Benecke, Norbert – Neef, Reinder

Faunal and Plant Remains from Sohr Damb/Nal: A Prehistoric Site (c. 3500–2000 BC) in Central Balochistan (Pakistan).

in: Franke-Vogt, Ute – Weisshaar, H.-J (Hrsg.), South Asian archaeology 2003: proceedings of the Seventeenth International Conference of the European Association of South Asian Archaeologists, 7–11 July 2003, Bonn 81–91.

DOI: https://doi.org/10.34780/mvc3-3u6b

Herausgebende Institution / Publisher:
Deutsches Archäologisches Institut

N. Benecke / R. Neef

Faunal and Plant Remains from Sohr Damb/Nal: A Prehistoric Site (c. 3500–2000 BC) in Central Balochistan (Pakistan)

Introduction

The excavations in 2001 and 2002 on the prehistoric mound Sohr Damb have produced well-stratified samples of animal and plant remains (for the archaeology of the site cf. Franke-Vogt, this volume). They allow some insight into the subsistence economy of this site throughout its period of occupation and they have yielded data for reconstructing the ancient environment of the surroundings. Chronologically, the assemblages of bone and plant remains so far available belong to the Periods II (c. 3000–2700 BC) and III (c. 2700–2400 BC) of Sohr Damb. Here, we present preliminary results of archaeozoological and archaeobotanical studies on these materials.

Location and environment

The site of Sohr Damb lies in the central part of the province Balochistan (27°40' N, 66°14' E) in the wide valley of the river Nal at a height of 1200 m above sea level. The valley has a length of about 30 miles and an average breadth of about seven miles. The climate is arid. During the summer months daily temperatures can be over 40 °C, not seldomly combined with dust storms caused by hot winds from the north. In winter night frosts are possible. The annual precipitation is about 100–200 mm (Pakistan Statistical Yearbook 1988) with two main periods of rainfall in the course of the year. Rainfall is possible from December to March, coming as winter rains from the northwest, frequently as one or a few heavy rain showers. A second period of rain is possible from the end of July to the end of August when the summer monsoon brushes the Nal area.

The area under investigation is built up of subparallel NE-SW running mountain ranges reaching a height of over 2000 m, with partly wide valleys between them. Strongly folded layers of limestone build up most formations. In general, the mountains have a harsh appearance caused by their strongly eroded surface. There is hardly any soil cover and a degraded treeless vegetation. At the beginning of the 20th century, open xeric woodland with wild olive (*Olea* spp.), almond (*Prunus* spp.) and pistachio (*Pistacia* spp.) could still be found on the mountain slopes, and on the highest ranges even juniper (*Juniperus* spp.; Gazetteer 1986). But intensive grazing and a strongly growing demand of fuel wood of the fast expanding population in this area have completely devastated these woodlands. In the valleys and on the high plateaus, fertile alluvial soils (clay/silt) have accumulated.

In the surroundings of Sohr Damb, the natural vegetation has completely disappeared. Unless too stony, the whole area is in use for irrigation agriculture, managed in a system with two-cropping seasons. Compared to the beginning of the 20th century, this is an enormous change. For the year 1906 it is mentioned that less than a quarter of the cultivated land was irrigated. It is also stated that rivers like the Nal could be subject to heavy floods, which inundate and fertilize the land, but that most of these rivers had no reliable perennial flow of water throughout its course (Gazetteer 1986).

In the wider area around Sohr Damb, at places unsuitable for irrigation agriculture, an arid scrub like steppe forest can be observed. This vegetation is dominated by tamarisk (*Tamarix* spp.) and tropical species like *Acacia* spp., *Ziziphus* spp., *Tecoma undulata* and *Calotropis procera*. The dwarf palm (*Nannorrhops ritchiana*) occurs scattered all over the plateau and on the lower mountain slopes. Most of the riverine forest vegetation has disappeared in the region of Sohr Damb as well. It is still to be found in less accessible areas, like in parts along the river Hunarka Chuchri Jhal. Here, the riverine forest is mainly composed by tamarisk bushes and trees and on the higher banks by acacia and poplar trees (*Populus* sp.).

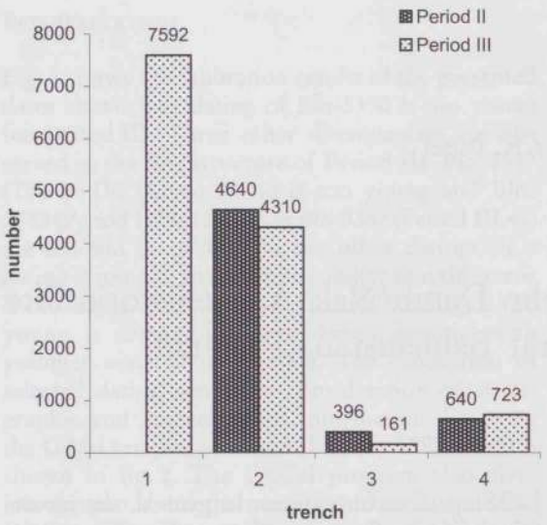

Fig. 1. Distribution of animal remains according to trenches and periods.

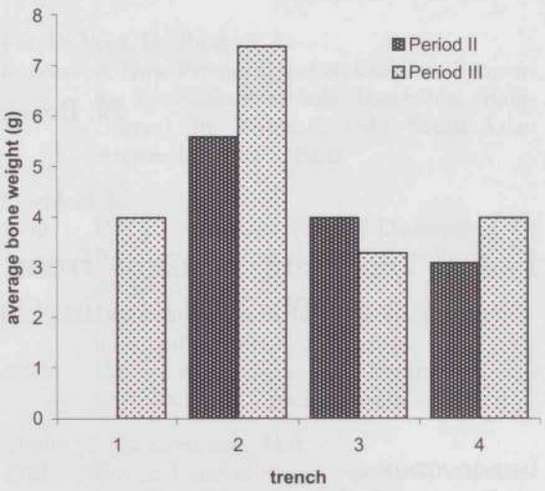

Fig. 2. Average bone weight of animal remains according to trenches and periods.

