Tethering Stones in Al-Mudhaibi, Oman Traps and palaeoclimatic indicators

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Abstract: *In January 2005, a few tethering stones were discovered by chance in Al-Mudhaibi area in the Sultanate of Oman. A survey was carried out and resulted in locating further twenty specimens. The stones were identified, their location (GP) recorded, they were weighed, and their position was plotted on a map. The study identifies the function of these stones as traps. It also attempts to reconstruct all parts of the trap. Moreover, the study proposes a hypothetical reconstruction of the trap including its camouflage and the manner in which it can be set. The study establishes an analogy with similar stones depicted in rock scenes reported from North Africa. It concludes that Al-Mudhaibi tethering stones can also be climatic indicators.*

"… the image of war without its guilt, and only five-and-twenty per cent of its danger" R.S. Surtees 1843

Introduction

Predator-prey relationships are complex and essential elements in comprehending the nature and effects of interactions between specific organisms in any ecosystem. It is a primary concern in behavioural biology. Predation depends on contact between two species. The loss of a prey population is dependent on the frequency of contact with the predator population (Slobodkin 1962:184). In other words, frequency of contact between two species is a crucial prerequisite for successful predation.

At a certain stage in the course of man\animal relationships, new developments emerged gradually to reveal characteristic aspects in behavioural biology. Contact between man and his prey has turned out to be more successful and profitable by gaining intelligent knowledge and developing new means of predation. Obviously, many impediments must have encumbered mastering methods and techniques of bringing down animals. However, the need to achieve a superior knowledge and skill was critical and indispensable. Tensity of food procurement must have been a major impetus for mankind to make and use effective tools. A number of these such as stone projectiles, pitfalls, traps and snares evolved to vary in design and mechanism but coincided in purpose. These tools have transformed mankind from a scavenging predator into a learned hunter. The laws of nature have never been repleaded (cf. Odum 1971:3), but new tools must have induced successful predation, especially when complemented by humans omnivorous capacity. Significantly, hunting tools have successfully contributed to elevating mankind to a distinguished position in the food chain.

Among the tools invented by mankind to enable him to kill some animals were the tethering stones. A trapping tethering stone can be viewed as an advanced device of hunting. It is an amalgamation of inventiveness, knowledge and experience, arrived at through experiment. It is the work of imagination.

A part of trap, a tethering stone consists of a stone and a cord/a rope. The stones and the rope

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vary in weight and length. The stone is usually an elongated one and in the middle of the stone, a groove that runs all around it. The grooves vary a lot in width and depth. Some stones bear bilateral notches, instead of grooves. The grooves and the notches mark the stone and distinguish it from others. Indeed, these man-made grooves and notches transformed the stones from their natural form into an artifact.

One end of the rope is tied to the stone along the groove or is secured by the notches. The grooves and the notches are intended to secure the rope in the stone and prevent it from slipping away. The other end of the rope is tied into a noose, which forms a loop by means of a slipknot. The loop can instantly tighten if the rope is pulled.

Evidence of tethering stones has been reported from various parts of Africa and Asia. Thousands of them have been reported from a vast area in the Sahara and along the Nile corridor (cf. Newbold and Shaw 1928; Morel 1982; Gabriel 1986; Ziegert 1978; Pachur 1991; Rudiger and Gabriele Lutz 1992-92:71-76; Allard-Huard 1993; Berger 1997; Anag et al. 2002). Consequently, two lines of argument developed as evidence of the built up of these stones. One line associates these artifacts with hunting activities; the other views tethering stones in the context of cattle pastoralism (cf. Pachur 1991).

In Oman little is known about tethering stones as it was only a few years ago that the stones were first reported from the area of Khor Rori in Dhofar (cf. Cremaschi and Negrino 2002:325-363) and in Jalan bu Ali (personal communication with Professor Serge Cleuziou, in January 2006). These reports confirmed the existence of these stones in Oman. The whole picture of them in Oman is not complete yet. One possibility that may explain the lack of knowledge is that the stones went unnoticed during the various archaeological surveys carried out in the country. Another possibility may lie in the limited geographical distribution of the stones in Oman. Perhaps more attentive efforts in the field can bring more geographical areas into such an evaluation. This paper anticipates bringing to light tethering stones in Arabia as a whole and drawing the attention of research efforts engaged in the antiquity of Oman.

This paper is the result of a survey targeting tethering stones in Al-Mudhaibi district in the Sultanate of Oman. It documents the tethering stones and argues that they were used as trapping devices in Al-Mudhaibi during a wet phase in the Holocene. It also attempts to reconstruct the different components of a tethering stone trap, how it was made, and how the trap itself was set to catch animals. However, before proceeding with this endeavour, it would be useful to have a closer look at Al- Mudhaibi and its geography.

The study area

Al-Mudhaibi area is located in Ash Sharqiyah region in eastern Oman (Plate 1a) and (Map 1). In view of the surface geology of Oman, Al- Mudhaibi lies within the alluvium gravel (cf. Clarke 1990: 18). The area is geologically described as "broad horizontal terraces and surfaces, little touched by wadis; composed of middle to rock deposits" (Scholz 1980: 41). The physical condition of the Northern wadi region that includes Al-Mudhaibi area is characterized by wide and flat terraces with long flat plateaus. Sparse vegetation covers the flat terraces (Scholz 1980: 159).

Annual precipitation is estimated to be 100 mm, while average annual temperature is ca 26 Celsius (cf. Scholz 1980:16-19). From a geographical point of view, Oman is an arid land, with the exception of Dhofar and Al-Jabal Akhdar. According to the classification of Oman's vegetation, Al-Mudhaibi is within the zone of Prosopsis Cineraria- Calligonum (cf. Ghazanafar 1992:6; Fig. 2). In general, the region is a dry land with scattered trees and grass along water galleries and minor wadis (ibid.).

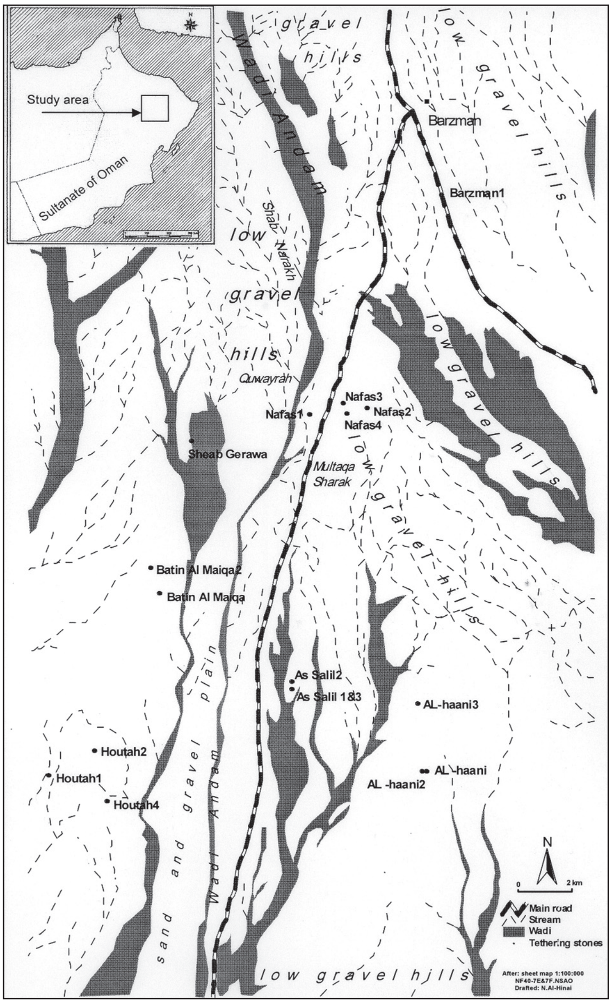
Flat plateaus and low gravel hills mark the landscape of the study area, with Wadi Andam running through it. In fact, Wadi Andam is a main feature in the environment of Al-Mudhaibi area, where the running water eroded its gully. Other minor water courses are also visible in the study area (cf. Map 1).

The study and its findings

Two tethering stones were first encountered by sheer chance in Nafas in Al-Mudhaibi by Said Salim Al-Jahafi, an engineering student and a member of the local community in the area. The finds were reported to the author, which led to a visit to the area to identify the stones. A research proposal to study them in the field and laboratory was formulated and submitted to Sultan Qaboos University. Thereafter, it found support and finance under project no: (IG\ART\ARCH\06|01).*

The survey plan was set to cover the area of Nafas and other adjacent areas in al-Mudhaibi. Dr. Mohammad Ali Al-Belushi (Dept. Archaeology SQU), Nasser Al-Henai (surveyor, Dept. Archaeology SQU), Yaqoub Al-Rahbi (photographer, Dept. Archaeology SQU), Yaqoub Al-Bahri (Archaeologist, Dept. Archaeology SQU), Said Salim Al-Jahafi (student, Dept. Engineering SQU) and Dr. Osman Abdalla (Department of Earth Sciences, SQU) have assisted effectively in the survey and laboratory.**

The survey started in early January 2006. The area of Nafas was covered and other areas were equally surveyed including Al-Bedha, Al-Haani, Batin Al-Maiqa and Al-Houtah (Map 1). In the course of the survey, twenty-one tethering stones were located. They were photographed in situ. The location of every stone was recorded by a 'GPS Rover' (Map 1) and drawings illustrate some specimens (Fig. 1a). Unfortunately, the stones were deprived of any stratigraphic context. They were found lying on the surface (in situ) and not connected



Map1: The study area: locations of tethering stones in al Mudhaibi, Sultanate of Oman

Plate 1a: Concentration of Fe oxides indicated by the red color soild in Salil

Plate 1b: Sculpts of Limestone

to an archaeological context. It is important to notice here that all tethering stones were found on the plains (Map 1). They were weighed and geologically identified. The identification of the stones proved that no specimens retrieved in the survey were in their true geological locations. This type of stone is found in Wadi Andam (Map 1). The effect of water erosion over the specimens is quite evident. Moreover, it is interesting to realize that all the spots where the specimens were located (Map 1) are at a distance from any wadi, which clearly indicates that they have been picked up, modified and transported by man to the plains, where they were spotted by the survey.

