STUDIES OF ANCIENT EGYPTIAN FOOTWEAR. TECHNOLOGICAL ASPECTS. PART III. LEATHER- OR STRING-REINFORCED PLAITED SANDALS FROM QASR IBRIM

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1. *Introduction*

Amongst the large number of pieces of footwear, leather as well as fibre (Adams, 1996: 179; Veldmeijer, 2006/2007, 2007/2008, accepted; Wendrich, 1999: 241-243) and wood (Veldmeijer, 2008) from Qasr Ibrim, Egypt, the leather-reinforced plaited sandals form a separate and unique group (Figure 1A, B). Twenty-nine complete or parts of sandals, the great majority of which originate from the Ottoman layers (1570-1811 AD),[1] have been studied at first hand. The current paper presents the results of the analysis of the technological aspects of these (Tables 1 & 2).[2]

The sandals are housed in magazines of the Supreme Council of Antiquities, Egypt, and the British Museum, London.[3] The terminology used in describing leather and footwear follows Goubitz *et al.* (2001).[4] The terminology used to refer to the various surfaces and sides of footwear is adapted from zoology and the related sciences: the ventral surface is the surface that faces the ground, and the dorsal surface is the surface that faces upwards; the lateral side is the side that faces outwards, and the medial side faces inwards. The front or toe can be referred to as anterior and the back or heel as posterior (Figure 1, inset).

2. *Description*

The leather-reinforced plaited sandals can be separated into three groups: the ones that only have a leather-sewn edge, the ones of which the sole as well as the edge is sewn with leather thongs, and the ones with an additional leather treadsole. The soles of this latter group of sandals may or may not have been sewn with leather thongs.

In all but two cases (cam-0107; Figure 2A and ASW-0592; figure 4D) the plaited fabric is in an 'over 2/under 2/shift 1' pattern;[5] ample attention to plaited fabrics in footwear has been given elsewhere (Veldmeijer, 2008/2009 [this JEOL volume]). Although the fibre often proved too

[1] See Alexander & Rose (forthcoming).

[2] The reader is referred to the forthcoming catalogues for a detailed description of each specimen individually (Veldmeijer, forthcoming a, b).

[3] All objects with prefix 'cam-' have been moved from Cambridge to the British Museum in 2008.

[4] For explanation of the method of classifying, see part IV of the studies of ancient Egyptian footwear, elsewhere in this JEOL volume (Veldmeijer, 2008/2009).

[5] In literature, often the fabric is described by means of formulae: over 2/under 2/shift 1, for instance, is written as \2/2\\1. However, I have abandoned this as it is confusing, especially in more complicated fabrics such as seen in cam-0107.

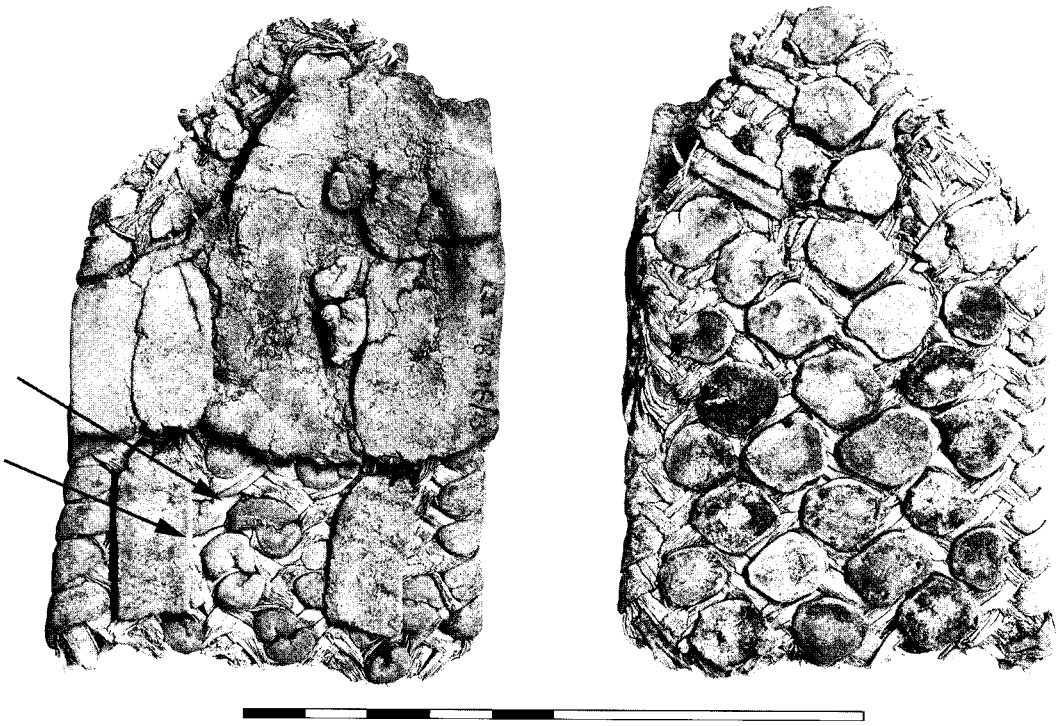


Fig. 7. The leather treadsole is a repair rather than an original feature of a new sandal. This interpretation is based on the characteristic wear of the sewn leather thong (arrows) and the used-to-be pointed insole. Ventral and dorsal view of QI 78.2.18/23, dated to the Christian period. Scale bars in cm. Photography by E. Endenburg. Courtesy of the Egypt Exploration Society.



Fig. 6. The strap complex in leather-reinforced plaited sandals. Cam-0618 is one of the best preserved examples. Dorsal and ventral view respectively. Scale bar in cm. Photography by E. Endenburg. Courtesy of the Egypt Exploration Society.