Archaeozoological studies

Material

The faunal collection available from Sohr Damb so far consists of about 18,500 remains. For the largest part, they represent discarded refuse originating from slaughtering animals and preparing food. The remains are characterized by a high degree of fragmentation with only a very few bones being unbroken. During the two field seasons in 2001 and 2002, faunal remains were carefully collected in four trenches of the site, labelled as Trench I, II, III, and IV representing different areas of the ancient settlement (cf. Franke-Vogt, this volume). The deposits encountered in these trenches are mainly dated to the Periods II and III of Sohr Damb. Figure 1 shows the distribution of animal remains according to trenches and periods. There are quite large assemblages from Trench I and II, but only small ones from Trench III and IV. With regard to average bone weight the collections from Trenches I, III, and IV are quite similar to each other (fig. 2). Interestingly, the assemblage coming from Trench II exhibits a significantly higher mean value. This is mainly due to differences in species composition, especially to a higher representation of cattle in relation to sheep and goat in this trench (see below).

Taxonomic composition

Nearly one third of the collection, that is about 5,300 specimens, could be identified to species or higher taxonomic levels. Remains of domestic animals form the bulk of the bone finds recovered from the site. Numerically, species of this group count for about 95 per cent of the identified bones (fig. 3).

The most frequent species of this group is cattle. Evidence provided by cattle figurines found at Sohr Damb suggests that humped or zebu cattle was kept in this settlement. The representational evidence is confirmed by the osteology. There are some bone finds which exhibit characters generally regarded as typical for zebu, for example cases of notched dorsal spines in thoracic vertebrae (spina bifida). According to osteometrical data, the cattle seem to have been quite uniform in terms of body size. The scatter plot in figure 4 shows the variability in cattle from Sohr Damb on the basis of first phalanx measurements. On the whole the bones represent animals in the lower to medium size range of prehistoric cattle, with withers heights probably varying between 110 and 135 cm.

Sheep and goats represent the second frequent group among the domestic animals. The ratio between both species is about 3:2 in favour of sheep, based on fragment counts. As a general pattern, there is a slight increase in sheep in relation to goats from the older Period II to the younger Period III. Osteometrical data point to a breed of sheep with withers heights between 55 and 70 cm. The mean wither height is 61 cm in Period II and 63 cm in Period III.

Domestic dogs were also present as is attested by a few of their own bones as well as by their tooth marks on other specimens.

Wild mammals account for only 5% of the bone remains. They are represented by a few species with onager *(Equus hemionus)* and gazelle (*Gazella* sp.) being the most abundant. Due to the lack of horn cores species identification of gazelle has not been possible yet. At Neolithic and Bronze Age sites in Pakistan, like Mehgarh, Balakot and Sibri, Indian

Species	Period II		Period III	
	NISP	Weight	NISP	Weight
Domestic Mammals				
Cattle	892	15131	1757	31374
Sheep/Goat	768	3078	1578	6597
(Sheep)	(53)	(298)	(145)	(1113)
(Goat)	(41)	(202)	(99)	(566)
Dog	–	–	2	14
Wild Mammals				
Hemione	54	1190	104	2731
Gazelle	23	175	51	542
Wild Goat	–	–	1	390
Fox	1	3	4	18
Bear	1	2	–	–
Mustelids	2	5	5	15
Unidentified	3934	10064	9282	23838
Sum	5675	29648	12784	65519

Fig 3. Mammal remains from Sohr Damb (Period II and III), quantified in terms of the number of identified specimens (NISP) and bone weight (in gramme). The bones of bandicoot rat remained unconsidered here.

gazelle or chinkara *(Gazella bennetti)* has been identified as the only gazelle species occurring at these locations (Meadow 1979, 1984). For zoogeographical reasons, the gazelle remains from Sohr Damb might belong to this species as well (Uerpmann 1987, 98). Beside onager and gazelle, there is evidence for another wild ungulate species at the site under discussion, i. e. wild goat. This species is represented by a fragment of an isolated horncore from Period III. It mostly resembles that of *Capra aegagrus*. Today, wild goat is still to be found in the mountain ranges south of Quetta (Schaller 1976, 136).

Wild carnivores are represented by a few bones, which could be assigned to fox, bear and species of mustelids. The fox bones could safely be assigned on morphological characters to red fox *(Vulpes vulpes)*. The only bear bone found at Sohr Damb, a distal part of a metacarpal, can belong either to brown bear *(Ursus arctos)* or to Himalayan black bear *(Selenarctos thibetanus)*. Mustelids are represented by bones of the postcranial skeleton. Unfortunately, species identification has not been possible.

Remains of rodents have been found in some deposits of the site. They belong to bandicoot rat *(Nesokia indica)*, a species living commensally with humans. Traces of gnawing by this rodent have been observed on many bones.

The faunal collection from Sohr Damb also comprises a few bird bones. Rock partridge *(Alectoris graeca)* and bearded vulture *(Gypaëtus barbatus)* have been identified so far. Fish is represented by a few vertebrae. They have not been identified yet.

Species frequency

Having shortly discussed the animal species present at Sohr Damb, intra-site variability and diachronic changes in species frequencies will now be considered. To make comparison more clear, only three groups of animals are considered here, that is cattle, sheep/goat and hunted wild mammals.

Figure 5 shows relative frequencies of these groups according to periods and trenches, counted on the basis of fragment numbers. There are remarkable differences in species composition between the various trenches of the site, especially with regard to the ratio between cattle and sheep/goat. As can be seen in the graph, this holds true both for Period II and Period III. Sheep and goat clearly outnumber cattle in most trenches. The only exception is Trench II where cattle is the predominant species.

