

# MUMMIFIED, DEIFIED AND BURIED AT HERMOPOLIS MAGNA – THE SACRED BIRDS FROM TUNA EL-GEHEL, MIDDLE EGYPT

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## INTRODUCTION

The *Ibiotapheion* (ibis burial place) at Tuna el-Gebel, located to the west of the ancient city of Hermopolis Magna has been the first and for a longer period the only ibis (and baboon) animal cemetery known in Egypt. It was probably inaugurated during the reign of Pharaoh Psammetikhos (664–610 BC; see KESSLER & NUR EL DIN 2005, 124). Though there must have existed other early sanctuaries nearby, only the temple of Osiris Baboon (and Osiris Ibis) standing above the animal galleries and dating to a later stage has been found until now. The animal cemeteries all over Egypt were promoted in the time of Pharaoh Amasis (570–526 BC) and again in Persian times. During the latter periods we find *Ibiotropheia* (ibis feeding places) in nearly every Egyptian nome (cf. MEEKS 1972, 68), as well as *Ibiotapheia* in the cemeteries of other major towns, such as the ones for falcons and shrews in Buto, for falcons and other birds in Edfu, for shrews in Letopolis, etc. Their installation was ordered by the pharaoh, who also decreed the death penalty for anybody in Egypt who mistreated (LIPPERT 2004, 23) or killed an ibis or a falcon (HERODOT, Hist. II, 65).

Judging from the Roman oil lamps, pottery and coins (last coin from 293 AD), the animal necropolis in Tuna el-Gebel was still in cultic use as a whole at least during the first three centuries AD. Presumably as a result of a decision by the Roman administration to stop financial and personnel support, the mass deposits of sacred birds ceased much earlier, conceivably during the first century AD. If the foregoing assumptions are correct, then the practice of *en masse* burials of ibises at Tuna el-Gebel lasted almost 700 years. Though it is impossible to give the exact number of birds buried at Tuna el-Gebel, also because in many

bundles or mummies we only find parts of birds, the total number of ibises deposited in the vast subterranean network of galleries clearly surpasses one million individuals, implying that on average some 15,000 birds had been placed each year in the galleries by the cult servants. Most specimens originated from the more than a dozen feeding places for ibises near Tuna el-Gebel, but there is evidence for mummified specimens being delivered from elsewhere, e.g. the Faiyum.

Besides the bundles and mummies of Sacred and Glossy Ibises which constitute the bulk of the material (> 80 %), at least 115 other vertebrate taxa could be evidenced in the galleries. These include domestic (cattle, sheep, dogs, cats) and wild mammals (shrews, monkeys, ichneumons, wild cats, gazelles etc), reptiles (crocodiles, snakes) and fishes, as well as a large variety of birds (herons, storks, geese, ducks, birds of prey, owls etc.). In 2004 we already published a synopsis of the remains of 247 primates that had been collected during survey work in the side branches and main corridors and inside several cult rooms for baboons in three Galleries (D, C, B) at Tuna el-Gebel (VON DEN DRIESCH *et al.* 2004). The present contribution deals with the birds found in the same contexts.

## THE SITE: ITS SETTING AND MATERIAL CULTURE

### The setting of Tuna el-Gebel

Today the archaeological zone of Tuna el-Gebel is located in a flat desert landscape to the west of the cultivated Nile valley, 5 km to the south of the modern village, opposite a broad desert wadi, through which a track once led to the Bahariya oasis. The settlement, which developed after 1000 BC, was located at the southern tip of a now extinct lake, known from geographic maps as the

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Fig. 1 Subterranean animal necropolis at Tuna el-Gebel, Middle Egypt. Plan of the Galleries D, C and B

Hod Tuna. Owing its existence to a geological depression between accumulated alluvial sands, the Hod Tuna received water during the annual flooding of the Nile from July to November and from the inundation waters of a natural water course, the Bahr Yusuf, winding nearby along the western desert edge and flowing into the Faiyum depression. Even after the floods had retreated, the Hod Tuna – until recently – never dried out completely due to the high ground water table.

The lake with its bordering wetlands presented an ideal place for birds associated with freshwater habitats, such as the Sacred Ibis, the latter arriving from their wintering grounds further south at the beginning of the inundation period to form large breeding colonies. Part of the ibis population may even have been resident at that time (see below). For many centuries the Hod Tuna must have sustained one of the largest ibis colonies in the country, and the foundation of an ibis-sanctuary in the vicinity was a logical consequence of this unique setting.

