

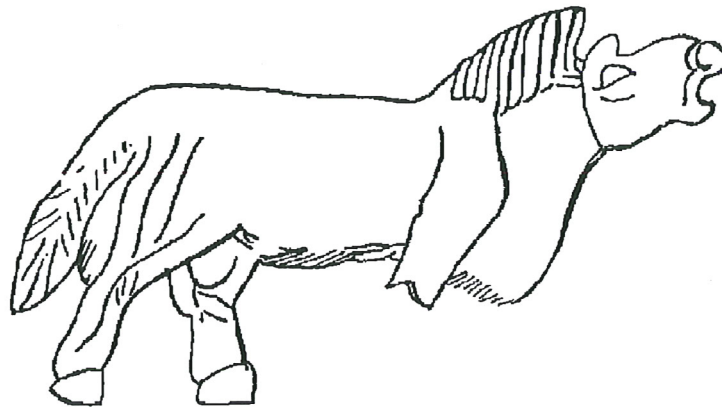


ARCHAEOZOOLOGY OF THE NEAR EAST IV B

Proceedings of the fourth international symposium on the
archaeozoology of southwestern Asia and adjacent areas

edited by

M. Mashkour, A.M. Choyke, H. Buitenhuis and F. Poplin



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PRELIMINARY REPORT ON THE FAUNAL REMAINS FROM AN 'UBAID SETTLEMENT ON DALMA ISLAND, UNITED ARAB EMIRATES

Mark Beech¹

Abstract

A preliminary analysis is provided of the vertebrate faunal remains from a newly discovered 'Ubaid settlement located on the island of Dalma in the United Arab Emirates. The site dates to the early 5th millennium BC. Fishing and hunting were of great importance although animal husbandry was also practiced, a small amount of bones of domestic sheep/goat being present at the site. Gazelle were sometimes hunted, and marine turtle, dugong and dolphin only appear to have been occasionally exploited. Other marine resources utilised included crabs and marine mollusca. Fish bones however form the most significant component of the assemblage. Ongoing analysis of the fish remains suggests that a wide range of species are present, including inshore as well as pelagic species. Major groups include the subclass *Elasmobranchii* (cartilaginous sharks and rays) as well as the following families amongst the *Osteichthyes* (bony fishes): *Belonidae* (needlefish), *Serranidae* (groupers), *Sparidae* (seabreams) and *Scombridae* (tuna/mackerel). Other fish families represented included *Ariidae* (marine catfish), *Carangidae* (jacks), *Lethrinidae* (emperors), *Sphyrnidae* (barracuda) and *Scaridae* (parrotfish). Initial biometric work suggests that some fishes were of a substantial size. A comparison is made with other published contemporary sites in the region.

Résumé

Une analyse préliminaire de la faune vertébrée d'un nouvel établissement Obeid situé sur l'île de Dalma dans les Émirats Arabes Unis est présentée. Le site appartient au 5^e millénaire BC. La pêche et la chasse étaient de grande importance, bien que l'élevage animal ait été aussi pratiqué, ce qui est confirmé par la présence d'ossements de caprinés sur le site. La gazelle était quelquefois chassée, et les tortues marines, les dugongs et les dauphins étaient exploités à l'occasion. Les autres ressources marines rencontrées sont les crabes et les mollusques marins. Les ossements de poissons forment cependant une composante importante de l'assemblage faunique. Leur étude en cours suggère un large éventail d'espèces exploitées, comprenant des espèces côtières et pélagiques. Les groupes les plus importants comprennent la sous-classe des *Elasmobranchii* (requins et raies) aussi bien que les familles suivantes parmi les *Osteichthyes* (poissons osseux): *Belonidae*, *Serranidae*, *Sparidae* et *Scombridae*. Les autres familles de poissons identifiés comprennent les *Ariidae*, les *Carangidae*, les *Lethrinidae*, les *Sphyrnidae* et les *Scaridae*. Une première analyse biométrique suggère que quelques poissons étaient de grande taille. Une comparaison est faite avec d'autres publications de sites contemporains de la région.

