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Footwear in ancient Egypt was common, and although manufacturing techniques were fairly limited, the variation in forms is quite large. The present paper presents yet another category of fibre sandals: coiled sewn sandals (Fig. 1). As usual in studies of ancient Egyptian footwear, this paper focuses on the technological aspects and includes a description. Other aspects will be discussed only briefly and will be dealt with in more detail at a later stage of the project. Footwear terminology follows Goubitz *et al.* (2001). Terms that are used to refer to the various directions of the foot and its footwear are explained elsewhere (Veldmeijer 2008/2009, 105).

The technique in which a horizontal bundle of material is fastened to another bundle by wrapping with a strip of vegetable material is referred to as 'sewing' (Figs. 2 [a, d]; Veldmeijer 2006/2007, 71; Veldmeijer, in press [a]; Veldmeijer, in press [b]). The term 'coiling' should be used when a length of fabric (this can be a bundle of unworked material, but also, for example, a plied string) is coiled and secured by means other than wrapping and sewing (Fig. 2 [b]). This method can be, for instance, stitching horizontally through and at right angles to the coils. Coiling is often seen in basketry (see for example Gourlay 1981a; 1981b; Wendrich 1999) and sandals (Veldmeijer, in preparation). The difference, however, between coiled sandals and coiled sewn sandals (Fig. 2 [c]) is that in the former, the coil is secured by stitching as explained above, whereas in the latter the coiled bundles are wrapped with strips that sew the coils together (Fig. 2 [d]). Sewn and coiled sewn sandals are comparable to a certain extent (Veldmeijer, in press [b]).

Description

Coiled sewn sandals are a rather small group that includes specimens in the British Museum, the Petrie Museum of Egyptian Archaeology (UCL) and one possible example from Mersa/Wadi Gawasis (Table 1).

Sole

The soles are made of a bundle of *halfa* grass,[1] which is coiled. In the middle of the sandal, the coiling might start by including the end of the bundle together with the first coil in the winding (Fig. 2 [c]), or not (Fig. 3 [b]). Sewing with small strips of dom palm leaf secures the coils; in doing so, the strips wrap the bundle (Fig. 2 [d]). In this, the manufacturing technique is the same as in sewn sandals. In contrast to sewn sandals, in coiled or coiled sewn sandals, no edges are attached because there are no ends to finish: the coiling itself already results in

[1] The identification of the material is preliminary; study and identification, together with archaeobotanists Dr. C.R. Cartwright (Science Group, British Museum, London) and Dr. A.J. Clapham (Worcester Archaeological Services) is still in progress.

a strong edge. However, one of the studied examples, Petrie Museum UC 28314iii (Fig. 2 [c], double arrow), shows a very thin outer bundle. This edge is not functional in contrast to the edge in sewn sandals where it secures the ends of the horizontal bundles (Fig. 2 [a]).[2]

Among the few examples of coiled sewn sandals, two shapes can be distinguished (Table 1, Figs. 3, 4), both of which are made using different techniques. At least one, but possibly three, sandals (Table 1) are longitudinally symmetrical and thus straight, with a slightly constricted waist (*cf.* Type A of sewn sandals). Towards the front, the lateral as well as the medial edge diverge outward and terminate in a rounded toe.

Sandal EA 4432 has a shape that compares well with type B of sewn sandals. These two sandals differ from the other categories in that they are clearly swayed, that is the shape indicates for which foot the sandal is meant, and have a strongly pointed big toe area. The heel is rounded and the medial edge is almost completely straight until the curvature of the heel and big toe. The lateral edge is curved, giving the waist a slightly constricted appearance. Towards the front, the lateral edge runs distinctly outwards, thus creating the largest width of the sandal. The front gently curves towards the big toe. The shapes of the left and right sandals of EA 4432, however, are not exactly the same.[3] Nevertheless, they are registered as a pair, but it is questionable if they were originally a pair (Fig. 3 [a]). The big toe area in the left one is much more square relative to the right one, resulting in a straighter medial edge. The right sandal has a centre that is comparable, although it does not show the triangular start: the bundle is much thinner and could therefore be folded more tightly. The main difference, however, is the fact that the first bundle is coiled one time, the end of which tapers and finally terminates at the first bundle, at the same level as the slits for the back straps. On the other (lateral) side, a new coil is started at about the same level, forming the second coil on this side (double arrow in Fig. 3 [a]); it continues on the medial side as the third coil. Thus, the increase of width of the front part of the left sandal is done by increasing the width of the coils in the front half; with the right sandal, however, the width is increased by inserting extra, tapering coils.

