A Late Period fish deposit at Oxyrhynchus (el-Bahnasa, Egypt)

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Abstract / Zusammenfassung

We describe the abundant faunal remains that were found in an extensive ritual deposit discovered in 2012 at Oxyrhynchus. This site in Middle Egypt has been famous since the first millennium BC for the mormyrid fish that were worshipped there and after which the town was named. The role played by these fish has already been amply documented through textual evidence, bronze statuettes and paintings, but until now, no remains and no mummies of these fish had been found. We first describe the ritual deposit as a whole, with emphasis on its extent, its stratigraphy and its relationship to the surrounding structures, which, together with a very specific artefact, allow the layers to be dated to the Late Period. The fish remains, as well as the sparse mammal bones, are quantified using both number of identified specimens (NISP) and minimum number of individuals (MNI). Body length reconstructions of the mormyrid fish are carried out using newly derived regression equations. Because of the large quantity of material, we performed the taxonomic identifications and size reconstructions on subsamples from which estimates were then made for the total number of fish that may have been present in the entire deposit. Attention was given to the way in which the fish bundles were prepared, a process that involved both the use of textiles and halfa grass, and to how the deposit was organised. We discuss the species spectrum in relation to both the Egyptian fish cult and evidence from written sources. Finally, we attempt to reconstruct the different events that may have taken place between the capture of the fish and their final deposition at the site, using a combination of both zoological/ecological and papyrological evidence.

Es werden umfangreiche Tierknochenmaterialien aus einer ausgedehnten rituellen Deponierung bei Oxyrhynchus beschrieben, die 2012 entdeckt wurde. Dieser in Mittelägypten gelegene Fundplatz ist berühmt wegen der Fische aus der Gruppe der Mormyriden, die dort bereits im 1. Jt. v. Chr. verehrt wurden und nach welchen dieser Platz benannt wurde. Die Rolle, welche diese Fische im Ritus spielten, ist durch Texte, Bronzestatuetten und Malereien bereits umfassend belegt, mumifizierte Exemplare lagen jedoch bisher nicht vor. In dem hier präsentierten Beitrag wird eine solche Deponierung erstmals komplett erfasst, sowohl im Hinblick auf ihre Ausdehnung und Stratigraphie, als auch den Kontext zu umliegenden Strukturen, welche gemeinsam mit sehr speziellen Artefakten eine Datierung der Ablagerungen in die Spätphase erlauben. Sämtliche Fischreste und die wenigen Säugetierfunde werden sowohl mithilfe der Anzahl bestimmbarer Stücke (NISP) als auch der Mindestindividuenzahl (MNI) quantifiziert. Unter Verwendung von Regressionsgleichungen wird die Körperlänge der Mormyriden rekonstruiert. Aufgrund der enormen Materialmenge können die Identifizierung und die Größenrekonstruktionen für verschiedene Untereinheiten erhoben werden. Damit ist es möglich abzuschätzen, wie viele Fische in der gesamten Anlage deponiert worden waren. Besondere Aufmerksamkeit wurde sowohl der Art und Weise gewidmet, wie man die Fischbündel mit Stoffen und Halfagrass herstellte, als auch der Frage, wie dieser Kultplatz insgesamt organisiert war. Das hier repräsentierte Artenspektrum wird im Hinblick auf den Fischkult in Ägypten generell und auch im Abgleich mit Hinweisen aus den Schriftquellen diskutiert. Schließlich wird versucht, den Ablauf der Ereignisse vom Fang der Fische bis hin zu ihrer Niederlegung an diesem speziellen Platz mittels einer Kombination von zoologisch-ökologischen und papyrologischen Evidenzen nachzuzeichnen.

Keywords: Ancient Egypt, Oxyrhynchus, Late Period, ritual deposit, fish mummies
Altes Ägypten, Oxyrhynchus, Späte Periode, rituelle Deponierung, Fischmumie

Fig. 1: Right lateral view of *Mormyrus kannume* captured from the Bahr Yusuf in April 2013. Catalogue numbers RBINS 24982 (SL 34 cm) and 24983 (SL 27 cm) (Photo: W. Van Neer).

1. Introduction

Animal cults are attested to in Egypt starting in the Predynastic period, but they became more popular during the New Kingdom, in particular at the end of the Dynastic period, during the so-called Late Period, and continuing into the Graeco-Roman period (Kessler 1989; Flores 2003; Ikram 2005, 7; Hoffmann & Kessler 2011). These cults are documented through votive statues, figurines, wall paintings, written accounts and, in particular, numerous mummies of a wide variety of species, such as dogs, cats, cattle, sheep, baboons, crocodiles and ibises. In some cases, fish were also worshipped. Examples are known from the sites of Esna, called Latopolis in Greek, where the Nile perch (*Lates niloticus*) was venerated (Lortet & Gaillard 1905, 185-190), and Lepidontopolis, where barbel (*Labeobarbus bynni*) was worshipped (Vernus & Yoyotte 2005, 205), and, of course, Oxyrhynchus, known as Per-medjed in ancient Egyptian. The name oxyrhynchus derives from the Greek word for 'sharp-nosed', and the fishes that it refers to are part of the taxonomic family of the Mormyridae (Fig. 1). Ancient writers, such as Strabo (Geography XVII, 1, 40), Plutarch (On Isis and Osiris 7, 353C and 72, 380B-C) and Aelianus (On Animals X, 46), described aspects of this cult practiced at Oxyrhynchus. The site is located in the el-Minya governorate in Middle Egypt, near the modern-day village of el-Bahnasa, about 190 km south of Cairo (28° 32′ 9.49″ N, 30° 39′ 19.21″ E). It lies west of the Bahr Yusuf, a branch of the Nile that feeds into Lake Faiyum (Fig. 2). Oxyrhynchus was the capital of the 19th nome of Upper Egypt during the Graeco-Roman period, and the site was of considerable importance because of its inland port and its strategic location at the junction of commercial roads. Starting at the end of the 19th century, the site received considerable attention for the large quantities of papyri that were collected there (e.g., Bowman et al. 2007), but actual excavations were only carried out relatively recently, starting at the end of the 20th century (Padró 2006).

Numerous bronze figurines of one of the genera of mormyrid fishes, *Mormyrus,* have been collected at various sites in the Nile Valley (Aubert & Aubert 2001, 328) and today can be found in museums and private collections. The sole figurine known thus far from the legal excavations at Oxyrhynchus (Pons 2015, 482) was recovered by the joint Egyptian–Spanish team that has been working at the site since 1992 (Padró 2006, 2008; Fig. 3). The same team also found polychrome murals depicting oxyrhynchus in two tombs of the so-called upper necropolis (Padró 2014; Pons 2014; Fig. 4) and on some stucco mummies (Mascort & Pons 2015, 25, Photos 11 & 12). Evidence for mummies was reported by Lortet and Gaillard (1905, 190), but they never saw any actual specimens. The only more detailed reference to this fish is by Bakry (1973), who mentions finds that were confiscated from the villagers of Zawiyet Barmasha, located at about 20 km north of el-Bahnasa. Two types of wooden coffins with the typical *Mormyrus* shape were retrieved, and were said to have still contained fish remains (Fig. 5 a, b). Because this faunal material is no longer available for analysis, the species

Fig. 2: Map of Egypt showing the location of Oxyrhynchus.

Fig. 3: Bronze statuette of a *Mormyrus* found in Tomb 23 at Oxyrhynchus (inv. 2010.64/390) (Photo: Missió Arqueològica d'Oxirrinc).

Fig. 4: Mural painting of a *Mormyrus* with Hathoric crown found in Tomb 18 at Oxyrhynchus (Photo: Missió Arqueològica d'Oxirrinc).

represented cannot be established. Although the use of wooden containers is known for other fish taxa (Guichard 2014, 306 cat. 340 a-d), it is likely, given their shape, that the coffins contained mormyrid fishes. The confiscated finds also included wooden objects representing 'Hathor crowns' or 'feather crowns', i.e. the cow horns of the Egyptian goddess Hathor enclosing a solar disk topped by two feathers (Fig. 5c).

Evidence for oxyrhynchus fish has been found elsewhere in Egypt as well, for instance, in the form of bronze figurines at Abydos (Naville et al. 1914, 96a; pl. 39.3) and dedications in the Faiyum, in line with statements by Strabo (Geography XVII, 1, 40) that this fish was revered all over Egypt. But although evidence for oxyrhynchus fish does not automatically imply an association with the town of Oxyrhynchus, the abundant papyrological evidence mentioned above, together with the find in 2012 of a large deposit of fish remains during excavations at el-Bahnasa, leaves no doubt about the identification of the archaeological site at el-Bahnasa as Oxyrhynchus.

The newly excavated material has the potential of documenting some of the cultic practices related to fish at Oxyrhynchus. Reports from the Greek authors, in particular Plutarch (On Isis and Osiris), about the Osiris myth may explain why some fish were excluded from the diet in certain places and why they were venerated. The fish deposit, which has thus far only been briefly mentioned in popular articles (Padró et al. 2012, 2013, 2014, 2015; Mascort & Pons 2015), is described in great-

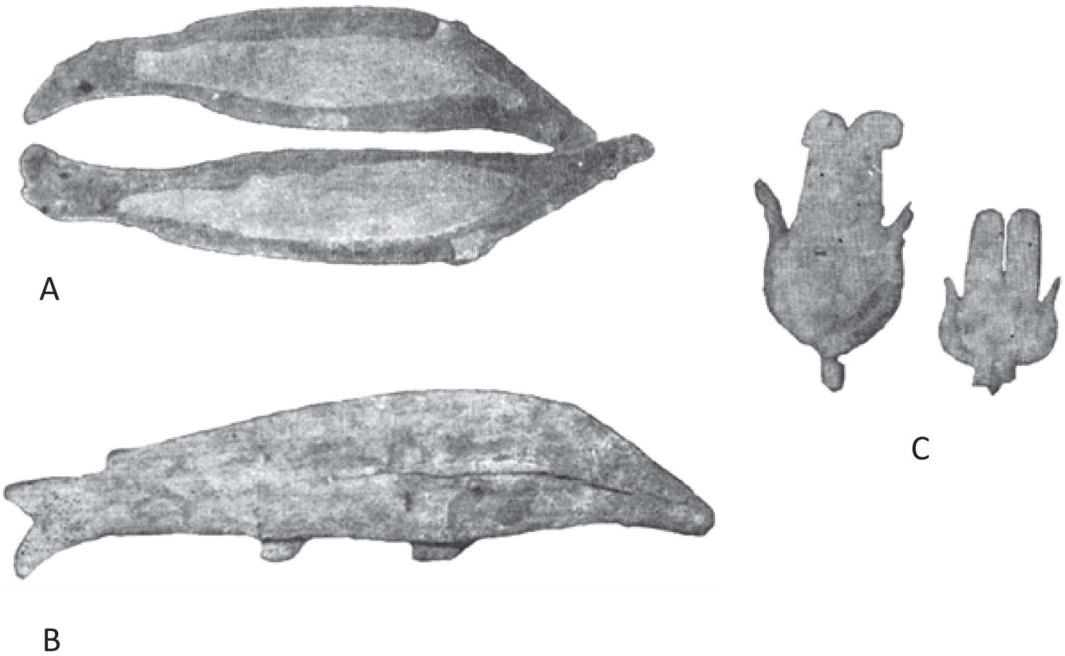

Fig. 5: Objects found at Barmasha. a. Interior view of the two halves that constitute a wooden coffin in the shape of an oxyrhynchus (after Bakry 1973, pl. VI); b. Right exterior view of another wooden coffin, made in one piece, that was hollowed out to enable it to contain a mummified fish (after Bakry 1973, pl. VII); c. Hathoric crowns made of wood (after Bakry 1973, pl. V).

er detail below. Its relevance for our understanding of ancient ritual practices is also discussed. In addition to attempting to reconstruct the series of events that took place between the capture of the fish and their deposition, we will also try to evaluate the faunal data with respect to the identification of the fish mentioned in the Osiris myth.

2. The fish deposits and their excavation

During the 2012–2013 season, excavations took place in the northwestern necropolis, which was in use from the Saite period (7th–6th centuries BC) to Byzantine times (4th–7th centuries AD; Padró et al. 2012; Mascort & Pons 2015; Fig. 6). Excavation of the zone south of Roman Tombs 11 and 23 revealed thick, layered deposits consisting of brown organic matter (Fig. 7) containing numerous fish in articulation, layers of halfa grass (*Desmostachya bipinnata*), and some textiles (Fig. 8). Unlike some examples with excellent preservation that are known from the literature, such as the Nile perch from Esna (Lortet & Gaillard 1905) or the unprovenanced *Bagrus* catfish described by Brier & Bennett (1979), the fish mummies and bundles of fish from Oxyrhynchus could not be lifted intact.

The excavated zone corresponds to units 31–32 (X4890-4910/Y5320-5310) and, partially, to units 34–35 (X4890-4910/Y5300-5310) of sector 2D (28°32′32.73″N, 30°39′07.01″E). The top of the archaeological layers is 40–41 m a.s.l. (above sea level), while the floodplain of the Bahr Yusuf is 34 m a.s.l. South of Tomb 11, three pieces of dressed stone wall (W 22754) were unearthed, as well as a wall of a structure delimiting Roman Tombs 25, 28 and 29 to the east. Archaeological material associated with these walls, which were oriented north–south, allowed them to be dated to the Roman period. A Byzantine crypt (C-5) is aligned with Tomb 23 and located west of a long, low wall (W 22757) with a north–south orientation that cannot be precisely dated. All these structural elements rested, at a height of 36.3 m a.s.l., on two reduction horizons with black chert nodules (SU 22762a-22762b), separated by a fine-grained and compact sandy stratum that was predominantly red–orange in colour (SU 22763) (Fig. 9).