The geology of the area and the stones were examined by Osman Abdalla, who reported in a personal communication (September 2006):

Tethering stones found in the study area are ex situ rock fragments of variable size, and mineralogical composition. Based on the topography, geology and geomorphology of the area, the rock fragments apparently were transported down the gradient of the Wadi Andam that drains the Jabel Akhdar Plateau (ca 4000 m amsl). Hence, tethering stones comprising the collection reflect the rock assemblage of the Jabel Akhdar Plateau, which is composed of ophiolitic rocks (basalt, gabbro and prediotite), carbonates of the Hawasinaha Formation and the sedimentary rocks (sandstones, shale, limestones) of the Hajar Super Group.

The study of the tethering stones facilitated a better understanding of these prehistoric devices relating to preparation of every component of the trap (Fig. 1a). The locations (Map 1) of the tethering stones and the manner by which they can be set will be discussed. In the following (Table 1), details of the specimens are illustrated.

Moreover, the survey identified the site of a concentration of lithic tools in Nafas (Fig. 1b). Examination of the site indicated that there is no other archaeological material than the micro-lithic tools. The context of this is mainly surface. The tools include denticulates and side scrapers among others. This material was found scattered at a distance of 50-80 meters from the channel of Wadi Andam on the eastern bank of the wadi in the Nafas area. Although there is no reason to reject the idea of any connection, there are no direct indications that associate this lithic material with the tethering stone retrieved in Nafas and the study area in Al-Mudhaibi.

Barzaman: east of Wadi Andam

	Site	Spec.	weight kg.	GPS Reading		Identification
				Northing	Easting	
1	1	1	12.5	2463207	611871	Sandstone

Nafas: east of Wadi Andam

	Site	Spec.	Weight kg.	GPS Reading		Identification	Plate
				Northing	Easting		
1	1	2 *	55-44	2455225	606806	Limestone	2
2	2	1	7.5	2455458	609008	Basalt	
3	3	1	8.5	2455646	608098	Limestone	
4	4	1	21.5	2455276	608227	Peridotite	3

Al-Salil: east of Wadi Andam

	Site	Spec.	Weight kg.	GPS Reading		Identification
				Northing	Easting	
1	1	1	17.3	2445281	606108	Basalt
2	2	1	7	2445581	606103	Basalt
3	3	1	5.2	2445282	606119	Limestone

Al-Haani: east of Wadi Andam

	Site	Spec.	Weight kg.	GPS Reading		Identification	Plate
				Northing	Easting		
1	1	2	21.5 – 16.5	2442347	611288	Basalt	4
2	2	1	44.5	2442366	611127	Sandstone	
3	3	1	21	2444770	610939	Sandstone	

Sheab Gerawa: west of Wadi Andam

	Site	Spec.	Weight kg.	GPS Reading		Identification	Plate
				Northing	Easting		
1	1	1	51	2454276	602254	Basalt	

Batin Al-Maiqa: west of Wadi Andam

	Site	Spec.	Weight kg.	GPS Reading		Identification	Plate
				Northing	Easting		
1	1	1	22	2448770	601019	Limestone	
2	2	1	4	244965	600671	Gabbro	5
3	3	1	20.5	.. ..	.. .. ..	Limestone	

Al-Houtah: west of Wadi Andam

	Site	Spec.	Weight kg.	GPS Reading		Identification	Plate
				Northing	Easting		
1	1	1	12.5	2442195	596803	Basalt	
2	2	1	13	2443067	598517	Gabbro	
3	4	1	17	2441276	599018	Gabbro	6

Table (1) details of tethering stones, Al-Mudhaibi

*** Not retrieved from its location in the study area.**

In Dhofar, the tethering stones were found in the Najd in association with flint stone tools (Cremsaschi and Negrino 2002: 333).

The two stones of Nafas (cf. Plate 2) were found within the vicinity of the site. These are among the heaviest tethering stones found in Al-Mudhaibi so far. They are worked and, clearly, each specimen bears a groove. However, their location is not right. It seems that they have not been transported to the hunting grounds in the plains or the flat ground similar to the rest of the tethering stones in the study area. Instead, they are on the eastern bank of Wadi Andam (the source of the stone material), and within the area of the archaeological site. This leaves the possibility that these stones were worked, but not transported to the hunting area and put to use.

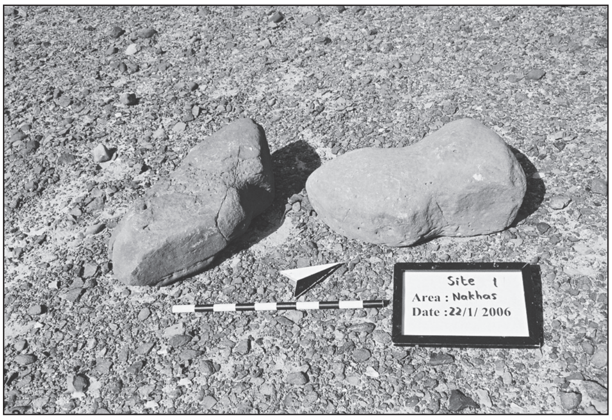


Plate 2: Nakhas, Site 1

Al-Mudhaibi tethering stones

It is important to identify Al-Mudhaibi tethering stones in the light of the two divergent lines of argument that associate tethering stones with either hunting or pastoral activities. On this issue, Pachur (1991) balanced the various suggestions and maintained both possibilities--that the stones were probably used for hunting and by cattle pastoralists to tether their animals in areas of pasture. However, it is noteworthy that there is no traditional pastoral group in Africa known to the author, who tethers its animals in areas of pasture. Again, in Africa and in Oman, traditional pastoral groups manage their animals in herds where they follow a free style of grazing and keep their animals in enclosures for the night, without the use of tethering stones (cf. Evans-Pritchard 1940; Spooner 1974; ElMahi 2001). Tethering an animal for grazing to impede it from straying is an unwise practice, since such a confined animal can fall an ease prey to predators or even insects. Pastoral groups in Dhofar, for example, manage the pasture in their tribal territory, but do not tether their cattle to certain localities in the pasture range (cf. ElMahi 2001). Again, in northern Oman, traditional herders kept their animals in enclosures. Tethering domesticates

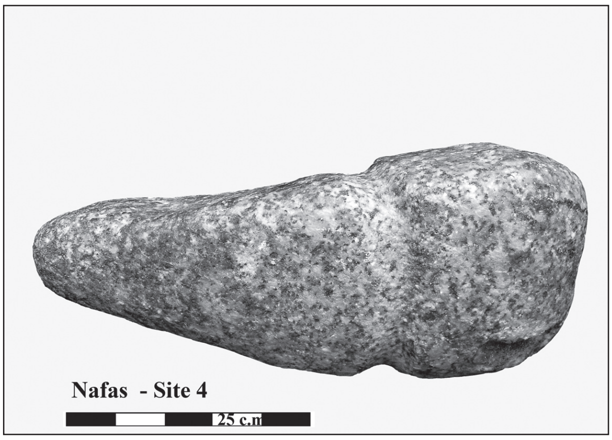


Plate 3: Nafas, Site 4

Plate 4: Al Haani Site 1

has not been reported or observed in this part of the country. Tethering animals in pasture can possibly turn out to be disastrous for same reasons mentioned above.