Strap complex

Two different strap complexes can be identified. One is comparable to the type of straps seen in sewn sandals (Veldmeijer, in press [a]; in press [b]) but not much is left; only the attachment of the back strap to the edge of the sole is left in two examples (Table 1). The other type is best represented by the pair of sandals in the British Museum (EA 4432, Fig. 3 [a]). The front strap is a broad strip of papyrus, which is inserted between the bundles at the front, and secured with a half knot.[4] The other end is folded, and originally looped around the back strap, which is now almost entirely lost. However, the ends of the papyrus back strap are still *in situ*, showing that these are inserted between the second and third bundle (seen from the outermost bundle), rather than being attached to the outermost coil (Fig. 3 [a]). Each one is secured at the ventral surface by means of an overhand knot (Fig. 3 [a], inset of ventral view).[5]

[2] The third core that is sometimes seen is, however, decorative rather than functional.

[3] Note that in sewn sandals, the shape of the left and right sandal is in most cases, but especially in the B- and C-types, exact mirror images.

[4] See Veldmeijer (2006).

[5] *Ibidem.*

Note that at one side of the strap, the grass bundle has, seemingly, not been sewn, which can be seen at the outer side of one, and at the inner side of the other, strap. However, the stitches wrapping the adjacent bundle shows that a stitch went through it originally (Fig. 3 [a] inset, arrow); possibly the stitches were worn away due to the movement of the back strap. This observation is supported by the fact that the left sandal shows the same condition.

Production and wear

The production of coiled sewn sandals consists of various stages. First, the material was collected and prepared, for which the reader is referred to Wendrich (1999, 273–82), who, in her work on ancient Egyptian basketry, gives much attention to this topic.

Usually the grass is halfa-grass (*Desmostachya bipinnata* or *Imperata cylindrical*), which has been used extensively in Egypt throughout history. Sewing is done with strips of dom palm leaf (*Hyphaene thebaica*), a plant which was used extensively for basketry, matting and related objects (*e.g.* Greiss 1949, 252–3; Murray 2000, 620–1; Wendrich 1999, 274–7). Papyrus (*Cyperus papyrus*) was also used extensively in ancient Egypt, especially for the production of papyrus sheets for writing (Leach and Tait 2000). As already pointed out by Lucas (1948, 130), papyrus was never used much for basketry (but was sometimes used to make boxes) and seems to have been of limited use in footwear, despite the reference to papyrus sandals in texts (see also Veldmeijer, in press [a]). Papyrus was, however, often used for making the strap complex.

After preparation of the material, the grass bundle was, depending on the type of beginning, folded. Taking the left sandal of EA 4432 as an example, the first coil was wrapped but the true sewing would start as soon as the second coil was laid against one side of the first coil. The stitches, while wrapping the coil, went through the first bundle and its stitches.[6] This process continued by adding more coils. When the required shape and size was obtained, the end was, at least in the British Museum example, tucked in the last winding at the heel (Fig. 3 [a]). Finally, the straps were attached.

The weakest part of sandals is the straps, which are often broken off at the attachment with the sole. As in all footwear, the most severely worn spots of the sole is at the ventral surface, but especially the heel, caused by dragging. The Petrie Museum sandal (UC 28314iii, Fig. 2 [b]) also shows severe wear of the dorsal surface of the heel, consisting of the damage of the fibre, the impression of the heel of the foot in the sole and accumulated dirt.

