Late Bronze and Iron Age animal exploitation in Masāfī, Fujairah, UAE

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Summary

Over the past fifteen years the French archaeological mission in the UAE has excavated several areas of Masāfī in Fujairah. A Late Bronze Age settlement was found in MSF-5 and Iron Age architectural remains in MSF-1, MSF-2, and MSF-3 that include, respectively, a public building, fortified settlements, and a temple possibly dedicated to the cult of the snake, similar to Bithnah.

The oasis environment in this rather arid region makes it suitable for agro-pastoral activities. The study of the faunal remains of these four areas (NISP 1657) indicates that domesticates — predominantly sheep and goat with a ratio of 1:2 — were the main meat/dairy component of the diet. Cattle are only present in a few remains and dromedary remains were recovered in the public areas of MSF-1 and 3. Wild taxa are only represented by gazelle remains. The absence of wild animals is the main difference from most contemporaneous sites in the UAE, where they have economic and social importance alongside domestic animals. While fish remains are scarce in Masāfī sites, molluscs are surprisingly abundant and confirm the existence of exchange between the coast and the hinterland. They were consumed or used for craft production.

Keywords: archaeozoology, Masāfī, bovids, dromedary, mollusc

Introduction

Archaeozoological studies concerning the Late Bronze and Iron Age human occupations in the United Arab Emirates, although still limited in number, provide precious insights into the human-animal relationship (Fig. 1). They have allowed a better understanding of the subsistence economies of the agro-pastoral societies that inhabited this area and their livestock management, hunting practices, ritual practices, and interactions through exchanges and trade between coastal and inland sites.

The number of Late Bronze Age sites investigated is half that of the Iron Age. These sites are located in a variety of environments: coastal areas, foothills, oases, and dune hinterlands (Fig. 1). However, despite this difference in environment, in either the Late Bronze Age or the Iron Age, the studies show almost the same pattern: a subsistence economy based on domesticated mammals, predominantly sheep and goat and, to a lesser extent, cattle. These animals were the main meat/dairy component of human diet. Equids, canids, and camelids whose domestic status is not always obvious are also documented (Magee 2015; Uerpmann M. & Uerpmann 2017).

Alongside domesticates, a wide variety of wild terrestrial mammals are also represented, although usually by a limited number of remains. Among the wild taxa, gazelle is the most common but we also find oryx, fox, wild canids and felids, hyena, and hare. A large number of species of fish and molluscs have been identified at both coastal and inland sites. Their presence at inland sites such as Saruq al-Hadid (Roberts et al. 2019) or al-Madam (Cerro 2013) attests not only to the existence of contacts with the coast but also to the importance of marine resources in the diet of these protohistoric societies. Marine mammals such as dugongs and dolphins or birds such as cormorants are also mentioned.

The general trend shows a very diversified spectrum of fauna. A perfect example is Tell Abraq where E. Stephan (1995) and M. Uerpmann (2001), in addition to domestic species, describe a long list of wild animals including Oryx leucoryx, Gazella sp., Canis lupus, Vulpes sp., Delphinus sp., Dugong dugon, birds, rodents, reptiles, invertebrates, and fish. This is also the case at Saruq al-Hadid where the faunal spectrum includes domesticated herbivores, gazelle, oryx, lagomorphs, dugongs, reptiles, birds, and fish (Roberts et al. 2018; 2019; 2020). The site of Muweilah is remarkable for the diversity of its carnivores with remains of Canis lupus, Vulpes rueppelli, Hyaena hyaena, Felis silvestris, Lynx caracal, and Panthera pardus, besides the importance of its domestic dromedaries, not to mention molluscs, marine mammals, and fish (Uerpmann & Uerpmann

2017). One could also mention Shimal (Vogt & Franke- Vogt 1987) and Hamriya (Magee et al. 2009). However, some sites are exceptions to this rule. The pits dug in the vicinity of the public building at Bithnah 44 only yielded remains of Caprinae, Bos sp., and a small number of gazelles (Skorupka, Mashkour & Benoist 2013). The site of al-Madam is also an exception with a spectrum composed exclusively of domestic mammals and a few gazelles. However, there is a high diversity of molluscs (Cerro 2013). On the other hand, al-Sufouh2 produced predominantly wild camelids (Driesch & Obermaier 2007).

This paper aims to describe the faunal remains discovered at the MSF-1, -2, -3, and -5, in particular the remains of terrestrial mammals, as they represent 85% of the material.

The sites of Masāfī

Presently, Masāfī is located on the border between the emirates of Ras al-Khaimah and Fujairah, in the north-western part of the Hajar Mountains. It appears to be a strategic area, standing at the junction of three significant valleys that connect the western part of the UAE to the eastern coast. Wādī Ham, to the south-east, provides access to the present-day city of Fujairah and its surroundings, Wādī Abadilah, to the north-east, connects the site to the Dibba region, while Wādī Sidji, to the west, leads to the western coast (Benoist 2013). In addition, it is an area with perennial freshwater sources (Charbonnier et al. 2020: 486), a boon in a region where arid climatic conditions prevail, and it is located within an area particularly rich in outcrops of copper ore, which were exploited at various times, as witnessed by the smelting sites still visible today (Goy et al. 2013).

Archaeological excavations and surveys have been carried out since 2006 by the French Archaeological Mission in collaboration with the Fujairah Tourism and Antiquities Authority. Five sites, dating from the Middle and Late Bronze Age and Iron Age II/Early III, were identified:

– MSF-1, -2, and -3, excavated under the supervision of A. Benoist, is an Iron Age II/Early III occupation that is divided into three clusters. MSF-1 and -3, respectively a public and a cultic building, occupy the centre of the oasis while the fortified settlement of MSF-2 is situated on a hill overlooking the palm grove. It should also be noted that Islamic-period occupations were uncovered on top of MSF-1 and -3 (Benoist et al. 2011; 2012; Benoist 2013).

– MSF-5, excavated in the past few years under the supervision of J. Charbonnier, is located in the south of the oasis. It is a Late Bronze Age settlement standing on the top of a hill overlooking the palm grove (Degli Esposti & Benoist 2015). Both settlements, MSF-2 and MSF-5, were located outside the irrigated areas that were dedicated to cultivation. Only buildings of a public and ritual nature were tolerated in the centre of the oasis. The hillside occupations also enjoyed a very good position from which to defend the oasis.

– Finally, MSF-4, not yet excavated, is a settlement probably dating to the Middle Bronze Age.

Material and methodology

A total of 1657 faunal remains were examined. They were excavated by hand and came from the excavated sites of MSF-1, -2, -3, and -5. The bones were not equally distributed among the four sites (Fig. 2). MSF-1 and -5 yielded 829 and 634 remains respectively, while MSF-

2 and -3 yielded only twenty-nine and twenty-seven remains for the protohistoric periods. Despite being outside our period of interest, we thought it would also be interesting to document the 138 skeletal remains collected from an Islamic-period well in MSF-3.

