation in the empire in 301 A.D. (Goodenough, 1986: 84). Maximum prizes were to be used for various merchandises. Diocletian's edict gives us an idea about costs. Fish from rivers and lakes were just as expensive as meat from cattle, sheep or goat but only half the price of sea fish. A barber had to shave 24 customers to be able to buy one kilo of the cheapest of the sea fishes! (Goodenough, Op. cit.).

There are further hints that the Building excavated by the Swedish team had been the home of rich people. Maybe the bath was a private one and guests were treated with luxury meals at the "pool side". The head of the meagre was reputed to be particulary delicious (the dentary found was apparently butchered). So the presumption after all is that the good Romans did prefer the fishes we have been able to identify!

HABITAT	TAXON	
	Chelon labrosus	**thick-lipped grey mullet**
	Mugil sp	**grey mullets**
brackish water	*Dicentrarchus labrax*	**sea bass**
	Argyrosomus regius	**meagre**
	Sparus aurata	**gilt-head sea bream**
	Conger conger	**conger eel**
	Epinephelus gauza	**grouper**
	Dentex sp	**dentex**
inshore	*Pagrus pagrus*	**Couch's sea bream**
	Pagellus sp	**sea breams**
	Labrus sp	**wrasses**
	Symphodus sp	"
	Sarda sarda	**Atlantic bonito**
	Squalus sp	**spurdog**
offshore	*Pomatomus saltator*	**bluefish**
	Trachurus sp	**scad**
	?Euthynnus alletteratus	**little tunny**

FIGURE 5. Ecological grouping of identified marine fish taxa from Carthage.

ACKNOWLEDGEMENTS

I am very grateful to Dr Carl-Gustaf Styrenius who entrusted me with the analysis of the bone material from Carthage. Without Leif Jonsson's generous offer to make his private reference collection of Mediterranean fish available to me this report would not exist. Many thanks also to Dr Johannes Lepiksaar who provided me with the basics in ichthyo-osteology and always offered his support; Dr Charles Schwartz gave me Davidson's Mediterranean Seafood to season my fish studies and Dr Humphry Greenwood who read the manuscript and kindly corrected my English.

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