Once again, the argument that proposes pastoral use of the tethering stones depends on certain clues in rock scenes that portray a man facing a buffalo, a position which is regarded in relation to domestication. In another scene, an animal is depicted tethered by a stone and an unidentified object that is viewed as a peg in the ground. These pictorial presentations have been assigned to the beginning of animal domestication (cf. ibid.) Nonetheless, it is well known that the process of animal domestication started with young animals but not with grown animals. Furthermore, domestication is a long complex process, which only succeeds with certain animals, especially when they are young (cf. Hediger 1964; Jarman Wilkinson 1972; Clutton-Brock 1984; Clutton-Brock 1981; Reed 1984). Therefore, the suggestion that tethering

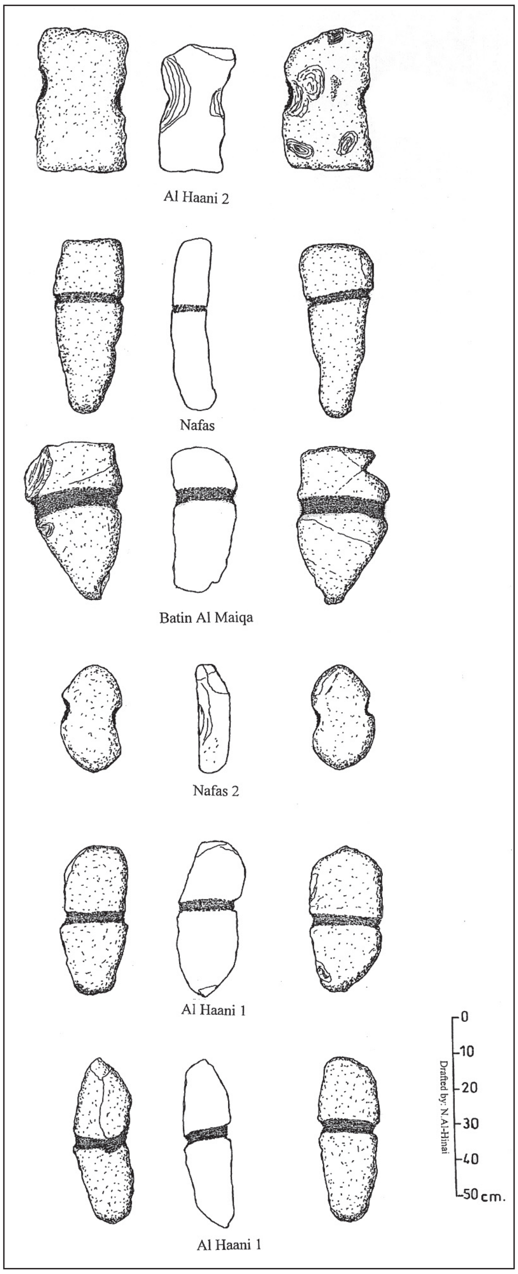
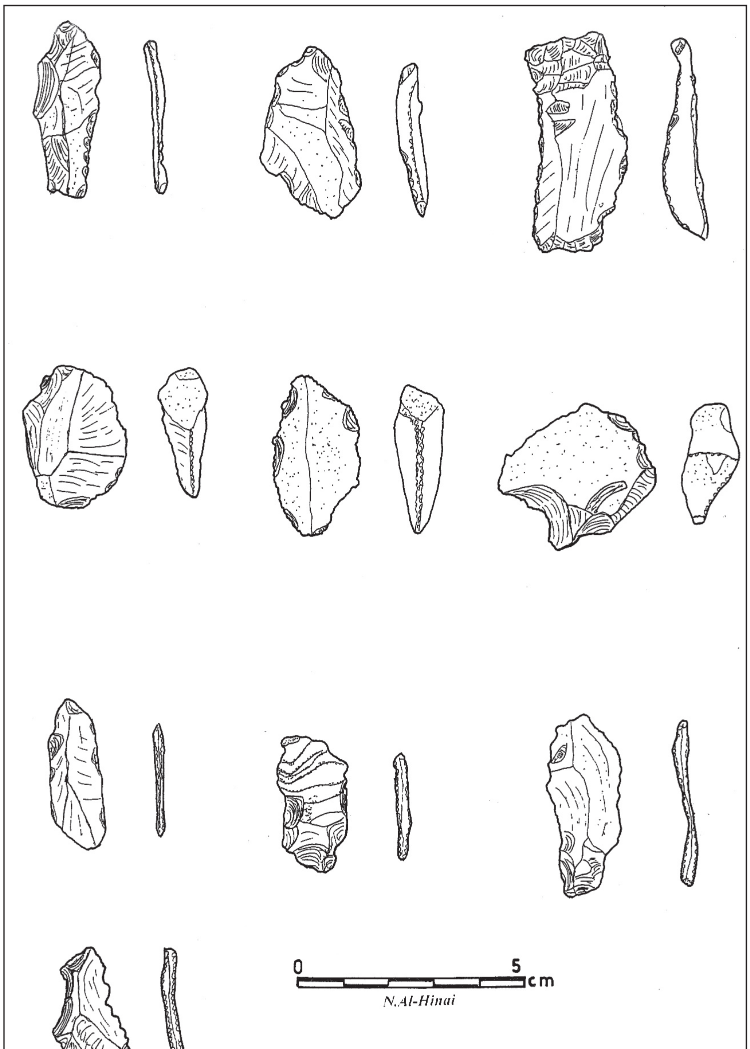


Fig. 1a: Tethering stones from Al Mudhaibi



(Fig. 1b) Lithic material from Nafas in Al Mudhaibi

Fig. 1b: Lithic material from Nafas in Al Mudhaibi

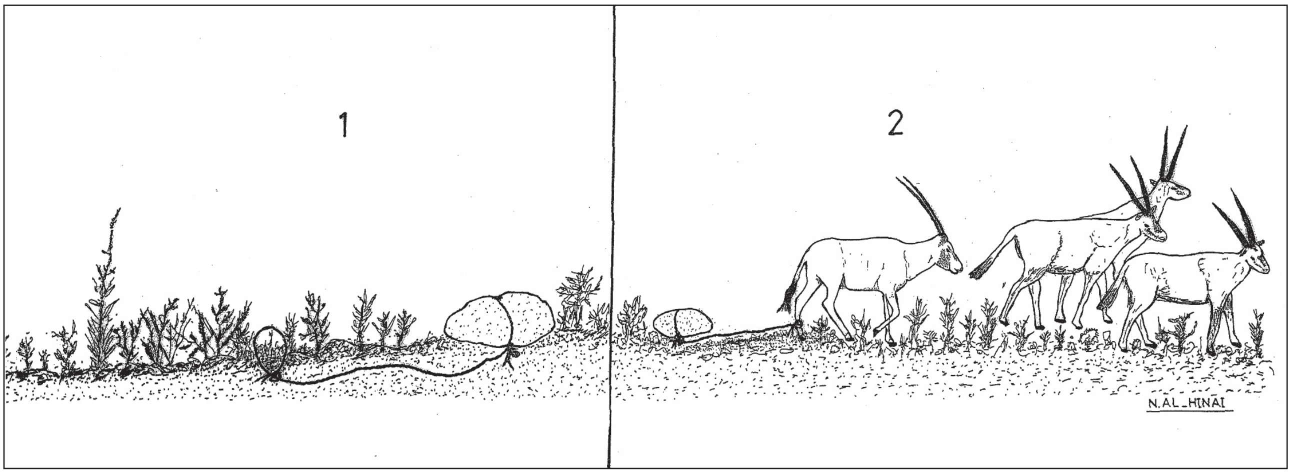


Fig. 2a: A hypothetical reconstruction of a tetheringg stone trap

stones are associated with the beginning of animal domestication does not hold, simply because there is no direct coherent evidence portraying domesticates being tethered. Indeed, there is not one single scene portraying domesticated animal confined by a tethering stone in the rock scenes mentioned above.

On the other hand, Rudiger and Gabriele Lutz (1992-92: 71-76) report substantial evidence from Messak Sattafet in Libya. It is twenty-five rock scenes depicting Bos "a tenaille", rhinoceros, asses, a lion, a giraffe, ostriches and a Bubalus. The Lutzs (ibid.) review the evidence and conclude as follows:

In accordance with present findings, all speculations as to the use of this stone, be it for tethering boats, tents or grazing animals or for clearing paths, have to be rejected. The rock engravings of the Messak Sattafet clearly identify it as a hunting instrument.

The evidence cannot be ignored, especially since the rock scenes unequivocally testify to the function of these stone as trapping and