Interestingly, the cattle remains from Trench II show a unique anatomical composition. Figure 6 illustrates the distribution of cattle bones by skeletal elements on the basis of relative bone weights. The curve "skeleton" presents the distribution to be found in a complete skeleton. The cattle remains from Trench I and IV resemble this distribution more or less, whereas those from Trench II display a completely different pattern with elements of the terminal extremities, especially phalanges, being largely over-represented. Possibly, the concentrations of foot and toe bones from cattle in Trench II represent waste originating from the production of leather. This assumption is corroborated by the fact that many of the toe bones exhibit cut marks resulting from skinning the animals. A large number of the bone tools found at Sohr Damb seem to have been used for working soft materials like leather.

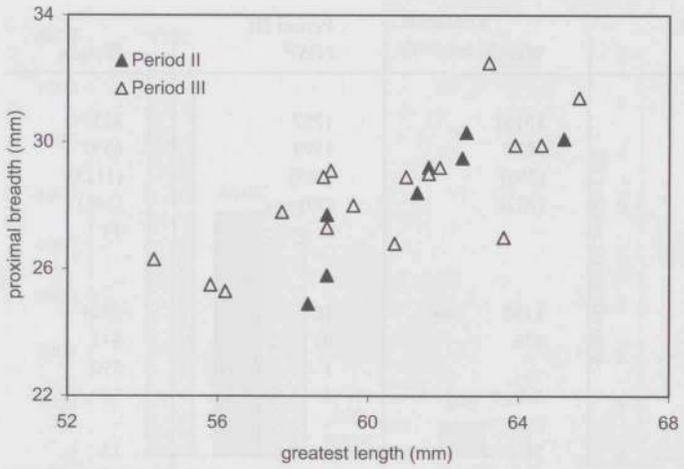

Fig. 4. Cattle, Phalanx 2 posterior. Plot of proximal breadth against greatest length of the peripheral half.

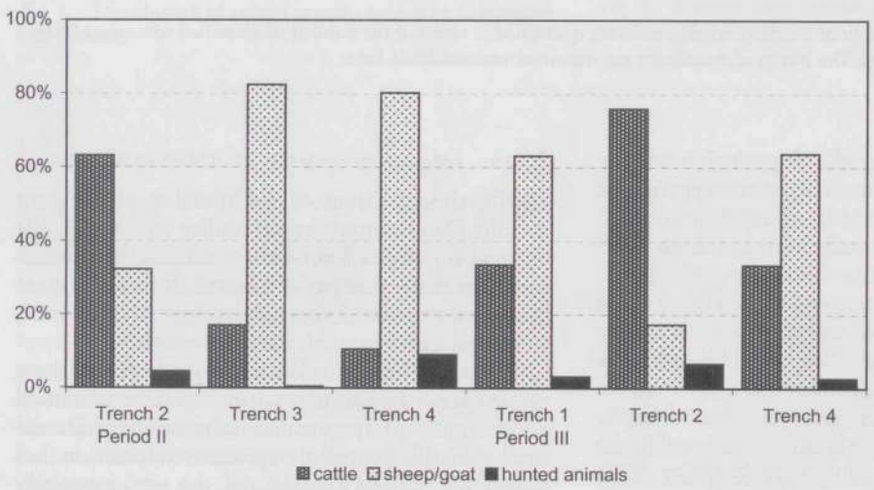

Fig. 5. Relative frequencies of cattle, sheep/goat and hunted wild mammals according to periods and trenches (% NISP).

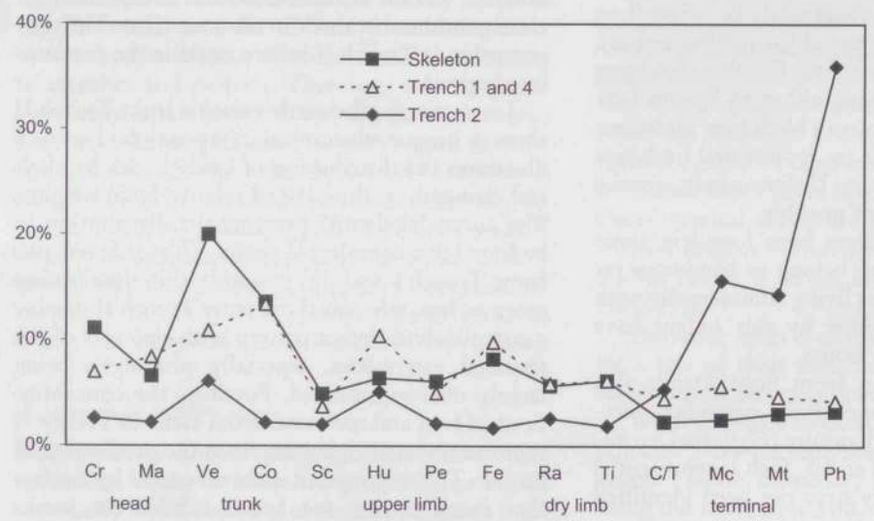

Fig. 6. Distribution of cattle bones by skeletal elements in the trenches of Period III on the basis of relative bone weights, compared to a complete skeleton.