Key Words: Vertebrate Fauna, 'Ubaid Settlement, Dalma, United Arab Emirates

Mots Clés: Faune Vertébrée, Occupation 'Ubaid, Dalma, Emirats Arabes Unis

Introduction

This paper presents the results of a preliminary analysis of the animal bones retrieved during the course of the 1993-94 and 1998 excavations at an early 5th millennium BC site located on the island of Dalma, United Arab Emirates. The island lies at UTM 6333000 E, 2710000 N, 45 km from the coast of Abu Dhabi, 29.5 km from the island of Sir Bani Yas and 80 km from the eastern coast of Qatar (Fig. 1). In the spring of 1992 during the first season of the Abu Dhabi Islands Archaeological Survey (ADIAS) a site was found within the compound of the Jama'iyya nahda li-imrat al-Zubayniyya (the Abu Dhabi Women's Association) in Dalma town (Flavin and Shepherd 1994; King 1998). The presence of flint scatters, pottery, beads and house structures, as well as subsequent radio-

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carbon dating, indicated that it was of 'Ubaid date (c. early 5th millennium BC). The settlement would have lain on or near the beach, the shoreline lying approximately 20 m or so to the west. The discovery of an 'Ubaid site on the island was quite unexpected. It is the first settlement of this period to have been found off the coast of the Arabian mainland and is therefore potentially of major archaeological significance. Dalma adds another site to the growing list of new 'Ubaid localities being discovered in the eastern Gulf (Boucharlat *et al.* 1991a,b; Haerinck 1991; Millet 1991; Phillips in prep; Uerpmann and Uerpmann 1996).

Fieldwork Methods

The compound area in Dalma town where the site is located has been used until recently as a playground and superficial damage to the site had been caused by the scuffing of children's feet. Plans to develop the buildings belonging to the Women's Association meant that there was a direct threat to the site's survival. This threat, together with the site's archaeological importance, meant that it was

