

THE CORDAGE FROM THE 2001- SEASON OF THE EXCAVATIONS AT BERENIKE (EGYPTIAN RED SEA COAST): PRELIMINARY RESULTS

ANDRÉ J. VELDMEIJER
veldmeijer@palarch.nl

PalArch Foundation, The Netherlands

Summary: The Cordage from the 2001- Season of the Excavations at Berenike (Egyptian Red Sea Coast): Preliminary Results

The excavations at Berenike, the Ptolemaic and Roman harbour at the Red Sea Coast, Egypt, yielded during the 2001-season over 700 pieces of cordage. The present paper presents the cordage, focusing on various aspects of cordage (such as the features) and on the relation within the appearance category.

Keywords: cordage – Berenike – features

Resumen: El cordaje proveniente de las excavaciones de 2001 en Berenice (costa egipcia del Mar Rojo): resultados preliminares

Las excavaciones llevadas a cabo en Berenice, el puerto ptolemaico y romano ubicado en la costa del Mar Rojo (Egipto), proveyeron más de 700 piezas de cordaje durante la temporada de excavación del 2001. En este trabajo presentaremos el cordaje, enfocándonos en varios aspectos del mismo (como los rasgos) y la relación dentro de la categoría de apariencia.

Palabras clave: cordaje – Berenice – rasgos

1. INTRODUCTION

Berenike, the Ptolemaic and Roman harbour at the Egyptian Red Sea coast (Figure 1), was excavated during 1994-2001. The cordage was treated as a separate finds category and during these years, about 10,000 pieces have been registered. The cordage has been extensively published¹; the present

¹ Veldmeijer 1998; 1999; 2003; 2005a; 2005b; 2005c, 2006; accepted; Veldmeijer and Van Roode 2004; Wendrich 1995; Wendrich and Veldmeijer 1996.

paper is the last in the series on the cordage from this important site and follows the same layout as the previous preliminary reports.

The 2001-season yielded a total of 784 pieces of cordage. The cordage originated from four trenches, although the bulk was recovered from one trench (BE01-48; figure 1 inset) the corpus of which will be given ample attention whereas the cordage of the remaining trenches will be dealt with only in passing.

The registration procedure used this excavation season was the same as in previous years² except for the fact that yarns were registered in terms of “low”, “medium” and “high” quantities per pb-number rather than per fragment. A second difference in registration between the 2001-season and previous seasons was the treatment of the soft fibre cordage. The procedure used for this material was comparable to the procedure used during the 1998-season,³ for which reason was that most of the “extreme”⁴ compositions of soft fibre cordage occurred only once. Therefore, a detailed description was not necessary because the figures are of limited statistical value. For terms and definitions, the reader is kindly referred to previous works.⁵

2. THE CONTEXT

2.1. Trenches BE01-44, BE01-47 and BE01-51

Seven pieces of cordage were recovered from trench BE01-44 (Figure 1 inset). The trench was situated at the westernmost part of the site and excavated in an area of burials. One piece of cordage, a zS₃ string (possibly grass but certainty on the material was impossible to obtain due to the deteriorated state) originated from locus 007, which was dated to the 5th-6th centuries AD. Three pieces (possible lamp wicks) were recovered from locus 010 and locus 052, also dated to the 5th-6th centuries AD, contained the other three pieces of zS₂ cordage, which were made of grass.

Trench BE01-47 (Figure 1 inset), situated east of trench BE96/...-10 in the city centre, yielded five pieces of cordage, which were all recovered from

² See Wendrich and Veldmeijer 1996: 270.

³ *Ibidem*.

⁴ The compositions in which ‘_n’ was larger than five (compositions in which ‘_n’ was three, four or five occurred more often).

⁵ Veldmeijer 2005a; 2005b; accepted.

locus 012. Three of the pieces were $zS_3[Z_2]$ ropes, made of palm. The other two pieces were zS_3 strings. The material was identified as palm but certainty could not be obtained due to the deteriorated state. Possibly, these two originated from the same or comparable cabled ropes as mentioned previously. The plies then, were left after the [Z]-cabling lost its coherence. The locus was dated to the 5th-6th centuries AD.