The establishment of cultic structures and sacred zones in areas where flocks of sacred birds could be kept was systematised during the new

Saite dynasty. New cultic rules were established for the use and worship of a pantheon of protective gods that took the appearance of animals, visible on the sacred standards and in statues. For temple rituals, living animals associated with particular gods were taken from these newly installed sacred areas, the latter also including ecologically favourable biotopes for birds outside the temple areas, e.g., the Hod Tuna. The avifaunas in such biotopes were taken care of by a group of cult servants. No doubt, protective measures likely led to an increase in the population density of Sacred Ibises and perhaps also of other bird taxa inhabiting similar biotopes. Besides, there is written evidence that the birds were nourished by the temple personnel. A so-called “Ibion trophe” or *Ibiotropheion*, a feeding place for Sacred Ibises, was created by the State with support from elsewhere in Egypt. At a later stage, the *Ibiotropheion* of Tuna el-Gebel was not the exclusive ibis feeding place in the region anymore, since the greek and demotic papyri mention the existence of 13 additional places (called *Ibion*) in the Hermopolite nome (DREW-BEAR 1985 s.v. *Ibion*)

Supplementary feeding in a suitable habitat



Fig. 2 Gallery C–Branch D-17. Pottery vessels with bird bundles piled up one on top of the other

not only led to an increase in bird density in the breeding colonies, but probably also caused part of the as a rule migratory Sacred (and Glossy) Ibis population to become resident (see below). As such, the huge number of ibises deposited not only relates to the nearby existence of a larger water body, but also to the protection and supplementary feeding offered by the cult personnel and the presence of additional *Ibiotropheia* near Hermopolis Magna. It has to be mentioned, though, that throughout the entire period the necropolis was in use, single mummified Sacred Ibises were also delivered from other cult places in Egypt.

Besides Sacred Ibises, numerous other bird species were attracted by the lake and its environs either to feed, to breed, to spend the winter, or to rest for a short time when migrating to their summer or winter grounds. Since many of the aquatic bird species found in the galleries as well as most diurnal and nocturnal birds of prey are tree-breeders, we can assume that in former times a good deal of the vegetation cover bordering the lake consisted in tall trees and bushes.

Today the Hod Tuna has disappeared completely, the remaining ground water being pumped up to irrigate the fields or to serve as drinking water for the local villagers. When exactly the lake dried out is not well known, but it is reported that in the 1950s the military still hunted ducks in the remaining wet biotopes.

### The subterranean gallery system

In the following a short description of the different building phases of the subterranean necropolis

is given (Fig. 1; see also VON DEN DRIESCH *et al.* 2004, 235ff.). Its oldest part named Gallery D dates to the Saitic period. It has been cut into the fragile rock of the desert plain lying at the foot of a steep limestone cliff of the western mountain range bordering the Nile valley. This earliest passage runs in a north-south direction. Its narrow entrance is located at the northern end, with a small staircase leading into the gallery, the latter consisting of a main passage giving access to a series of side branches to its left and right. It is in the side branches that we find the pottery vessels stored one on top of the other (Fig. 2), the jars being filled with bird bundles, numbering between 5 and 20 and containing the bones of ibises, falcons, herons, etc., sometimes mixed with isolated skeletal elements of cats, dogs, shrews, fishes, etc. After being completely filled with jars, the side branches were sealed off by mud brick walls. Assumedly access to the Saitic gallery was limited to certain festival days and to the days the cult servants carried down the animal gods in jars to their final resting place. There is evidence from other ibis and falcon cemeteries that this was the case once or twice a year.

Due to the increasing number of ibises delivered from the nearby feeding places and from all over Egypt, the existing gallery system in Tuna el-Gebel had to be extended during Persian times, which was done in an eastern direction (branch C–D) (Fig. 1). As to the origin of some of the ibises deposited in branch C–D, the papyri mention the delivery of deified birds from the Faiyum area (ZAGHLOUL 1985).

During the last indigenous dynasty (380–342 BC) harder rock formations were chosen for constructing new galleries. Following first the direction of Gallery C–D to the east, Gallery C–C turns then about 90 degrees from branch C–C-7 onwards to continue in a northerly direction. Near the crossing of the passages C–C/C–D, the character of the necropolis changes suddenly: the walls of the main passages are now honeycombed with larger niches for baboon burials and with rows of smaller niches for rectangular, and later rounded limestone coffins containing bundles or mummies of ibises. Some of these wall niches may date to the Ptolemaic period.