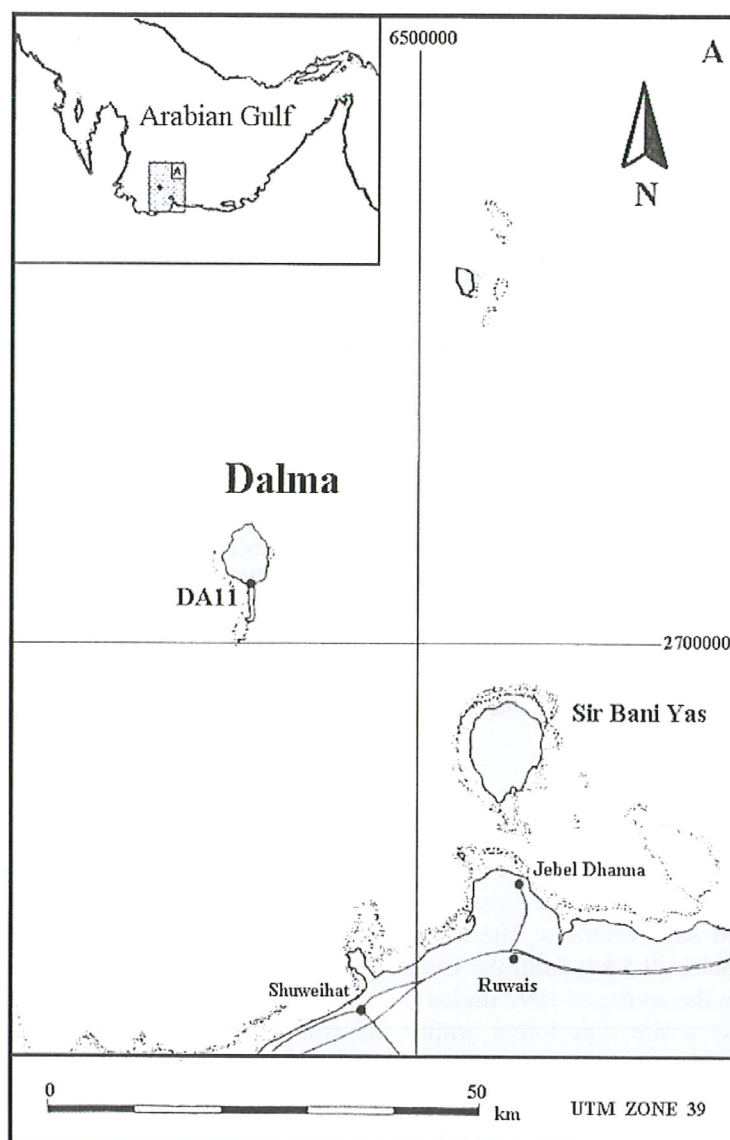


Fig. 1. Location of Dalma and site DA11

selected for further investigation when the survey team returned for a second season in 1993. Subsequent work confirmed the presence of a large 'Ubaid settlement with a high level of archaeological survival. Surface sieving produced a considerable quantity of 'Ubaid finds with unexpectedly low levels of later contamination. A trial trench revealed over one metre of complex deposits and four "phases" of activity were identified. Gypsum surfaces and related features indicate the presence of structures, perhaps "barasti"-like houses (Flavin and Shepherd 1994). A further season of fieldwork was carried out in the spring of 1994 to establish the total extent of the site. This revealed that the site encompassed an area of about 175m east-to-west and 210m north-to-south. A further trial trench was excavated which revealed c. 1.30m depth of deposit.

In the spring of 1998 a short field season was carried out at the site in order to reopen and continue the excavation of the 1993 and 1994 trial trenches so that samples could be taken for radiocarbon dating and further environmental analysis. This work uncovered traces of at least two round house-like structures with surviving post-holes and floors, at a depth of c. 1 m below the present day ground surface (Beech and Elders 1999, Beech *et al.* in press). Further small quantities of imported painted 'Ubaid wares from southern Mesopotamia were recovered, along with substantial quantities of gypsum plaster vessel fragments. The numerous flint flakes collected included a good number of tools, mostly awls and a tile knife. Other finds included several ornamental beads. Large quantities of food debris in the form of marine mollusca and animal bones were also retrieved.

The recovery of bones during surface sieving of the top 5-10cm, as well as the excavation of deposits within the trial trenches, was undertaken utilizing 3mm mesh sieves. All excavated sediment was 100% sieved in order to ensure the recovery of small bones and other finds. In addition, a number of whole earth bulk samples were taken during the excavation of the trial trenches in order to monitor the recovery of material from different contexts. These samples were usually between 7-8 litres (5-6 kg) in size. All of these samples were dry sieved using 1mm mesh sieves to check if smaller material was being missed by the standard dry sieving (3mm) process.

Dating of the site

AMS radiocarbon dating of two carbonised datestones (*Phoenix dactylifera*) from the site produced the following dates:

1. context 4, a redeposited sand layer just below the present day ground surface: 4670 +/- 130 cal BC (AA-32031) - (100%)
2. context 15, a burnt layer located about 80cm below the present day ground surface and 25 cm above the floor level of one of the house structures: 5120 +/- 170 cal BC (AA-32032) - (98.8%)

Both samples were processed by the Scottish Universities Research and Reactor Centre (SURRC) radiocarbon laboratory at the University of Glasgow who, in conjunction with the University of Arizona AMS facility, performed the dating. Calibrations have been made using the University of Washington, Quaternary Isotope Laboratory, Radiocarbon Calibration Program, Rev. 4.0 1998, using the datasets derived from Stuiver *et al.* (1998). The decadal atmospheric calibration curve is used throughout. Calibrated age ranges are presented calculated with 2 sigma errors from the probability distributions. The relative area under the probability distribution is given in brackets after the age range.

