Chapter 10

Archaeological Fish Bones from the Farasan Islands

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10.1 Introduction

This report provides the results of the analysis of fish bone samples retrieved from two archaeological sites located in the Farasan Islands (Figure 10.1). These are the Janaba East (site JE004) and Khur Mahdi (site KM1057). The samples reported on here were recovered from excavations carried out at Janaba Bay in 2008 and 2009, and at Khur Mahdi in March 2008

10.2 Methods

A variety of experiments were carried out to determine the most effective method of retrieving fish bones from the excavated shell matrix, including sieving of all material excavated through 10 mm and 2 mm meshes on the site, and removal of bulk samples to a compound in the town with availability of water for wet sieving and large sorting tables. In the event it was found that wet sieving offered no advantages over dry sieving in recovering small fragments of fish bone (for full details of excavation and recovery procedures see Alsharekh et al. 2013 and Bailey et al. 2013)

Fish bones were identified using the author's personal osteological reference collection of Arabian Gulf fish skeletons which is located in Abu Dhabi in the United Arab Emirates.

Quantification of the remains was made following the methodology of Beech (2004). The principal diagnostic elements recorded were the vomer, articular, dentary, maxilla, premaxilla, quadrate, cleithrum and post-temporal. Secondary elements which were recorded include the basioccipital, hyomandibular and operculum. A number of other elements were also recorded which were characteristic of certain families, genera or species.

An attempt was made to reconstruct the relative size of individual fish where diagnostic elements were complete enough to permit their evaluation. This was done in the case of the following elements: vomer, upper pharyngeal, lower pharyngeal, premaxilla, dentary, articular, quadrate, hyomandibular and post-temporal. The size of all vertebrae was recorded based on measuring the maximum width of the centrum, this being recorded to the nearest millimetre.

All of the above data were recorded into a database stored in Microsoft Excel.

Photographs of interesting specimens were taken using a Dino-Lite Premier Digital Microscope AM4113/AD4113 Series (AM4113ZT).

10.3 Results

10.3.1 Janaba East (site JE004)

A total of 3,297 fish bones were examined (Table 10.1). At least 8 families are represented. These included requiem sharks (Carcharhinidae), eaglerays (Myliobatidae, Figure 10.2), needlefish (Belonidae), groupers (Serranidae, Figure 10.3), jacks/trevallies (Carangidae), emperors (Lethrinidae), seabream (Sparidae, Figure 10.4) and parrotfish (Scaridae, Figures 10.5 and 10.6)

The majority of the remains consisted of small fragmentary vertebrae from small bony fishes, which were extremely difficult to identify (Table 10.2, Figure 10.7). Most of these could not be identified, probably due to lack of suitable comparative material. Such small fish have comparatively small and fragile cranial elements, which are usually the most diagnostic elements, so this means that they are not so readily identified. As cranial and vertebral elements were represented in the case of most of the other remains, this may indicate that some fish were caught and introduced whole to the site.

Analysis of the relative size of diagnostic elements suggests that the majority of the fish were small, in the 10–20 cm size class (Table 10.3, Figure 10.8). These small fishes identified included groupers, emperors, seabream and parrotfish. In actual fact 90% of the diagnostic elements examined belonged to fishes between 10–30 cm in size. The only larger fish present within the assemblage was a 70–80 cm sized golden trevally (*Gnathanodon speciosus*), represented by a premaxilla in F09/11FB/11GA/977/2.

Analysis of the relative size of all the fish vertebrae at Janaba East confirms the overall picture derived from analysis of the diagnostic fish elements. The majority of the vertebrae, over 98%, were between 1–3 mm in size (Table 10.4, Figure 10.9).

10.3.2 Khur Mahdi Bay (site KM1057)

Only a small assemblage of fish bones was retrieved. A total of 31 fish bones were noted (Table 10.5). Only one specimen could be identified as being a tooth fragment belonging to a grouper. The remainder of the bones consisted of vertebrae only 2–3 mm in diameter from indeterminate species.