fig. 5a

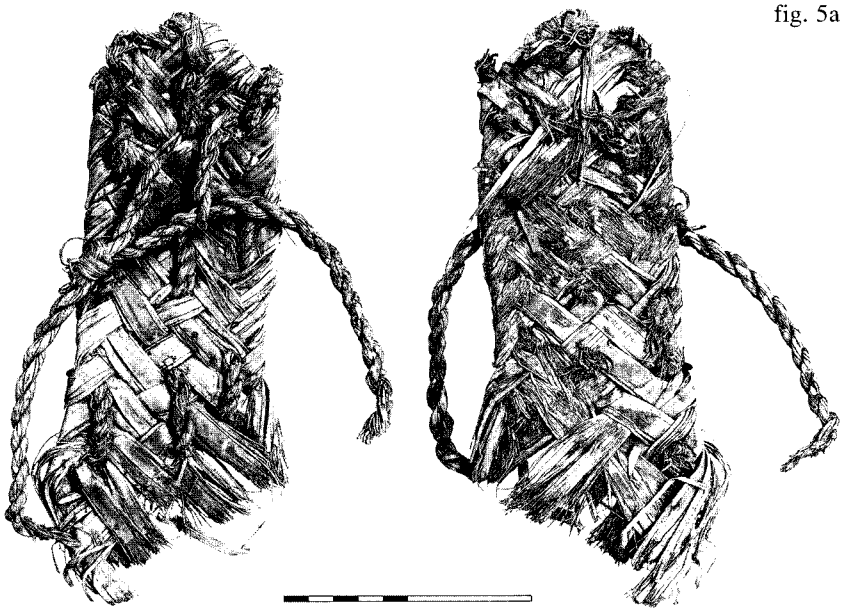


fig. 5b

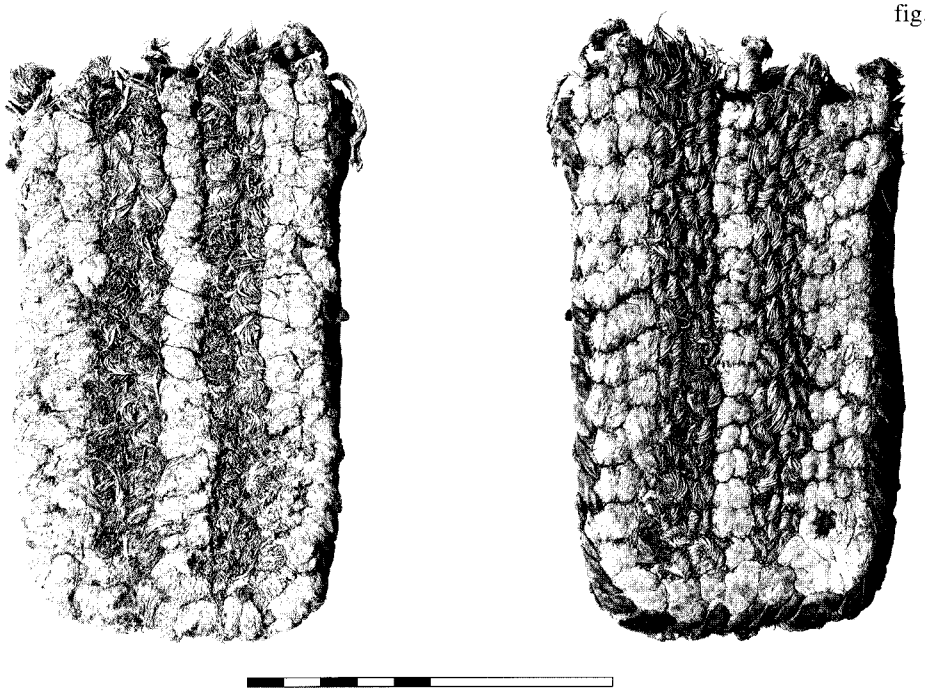


Fig. 5. Plaited fabric sandals, reinforced with string rather than leather. A: Cam-0051, a plaited sandal, sewn with three longitudinal rows of stitches to the treadsole (now lost). The string is not to be interpreted as reinforcement. Dorsal and ventral view respectively. B. Cam-3718 shows decorative reinforcement of the plaited fabric with palm leaf(?) and palm fibre string. Obverse and reverse views. Photography by E. Endenburg. Scale bars in cm. Courtesy of the Egypt Exploration Society.

fig. 4c

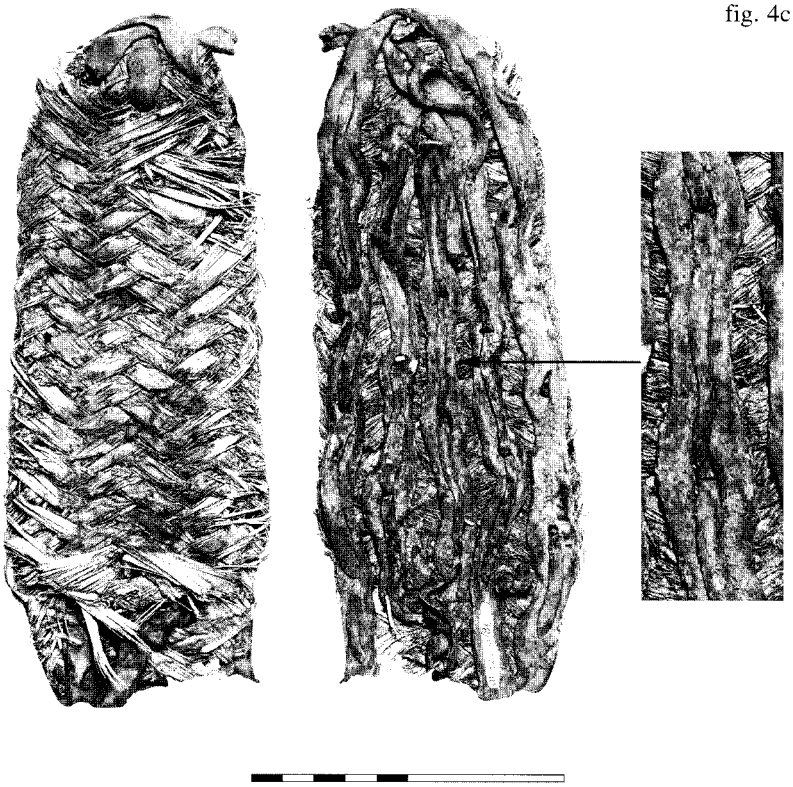


fig. 4d

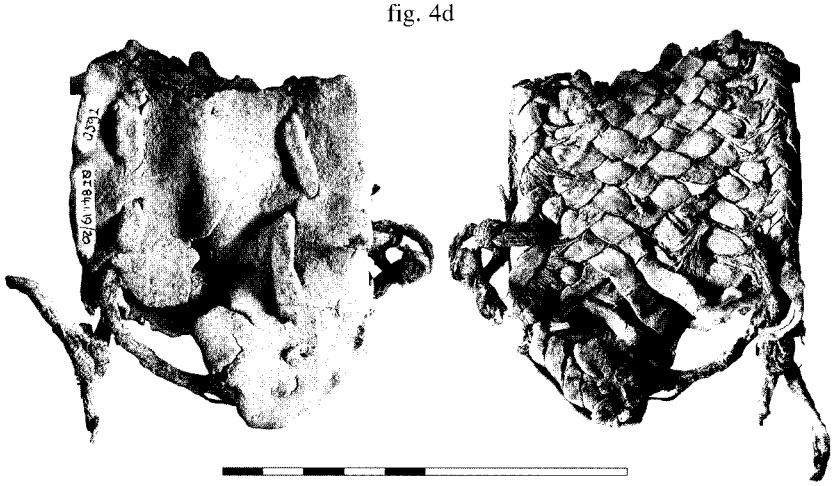


Fig. 4. C: Cam-0111 differs in that strips of leather are sewn with leather stitches. Note that the stitches are very long at the ventral surface of the treadsole (right) whereas there are almost no stitches visible at the dorsal surface of the insole (left). D: Asw-0592 is the only example of a plaited insole of strips of palm leaf and leather. Ventral and dorsal view respectively. Scale bars in cm. Photography by E. Endenburg. Courtesy of the Egypt Exploration Society.