Material

There were considerable problems with the retrieval of bone from the site, due to its fragile condition. Many fragments from the trial trenches were only held together by the encrustation of salts and minerals on their surface and collapsed as attempts were made to lift them. A good proportion of the bone fragments was also burnt adding to their general fragility. Wherever possible associated groups

of bones were recorded and lifted together so that important information would not be lost. Over 29 kg of animal bone fragments were recovered during all the excavations, and the study of these is currently underway as part of the author's Phd research modelling ancient marine resource exploitation in the southern Arabian Gulf.

(a) surface material

The majority of the identifiable fragments collected from surface sieving at the site consisted of small elasmobranch vertebrae, probably belonging to young rays and skates. Several larger elasmobranch vertebrae belonging to shark were also noted. Other fishes represented included needlefish (*Belonidae*), grouper (*Serranidae: Epinephelus* sp.) and sea bream (*Sparidae*). Marine mammals were represented by dolphin/porpoise (*Delphinidae*). Terrestrial mammals were only sparsely represented by gazelle (*Gazella* sp.) and sheep/goat (*Ovis/Capra*). Many of the bone fragments had surface discolouration suggesting that they had been exposed to prolonged heat, presumably in relation to cooking (some were singed black in colour whilst others were grey/white/pale-blue and calcined). No definite traces of butchery marks were observed on any of the bones although their degree of fragmentation may have masked any such marks.

(b) excavated material

Tables 1 and 2 summarise the species represented within the excavated trial trenches. Some of the excavated bones were also burnt like the surface material. Again, no obvious butchery marks were visible on the bones. The remains of crabs (*Crustacea*), mostly *chela* (pincer) fragments, occurred in a number of layers throughout the sequence. The inhabitants of the site would have probably collected many of these as they scoured the shorelines of Dalma for marine mollusca at low tide. Turtle (*Cheloniidae*) was represented in several layers, mostly by carapace fragments and a few post-cranial fragments. None of the fragments were sufficiently well preserved to determine which particular species of marine turtle was being exploited. The only bird species recognised to date within the Dalma deposits are several bones belonging to Socotra cormorant (*Phalacrocorax nigrogularis*). Gazelle occurred in small quantities within the deposits. One of the best preserved bones was a fused distal metatarsal in context 12 which had a distal articulation breadth (Bfd) of 18.9 mm. Dugong (*Dugong dugon*) was quite rare and was only represented by occasional rib fragments, immediately recognisable by their dense characteristic structure and weight. Dolphin/porpoise (*Delphinidae*) vertebra fragments were recovered in several different deposits. Most of the terrestrial mammal bone fragments were extremely fragmented and could only be attributed as belonging to small ruminant, i.e. sheep or goat or gazelle (*Ovis/Capra/Gazelle*). Sheep or Goat (*Ovis/Capra*) was represented however by a small number of fragments.

By far the majority of the animal bones from Dalma by number and weight belonged to fishes. Several clear groups of apparently butchered fish remains were recovered from a number of contexts. During the excavation of a redeposited layer of beach sand (context 4), two *in-situ* articulated fish vertebrae segments were recorded which were situated immediately adjacent to two parallel gully-like features (cf. figure 5 in Flavin and Shepherd 1994). These consisted of a group of four large shark vertebrae and a fragmentary group of grouper (*Serranidae: Epinephelus* sp.) caudal vertebrae. A further group of articulated fish bones was found in a sand layer (context 10) which also contained burnt bone, shell and patches of ashy sand. This consisted of the fragmentary remains of a caudal fin of an unidentified species. Excavations in 1998 revealed further groups of articulated fish bones, which included a concentration of needlefish (*Belonidae*) skulls, as well as additional groups of articulated shark vertebrae. It may not be coincidental that all these articulated groups of fish bones were usually no more than about 10cm in length. It is possible that such remains may represent waste from organised fish processing activities at the site. There is a clear overlap in the distributions of surface bones and flint debitage implying the existence of zones of activity within the area of the site.