Only one deteriorated (palm?) sZ_2 piece of cordage was recovered from trench BE01-51 (Figure 1 inset). This trench was situated in the area of the church, at the easternmost part of the site, and the locus from which the cordage originated (locus 004) was dated to the late Roman era.

2.2. Trench BE01-48

The most prolific trench of the season was trench BE01-48 (Figure 1 inset). The trench was the westernmost trench in the area of the 1st century AD dump (all loci of trench BE01-48 were dated to the 1st century AD), and its position was next to trench BE00-33. Other trenches in that area were BE96/97-13, BE97/98-19, BE99-29, BE99-31 and BE00-33.

Table 1 shows the materials of which the cordage was made, divided by locus. The cordage was recovered from 20 different loci. The baulk cleaning loci (ebc, nbc, sbc) are regarded as ‘normal’ loci because they were dated like the rest of the loci, *viz.* the 1st century AD. This situation contrasts with, for instance, trench BE94/95-01, in which a deposition over different periods occurred. The trench clean loci (tc) remained undated.

The table⁶ shows that one locus (008) in particular contained large numbers of cordage (29% of the total from this trench) whereas other loci contained far less and never exceeding more than 100 pieces. The cleaning loci were responsible for 13% of the total of recovered cordage. The number of loci, if compared to the other trenches from the same area, were especially comparable to that of trench BE00-33.

The preservation of the cordage was less favourable relative to the other trenches, hence the relatively large number of pieces of which the material was unidentified (listed with “other material”). Furthermore, the classification “other material” was given to cordage that was made of leather or of cordage made from two different materials (only two “multi-material”

⁶ The presented percentages (except of the total of the material) do not appear in this table, although the figures in the table were used to calculate the percentages.

pieces of cordage were registered). Besides this, 10 pb-numbers contained large numbers of deterioration products. This cordage was recognisable as cordage but no description of the twist/composition and no measurements or identification of the materials proved possible anymore.

As with all trenches from this early Roman rubbish dump area, grass was the most important material (50%). The second most often encountered material was palm (21%) followed by soft fibre (12%), (goat) hair (7%) and “other material” (10%).

3. THE CORDAGE

3.1. *Statistics*

Cordage that was registered as “other material” is left out of the discussion due to the character of this group. The amount of plied cordage made of soft fibre and (goat) hair was too small (see table 2) to provide statistical reliable percentages; the detailed discussion of plied cordage is therefore limited to the plied cordage made of grass and palm. A general description of all plied cordage is presented.

Plied cordage

Eighteen pieces of soft fibre cordage were plied (Table 2). This was three percent of the total of plied cordage⁷ and 19% of the total of recovered soft fibre cordage.⁸ All plied cordage made of (goat) hair was sZ₂-plied. The plied cordage made up 41% of the total of recovered (goat) hair cordage,⁹ which was 4% of the total of plied cordage.¹⁰

A detailed description, accompanied with a table of percentages, of the exact occurrence of twists and compositions will be published elsewhere¹¹ but it became clear that the far majority of the plied grass cordage was made in the zS twist (94%) which was over half of all plied cordage, regardless

⁷ 18 out of 552 (table 2).

⁸ 18 (Table 3) out of 94 (Table 1) pieces of cordage.

⁹ 23 (Table 2) out of 56 (Table 1).

¹⁰ 23 (Table 2) out of 552 (Table 1).

¹¹ Veldmeijer, accepted.

the material from which they were made. Of these, 81% was made in the zS_2 composition. Thus grass was, as seen in general in Berenike, by far the most important material for cordage.

Plied cordage made of palm did not exhibit as strong an emphasis on one of the twists as seen with grass: 49% of the total of plied palm cordage was zS twisted (this was 39% of all palm cordage). Of these, only 22% was made in the zS_2 composition. This contrasted sharply with grass cordage; with palm the sZ_2 and zS_3 compositions were more often encountered than with grass plied cordage.

Cabled cordage

Cordage with a composition in the 'I'-direction was regarded as non-alternating because the 'I'-orientation does not lock previous levels. The 10 pieces of cordage that were registered as "other" (various compositions which were not registered in detail), are left out of the discussion.