fig. 4a

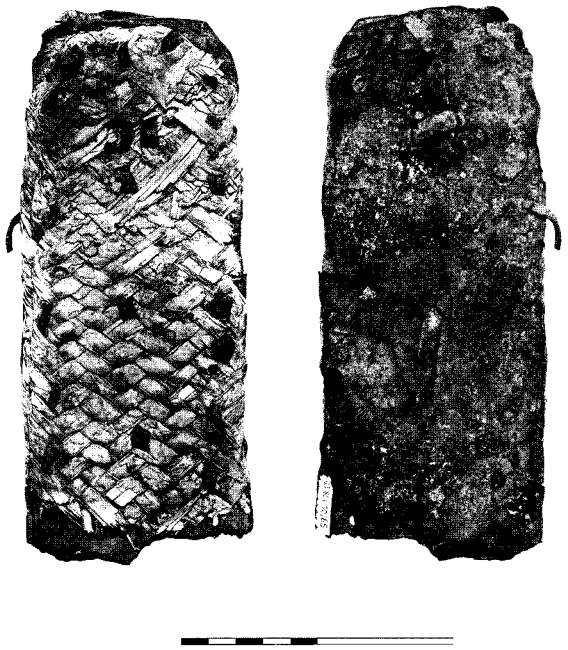


fig. 4b

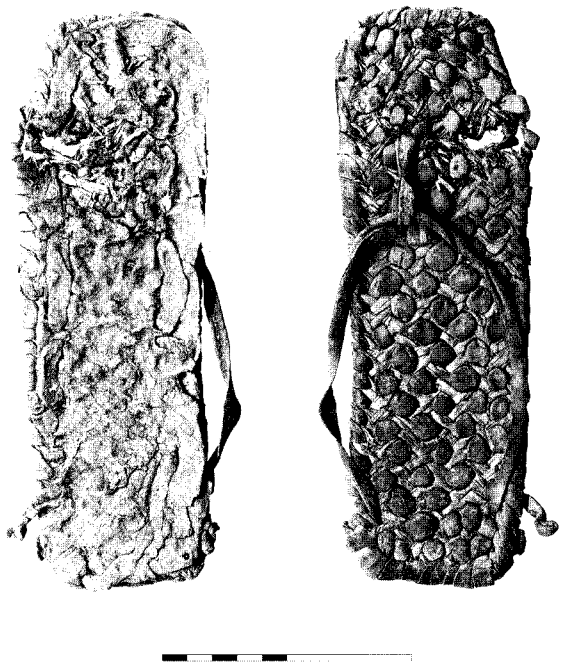


Fig. 4. Plaited sandals with a leather treadsole. A: Dorsal and ventral view. Cam-0620 has two leather sole layers, bringing the number of layers to four. Ottoman. B: Cam-3716 is one of the best-preserved sandals of this type, but is unfortunately undated. Dorsal and ventral view respectively.

fig. 3c

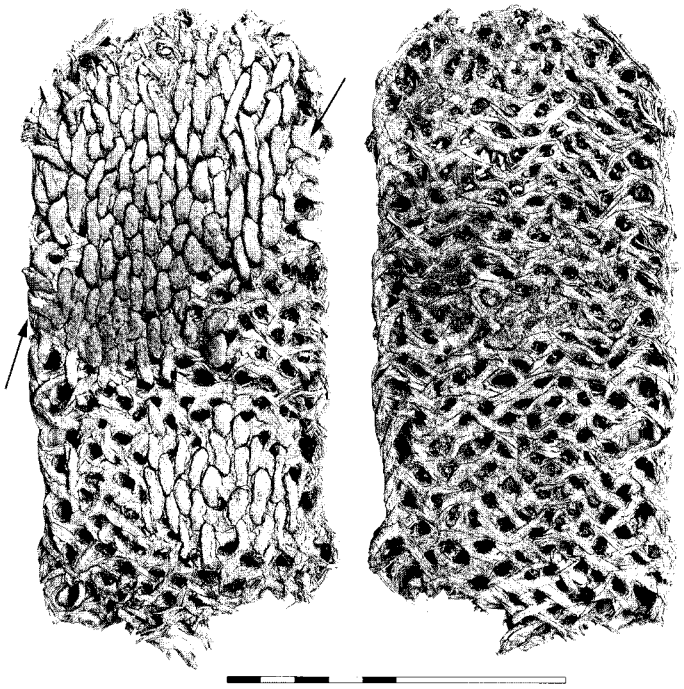


fig. 3d

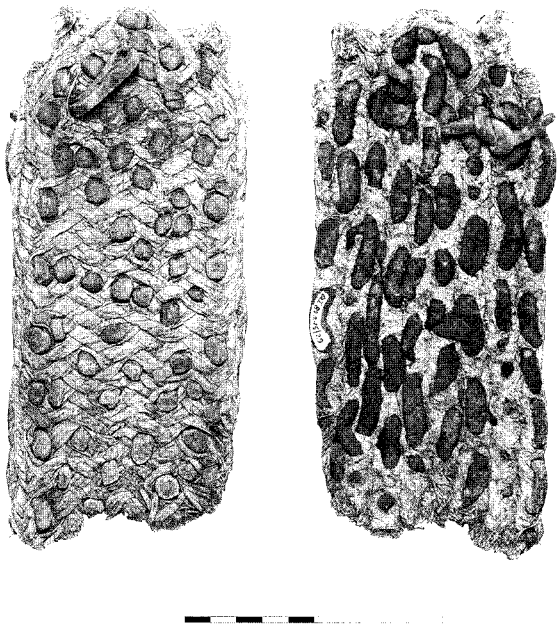


Fig. 3. C: Obverse and reverse of cam-0066. The leather thong is narrow but numerous and tightly sewn. Note the remnants of whip stitches of the edge (see figure 2A inset). Ottoman. D: Dorsal and ventral view of cam-0109, which most likely forms a pair with cam-0108. The sandal consists of three sole layers, which are sewn with leather thong. Ottoman. Scale bars in cm. Photography by E. Endenburg. Courtesy of the Egypt Exploration Society.

fig. 3a

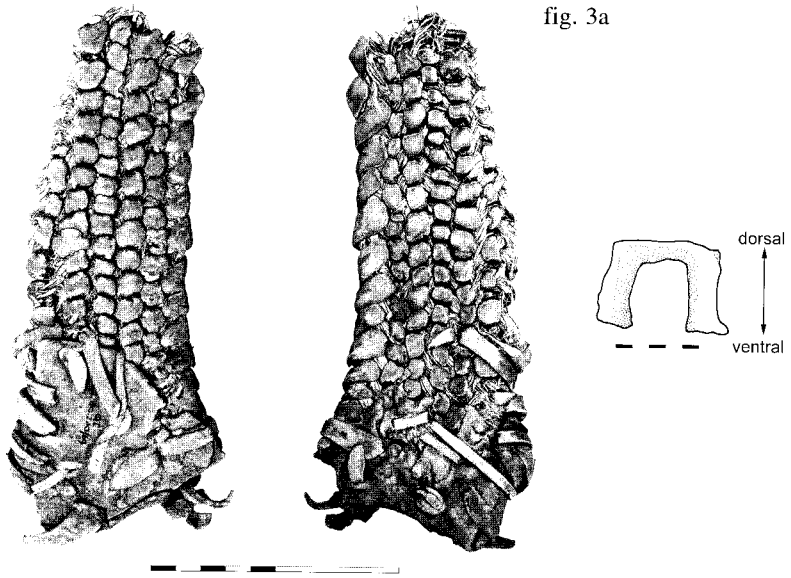


fig. 3b

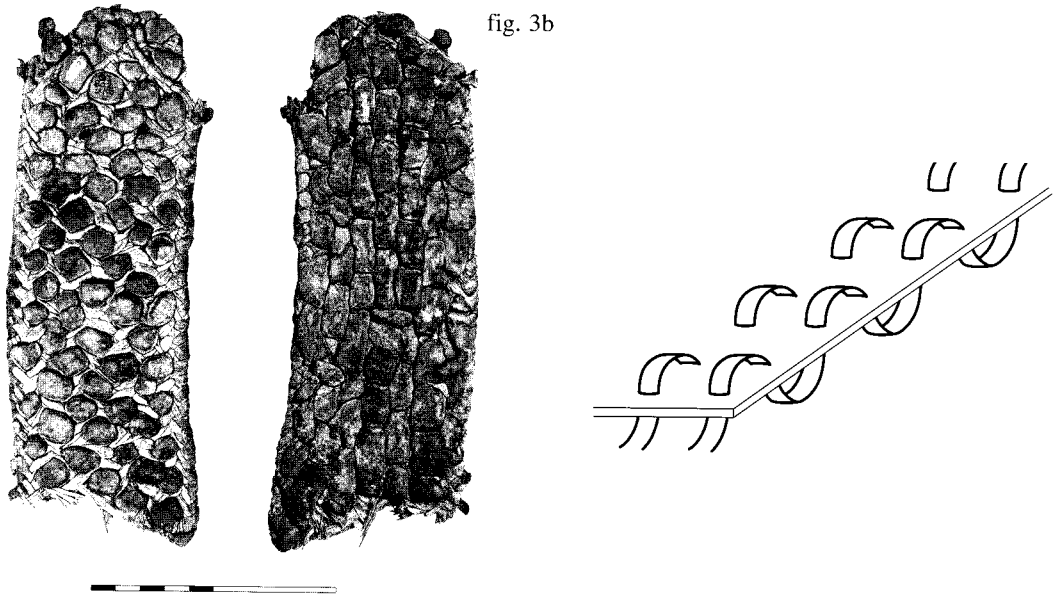


Fig. 3. Leather-reinforced plaited sandals with leather thong sewn soles. A: Dorsal and ventral view of cam-0613; the stitches are short at both sides of the sandal. Ottoman. A inset: if the bend of the stitch is worn entirely, the characteristic U-shaped stitch remains. Note the compressed appearance due to the weight of the owner. Drawing by A.J. Veldmeijer. B: The stitches in cam-0614 are short at the dorsal (left) but large at the ventral surface (right). Ottoman. Inset: construction drawing. Drawing by E. Endenburg/A.J. Veldmeijer.