Table 1. Crustacea, reptiles, Birds and Mammals represented at Dalma and contemporary sites in the Arabia Gulf region. (FF=very frequent, F= frequent, R= rare, RR= very rare)

SITE	Abu Kha- mis	Ain Qannas	Al Markh 1	Al Markh 2	Dalma	Dosariyah	Khor FB	Khor P	Ras Abaruk 4	Ra's al- Hamra	Shagra	Umm al- Qatwain	Umm al- Qatwain, Site 69
COUNTRY	Saudi Arabia	Saudi Arabia	Bahrain	Bahrain	UAE	Saudi Arabia	Qatar	Qatar	Qatar	Oman	Qatar	UAE	UAE
PERIOD	Late Ubaid	Ubaid	Ubaid ("Early phase")	Post-Ubaid ("Late phase")	Ubaid	Ubaid	Ubaid	Ubaid	Ubaid 4/ Post-Ubaid	Ubaid	Ubaid	Ubaid	Ubaid
DATE (mill. BC)	early 4th	early 5th	4th	?4th-3rd	early 5th	early 5th	5th	5th	4th	5th		5th	5th
REFERENCE	Masry 1974	Masry 1974	Roaf 1974	Roaf 1974		Masry 1974	Desse 1988	Desse 1988	Smith 1978	Durante and Tosi 1980	Desse 1988	Mosser- li-Marlio in prep.	Uerpmann + Uerpmann 1996
<i>Crustacea</i>	present				R								
<i>Chelonidae</i>	present				F					dominant			
<i>Chelonita mydas</i>									present	dominant			
<i>Aves</i>	present												
<i>Phalacrocorax nigrogularis</i>					R								
<i>Rodentia</i>	10 (8%)												
<i>Lepus capensis</i>						present							
<i>Gazella</i> sp.	53 (39%)			common	R	62			present			present	
<i>Dugong dugon</i>					RR								
<i>Delphinidae</i>					R								
<i>Bos taurus</i>		2				77						present	
<i>Capra hircus</i>	7 (5 %)	1		common								present	
<i>Ovis/Capra</i>	29 (21%)			common	R	60						present	
<i>Ovis/Capra/Gazella</i>					R	8						present	
<i>Canidae</i>						3						present	
<i>Equus</i> sp.		20				24			present				

Table 2. Fishes represented at Dalma and contemporary sites in the Arabian Gulf region. (FF = very frequent, F = frequent, R = rare, RR = very rare)

SITE	Abu Kha-mis	Ain Qannas	Al Markh 1	Al Markh 2	Dalma	Dosariyah	Khor FB	Khor P	Ras Ab-aruk 4	Ra's al-Hamra	Shagra	Umm al-Qaiwain	Umm al-Qaiwain, Site 69
COUNTRY	Saudi Arabia	Saudi Arabia	Bahrain	Bahrain	UAE	Saudi Arabia	Qatar	Qatar	Qatar	Oman	Qatar	UAE	UAE
PERIOD	Late Ubaid	Ubaid	Ubaid ("Early phase")	Post-Ubaid ("Late phase")	Ubaid	Ubaid	Ubaid	Ubaid	Ubaid 4/ Post-Ubaid	Ubaid	Ubaid	Ubaid	Ubaid
DATE (mill. BC)	early 4th	early 5th	4th	?4th-3rd	Early 5 th	early 5th	5 th	5 th	4th	5th		5 th	5 th
REFERENCE	Masry 1974	Masry 1974	Roaf 1974	Roaf 1974		Masry 1974	Desse 1988	Desse 1988	Smith 1978	Durante and Tosi 1980	Desse 1988	Beech, in prep.	Uerpmann +Uerpmann 1996
<i>Pisces</i> (general comments)	very common (85% by total weight)	none reported	very common "medium fish, 20-35 cm, 0.5 - 1 kg, mostly Sparidae")	common ("large carnivorous fish")		"most extensively represented... small -medium varieties"			present	very common			
<i>Elasmobranchii</i> (large)					R						present, <i>Mustelus</i> sp.		
<i>Elasmobranchii</i> (small)					F			1, <i>Carcharhinus</i> sp.			present, <i>Carcha - rhinidae</i>		
<i>Clupeidae</i>												R	
<i>Ariidae</i>					R			present					
<i>Atherinidae</i>							present	173					
<i>Belontiidae</i>					F								
<i>Serranidae</i>					FF			present			present		
<i>Carangidae</i>					F			present				RR	
<i>Lutjanidae</i>												R	
<i>Haemulidae</i>												RR	
<i>Lehrinidae</i>					F							R	
<i>Sparidae</i>			Present		FF		present	670			present	FF	present
<i>Sphyraenidae</i>					R								
<i>Scorpaenidae</i>					R								
<i>Scombridae</i>					F							RR	