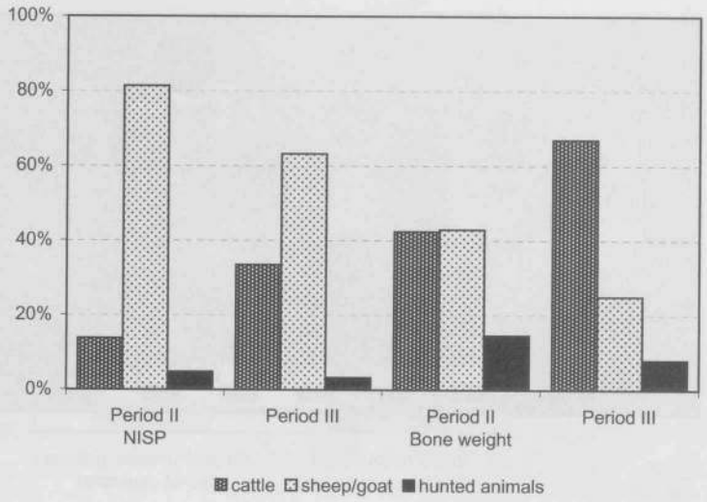

Fig. 7. Relative frequencies of cattle, sheep/goat and hunted wild mammals in living areas of the site (Trench 1 and 4) in Period II and III.

According to the archaeozoological record, Trench II is located in an area of the former settlement which appears to have had a special function.

Figure 7 shows a comparison of species frequencies between Period II and III counted on the basis of fragment numbers (NISP) and bone weights. Here, only animal remains from living areas of the site (Trench I and IV) have been considered. These materials exclusively represent kitchen refuse. The data presented in this graph point to a significant role of animal keeping for providing meat at this site, while hunting contributed little to the diet of the former inhabitants. There are clear differences in the contribution of sheep/goat and cattle for meat supply between both periods. As a general trend, the importance of cattle is increasing while that of sheep and goats is decreasing. This might reflect changes in herd composition.

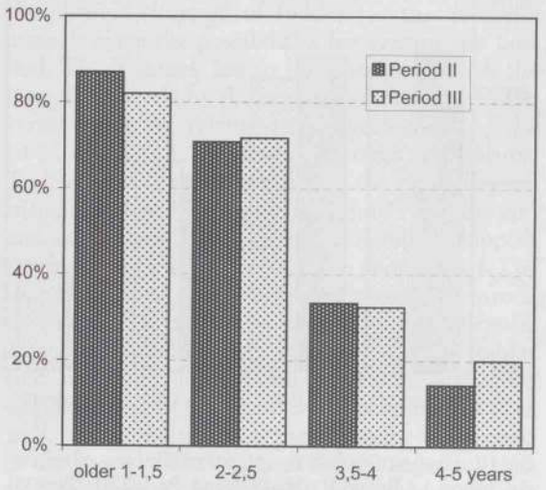

Fig. 8. Age structure in cattle on the basis of epiphysial fusion in Period II (N=98) and Period III (N=258). Grouping of epiphyses: 1–1,5 years (Humerus, distal; Radius proximal), 2–2,5 years (metapodials, distal; tibia, distal), 3,5–4 years (Humerus, proximal, Radius, distal; Femur, proximal and distal; Tibia, proximal), 4–5 years (Vertebrae).

Forms of exploitation

As the bone finds clearly show, the keeping of cattle, sheep and goats was the mainstay of animal husbandry at Sohr Damb in Periods II and III. All three species are multi-purpose animals which may be raised for a variety of economic purposes such as meat, milk, wool and traction. The main forms of exploitation practised at Sohr Damb can be deduced to a certain degree from data on age structure and sex ratio in these species.

Due to the lack of complete tooth rows, age structure in cattle was evaluated on the basis of epiphysial fusion in postcranial elements. The results are summarized in figure 8 exhibiting a similar kill-off pattern in cattle in both periods. Only a few animals were slaughtered at an juvenile age. There was a significant kill-off at an age between 2,5 and 4 years. These were cattle which had just reached bodily maturity. Nearly 20% were even older than 4 to 5 years of age when slaughtered. Sex ratio in cattle was evaluated on metrical evidence. The data indicate that females and males were represented in equal numbers among adult cattle, both in Period II and III.

According to the age structure and sex ratio observed in the bone finds, cattle husbandry at Sohr Damb was probably mainly orientated towards meat production. Dairying appears to have been of only limited importance. Otherwise, a much higher proportion of young calves should

Fig. 9. Cattle phalanges of the fore and hind limb exhibiting osteoarthritis at the joint surfaces (to be seen on the second and fourth specimen from the left).

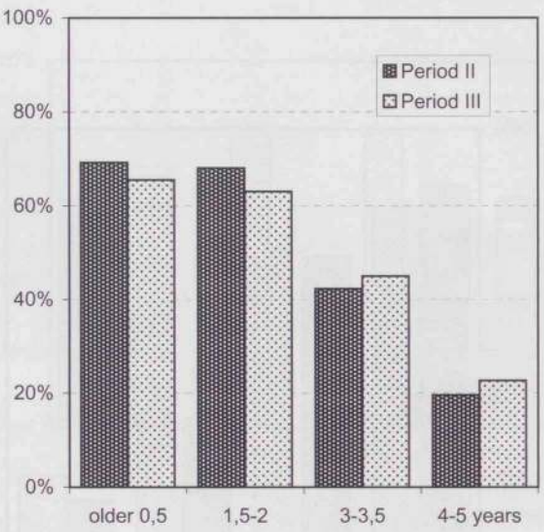

Fig. 10. Age structure in sheep/goat on the basis of epiphysial fusion in Period II (N=192) and Period III (N=433). Grouping of epiphyses: 0,5 years (Humerus, distal; Radius proximal), 1,5–2 years (metapodials, distal; tibia, distal; calcaneum), 3–3,5 years (Humerus, proximal, Radius, distal; Femur, proximal and distal; Tibia, proximal), 4–5 years (Vertebrae).

have to be found in the collections and females should have outnumbered males. Cattle were probably also used as working animals, that is in transport or tillage. Several of the cattle first phalanges from Sohr Damb show evidence of osteoarthritis at the joint surface (fig. 9). One of the causes of osteoarthritis can be heavy work. Still today, zebu cattle are exploited as working animals in agriculture, as draught animals or for threshing corn.