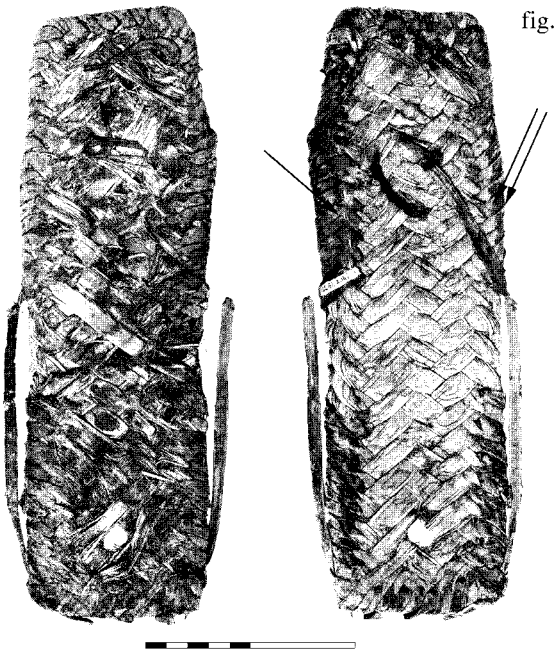
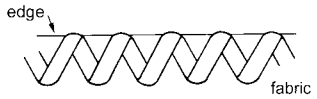


fig. 2a



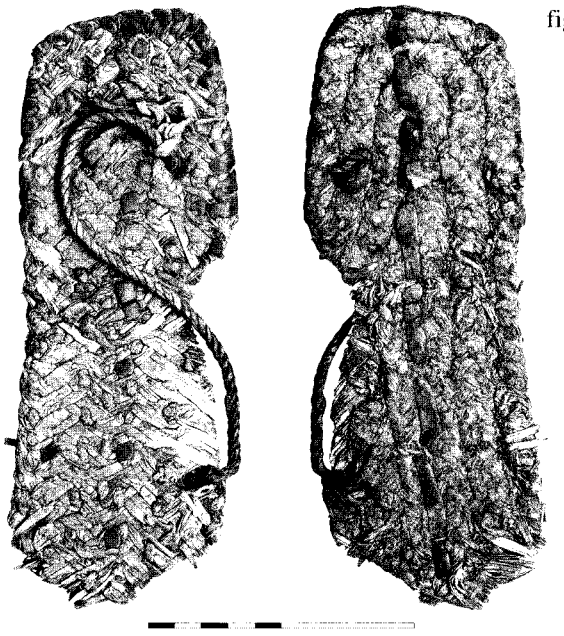


fig. 2b

Fig. 2. Plaited sandals with leather-sewn edges. A: Dorsal and ventral view of cam-0107. The heel is worn through. Ottoman. Note the difference in edge stitching (arrow and double arrow). Inset: whip stitch used to reinforce the edge or to fasten the insole firmly to the treadsole. Drawing by E. Endenburg / A.J. Veldmeijer. B: Cam-0064 (see fig. 1A), dorsal and ventral view. In contrast to cam-0107, this sandal consists of a three sole layers. Date unknown. Scale bar in cm. Photography by E. Endenburg. Courtesy of the Egypt Exploration Society.

fig. 1a

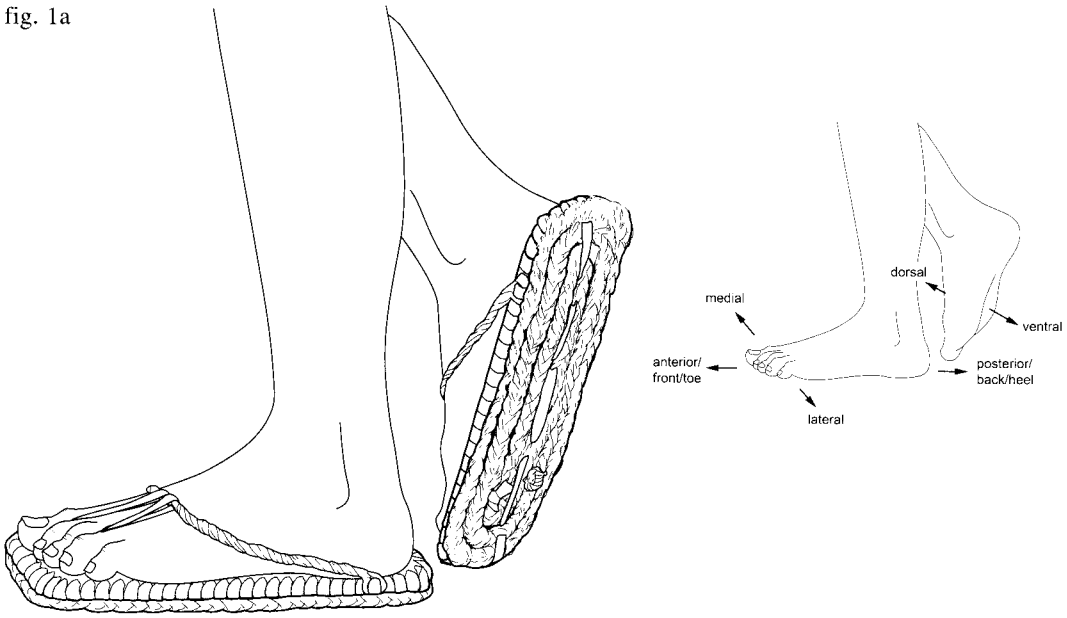


fig. 1b

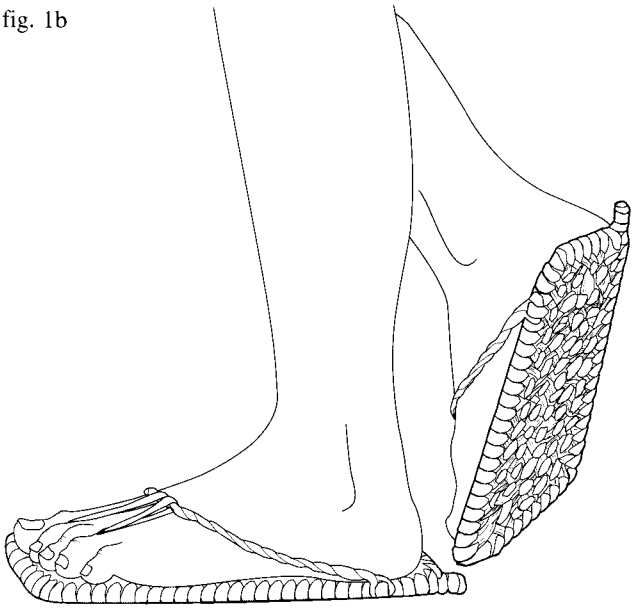


Fig. 1. Artist impression of two types of leather-reinforced plaited sandals as discussed in the text. A: Cam-0064 (see Figure 2B). Note that the attachment of the back strap is likely a repair in the original (Figure 2A); here it is after the construction as seen in cam-0618 (Figure 6). B: BM EA 72093. Inset: the directions of a foot as used in the description of footwear. Drawings by M.H. Kriek.