Stone wall W 22757 rested on top of the remnants of a mud brick wall (W 22758) (Fig. 10) that was the counterpart of another such wall located 0.33 m farther east (W 22756). The mud bricks were of an average parallelepipedal module of 0.32 × 0.17 × 0.08 m that is well attested to in the Late Period (Spencer 1979, 52-53). The bases of these walls were in a trench dug through a layer of black chert nodules (SU 22762b). Wall W 22756 was preserved to a maximum height of 1.12 m over a length not exceeding 1.20 m, and wall W 22758 was 1.48 m high and 1.30 m long. Each wall consisted of two parts (see also Fig. 11): a basal part, starting from a height of 34.8 m a.s.l., with bricks that created a support for another alignment of bricks that formed a kind

Fig. 6: Overview of sector 2D with indication of the tombs, the fish deposits (SU, stratigraphic units) and the walls (W) mentioned in the text (Drawing: J. Gonzalez).

of vaulted wall. East of wall W 22756, under the tilted part of the wall, two clusters of 7 collapsed bricks were found. These had fallen on fish deposit SU 22761 at an altitude of 34.95 m a.s.l. They were covered by a loose layer (SU 22765a) of grey, unrefined sand mixed with limestone chips and gravel. Once the surface of this area had been cleared it became apparent that the fish deposit was cruciform in shape (Fig. 6, 9). Four partly overlapping depositional phases could be distinguished. The northern part (Fig. 9, area A), measuring about 1.50 m long and 0.50 m wide, corresponds to the first phase of deposition. The eastern part (Fig. 9, area B; ca. 1.73 × 1.40 m) represents a second phase of deposition. These two deposits are covered by a third, central deposit (ca. 2.43 × 1.12 m, maximum thickness 32 cm; Fig. 9, area C) that rests on wall W 22756 and partly covers the eastern deposit (area B). It is assumed that in the southwestern part, about 40% of this deposit was destroyed. Lastly, the southern deposit (Fig. 9, area D; ca. 2.80 × 1.20 m; maximum thickness 19 cm) corresponds to a fourth depositional phase.

It appears that in this deposit, and also in SU 22772 (see below), the different layers had undergone some kind of compaction in the centre that resulted in the centre of the deposit dipping down to 34.63 m a.s.l. (Fig. 11) in relation to the margins of the deposit. This must be due to the weight of these layers and to the leaching out of bodily fluids from the abdominal cavity of the fish, which would have resulted in a reduction in volume. It

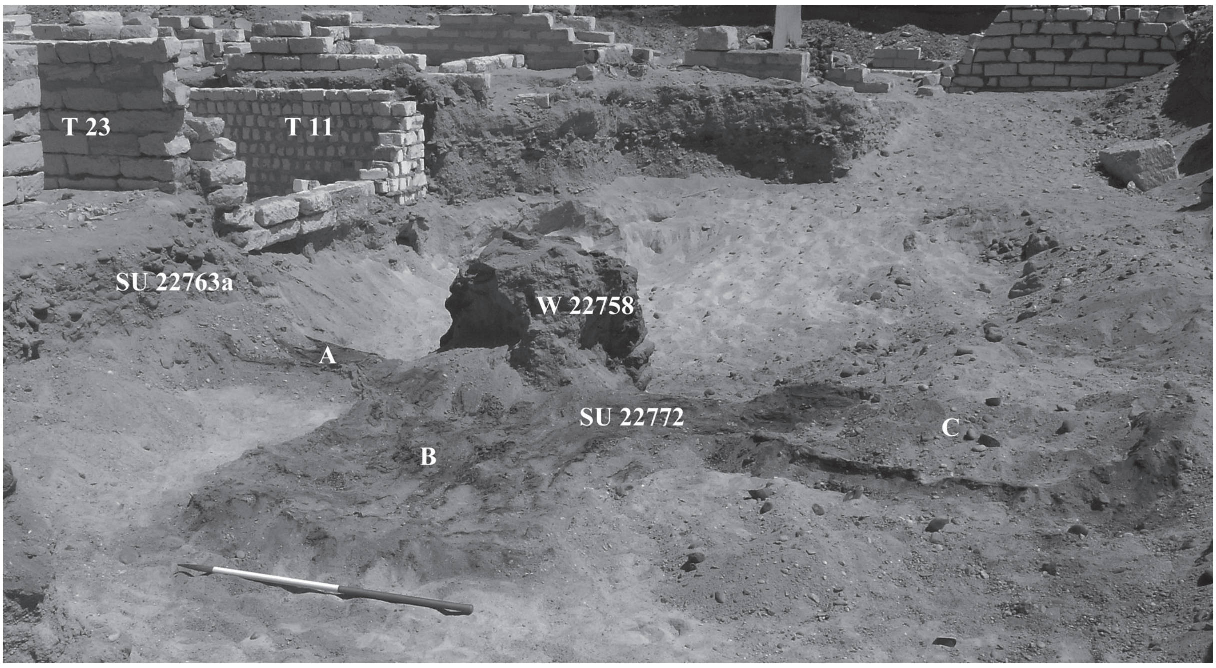

Fig. 7: Fish deposit SU 22772 at the end of the 2012 season, when SU 22761 had already been removed (Photo: Missió Arqueológica d'Oxirrinc).

Fig. 8: Detail of fish deposit SU 22772, showing vertebral columns, textile (below) and halfa grass (above, between the two rows of vertebrae) (Photo: W. Van Neer).

may also partly have been a result of desiccation curling up the edges, which may then have allowed sand to penetrate between the layers of fish and the bundles of textile and halfa grass. The sediment between these layers was comparable in texture to that of the unconsolidated sandy gravel horizon (SU 22760: mainly white to yellowish millimetric grains quartz), of which the thickness could not be recorded. In certain areas, fish deposit SU 22761 partly overlaid remnants of the layer with black chert nodules (SU 22762b).

A second fish deposit (SU 22772) was excavated west of wall 22758. It was T-shaped, and the maximum altitude, which occurred along its western border, was 35.56 m. It was covered with the same kind of sediment (SU 22765a) as fish deposit SU 22761. Three subdeposits were identified within SU 22772. The one in the northern part (Fig. 7, area A; 2 × 0.53 m) was the thickest deposit found on the entire site. In the centre of this deposit, the fish layers had compacted and had a total thickness of about 70 cm, whereas at the southern and

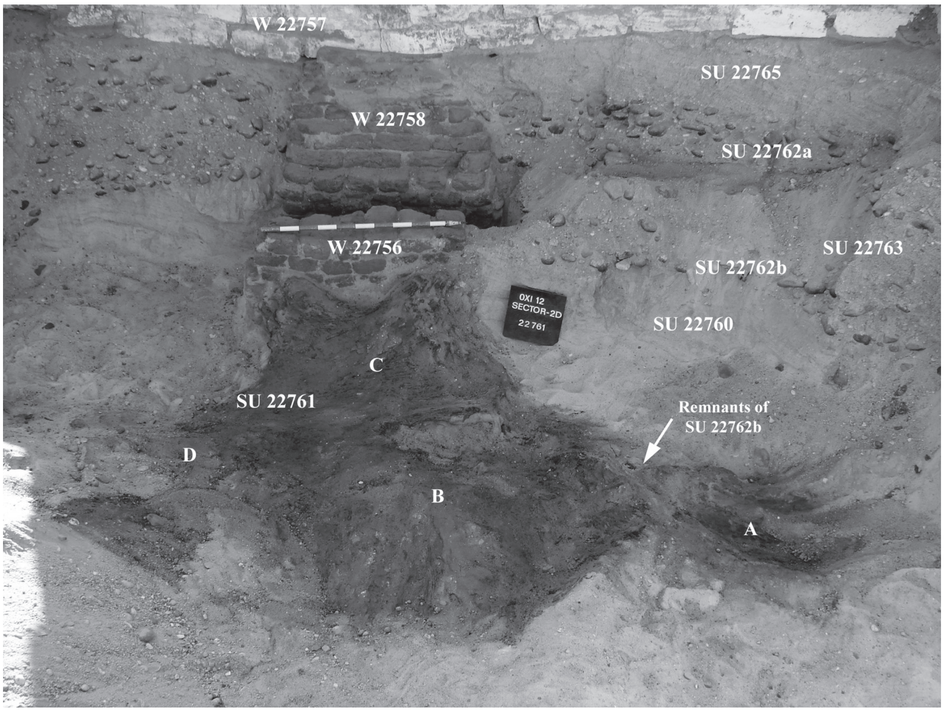

Fig. 9: Fish deposit SU 22761 and its association with the mud brick walls W 22756 and W 22758, viewed from the east (Photo: J. Gonzalez).

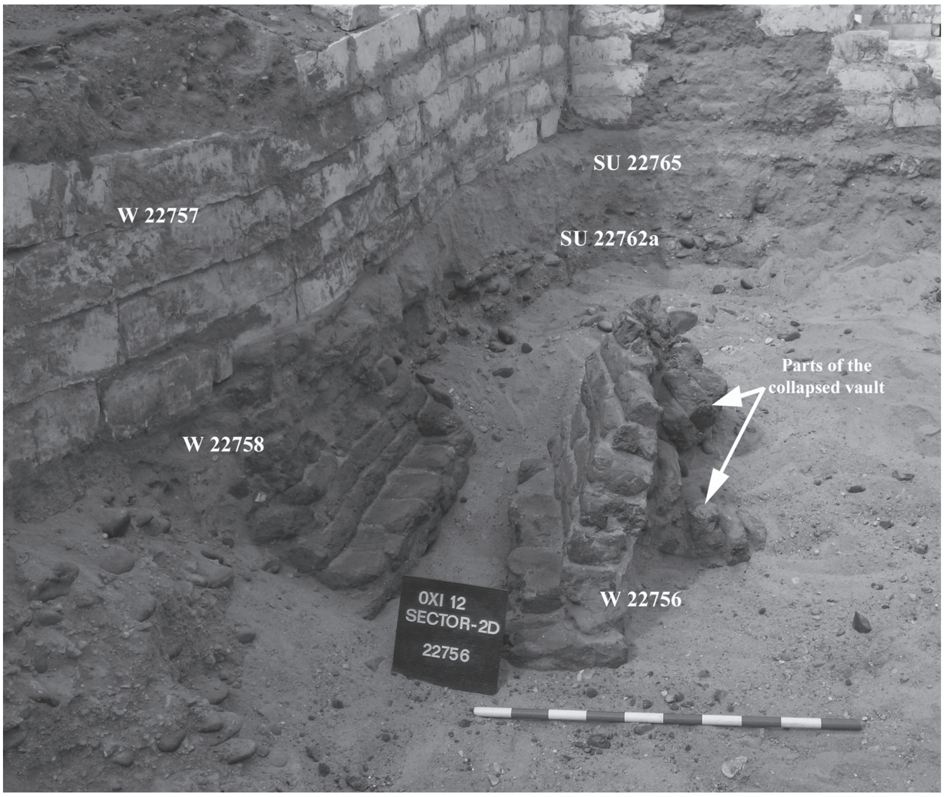

Fig. 10: The two collapsed mud brick walls (W 22758 and W 22756), viewed from the south (Photo: J. Gonzalez).

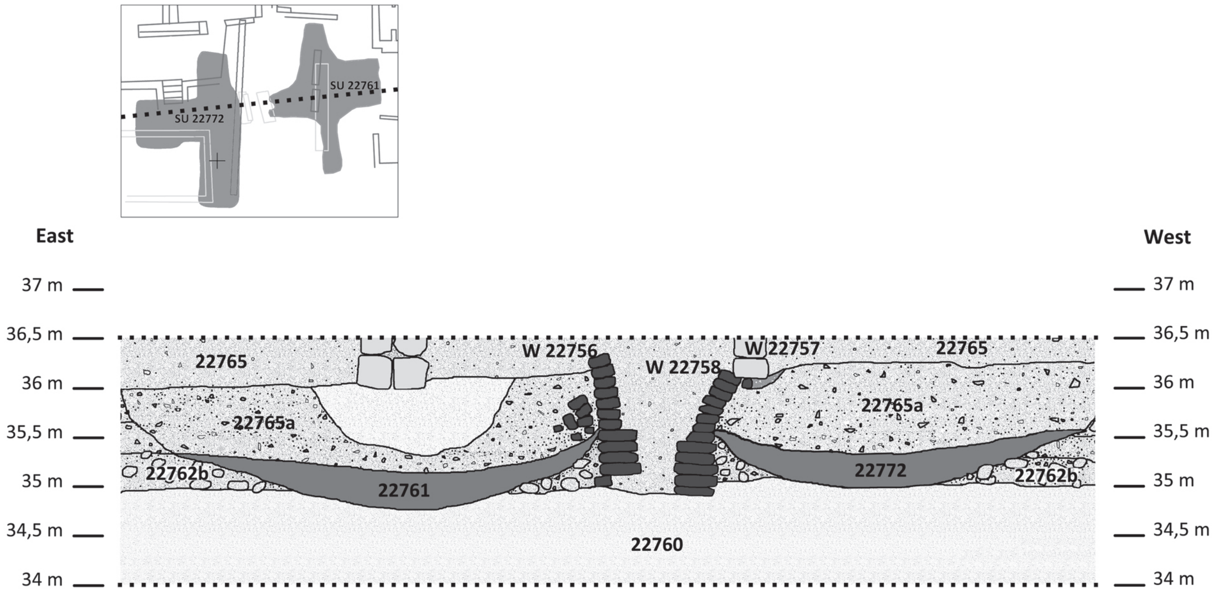

Fig. 11: East–west profile of the fish deposits, SU 22761 and 22772 (Drawing: J. Gonzalez).