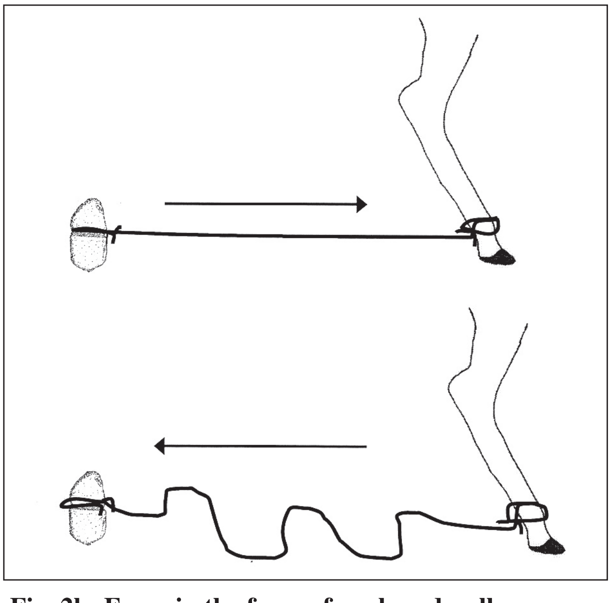


Fig. 2b: Force in the form of push and pull

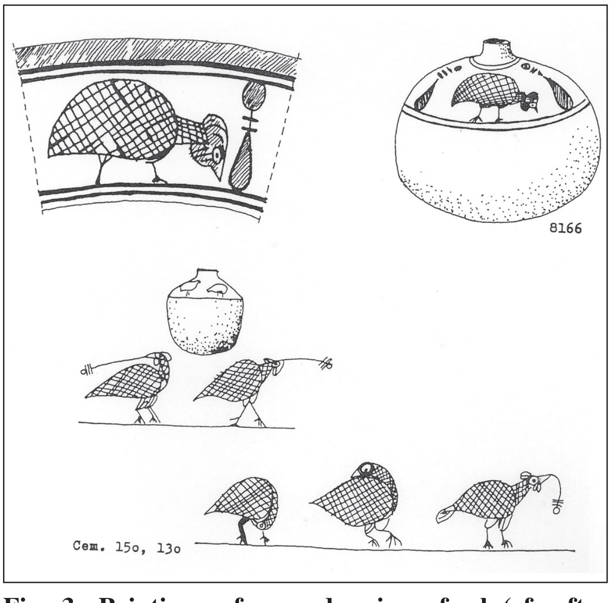
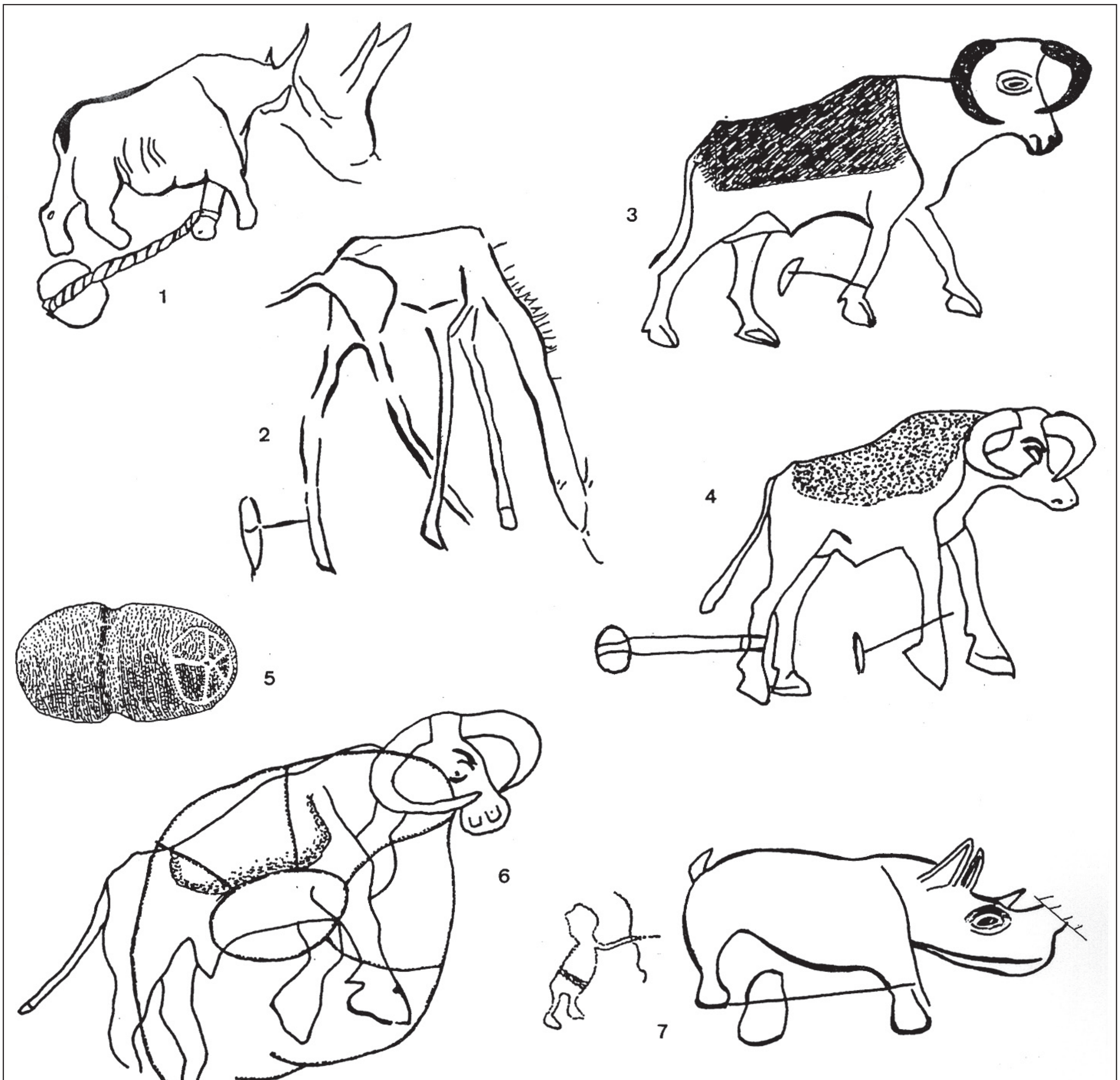


Fig. 3: Paintings of snared guinea fowl (cf. after Torrok 1987 and ElMahi 1995: Figs. 2, 3, 4)

hunting tools (Fig. 4; 57 and Fig. 5a, 5b, 5c, 5d). Nevertheless, it remains to be asked whether these stone traps belonged to foragers or Neolithic hunters. In general, traditional pastoral groups show occasional engagement in hunting and gathering in spite of the fact that food-production is the principal constituent of their economy. For some, such as Bedouin herders, it is opportunistic and foraging is practiced whenever opportunity arises (cf. ElMahi 2002). For other pastoral groups it is planned in response to seasons and the potential of natural sources (cf. Evans-Pritchard 1940; Cunnison 1958; Cunnison 1966; Murray et al. 2000; ElMahi forthcoming). Therefore, in the absence of direct archaeological material evidence, it is possible that Al-Mudhaibi tethering stones belonged to any of the two categories mentioned above, foragers or Neolithic hunters. For this reason, whatever



(Fig. 4): Rock scene from Messak Settafet, Libya, After Allard-Huard (1993: Fig. 57/1, 2, 3, 4, 5, 6, 7)

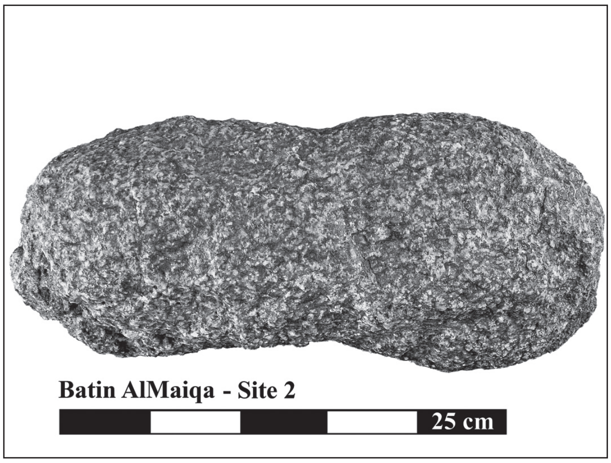


Plate 5: Batin Al Maiqa Site 2

Plate 6: Al Houtah Site 4

their identity was, they will be referred to in this paper as Al-Mudhaibi hunters.

A reconstruction of the tethering stone trap

Hunting is a complex process that has developed by gradual improvement enhancing its efficiency. Undoubtedly, it was accomplished through accumulation of experience and knowledge. Hunting demands a variety of skills such as scanning, intelligence, stalking, immobilization, killing, and retrieval (cf. Laughlin 1968:304-320). In addition, tools to perform the act of hunting are a necessity.

The spread and geographical distribution of a hunting tool such as a trap indicate its efficiency and utility in achieving the purpose it was designed and meant for in the first place. In addition, it indicates its suitability for the biotic and aboitic conditions prevailing in the new areas of distribution. Therefore, the attested distribution of tethering stones in Oman (Dhofar, Jalan Bu Ali and Al-Mudhaibi) shows its suitability for the ecological conditions and fauna species that prevailed in prehistoric times. Principally, it highlights the archaeological significance of tethering stones.

In what follows, the different components of the tethering stone trap from Al-Mudhaibi will be examined on the basis of how they are made; how such a trap is set, and how it functions. Finally, a hypothetical image of the trap will be reconstructed.

The making of a tethering stone

The transformation of any stone into a tethering stone requires the selection of a suitable specimen in terms of shape and material. Moreover, the size, weight and material of the stones vary. It seems that the material of the stone in one way or another is related to the weight and size of those used as tethering traps. This observation has been put by Osman Abdalla of the Department of Earth Sciences, Sultan Qaboos University, who identified the rocks

Plate 7: Nannorrhops ritchieana dwart plam

Plate 8: The fan-shaped leaves of N. ritchieana are separated

Plate 9: Braiding ofthe leaves by interweaving four leaflets together

Plate 10: An braided repe is doubled to make it thicker

Plate 11: Polishing the rope with a bundle of leaves

and minerals of stones and studied the geology of the study area. In a personal communication (September 2006) Osman Abdalla reports the following:

The tethering stones reported are basalt, gabbro, peridotite, limestone and sandstone. Although the size of the stones is variable, a general tendency has been noticed that the basalt, gabbro and peridotite are smaller in size compared to the limestone and sandstone. The former three are composed predominantly of ferromagnesian minerals that are known of their high specific gravity, whereas the limestone and sandstone are composed of the lighter minerals: quartz, dolomite and calcite. This observation is in accordance with the archaeological hypothesis that the weight of the tethering stones is a decisive factor in their function as animal traps.

Judging from Al Mudhaibi specimens, one can say that elongated stones were preferred to any others. The reason for this may rest on the function of the elongated shape that allows space between the axils of the stone to be tethered by a rope. Again, when a rope is tied to such a stone and lifted from the ground, the stone seems to be well balanced. This proves that the groove or the notches are in the axis of the stone. Most of the elongated stones gained that shape from being subjected to water erosion. Their surface texture is smooth as a result of rotation in water. There are few specimens of irregular shapes (cf. Fig. 1a.). It is evident that all stone specimens were taken from Wadi Andam's bed (cf. Map1) and brought by prehistoric hunters to the position where they were located.