Date and Distribution

Our knowledge of dating and distribution is fairly limited, due to the fact that much material in collections is without an archaeological context. There are, however, some dated examples. The Italian-American expedition at Mersa/Wadi Gawasis has unearthed several caves in

[6] In UC 28314iii, figure 2C, however, the stitches do not go through the stitches of the previous coil but rather in between them, *cf.* Veldmeijer (In press [b]). This is also observed in basketry (Wendrich 2000: 259, 260, figure 10.6a, b).

which remains of boats, including their equipment, such as bundles of ropes, were left by the Egyptians after their seafaring missions to Punt.[7] In front of the caves, part of a coiled fabric (Fig. 5) was found in a Middle Kingdom context during the 2005-06 season (K.A. Bard and R. Fattovich, pers. comm.). Although incomplete, enough is preserved to demonstrate the manufacturing technique, but the material is much more difficult to identify. The material is not papyrus, as has been suggested elsewhere (Zazzaro 2007, 196). The cores of the bundles most likely consist of grass, while the sewing strips might be palm. The measurements of the excavated remnant are inserted in the table, but we should bear in mind that, when still *in situ,* the length was substantially larger and extended well over 30cm. Due to the bad preservation, we cannot entirely rule out the possibility that the object is the (part of a) base of an oval basket (*contra* Zazzaro 2007, 196, who identified the remnants as 'papyrus sandal'). Note that there was no indication of waist or straps, although this in itself is not a proof against it being a sandal. Examples of oval baskets are abundant in Egypt and the coiled sewn technique is a well-known basketry technique, usually referred to as 'coiling' (for details on this technique see Wendrich 1999, 182–6; 2000, 255–61). For comparable examples from the New Kingdom community at Deir el-Medinah, see Gourlay (1981a, pls. X, XI)). Moreover, a comparable but larger piece, which is certainly a basket bottom, was found during the 2006-07 field season in one of in area WG39, inside Cave 3. Possible additional support is the fact that the Mersa Gawasis 'sandal' was found in front of the caves: also in front of the caves, albeit in a different area, other storage devices such as wooden boxes were discovered.

Discussion

The differences in the 'pair' of sandals in the British Museum (EA 4432) are substantial, suggesting they were not a pair originally. This, however, does not necessarily mean that they were not worn as a pair: perhaps the broken sandals of two pairs were discarded and a new pair was made with the two intact ones. The two sandals show fundamental differences in manufacturing technology: one is shaped by using bundles of a larger diameter, whereas the other one is widened at the front by inserting extra bundles, which suggests different traditions in sandal making. This, in its turn, could be an indication of different workshops.

Although the types of footwear in ancient Egypt are fairly limited, the variety within these types is enormous. Even with the biases in the archaeological record, as mentioned elsewhere (Veldmeijer, in press [a]), we are able to date sandals, albeit less precisely than one would like. The manufacturing technique, *i.e.* the sewing of bundles, is attested for basketry in prehistoric times. The sewing technique in footwear can at least be traced to Middle Kingdom times. One of the important criteria of dating footwear is shape. Coiled sewn sandals of straight shape are probably of Middle Kingdom date; this shape is also found in sewn sandals (so-called Type A). The swayed shape (Type B in sewn sandals), however, is only found in the Middle Kingdom (Montembault 2000, 47–50; Veldmeijer, in press [b]; Vogelsang-Eastwood 1994, 142). Although iconography is beyond the scope of this work and will be dealt with in a later

[7] There are excavations reports for each season, edited by the directors, available at www.archaeogate.org/egittologia. See also the final report of the first five seasons, Bard and Fattovich 2007. For a general account see Bard and Fattovich 2006, 1–3; Bard *et al.* 2008.

phase of the research on ancient Egyptian footwear, a survey suggests that this shape only occurs in reliefs and paintings of the Middle Kingdom. Moreover, the well-known wooden tomb sandals of Middle Kingdom times are often in this shape (although other shapes occur as well).

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Table 1: Coiled sewn sandals

∞ Registered as a pair, but see below

* The looping of the front strap is also seen in sewn sandals, but the attachment of the back strap differs.