Table 3 shows nine types of twist of which four were double cables. Those twists contained 25 compositions of which the majority were alternating twists, *i.e.* $sZ[S]$ and $zS[Z]$. The total of alternating twists was 76%.¹² Twenty-two percent of the total amount of cordage from this trench was cabled.¹³

Only one grass cable was made in a non-alternating twist ($zS[S]$) whereas the rest was made in the alternating twists (three different twists). The $zS[Z]$ twist was encountered most often and not only with grass but among the cables in general. Eight percent of all grass cordage was cabled¹⁴ and seventeen percent of the cables from trench BE00-48 were cables made of grass (Table 3). The four twists exhibit seven different compositions.

Eighteen percent of the palm cordage was cabled.¹⁵ All cables were made according the alternating twists, $sZ[S]$ and $zS[Z]$ of which the majority in the $zS[Z]$ twist. Palm cables exhibited four different compositions: double cables were not encountered. Palm cables comprised 16% of the total of cables from trench BE00-48 (Table 3).

Forty-six percent of the soft fibre cables from trench BE00-48 were made according a non-alternating twist ($zZ[S]$, $zS[S]$, $zI[S]$ and $zI[S]\{S\}$),¹⁶

¹² 132 out of 173.

¹³ Table 3 shows 23, but this difference is due to the adding of rounded off figures.

¹⁴ 29 (Table 4) out of 384 pieces of grass cordage (Table 1).

¹⁵ 28 (Table 4) out of 158 pieces of cordage (Table 1).

¹⁶ 30 out of a total of 65 soft fibre cables, Table 3.

which was much higher relative to the other materials. Fourteen compositions occurred within these six twists. The variety in composition was large. Soft fibre cables comprised 38% of the total of cables, which was a far higher percentage relative to any of the other materials. Sixty-eight percent of the total of the soft fibre cordage from the trench was cabled,¹⁷ which was also by far the largest percentage.

All (goat) hair cables were made according to one of the alternating twists. The three twists exhibited eight different compositions. The six pieces of cordage that were made with zS as first two levels were surprising because most of the (goat) hair cordage was made with sZ as first levels. The majority (57%) of the excavated (goat) hair cordage was cabled.¹⁸ The (goat) hair cables made up 18% of the total of cables.

The relation between material and CIP¹⁹

CIP values were calculated for 59% of all grass plied and cabled cordage and of the majority of the palm cordage too (63%). The bar graph (Figure 2) is the graphic representation of the calculations (not included). It shows the distribution of CIP values of grass and palm cordage and represents the relation between the materials and the CIP's, visualized by means of percentages CIP's (calculated of the total number CIP's of that material) per interval.

With grass cordage, CIP values falling in the intervals '40-49' and '50-59' were encountered most often (representing 69% of all CIP-calculated cordage). The values falling in the interval before ('30-39') and after ('60-69') were encountered less often.

Cordage made of palm showed a different pattern. The CIP values were much more evenly spread but with a slight domination of the values of the lower intervals '20-29' and '30-39': these two intervals represented 51% of the CIP-calculated material.

The picture representing all CIP's calculated (thus including the soft fibre, (goat) hair and "other material" cordage) showed a gradual increase of the percentages towards the peak-interval '40-49'. The intervals after this peak-interval showed a gradual decrease in occurrence.

¹⁷ 65 cables (Table 3) out of 95 soft fibre pieces (Table 1).

¹⁸ 32 cables (Table 3) out of 56 (goat) hair pieces (Table 1).

¹⁹ The discussion is limited to grass and palm cordage; soft fibre and (goat) hair cordage are not taken into account due to their small number.

The relation between composition and CIP

The relation between the composition and CIP is visualised in Figure 3.²⁰ The zS_2 composition showed a domination of CIP values falling in interval '40-49' and '50-59' (69% of the zS_2 cordage). Far less material showed values in the intervals previous to and following onto these two. Most of the sZ_2 cordage displayed CIP's falling in the first intervals ('20-29' and '30-39'), whereas the cordage with a zS_3 composition fell mainly in the '40-49' interval. The sZ_3 cordage, by contrast, displayed predominantly higher values (the '60-69' interval represents over half of the pieces). The cabled cordage showed a tendency towards the highest CIP intervals ('60-69' up to '90-99').