10.4 Discussion

The fishes represented are all common types known in the Red Sea (Randall 1983). Shark members of the Carcharinidae family typically inhabit inshore coastal waters, but can also be caught in moderate depths in pelagic waters around the islands. Eaglerays are generally caught in open water, although they can be found at some times of year in shallow coastal waters. Needlefish are surface dwellers and can also be caught in coastal pelagic and offshore waters. Many of the fishes represented, such as groupers, trevallies, emperors and parrotfish, are caught near coral reefs in inshore coastal waters. Some of the fishes, like emperors and seabream, can be caught on muddy, sandy bottoms, including in estuaries.

The situation with regard to modern fisheries in the Farasan Islands is described by Gladstone (2002). The fishery resources are exploited by artisanal, investor and industrial sectors. The artisanal fishery consists mostly of line fishing around coral reefs. About half of the fishing effort occurs within the proposed Farasan Islands marine protected area (MPA). Activities by investor and industrial fisheries include line fishing, gill netting, fish trapping and demersal fish trawling. Major issues relating to the establishment of the Farasan Islands MPA include the decline in the catch of the artisanal fishery, habitat degradation, and the general lack of detailed information such as stock assessment and catch and effort data.

Gladstone (2002) does, however, report that at least 42 fish species can be caught in the artisanal fishery of the Farasan Islands: sharks, needlefish, milkfish, groupers, jacks/trevallies, snappers, grunts, emperors, batfish, silver biddies, mullets, barracuda, wrasse, parrotfish, rabbitfish, flatheads and tuna/mackerel. Emperors (Lethrinidae) were the most favoured catch. He also made some interesting observations about the locations where artisanal fishers operated on the islands. It was noted that fishing trips began from launch sites throughout the Farasan Islands, but usually near the fishermen's village. The fishermen worked around the islands and reefs within the vicinity of their launch site for 1–6 days, living in island camps. An average of about five fishing trips per day were made from the Janaba Bay launch site, whereas an average of only one and half fishing trips per day were made from the Tobtah launch site (Gladstone 2002: 31). It was observed that traditional management practised in the Farasan Islands involved rotating fishing grounds. When

catches declined on a particular reef, then the artisanal fishers stopped fishing there for up to three months and concentrated their efforts on another reef. This was co-ordinated by the chief fisherman.

Investor fishing on the Farasan Islands is carried out in larger boats with gill nets, or hook and line, or both (Gladstone 2002: 33). As reefs were fished which were deeper and further offshore than those frequented by the artisanal sector, additional species such as snappers and emperors were also caught.

Industrial fishing on the Farasan Islands is undertaken by a single company, Saudi Fisheries. Its operations involve demersal fish trawling, gill netting and fish trapping. This mostly occurs in the deeper shelf waters of the Red Sea. The largest component of the catch is rabbitfish (Siganidae). Interestingly, it is reported that fish traps were not historically used by artisanal fishers. The use of 'gargoor' fish traps was introduced to the area by foreign fishers. These traps catch similar species to those already mentioned above, as well as non-commercial species such as angelfish (Pomacanthidae), butterflyfish (Chaetodontodae) and surgeonfish (Acanthuridae).

Depressingly, this modern study reported that the catches, sizes of fish and income from fishing had all declined in recent years, and that therefore more time and a larger area was needed to catch the same number of fish as in the past.

10.5 Parrotfish Aggregations and the Hareed Festival

The Farasan Islands witness a unique annual aggregation of longnose parrotfish (Gladstone 1996). Schools of migrating parrotfish congregates in the Farasan Islands area each year in April, each school consisting of between 500 and 2,500 fish. The parrotfish is known locally as the "Hareed fish" after the local area where it proliferates, namely the Hareed Bay, an enclosed bay with a relatively narrow channel connecting the bay with the open sea (Figure 10.1).

A huge net covering an area of approximately 2,500 square metres is used to catch the fish. It takes nine days and 17 fishermen to lay out the net. Once it is ready, people who have waded out to the sea move inwards, forcing the fish towards the nets. Celebrations of this occasion have been performed in the region "since olden times". All fish caught are given as presents to relatives and to those people who are in need (Dawoud 2011). This event is a special occasion attended by VIPs and other senior figures from the region.