Other than the signs of weathering, the stones exhibit clear marks of abrasion made in the process of abrading the grooves. The grooves and notches are not very deep and differ in width and depth from one specimen to another. Their depth ranges from 1.5 cm to less than 1 cm. Each stone must have been worked by using a stone to abrade the groove all around it. Other stone specimens have been bilaterally notched. Notches are commonly found in Stone Age lithic tools, especially in net sinkers. Stones used for making grooves differ from each other. For this reason, the grooves show a wide variation in depth and width. Given the type of rock, it must have been a tedious and time-consuming task.

The rope

What material was there available to Al-Mudhaibi hunters to make ropes? It is evident that such a rope had to be of material and design that could stand the stress and tension caused by the pull and force in opposite directions. Two forces exert tension against the resistance of the material and the weight of possibly 40 kilograms. It is a tension exerted by two forces in opposition. To answer this question, attention was directed to the local Bedouins of Al-Mudhaibi to assist in finding the types of ropes they used before the introduction of modern ones. Several of the elderly Bedouins report the following ranked options: goat hair, date palm fronds and animal hide. This was the material

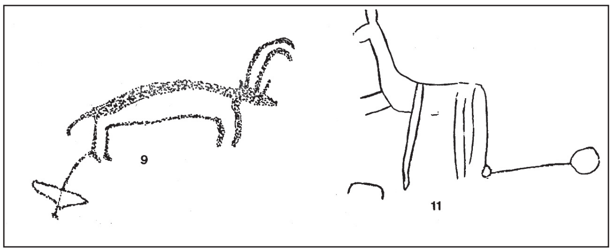


Fig. 5a: Rock scene from Gorgod, 3rd Catract, Sudan, After Allard-Huard (1993: Fir. 28/9,11)

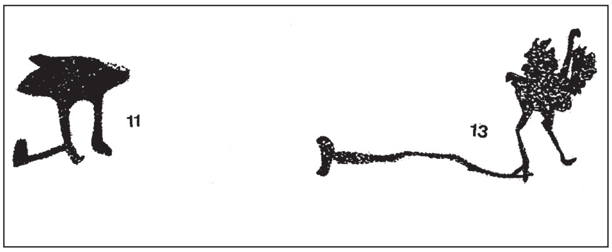


Fig. 5b: Rock scene from Weinat, Sudan, After Allard-Huard (1993: Fig. 48/11,13)

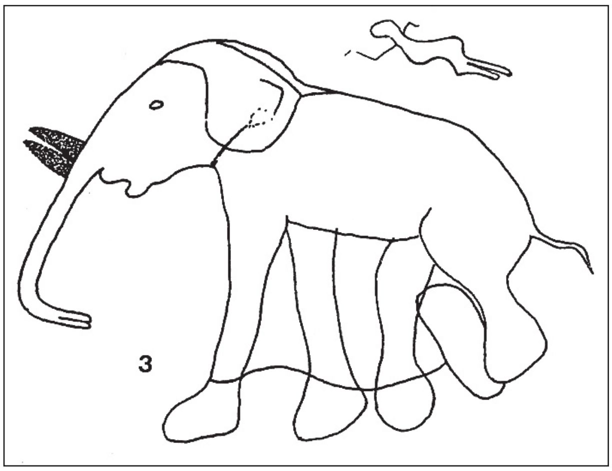


Fig. 5c: Rock scene from Serkout, Hoggar,, Algeria, After Allard-Huard (1993: Fig. 48/11,13)

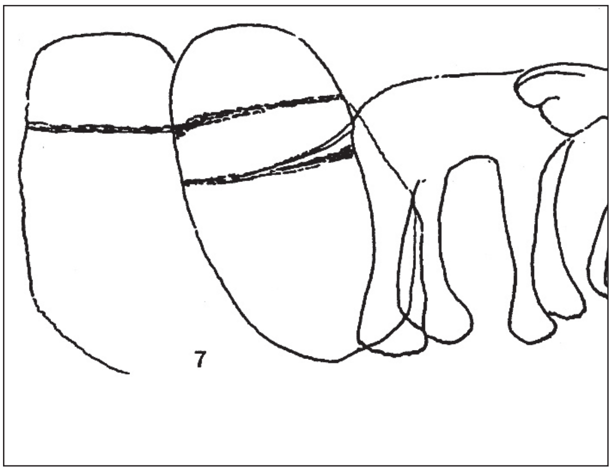


Fig. 5d: Rock scene from Serkout, Hoggar, Algeria, After Allard-Huard (1993: Fig. 48/11,13)

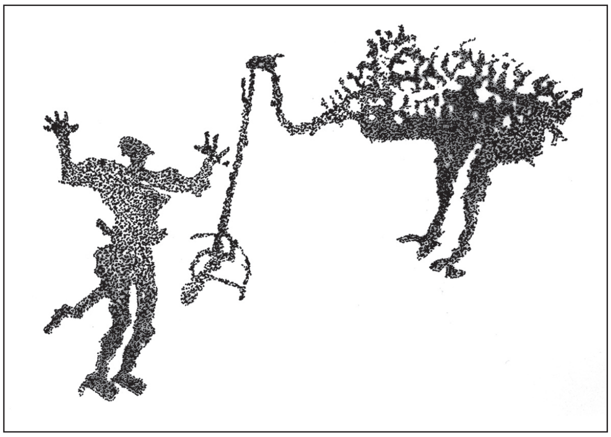


Fig 6: Ostrich hunt from Najran, Saudi Arabia after (Nayeem 1990:fig. 52:4)

used in making ropes in the past. However, experienced informants added that ropes made of animals hide are not that reliable, they can easily tear under pressure; therefore, no one uses such ropes when it comes to camels. It is not known whether the three proposed materials were used with the early prehistoric trapping stones given the currently available C14 dates on domestic goats and palm trees in Oman. Here, the present archaeological evidence dates the domestic goat in RJ-2 of Ra's al-Jinz to ca. 2300 BC (Cleuziou and Tosi 2000: 28,41,43; Bokonyi 1998:96-97). Evidence from Manal points to the end of the second and the beginning of the first millennium BC (ElMahi and Ibrahim 2003). In Khor Ruri, evidence of goats dates to the late first century BC (Bonacossi 2002:41-48). The same can be applied to the evidence on the date palm in Oman. The present evidence (2300 B.C.) comes from Ra's al Jinz site (Costantini and Audisio 2000: 143-156). Again, evidence reported from Dalma Island is estimated to be 7000 years old (Beech and Shepherd 2001:83-89). At present, there is no archaeological evidence to date the goat and the date palm tree in Al-Mudhaibi. Therefore, it is difficult to consider the possibility of ropes made of goat hair or palm fronds in this attempt.

Informal interviews with elderly members of the Bedouin community continued and Mohammad Al-Jahafi, came up with a reasonable possibility. He reported that not many years back, ropes were made using the leaves of a wild plant known locally as "al gadaf". This plant grows in wadis. With Al-Jahafi's assistance the plant species was located in several localities in Al Mudhaibi and other adjacent areas. The plant species proved to be Nannorrhops ritchieana (Plate 7). In Oman, it is commonly found in wadis and on low ground in desert areas (Miller and Morris 1988:224-225). Ghazanfar (1992; 1220) refers to Nannorrhops ritchieana (dwarf palm), which has fan-shaped leaves and occurs in the central desert of Oman. This low shrubby palm has leaves, which are

Plate 12: A loop and a slipknot forming a noose

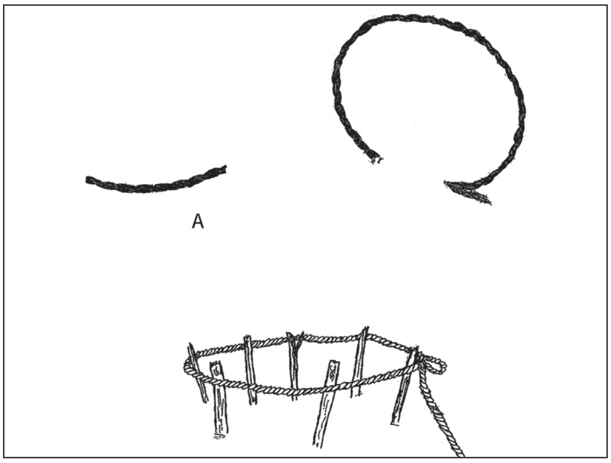


Fig. 7: Types of nooses used in trapping and snaring

palmate in shape and 30-120 (-135) cm long. The length of the leaflets is 30-45 cm and greenish in colour. The leaflets separate halfway along their length (cf. Miller and Morris ibid.). This plant species commonly grows in clusters or colonies in wadis and depressions in the desert (ibid.). The use of this plant to make rope does not prove that the Holocene hunters of Al-Mudhaibi used the same plant species, but explains the possibility that some other plant species were used. Contemporary foragers use various wild plants in their immediate environment to make cords and ropes (cf. Silberbauer 1972:292). Again, it cannot be tested whether Nannorrhops ritchieanas, the arid environment species, was part of the Holocene wet phase flora, as environmental indications will be discussed in the process of this paper.

Mohammad Al-Jahafi explained the treatment of the plant material and its preparation and made several 'gadaf' ropes to demonstrate the techniques applied. The process of making a rope is fully documented.

The making of a rope

In the following steps, the making of a 'gadaf' rope of Nannorrhops ritchieanas is described:

(1) The fan-shaped leaves of Nannorrhops ritchieana are cut.