As mentioned above, the majority of the remains belong to terrestrial mammals (85%). While fish are almost absent from the faunal spectrum, the MSF-5 excavation yielded a significant number of mollusc shells that will be discussed only briefly here since a specific paper is being prepared (Lidour et al., in preparation).

A faunal spectrum was established for each site and context (Figs 3 & 4), presented in number of remains (NR) and weight of remains (WR). The mean weight of the remains was used to assess the degree

of fragmentation of each assemblage. This is also a proxy to evaluate meat weight (Bartosiewicz 2009; Casteel

1978; Uerpmann H-P 1973; Vigne 1991) but in the case of the faunal assemblage of MSF the weight of remains is certainly affected by demineralization due to extremearidity. For some contexts, the MNE (Minimum Number of Elements) was calculated in order to establish the MNI (Minimum Number of Individuals) of each species represented.

The anatomical and taxonomic identification of the mammal remains was carried out at the National Museum of Natural History in Paris (MNHN) within the Archaeozoology & Archaeobotany Research Unit, using the modern comparative comparison collections of the archaeozoology laboratory and the patrimonial collections of the National Museum of Natural History. We also used several atlases (Barone 1986; Hillson 1986; Schmid 1972).

In this paper, the Caprinae category is used when a bone can be identified as sheep or goat but with insufficient diagnostic morphological features to allow a distinction between the two genera (Boessneck 1969; Fernandez 2001; Halstead & Collins 2002; Helmer & Rocheteau 1994; Zeder & Lapham 2010; Zeder & Pilaar 2010), while SR category (Small Ruminants) includes caprines and gazelles. LM (Large Mammals) is used for unidentified bones of the size of cattle to camelids, since these taxa were present at MSF sites.

The Bronze Age site of Masāfī-5

MSF-5, which dates from 1600 to 1200 BC, is located on a small rocky hill overlooking the oasis and cultivable land. The settlement is organized in terraces built on the hillside including small domestic facilities such as fireplaces, stone benches, and temporary shelters. In the eastern part, a large vertical cavity (C1421) was excavated during the 2018 and 2020 campaigns. Its function is not clear and is still under debate.

The faunal remains of MSF-5 were collected in two different contexts, the settlement and the filling of C1421. Since the latter is a closed context, the study of these two assemblages was carried out separately. We immediately noted a huge difference in taxonomic diversity between the settlement and C1421 (Fig. 3). The latter yielded only mammalian remains, whereas the bulk of the assemblage from the settlement consists of molluscs and curiously, only nine fragments belonging to caprines or small herbivores were identified.

Faunal remains of the settlement

Molluscs constitute a set of 250 fragments of shells weighing 2.4 kg, with 99% of them belonging to marine species. It includes a total of twenty-three species distributed between twenty-two genera and sixteen families. Bivalves are represented mostly by the black- lipped pearl oyster (Pinctada persica) (13.2% of the whole shell assemblage, based on the MNI calculation), large venus clams (Callista spp.) (11.8%), ark shells (Arcidae) (5.9%), and the violet asaphis (Asaphis violascens) (2.8%). Gastropods are composed essentially of the giantmangrove whelk (Terebralia palustris) (29.6%) and cones (Conidae) (7.1%).

All of these molluscs attest to the contacts and exchanges that exist between coastal and inland territories. Most of the taxa identified in the shell assemblage could have been gathered along the coast of the Gulf of Oman, in particular in the Dibba-Khor Kalba area which is reachable within a few hours on foot by following the wadi roads to the east (35 km to Murbah and 37 km to Qurayyah) or the south-east (30 km to Fujairah through Bithnah). The joint occurrence of many ark shells, large cones, and some fragments of the giant frog snail (Tutufa bardeyi) in the assemblage suggests connections with the coast of the Gulf of Oman. Indeed, ark shells have been extensively exploited in the past in the Kalba area, including during the Bronze and Iron Age periods at Kalba 4 (Phillips & Mosseri-Marlio 2002). Furthermore, great quantities of large Conus shells (mostly belonging to Conus betulinus) can be found washed up on the beaches near Khor Fakkan. The giant frog snail is not reported from the Persian Gulf by Bosch et al. (1995: 102) whereas it is encountered in the Gulf ofOman, down to southern Oman and Yemen.

Only 1% of the assemblage is made up of freshwater molluscs including the red-rimmed melania (Melanoides tuberculata) and an unidentified mud snail belonging to the genus Hydrobia. The irrigation systems of the oasis would explain the presence of these freshwater molluscs in the MSF-5 shell assemblage. The favoured consumption of the giant mangrove whelk is supported by the high frequency of fragmentation and combustion marks observed on shell fragments of this species. It is likely that the giant mangrove whelks were brought to the site alive before being cooked there. Most clam and ark shells were potentially consumed at the site as well, but some specimens could have been reused as small containers or raw material for adornments and appropriate tools.

Indeed, an important part of the assemblage consists of worked elements. Several large valves bear retouching and may have been used as multipurpose tools such as scrapers or knives. Shells were also used for ornamental purposes, such as the manufacture of adornments. Several rough-outs of Conus rings were found, as well as thick polished mother-of-pearl plates made from Pinctada persica valves. Despite the presence of a few broken Conus rings, the absence of finished products in the assemblage is noticeable. The presence of shell workshops at MSF-5 must be contextualized on a regional scale, where many other Late Bronze and Iron Age sites have yielded Conus and mother-of- pearl elements of adornment. A few valves (mainly of bittersweet clams, Glycymeris sp.) were potentially used as containers for cosmetic products (probably metal oxide-based). Chemical composition analyses are currently being conducted to confirm this hypothesis.

Faunal remains of C1421

The large cavity C1421 occupies a strange location on the top of the rocky hill of MSF-5 and its function is not clear. The hypothesis of a water well has been ruled out because of the inappropriate location of the structure dug on top of the hill. It could also be a mining gallery but we do not have any evidence for this. Further excavations and analyses are needed. This feature was entirely dug into the bedrock; it was excavated to a depth of 6 m without reaching a natural base. The pit yielded only Late Bronze Age ceramic sherds, so there is no doubt about its chronological allocation. One of the aims of this analysis is to provide a better understanding and establish a chronology of the accumulation of deposits.

The bones were found in two separate layers: UF816 and UF 819 (Fig. 5) and we noticed a quantitative and qualitative imbalance between them. The former yielded only thirty-nine very poorly preserved remains, of

which only one distal metacarpal could be positively identified as belonging to a domestic bovine. The assemblage of UF 819 is much more abundant and relatively more diversified since, in addition to bovines, we also found remains of domestic caprines and only four bones — a distal humerus, a proximal radius, and two tali — were identified as belonging to Ovis aries (see Fig. 3).