10.6 Conclusion

The archaeological fish remains identified from the Farasan Islands are similar to those known in the present day fauna. It seems likely that most fishing was carried out with nets in shallow inshore waters, judging from the fact that the majority of the fishes caught were extremely small. Some hook and line fishing may have been carried out to catch some of the larger fishes like groupers and jacks/trevallies. It is worth noting the presence of parrotfish at the Janaba East site. Did the ancient populations exploit the curious natural phenomenon of an annual parrotfish aggregation each April? The particular setting of the Farasan Islands may have facilitated this opportunity for the prehistoric communities to come together to exploit this valuable marine resource.

Future research on the archaeological fish bones from these and other sites in the region will profit from a closer examination of artisanal fishing practices on the Farasan Islands. It will be necessary to collect modern comparative fish skeleton specimens of more species in order to be able to identify more precisely the many hundreds of tiny vertebrae retrieved. The author has begun to photograph some of these using microscopic techniques in order to more easily characterise their morphology (Figures 10.2–10.7), but until more modern comparative reference samples can be obtained, their identification remains problematic. It should be noted that within the Red Sea/Western Indian Ocean province it is usually not possible to identify fish vertebrae beyond the level of family, due to the high degree of diversity of small fishes with relatively similar anatomical morphology.

Acknowledgements

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Figures

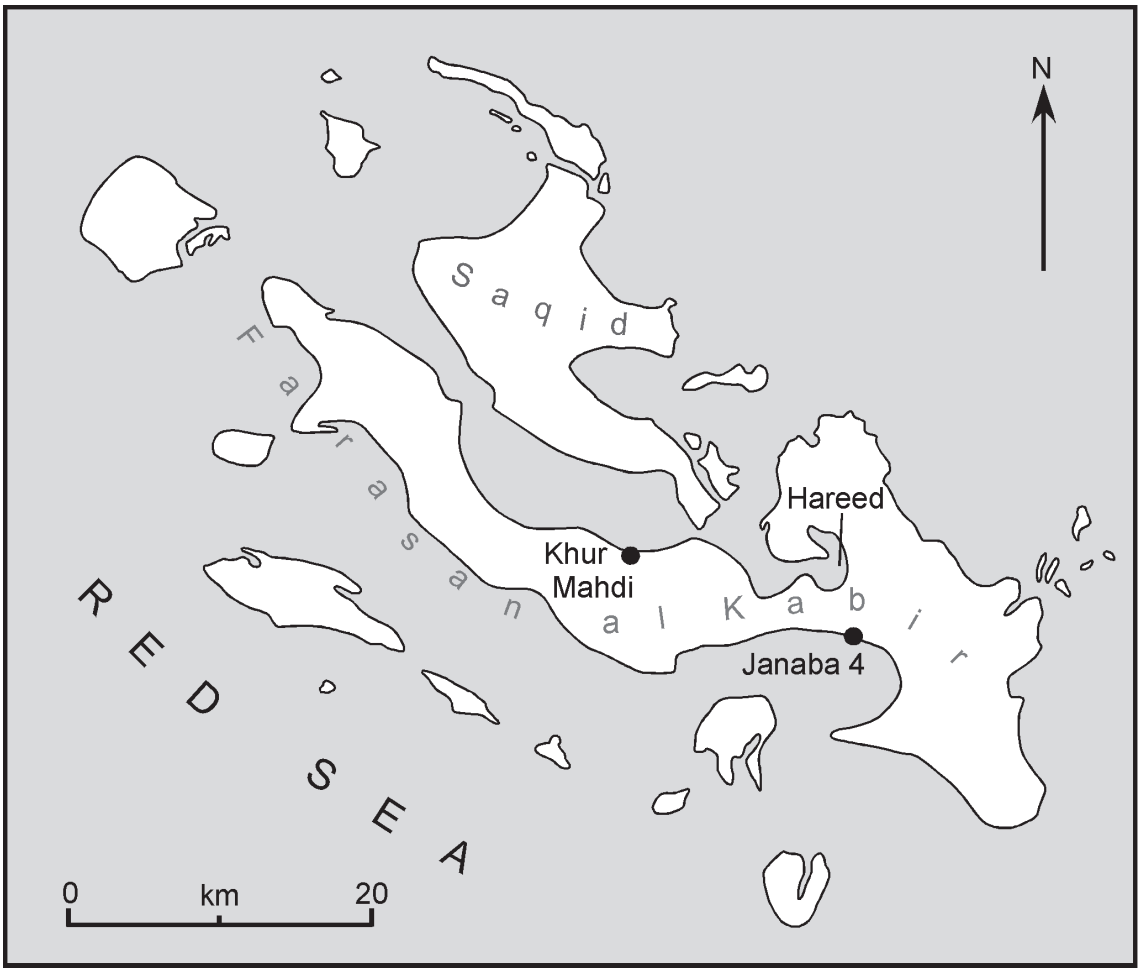

Figure 10.1. Map of the Farasan Islands showing the location of the Janaba East and Khur Mahdi shell mounds, and the bay where the Hareed festival takes place. Drawn by Geoff Bailey.

Figure 10.2. Eagleray (Myliobatidae) pavement tooth fragment. Photo: Jonathan Mark Jonathan Beech.

Figure 10.3. Grouper (Serranidae) dentary. Photo: Mark Jonathan Beech.

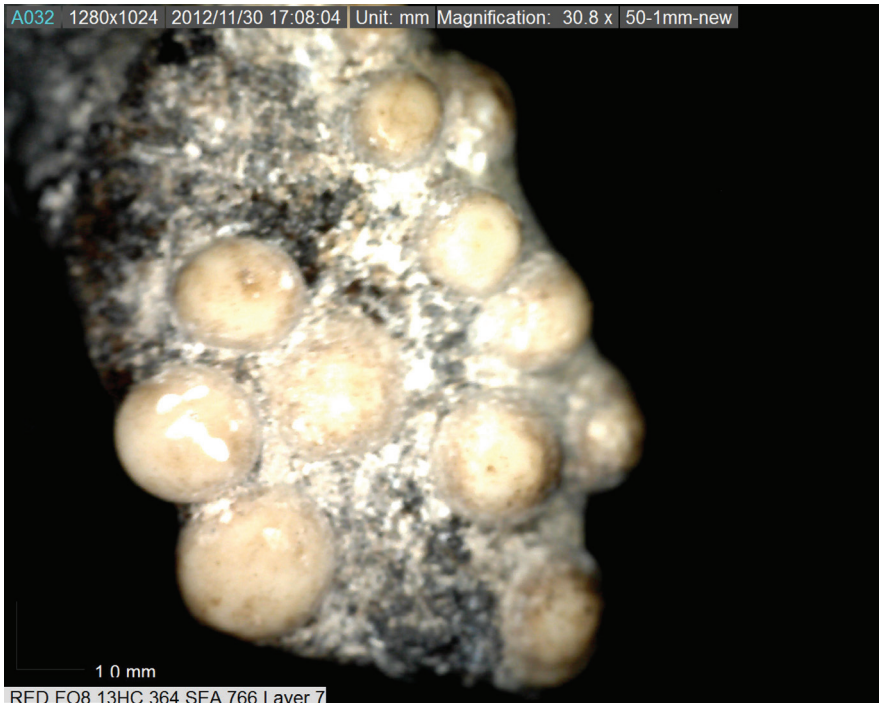

Figure 10.4. Seabream (Sparidae) teeth. Photo: Mark Jonathan Beech.

Figure 10.5. Parrotfish (Scaridae) upper pharyngeal. Photo: Mark Jonathan Beech.

Figure 10.6. Parrotfish (Scaridae) lower pharyngeal. Photo: Mark Jonathan Beech.