String and rope

Table 4 shows the number of recovered ropes. Ropes made of soft fibre and (goat) hair were not encountered. The percentage of ropes made of grass was five percent of the total of plied and cabled cordage whereas 14% of the palm cordage had a diameter of 10 mm or more. The percentage ropes made of "other material" was surprisingly large (35%).

The total number of ropes, regardless material, was 67, which made up 11% of the total number of 587 plied and/or cabled pieces of cordage and 9% of the total of recovered cordage. Cabled cordage had more often a diameter of 10 mm or more relative to plied cordage.

3.2. Features

Knots

The number of registered knots was 175, of which the far majority were known types.²¹ One knot was not previously encountered (Figure 4).²² The material could not be determined due to its deteriorated state. The zS_3 string had a CIP of 73. The knot was tied with two strings and seems to have functioned as a bend. However, the construction functioned badly as a bend

²⁰ Note that the amount of cordage of most compositions, except zS_2 , from which CIP's were established was low. Consequently, the percentages has to be regarded as to illustrate a tendency and one has to reckon with distortion.

²¹ See Veldmeijer, accepted.

²² BE01-48.019 3411-h-7243.

because the knot slips by pulling the extremities marked 'I' and 'II' in the figure or change into a hitch when pulling the extremities marked 'III' and 'IV'. The construction was encountered only once and the fact that it can easily be the result of the malformation of other knots, as discussed below, leads to the suggestion that it was the result of the malformation rather than an intended construction.

Beginnings

Plied cordage did not display the start or finish of plying often. A total of eight pieces of cordage (four grass, two palm, one soft fibre and one "other material") showed a beginning (which is almost 1.5% of all plied cordage). All beginnings were the result of folding of the yarns.

The number of beginnings in cabled cordage was larger. Twenty-three beginnings were registered, encountered in a total number of 18 pieces (two grass, three palm, eight soft fibre, three (goat) hair and two "other material"). Those 18 cables made up 10% of the total of cabled cordage. The majority of the beginnings were the result of folding the plies (FT1); only one cable displayed FT2 as beginning.

Loops

Only one new loop lock was registered. The zS_3 palm string shown in Figure 5²³ had an irregular CIP. The piece of cordage was made into a noose of an approximate diameter of 78 mm. The loop lock was an S-granny knot and although the granny knot is known as an extremely unreliable knot which slips easily, the loop itself is fixed due to the fact that the two halves of the granny turns in comparison to each other and locks. However, this happens only when forces are exerted from inside out or by pulling the extremities (marked 'I' and 'II'). Pulling one of the extremities and one of the points marked 'III' and 'IV' results in slipping and moving of the loop lock. Pulling both 'III' and 'IV' tighten it. The noose can be changed relatively easy into the running loop of figure 5B by pulling the extremity marked 'I'.

²³ BE01-48.018 3377-h-7258.

4. COMPARISON²⁴

The number of pieces of cordage was comparable to that of the, previous mentioned, neighbour trenches. The layout of the corpus of trench BE01-48 was, regarding the materials, most comparable to the corpus of trench BE00-33 (same date) except for the relative large percentage of "other material". The most comparable 5th-6th centuries AD corpus was that of trench BE6/16. The number of soft fibre yarns, and to a lesser extend grass and palm, and unspun material, soft fibre as well as grass and palm, recovered from trench BE01-48 was high, as with the other trenches from this area.