The bones from UF819 were in a very poor state of preservation with numerous flakes and cracks. The loss of organic matter made the bone remains extremely brittle and it was very difficult, if not impossible, to collect them without destroying them. In these conditions, it was decided to collect the identified pieces during excavation in individual bags in order to refit them together later on and avoid a large number of unidentified fragments. Of the traces observed on the bones, we noted some cut marks but no traces of fire that could be directly or indirectly associated with consumption. In addition, one bone bore oxidation traces from copper.

During the excavation, because of the bone fragmentation and preservation explained above, it was not possible to make anatomical connections. For this reason, we plotted the bones and projected the scatter on a zenithal projection of UF 819.

On more careful examination of the cattle bones (Fig.6/a), it became evident that some parts of the carcass were in association. Lower limb sections could be identified: radius/ulna–metacarpus or tibia-metatarsus with nearby areas of phalanx concentrations. The humerus and femur appear to be isolated. Ribs and vertebrae are scattered on the ground with no apparent coherence, but the fragmentation was such that it is not possible to reconstruct the axial skeleton.

The MNI is three, taking into account the MNE, which is one for all bones (almost all represented) except for three right metatarsals. It should be noted that the phalanges could belong to different individuals. In fact, the number of second phalanges identified as being abaxial is five (Fig. 6/b). According to the fusion stage, the three bovids present are at most 2 years old. The fused bones include one humerus and first and second phalanges that fuse before the age of 2 years. The remaining bones are not fused, notably vertebrae, distal ends of metapodials, and distal and proximal ends of tibia and femur that fuse after two years (Barone 1986). The coxal bone is poorly preserved and does not allow identification of the sex. Consequently, we determine that we are dealing with one bovid plus two right lower limbs belonging to different individuals. Some phalanges could have been lost during the processing of the carcass.

Although almost all the bones are represented, the skull (including the mandibles) and the scapulae are missing. This absence is not the result of post-depositional phenomena, as the teeth and the proximal part of the scapula are usually well preserved. It seems unlikely that they were present at the time of deposition and we can therefore confidently assume that the animal was dismembered and cut into anatomical segments before being thrown into the cavity, perhaps because of the limited space available in the bottom of C1421 (Fig.

5). Cut marks were identified on some of the vertebrae and ribs, suggesting that the axial skeleton was cut into segments. Incisions on the head of the femur result from disarticulation. Finally, fine incisions were found on the distal ends of two metatarsals. They are suggestive of skinning.

The scatter of goat bones also reveals connected skeletal elements (Fig. 7/a). Nevertheless, these are not

exactly the same carcass parts as those described for the cattle. There are still lower limb connections (radius/ ulna–metacarpus and tibia-metatarsus) but also upper limb connections such as a femur–tibia and humerus– radius/ulna. The parts of the carcass appear to have been discarded, rather than deposited, as evidenced by the disorganized remains.

The MNI is also three and among these three caprines, at least two have been identified as sheep based on two left tali (Fernandez 2001; Zeder & Lapham 2010) (Fig. 7/b). The age of these caprines was calculated using teeth from a hemi-maxillary and the age of fusion of the epiphyses. These factors indicate that they must have been between 4 and 6 years old. Again, some skeletal parts are missing. Only a hemi-maxillary was found, the remaining skull and the mandibles are missing. Moreover, no phalanges were discovered. As with the cattle, the absence of these bones cannot be explained by a post-depositional process. No anthropogenic traces were found, but the poor preservation of the assemblage could explain this observation.

Unfortunately, the faunal analysis does not allow us to make any assumptions about the function of C1421. Nevertheless, it can be assumed that this was a single deposition if one refers to the preservation and intermingled state of the bones that must have been covered quite quickly. Due to the low number of anthropogenic traces, it seems difficult to hypothesize about the removal of the meat. Nevertheless, the absence of butchery marks does not necessarily mean that those bones are not remains of consumption; it is possible that the meaty parts were deboned without marking the bones or that only certain cuts were removed. The absence of burning or roasting marks can be explained by the simple fact that the meat was boiled.

Nevertheless, in the case of cattle, it seems unlikely that segments as large as a tibia–tarsus–metatarsus would have been cooked together. For caprines, this is not so easy to discount — an entire haunch of sheep/ goat with femur–tibia or humerus–radius articulation is more likely.

A hypothesis to explain this animal bone deposit could be the rendering of the carcases following a natural death (Putelat 2013; Barme & Clavel 2014). Disease may explain why the meat does not seem to have been used, at least for the cattle. The incisions on the bones may be related to the action of rendering. If we follow this hypothesis, it is possible that people threw extra waste, such as the two lower legs, into the cavity at the time of deposit.

On the other hand, the lack of certain skeletal elements of both species, particularly skulls/mandibles, raises the question of ritual deposits. Following the discovery of Iron Age foot-braziers, including one decorated with a snake at the top of MSF-5, Benoist et al. (2015: 26) speculated on the symbolic importance of the site that is the highest point of the oasis, and the possibility of the presence of an Iron Age altar there. However, excavation of this area did not reveal any evidence of a Bronze Age or Iron Age ritual building. In the meantime, the site was seriously damaged by the construction of a highway and a pipeline.

On the subject of ritual spaces, it should be remembered that the nearby sites of Bithnah 44 (Fujairah), and al-Madam 1-Tuqeibah (Sharjah) have both delivered ritual contexts where remains of cattle and caprines were buried in pits or cenotaphs (Skorupka, Mashkour & Benoist 2013; Cerro 2013). Could it be a ritual deposit and offering, or simply the remains of food or a rendering to get rid of sick animals? The little data in our possession do not allow us to come to a definitive conclusion.

The Iron Age II and Early III sites of Masāfī-1, -2, and -3

The Iron Age II/Early III occupation (1300–600 BC) is distributed around a central area of cultivated land dominated to the north-east by MSF-2, a hillside fortress. To the south-east lies a collective area, including a building with a large, pillared meeting hall, a possible market, a canal (Charbonnier et al. 2017) and an altar associated with several vertical pits (MSF-1). Not far from there, researchers have uncovered a cultic site dedicated to a divinity represented as a snake (MSF-3).

The preservation of faunal remains is far from satisfactory and bones are highly fragmented and brittle (Fig. 8). On the sites located in the oasis (MSF-1 and MSF-

3), the percentage of identified fragments is about 50% of the material if we consider the NR. The percentage of the WR appears to be consistently higher and reveals that the unidentified remains are small and light fragments. The bones found at MSF-2 appear somewhat better preserved. However, it should be kept in mind that three quarters of the material was assigned to the small ruminant (SR) category (see Fig. 4).

Apart from the Iron Age deposits in MSF-3, we should also note the presence of a pit (C302) that dates to the late Islamic period and contained 138 bones comprising small bovids, camelids, birds, fish, and molluscs (see Fig.