Fig. 12: Detail of fish deposit SU 22772A, showing articulated fish, viewed from the east (Photo: E. Pons).

northern edges they were almost a metre thick (Fig. 12). A second deposit (Fig. 7, area B) covered a very large spatial extent (4.30 × 1.40 m; maximum thickness 30 cm). At its northeastern border, it partly overlaid the lower half of the northern deposit, and its eastern edge rested on mud brick wall W 22758. In the latter contact zone, the layers curved upwards, clearly indicating that the wall was already in place when the fish were deposited (Fig. 13). As in the other fish deposit, SU 22761, sand had penetrated between the layers in the marginal area. Adjacent to and south of the central deposit SU 22772B was a third deposit (Fig. 7, area C). It measured 2.82 × 1.10 m, with a maximum thickness of 19 cm. At an altitude of 35.26 m, the entire fish deposit SU 22772 lay directly on top of sandy horizon SU 22760, which was also observed below fish deposit SU 22761.

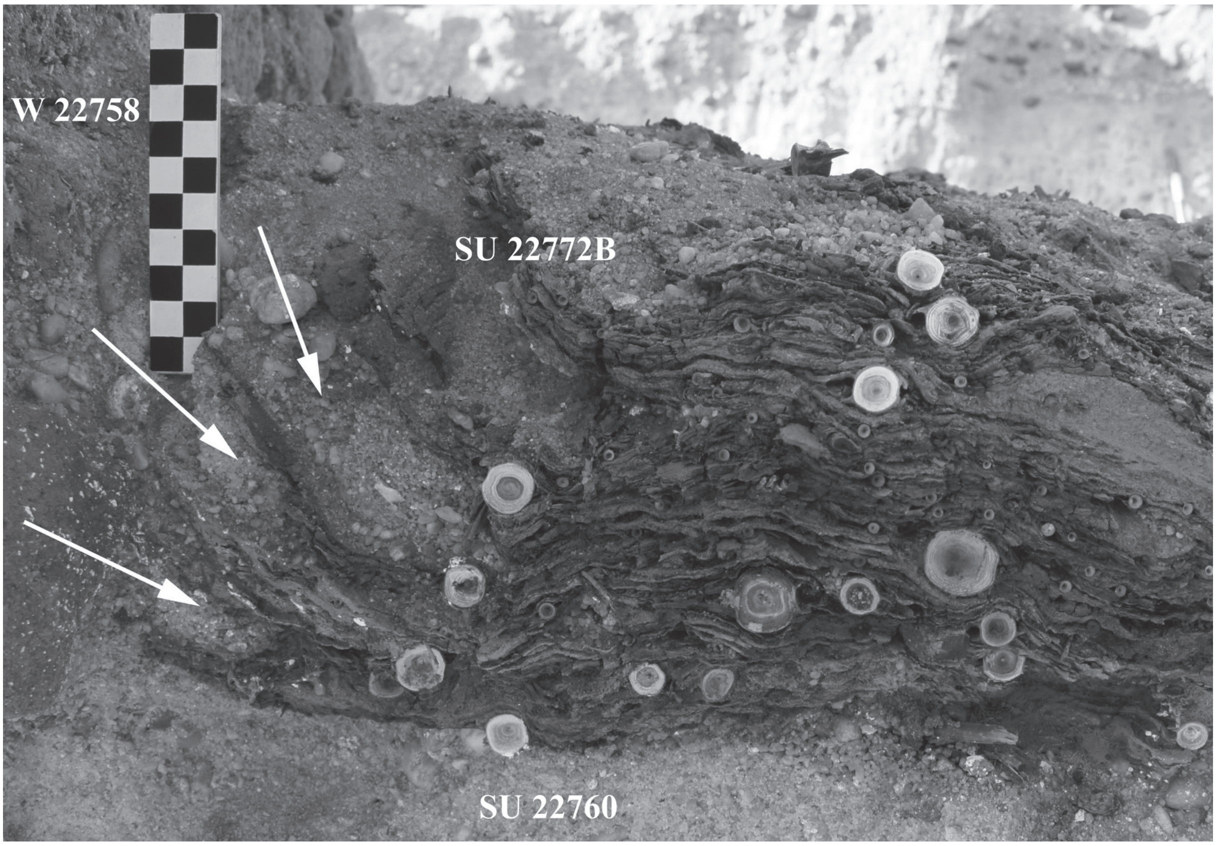

Fig. 13: Detail of the southern section of SU 22772B. Vertebrae of fish of different sizes can be seen between the thick layers of halfa grass. The arrows in the easternmost part of the deposit indicate layers of sand that had penetrated between the layers (Photo: J. Gonzalez).

Different excavation and sampling strategies used over the years have had an influence on the effectiveness of bone recovery. In the campaign during which the deposit was first discovered, the eastern fish deposit SU 22761 was excavated in its entirety, using only hand-collecting. From 2013 onwards, when the first author joined the excavations, the westernmost deposit, SU 22772, was investigated. The deposits that were hand-collected were subsequently sieved on nested 4 mm and 2 mm mesh. In 2013, efforts concentrated on SU 22772A, the relatively small, northern part of the deposit. Using small brushes, the excavators tried to expose and lift as many as possible of the individual articulated fish (Fig. 12). Due to the soft and unstable nature of the deposit, the fragility of the bones, and the difficult physical conditions during the excavation, in particular the wind, the skeletons could not always be adequately removed in their entirety. In addition to the individuals that were separately lifted and bagged, there was also a lot of isolated bone material that was recovered during the subsequent sieving of the remaining sediment. As will be shown in the results section below, the fish collected in the trench were of medium to large size. However, it was noted during brushing that smaller fish were also present, but these could not be properly exposed or lifted. The presence of these small fish could also be observed in the profiles (cf. the small vertebrae in the section of the adjacent deposit, SU 22772 B; Fig. 13). In 2014, with the aim of more adequately observing and lifting the smaller fish individually and better estimating the number of fish per unit volume, a small block of the fish deposit was extracted from the southern edge of UE 22772 B. The sediment was transported in a gypsum container to the excavation house, for excavation under more favourable conditions, that is, in the absence of wind and with fewer time constraints (Fig. 14). During the 2015 season, the remainder of the deposit UE 22772 (areas B and C) was excavated and sieved in its entirety.

The stratigraphic position of the fish deposit well below the level of Tombs 11 and 23 indicates that the assemblage must be pre-Roman. It also appeared during the excavation that the fish layers of SU 22772 were resting against mud brick wall W 22758, which, as already mentioned above, dates to the Late Period judging from the size of the bricks (Spencer 1979). This chronological attribution is supported by a wooden feathered Hathoric crown (inv. 2013/6), which is the sole archaeological object found in fish deposit SU 22772 (Fig. 15). It is identical to the crowns found by Bakry (1973) at the site of Zawiyet Barmasha (Fig. 5c), and the statu-

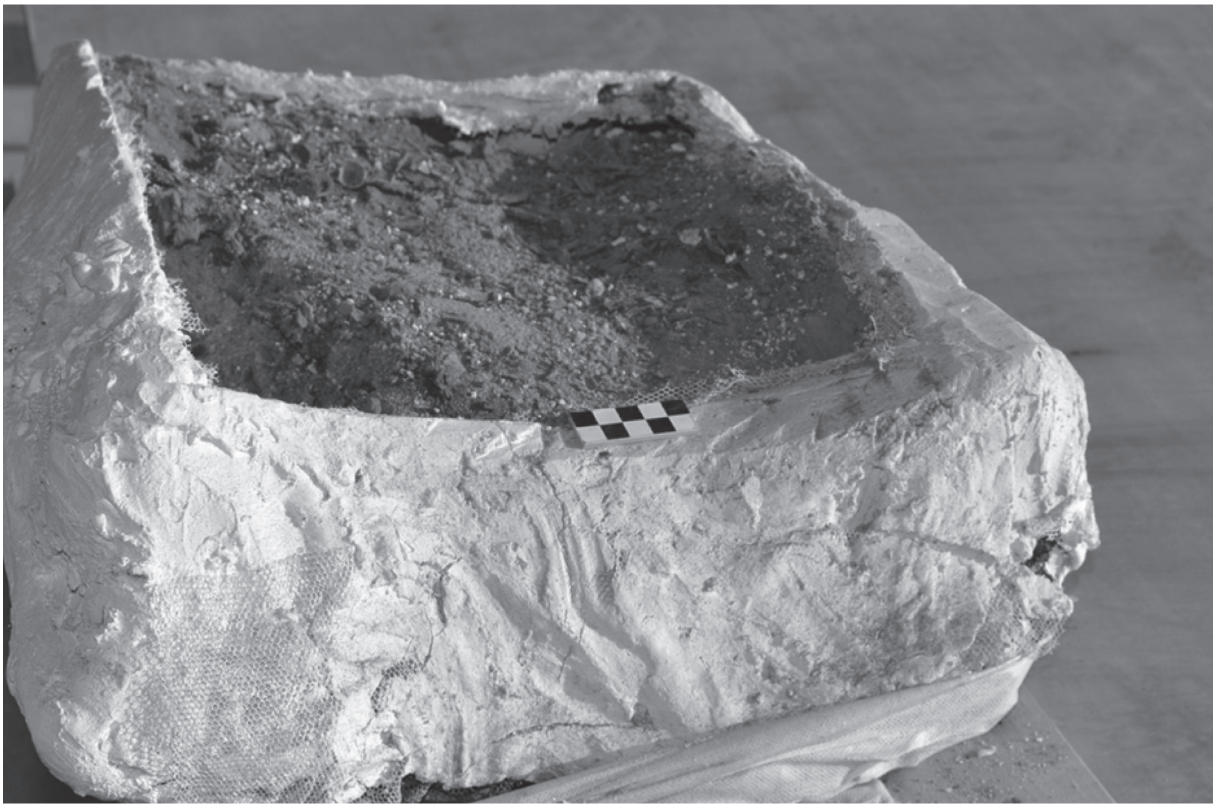

Fig. 14: Sediment block, extracted from SU 22772B, prior to its excavation (Photo: W. Van Neer).

ettes associated with the latter finds belong to the Late Period. This suggests that the Hathoric crown from Oxyrhynchus, and hence the associated fish deposit, also belongs to the Late Period.

3. Results

The identification of the fish remains was carried out with the aid of modern reference specimens that had been brought to the site. In an attempt to deal with the vast numbers of fish remains in a time-efficient manner, different quantification methods were tested, namely, NISP (number of identified specimens), MNE (minimum number of elements) and MNI (minimum number of individuals). The reconstruction of fish lengths was done by comparison with modern specimens of known length and, in the case of the mormyrids, by the use of regression equations that were established based on larger series of modern fish skeletons. Fish size was expressed as standard length (SL), i.e. the distance from the tip of the snout to the base of the tail.

3.1. The assemblage from SU 22761

The material from this assemblage was collected the same year that the fish deposit was discovered. As only hand-collecting was carried out, we can expect recovery to have been incomplete, with an underrepresentation or absence of smaller fish. However, this material, of which we identified about 80%, gives a good first impression of the overall composition of the deposit in this area (Table 1). The assemblage is dominated by the family of the elephant fishes (Mormyridae), and in particular by the genus *Mormyrus,* of which two species occur in the Egyptian Nile, namely, *Mormyrus kannume* Forsskål, 1775 and *Mormyrus caschive* Linnaeus, 1758. The difference between the two species is very subtle even in complete fish (Sandon 1950), and they can usually not be distinguished in archaeological fish. Both species can be considered equal to the oxyrhynchus mentioned by the classical authors. In addition to the 'real' oxyrhynchus (that is, *M. kannume* and *M. caschive*), bones from a third species in the Mormyridae family have been identified, albeit it in smaller numbers. This species is *Mormyrops anguilloides* (Linnaeus, 1758), whose cranial bones are morphologically distinct from those of the genus *Mormyrus* (Taverne 1972).

In the fish deposit, elements of the skull, the pectoral girdle and the pelvic girdle were identified in relatively low numbers, because they are rather brittle and therefore have a relatively low chance of being preserved compared with the vertebrae. Vertebral centra of the mormyrids predominate. However, only the precaudal vertebrae allow us to distinguish *Mormyrops* from *Mormyrus.* This explains why the majority of the unidentified Mormyridae remains in Table 1 are caudal

Fig. 15: Recto (left) and verso (right) of the wooden feathered Hathoric crown (inv. 2013/6) from SU 22772 (Photo: J. Gonzalez).

	NISP	% NISP	MNI	% MNI
Mormyrus sp.	2116	25.2	150	90.4
Mormyrops anguilloides	102	1.2	5	3.0
Mormyridae indet.	5880	70.0		
Bagrus sp. (bagrid catfish)	289	3.4	7	4.2
Clarias sp. (clariid catfish)	7	0.1	1	0.6
Lates niloticus (Nile perch)	1	0.01	1	0.6
Haplotilapiini (tilapia)	3	0.04	1	0.6
Labeobarbus bynni (barbel)	1	0.01	1	0.6
TOTAL	8399	100	166	100

Table 1: Number of identified specimens (NISP) from SU 22761 and an estimation of the minimum number of individuals (MNI) these represent.

vertebrae. The MNI was estimated on the basis of the precaudal vertebrae, of which 13 are present in each of the two species of *Mormyrus* and 20 in *Mormyrops*. All of the mormyrids combined represent 96% of the NISP in this assemblage, and a similar value is obtained for the MNI (93%). The relative importance of *Mormyrus* versus *Mormyrops* is 95:5 based on NISP and 97:3 based on MNI. Because this assemblage was not sieved, many small fish were probably not retrieved, therefore, we did not attempt detailed reconstructions of fish lengths. It appears that *Mormyrus* is represented in this assemblage by fish of variable size, from rather small individuals (about 15–20 cm SL) to very large ones (some in excess of 100 cm and up to about 120 cm SL). The *Mormyrops* vary in size from about 40–50 cm SL to almost 100 cm SL.