As with all other corpora, the far majority of recovered cordage was plied. The most important twist for grass was zS. Although this twist was most important with the grass cordage of the other early corpora as well, the percentage of BE01-48 was slightly higher and more in line with the corpora of the 5th-6th centuries AD. Palm did not exhibit an emphasis on the zS twist, a situation encountered in most of the early trenches (except for trench BE99-29 and, to lesser extend, BE00-33). The palm cordage originating from the later periods again showed far higher percentages of zS twists. The percentage twist of the total of material was influenced by the registration of yarns and unspun material (the total of material). This percentage was therefore higher with trenches of which the yarns and unspun material were not counted by number of pieces.²⁵

As with all other trenches, regardless period, grass plies were the most often encountered plied cordage. They made up between 50% and 65% in all but two trenches (trench BE96/97-13 and trench BE99-29). Most of the trenches displayed a share of the palm-plied cordage between 25% and 40% of the total of plied cordage, except for trench BE96/97-13, BE97/98-19 and BE01-48 which had lower percentages. The amount of soft fibre plies was low; comparable percentages were encountered in trenches BE94/95-01, BE99-31 and BE00-33, whereas the percentage (goat) hair was in line with that of the percentages of the other trenches, except the relative large percentages of trench BE6/16 and BE96/97-13.

²⁴ The comparison of the tables and graphs of the cordage of trench BE01-48, which is based on a few hundreds of data, with those of the tables and graphs of the final publications, which is based on thousands of data, is malformed due to the large difference in data.

²⁵ For example, the grass plies of trench BE96/97-13, of which yarns were registered by piece, made up 76% of the total of grass material whereas this percentage was 95% with trench BE97/98-19, of which no yarns and unspun material was registered during the 1998-season.

Cabled cordage had, as the corpora of all other trenches, the largest variety in composition among the cordage made of the soft fibres. Furthermore, the (goat) hair cordage was mainly made with sZ as the first two levels. Six pieces of (goat) hair cordage were recovered that were made with zS as first two levels. This was encountered rarely. Grass and palm cables showed, as with the cables from the other trenches, predominantly alternating (zS[Z]) twists.

The percentages cabled cordage, made of a certain material, relative to the total amount of cordage recovered from the trenches fluctuated. The grass cables made up 17% of all cables. This was relatively low because most other trenches showed a percentage between 20-35%, except trench BE97/98-19 and BE00-33. The percentage palm cables, of the total of cables, was comparable to that of three other trenches (BE96/97-13, BE99-29 and BE6/16). The percentage soft fibre cables fluctuated strongly; the lowest percentage (13%) for trench BE98-21 and the highest (68%) for trench BE97/98-19. Strong fluctuations were also observed with the percentages (goat) hair cables of the total of cables, varying from 0% and 2% for trench BE97/98-19 and BE99-29 respectively up to 24% for trench BE6/16.

The percentage cabled cordage of the total corpus of trench BE01-48 was higher relative to the average from the site. This is not surprising because all corpora from early Roman periods showed higher percentages cables relative to corpora from late Roman periods.

Although the number of CIP calculated pieces of grass and palm cordage was high in comparison to that of soft fibre, (goat) hair and "other material" one should keep in mind that Figure 2 visualises a pattern based on a smaller number of calculated CIP's relative to the tables and bar graphs to which it is compared. The pattern of the plied cordage made of grass from trench BE01-48 was comparable to that of the total of the site regardless period. Values falling in interval '40-49' and '50-59' were most often encountered although '30-39' was strongly represented as well with the total of the site. The same patterns were visible with cordage separated by period.

The palm cordage showed an emphasis on the lower CIP's whereas the total of the site showed a clear peak at the '40-49' up to and including '60-69' intervals. This latter observation was made of the dated material as well.

The zS₂ cordage showed mainly CIP values falling in the '40-49' and '50-59' interval; the '30-39' interval was less well represented. However, the total reveals that values falling in the latter interval ('30-39') were encountered almost as frequently as the values falling in the '40-49' interval and even more often as the values of the '50-59' interval. The sZ₂ cordage showed a

similar pattern (the intervals with lower CIP values strongly represented), as did the other composed material. The zS_3 cordage from trench BE01-48 displayed a larger percentage values that fell in the '40-49' interval.

The percentage ropes that was made of cabled cordage was higher relative to the percentage ropes of plied cordage. This was seen with the corpora of all trenches and with all materials. The percentage ropes of all cordage and made of grass did not exceed 10% in most cases (except trench BE96/97-13 and BE99-29). The percentage palm ropes of the total of palm cordage fluctuated more heavily. The percentage ropes of the total of cordage registered from the trench was 9%, which was relatively high and only surpassed by trench BE99-29 and BE99-31.