4). The preservation of the bones here is far better than that for the Iron Age levels (Fig. 8). The bulk of the remains recovered from the three Iron Age sites belongs to mammals. Molluscs and fish (including a shark vertebra) are represented by only a few remains at MSF-1. Among the mammals, caprines — sheep and goats — are the most abundant. At MSF-1,goats outnumber sheep with a ratio of 2:1. No sheep were identified at either MSF-2 or MSF-3. It should be noted that even if they are present in the region, sheep are less well adapted than goats to the hyper-arid climate.

The four bones identified as camelids were found in the sites of MSF-1 and MSF-3. A single vertebral fragment was attributed to domestic cattle. However, it is likely that other cattle bones were present, but since they could not be distinguished precisely they are listed in the large mammals (LM) category that also comprises other large mammals such as camelids.

Recalling the introduction and the general trend of faunal spectra at that time, one cannot but notice the absence of wild taxa. Even if the presence of gazelle is highly probable, no bone could be attributed to it with certainty. However, there are several poorly preserved fragments that are in doubt which were allocated to ‘possibly Gazella sp.’ In the absence of medium-sized mammals other than caprines and gazelle, we would expect the MM (Medium Mammals) category to be composed of these species.

The distribution of faunal remains in the excavated areas

The three construction phases of the large pillared building of MSF-1 are shown in Figure 9. With the exception of a few remains buried in a pit in the first phase of the public building, no bones were found in the main room. Instead, they were found in the storage rooms to the west, in the small northern room that housed a podium, and outside the building (Fig. 9/a).

During Phase II, the bone remains are concentrated in the western storage rooms (Fig. 9/b). During Phase III all faunal remains were found to the north of the public building, in an area rich in ceramics and artefacts that has been interpreted as a market place. It seems consistent that animals were also found there. The species are varied: goats, cattle, dromedaries, fish (both bony and cartilaginous fish), and marine molluscs (Fig. 9/c).

MSF-1 must have been a place for ceremonies and banquets (Benoist et al. 2012). The preparation of the former may have taken place in the open air or in the secondary rooms of the public building. The absence of bones associated with the last phase of the pillared building could be explained by the poor preservation of the bones if they had been processed outside. Another possible explanation is that the cooking or refuse area was located to the north-east, but Islamic graves have obliterated much of this area.

Not far from MSF-1 stands the small cultic structure of MSF-3 (Fig. 10/a). Except for a single goat fragment, the temple did not yield any bones, which were concentrated in the eastern outer area.

The faunal remains at MSF-2 (Fig. 10/b) were mainly found in the rooms of the orthogonal structure associated with a settlement or production area.

Discussion

MSF-1 and MSF-3 probably functioned in a complementary way. In the area of MSF-1, meetings and various ceremonies were held, while MSF-3 was used as a devotional area. The cultic character is corroborated by the discovery of some objects or ceramics related to the cult of the snake: incense burners, ceramics decorated with snakes, copper snake figurines, and votive weapons. The buildings and artefacts found at MSF-1 and MSF-3 are echoed at a number of other sites that also yielded faunal remains associated with ritual activities: sacrifice and offering (Benoist et al. 2015). For example, at Bithnah, excavators found a large number of pits filled with bones belonging to caprines and domestic cattle (Skorupka, Mashkour & Benoist 2013). At Tell Abraq, a large quantity of bones filled the pit of a possible altar (Locus 48 – Potts

1991: 78; Benoist 2013). At Mudhmar East, in present-day Oman, the filling of Building 2 contained burnt bones of young domestic caprines and cattle (Decruyenaere, Jean& Gernez, in preparation). At Al-Madam, there were no human skeletons in the cenotaphs, only specific parts of young goats (Cerro 2013); no heads, teeth, or vertebrae were found. Saruq al-Hadid is more difficult to interpret, but it seems that a small quantity of the camel remains may have been deposited in ritual contexts (Roberts et al., forthcoming). It is true that the Iron Age levels of Masāfī did not yield any such deposits, but two observations deserve to be made. Firstly, the vertical pits associated with the altar to the east of MSF-1 are similar to those found at Bithnah. Some were found empty and interpreted as libation pits. Subsequently, the deposit in the Late Bronze Age pit at MSF-5 echoes the above. Secondly, the species present are similar to those found in the Iron Age pits of Bithnah, in the cenotaphs of al- Madam or in Building 2 of Mudhmar East. In the latter two cases, selection of the bones had also been made. Are we observing the beginnings of a ritual tradition involving banqueting practices that will continue until the Iron Age?

In conclusion, we have presented the faunal evidence found in the oasis of Masāfī from the Late Bronze Age to the Early Iron Age III and some later settlements during the Islamic period. In Masāfī, sheep and goats occupy a predominant place in the diet of the inhabitants with a ratio of 1:2. Cattle are not abundant, but they are present and must have been a complementary resource for meat and dairy products alongside

sheep and goat. The rare remains of camels were only found in public areas during the Iron Age and they were also found in deposits of the Islamic period.

Wild taxa are only attested by a small number of bones potentially attributable to gazelle. This lack of diversity is the major difference from most Late Bronze and Iron Age sites in south-eastern Arabia where wild animals have economic and social importance alongside the domesticates. However, this is also a feature that brings it closer to the sites of Bithnah or al-Madam. Fish remains are rare at Masāfī, but this could be explained by the lack of sieving. Conversely, marine molluscs are surprisingly abundant in MSF-5.

While a more detailed paper on the MSF-5 shell assemblage is currently in preparation, the preliminary information provided in the present study highlights the importance of marine resources both in the diet of the inhabitants of the site, and in the economic activity such as the manufacture of shell adornments and the use of shell tools. The large proportion of worked shell suggests the presence of a workshop during the Late Bronze Age. Further studies are needed to assess the use of shell tools (such as scrapers or knives) at the site. Shell taxa, which have been identified, show contacts with sites located on the coast of the Gulf of Oman.

Acknowledgements

We are very grateful to our collaborators from the Fujairah Tourism and Antiquities Authority: S. Al-Samahi, A. Al-Shamsi, S. Ali Hasan, and A.K. Late Wahid Ali. We also thank the French Archaeological Mission in the United Arab Emirates headed by S. Méry and the French Ministry of Europe and Foreign Affairs for their support. Finally, we wish to express our gratitude to the Muséum national d'Histoire naturelle de Paris and the UMR 7209 for allowing us access to their collections.