An additional five taxa occur in the assemblage (Table 1; Fig. 16, D-H), but only the bagrid catfish (*Bagrus* sp.) is represented by a substantial number of remains. In fact, this genus is even more frequent than *Mormyrops*. The bagrid remains comprise one skull fragment and one

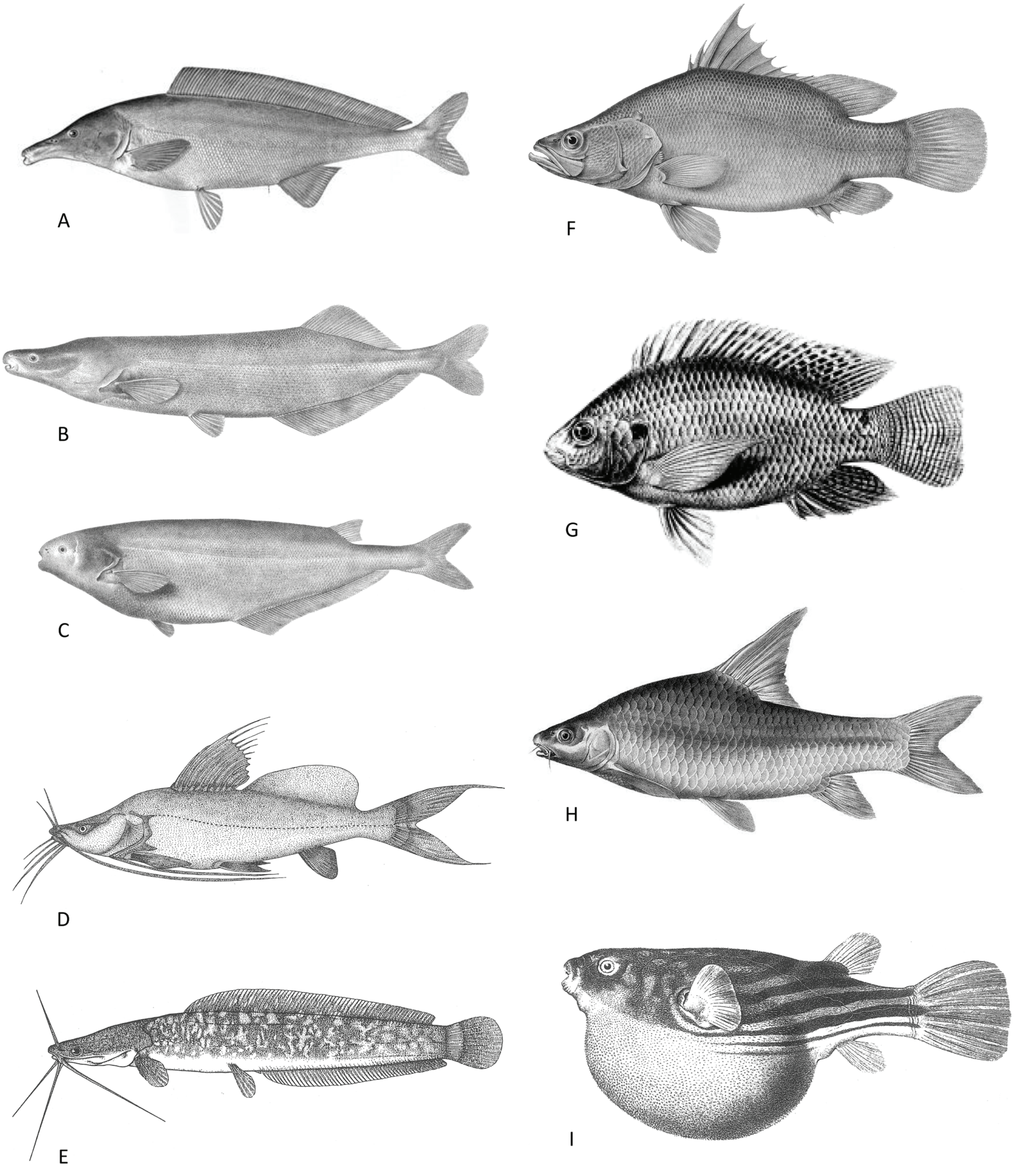

Fig. 16: All the fish taxa identified at Oxyrhynchus: A) *Mormyrus*, B) *Mormyrops anguilloides*, C) *Hyperopisus bebe*, D) *Bagrus*, E) *Clarias*, F) *Lates niloticus*, G) Haplotilapiini, H) *Labeobarbus bynni*, I) *Tetraodon lineatus* (Illustrations reproduced from Poll 1967 (A); Boulenger 1907 (B, C, F, H, I); Blache 1964 (D); Teugels 1986 (E)).

posttemporal, and for the rest only precaudal (80) and caudal (207) vertebrae. *Clarias* catfish is represented by seven caudal vertebrae that may belong to the same individual. The three tilapia bones found, an operculum and two precaudals, may also be from a single individual, measuring between 30 and 40 cm SL. The presence of Nile perch, *Lates niloticus* (Linnaeus, 1758), is only attested to by a skull fragment, and the barbel *Labeobarbus bynni* (Forsskål, 1775) by a pharyngeal tooth plate.

3.2. The assemblage from SU 22772A

The fish remains recovered from this northern extension of fish deposit SU 22772 (Fig. 12) come from a sediment volume of approximately 250 litres. A total of 130 fish could be lifted individually, and their sizes varied between 40–50 cm SL and 100–110 cm SL. The majority of the fish had been laid down in a north–south orientation, facing either north or south. The preservation of some of the specimens was extraordinary, al-

SL in cm	*Mormyrus* sp.	*Mormyrops*	Mormyridae	*Bagrus* sp.	*Clarias* sp.
>20	-	-	127	-	-
20–30	1	-	-	-	-
30–40	-	-	-	-	-
40–50	2	-	-	-	-
50–60	2	-	-	1	-
60–70	9	2	-	1	-
70–80	5	-	-	-	-
80–90	-	1	-	-	-
90–100	1	-	-	-	1
all sizes	20	3	127	2	1
remarks	skeletons rather complete	skeletons rather complete	skeletons rather complete; all from sieve	skeletons incomplete	skeletons incomplete

Table 2: Minimum number of individuals retrieved by hand-collecting and by sieving on 2 mm mesh from a 14 litre sediment block taken from SU 22772B, by reconstructed body length.

lowing us to observe the skin and the minute scales of the fish or, in one case, making it possible to count the number of dorsal fin rays. In that particular individual, 81 dorsal fin rays were present, allowing its identification as *Mormyrus caschive* because the other species, *Mormyrus kannume,* always has fewer than 75 rays (Sandon 1950). Numerous fish could not be adequately exposed and lifted, but their remains were recovered during the subsequent sieving of the sediment. The identifiable bones retrieved during sieving were mainly vertebrae, of which only the precaudals, which all appeared to be from *Mormyrus*, were quantified. The 620 precaudals correspond to 48 individuals. Using only the first precaudal vertebra, which is an efficient way of dealing with vast numbers of vertebrae, a MNI of 36 is obtained. This means that there is an underestimation of 25% compared with using all of the precaudal vertebrae, no doubt as a result of the more frail nature of the first precaudal vertebra.

The deposit also yielded a pectoral spine fragment of *Synodontis*, a mochokid catfish. The piece, which is broken and has an approximate length of 3.5 cm, shows some polish that may be use wear. This type of skeletal element can be hafted and then serve as an arrowhead (von den Driesch 1986a; Van Neer 1999).

3.3. The assemblage from the small sediment block taken from SU 22772B

During excavation in the field, we were unable to observe in detail or to expose and lift individually the numerous smaller fish that were present. In an attempt to improve our observations, a small sediment block with a volume of 14 litres was examined in the excavation house (Fig. 14). An overview of the fish retrieved from this sample is given in Table 2. The large and medium-sized animals that could be adequately lifted were mainly rather complete *Mormyrus* and *Mormyrops*, as well as *Bagrus* and *Clarias* catfish of which only small portions of the vertebral column were present. Besides these fish that were exposed by brushing and then lifted individually, there were numerous remains – mainly vertebrae – of small fish that could not be collected that way. For that reason, all the sediment was sieved on 2 mm mesh, after which the bones were picked out and the vertebrae counted. Given that we were unable to identify these small vertebrae below the taxonomic level of family, it was less time consuming to count all the vertebrae of these small fish than to handle each and every one of them and select the first precaudals, which was the procedure employed for the large and medium-sized fish from SU 22761 and SU 22772A. When the total number of these small vertebrae was divided by 50, which is the approximate number of vertebrae in a mormyrid fish, an MNI of 127 was obtained.

An observation that is worth mentioning here is that, now and then, organic layers alternated with fine layers of sand, in particular at the margins of the deposit. This shows that accumulation must have been relatively rapid, occurring over a rather limited time interval; otherwise, thicker layers of sand would be expected.

3.4. The assemblage recovered through nested sieving from SU 22772B

The material described below was collected during the 2015 season, when the last part of the fish deposit was excavated, namely, its central part (Fig. 7, area B). The fish were exposed by brushing and lifted separately as

Fig. 17: Dry sieving of sediment from SU 22772B on nested 4 and 2 mm mesh (Photo: W. Van Neer).

	MNI	% MNI
Mormyrus sp.	638	31.0
Mormyrops anguilloides	25	1.2
Hyperopisus bebe	2	0.1
small Mormyridae	1378	66.9
Bagrus sp. (bagrid catfish)	14	0.7
Lates niloticus (Nile perch)	1	0.05
Labeobarbus bynni (barbel)	1	0.05
Tetraodon lineatus (pufferfish)	1	0.05
TOTAL	2062	100.0

Table 3: Minimum number of individuals retrieved during the 2015 campaign by hand-collecting and by sieving on nested 4 and 2 mm mesh from SU 22772B.

much as possible. In addition, the sediment was sieved on nested 4 and 2 mm mesh. This is the largest assemblage from within the entire fish deposit that was systematically sieved (Fig. 17). It allowed us to add more taxa to the species list and also to make more accurate estimations of the fish size distributions. It was also possible to make additional observations on the way in which fish were processed and subsequently deposited.

An overview of the number of individuals is given in Table 3. For *Mormyrus* and *Mormyrops,* the MNI was established on the basis of the first precaudal vertebra. The presence of an additional mormyrid species, *Hyperopisus bebe* (Lacepède, 1803), was shown by two tooth plate fragments (either parasphenoid or suprabasihyale) of fish of about 20 cm SL. The fish labelled as small Mormyridae all come from the 2 mm fraction. The MNI of 1378 was established by dividing the total number of vertebrae (68,800) by 50, which is the approximate average number of vertebrae in this family.

Using 12 modern reference specimens of *Mormyrus caschive* and *M. kannume* ranging in size between 27 and 93 cm SL, we calculated regression equations that

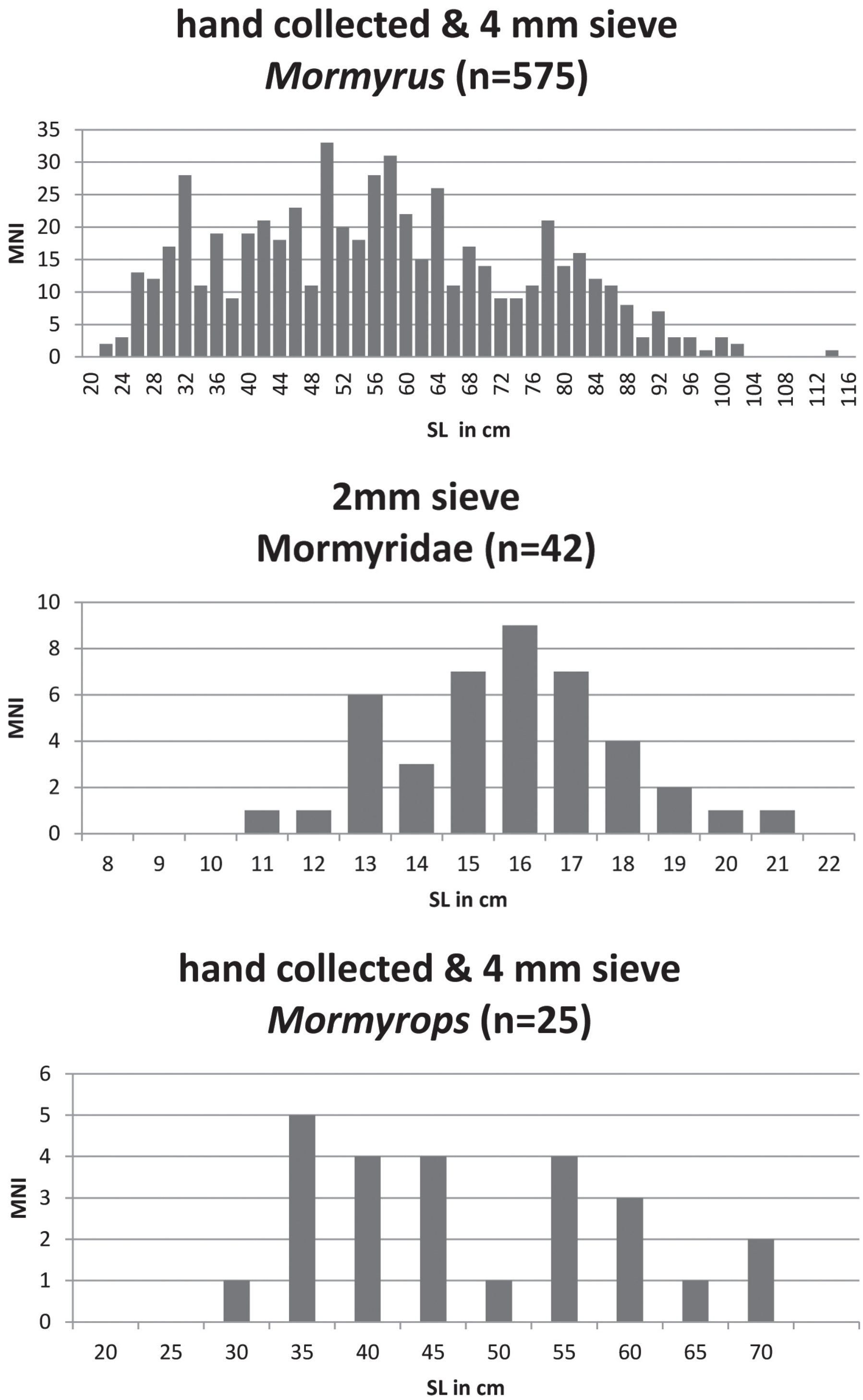

Fig. 18: Length reconstructions of the mormyrids from deposit SU 22772B.