(2) The leaves are soaked in water for a couple of hours.

(3) The leaflets are separated from each other (Plate 8). Each leaflet is split into two, taking advantage of the halfway separation along the length of the leaflet.

(4) Braiding starts by interweaving four leaflets together (Plate 9). This stage takes more time than the others.

(5) The braided parts are doubled together once again to make a thick rope (Plate 10).

(6) Doubling the rope with another braided one makes a thicker rope.

(7) The rope is stretched to its full length, and then polished with a bundle of leaflets all the way (Plate 11). This step is repeated over and over to ensure that the reticulated strands of leaflets are firm. It is also to smooth the new twined texture of the 'gadaf' rope.

(9) The rope is ready for use. It is important to notice that, whenever it is soaked in water, it turns out more capable of withstanding tension and stress.

Setting a trap

Setting a trap requires knowledge of the animal and its behaviour and habitat. A tethering trap is unrelated to what is known as baited traps. Baited traps are dependent on the stimulation of the reception of sense impressions, namely olfactory and visual senses, while a tethering trap is dependent on "frequency of contact" with the animal. The very concept of "frequency of contact" is an unambiguous understanding of the ecological interactions between different species in a given ecosystem (cf. Slobodkin 1962:184). The reasoning behind the idea is that predation can possibly increase if frequency of contact between prey and predator increases. Therefore, it is possible to apply analogically the same concept to tethering traps. In other words, the success of tethering traps is dependent on the frequency of contact between game and the device itself, which is, in a sense, a tool and a means of predation/ hunting.

As already mentioned, a trap consists of a stone and a rope (with a noose) to steadily tighten around an animal's limb to confine and

	Calcite	Dolomite	Quartz	Palygorskite	Chlorite	Goethite
Rock 1	22	41	17	15	5	0
Rock 2	24	38	19	13	6	0
Soil 1	36	16	21	7	9	11
Soil 2	32	15	23	7	8	15

Table 2: Mineralogical composition of soil and rock samples from the study area obtained by X-Ray Differaction

	Nb	Zr	Sr	Rb	Pb	Ga	Zn	Cu	Ni	Cr	V	Ba
Rock 1	4.4	81.8	1033.4	14.9	5.9	6.1	49.8	25.7	291.7	1731.7	105.8	154.9
Rock 2	5.7	114.6	425.8	16.1	8.1	5.3	42.1	12.5	105	427.4	57.8	185
Soil 1	6.6	100.5	332.5	18.1	10.7	6.8	50.1	20.8	462.3	1908.8	84.1	93.1
Soil 2	6	93.6	573.2	14.4	3.8	5.1	40.8	11.2	93.7	336.9	45.7	60.2

Table 3: Trace elements' concentration for soil and rock samples from the study area

restrain it from fleeing. In consideration of that, the location of a tethering trap is vital for its success. Butzer (1982:213) regards space as heterogeneous and all points in space are of equal value. It is evident that the location is chosen in response to the conditions of the animal's habitat and ecological behaviour. Most mammalian ungulates are territorial. It is an area or territory designated for breeding, foraging purposes, etc. It is typified by certain ecological characteristics that reflect the animal's requirements. In short, the criteria for choosing a spot to set a trap must be ecological, economic and cognitive. By looking at Al-Mudhaibi terrain, one can immediately observe the sand and gravel plains and low gravel hills. Characteristic natural and topographical features of this kind are suitable to certain mammalian ungulates with "flight and distance instincts" (cf. Slobodkin 1962) that enable them to see and flee their natural enemies. It is part of their self-defense mechanism.

It is unquestionable that prehistoric hunters were knowledgeable about the ecology and behaviour of the animals in their ecosystem. They comprehended the animals' habitats and its various components. They watched, observed and learned the behaviour of different animals in their realm. Although the archaeological evidence falls short of providing such data, it can be assumed that prehistoric hunters must have recognized the behaviour, ecological requirements and habitat of their animal prey and predators.

The camouflage

The setting of a tethering stone trap and its camouflage can perhaps be reconstructed in the following manner. The spot where the trap is to be set must be chosen with great care. It should be an area frequented by the prey. In a sense, it must respond to the prey's behaviour and its type of habitat. The different components of the trap are put together, and the rope is tied around the stone (in the groove). A loop is made out of the other end of the rope by means of a slipknot forming a noose (Plate 12) (Fig. 2a:1). The noose is partially buried in the ground in a vertical position (one quarter of the noose is covered by soil, while the remaining part of the noose is exposed (Plate 13 & Fig. 7a). The remaining part of the rope is covered by soil for camouflage. Setting the trap can possibly be hypothesized in the manner which Fig. (2a) illustrates. It is camouflaged and set in a way that it steadily tightens around the limb of any animal that hits the noose. Once the limb of an animal pulls the rope, it will be tightened and the animal is trapped with the weight of the stone. As the animal tries to free itself, the rope tightens. The drawing in (Fig. 2a:1 & 2) is an imaginary illustration meant to portray and explain the position of the trap set and an animal being trapped.

Length versus weight

All the stone specimens retrieved from Al Mudhaibi weigh less than fifty-five kilograms (cf. Table 1). Is it possible that the weight of the stones bears any significance such as the animals' size? To get closer to this question, it would be useful to view the animals on the plains of Oman. At present, the largest mammalian ungulate in Oman is the Arabian oryx Oryx leucoryx. An adult oryx weighs ca 90 kilograms. Therefore, it is only logical to assume that such a medium sized animal can easily be caught by a ca 40-50 kilograms tethering stone. It can drag the stone for only a short distance before it is completely exhausted. However, if a 30-20 kilograms stone catches it, the distance will be longer before the animal comes to a standstill. Alternatively, the rope and its length must have played a significant part in the fulfillment of the weight purpose, which will be examined below.

As already mentioned, once an animal limb hits the noose, it will automatically tighten with the tension exerted by the animal's movement. The slipknot that forms a loop will slip causing the noose to tighten more and more. The instinctive reaction of the animal is to free its limb. The animal will jerk its tied limb. As it keeps hauling, the noose will tighten.

The length of the rope is very much related to the weight of the rope. The rule is simple. A heavy stone goes with a rope short in length, while a long rope can achieve the purpose of a light stone. An animal tethered by a short rope tied to a heavy stone cannot tow or drag it for a long distance or for a long period. However, if the stone is light and the rope is short, it is possible that the animal will tow the stone and run away with it for a longer distance, especially if it is a large mammalian ungulate. In an inverted context, if a long rope is tied to a light stone, the animal will haul and jerk its limb with force. The situation can be explained by the equation ($T = Ma$), (Tension = Mass and acceleration) which is applied here. The repeated action of hauling, jerking and towing will eventually entangle the long rope around the other limbs of the animal (Fig. 2b). The animal impelled through panic, can even become bound and perhaps able to move with a leap or a series of leaps, but cannot free itself. It is restricted and restrained by the long rope. Of course, the entanglement of the animal will be more effective if the noose catches the animal in the front leg. Hauling the stone with the long rope will effectively entangle the animal with the motion of the stone, the tension on the rope, and the animal's three moving limbs. The same situation can take place even if the noose catches a hind leg and the stone with a long rope is hauled.

Evidence of traps and snares that combine the length of the rope with the weight of the stone has been reported from Northern Sudan. Paintings on pottery vessels show guinea fowl before and after being snared and entangled by a long cord (Fig.3: after ElMahi 1995: Fig. 2, 3, 4). Perhaps certain rock scenes from the Sahara possibly portray a similar situation (Fig. 4:6) and (Fig. 5a: 11; 5b:13; 5c & 5d). Equally, this explains the presence of tethering stones of light weight (less than 10 kilograms) in Al-Mudhaibi. Accordingly, the possibility that prehistoric hunters had deliberately used long ropes with light tethering stones in Al-Mudhaibi cannot be dismissed.

Tethering stones and environmental conditions

The fact that these specimens are found on the surface and not within an archaeological context or a stratigraphic sequence precludes dating. However, tethering stones have been described as a climatic indicator. Tethering stones are reported from a large area across the Sahara. Their physiographic position and distribution have been identified in association with Holocene lacustrine, semi-lacustrine and fluvial deposits (cf. Pachur 1991:16). In Khor Rori, they have been found semi-buried in a shallow soil of reddish Bw horizon, which has been interpreted by Cremaschi and Negrino (2002:334) as belonging to a Holocene wet phase. They have also been associated with Neolithic hunting activities (ibid.)

The study area has been investigated to cast more light on this issue. Osman Abdalla reports as follows:

The geology and stratigraphy of the area together with palaeoenvironmental indicators were thoroughly investigated. Rock and soil samples were collected for analysis. Rock samples were obtained from the freshest surface possible, whereas the soil samples were collected from in situ soil directly above the bedrock. The samples were analyzed for their mineralogical and chemical composition using X-Ray Diffraction (XRD) and X-Ray Fluorescence (XRF), respectively. The analyses were carried out in the laboratories of the Earth Science Department, SQU, and the results are shown in Tables 2 and 3.