Spec. no. / Excavation no.	Date	Measurements	Technical characters				No of layers (single/double/triple)
			String sewn	Edge sewn	Leather treadsole	Fabric (plaiting pattern)	
cam-3718 72/391	?	W at front: 91.2; W at heel: 86.4. L: 170.	√	√	-	?	double?
cam-0065 78.2.15/33	Classic Christian 2	W at front: 66.5. W at heel: 45. L: 120.	-	√	-	over 2/under 2/shift 1	double
cam-0059 82.1.31/64	(ca. 1000-1100 AD) Ottoman (1570-1811 AD)	W at front: 67; W at back: 72. L: 225.	√	√	-	over 1/under 1	double

Table 2. String reinforced plaited sandals from Qasr Ibrim showing excavation registration number and specialist number (first column [objects with specialist identification number that starts with 'cam-' were stored in Cambridge, England, but have been moved to the British Museum in 2008]), date (second column), measurements (third column), technical characters, including the plaiting pattern (shared fourth-seventh column), and the composition of the sole (eighth column).

Veldmeijer (2008/2009 [this JEOL volume]).

cam-0614 80.2.28/59	Ottoman (1570-1811 AD)	W heel: 77; W: 72. L: 225.	√	insole: small; treadsole: large	√	-	over 2/under 2/shift 1	single
cam-0067 80.3.14/42b	Ottoman (1570-1811 AD)		√	small	√	-	over 2/under 2/shift 1?	?
cam-0066 80.3.14/51a	Ottoman (1570-1811 AD)	W: 84. L: 81.8.	√	small	√	-	over 2/under 2/shift 1?	single
cam-0105 82.1.15/87	Ottoman (1570-1811 AD)	W: 109. L: 250.	√	insole: small; treadsole: large	√	√	over 2/under 2/shift 1	triple
cam-1321 82.1.26/74	Ottoman (1570-1811 AD)	W: 71. L: 100.	√	small	√	√	over 2/under 2/shift 1	triple?
cam-0106 82.1.30/65	Ottoman (1570-1811 AD)	W: 82.5. L: 205.	-	n.a.	-	√	over 2/under 2/shift 1	triple
cam-0107 82.2.14/68	Ottoman (1570-1811 AD)	W heel: 86.4; W front: 82.2. L: 290	-	n.a.	√	-	over 3/under 2/over 2/under 2/over 2/under 2/over 2/under 3	double
cam-0111 82.2.21/86	Ottoman (1570-1811 AD)	W heel: 83.9; W front 69.4. L: 230.	√	insole: small; treadsole: large	-	-	over 2/under 2/shift 1	double?
cam-0108 82.2.22/93	Ottoman (1570-1811 AD)	W: 73.5/83.7. L: 170.	√	insole: small; treadsole: large	-	√Δ	over 2/under 2/shift 1	double
cam-0109 82.2.25/29	Ottoman (1570-1811 AD)	W heel: 73.5; W front: 83.7. L (as pres): 170.	√	insole: small; treadsole: large	√§	√Δ	over 2/under 2/shift 1	double
asw-0592 / 84.1.19/20	Ottoman (1570-1811 AD)	L: 91.	-	n.a.	√	√	over 1/ under 1	double?
asw-1326 86.1.20/28	Ottoman (1570-1811 AD)?	W: 72. L: 91.	√	small?	√	-	over 2/under 2/shift 1?	?
asw-1247 95.1.02/325	Ottoman (1570-1811 AD)	W: 77. L: 215.	√	small	√	√	over 2/under 2/shift 1?	double?

Table 1. Leather reinforced plaited sandals from Qasr Ibrim showing excavation registration number and specialist number (first column), [objects with specialist identification number that starts with 'asw-' are stored in magazines of the Supreme Council of Antiquities, Aswan, Egypt; the ones pre-fixed with 'cam-' were stored in Cambridge, England but have been moved in 2008 to the British Museum; [BM], date (second column), measurements (third column), technical details, including the plaiting pattern (fourth-eighth shared column) and the composition of the sole (ninth column). Key: N.a.: not applicable; § The edge is whip stitched with palm leaf rather than leather strips. Δ The sole of cam-0109 consists of a folded plaited fabric at which a treadsole is made of braids. The sole of cam-0108 possibly consists of a folded fabric. Both might be a pair.

Spec. no. / Excavation no.	Date	Measurements	Technical characters					No of layers (single/double/ triple)
			Leather sewn	Length stitches	Edge sewn	Leather treadsole	Fabric (plaiting pattern)[15]	
cam-0064 66a/362	?	W: 77.6. L: 220.	√	n.a.	√	√	over 2/under 2/shift 1?	triple
cam-0110 78.1.22/19	'Early Christian' (ca. 650-850 AD)	W heel: 81.6; W front: 84.5. L: 200.	√	insole: small; treadsole: large	√	-	over 2/under 2/shift 1	double
cam-3715 72/391	?	W: 67.4/63.3. L: 135.	√	small	√	√	over 2/under 2/shift 1	triple
cam-3716 72/391	?	W heel 68.2; W front: 71.6. L: 230.	√	small	√	√	over 2/under 2/shift 1	double?
BM EA 72093 82.1.27/52	Ottoman (1570-1811 AD)	W: 73.5/81.8. L: 200.	√	small	√	-	over 2/under 2/shift 1	double?
78.2.18/23	'Classic Christian 2' (ca. 1000-1100 AD)	W: 65. L: 100.	√	small	√	√	over 2/under 2/shift 1	triple
80.2.11/106	Ottoman (1570-1811 AD)	W: 67. L: 100.	√	small	√	-	over 2/under 2/shift 1?	?
cam-1322 82.2.6/43	Ottoman (1570-1811 AD)	W: 45. L: 70.	√	small	?	-	over 2/under 2/shift 1	?
cam-0662 78.2.11/25	Ottoman (1570-1811 AD)	W: 70. L: 150.	√	small	√	-	over 2/under 2/shift 1	double
cam-0618 78.2.12/12a	Ottoman (1570-1811 AD)	W: 100. L: 260.	√	insole: small; treadsole: large	√	-	over 2/under 2/shift 1	double
cam-0620 78.2.12/12b	Ottoman (1570-1811 AD)	W: 82.5. L: 205.	√	small	√	√	over 2/under 2/shift 1?	triple?
cam-0655 78.2.22/82	Ottoman (1570-1811 AD)	W heel: 65; W front: 63. L: 125.	√	small	√	√	over 2/under 2/shift 1	triple?
cam-0613 80.2.10/69	Ottoman (1570-1811 AD)	W: 85. L: 210.	√	small	√	-	over 2/under 2/shift 1?	single

[15] It is in most cases not possible to determine the number of strips because much of the fibre fabric is obscured by leather. However, see for comparable fabrics Veldmeijer (2008/2009 [this JEOL volume]).

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The examples of plaited sandals with edges sewn with leather thong show that this was done only to attach the insole. The sewing of the fabric through the entire sole, however, was clearly a reinforcement. The addition of a leather treadsole to the leather sewn sandals is a repair rather than an original feature.

Of the roughly 2500 year's history of Qasr Ibrim, starting in the 25th Dynasty and running until the last Ottomans left the site in 1811, the great majority of this type of sandals originates from the Ottoman layers. However, one leather-reinforced sandal and one string-reinforced sandal originate from layers which have been dated to the 'Classic Christian' era; one example is even dated to 'Early Christian' times (Tables 1 & 2). The context of the leather-reinforced sandals are pit fills and it is possible that the contents were disturbed and mixed. The Christian string-reinforced sandal was recovered from the west plaza of the Cathedral, (level three). Note that a badly preserved example comes from the 5th-6th century layers of Elephantine (Veldmeijer, pers. obs. 2005-2008).