allow for the reconstruction of fish size based on the posterior width of the first vertebra and of the basioccipital.

posterior width of first vertebra: $SL = 6.2401x^{0.9776}$ ($R^2 = 0.9879$)
width of basioccipital: $SL = 3.9988x^{1.1415}$ ($R^2 = 0.9891$)

When we applied the formula for the first vertebra on the hand-collected and 4 mm sieve material, the length distribution seen in Fig. 18 (upper graph) was obtained (MNI = 575). The reconstructed lengths vary between 21 and 115 cm SL, and several peaks can be noticed in the distribution. The absence of fish below 21 cm SL is of course an effect of the mesh aperture, since smaller bones will have passed through the mesh. For the fish bones from the 2 mm sieve fraction, we selected the ba-

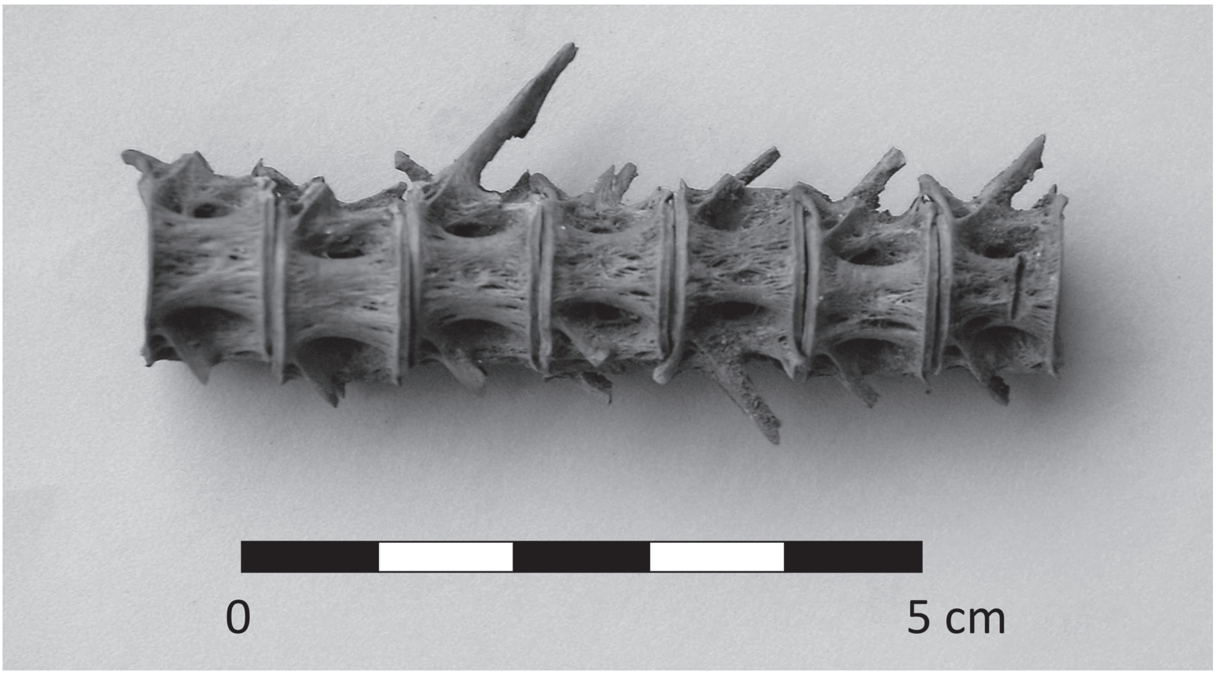

Fig. 19: Seven articulating caudal vertebrae of *Bagrus* sp., with a cut mark on the last vertebra of the series (Photo: W. Van Neer).

sioccipitals for the size reconstructions. Because of their larger size compared with first vertebrae, they were the most conspicuous element that could efficiently be picked out with tweezers from the thousands of minute bones. Compared with first vertebrae, it was also easier to manipulate the basioccipitals and to measure them. Because of time constraints, only a subsample of 42 of these elements were measured (Fig. 18 middle graph). The reconstructed sizes vary between 10.9 and 20.0 cm SL. Because this is only a subsample and because there are twice as many small mormyrids as medium-sized and large ones, it is obvious that a combined graph of all the 4 and 2 mm material would result in a large peak at the left of the graph.

For *Mormyrops,* a regression formula was established for the greatest posterior width of the first vertebra, using the seven modern reference specimens that we have at our disposal. They range in size from 28.5 to 66 cm SL and comprise 3 *M. anguilloides* from the Nile and 3 *M. deliciosus* (Leach, 1818) and 1 *M. oudoti* (Daget, 1954) from the Niger River.

posterior width of first vertebra: SL = $10.598x^{0.7003}$ ($R^2 = 0.9169$)

The distribution of the reconstructed lengths of all 25 first vertebrae of *Mormyrops* from SU 22772B is given in Fig. 18 (lower graph).

In contrast to the Mormyridae, none of the other taxa are represented by complete fish. In the case of *Bagrus*, a single cranial fragment was found from an individual of about 60–70 cm SL; all the other remains are vertebrae. They represent a minimum of 14 clusters of articulating vertebrae that correspond to fish chunks from different parts of the body. It appeared, however, that most of the larger portions – consisting of up to 24 articulating vertebrae – were from the middle of the body, which is the meatiest part. In several cases, cut marks could be observed on the lateral side of the first and/or last vertebra of an articulating series (Fig. 19). The reconstructed body lengths of the fish from which the chunks were taken varied between 50–60 and 70–80 cm SL. The two Nile perch bones that were found, a hyomandibular of a fish measuring 75 cm SL and a branchiostegal of a large animal, may belong to the same individual. Eight cyprinid bones were found in the deposit, of which two precaudals and a cleithrum could be confidently identified as *Labeobarbus bynni*. The three caudal vertebrae (of which two articulate) and two dorsal pterygiophores that are in the same size range (60–70 cm SL) as the barbel, probably belong to the same individual. A final species that was found in SU 22772B is the Nile puffer fish *Tetraodon lineatus* (Linnaeus, 1758), represented by a left pteroticum and a first precaudal vertebra of a fish measuring 35–40 cm SL.

In addition to fish, this deposit also yielded some remains of other species. A single mandible of a house mouse (*Mus musculus*) and three bones (left and right mandible and left maxilla) of a shrew (Soricidae) belonging to the same individual were also recovered. The proximal end of a cattle rib that was found had a cut mark through the neck. In addition, two partial

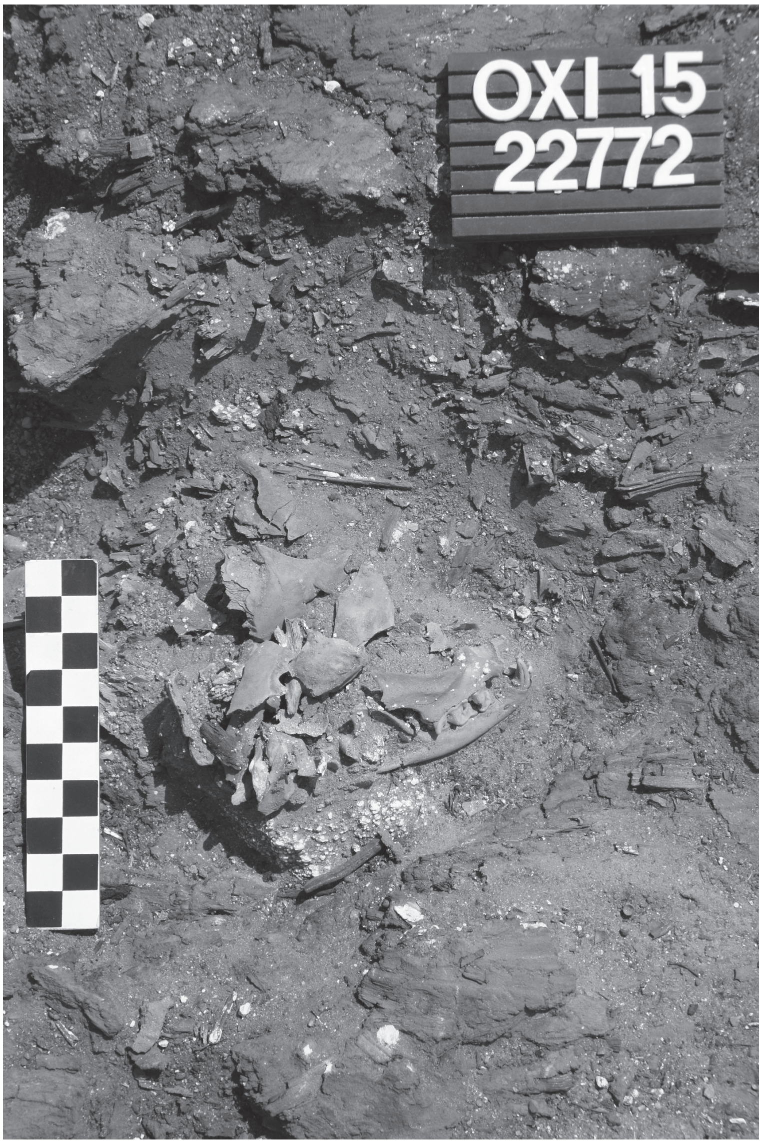

Fig. 20: Skull and mandible remains of a young cat from SU 22772B (Photo: J. Gonzalez).

skeletons of cats were found. A young cat (Fig. 20) is represented by its skull, the mandibles, two unfused cervical vertebrae, one unfused thoracic vertebra, and a radius with an unfused distal epiphysis. The second individual was an adult of which all of the vertebrae, part of the skull, and a femur were present.

3.5. Observations on the organisation of the fish deposit

When, at the end of the excavations, the lower levels of the deposit had been reached, it became clear that the lowest layers of fish were in contact with the virgin sandy soil and that apparently no particular preparation of the area had taken place (Fig. 11, 13). As far as the large and medium-sized mormyrids are concerned, it was clear that there was some kind of standardisation in the positioning of the fish bodies. In SU 22772A, all the fish were oriented north–south (Fig. 12), whereas in UE 22772B, layers of fish with a north–south orientation alternated with layers of fish with an east–west orientation. During the excavation, it was noted that layers with abundant fish bodies alternated with levels that were almost exclusively made up of vegetal matter. These layers, which were often very thick, were composed of the stems and rhizomes of halfa grass (Fig. 21). Sometimes fine layers of sand were also observed. Pieces of textile were regularly noticed, but detailed observations on individual fish mummies or fish bundles could only be made sporadically as a result of their brittle nature. Only now and then was a partial fish bundle found intact, but no entire fish mummies could be lifted (Fig. 22). Nevertheless, it was possible during and after the excavation to document the various ways in which fish were processed and to document the types of wrapping that were applied. In some cases, a bundle

Fig. 21: Mormyrid vertebral columns resting on thick layers of halfa grass in SU 22772. The vertebrae are partially covered by a thin layer of cloth bandages (Photo: J. Gonzalez).

Fig. 22: Tail parts of fish mummies emerging from under the thick layers of halfa grass (Photo: W. Van Neer).

contained a single fish, around which up to six or seven layers of textile were folded, held together with textile ropes or braided vegetable fibre ropes (Fig. 23, 24). In a few instances, knots in these ropes were observed. Another kind of wrapping involved fabric strips – arranged in a criss-cross pattern – being applied over the different layers of textile to keep the bundle together (Fig. 25). Most of the bundles contained two to three fish of medium to large size, and in several cases it was noticed that small fish had been put between the layers of textile that were used to wrap the large fish (Fig. 26). Halfa grass was applied on top of the fish bundles (Fig. 27), but above all it was used in very large quantities to separate the different thick and extensive layers of fish (Fig. 21, 22). Occasionally, deviations from the aforementioned treatment were noticed, i.e. halfa grass applied in flat layers directly on top of the fish without any visible use of textile, or small fish deposited within layers consisting only of halfa grass. The use of halfa grass is attested to since at least the New Kingdom (16th century BC), for instance, at Gurob (Faiyum), where fish wrapped in halfa were discovered in shallow pits (Gasperini 2010, 42-50). No bundles containing only small fish were observed in the Oxyrhynchus deposit.

All the observed textile fragments showed the simplest form of weaving (tabby weave). A significant number of fragments had a yarn count of 30 × 10 per cm (Fig. 28), which results, in most cases, in a quite fine textile with a 'faced' effect. A yarn count of 25 × 9 per cm was also noted, particularly in pieces with a loose weave. In strips of rolled textile, an average yarn count of 19 × 8 per cm was observed (Fig. 25, 29). In one case, the sel-

Fig. 23: Shroud with crossing strips from SU 22772 (Photo: J. Gonzalez).