Under the leadership of Ptolemy I, before 304 BC, Gallery C–C was extended further north (Fig. 1). A new stairway leading to the galleries was built to the south of the older passages. This entrance was integrated into the new temple of Osiris

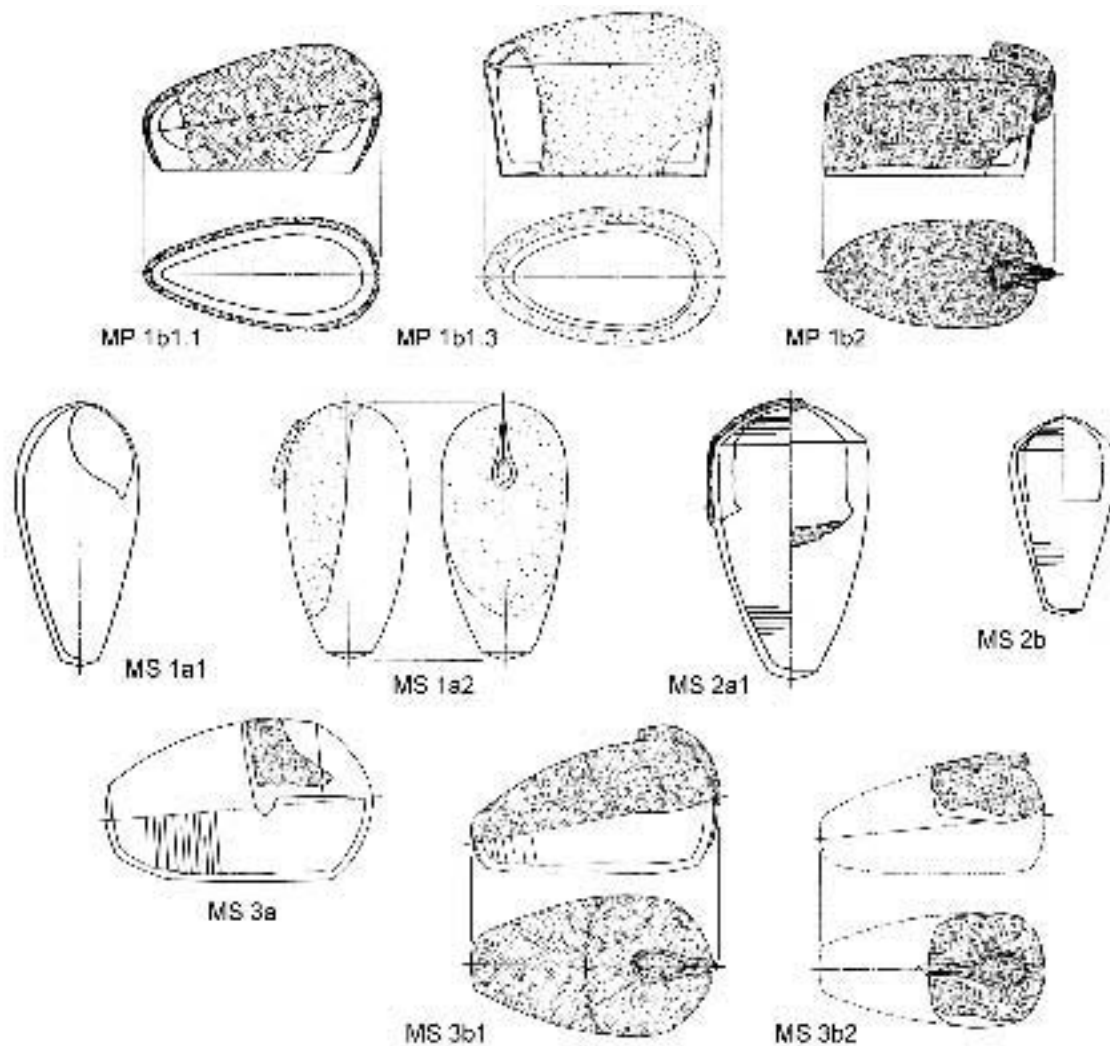


Fig. 3 Types of clay coffins for ibises, scale 1:10

Baboon (and Osiris Ibis) erected above the galleries. At the foot of the staircase a baboon chamber (C-C-2) was constructed. It was a subterranean cult place with ibis and baboon statues which also served for oracle practises. During the later reign of Ptolemy I new subterranean passages were hewn into the rock to the south of the Ptolemaic entrance (Gallery C, branches C-A and C-B).

Probably due to a collapse of the main passage to the north, Ptolemy II decided to let construct a second entrance giving access to Gallery B (Fig. 1). Built some 50 m away from the existing main axis, branches were made in opposite directions: two branches, one to the south and one to the south-west, were directed to meet the former main axis of Gallery C, whereas a new passage starting at the foot of the staircase was directed to the north.

The northernmost parts of Gallery B date to later Ptolemaic times. In B-E-6, which may date to the reign of Ptolemy III (246–221 BC), painted side niches without staircases replace the larger rock chambers in the earlier galleries. These niches as well as the rock chambers were reserved for particularly valued sacred baboons. In later Ptolemaic time the limestone sarcophagi used for the deposition of particularly valued ibises were replaced by wooden containers, some of them beautifully decorated (Fig. 16). Obviously, the expensive installation of entirely new cult places for special animals came to a halt early during the reign of Ptolemy III, but the official cult inside the existing chambers was probably maintained well into the Roman period.