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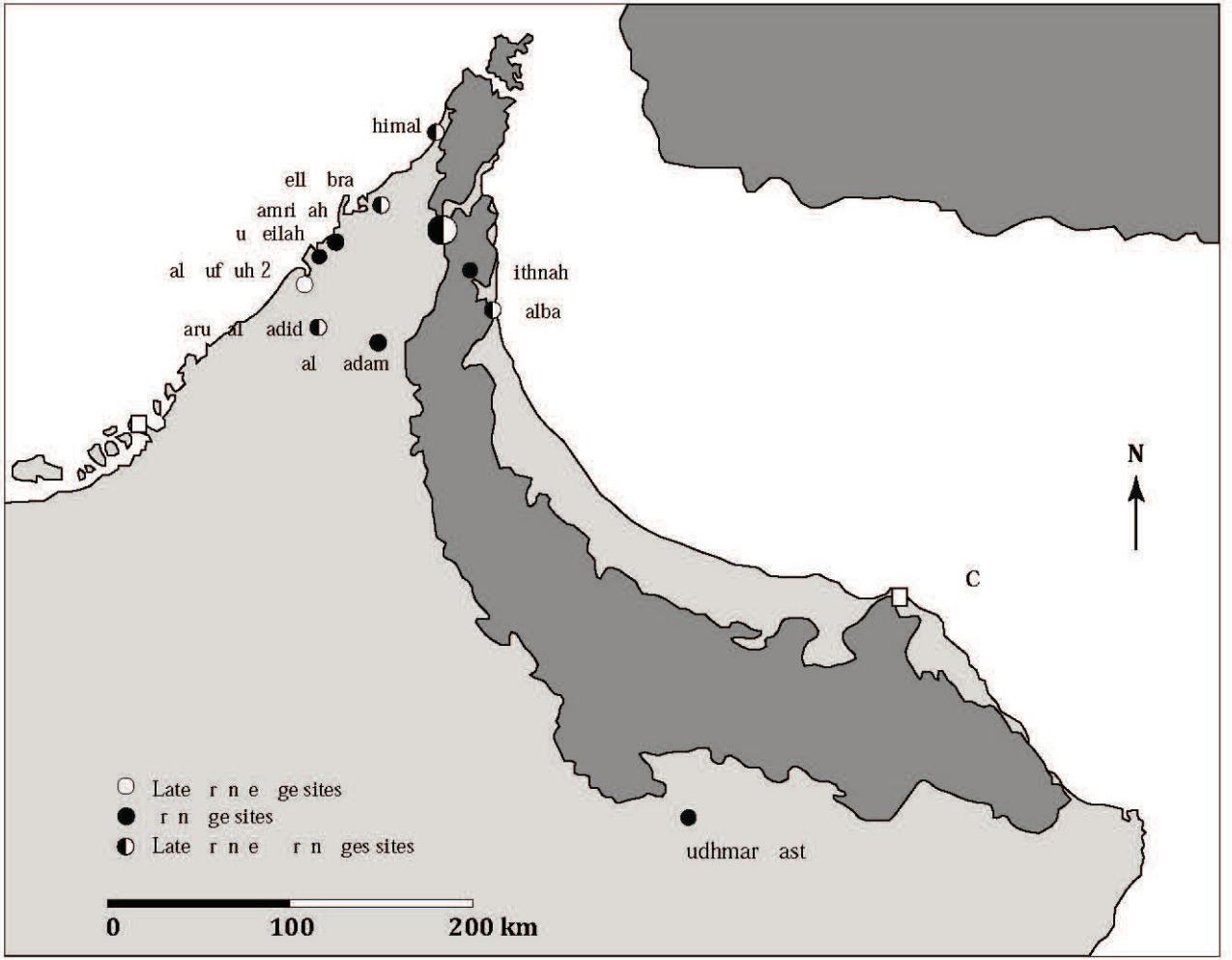


FIGURE 1. *The location of the Late Bronze and Iron Age sites mentioned in this paper.*

	MSF-1	MSF-2	MSF-3	MSF-5	Total
Late Bronze Age				634	634
Iron Age II	519	29	27		575
Iron Age II - Early Iron Age III	1				1
Early Iron Age III	309				309
Islamic			138		138
Total	**829**	**29**	**165**	**634**	**1657**

FIGURE 2. *Distribution of faunal remains in NR (number of remains) by period and site at Masāfī.*

	MSF-5											
	C1421								Settlement			
	UF 816				UF 819							
Species	NR	%NR	WR	%WR	NR	%NR	WR	%WR	NR	%NR	WR	%WR
Bos sp.	1	2,6	37,3	30,2	180	53,6	2360,5	90,6				
Capra hircus									2	0,8	2,1	0,1
Ovis aries					6	1,8	33,3	1,3				
Caprinae					67	19,9	176,5	6,8	3	1,2	15,6	0,6
LM	7	17,9	67,8	54,9								
SR									2	0,8	1,9	0,1
Unidentified Mammal	31	79,5	18,4	14,9	83	24,7	34,6	1,3	2	0,8	6,9	0,3
Mollusc									250	96,5	2402,5	98,9
Total	**39**	**100**	**123,5**	**100**	**336**	**100**	**2604,9**	**100**	**259**	**100**	**2429**	**100**

FIGURE 3. *Distribution of faunal remains in NR (number of remains) and WR (weight of remains) at MSF-5.*

	MSF-1						MSF-2		MSF-3			
	Iron Age II		Iron Age II-III		Early Iron Age II		Iron Age II		Iron Age II		Islamic	
	NR	WR	NR	WR	NR	WR	NR	WR	NR	WR	NR	WR
Capra hircus	15	19					2	115	1	10,5		
Ovis aries	8	29,6									2	22,3
Caprinae	143	191,6			47	79,8	5	12,4	7	9,9	37	71
Capra/Gazella	3	2									1	0,7
SR	137	68,9			59	37,4	22	7,2	2	0,9	64	39,8
Bos sp.	1	0,4										
Camelus sp.	3	12,6							1	224	1	63
Total Identified	**310**	**324,1**			**106**	**117,2**	**29**	**134,6**	**11**	**245,3**	**105**	**196,8**
LM	5	39,4			46	55,4			2	52,6		
MM	5	2,1			147	33,5						
Indet	171	36			6	3,4			14	2,2	30	3
Total Unidentified	**181**	**77,5**			**199**	**92,3**			**16**	**54,8**	**30**	**3**
Total Mammal	**491**	**401,6**			**305**	**209,5**	**29**	**134,6**	**27**	**300,1**	**135**	**199,8**
Aves	1	0,2									1	1,2
Total Aves	**1**	**0,2**									**1**	**1,2**
Carcharhinidae (Shark)					1	1						
Fish (Cf. Tuna)					1	1,4						
Fish	3	0,4									1	0,2
Total Fish	**3**	**0,4**			**2**	**2,4**					**1**	**0,2**
Mollusc (bivalve, Cf. bénitier)			1	7								
Mollusc (bivalve)	2	4,3										
Mollusc (gasteropod terrestrial)	15	0,7										
Mollusc (gasteropod)	3	0,5										
Mollusc	4	1,5			2	1,3					1	1
Total Mollusc	**24**	**7**	**1**	**7**	**2**	**1,3**					**1**	**1**
Total	**519**	**409,2**	**1**	**7**	**309**	**213,2**	**29**	**134,6**	**27**	**300,1**	**138**	**202,2**