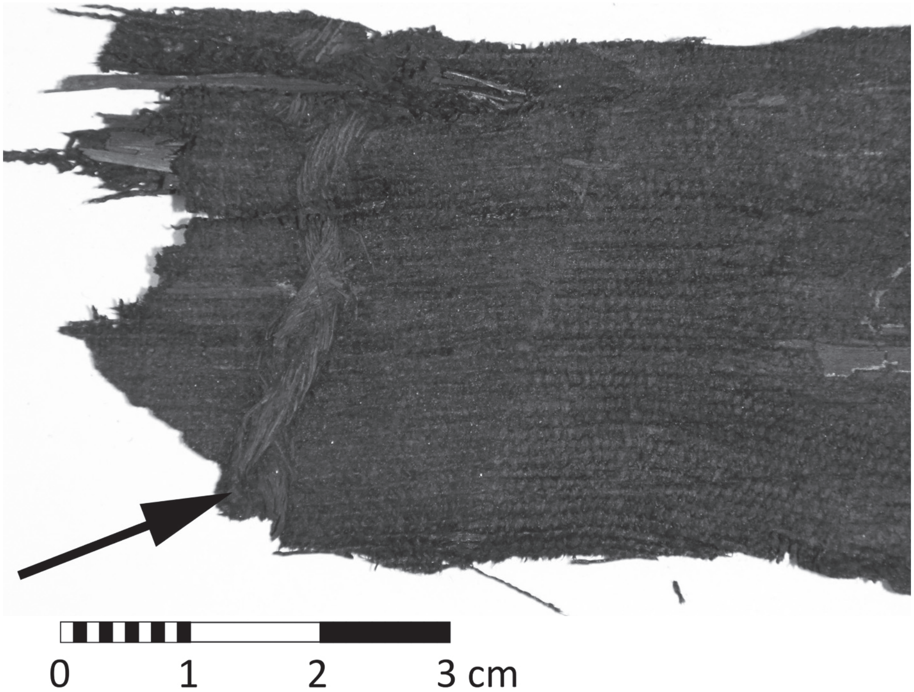

Fig. 24: Shroud with a braided vegetable fibre rope from SU 22772 (Photo: J. Gonzalez).

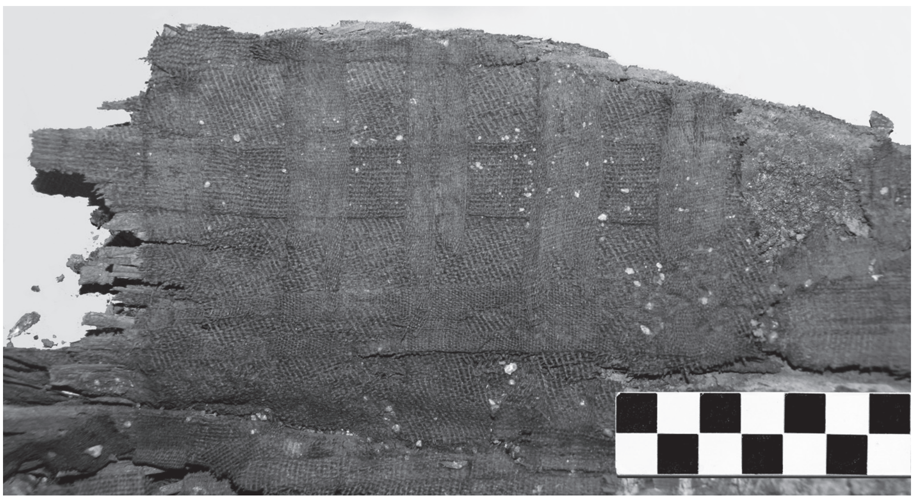

Fig. 25: Example of the wrapping that surrounded one of the fish mummies from SU 22772, consisting of a lattice of linen strips over a cloth shroud (Photo: J. Gonzalez).

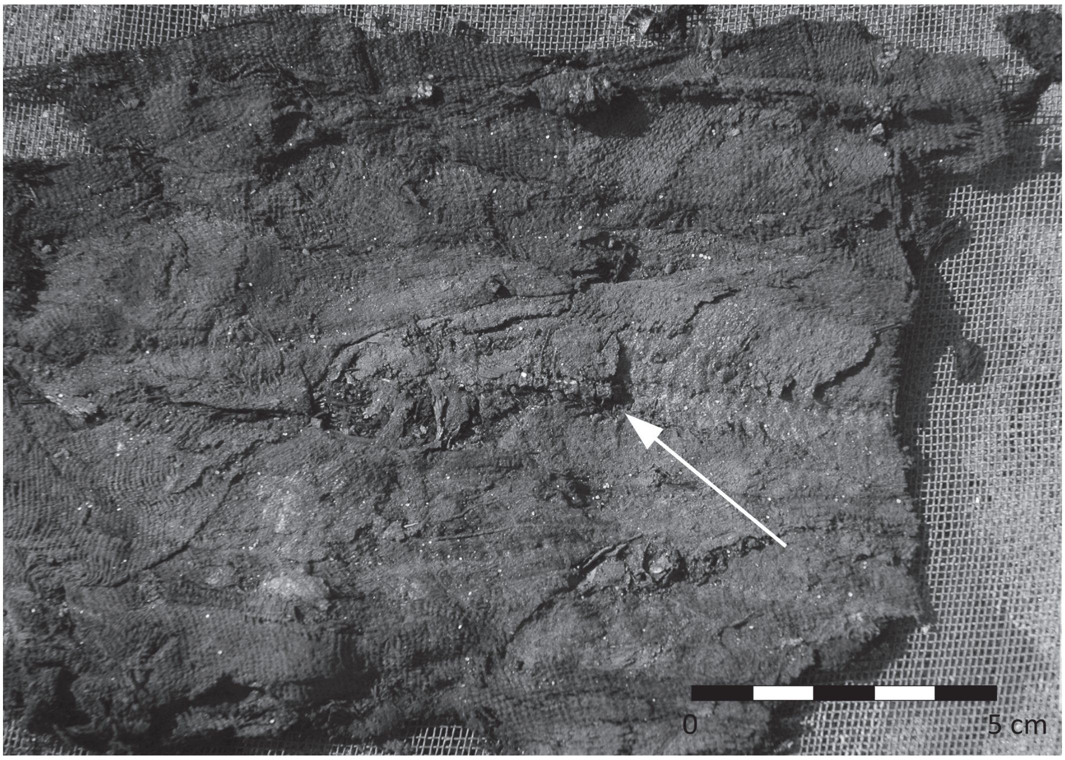

Fig. 26: Inner part of a fish bundle from SU 22772, showing a small fish that was packed between layers of textile (Photo: W. Van Neer).

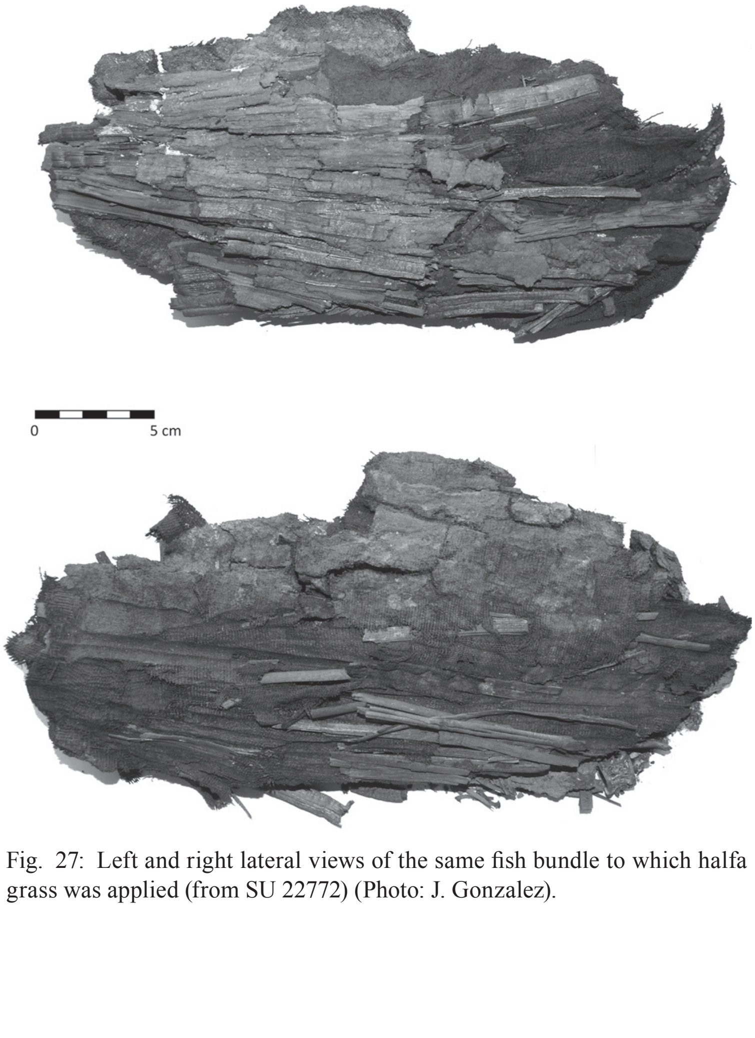

Fig. 27: Left and right lateral views of the same fish bundle to which halfa grass was applied (from SU 22772) (Photo: J. Gonzalez).

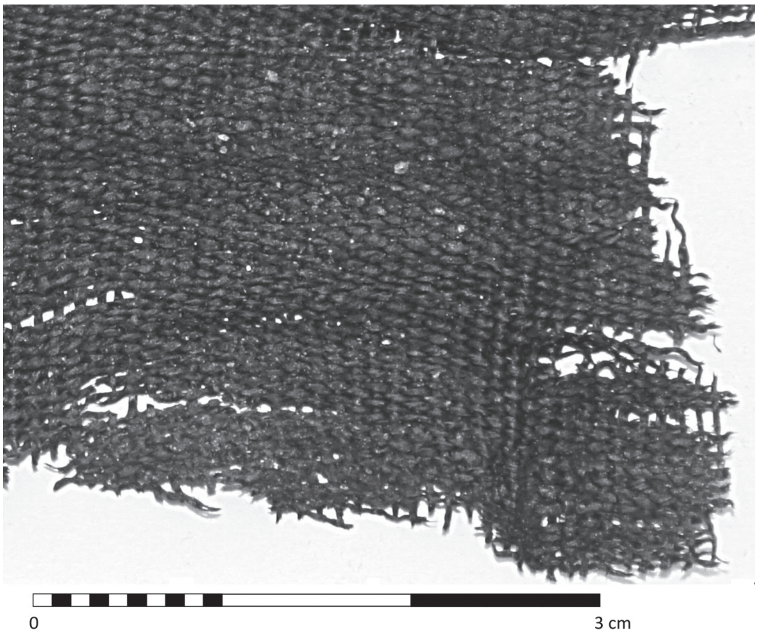

Fig. 28: Tabby weave in a linen shroud from SU 22772 (enlarged view of a portion of Fig. 30, below) (Photo: J. Gonzalez).

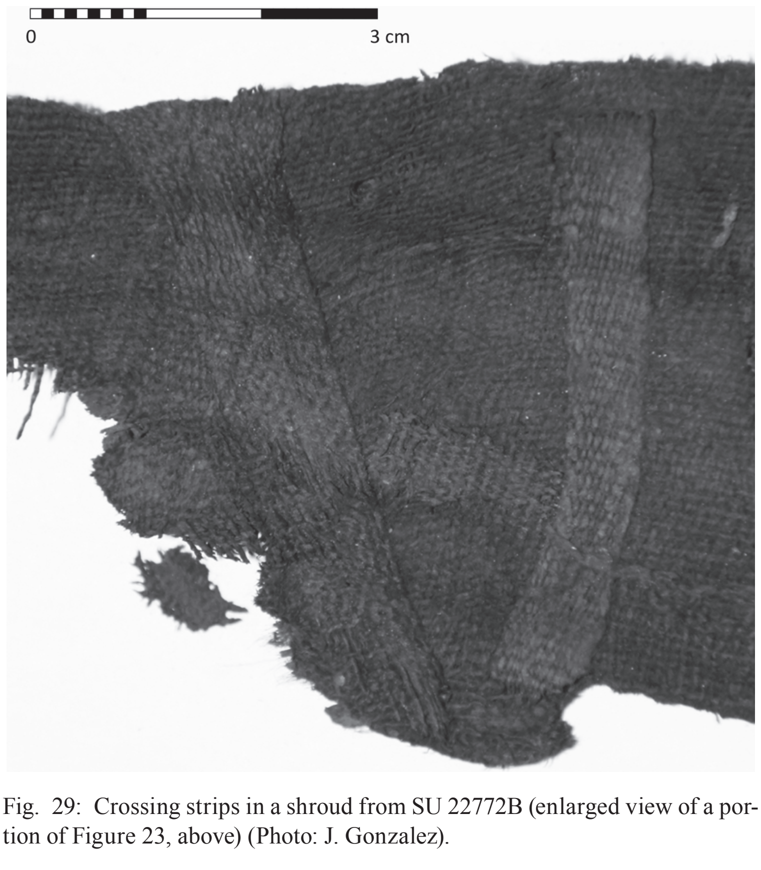

Fig. 29: Crossing strips in a shroud from SU 22772B (enlarged view of a portion of Figure 23, above) (Photo: J. Gonzalez).

vedge, hemmed and sewed, can be observed on a fragment of linen cloth (Fig. 30; cf. Kemp & Vogelsang-Eastwood 2001, 172-179).

No evidence was found for special treatment of the fish bodies before the preparation of the bundles. In some of the larger Nile perch mummies found at Esna, a longitudinal cut was observed in the abdomen, believed to have been made to enable better penetration of the brine in which the fish were soaked (Lortet & Gaillard 1905, 186; Charron in press). In the fish deposit at Oxyrhynchus, no evidence for such a practice was noticed.

Fig. 30: Textile fragments from SU 22772, from left to right: A rolled hem with standard stitching; a piece of linen shroud; and two ropes manufactured from rolled textile (Photo: J. Gonzalez).