The group of sandals is unparalleled. This may lead to the conclusion that it is a more traditional Ottoman sandal (despite the three which may be Christian in date), like the wooden pattens found at the site, but the double front strap seems to point to a more traditional Nubian sandal.

There is a large distinction between the footwear of the earlier and later occupation phases: from Christian and Ottoman times the footwear is very tough and strong: the great majority of plaited sandals consists of thick folded fabrics whereas others are reinforced with leather strips, the topic of this paper. Furthermore, the wooden pattens from the Ottoman layers and the large numbers of pieces of leather footwear suggest that there was a need for strong footwear. The main reason for this seems to have been to protect the feet against the local rocky terrain. Although the archaeology of these later phases of Egypt's history awaits more attention, it seems that this issue was of much more concern in Qasr Ibrim than elsewhere: the leather-reinforced plaited sandals as well as other sturdy footwear such as the thick plaited sandals and the wooden pattens are only known from this site.

9. *Acknowledgements*

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10. *Cited literature*

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Adams, W.Y. & N.K. Adams. 1998. *Kulubnarti II. The artifactual remains.* – London, The Sudan Archaeological Research Society.

product is inferior to vegetable tanned leathers, unstable and the constituents are difficult to analyse; a field test such as the one mentioned for vegetable tanning does not exist.

In general, on the basis of the field test and applied to almost all leatherwork from Qasr Ibrim, no vegetable tanned leather was used to reinforce the plaited sandals. However, the repair patch in cam-0613 (Figure 3A) is vegetable tanned.

7. *Wear and repair*

All footwear has parts that always show signs of wear, such as the heel (dragging of the heel) and at the ball of the foot (friction due to the bending of the foot). Strap complexes also often show repairs or substituted parts. But besides these general points of wear, each type of footwear has its own more specific wear patterns. In leather-reinforced plaited sandals, the loops of the leather thong running stitches are compressed due to the weight of the owner. Consequently, these look like U-shaped, flattened at the bend, if the loop at one end is worn through entirely (Figure 3A, inset). Once the sandal is discarded, these U-shaped stitch remnants are prone to drop out of the plaited fabric; several of these isolated stitches have been documented. The recognition of the wear has led to the conclusion that the leather treadsole, with which some of the sandals are equipped, is a repair rather than an original feature. In QI 78.2.18/23[13] (Figure 7) the leather treadsole is sewn to the plaited layers by means of running stitches along the perimeter only. These appear long (about 30 mm) at the ventral surface of the treadsole and small (about 10 mm) at the dorsal surface of the insole. The damage at one end exposes the leather thong, which is sewn through the plaited fabric and clearly shows the characteristic worn loops, resulting in a U-shaped stitch remnant (Figure 3A, inset; Figure 7 arrows). Moreover, the leather treadsole is attached to the pointed former insole characteristic of folded fabric sandals (*cf.* Figure 3D; see also Veldmeijer, 2008/2009 [this JEOL volume]).

8. *Discussion*

Most of the sandals that still have (parts) of the strap complex preserved show the double front strap. This has been interpreted as a characteristic of Nubian footwear (Adams, 2005: Figure 61, Plate 25; Adams & Adams, 1998: 62-64; Veldmeijer, 2006/2007: 73), as no footwear in Egypt proper or from Egyptian (as opposed to Nubian) contexts shows a double front strap. It is interesting therefore to find some leather sandals with a double front strap at Didymoi, a Roman *Praesidium* at the road between Coptos and Berenike, which are dated to the first three centuries AD (Leguilloux, 2006). The discussion of the distribution and dating of this feature is outside the framework of this paper, but it is remarkable that with the exception of one badly preserved example presented by Winterbottom (2001: 324, fig. 10.9, 23), sandals with this type of front strap do not seem to be common in Roman contexts. The great majority of sandals found in late (*i.e.* from Christian times onwards) layers of Qasr Ibrim have a double front strap and are regularly found at more southern sites in modern Sudan. The tradition of double front straps is much older, as an example from C-group Adindan proves.[14]

[13] This is also observed in the comparable sandals.

[14] For example E23369 in the collection of the Oriental Institute Museum Chicago.

It is fastened at the right side by putting it through the leather whip stitch and secured with an S-overhand knot. This differs from the usual way of fastening, which is by inserting the back strap through the sole itself and tying it, as with the front strap, with a knot at the ventral surface of the treadsole. The left side is fastened by knotting the eye of the folded ply around a leather edge stitch. The equivalent place relative to the right side is torn and the loop is attached 20 mm more towards the front, which thus seems a repair.

In cam-0107 (Figure 2A), the leather back strap, a small thin strip, was also inserted in the edge thongs and secured with an overhand knot. At the front, the straps are connected with an sZ_2 leather string; exactly how is unclear.

In cam-0064 (Figure 2B), the left front strap is broken; the back strap is pulled through a hole after it was passed through the right front strap. At the front this back strap is knotted by means of an S-overhand knot at the ventral surface of the treadsole; at the back it is knotted, also at the ventral surface of the treadsole, with a Z-overhand knot. The front straps are looped strips of leather; the back strap is an sZ_3 string.

Originally there were two front straps in cam-3716 (Figure 4B), one of which remains. These are loops inserted through the soles, the attachment at the ventral surface of the treadsole of which is unclear but could have been fastened with a knot. The back strap, consisting of a small leather strip, is inserted through the soles just before the heel and at the inner side of the whip stitched edge, and runs from one side to the other by going through the front straps. The back straps are not knotted at the ventral surface of the treadsole, but probably were originally.

6. *Production*

For the harvesting and preparation of the raw material the reader is referred to Wendrich (1999: 273-282)[11] who, in her work on ancient Egyptian basketry, gives ample attention to this topic. Once the plaited fabric was made, the leather was applied. Since the plaited fabric is quite thick and tough, the leather strip cannot penetrate the fabric without the use of a tool. The leather treadsole, being a repair (see below) was attached after the sole was worn and in need of repair. Finally, the strap complex was attached to the sandal.

Vegetable tanning of leather is the only procedure in ancient times that produces the water-resistant, imputrescible product (Van Driel-Murray, 2000: 299, 304). Traditionally it is thought that vegetable tanning was brought to Egypt in Greaco-Roman times.[12] The use of vegetable tannins can be detected with a simple test (Daniels, 1993; Leach, 1995: 241-242; Van Driel-Murray, 2002a, b; Van Roode & Veldmeijer, 2005: 4-5) using a solution of ferrous sulphate ($FeSO_4$) in distilled water. However, problems with this test have been noted (Thomson, 2006: 59; Trommer, 2005: 41-44 [who discussed the problem with the identification of tannins in general]; Van Roode & Veldmeijer, 2005: 4-5, pers. obs. several sites 2005-2008) and results should be viewed in this light. Curing is another way of making skin durable and was either done with oils and fats or mineral earths (Van Driel-Murray, 2000: 303) but the

[11] The production of plaited fabric is explained here in detail too.

[12] However, the lack of analyses might distort this picture (see also Van Driel-Murray, 2000: 304-305). For example, the field test used to indicate vegetable tannins tested Nubian C-group leather from Hierakonpolis (Middle Kingdom) positive. The results are currently being analysed.