Concerning age structure in sheep and goats, the most reliable data come again from evidence on epiphysial fusion in the postcranial elements. The results are presented in figure 10. Similar to cattle, the kill-off pattern only slightly differs between both periods indicating similar forms of exploitation. As can be seen from the graph, nearly one third of the animals was killed as lambs and kids, that is during the first six months of life. Another 20% to 30% was slaughtered at an age between 2 and 3,5 years and about 20% of the animals were older than 4 to 5 years of age before being killed. Unfortunately, the number of bones which could be determined according to sex is too small for a reliable reconstruction of the sex ratio in sheep and goats.

The ageing evidence presented here suggests that sheep and goats were exploited for both primary products (meat) and secondary products (milk, wool). The relatively high proportion of remains from animals being younger than six months of age may indicate that milking was an important aspect of exploitation in sheep and goats at Sohr Damb. Shepherds emphasizing milk production will eliminate excess lambs and kids early in the first year of life. In addition to the possibility of milking, sheep probably was also a provider of wool at this site.

Archaeobotanical studies

Material

During the spring campaign in 2002, flotation samples were taken from the Trenches I, III, and V, partly from the standing profiles of the preceding excavation season (cf. Franke-Vogt, this volume). The samples comprise a total volume of 260 litres. Plant remains other than wood have been found in samples of 140 litres. Beside wood from the flotation of soil samples, wood remains have been picked up by hand in the course of the excavation as well. In general, the plant remains from Sohr Damb, i. e. wood, seeds and fruits, are preserved carbonised. Only some larger beams, mainly wood for construction, are preserved uncarbonised. Chronologically, the plant remains presented in this paper derive from Period III of Sohr Damb.

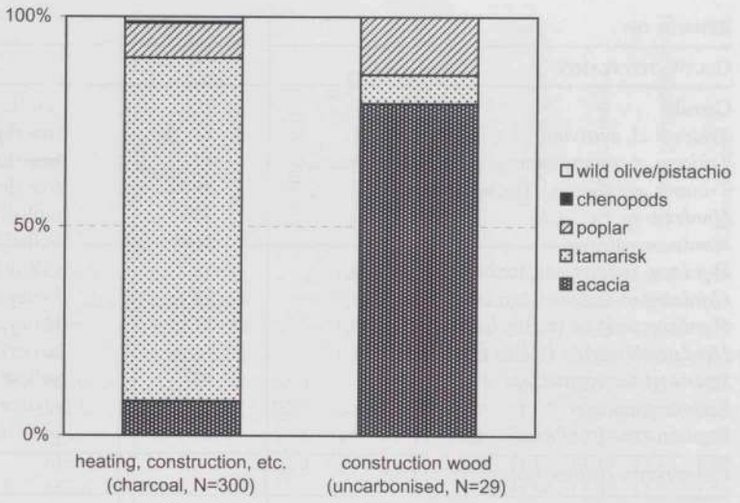

Fig. 11. Species composition in wood remains from Period III.

Wood

The results of the wood analysis presented here refer only to the samples picked up by hand. The identification of the charcoal from the flotation samples is still in progress. Figure 11 presents the number of identifications of the main wood taxa expressed as relative percentages. Here, a difference is made between uncarbonised construction wood, which was found *in situ* in the course of the excavation, and charcoal collected by hand. With regard to the charcoal samples, no differentiation was made yet between charcoal originating from firewood for heating and cooking, or charcoal from construction wood (wooden implements included). More than 98% of the 300 charcoal pieces identified at Sohr Damb so far come from wood of species of the steppe forest vegetation on the plateaus as well as of the riverine forest/bush vegetation. These are mainly poplar (*Populus* sp.), acacia (*Acacia* sp.) and tamarisk (*Tamarix* sp.). Almost 82% of the identified pieces belong to the latter species. At present, tamarisk bushes and trees can also be found along irrigated fields. This could have been the case in the 3rd millennium BC as well.

With regard to construction wood, all identified pieces belong to the three taxa mentioned above. In contrast to the charcoal samples, wood used for constructional purposes was mainly acacia and to a lesser extent poplar and tamarisk (fig. 11). Wood of acacia is hard and durable and therefore preferred as timber. In total, 23 beam remains of this species have been found in various trenches of the site, mainly as construction wood in houses.

Only a small amount of the wood used for heating and cooking comes from the open xeric woodlands on the mountain slopes, indicating a limited presence of woodlands in the vicinity of Sohr Damb already in the 3rd millennium BC. Two species of this type of vegetation could be identified, i. e. wild pistachio (*Pistacia* sp.) and olive (*Olea* sp.).

One of the main problems in Balochistan nowadays, as in other less favourable environments, is the chronic shortage of fodder for the domestic animals since the possibilities for grazing are limited. The livestock has to be brought through the long dry periods by the vegetation on fallow fields, cereal straw, the relative lush vegetation along the riverbeds and by browsing on trees and shrubs. Today, most of the larger trees in the Nal valley are in use as fodder trees, especially jujube (*Ziziphus* sp.) and acacia tree. These trees are regularly lopped, i. e. leaved twigs and branches are chopped off. The lopped material is fed immediately to the livestock or transported to the villages. For this purpose, acacia and jujube trees are also planted as fodder trees near the villages. Beside for wood, in the case of jujube this tree is planted for its edible fruits as well. Interestingly, fruit stones of jujube were found in the layers of Period III at Sohr Damb. But this, of course, cannot be regarded as proof for the use of jujube as fodder tree at Sohr Damb. In general, the availability of fire wood seems to have been sufficient at Sohr Damb, since there are no indications for the use of dung for fuel from the site so far.