Although we cannot totally exclude the possibility that the absence of such evidence is related to the poor preservation, it is worth mentioning that in numerous cases, fine, greyish sediment was observed in the abdominal area of the mormyrids; this may correspond to intestinal content that had remained in place. Finally, it should also be mentioned that no evidence was found for the use of resin or bitumen, substances that were easily recognizable elsewhere on the site. We observed it, for instance, in an ibis mummy from the Graeco-Roman period found in Sector 26. The absence of any addition of substances for the artificial preservation of the fish bodies, combined with the thick layers of halfa grass, suggest that fish were preserved by what is termed 'intentional natural mummification' by David (2000, 373). In this case, desiccation of the bodies was possible thanks to the heat from the sun and the surrounding dry halfa grass that absorbed the bodily fluids.

Deposits SU 22772 and SU 22761 do not show any signs of disturbance by scavengers, such as dogs, cats, rodents or birds, which normally would have been attracted to the fish. The house mouse and shrew remains found in SU 22772 correspond to one individual each. Although we did not observe any burrows during excavation, we cannot totally exclude the possibility that these remains represent scavengers that burrowed their way into the deposit and died there of natural causes. In the case of the two cats, it is likely that humans were responsible for their death and for their presence in the deposit (see discussion below). The absence of any noticeable disturbance of the fish layers could be seen as an indication that the deposit was permanently guarded. Alternatively, it is possible that an easily removable protective coating was used, like the 5 cm layer of plaster covering the statuary deposit (*favissa*) at the temple at Luxor (El-Saghir 1991, 7; 11-12, Abb. 24). Yet another explanation for the undisturbed character of the fish deposits could be that they were protected by architectural features that have since disappeared. The absence of the layer of pebbles in the area adjacent to the fish deposits is noteworthy, as is the partial preservation of two mud brick walls dating to the Late Period. One of these mud brick walls supports a Roman stone wall and must thus have been dismantled before the Roman wall was built. As mentioned above, these Late Period mud brick walls have been interpreted as the bases of an arch. It is reminiscent of structures recently observed at Quesna (Al-Minufiyah Governorate), where mud brick corridors delineate enclosures in which falcon mummies were buried (Rowland et al. 2013, 53-84). Because the layers with fish from Oxyrhynchus sit on top of the preserved mud brick walls, it seems reasonable to suggest that they may have been deposited in comparable storage structures. The southwestern part of fish deposit SU 22761B seems to have been removed, suggesting that a partial reorganisation took place there. The remaining fish layers were not altered. It seems that a great part of the layers with pebbles was removed, probably at the same time as the other elements of the pre-existing mud brick walls were removed, including the roofing. This rearrangement can only have taken place between the Ptolemaic Period and the beginning of the Roman Period (4th century BC–2nd century AD).

	MNI based on large subsample		MNI based on small subsample	
	Subsample of 600 litre	Extrapolated for 6000 litre	Subsample of 14 litre	Extrapolated for 6000 litre
Mormyrus sp.	638	6380	20	7059
Mormyrops anguilloides	25	250	3	1059
small Mormyridae	1378	13780	127	44824
Bagrus sp.	14	140	2	706

Table 4: Minimum number of individuals observed in two subsamples from SU 22772B and the estimated numbers derived for the entire fish deposit.

4. Discussion

4.1. How many fish?

When trying to make an estimate of the number of fish that were present in the excavated deposits, we need to take into account that not all the individuals could be adequately counted. This is due to the sampling strategies, which varied from one sector to another, and to the fact that only subsamples could be quantified because of the vast amount of material recovered. A very rough estimate can be made of the volume represented by the fish deposits, taking into account the measurements mentioned above (see chapter 2). The approximate thickness of the various parts of deposit SU 22772 was recorded, but such data are unavailable for parts of the deposit that was excavated earlier. Nevertheless, assuming that the average thickness was 25 cm and also taking into account that 40% of SU 22761C was missing, we arrive at an approximate volume of 2.65 m³ for deposit SU 22772. For deposit SU 22772, we calculate an approximate volume of 3.25 m³, meaning that the entire volume of the two fish deposits was around 6 m³.

The fish assemblage from SU 22772A was retrieved from a volume of about 250 litres and yielded 178 medium-sized and large mormyrids. There was likely a considerable loss of smaller fish. A MNI of 4,272 fish is obtained when a volume of 6,000 litres is accepted for the totality of deposits SU 22772 and SU 22761. An alternative way to calculate the number of fish is to look at the specimens retrieved by hand-collecting and by sieving on nested 4 and 2 mm mesh from SU 22772B. This deposit has an approximate volume of 0.6 m³ and thus represents roughly one tenth of all the fish layers excavated at Oxyrhynchus. There would have been more than 6500 medium-sized and large *Mormyrus* and *Mormyrops*, with *Mormyrops* only representing about 4% of that total. And there are estimated to be more than twice as many small mormyrids (20 cm SL and under) (Table 4). When a similar exercise is done on the basis of the fish found in the 14 litre subsample from SU 22772B, a somewhat higher number of specimens (MNI around 8,100) is obtained for the medium-sized and large *Mormyrus* and *Mormyrops,* with *Mormyrops* now accounting for 13% of that total. The most striking difference of this subsample compared with the rest of 22772B is that the number of small mormyrids is more than tripled, no doubt because the excavation, and in particular the retrieval of the individual small vertebrae, was more efficient than during the routine retrieval in the field. If it is accepted that the proportions of the mormyrids seen in the 14 litre sample adequately reflect reality, then it appears that 85% of all fish are 20 cm or smaller. Extrapolating numbers for the other fish taxa from the numbers found in the subsamples is less straightforward. Estimates are given for *Bagrus* in Table 4. For the other species, represented by only a few remains, there is a high risk that chance fluctuations play a role in the proportions; we have therefore omitted estimates for them.

4.2. The meaning of the major fish species present

The most frequent taxon in the fish deposits described above is *Mormyrus*, which corresponds to the oxyrhynchus fish that is one of the three species mentioned in the Osiris myth. It says that in the time of the gods, Osiris ruled the world, and that he was murdered by his brother Seth, who cut up of Osiris's body and threw the pieces into the Nile. Osiris's wife, Isis, managed to recover all the pieces except the phallus, which had been eaten by three fish: the oxyrhynchus, the lepidotus and the phagrus (Plutarch, On Isis and Osiris, 18, 358B). The lepidotus corresponds to the barbel *Labeobarbus bynni*, which is sometimes represented together with the oxyrhynchus (Vernus & Yoyotte 2005, 205; Erroux-Morfin 2008, 132). However, no complete individuals of *Labeobarbus bynni* have been found in the fish deposits at Oxyrhynchus. A single bone was identified from SU 22761, and the eight bones found in SU 22772 may all belong to the same individual. It is striking that no complete fish were found and that there were two articulating dorsal pterygiophores among the bones from SU 22772; these bones form the anatomical support for the dorsal fin that is so typical for this fish and that is always prominently visible in the depictions and

Fig. 31: A statuette of lepidotus (from Guichard 2014, 307).

statuettes (Fig. 31). Whereas the identification of the oxyrhynchus and the lepidotus is straightforward, that of the phagrus is more difficult. There is confusion in the literature about which species the word ‘phagrus’ refers to. In her compilation of the data, Gamer-Wallert (1970, 101-107) mentions that phagrus has been variously said to correspond to mullet (Mugilidae), to eel (*Anguilla anguilla*) and to tilapia. Other scholars have emphasised that the Greek word ‘phagros’ means ‘voracious’ and that the fish could therefore be *Hydrocynus* (tigerfish) or *Bagrus* catfish, the latter also because of the resemblance in the names. It appears that ‘phagrus’ may have meant different species in different parts of the Nile, referring to Mugilidae in the delta and to other species farther south. It is tempting to view the large number of *Bagrus* remains at Oxyrhynchus, albeit represented by chunks of fish rather than complete animals, as an indication that this taxon may be the ‘phagrus’ that is mentioned in the texts. This is an assumption that is in line with that of Brier and Bennett (1979), given in their description of a *Bagrus* mummy believed to be of Ptolemaic age. They also refer to the interpretation of D’Arcy Thompson (1928, 27), who considered ‘phagrus’ to correspond to *Bagrus bajad* on the basis of the similarity to the Arabic name.

Besides the fish taxa just mentioned, the site also yielded remains of Mormyridae other than *Mormyrus,* namely, *Mormyrops anguilloides* and *Hyperopisus bebe*. The latter, small species was recognisable thanks to the diagnostically helpful tooth plate fragments (parasphenoid/suprabasihyale), but we cannot exclude the possibility that still other small mormyrid species were deposited. The Egyptian Nile also contains *Marcusenius cyprinoides* (max. 33 cm SL), *Petrocephalus bane* (max. 20 cm SL), *Petrocephalus bovei* (max. 11 cm TL) and *Pollimyrus isidori* (max. 10 cm TL). On the tomb walls of Mereruka and Ti, realistic depictions can be found of all of these species, as well as *Hyperopisus bebe* (Gaillard 1923). However, on the basis of the isolated vertebrae, which are the only elements available, it is impossible to identify these small fish or to distinguish them from species in the genus *Mormyrus*. *Mormyrops*, on the contrary, is easily recognised on the basis of both cranial elements and precaudal vertebrae. It represents between 4% and 13% of the larger mormyrids at Oxyrhynchus. The fact that *Mormyrops* occurs rather frequently should be of no surprise, given that their general morphology is somewhat reminiscent of that of *Mormyrus*. However, we were unable to find any clear representation of *Mormyrops anguilloides* in Egyptian art.

4.3. Reconstruction of events

An attempt can be made to reconstruct, at least in part, the series of events that took place between the capture of the fish and their deposition, using a combination of written, archaeological and ichthyological evidence.

As is the case for each deposit of mummified animals, their provenance and the reason they were collected needs to be established (Charron 2014, 276; McKnight & Atherton-Woolham 2015, 24). It is clear that the answer to the question why animals were deposited must be sought in the religious realm. In the case of the oxyrhynchus fish, the link to religion is clearly demonstrated by textual evidence, mainly dating to the Graeco-Roman period (Johnson 1959, 376-378; Melaerts 1989).

Three papyri are of relevance for the understanding of some of the events that may have taken place between the capture of the fish and their deposition. The first document is Pap. Tebt. 3.1 701a from Tebtunis, in the Arsinoites nome of the Faiyum, dated between 139 and 131 BC (Dumont 1977, 125-142). This administrative register describes, among other things, the type of fish captured, as well as their processing, storage, transport and sale. Among the fish captured by the Greeks and the Egyptians are listed fish that we can deduce to have been clupeids, cyprinids and mullets, some of which are mentioned as being dried or salted, or τάριχος in ancient Greek (Dumont 1977). In the list of fish meant for consumption, at least one plays a role in Egyptian religion, namely, labes (Thompson 1928, 22-23), a cyprinid of the genus *Labeo*. The types of fish, including mormyrids, that have been consumed since pharaonic times are documented through archaeozoological evidence (von den Driesch 1986b) as well as written sources. The catching, preparation and consumption of fish, including oxyrhynchus, is mentioned in New Kingdom epigraphic documents from the workers village Deir el-Medinah in Upper Egypt (13th–11th century BC). Fish appear to be a major food resource, with two thirds of them being delivered in dried or salted form (Janssen 1997, 37-54, in particular 47-49). Fish are frequently depicted on tomb walls from the Old Kingdom onwards, and some of those representations show processing techniques, such as the longitudinal cutting of fish with a view to their further preparation as dried or salted fish or, in the case of mullets, also for the extraction of roe (van Elsbergen 1997, 78-80). Longitudinal cuts have also been observed in the ventral part of the bodies of mummified fish, such as the Nile perch from Esna, which are thought to have been made with the aim of facilitating the penetration of natron (Lortet & Gaillard 1905, 186). This seems to suggest that similar processing techniques were used, possibly at the same place, for fish meant for consumption and fish used for ritual purposes. If the processing involved the use of salt, a costly substance that was strictly state controlled in pharaonic and Graeco-Roman times (Adams 2013, 272-278), it is likely that salting operations were to some extent centralised. It is significant that salted fish and mummies are designated by the same word in Greek, i.e. τάριχος, and that the term *taricheutai* is used for both the producers of salted and salt-dried fish and the people in charge of the preparation of mummies (Raven & Taconis 2005, 317; Palme 2009, 77-78). Besides the complete mormyrids described above, the deposits also contained fish that were incomplete. Among those, the chunks of *Bagrus*, with their transversal cut marks, correspond most closely to portions of (salted) fish. Possibly the same is true for the partly articulating but incomplete skeletons of Nile perch and *Labeobarbus bynni* – a scenario that seems more plausible than either differential preservation or inadequate retrieval during excavation. However, the latter factor could explain the fact that only the very characteristic jaws and cranial remains of house mouse and shrew were recognised and retrieved from the sieved residue. It is unclear whether we should consider these micromammals, which are burrowers, as intrusive individuals that entered the deposit on their own (although we did not observe any burrows), or as animals that were deposited by humans. The clusters of cat remains that we lifted ourselves were from incomplete individuals that were only partially articulated, indicating that no complete cats had been deposited. Therefore, we cannot exclude the possibility that they may represent animal parts that underwent treatment by *taricheutai* who were preparing various animals intended for mummification.

Another document worth mentioning here is a royal ordinance dating to the reign of Ptolemy X Alexander and Berenice III (Pap. Yale I 56; ± 100 BC; Oates et al. 1967, no. 56) that contradicts what has been said above. It stipulates that any capture of oxyrhynchus or even *Synodontis* (χοιρόγυνος) (Clackson 2002, 6-11) is forbidden and that contravening this order will result in the death of the offender. Related to this, we can mention the fisherman's oath described in a third papyrus (PSI 8 901) coming from Tebtunis, which dates to AD 46 April 17 (reign of Claudius; Henne 1951). The guild of fishermen from the villages of Berenicis and Narmuthis swears never to have captured oxyrhynchus or lepidotus fish. Lines, seine nets and cast nets are mentioned with regard to the fishing technology used. Hooks would not have been efficient gear, given the morphology of the mouth and the feeding behaviour of *Mormyrus*; both species in the genus are bottom feeders taking mainly small invertebrates (Bailey 1994, 942). No fish hooks were found in the deposit, and it is unclear whether or not the sole pectoral spine fragment of *Synodontis* represents a spear head that was used for capturing fish.