¶ Measurements taken from photographs

Comparable to the attachment of the back strap in sewn sandals.

Collection/ Excavation	Identification	Provenance	Date	Sole			Strap complex
				Measurements (mm)	Shape	Start of Coiling	
British Museum	EA 4432∞	?	?	Heel width: 84.5 Front width: 122.3 Length: 295		End of bundle included in first coil	Back strap: inserted between bundles; front strap looped around back strap; secured at ventral surface with knot.*
Petrie Museum of Egyptian Archaeology	UC 28314i	Hawara	Middle Kingdom?	Heel width: 78 Front width: 111 Length: 233		End of bundle is first coil	Back strap: tied to outer edges.#
Petrie Museum of Egyptian Archaeology	UC 28314ii	Hawara	Middle Kingdom?	Heel width: 81 Front width (preserved): 94 Length (preserved): 183	 ?	End of bundle is first coil	Back strap: tied to outer edges.#
Petrie Museum of Egyptian Archaeology	UC 28314iii	Hawara	Middle Kingdom?	Heel width (preserved): 88 Front width. (preserved): 111 Length (as preserved): 210	 ?	End of bundle included in first coil	Back strap: tied to outer edges.#
Mersa Gawasis	cid_ ED40221A-B783-4D3C-A30F-EC0688E0348	Mersa Gawasis	Middle Kingdom	Width (preserved): 7.5 Length (preserved): 200 Length (as discovered): 320	?	End of bundle is first coil	?