FIGURE 4. *Distribution of faunal remains in NR (number of remains) and WR (weight of remains) at MSF-1, -2, and -3.*

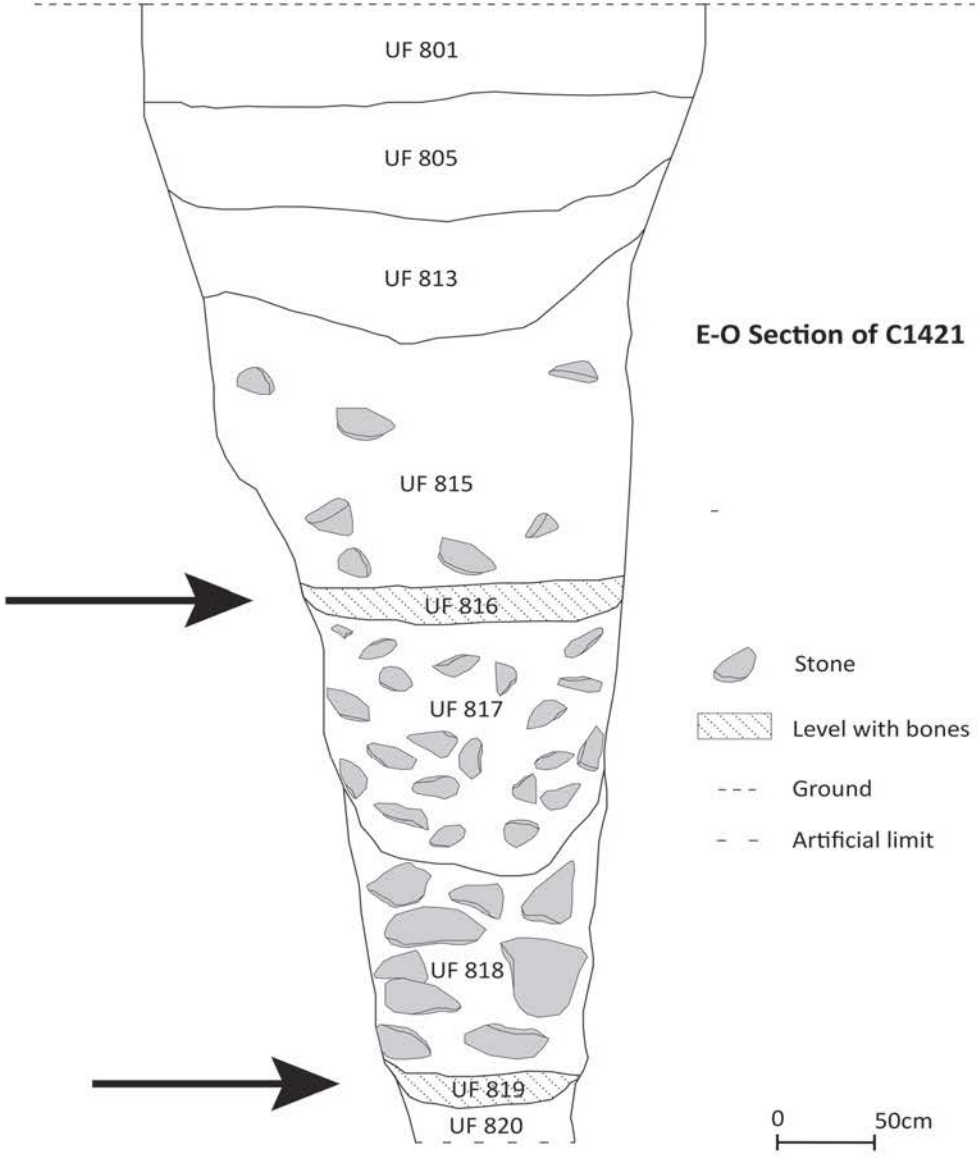


FIGURE 5. *MSF-5: east–west section of cavity C1421 with UF 816 and UF 819.*

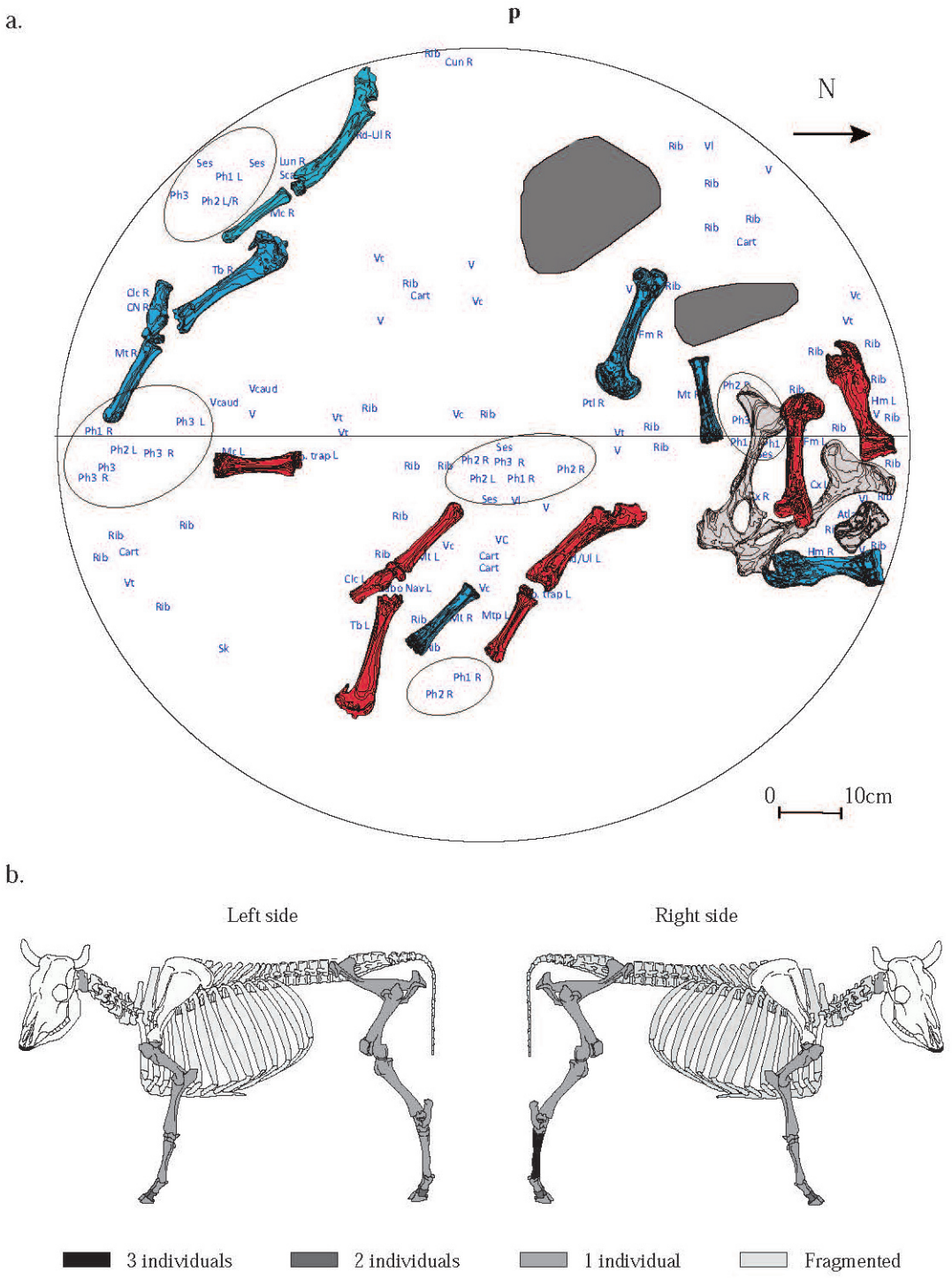


FIGURE 6. *MSF-5:* **a.** *distribution of cattle bones, UF 819; left bones in red, right bones in blue, axial bones in grey, stones in dark grey;* **b.