Although the majority of the flint tools (Czastka, pers.comm.) consist of drills and piercers, some of the tabular knives and scrapers may have been used for fish processing activities such as the removal of sharp dorsal spines, descaling and the filleting of fish into portions to be dried or cooked. The most common families represented amongst the fish bones recovered were the seabreams (*Sparidae*), followed by the cartilaginous sharks, rays or skates (*Elasmobranchii*), needlefish (*Belonidae*), groupers (*Serranidae*), and tuna/mackerel (*Scombridae*). Many of the seabream dentaries and premaxillae appeared to belong to the genus *Acanthopagrus* sp., with their 4-6 incisors and 3-6 rows of molariform teeth. They were mostly from individuals c. 30-40cm in length. Some belonged to the genus *Rhabdosargus* sp. and were c. 20-30cm in length. The majority of the elasmobranch vertebrae were small in size (c. 5-7mm in diameter), suggesting that they probably come from small sharks, rays or skates. Although the flesh of stingrays (*Dasyatidae*) is not considered by some to be good to eat, it is often described as having a bitter taste (Relyea 1981: 38), others such as sharks and guitarfishes (*Rhinobatidae*) are reputedly good to eat. The needlefish (*Belonidae*) represented probably belong to one of the three common species which occur in the Arabian Gulf (*Ablennes hians*, *Strongylura leiura* or *Tylosurus crocodilus crocodilus*). Needlefishes are carnivorous and mostly feed on small fishes which they catch sideways in their beaks. Most of the remains here were from individuals about 50-70cm in length. The majority of the grouper (*Serranidae*) bones belong to the subfamily *Epinephelinae*. They are carnivorous fishes which occupy a range of habitats from shallow coastal waters to moderate depths. Certain species prefer seagrass beds and mud or sandy bottoms, but most are fishes of coral reefs and rocky bottoms (Smith and Heemstra 1991: 515). Preliminary biometric work suggests that some of the groupers were of a substantial size, as much as 90cm in length (Fig. 2). Tuna/mackerel (*Scombridae*) occurred in moderate quantities, particularly closer to the base of the sequence in the layers immediately overlying one of the circular house structures (contexts 15-17). A preliminary examination of these bones suggests that most were from medium-sized scombrids, c.60-80cm in length; many of them belonged to the genus *Thunnus* sp. The most frequently occurring species in that particular genus within the southern Arabian Gulf at the present day is the longtail tuna (*Thunnus tonggol*). This is one of the smaller tuna species occurring within the Western Indian Ocean region, having a maximum fork length of c.130cm but more commonly being around 70cm (Collette and Nauen 1983). This is a surface dwelling, neritic species, not usually found in turbid low-salinity waters (Randall 1995: 376).

Other fishes represented at Dalma included marine catfish (*Ariidae*), jacks (*Carangidae*), emperors (*Lethrinidae*), barracuda (*Sphyraenidae*) and parrotfish (*Scaridae*).