The prohibition on taking certain fish is also known to have applied in a funerary context, as indicated in the Book of the Dead, Spell 125, which was known until the Graeco-Roman period (e.g. Allen 1960, 196-203). One passage in its main known version (Lapp 2008, 44-47) is of relevance for the light it sheds on the fish deposits from Oxyrhynchus. The passage quotes the deceased, who states that he never took dead fish during his life on Earth. The dictionary translation of the term , *ẖ3.wt,* employed in the main version (a term which uses the same sign that is used for the oxyrhynchus fish), is 'corpses' in English (*Wörterbuch der ägyptischen Sprache* III, 359, 9-20). This is the translation used by, for example, Allen (1960, 196). It is unclear why Stadler (2003, 66) translates the term into German as 'Körper', meaning live bodies. This text from the Book of the Dead illustrates just how valuable animals that had been found dead were considered to be for their role as mediators with the world of the gods (see below). This text is all the more significant given the fact that in the same spell, the deceased expresses his respect towards certain sacred/sacralised animals, for example, his declaration that he did not hunt any birds meant for the gods, nor kill the 'divine/ritualised bull' (*kȝ nṯry*) (Legras 2016).

The sources do not give many hints about the possible fishing grounds or the season of capture of the mormyrids found in the deposit at Oxyrhynchus. An exception is Dumont (1977, 30), who mentions the harvesting of suffocated fish in small residual pools. In the case of oxyrhynchus, this is a highly unlikely scenario for the adult fish because they normally return to deeper waters after the floods, but we cannot exclude the possibility that some of the smaller, young fish were taken (dead or alive) in such shallow water environments. Other written information on the timing of the procurement of dead or live fish is missing, but it is nevertheless conceivable, based on their behaviour, that fish were obtained on a seasonal basis. *Mormyrus* and *Mormyrops* are usually solitary. The only time they congregate is during the spawning season. It is in that season (August–September), which coincides with the annual Nile floods (Bailey 1994), that these fish would have occurred in large numbers and would have been easily accessible. Further indication for seasonal exploitation is found in the size distribution of the *Mormyrus* (Fig. 18), which shows several peaks that must represent year classes. Such a distribution is only seen in archaeozoological assemblages when fishing is limited to a particular season, not when it is carried out year-round (Bødker-Enghoff 1986). It is likely that during the spawning season, the landings of mormyrids (and other fish) were high and therefore this was also the season that the fish must have been brought to the town. As for the smaller mormyrids, it is difficult to determine their season of capture because in most cases we cannot verify what species we are dealing with. Certain species of the Mormyridae family do not attain large sizes, and the fish smaller than 20 cm may therefore also represent adult (non-*Mormyrus* or non-*Mormyrops* species) fish that used the same spawning grounds at the same time of year as the large taxa. In that case, all fishing activities would have been centred around the annual flood season. If, however, the small fish represent juveniles of *Mormyrus* and *Mormyrops*, they must have been captured later in the year than the large fish (and because this would also always have happened at the same season of the year, it would have resulted in a separate peak). In relation to a scenario whereby the simultaneously deposited fish derived from two distinct fishing seasons, it is worth mentioning that the periodic burial of mummified animals other than fish has been documented (Ray 1976, 140; Dils 1995, 165), and it appears that in certain animal cemeteries mummies were stored before being deposited (Davies & Smith 2005, 62). Possibly the deposit of fish discovered at Oxyrhynchus also consists of fish that were (in part?) being stored for a short period of time before the actual deposition took place. However, there are no indications that fish were taken from water basins inside temple *temenoi* (cf. Hengstl 1994, 275-284; Baetens 2013, 18; Blouin 2014, 229-230).

The aforementioned papyrus PSI 8 901 provides some additional information on the nature of the oxyrhynchus and lepidotus fish that is worth mentioning here. In fact, both fish are considered to be ἴδωλα θεῶν, meaning that – as stated in the ordinance of Pap. Yale I 56 – they are living fish that are not allowed to be captured. Aelianus (On Animals X, 46) reports that for this reason net fishing needed to be avoided, as it might result in the capture of oxyrhynchus fish. It needs to be emphasised that the terms θεῶν ζώων or ἴδωλα θεῶν mentioned in Graeco-Roman documents must refer to entities observed in nature that can be connected, in theory, to divinities. On the other hand, ἱερῶν ζώων refers to a religious image and/or a mummified animal (cf. Redford & Redford 2005, 196). This is obvious, for instance, from a 1st century BC ostracon from Kom Ombo: ἔτους ι, Θώυθ ζ. ταφῆς ἰβίων καὶ ἱεράκων καὶ τὴν ἄλην ἱερῶν ζώων (O.Joach. 8, 1-3; Smith 2002, 371), indicating that burying ibises or falcons associates them with the category of sacred animals. In this regard, it is notable that it is fish statuettes, and not living fish, that are represented, for instance on a relief of the association of 'bearers of gods', who were involved in carrying the animals-mummies to the necropolis and who dedicated a propylon to Thoeris (Heinen 1991, 53). Similarly, bronze figurines show fish that are clearly not alive placed on sledge-shaped bases (Yamamoto 2011).

The fish mummies, coffins and bronze figurines obtain their full divine, consecrated character (in the sense of the Greek word ἱερός) at the moment when 'the divine comes into being by the ritual', which - as shown by Dimitri Meeks (1988) - involves, amongst other things, the use of linen bandages. This author emphasises that the Tanis Sign Papyrus (1st century AD) defines the hieroglyph of the word 'god using bandages' as 'he who is buried' (Meeks 1988, 427 and 440 for the ritual ornament of the mummy as a medium for the cult, for the rite). This ritual actualisation is all the more necessary for fish because, unlike is the case, for instance, for the Apis or Mnevis bulls, individual fish cannot be distinguished by the typical physical characteristics that reflect a divine investment in the living animal.

Fish apparently were not designated by a superior authority (god or priest) as a living animal whose sacred nature is renewed each year, as was the case, for instance, for the falcon at Edfu (Meeks & Favard-Meeks 1996, 129-130). In the case of the falcon, this implies that the animal is a temporary medium of the divine, which can only obtain its divine or sacred nature as a result of complex rituals that need to be renewed. When Strabo (Geography XVII, 1, 40) mentions a temple of oxyrhynchus (ἱερὸν ὀξυρύγχου) at Oxyrhynchus, he may, at first glance, seem to be referring to a living sacred animal. However, upon closer examination, it becomes clear that he is using the word in a generic sense, referring to the cultic complex dedicated to the (mummified) fish as a whole. In fact, following the example of rulers taking care of the funeral arrangements and costs of all the sacred animals, individuals had to finance the consecration of fish mummies, as is known to have been the case for the bronze figurines, which were initially wrapped in linen and then brought to life by the ritual (McKnight & Atherton-Woolham 2015, 21-22, and fig. 11; for an oxyrhynchus fish from el-Bahnasa: Burgaya Martínez 2012, 63). Plutarch (On Isis and Osiris 359c-d) mentions this payment when he makes the link between the body of the deceased gods and the tomb of the worshipped animals, whose inhumation was taken care of by the Egyptians (see also Herodotus, The Histories II, 65). They hence fostered the divinisation of the animal (Ray 2011, 234-235, n. b), which, without the ritual, would have remained potentially a simple image of the divinity or, rather, a simple receptacle.

This process in which the Egyptians took part is similar to - although in the case of our fish mummies certainly less costly than - the donation of propitiatory bronzes (De Meulenaere 1990; Colin 1998, 346-350). It differs from a votive practice because, strictly speaking, it does not correspond to fulfilling a vow, but rather, to a request for a reward in return for a gift, either financial or in kind (Bleiberg 2013, 100-104) through a professional who is in contact with the world of the gods. Thanks to the custodians, engaging in such a procedure leads to the life that is repeatedly wished for through, for example, inscriptions on bronze statuettes. In fact, specialised priests bring a portion of life to the divinity through its favourite ritualised form; they communicate divinity into an element that, without such a ritual (and its offering), would be devoid of it (Derchain 1962, 72-73). A text from the archives of the priest Hor (2nd century BC) clearly states this when it mentions that producing a mummy is beneficial for the god, by means of its emblematic animal which henceforth becomes *ba* of the god (Ray 1976, 92; Kessler 1989, 12-15; ibid.: 258: 'der Ibis ist der verjüngte Ba des Hermes Trismegistos, vor dessen Kultbild die Angelegenheiten der Menschen des Hermaion geregelt wurden'). This practice is somewhat reminiscent of the use, in the magical documentation, of the *Parhedros* in the form of an animal, in this case of a dead falcon, the mummification of which reveals the will of the gods (Quack 2011, 143 for the officiant having access to the embalming workshop of the sacred animals, 147 for a killed falcon being transformed into *Parhedros*).

Also worth mentioning are the dead and sacred animals through which foretellings were obtained (Iamblichus, On the mysteries of the Egyptians VI, 1; VI, 3), as well as the remarks of the Neoplatonic philosopher Porphyry (On abstinence from killing animal IV, 9, 7; IV, 10, 1), for whom a dead falcon is the perfect example of an animal that can typically be found in sanctuaries and through which it is possible to consecrate (τελεῖν) statues. This process corresponds perfectly to the idea of a mummy or statue as a receptacle of a part of the divine. The choice of a particular animal category is dictated, on the one hand, by the religious value that is assigned to it and, on the other, as a function of the part of the divine one wishes to include. With regard to fish, one can think of the procedure privileged by certain divinities, or decan stars, to regenerate their body during 70 days in the water - which was the time needed to execute the mummification ritual of a body - before emerging from the water in the form of a bird (Hornung 1983, 456; Altenmüller 2005, 74-76; Klotz 2009, 137-138). In the case of the mormyrid, besides it being the phonogram for the word 'corpse' (see above), this fish is also known in later periods for issuing from the body of Osiris like the humours/flood (Aelianus, On Animals X, 46). The bodily fluids need to be reintegrated ritually in order to proceed to the renewal of the god (Assmann 2003). In this sense, the oxyrhynchus could be a vector of renewal, just like the goddess Hathor/Thoeris acted as receptacle for regeneration - which may explain why certain bronze statuettes of oxyrhynchus bear a so-called Hathoric crown or an Atef crown, which is the typical Osirian crown (Gamer-Wallert 1997, 135-142, Taf. 34). It is tempting to link the lepidotus to this same type of regeneration receptacle, as the capture of this fish was also taboo. This was the case because it seems that the goddess linked to *Labeobarbus bynni*, namely, Mehyt (whose name can mean 'the-one-who-is-filled'), may have been identified with the stuffed skin making up an Imiut fetish, being a bag in which the body parts of Osiris were to regenerate (Köhler 1975, 432-436).

5. Conclusions

The deposit from Oxyrhynchus described here provides the first archaeozoological evidence for the worshipping of fish at this site, a practice that had already been documented through a variety of non-archaeozoological sources (including written evidence, artefacts, such as bronze statuettes, wooden containers in the shape of fish, tomb paintings). The stratigraphic position of the fish layers at the site of Oxyrhynchus and the find of a wooden Hathoric crown within these deposits indicate that they date to the Late Period. The preparation of the fish mummies did not involve the use of bitumen or resin and it is postulated that the drying of the fish bodies was effected by natural mummification through the heat of the sun and the absorption of bodily fluids by the thick layers of halfa grass that alternated with the layers of fish.

The total volume of the fish layers has been estimated at about 6 m^3. By extrapolating the minimum number of individuals established from subsamples, a rough estimate of more than 50,000 fish was obtained for the entire deposit. It appears, as expected, that the genus *Mormyrus* was the most common taxon represented, although *Mormyrops anguilloides* also occurs frequently. The state of preservation did not permit the lifting of entire mummies, but it appears that medium-sized and large mormyrids (up to more than 1 m in length), although sometimes packed separately, were more often placed in bundles of two or three fish, involving the use of up to six or seven layers of textile bandages. Small mormyrids, up to 20 cm long, are five times as common as the larger fish. They were not packed in separate bundles, but, rather, seem to have been put between the bandages that were wrapped around the medium- and large-sized mormyrids. Layers of fish bundles, usually laid down in a north–south or east–west direction, alternated with thick layers of halfa grass. After the mormyrids, the most common taxon was the *Bagrus* catfish, of which only chunks were deposited. Other fish, represented by very incomplete skeletons, sometimes only a few bones or a single element, are the barbel *Labeobarbus bynni*, the Nile perch, tilapia, *Clarias* catfish and pufferfish. Two partial cat skeletons, a cattle rib and the jaws of house mouse and shrew are the only non-fish remains found. It is supposed that, with the possible exception of the micromammals, all of the mammals and the less frequently occurring fish were also processed by *taricheutai,* who were responsible not only for the production of salted fish and meat for consumption, but also for the preparation of mummies. They must have obtained the fish from professional fishermen who were able to capture large quantities of mormyrids during the reproductive season, when these otherwise solitary animals aggregate for spawning in shallow, inshore waters. This hypothesis, based on ecological observations, is supported by the size distributions of the archaeological fish, which show multiple peaks that probably correspond to year classes. The fish deposit was remarkably intact, with no trace whatsoever of damage or disturbance by scavengers that might have been attracted by this massive deposit of fish. It is possible that the mud brick walls found in relation to the fish layers may have been part of a much larger structure in which the fish mummies were deposited and protected.

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