The present-day climate in the study area is hyperarid and precipitation is less than 100 mm/year. However examination of the rock units in the field and the results of the lab analyses indicate that the area had once witnessed humid and hot conditions that suggest a tropical paleoenvironment. Evidence of the humid period includes sculpts of the limestones (Plate 1b) and the high concentration of Fe oxides as indicated by the red color seen in the soil (Plate 1a) and by the presence of goethite in the mineralogical composition of the soil (Table 1). Goethite, normally found in well-drained soil, is only present in the soil samples, indicating oxidation conditions with abundant water that led to the weathering of the rocks to form the present soil. The increasing ratio of calcite: dolomite in the soil compared to rock samples indicates the influence of weathering. Dolomite, which resists weathering, remains in the rock portion whereas calcite disintegrates from the rock to enrich the soil.

As soils of more humid climates tend to be red-colored and contain clay minerals such as chlorite (Retallack, 2001), chlorite concentration has rather increased in the soil samples. On the other hand, the concentration of palygorksite that indicates arid conditions has notably decreased in the soil compared to rocks. In addition, the size of the gravels (75 – 0.2 cm diameter) within the alluvium bed along Wadi Andam suggests their formation under powerful water currents only associated with high precipitation.

The red soil in the study region is similar to the Oxisols in Thailand described by Tawornpruek et al., 2006 as soil commonly forms on limestone in hot tropical climates with alternating wet and dry seasons. The specific pedoenvironment in which these red Oxisols form is characterized by an association of a strongly seasonal climate and high internal drainage which prevails under karstic conditions on hard limestone (Boero and Schwertmann, 1989). Red Oxisols are perhaps the only group of soils that are truly confined to the Tropics as high temperatures and rainfall are necessary to induce intense weathering. (Tawornpruek et al. 2006).

The aforementioned evidence of wet and hot paleoclimate in the study area confirms the findings of the previous paleoclimatic studies conducted in Oman. This wet period was identified in speleothems of the Oman Mountains from 10,000 years to 5500 years BP (Fleitmann et al., 2005; Burns et al., 1998, 2001). Moreover, Radies et al. (2005) studied the interdune deposits of the Wahiba Sand and dated the Holocene wet period (ca. 9300 to 5500 years ago) using infrared stimulated luminescence (IRSL). During the onset of the Early Holocene wet period, the amount of precipitation increased over southern Arabia (Fleitmann et al., 2005; Burns et al. 1998, 2001).

Furthermore, Speleothem, which is a mineral deposit formed in caves by the evaporation of mineral-rich water, has been tested in certain localities in the Sultanate of Oman. In Al-Hoti cave (northern Oman) stable isotope analyses of speleothems indicated that rapid speleothem growth occurred during the early to middle Holocene (Burns et al. 2001: 623-626). This is considered as an indication of a Holocene wet phase.

From a geological point of view, the stones in the Sahara and Dhofar have indicated a type of environmental conditions different from to the present day. Their immediate association with the Holocene lacustrine, semi-lacustrine and

From	To	Distance
Barzman1	Nafas1	9.498 km
Barzman1	Nafas3	8.437 km
Barzman1	Nafas2	8.276 km
Barzman1	Nafas4	8.750 km
Nafas1	Nafas2	2.183 km
Nafas1	Nafas3	1.365 km
Nafas1	Nafas4	1.431 km
Nafas1	Al Haani3	11.302 km
Al Haani3	Al Haani1-2	2.500 km
Houtah2	Houtah4	1.880 km
Nafas1	Batin Al Maiqa	8.631 km
Batin Al Maiqa	Houtah1	7.900 km
Al Haani	Houtah1	14.440 km
Barzman1	Barzman1	67.554 km (along the line)
Nafas1	Nafas1	48.538 km (along the line)

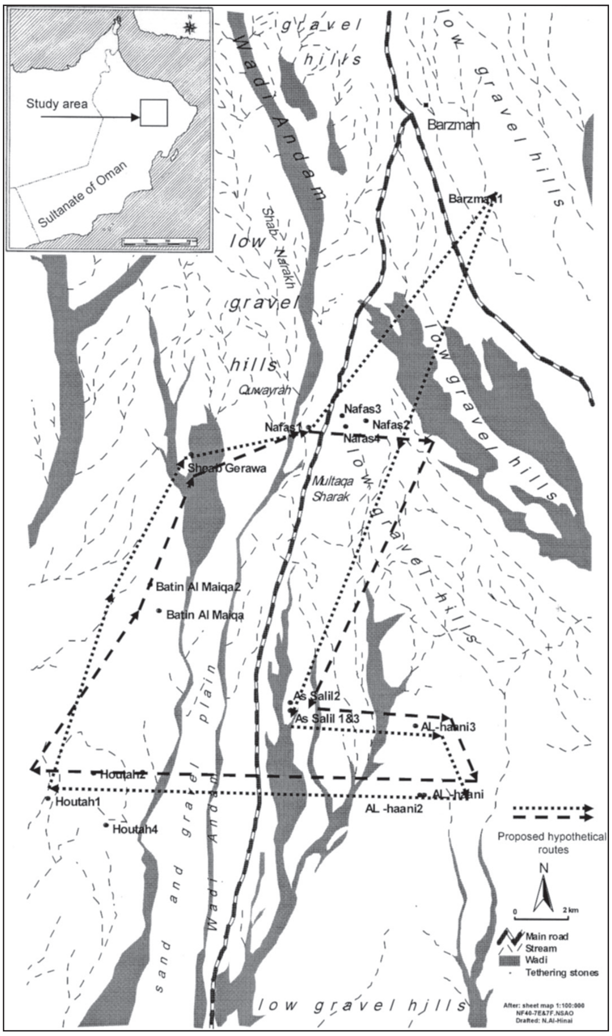
Table 4: The distance between tethering stones in Al-Mudhaibi

fluvial deposits in the Sahara and shallow soil of reddish Bw horizon in Dhofar is a sufficiently acceptable indicator of wet conditions (cf. Pachur ibid. and Cremaschi and Negrino ibid.). Consequently, the stones point to a wet phase in the Holocene. Again, the nature of the stone and the trap it constitutes must be taken into consideration. It is designed to trap large size animals, which require ecological conditions characterized by sufficient vegetation and wetness for their survival. In Dhofar, Amirkanov (1994:226) identified the Neolithic (period I) based on site Habrut 1 and attributed it to the late seventh and early sixth millennium BC. This period is associated with geological evidence that indicates a wet phase.

Subsistence strategies in the Holocene environment

In any ecological conditions, marked by a vegetation cover, that sustain large mammals, hunting gathering becomes a feasible and gainful way of subsistence. It should be noted that gathering esculent wild plants is a more reliable source than what hunting can provide. A comparison between plant and game sources and the input efforts needed to exploit each source can easily indicate the reliability of the former. Whether it is a wet phase or an arid phase, gathering wild plants is more reliable. The wild vegetable food source can be characterized as being abundant, predictable and nutritious (cf. Lee 1972:342). Therefore, it would be surprising if the trapping stones of Al-Mudhaibi were not part of a subsistence strategy that recognized gathering in such an environment. In this context, it should be mentioned that the exploitation of wild resources (plants and game) was not abandoned completely after the introduction of animal keeping and farming in the Neolithic tradition.

Did Al-Mudhaibi tethering stones belong to one hunting group or to more than one band? Moreover, who were the owners of these tethering stones, foragers or nomadic pastoralists? To answer this question, it would be useful to look at the distance (in kilometers) between the locations of the tethering stones and the practices of traditional hunters. Nonetheless, whatever answer is concluded, it should be regarded as a relational analogy that aims at explaining a possible situation in prehistoric times. However, before answering this question, it would be useful to mention that field studies of the few remaining contemporary hunter-gatherers have furnished an insight



Map 2: Area possibly exploited by prehistoric hunters in Al Mudhaibi

into their organization, socio-economic life, mobility, division of labour (cf. Clark 1951; Lee 1965; Lee 1968; Birdsell 1968; Woodburn 1968; Silberbauer 1972; O'Connell 1988; Hawkes et al. 1991). In fact, hunting is a vast range of activities that includes: (a) killing animals with arrows or projectiles (with or without poison); (b) trapping and snaring; (c) probing of underground burrows; (d) catching game birds by snares and harvesting nests for eggs and nestlings.

It would be useful to examine the Al-Mudhaibi case in relation to the distance between the stones and their distribution. Hunting activities in terms of distance among a contemporary group of foragers, namely G/wi Bushmen of southern Africa can possibly serve as an analogue in this respect. However, it should be noticed here that the environmental conditions of the G/wi Bushmen are not what can be described as wet. They inhabit the so-called Kalahari Desert, which consists of three regions: the north dune woodlands, the central scrub plain, and the southern scrub woodlands (cf. Silberbauer 1972: 276). Their exploitation of the natural resources is geared to the potential of the seasons in each region. Nonetheless, this group is considered a demonstrative analogue for the distances covered in hunting operations.

The daily operational radius of a G/wi Bushman hunting party is estimated to be ca. 9.3 kilometers (Silberbauer 1972: 290). Moreover, although the hunting efficiency varies from one group to another, the total hunting time has been estimated at an average of four hours a day (Bodley 1997:68). When taking into consideration that a person can walk around 5 kilometers in one hour, it means that in 4 hours a hunter can cross a distance of ca 20 kilometers. Table (4) and map (2) illustrate the distance between the stones. These calculated distances coincide with the average hunting effort of contemporary foragers. In other words, Al- Mudhaibi hunters could have visited ca two trapping locations in one day such as Barzman 1 - Nafas1, 2, 3 and 4.