The Dalma bone assemblage and site: a regional comparison

Tables 1 and 2 compare the Dalma faunal assemblage with those from other contemporary sites in the region. It is clear that, at most sites, there is a predominant emphasis on the exploitation of fish with comparatively little emphasis on terrestrial mammals. Unfortunately there are few published sites available for a detailed comparison of the occurrence of particular species and their relative importance. Most reports simply mention qualitative rather than quantitative data. At Al Markh 1 in Bahrain, it is stated that the fish represented there primarily consisted of medium-sized fish, mostly seabream (*Sparidae*), about 20-35cm in length and weighing between 0.5 - 1kg (Roaf 1974). A similar emphasis on seabreams was recognised at Khor P and Shagra in Qatar (Desse 1988), as well as at Umm al-Qaiwain in the United Arab Emirates (Beech in prep; Uerpmann and Uerpmann 1996). The Dalma assemblage broadly matches this picture, suggesting that perhaps the predominant fishing method was utilizing fishnets or traps in shallow coastal inshore waters. What is interesting though is the fact that the Dalma assemblage has a more diverse and richer range of material in comparison with the other contemporary sites. The occurrence of pelagic fish such as tuna clearly demonstrates that fishing may have also been carried out further offshore, although tuna are known to come close to shore and island masses at certain times of year. Alverson (1963) is of the view that the availability of more food in the vicinity of islands than the surrounding seas, is a possible reason for the aggregation of

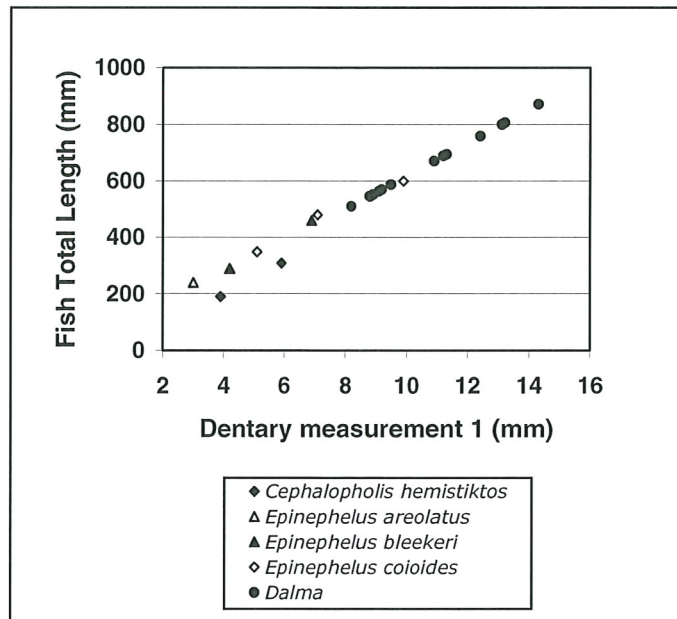


Fig. 2. Reconstructing the size of the Dalma groupers (Serranidae). Height of dentary measurement taken after Desse and Desse-Berset (1996). Derived regression formula calculated from modern grouper specimens in my comparative reference collection: *Cephalopholis hemistiktos*, *Epinephelus areolatus*, *Epinephelus bleekeri* and *Epinephelus coioides*. ($y = 59.211x + 24.539$, $r^2 = 0.904$). Black circles mark the points calculated for the Dalma grouper dentaries

tuna. An island offers a different environment than the surrounding sea, in that benthic fauna and flora, in addition to the pelagic, may contribute to the food chain.

Previous reports on 'Ubaid settlements in Eastern Arabia have largely stressed that sites were probably seasonally occupied with the occupants engaged in hunting (more usually inland), fishing and mollusc gathering (along the coasts). Most of these sites are ephemeral in nature, consisting of small surface scatters of finds, although this is perhaps because many have been damaged by natural erosion. A few sites are however deeply stratified. At Dosariyah there was c. 3.5m depth of occupation and a mound at Abu Khamis yielded nearly 4m of deposit. It is clear from the investigations at Dalma that the site is of a considerable size and depth. The 1998 season of excavations confirmed that the settlement was a multi-phase occupation site and it seems quite possible that the inhabitants of Dalma could have lived there all year round. The building structures may indicate occupation for several months of the year, if not permanently, perhaps interspersed with periods of shorter, seasonal activity. Freshwater would have been readily available on the island, as well as other important natural resources such as flint and gypsum (Beech *et al.* in press.). It is apparent that the 'Ubaid fishermen, sailing along the Arabian coastline from Southern Mesopotamia, must have traveled further seawards than has previously been thought. Dalma would have provided an obvious staging point in trade down the Gulf.