** *anatomical distribution of cattle bones (NMI) recovered from UF 819 (original CAD M. Coutureau [Inrap]).*

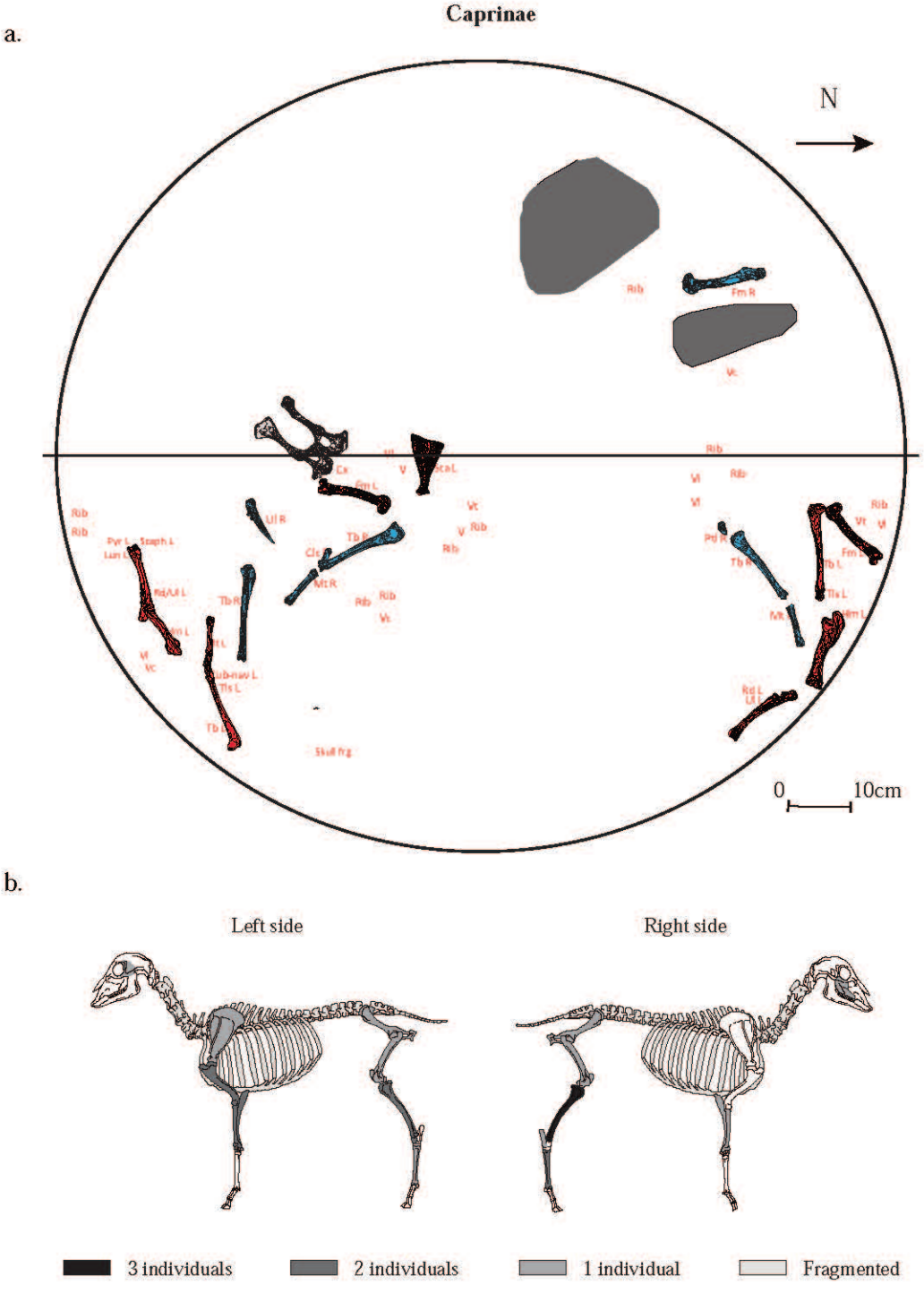


FIGURE 7. *MSF-5:* **a.** *distribution of Caprinae bones, UF 819; left bones in red, right bones in blue, axial bones in grey, stones in dark grey;* **b.** *anatomical distribution of Caprinae bones (NMI) recovered from UF 819 (original CAD M. Coutureau [Inrap]).*