What is important here is that Al-Mudhaibi hunters were possibly able to visit their traps on a regular basis. Each trap was perhaps visited within intervals of a few days where it was checked and if it contained nothing, its camouflage and setting are adjusted if need be. Economically, it signifies that these traps were the hunters' investment on the ground. Interestingly enough, such a considerable investment of labour can partially qualify it as a delayed-return system and not as an immediate-return system in a subsistence economy.

It will be equally unsurprising if the location of these stones (cf. Map 2) falls in the path or is part of Al-Mudhaibi hunters' movement pattern. A cyclic movement of gathering esculent wild plants, hunting small animals, harvesting bird nests, and checking on their tethering traps seems reasonably analogous to movement patterns carried out by any of the following prehistoric groups: a band of nomadic hunters or a nomadic pastoral group. It is meaningful to realize that the prime economic objective of any nomadic cyclic movement is the exploitation of wild resources. For foragers it is hunting and gathering, while pasture for nomadic pastoralists is the immediate priority.

Factors such as security, size of the group and food procurement necessitate mobility for such a group. Security comes as a prime objective among these factors, then the size of the group and food procurement based on exploiting various natural resources. In a sense, the three factors are complementary. Simply, a group of low population density can thus move easily and ease the progress of mobility. In addition, continuous mobility among contemporary foragers proved to be effective when health and security of the group became a issue. Yet, methods and techniques of archaeology cannot gauge a population size from unearthed artifacts or food waste or even from the size of archaeological sites. Nonetheless, anthropological studies report that bands of contemporary hunter-gatherers usually consist of a small number of individuals (cf. Clark 1951; Lee 1965; Lee 1968; Birdsell 1968; Woodburn 1968; O'Connell 1988; Hawkes et al. 1991). It has been indicated that hunter-gatherers have successfully kept their population density homeostatically regulated in relation to the carrying capacity of the natural resources in their immediate environment (Binford 1977:246-427). The concept of "security in numbers", when applied to hunters/gatherers or nomadic pastoralists, so far provides reasonable explanations and justification for the small numbered band. It is useful in this respect to recall the statement made by Johnson and Earle (1987:27): "Where population densities are low, the efficiency of a subsistence strategy is inversely related to its intensity". As much as the environment and the technology, "Security in number" forms a principal constituent in the survival strategy of any given band. Consequently, the likelihood of a low-density population in Al-Mudhaibi is evident whether the conditions were wet or dry and whether the economic bases were of foragers or Neolithic hunters.

It is also worthwhile considering the significance of the distribution of the stones. They are found on both sides of Wadi Andam (Map 1). In every case, they are not far from the wadi's favourable ecological setting for plants, animals and foragers. This position for setting tethering traps within the proximity of the wadi was also reported by Cremaschi and Negrino (2002:333) in Dhofar. They specifically described the location of the stones as "the strategic physiographic position for easier accessibility to the wadis". Indeed, the traps are set in such a location, because large mammalian ungulates establish their ecological niche on the plains, but within available water source, which they visit frequently. A clear analogy of this ecological setting can be seen in the savanna plains of Africa. If this is acceptable, then it is possible that Al-Mudhaibi hunters set their traps where the animals lived in the plains and not in the wadi banks. It is therefore, reasonable to visualize the significance of "frequency of contact" between the prey and the traps under such conditions.

Would there be a different adaptation if the group in question were a group of Neolithic hunters? The emergence of the Neolithic at the beginning of the Holocene ca 10000 BC was the result of a technical stage where human societies adopted a food production strategy that involved animal breeding and farming. Nonetheless, hunting wild animals and gathering esculent wild plants were not completely forsaken. They continued to play a substantial role in the economy and subsistence strategies. Evidence for such a continuation is well documented among traditional pastoral groups. In Dhofar, these groups practiced hunting and gathering esculent wild plants until recent times (ElMahi forthcoming). If that is the case, then it means that these Neolithic hunters followed some sort of movement, maybe a cyclic one, to take advantage of mobility and check on their investment on the ground-- the tethering stone traps (cf. Map 2). However, to identify these tethering stones with Neolithic hunters would require more direct evidence that associates them with the Neolithic tradition. It is evident that further investigations are needed to reconstruct a bigger picture of tethering trapping stones in Oman and Arabia.

It is likely that Al-Mudhaibi foragers or (nomadic pastoralists?) adopted some sort of a nomadic cyclic movement geared towards the potential of the seasons and natural resources and to avoid environmental and ecological limitations. It is only common sense to assume that such mobility becomes imperative when potential\limiting ecological factors are taken into consideration by foraging or nomadic pastoralism.

Ostrich hunting rock scene

The distribution of tethering stones in Arabia must be considerable, yet received little attention or was overlooked during archaeological surveys. Whatever the case, tethering stones are a valuable source of information. An interesting rock scene from Najran in southern Saudi Arabia portrays an ostrich (cf. Nayeem 1990: fig. 52:4). In fact, the scene is referred to as an ostrich hunt without giving any details (cf. Nayeem ibid.). However, a closer look at the scene shows an ostrich caught by the head and the end of the rope is connected to an unidentified body (Fig. 6). When compared with rock scenes of ostrich caught by tethering stones from Jabal Weinat in the Sudan (cf. Fig.5b), a clear difference is projected. Jabal Weinat ostriches are depicted caught by the leg, while the one from Najran is caught by the head. There are two possibilities worthy of examination to explain the context of Najran's scene.

Ostriches are known to avoid dense vegetation and swamps and prefer open plains where they can spot and flee predators (Brown et. al. 1982:34). The rock scene of Najran depicts an ostrich caught either by a baited tethering stone or by spring snare. The Bushmen of the Kalahari Desert snare animals or bird game by using a spring-loaded noose, (Fig. 7b) (cf. Silberbauer 1972:292). It is a pegged out noose on the ground and concealed by sand or grass. Bait (e.g. an Acacia gum) is placed in the middle of the pegged noose. The other end of the cord is secured to a springy sapling anchored firmly to the ground. Hence, the springy sapling is in a flexed position due to the tension on the cord. Once a bird touches the noose, the tension on the cord and the springy sapling will snap at warp speed tightening the noose around its head and the spring, like sapling pulls and holds it (ibid.). Then again, this type of "spring-loaded noose" (cf. Fig. 7b) cannot be effective if a bird of the size and weight of an ostrich is involved. A male ostrich can weigh ca 110-130 kilograms and stand ca 2.2 meters in height though the female is relatively smaller (Siegfried 1984: 364).

The second possibility can be a baited tethering stone trap since the bird's head rather than one of its legs is caught. However, this cannot be achieved if the noose is set in a vertical position as illustrated by the Bedouins (Fig. 7a). It has to be a pegged noose in order to bait it. Therefore, it is more likely that a baited tethering stone trap caught the Najran ostrich. If this explanation is acceptable, then it signifies three matters. First, the noose position, whether vertically positioned or horizontally pegged, signifies the requisite purpose of trapping animals and large sized birds. Secondly, a tethering stone trap can also be successful when baited and the noose is pegged to catch large sized birds. Thirdly, tethering stones must have had a vast geographical distribution in Arabia during Holocene times.

Conclusions

To sum up, this study has cast light on the presence of tethering stones in Al-Mudhaibi area in the Sultanate of Oman. It has studied and documented the stones and identified them as hunting devices. A tethering stone is one single component of a more complex trap. The trap has been reconstructed in terms of the making of the stone, the rope and the setting of the trap in terms of the concept of weight versus length.

Traditional practices of the Bedouins and contemporary hunters in Africa have provided a possible analogy for ways and techniques of setting a noose in a trapping device. Based on this analogy, the paper proposed two possible ways of setting a noose for catching bird and animal game. As a result, a rock scene of an ostrich hunt from Najran in Saudi Arabia has been re-viewed as a possible scene that involved trapping by a tethering stone.

Tethering stone traps are a work of imagination. It has been concluded that these stones must have been used to trap medium and large sized animals. Consequently, such herbivores must have been sustained by an ecological carrying capacity of verdant biotopes. Examination of the geology of the area indicates humid conditions that prevailed in the mid-Holocene. This wet phase has been dated to the seventh millennium BC. Similar to the samples found in the Sahara, the Al-Mudhaibi tethering stones proved to be climatic indicators.

The paper also proposes that the location, distribution and distance between the tethering stones can possibly indicate a cyclic movement of foragers. Moreover, the use of tethering stones in trapping game must have had a wide distribution in Oman and Arabia. Only careful surveys can create a better awareness of their true geographical distribution in the country and heighten the status of our knowledge about the prehistory of the region.

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ملخص: كشف المسح الأثري عن حجارة للصيد منتشرة فى مساحة واسعة فى منطقة المضيبى بسلطنة عمان. ودلت الدراسة أن حجارة مشابه لهذه الحجارة تم العثور عليها فى منطقة تمتد فى شمال أفريقيا بين السودان وليبيا والجزائر. وأتضح أن هذه الحجارة تستعمل كفخ لصيد الحيوانات من نوع أكلات العشب. الدراسة تناولت الحجارة بالتوثيق وتحديد الإحداثيات والمسافات بينها. ثم قامت الدراسة بإعادة تركيب أجزاء الفخ، وطرق نصبه. كما أوضحت التحاليل الكيميائية بأن هذه الحجارة تعود للفترة المطيرة من عصر الهولوسين والتي يؤرخ لها بالألف السابع قبل الميلاد.

Notes

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