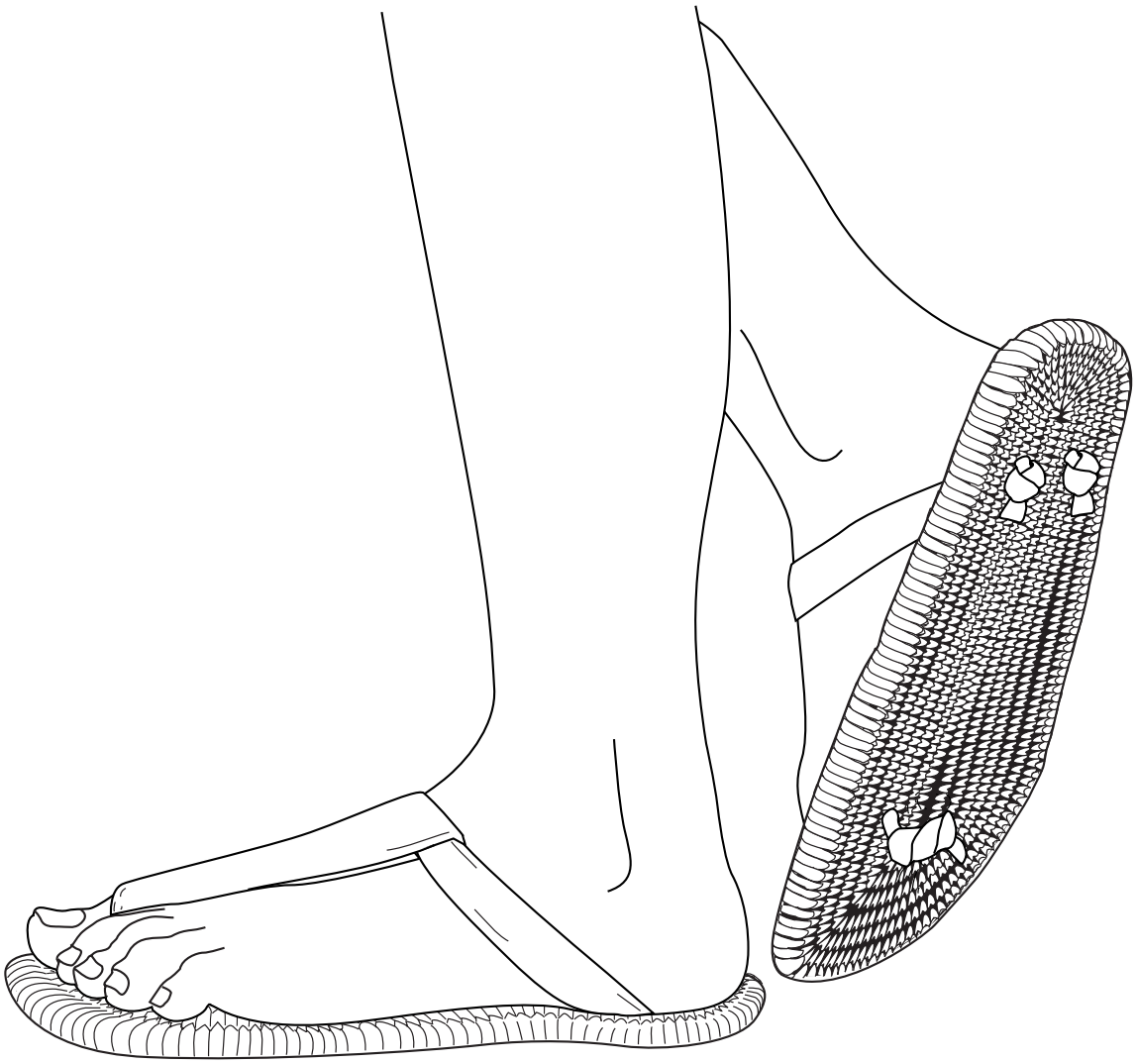

Fig. 1: Artist's impression of coiled sewn sandals, based on British Museum EA 4432 (Fig. 3). Drawing by M. H. Kriek.