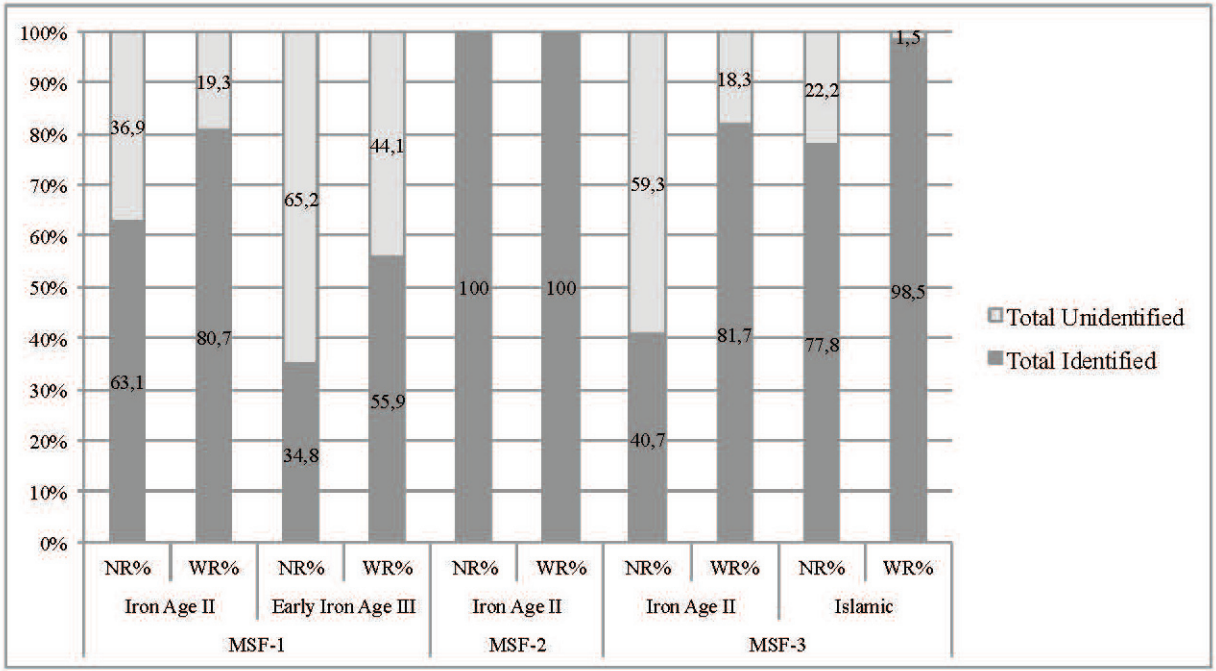


FIGURE **8.** *Percentage of identified taxa in NR (number of remains) and WR (weight of remains) at MSF-1, -2, and -3.*

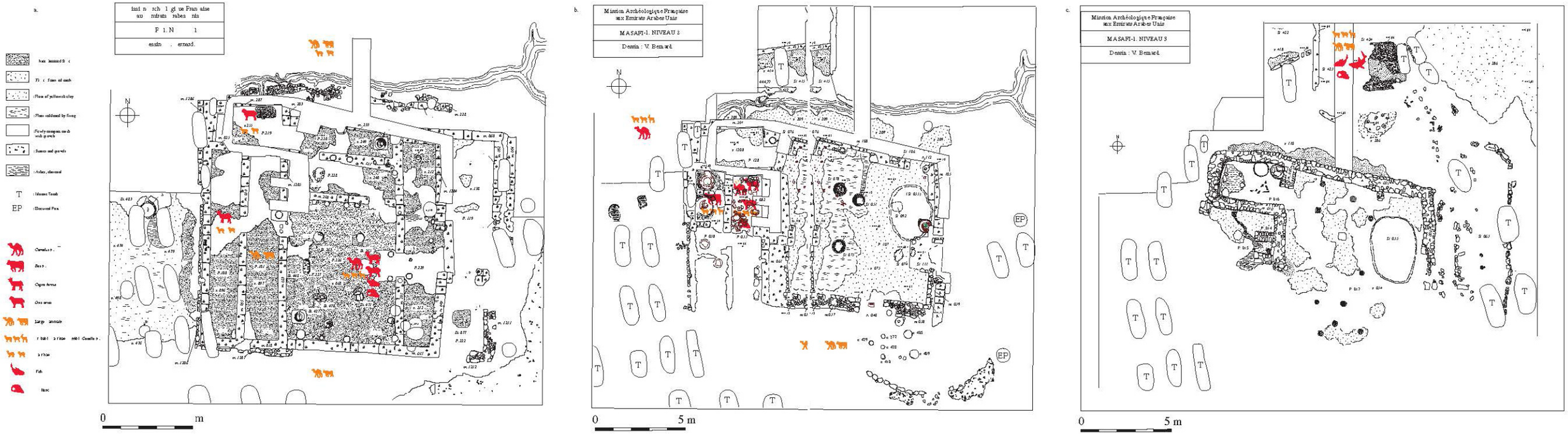


FIGURE 9. *Distribution of faunal species at MSF-1.* **a.** *Phase I;* **b.** *Phase II;* **c.** *Phase III; in red: species identified; in orange: categories Caprinae, Small Ruminants, or Large Mammals.*

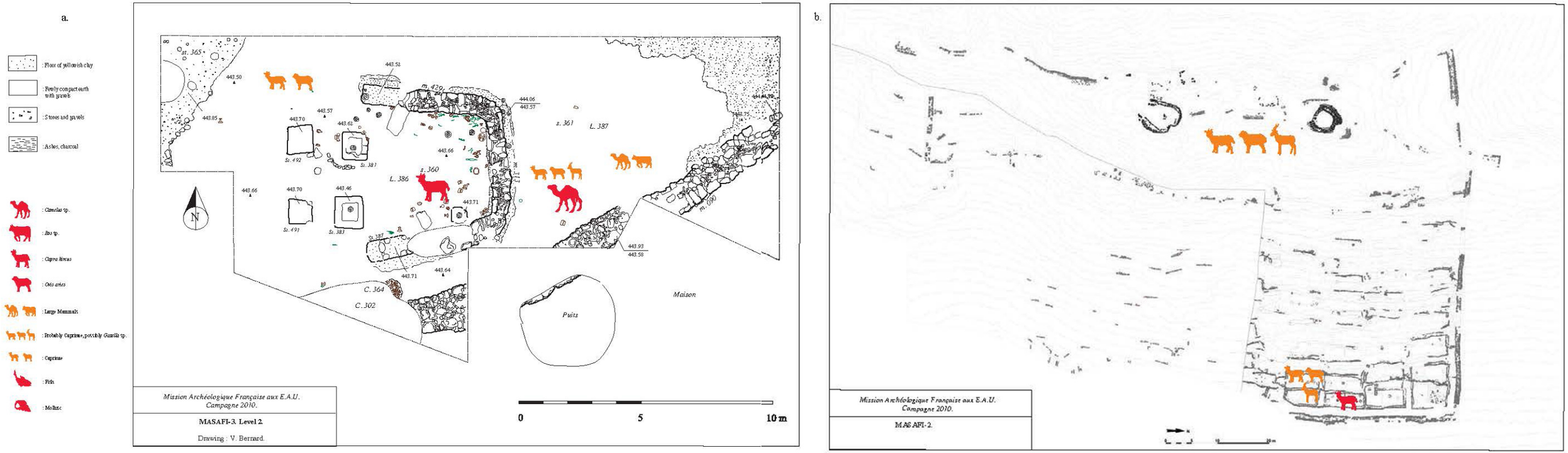


FIGURE 10. *Distribution of faunal species at:* **a.** *MSF-2; and* **b.** *MSF-3; in red: species identified; in orange: categories Caprinae, Small Ruminants or Large Mammals.*