This is unusual since normally the orientation is the same at both sides. The strips, with an average width of six mm, are plaited together with the palm leaf strips into an insole. The fabric is plaited 'over 1/under 1'. A leather treadsole about two mm thick (bringing the total thickness to 12 mm) is sewn with leather thong in running stitch along the perimeter. The stitches are long at the ventral surface of the treadsole and short at the dorsal surface of the insole. Just before curving towards the heel, there are two strings of blue textile knotted to the edge. Probably this is a repair. Taking the position of the string at the edge into account as well as the way it is attached by inserting it through the sole and knotted with a reef knot, it is assumed that they are part of the back strap.

3. *String sewn sandals (Table 2)*

The technique of sewing a plaited fabric with leather thong is not the only method of reinforcement that was used. A comparable way is to sew a plaited fabric with string, although this technique is less common. There are, however, various sandals with string stitching through the sole, but these differ from the reinforced sandals in the fact that the stitches are less numerous and much more widely spaced (Figure 5A), their primary function being the attachment of the insole and treadsole.

Figure 5B shows cam-3718, the back part of a sandal that is much worn, and therefore, the construction cannot be identified with certainty. The folded plaited 'over 1/under 1'(?) fabric is reinforced by sewing longitudinally with zS_2(?) string of palm leaf(?), in between which are two rows of red brown palm fibre reinforcement, creating a decorative effect (total thickness 17 mm). Remnants of leather back straps remain *in situ*, inserted in the sole a short distance from the edge. The ventral surface of the treadsole is worn.

4. *Shape*

Due to the fact that most leather-reinforced plaited sandals are incomplete, not much can be said about the original shape. However, it is likely that the sandals which consist of two layers of plaited fabric, originally was one layer folded at the middle as seen in the plaited sandals from Qasr Ibrim. This suggestion is supported by cam-0107 (Figure 2A), cam-0064 (Figure 2B), cam-0108 & 0109 (Figure 3D), which show the characteristic pointed front of the insole. The more intact sandals all have one thing in common: they have a square heel, which is not difficult to explain if a sandal consists of a folded plaited fabric. The intact toe parts of non-folded fabric sandals show that most of them are 'swayed,' *i.e.* the shape of the sole is specifically made for the left or the right foot. Cam-3716 (Figure 4B) however, is a straight sandal *i.e.* there is no difference in shape between the sandal for the left and right foot.

5. *Strap complex*

The strap complex in leather-reinforced sandals does not show much variation. Cam-0618 (Figure 6) is one of the best preserved: two holes, 30 mm apart and 50 mm from the front, take two separate leather loops (each about 40 mm long and four mm wide), which are fastened at the ventral surface of the treadsole by knotting the ends into a Z-overhand knot. Through these loops passes an sZ_2 palm leaf string (diameter 5.6/3.5 and about 300 mm long).

at the treadsole (up to 30 mm). Special to this sandal is the fact that the edges of the insole and midsole are sewn with a strip of palm leaf rather than with leather. This was done before the fabric was folded, since the stitches do not go through both layers together. Note the large knot, which is likely to be a finishing of the thongs sewn through the plaited fabric. Cam-0108 and cam-0109 came from Ottoman layers.

2.3 Leather treadsole (Table 1)

The biggest group of sandals that are made of different materials are the ones with a leather treadsole. Figure 4A shows cam-0620, a square-toe sandal from the Ottoman layers of which the backmost part is missing. The insole and first midsole are made from a folded plaited 'over 2/under 2/shift 1' fabric, made from strips of palm leaf (average width 7.5 mm). Two leather soles are sewn ventral to this fabric, bringing the total to four soles with a total thickness of 13 mm. The leather soles are sewn by means of three longitudinal rows of leather thong running stitches of an average width of six mm, one along each of the edges and one down the centre. Two small loops represent the front strap, and the back straps undoubtedly were pulled through in a comparable way to cam-0618 (see below). Note that the leather soles slightly protrude from the plaited ones. In another sandal (cam-3716) the leather treadsole is sewn with stitches along the perimeter only. However, this sandal, discussed in some detail below, differs from cam-0620 in the fact that the plaited sole is sewn with leather thong.

Cam-3716 (Figure 4B) is one of the most complete and best-preserved leather-reinforced plaited sandals. Unfortunately its date is not known. The sandal has a square heel and is rather uniform in width. The toe is also square, resulting in a 'straight' sandal.[10] The 'over 2/under 2/shift 1' fabric, made of strips of palm leaf, is sewn longitudinally with leather thong running stitches that appear at the insole as almost square stitches. It seems that these stitches are larger at the ventral surface of the insole, but the leather treadsole obscures any clear view. The edge of the plaited sole is whip stitched with leather thong. The leather treadsole is attached with large running stitches of about ten mm wide, which appear small (about ten mm) at the insole but large (about 30 mm) at the ventral surface of the treadsole. These bring the total thickness to 11.5 mm. Note the wear at the ball of the foot; as the sandal is a right sandal, the owner must have walked on the outside of his feet quite heavily.

Although not a sole proper, the cover of the Ottoman sandal cam-0111 is almost complete as shown in Figure 4C. The sandal tapers towards one end, interpreted as the anterior end. The sole consists of two thicknesses of 'over 2/under 2/shift 1' fabric, made of strips (average width 7.5 mm) of palm leaf, the second thickness of which has four leather strips about 12.5 mm wide sewn longitudinally at the ventral surface (resulting in a thickness of 19.8 mm). The narrow leather thongs that sew the strips (3.5 mm wide), are inserted in slits in the leather strips (Figure 4 inset) and go through the midsole; only the row down the centre fastens the insole and midsole to the 'treadsole' (*i.e.* the layer of leather strips). At the front, the strips are folded around the fabric and pulled through the fabric.

The last example of plaited footwear with an additional leather sole is shown in Figure 4D, which is a part of a sandal (asw-0592) with some unusual features. This example is also from the Ottoman layers. The edges are whip stitched S-wise at one side and Z-wise at the other.

[10] The slight off-centre-standing front part is due to wear.

sewn sandals. Another example is cam-0065 whose sole is also reinforced with thick strings. String-reinforced sandals will be discussed in detail below.

2.2 Sole sewn sandals (Table 1)

There are a number of sandals with a sole that is sewn longitudinally with leather thongs (Table 1). Within these, two ways of sewing the plaited fabric (Figure 3) can be identified. Cam-0613 (Figure 3A) is an 'over 2/under 2/shift 1' fabric of palm leaf, dated to the Ottoman period. The sandal is an example of the sewing of the leather thong (width of the thong is between 5.3 and eight mm) very close to each other in such a way that the stitches are close together on both surfaces (the length between the stitches varies from four to nine mm). If such a sole is severely worn, one bend of the stitch might be worn away entirely, leaving the characteristic U-shaped bend that occasionally have been found separately (Figure 3A, inset). The edge is also sewn with leather thong. Note the big repair patch in two parts, attached with coarse randomly placed stitches. It is remarkable that the leather used for sewing is not vegetable tanned, but the leather of the patch is.

Cam-0614 (Figure 3B) is also an 'over 2/under 2/shift 1' fabric, made of palm leaf strips, and originates from the Ottoman layers. The dorsal surface shows more of the plaited fabric; the running stitches of the leather are small here (width varies from 7.4 to 14.2 and the length varies from 5.5 to 12.2 mm). The ventral surface shows seven rows of large, longitudinally running stitches (Figure 3B, inset; the width varies from 6.2 to 13.4 mm and the length from 16.6 to 26.5 mm) thus presenting a virtually unbroken surface of leather. The edges are sewn with leather thong with the same orientation and traces at the surviving short ends suggest it was also sewn. Two holes at approximately 40 mm from the nearly intact front suggest the attachment of a double front strap (see below).