5. DISCUSSION

The fact that the number of pieces of cordage was comparable to that registered from the neighbour trenches was not surprising. The trenches were located in an early Roman (1st century AD) rubbish dump. No rubbish was encountered after the excavation of these early Roman layer.²⁶

All excavated trenches in this area contained large amounts of soft fibre yarns (and to a lesser extend yarns of grass and palm), and unspun material (soft fibre as well as grass and palm). This was partly due to the deterioration of matting, basketry, textile (also present in abundance) and cordage, also suggested by the bad conservation of the registered cordage.²⁷ More will be said on the possibility of production centres in the final publications.

The superficial comparison of the corpus of trench BE01-48 with the previous published corpora showed that the corpus of the trench excavated in the 2001-season, was well within the established pattern of cordage from Berenike, for the material of which cordage was made as well as for the distribution of twists and compositions (plied and cabled cordage alike). The corpus however, contained a relative large percentage cabled cordage. The patterns of CIP values were, except few smaller differences, comparable as well. The strong representation of the lower values with palm cordage in trench BE01-48 might be due to the fact that half of the palm cordage had an sZ twist and, has been shown, sZ_2 -composed cordage in particular had a low CIP. Whether this was due to a less strong plying of sZ cordage in general or that cordage with an sZ twist was more susceptible to deterioration remains

²⁶ This was true for all trenches in this early Roman layer.

²⁷ Hence the large numbers of pieces of cordage registered as "other material".

at the moment questionable. The general tendency of relative more CIP values that fell in the lower intervals might be explained, at least partly, by the fact that deterioration lessened the internal coherence of cordage, with plies more strongly than with cables, through which the CIP value decreased. The corpus of knots (one of the features) was extended with one knot. Possibly, the knot was a malformation of a reef knot.

A new type of loop lock was presented as well. The knot that was used (a granny knot) was registered before but its use as a loop lock was new. Although the granny knot has a bad reputation, the knot used as a loop lock is less unreliable. Still, people who are used to work with cordage and has to rely on cordage probably will choose more secure loop locks.

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context	dated	material						total
			grass	palm	soft fibre	(goat) hair*	other	
	001	1 cad	25	10	6	11	6	58
	005	1 cad	49	19	12	5	10	95
	008	1 cad	136	38	14	12	22	222
	009	1 cad	22	14	10	6	2	54
	014	1 cad	0	3	1	0	0	4
	015	1 cad	1	0	0	0	2	3
	016	1 cad	0	0	0	0	2	2
	017	1 cad	20	4	4	1	1	30
	018	1 cad	34	4	4	4	7	53
	019	1 cad	26	8	17	9	9	69
	020	1 cad	6	10	6	0	8	30
	021	1 cad	1	0	0	0	0	1
	022	1 cad	3	11	10	0	0	24
	026	1 cad	2	4	1	0	1	8
	027	1 cad	1	0	0	0	0	1
	028	1 cad	2	11	2	4	0	19
subtotal	16	n/a	328	136	87	52	70	673
	ebc	1 cad	2	2	1	0	1	6
	nbc	1 cad	50	15	6	4	7	82
	sbc	1 cad	4	5	0	0	0	9
	tc	n/d	0	0	0	0	1	1
subtotal	4	n/a	56	22	7	4	9	98
total	20	n/a	384	158	94	56	79	771
% of total								
trench	n/a	n/a	50	21	12	7	10	100

Table 1.

Materials from which the cordage, encountered in trench BE01-48 during the 2001-season was made. The corpus is presented per locus. Dates are incorporated as well (“n/a” = “not applicable” and “n/d” = “not dateable”).

* On the identification of (goat) hair see Wild and Wild 1996; 1998.

composition	material					total
	grass	palm	soft fibre	(goat) hair	other	
zS ₂	264	27	9	0	18	318
sZ ₂	7	49	0	23	6	85
zS ₃	33	34	4	0	4	75
sZ ₃	13	15	0	0	27	55
zS _n	11	0	4	0	1	16
sZ _n	0	0	1	0	2	3
total	328	125	18	23	58	552

Table 2.