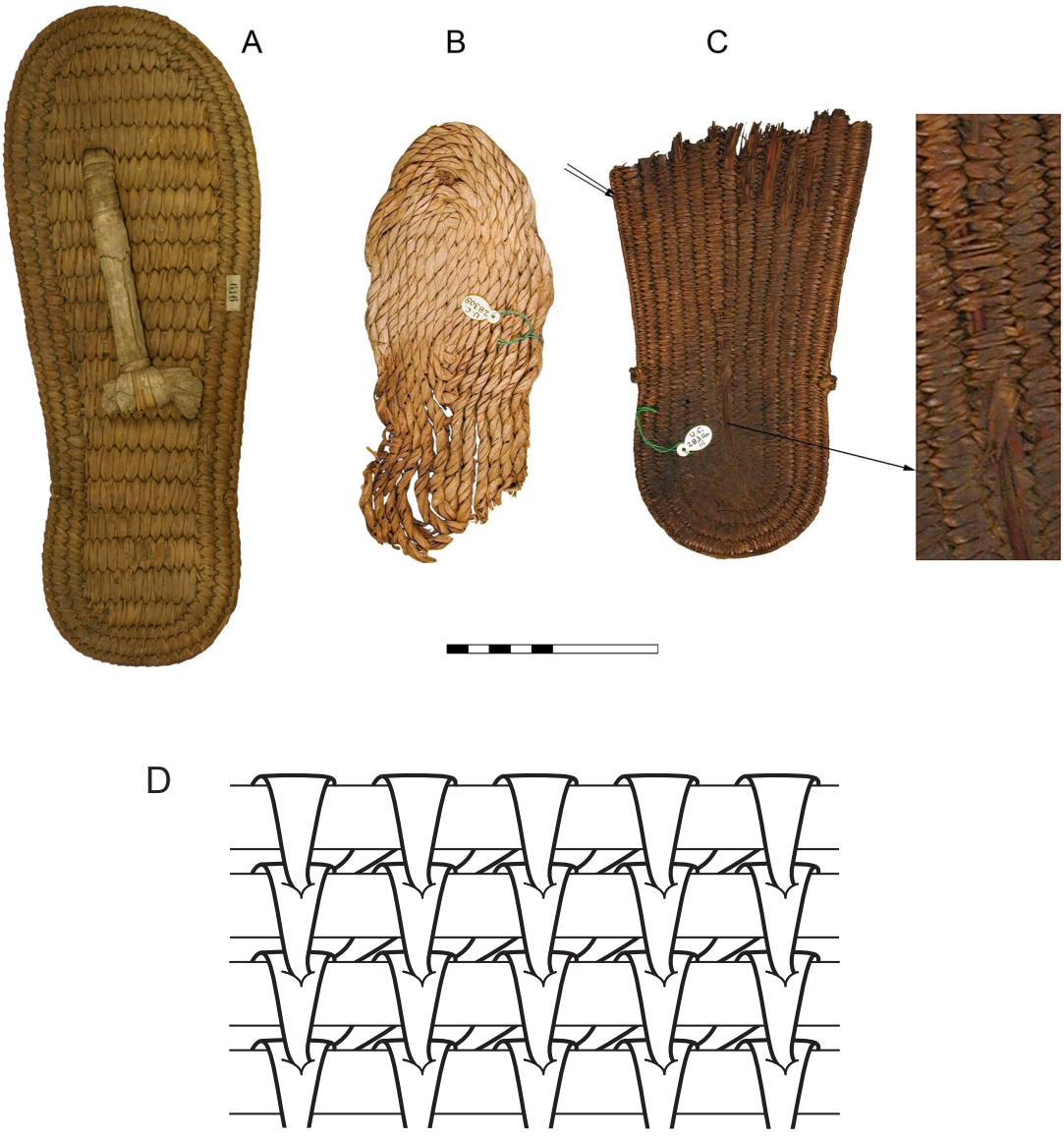

Fig. 2: Three sandals, made with closely connected manufacturing techniques. Scale bar in cm.
[a] Dorsal surface of sewn sandal, Ägyptisches Museum und Papyrussammlung Berlin ÄM 616. Photography by E. Endenburg, courtesy of Ägyptisches Museum und Papyrussammlung Berlin.
[b] Dorsal surface of coiled sandal, Petrie Museum UC 28308. Photograph copyright of the Petrie Museum of Egyptian Archaeology (UCL).
[c] Dorsal surface of coiled sewn sandal, Petrie Museum UC 28314iii.
Inset: detail of the start of the coiling in the centre of the sandal. Photograph copyright of the Petrie Museum of Egyptian Archaeology (UCL).
[d] Construction drawing of the sewing technique in footwear. Drawing by E. Endenburg. Not to scale.