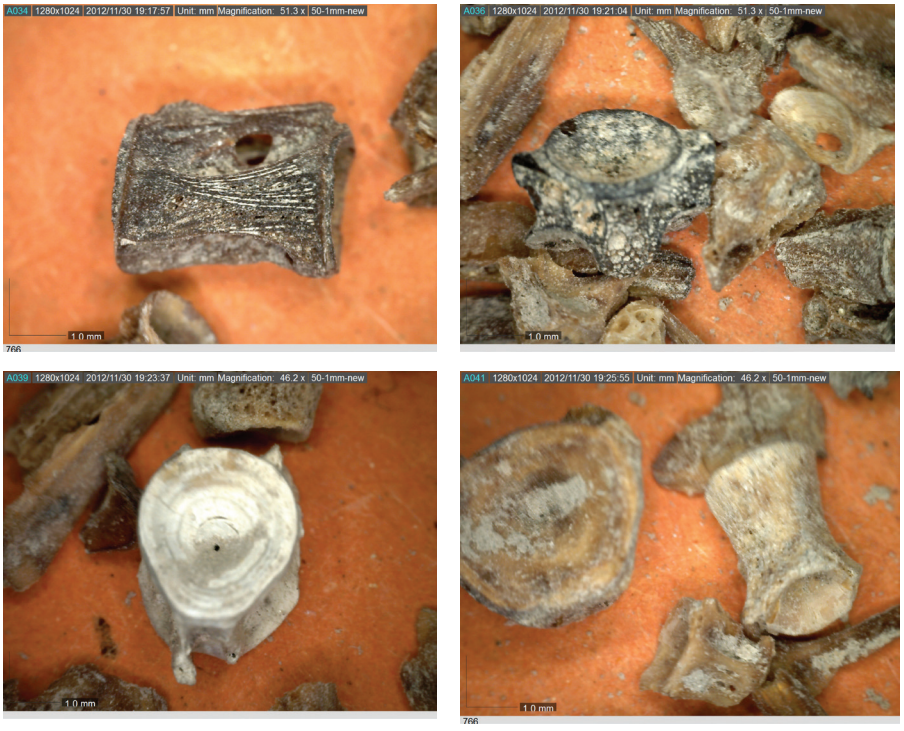

Figure 10.7. Various small fish vertebrae. Photo: Mark Jonathan Beech.