Plied cordage and the variety of compositions, quantified per material. The table shows the quantities from which the percentages, discussed in the text, were calculated. Key: Forty-nine (bold) pieces of all plied palm cordage showed the sZ₂ composition whereas 85 (bold) plied pieces of cordage displayed the zS₂ composition.

twist	composition material		total						
			grass	palm	soft fibre (goat)	hair	other		
cables	zZ[S]	zZ _n [S ₂]	0	0	15	0	0	15	
		zZ _n [S ₃]	0	0	1	0	0	1	
	sZ[S]	sZ ₂ [S ₂]	3	0	1	19	0	23	
		sZ ₂ [S ₃]	0	0	0	2	0	2	
		sZ ₂ [S _n]	0	2	0	1	1	4	
		sZ _n [S ₂]	0	0	2	0	0	2	
	zS[Z]	zS ₂ [Z ₂]	3	10	1	0	0	14	
		zS ₂ [Z ₃]	13	6	0	2	3	24	
		zS ₂ [Z _n]	6	0	1	0	3	10	
		zS ₃ [Z ₂]	2	0	3	0	1	6	
		zS ₃ [Z ₃]	0	10	0	0	7	17	
		zS ₃ [Z _n]	0	0	0	0	1	1	
		zS _n [Z ₂]	0	0	10	0	2	12	
		zS _n [Z ₃]	0	0	4	4	0	8	
		zS _n [Z _n]	0	0	3	0	0	3	
		zS[S]	zS ₃ [S ₂]	1	0	0	0	0	1
			zS _n [S ₂]	0	0	4	0	0	4
			zS _n [S ₃]	0	0	1	0	0	1
		zI[S]	zI _n [S ₂]	0	0	8	0	0	8
	other	other	0	0	10	0	0	10	
	double cable	Z[S]{Z}	sZ ₂ [S ₂]{Z ₃ }	0	0	0	2	0	2
			sZ ₂ [S ₃]{Z ₂ }	0	0	0	1	0	1
		zS[S]{Z}	sZ ₂ [S ₃]{Z ₂ }	0	0	0	1	0	1
zS ₂ [S _n]{Z ₃ }			0	0	0	0	1	1	
zI[S]{S}		zI ₂ [S ₂]{S ₂ }	0	0	1	0	0	1	
zS[Z]{S}		zS ₂ [Z ₂]{S ₂ }	1	0	0	0	0	1	
total alternating			28	28	25	32	19	132	
total non-alternating			1	0	30	0	0	31	
total trench			29	28	65	32	19	173	
% of total cables			17	16	38	18	11	100	
% of total trench (= 771)			4	4	8	4	3	23	

Table 3.

Cabled cordage an the variety of twist and composition, quantified per material. The row ‘% of total cables’ shows the percentage cables of a material from the total number of cables recovered from the trench. The row “% of total trench” shows the percentage cables of the total of cordage regardless material, twist and composition. Key: Seventeen percent (bold) of the total number of 173 cabled pieces of cordage was cabled cordage of grass and 4 % (bold) of all registered cordage from the trench was cabled palm cordage. _n >3

quantity/ percentages	material					totals
	grass	palm	soft fibre	(goat) hair	other	
quantity rope	18 (13/5)	22 (9/13)	0	0	27 (19/8)	67 (41/26)
n=total (ply/cable)	357 (328/29)	153 (125/28)	0	0	77 (58/19)	587 (511/76)
percentages of 'n'	5 (4/17)	140 (7/46)	0	35 (33/42)		11 (8/34)
total material	384	158	94	56	79	771
percentages of total	5	14	0	0	35	9

Table 4.

The occurrence of ropes among the different materials of trench BE01-48, quantified per plied and cabled cordage and in percentages. Key: Eighteen percent (bold) grass pieces of cordage were ropes of which 13 (Italic) were plied and 5 (Italic) cabled. Five percent (bold) of the total amount of plied and cabled cordage, made of grass, were ropes whereas 4% (Italic) of the plied cordage were ropes; 17% (Italic) of the cabled cordage were ropes. Fourteen percent (bold) of the total amount of palm cordage (regardless twist and composition) were ropes. The last column shows the totals.