Taking into account human preferences in the choice of wood for different purposes, the results of the wood analysis suggest that the former climate in the area around Sohr Damb did not differ greatly from nowadays. The absence of wood of Parpuk tree *(Tecoma undulata)*, an abundant tree in the area under investigation today, in the samples studied from Sohr Damb is surprising. It suggests a later introduction of this tree from the Indian subcontinent.

Cultivated Plants

Figure 12 presents the results of species identification on plant remains from the flotation samples. A total of c. 6750 seeds, fruits and other plant remains

Remains of:	Total (N)	
Cultivated plants		
Cerealia	7*	cereal grain fragments
Triticum cf. *aestivum*	11	free-threshing wheat
Triticum cf. *compactum*	12	free-threshing wheat, compact grain type
Triticum aestivum s.l. (rachis fragments)	79	free-threshing hexaploid wheat (rachis fragments)
Hordeum sp.	40*	hulled barley
Hordeum vulgare	210*	hulled barley, six-rowed
Hordeum vulgare var. *nudum*	15	naked barley, six-rowed
Hordeum sp. (rachis fragments)	58	barley (rachis fragments)
Hordeum vulgare (rachis fragments)	172	barley, six rowed (rachis fragments)
Hordeum/Triticum (rachis fragments)	81	barley/wheat (rachis fragments)
Setaria glauca/verticillata	927	yellow foxtail/rough bristle-grass, bur
Sesamum indicum	33	sesame
Papilionaceae (cf. *Pisum)*	6	pea family (pea like)
Cultivated and/or collected plants		
Cucumis sp.	4	cucumber, melon
Ficus sp.	2	fig
Vitis sp.	2	grape
Nannorrhops ritchiana	26*	dwarf palm, mazri
Ziziphus sp.	3½*	jujube
Weeds, collecting possible		
Cruciferae (cf. *Lepidium)*	18	mustard family (pepperwort like)
Caryophyllaceae	2	pink family
Convolvulaceae	1	morning-glory family
Cyperaceae	517	sedge family
Cynodon dactylon	3296	Bermuda grass/dhub grass
Digitaria type	679	millet, finger-grass type
Digitaria/Setaria type	350*	finger-/bristle-grass type grain fragments
Echinochloa sp.	2	cockspur
Malvaceae	2	mallow family
Papilionaceae	30	pea family
Astragalus sp.	64	milk-vetch
Medicago sp.	28	medick
Melilotus/Trifolium	9	melilot/clover
Trigonella sp.	3	fenugreek
Plantago cf. *ovata*	32	plantain
Solanaceae	1	nightshade family
Umbelliferae	7	carrot family
Indeterminata	37	indeterminata
Volume of flotation (litres)	140	

Fig. 12. Results of species identification on plant remains from floated soil samples dating to Period III of Sohr Damb. Total numbers are given (* = estimated number of complete seeds and fruits from small fragments).

have been identified, with species of grasses dominating. Unfortunately, a definite identification of two groups among the small millets, Digitaria type and Digitaria/Setaria type, has not been possible yet. In general, the samples studied come from waste or destruction levels of Period III, mainly from mixed contexts. Measurements of the macro remains were taken with the help of a Leica binocular using the image processing and analysis software Leica Qwin, version 2 (for further information cf. Neef 2000).

There is only limited archaeobotanical information on the history of farming in Pakistan available so far. According to studies on plant remains from the aceramic Neolithic levels of Mehrgarh in Northeastern Balochistan (Costantini 1984) and from layers of the 4th millennium BC at Miri Qalat in Southern Balochistan (Tengberg 1999), the oldest crop plants seem to have been introduced into Pakistan from the Near East. Already in early times a particular crop assemblage developed here with naked wheat, and hulled and naked barley as the

	View	Measured (n)		Length (mm)	Breadth (mm)	Height (mm)	Aspectratio (L/B)	Aspectratio (L/H)	Area (mm²)	Convex area (mm²)	Perimeter (mm)	Convex perimeter (mm)	Roundness
Triticum cf. *compactum*	dorsal	5	Mean	5,27	3,43	.	1,55	.	14,59	15,83	14,98	14,23	1,16
			Std Dev	0,35	0,35	.	0,16	.	2,12	2,24	1,06	0,97	0,03
			Max	5,95	3,82	.	1,84	.	18,51	20,04	16,89	16,06	1,19
			Min	4,91	2,84	.	1,38	.	12,28	13,73	13,96	13,39	1,12
	lateral	5	Mean	.	.	2,95	.	1,80	11,78	13,75	13,99	13,35	1,25
			Std Dev	.	.	0,34	.	0,20	1,89	1,90	0,95	0,88	0,05
			Max	.	.	3,32	.	2,11	15,09	17,31	15,77	15,02	1,34
			Min	.	.	2,50	.	1,53	9,71	11,99	13,17	12,63	1,20
Triticum cf. *aestivum*	dorsal	5	Mean	4,99	2,50	.	2,01	.	10,04	11,54	12,88	12,34	1,24
			Std Dev	0,21	0,24	.	0,17	.	1,11	1,11	0,58	0,56	0,06
			Max	5,18	2,87	.	2,25	.	11,43	12,81	13,46	12,94	1,32
			Min	4,65	2,15	.	1,79	.	8,25	9,85	12,05	11,52	1,19
	lateral	5	Mean	.	.	2,27	.	2,18	8,52	10,32	12,28	11,75	1,33
			Std Dev	.	.	0,18	.	0,12	0,97	1,10	0,63	0,60	0,06
			Max	.	.	2,47	.	2,41	9,46	11,39	12,82	12,30	1,44
			Min	.	.	1,99	.	2,05	7,15	8,88	11,34	10,88	1,27
Hordeum vulgare	dorsal	6	Mean	4,72	2,81	.	1,69	.	10,15	11,17	12,61	12,03	1,18
			Std Dev	0,35	0,26	.	0,13	.	1,41	1,53	0,87	0,82	0,03
			Max	5,12	3,35	.	1,83	.	12,29	13,16	13,65	13,00	1,22
			Min	4,22	2,55	.	1,50	.	8,46	9,19	11,58	10,92	1,13
Hordeum vulgare var. *nudum*	dorsal	8	Mean	5,71	2,57	.	2,23	.	11,51	13,89	14,33	13,68	1,34
			Std Dev	0,33	0,23	.	0,18	.	1,33	1,57	0,82	0,80	0,05
			Max	6,21	3,00	.	2,63	.	13,60	15,82	15,27	14,52	1,44
			Min	5,10	2,23	.	1,97	.	8,91	10,70	12,66	12,03	1,28
Setaria glauca/verticillata	dorsal	25	Mean	1,10	0,81	.	1,36	.	0,68	0,70	3,12	2,98	1,08
			Std Dev	0,12	0,07	.	0,10	.	0,11	0,12	0,25	0,25	0,02
			Max	1,42	0,98	.	1,54	.	0,92	0,99	3,72	3,57	1,13
			Min	0,90	0,66	.	1,16	.	0,48	0,51	2,66	2,54	1,05
Vitis sp.		1		3,27	2,66	.	1,23	.	6,20	6,79	9,88	9,26	1,18
Sesamum indicum		2		2,12	1,30	.	1,62	.	2,09	2,33	5,77	5,49	1,19
				2,16	1,26	.	1,71	.	1,96	2,27	5,76	5,44	1,26
Nannorrhops ritchiana		1		9,29	7,30	.	1,27	.	51,65	52,69	26,73	25,83	1,04
Cynodon dactylon	lateral	20	Mean	1,17	0,62	.	1,91	.	0,54	0,62	2,99	2,85	1,25
			Std Dev	0,10	0,05	.	0,17	.	0,07	0,09	0,22	0,21	0,06
			Max	1,40	0,72	.	2,23	.	0,66	0,79	3,40	3,25	1,38
			Min	1,00	0,53	.	1,62	.	0,43	0,48	2,64	2,50	1,18