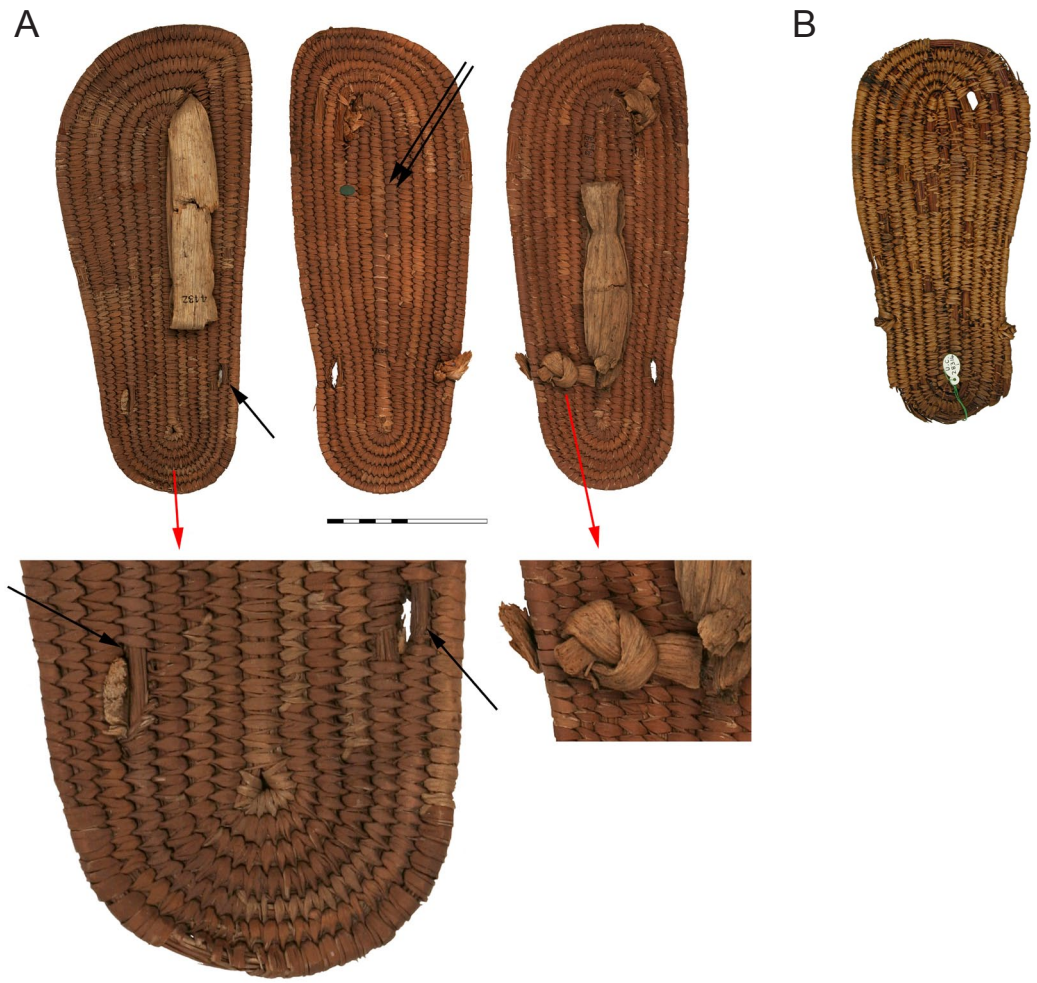

Fig. 3: Two coiled sewn sandals.
[a] British Museum EA 4432, from left to right, dorsal surface of the left and right sandals (showing the differences in shape as well as the difference in the way the coiling and sewing were started) and ventral surface of the right one. Note that the front strap is detached and inserted in the wrong side. The double arrows point to the extra bundles in the right one.
Inset bottom left: detail of the start of the coiling in the centre as well as the finishing at the outer edge of the left sandal. The arrows point to the bundle that lacks the stitching.
Inset bottom right: the straps are fastened at the ventral surface by means of a half knot.
Photography by A. 't Hooft. Courtesy of the British Museum.
[b] Petrie Museum UC 28314i, dorsal surface. Photograph copyright of the Petrie Museum of Egyptian Archaeology UCL.

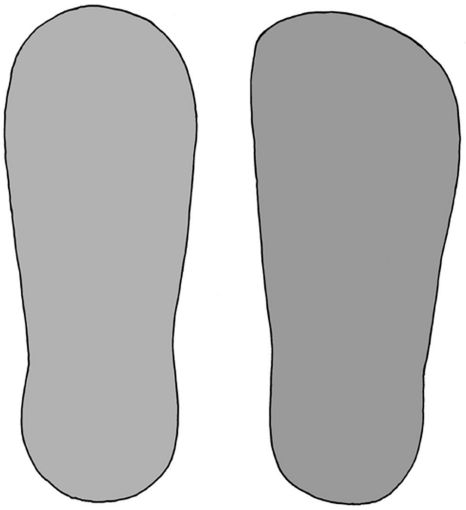

Fig. 4: Coiled sewn sandals occur in two different shapes. The left one is a straight sole (symmetrical longitudinally) and is similar to Type A of sewn sandals. The right one is a swayed model (the shape indicates the foot) and is similar to Type B of sewn sandals. Drawings by A. J. Veldmeijer. Not to scale.

Fig. 5: Coiled basketry or coiled sewn sandal, cid_ED40221A-B783-4D3C-A30F-0EC0688E0348, found in front of the caves at Mersa/Wadi Gawasis. Courtesy of University of Naples 'l'Orientale'/Boston University Expedition at Mersa/Wadi Gawasis.