Besides these two most common types, there are variant layouts. Cam-0066 (Figure 3C) is an incomplete, badly preserved plaited fabric of palm leaf from the Ottoman layers, which is continuously sewn longitudinally with about 15[8] rows of narrow rawhide thongs (width about four mm, and the length varies from about five to 15 mm, total thickness of the sole 12.6 mm). The original fabric cannot be established with certainty due to the large number of stitches, but seems to be 'over 2/under 2/shift 1'. Originally, the edge was sewn with leather thong as usual, with a whip stitch at both sides in the same orientation, evidenced by few remaining stitches *in situ* (arrows).

Most of the sole sewn sandals are composed of one layer of plaited fabric. There are, however, sandals with a multilayered sole that are also reinforced with sewn leather thong. Figure 3D shows sandal cam-0109. The 'over 2/under 2/shift 1' plaited fabric is folded to form an insole and midsole.[9] Although it seems from the wear of the leather in cam-0108, which almost certainly forms a pair with cam-0109, that these two layers are the ventral layers, cam-0109 clearly shows a third layer, the treadsole, made of fibre braids (*cf.* cam-0064; Figure 2B). This results in a thick sandal (17 mm). These three-strand-braids (average width of ten mm) are sewn with leather thongs, which appear small at the insole (five to ten mm) but long

[8] The stitches are not neatly arranged in rows.

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badly preserved to identify the exact species, preliminary research suggests that the sandals are made of dom palm leaf.[6]

2.1. Edge sewn sandals (Table 1)

Only two examples of sandals of which just the edge is sewn with leather and without any other leather reinforcement were documented. Cam-0107 (Figure 2A) is a large sandal with a square heel from the Ottoman layers. It does not widen towards the front but there is a slight increase in width at the ball of the foot. The toe is square but one of the corners is pronounced and meant for the big toe, indicating the sandal was made for the right foot. The sandal consists of a folded plaited fabric (*cf.* Veldmeijer, 2008/2009 [this JEOL volume]), the two layers of which form a complete in- and treadsole. The thick fabric (the total thickness of the sole is 18.8 mm) is made with various strips of palm leaf on top of each other, which act as one strand in plaiting the fabric. The width of these strands varies between nine and 13.5 mm. The pattern, 'over 3/under 2/over 2/under 2/over 2/under 2/over 2/under 3', is extraordinary; this is the only example amongst the leather-reinforced plaited sandals as well as amongst the plaited sandals. The edges of the insole and treadsole are sewn with whip stitches (Figure 2A, inset) of leather thong, seven mm wide, which was not vegetable tanned. Usually, this sewing is done with a tight whip stitch, allowing no space between the subsequent stitches. At the lateral edge, the stitches are big, including not only the edge of the fabric, but also the first layer of the fabric itself (Figure 2A, arrow). The leather thong stitches at the medial edge, however, only include the edge of the fabric (Figure 2A, double arrow). The point of the insole is not included in the edge stitching, but a single leather stitch fastens the tip to the treadsole. Note that the edge stitches have the same direction. The heel is worn through, showing a small hole; the entire ventral surface of the treadsole shows wear.

The sole of the sandal in Figures 2B (cam-0064, date unknown) consists of three layers: a folded plaited fabric of dom palm leaf made with strips of an average width of 10 mm in an 'over 2/under 2/shift 1' pattern (this is uncertain due to its bad condition) and a treadsole which is made by attaching a coiled braid over the entire surface (total thickness is 12.8 mm).[7] The material of this braid is unidentifiable due to wear. A row of leather thong running stitches longitudinally down the centre attaches the treadsole to the other two sole layers; the stitches appear small (about five mm) at the insole but large (about 20 mm) at the treadsole. The braid is, seemingly, only fastened with the leather thong stitches in the centre but this can hardly be so, as the outer coils would have fallen off without fastening. There is a row of zS_2 palm fibre string running stitches, which flank the leather stitches at each side, but it seems that these go through the insole and midsole only as they are not visible at the treadsole. Only the edge of the insole and midsole are sewn in whip stitch with leather thong but they are sewn together, rather than each one separately. This means that the sewing was done after the fabric was folded.

Cam-3718 (not illustrated) has also edges that are whip stitched with leather thongs, but differs on various points from cam-0107. The sole of this sandal is not reinforced with leather thong, but rather with two types of string, sewn in a comparable way to the leather

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relativ einfach, indem er sie lediglich als Fehler abqualifiziert. In leicht abgewandelter Forı ist diese Angabe auch ins Wörterbuch[6] übernommen worden, das darüber spekuliert, ob da als „*ḏ3ỉr*" gelesene Wort korrekt oder nur eine fehlerhafte Schreibung für „*ḏ3r.t*" ist. Im Prin zip geht dieser Hinweis bereits in die richtige Richtung. Wie im Anschluss deutlich werde wird, lässt sich die Methode aber noch verfeinern. Die Bemühungen des Wörterbuches um ei besseres Verständnis des „Auges" bei „*ḏ3r.t*" sind damit jedenfalls ebenso im Ansatz stecke geblieben. Über eine Parallelstelle für die Schreibung von „*ḏ3r.t*" mit dem „Auge" in pChe ster Beatty V, recto 8, 3 weiß das Wörterbuch dafür um so genauer Bescheid. In der Standar dedition des Textes ist das Wort jedoch von Gardiner[7] nur aus der Distanz betrachtet worden Wenn man von dem Fragezeichen hinter seinem äußerst kurz gefassten Kommentar „ein Frucht (?)" ausgeht, hat er mit ihm offenbar nicht viel anfangen können. Die beiden scho länger bekannten Belege für die Schreibung „*ḏ3r.t*" mit „Auge" aus pBerlin 3038 sind vo Gardiner in seiner Arbeit ohnehin nicht zur Kenntnis genommen worden.

Vor diesem Informationshintergrund erscheint der weitere Weg der Argumentation fas schon vorprogrammiert. Welche Hypothese nämlich abgeleitet werden soll, ist, dass jen Schreibungen für die „*ḏ3r.t*" – Frucht in zwei im NR[8] niedergeschriebenen Texten durch ein mindestens ebenso alte Schreibung von „*ḏ3r*" „sehen" beeinflusst worden sind. Die Tatsa che, dass die meisten anderen Beispiele für „*ḏ3r.t*" in pBerlin 3038 normal geschrieben sind steht hierzu nicht im Widerspruch, da auch hier der schöne Satz gilt, dass Ausnahmen di Regel bestätigen. Die Kontamination durch „*ỉrỉ*" „tun" oder „*ỉr.t*" „Auge" aufgrund de Nähe zu „*r*", die zunächst ebenfalls erwogen werden könnte, scheint m.E. die weniger wahr scheinliche Variante zu sein.

Wenn die hier vorgetragenen Ideen auch nur halbwegs richtig sind, machen sie ein Umden ken in der Frage nach dem frühesten Beleg von „*ḏ3r*" im Ägyptischen erforderlich und las sen hoffentlich deutlich werden, dass die Angaben im WB zu diesem Punkt ganz offensich lich zu spät sein dürften.

Um das Ergebnis dieses kleinen Artikels am Schluss noch einmal auf einen Nenner zu brin gen, so ist zu sagen, dass es keine große Überraschung wäre, wenn irgendwann wirklich di ersten „echten" Belege für „*ḏ3r*" „sehen" in älteren als griechisch-römischen Texten an Tageslicht kommen würden.

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[6] *WB* V, 520, 10-11.

[7] Gardiner, *Hieratic Papyri in the British Museum, Third Series, The Chester Beatty Gift, Volume I, Text* (1935 S. 49 n. 2.

[8] Zu dieser Altersangabe von pBerlin 3038 siehe Wreszinski, *Der große medizinische Papyrus des Berlin Museums (Pap. Berl. 3038)*, S. VI. Zu derselben Altersangabe von pChester Beatty V vgl. Hill, in Gardine *Hieratic Papyri in the British Museum, Third Series, The Chester Beatty Gift, Volume I, Text* (1935), Preface.