Fig. 13. Measurements and indices of seeds and fruits from floated soil samples dating to Period III of Sohr Damb.

main cultivars. Most of the barley as well as wheat grains retrieved from Mehrgarh and Miri Qalat have a typical rounded appearance and are relatively small. Another characteristic of this crop plant assemblage is the almost total absence of hulled wheats like einkorn and emmer as well as pulses. The previously mentioned species seem to have been the major crops of the Harappan agriculture, at least until the end of the 3rd millennium BC. This is suggested by the botanical evidence from the large Harappan cities like Mohenjo-Daro and Harappa (for a general and critical overview cf. Fuller 2000; 2002).

The crop assemblage evidenced from Period III of Sohr Damb fits well in this picture. There is evidence of a free-threshing wheat and six-rowed naked barley *(Hordeum vulgare* var. *nudum)*. Two types of wheat grains can be distinguished: a wheat with a rather plump grain with an average length-breadth-index of 1,55 *(Triticum* cf. *compactum)* and a wheat with a more slender, rather small type of grain with an average length-breadth-index of 2,01

Fig. 14. Sesame (*Sesamum indicum*) from Period III at Sohr Damb (length = 2,1 mm).

(*Triticum* cf. *aestivum*, fig. 13). The identifiable wheat rachis fragments are all of the hexaploid type (*Triticum aestivum* s.l.). Similar to the grains, they can be divided into two groups: a long loose-eared type and a dense-eared type with more constricted rachis fragments. The many threshing remains (rachis fragments) of barley and wheat found in the samples indicate that these crops were grown in the vicinity of Sohr Damb.

According to the botanical evidence from Harappan sites available so far, a diversification of the agricultural system took place by the introduction of summer crops like sesame and different millets indigenous to the Indian peninsular in the Late Harappan period, i. e. some time in the late second half of the 3rd millennium or in the beginning of the 2nd millennium BC (Weber 1998; Fuller 2000). Remarkably, there are indications for summer cropping in Sohr Damb already as early as in Period III. This is documented by the presence of sesame (*Sesamum indicum*, fig. 14), small seeded millets (for example *Setaria glauca/verticillata*), and numerous seeds of a wild grass, *Cynodon dactylon*.

Little is known about the domestication and early cultivation of sesame (see Fuller 2003). The oldest records of this crop in a context of the late 3rd millennium at Miri Qalat and its even earlier presence in layers of Period III at Sohr Damb strongly suggest that the domestication of this oil plant took place on the Indian subcontinent. However, the presence of sesame at Sohr Damb is no definite proof for an early summer crop cultivation in the area under investigation, since the sample is quite small, consisting of only 33 seeds. On the other hand, remains of other plant species also suggest summer cropping at Sohr Damb. From bristle grass (*Setaria glauca/verticillata*) almost 1000 fruits have been found here. According to the metrical data, they most likely belong to yellow foxtail millet (*S. glauca*). This grass is a common weed in irrigated fields, exclusively in sommer crops. We cannot rule out the possibility that this small millet was grown as a crop plant on its own. In a few areas of India, *Setaria glauca* is still to be found as a cultivated plant in mixed stands with little millet (*Panicum sumatrense*) (Kimata et al. 2000). Yellow foxtail millet is just as nutritious as the widely cultivated foxtail or Italian millet (*Setaria italica*), but not so productive.

A total of more than 3000 fruits of a wild grass, *Cynodon dactylon*, have been identified from the floated soil samples. *Cynodon dactylon*, Bermudagrass or dhub grass, is a valuable fodder grass vigorously growing under humid conditions, like irrigated fields. Here, it can become a persistent weed especially in summer crops. This grass can also be found under other humid conditions, for example as undergrowth in riparian vegetation. The grass is able to withstand droughts, but does not flower then, and a certain degree of salinity.