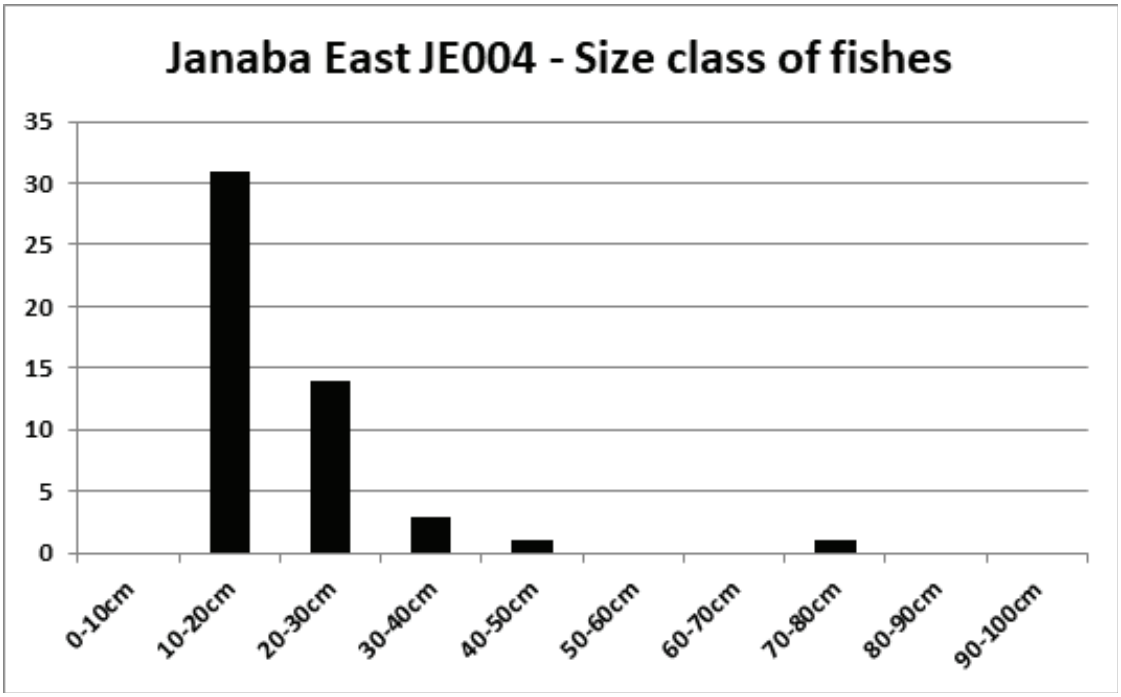

Figure 10.8. Proportional representation of different size classes of fish at Janaba East.

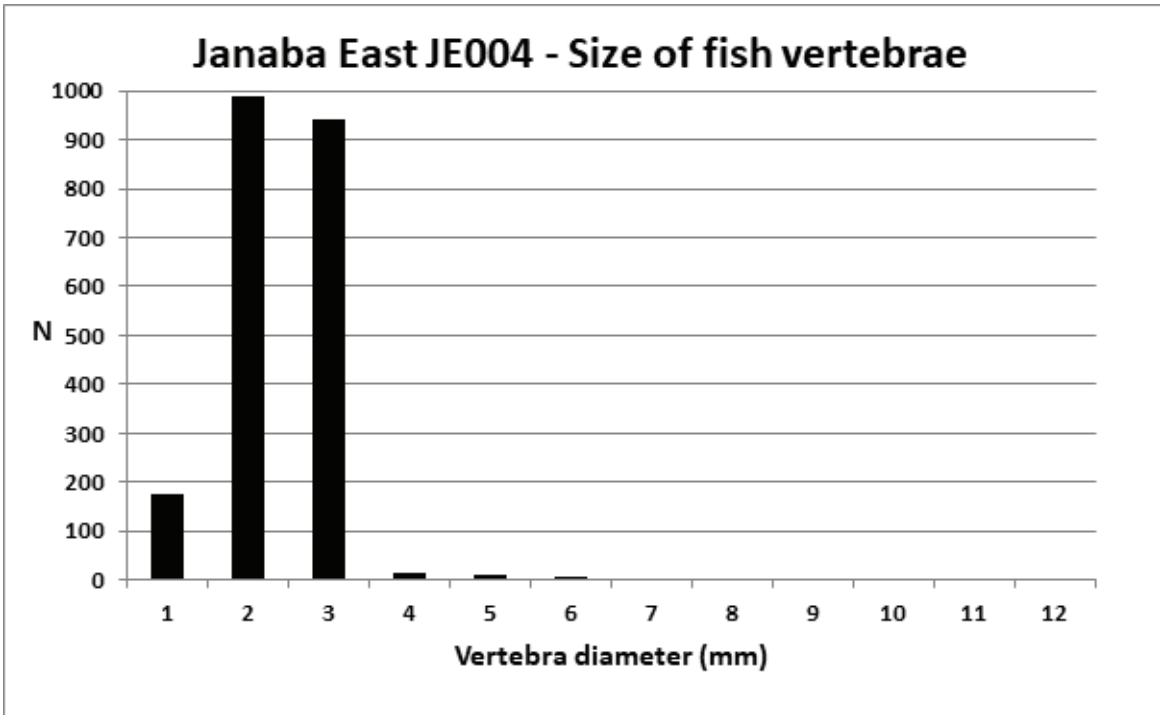

Figure 10.9. Proportional representation of different size classes of fish vertebrae at Janaba Bay.