Conclusion

Preliminary work on the Dalma animal bone assemblage has provided a wealth of information about hunting and fishing during the early 5th millennium B.C. in the southern Gulf region. The inhabitants of the site appeared to have subsisted predominantly on marine rather than upon terrestrial resources. The discovery of sheep or goat (*Ovis/Capra*) and gazelle (*Gazella* sp.) on Dalma during this period is of particular interest. Dalma island is presently situated some 45 km from the mainland. As far as we know Dalma was still very much an island at that particular time. Such animals therefore

may have been deliberately introduced to the island by boat as additional “walking larder” supplies. Alternatively they may, in the case of the gazelle, represent traces of hunting of a native indigenous population.

Fishing seems to have played a major role and most of the fish were probably caught close inshore, judging by the numbers of small sea breams (*Sparidae*) and elasmobranchs. A number of stone and pottery perforated discs were found during both surface sieving and excavation of the trial trenches. These may have been used as net sinkers for fishing nets. Some of the larger groupers (*Epinephelus* sp.) may have been caught by line fishing from boats further offshore. Groupers, however, can also be found quite close to shore in coastal waters as well as at greater depths. No fish hooks have so far been identified at Dalma such as those made from steatite and marine shell found in 4th millennium B.C. sites in Oman (Tosi 1986: 98). They probably would have been carefully curated though and so their absence from the small area of the site so far investigated is perhaps not surprising. Other methods such as basket traps, and even capture by hand, are commonly used by locals at the present day (Peter Hellyer, pers. comm.).

The occurrence of significant quantities of tuna at Dalma is very interesting. According to modern fisheries data obtained from the Dalma Cooperative Fisheries Office (Mr. Asad Shahin, pers.comm.), only relatively small amounts of tuna are caught near Dalma at the present day, most of the scombrids captured being narrowbarred Spanish mackerel (*Scomberomorus commerson*). In 1998 a total of 64,552 kg of narrowbarred Spanish mackerel were caught, representing the third most important group of fishes to be exploited after groupers (*Serranidae: Epinephelus* sp.) and sweetlips (*Haemulidae: Plectorhinchus pictus*). Out of these almost 51.4% were caught during the month of November, and 78.8% between the months of October to November. Surprisingly very few bones have been identified as belonging to this species within the Dalma bone assemblage. Although tuna are not caught in great numbers presently they perhaps were more readily available in the past. As stated earlier, the availability of more food in the vicinity of islands than the surrounding seas, is a possible reason for the aggregation of the tunas. The inhabitants of Dalma would have been able to take advantage of the marked seasonal occurrence of these pelagic species as they passed on their migratory passage through to the deeper waters of the central Gulf. A further tantalising possibility is that tuna and other pelagic species may have been traded to and from Dalma in the early 5th millennium BC. Traditional drying of longtail tuna (*Thunnus tonggol*) is still carried out as a seasonal activity on Dalma, as witnessed by the author in March 1998. Dried fish may very well have been traded in exchange for southern Mesopotamian goods such as pottery and beads.

The author is currently carrying out a more detailed analysis of the Dalma faunal assemblage. Future objectives include: (i) the completion of a more comprehensive list of species represented at the site, which will permit more detailed modelling of the fish communities being exploited, (ii) further biometric work on the size of the archaeological material in comparison to modern fish reference data. Such work will allow the reconstruction of the approximate original size/weight of the fish being caught at Dalma. Finally, (iii) a more detailed comparison with other sites in the southern Gulf region and its environs in order to reconstruct a more detailed subsistence model illustrating marine resource exploitation during the early 5th millennium B.C.

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