The presence of both grasses (yellow foxtail millet, dhub grass) is an indication for the availability of water in the summer period, in the case of yellow foxtail millet even of irrigated fields near the site during the summer months. The material from Period III at Sohr Damb seems to be an early proof for summer cropping in Harappan agriculture, pointing to a transition from an agricultural system with traditional winter crops to a more diverse system with introduced summer crops indigenous to the Indian subcontinent.

The presence of more than 500 fruits from the sedge family (Cyperaceae), grass- or rush-like herbs of damp, marshy or riparian habitats, indicates humid growing conditions near the site.

Beside cereal plants and weeds, remains of wild or cultivated fruits have been found in samples from Period III of Sohr Damb. These are seeds of cucumber (*Cucumis* sp.), pips of fig (*Ficus* sp.), fruit stones of jujube tree (*Ziziphus* sp.), and seeds of dwarfpalm (*Nannorrhops ritchiana*). The fleshy fruit of this palm can be eaten and its leaves can be used in a variety of everyday products including baskets, mats and cordage. All these species could have been cultivated or collected in the surroundings of Sohr Damb. There is one remarkable exception, i. e. grape vine which is documented by two seeds. We are probably dealing with cultivated grapes (*Vitis vinifera*), since the ecological conditions in the area under investigation are not suitable for the presence of wild grape.

Conclusions

Summarizing the archaeo-biological data presented and discussed in this paper, the following conclusions can be drawn:

1. The subsistence economy at Sohr Damb was mainly based on animal husbandry and plant cultivation. The exploitation of natural food resources was of limited significance.
2. In the Periods II and III of Sohr Damb, the settlement's population relied on animal keeping rather than hunting.
3. Cattle (zebu) as well as sheep and goat were the economically most important species. There is an increase in cattle and a decrease in sheep/goat from Period II to III, probably reflecting changes in herd composition.

4. Cattle husbandry at Sohr Damb was mainly orientated towards meat production, while dairying appears to have been of only limited importance. There are clear indications that cattle were used in traction, probably in field work (ploughing).
5. Similar to cattle, sheep and goats served as providers of animal protein (meat and probably milk) in the first place. In addition, some of the sheep may have produced wool as well.
6. Hunting of hemiones and gazelles played a minor role in meat provisioning at this site. There is only single evidence for activities like fowling and fishing.
7. Poplar, acacia and tamarisk were the most frequently exploited trees for the wood supply of the settlement. There is a clear preference of acacia for constructional purposes. The wood spectrum suggests almost similar climatic conditions as nowadays.
8. The botanical evidence from Period III of Sohr Damb points to a transition from an agricultural system with traditional winter crops (naked wheat, hulled and naked barley) to a more diverse system also including summer crops indigenous to the Indian subcontinent (sesame, millet). The intensification of agriculture could have meant a stronger demand on the use of cattle for ploughing fields (see conclusion 4).
9. The sesame sample from Period III is the oldest, stratified record from this crop until now.
10. Wild or cultivated fruits from species like cucumber, fig, jujube, dwarfpalm and grape vine were exploited as well.

Bibliography

Costantini, L.
1984 The beginning of agriculture in the Kachi Plain: the evidence of Mehrgarh. In: Allchin, B. (ed.), South Asian Archaeology 1981. Cambridge, 29–33.

Fuller, D. Q.
2002 Fifty years of archaeobotanical studies in India: Laying a solid foundation. In: Settar, S./Korisettar, R. (eds.), Indian Archaeology in Retrospect Vol. III, Archaeology and Interactive Disciplines. New Delhi, 247–364.
2003 Further evidence on the prehistoric sesame. In: Asian Agro-History 7, 127–137.

Fuller, D. Q./Madella, M.
2000 Issues in Harappan Archaeobotany: Retrospect and Prospect. In: Settar, S./Korisettar, R. (eds.), Indian Archaeology in Retrospect Vol. III, Archaeology and Interactive Disciplines. New Delhi, 317–390.

The Gazetteer of Balochistan (Jhalawan)(2nd ed.),
1986[2] Government of Balochistan. Quetta (1st ed. 1906).

Kimata, M./Ashok, E. G./Seetharam, A.
2000 Domestication, cultivation and utilization of two small millets, *Brachiaria ramosa* and *Setaria glauca* (Poaceae). In: South India. Economic Botany 54 (2), 217–227.

Meadow, R. H.
1979 Prehistoric Subsistence at Balakot: Initial Considerations of the Faunal Remains. In: Taddei, M. (ed.), South Asian Archaeology 1977. Naples, 275–375.
1984 Animal domestication in the Middle East: a view from the eastern margin. In: Clutton-Brock, J./Grigson, C. (eds.), Animals and Archaeology: 3. Early Herders and their Flocks. British Archaeological Reports, International Series 202. Oxford 1984, 309–337.

Neef, R.
2000 Umwelt und Landwirtschaft. In: Parzinger, H./Sanz, R., Das Castro von Soto de Bureba. Rahden/Westf., 219–229.

Schaller, G. B.
1976 Pakistan: Status of Wildlife and Research Needs. IUCN Publications, New Series 34, 133–146.

Tengberg, M.
1999 Crop husbandry at Miri Qalat, Makran, SW Pakistan (4000–2000 B.C.). In: Vegetation History and Archaeobotany 8, 3–12.

Uerpmann, H.-P.
1987 The Ancient Distribution of Ungulate Mammals in the Middle East. Beihefte zum Tübinger Atlas des Vorderen Orients, Reihe A (Naturwissenschaften) Nr. 27. Wiesbaden.

Weber, S. A.
1998 Out of Africa: The Initial Impact of Millets in South Asia. In: Current Anthropology 39 (2), 267–274.