TAXON	COMMON NAME	HABITAT	NISP
Carcharhinidae, indet.	Shark/Ray/ Skate	Inshore coastal waters, Moderate depth, Pelagic	1
Myliobatidae, indet.	Eagleray	Open water	1
Belonidae, indet.	Needlefish	Surface dwelling, Coastal Pelagic, Offshore	1
Serranidae: *Epinephelus* sp.	Grouper	Coral reef, Near Coral reef, Near caves, Inshore coastal waters, Moderate depth	1
Serranidae, indet.	Grouper	Coral reef, Near Coral reef, Near caves, Inshore coastal waters, Moderate depth	12
Carangidae: *Gnathanodon speciosus* (Forsskål, 1775)	Golden Trevally	Coral reef, Near Coral reef, Inshore coastal waters, Rocky reef	1
Carangidae, indet.	Jacks/Trevallies	Coral reef, Inshore coastal waters, Moderate depth, Offshore, Pelagic	9
Lethrinidae: *Lethrinus* sp.	Emperor	Coral reef, Near Coral reef, Inshore coastal waters, Moderate depth, Sandy bottom, Seagrass bottom	8
Sparidae, indet.	Seabream	Inshore coastal waters, Estuaries, Muddy sandy bottom, Moderate depth	33
Scaridae, indet.	Parrotfish	Coral reef, Inshore coastal waters	21
Pisces, indet.	Fish, unknown		3209

Table 10.1. Quantification of fish bones by NISP at Janaba East

TAXON	VOM	TOO	UPH	LPH	PHA	PMA	DEN	PMA/ DENT	MAX	ART	QUA	HYO	POST	FV	AV	CV	V	F	TO-TAL
Carcharhinidae, indet.		1																	1
Myliobatidae, indet.		1																	1
Belonidae, indet.								1											1
Serranidae: *Epinephelus* sp.											1								1
Serranidae, indet.	2				1	2	6										1		12
Carangidae: *Gnathanodon speciosus* (Forsskål, 1775)						1													1
Carangidae, indet.																9			9
Lethrinidae: *Lethrinus* sp.						4	2		1					1					8
Sparidae, indet.		3				2					1		1		7	19			33
Scaridae, indet.			14	5			2												21
Pisces, indet.		2				4	1			1	1	1		1	26		2081	1091	3209

Table 10.2. Quantification of fish bones by anatomical element at Janaba East

Key: VOM = vomer; TOO = tooth; UPH = upper pharyngeal; LPH = lower pharyngeal; PHA = pharyngeal; PMA = premaxilla; DEN = dentary;

PMA/DENT = premaxilla/dentary; MAX = maxilla; ART = articular; QUA = quadrate; HYO = hyomandibular; POST = post-temporal;

FV = first vertebra; AV = abdominal vertebra; CV = caudal vertebra; V = vertebra; F = fragment.

SIZE CLASS	EPIN	SERR	GNATH	LETH	SPAR	SCAR	PISC	N
0-10cm								0
10-20cm		10		5	1	9	8	31
20-30cm				2	3	9		14
30-40cm	1	1		1				3
40-50cm						1		1
50-60cm								0
60-70cm								0
70-80cm			1					1
80-90cm								0
90-100cm								0

Table 10.3. Size class of fishes based on diagnostic elements at Janaba East

Key: EPIN = Serranidae: *Epinephelus* sp.; SERR = Serranidae, indet.; GNATH = Carangidae: *Gnathanodon speciosus* (Forsskål, 1775); LETH = Lethrinidae: *Lethrinus* sp.; SPAR = Sparidae, indet.; SCAR = Scaridae, indet.; PISC = Pisces, indet.

VERTEBRA DIAMETER (mm)	SERR	CAR	SPAR	PISC	N
1				176	176
2				990	990
3			14	927	941
4		1	8	6	15
5			3	7	10
6		3	1	1	5
7					0
8		2		1	3
9		1			1
10	1				1
11		1			1
12		1			1

Table 10.4. Size of fish vertebrae at Janaba Bay based on the diameter of the centra. Measurements are in mm.

Key: SERR = Serranidae, indet.; GNATH = Carangidae, indet.; SPAR = Sparidae, indet.; PISC = Pisces, indet.

NISP	HABITAT	COMMON NAME	TAXON
1	Coral reef, Near Coral reef, Near caves, Inshore coastal waters, Moderate depth	Grouper	Serranidae: *Epinephelus* sp.
30		Fish, unknown	Pisces, indet.
4		Crab, unknown	Crustacea, indet.

Table 10.5. Quantification of fish bones and crabs by NISP at Khur Mahdi Bay (KM1057)