The northern part of Gallery B extends into geologically unstable rock layers. Large parts of it

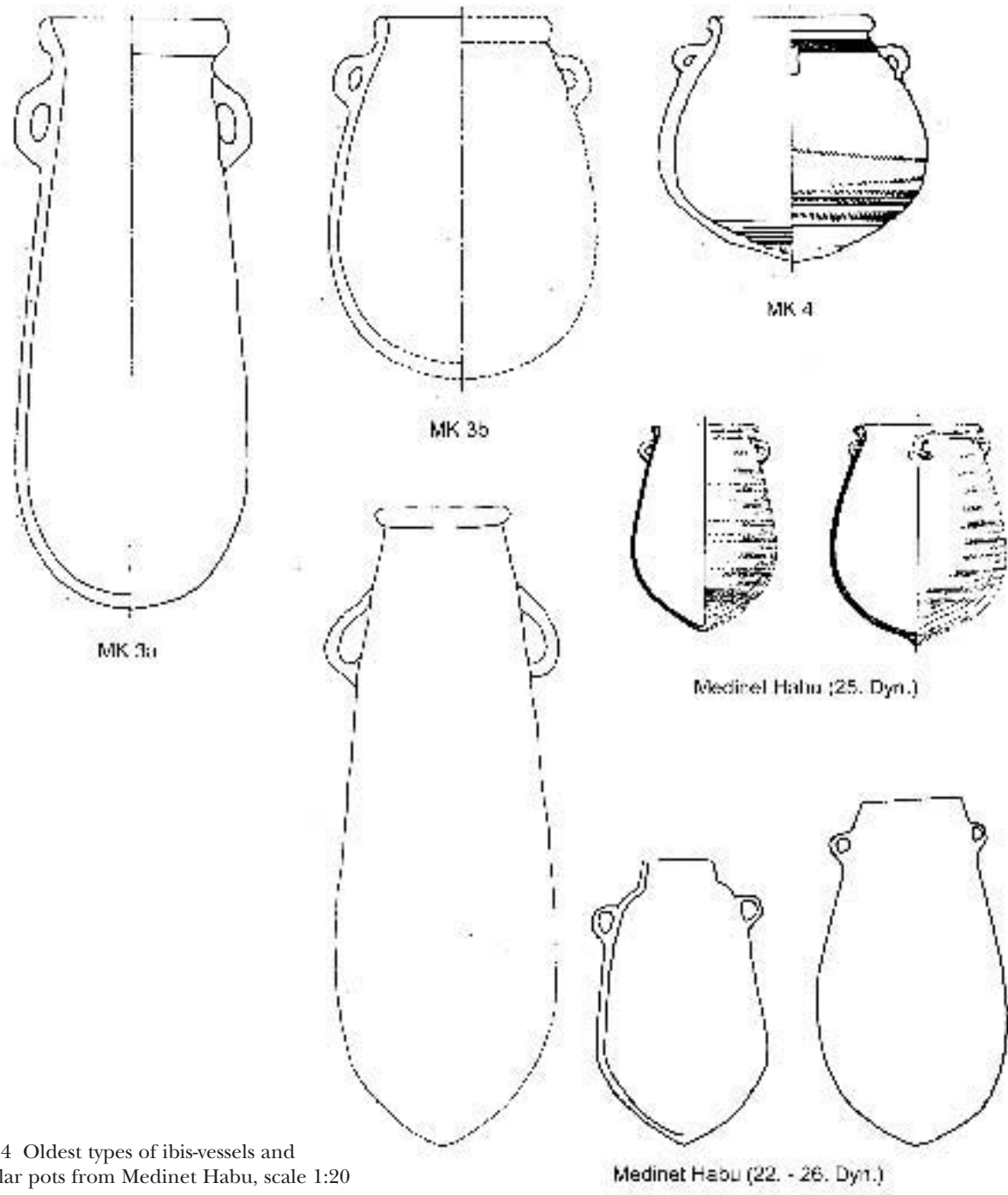


Fig. 4 Oldest types of ibis-vessels and similar pots from Medinet Habu, scale 1:20

may have already collapsed in antiquity, perhaps as a result of the same earthquake that caused the destruction of many sections of the early Ptolemaic Gallery C–A. To keep the northern part of the necropolis accessible, another entrance leading to Gallery A was built. Chronologically, this gallery represents the last building phase at Tuna el-Gebel. Its contents were almost totally removed by the Egyptian archaeologist Sami Gabra, who

worked here in the middle of the 20<sup>th</sup> century and who, unfortunately, did not document his research very well. Be that as it may, a number of jars containing remains of ibises found in Gallery A definitely originate from the oldest Gallery, D, and were obviously displaced during Gabra's work. In the absence of reliable information about their exact place of origin in the galleries, these finds had to be omitted from this study.

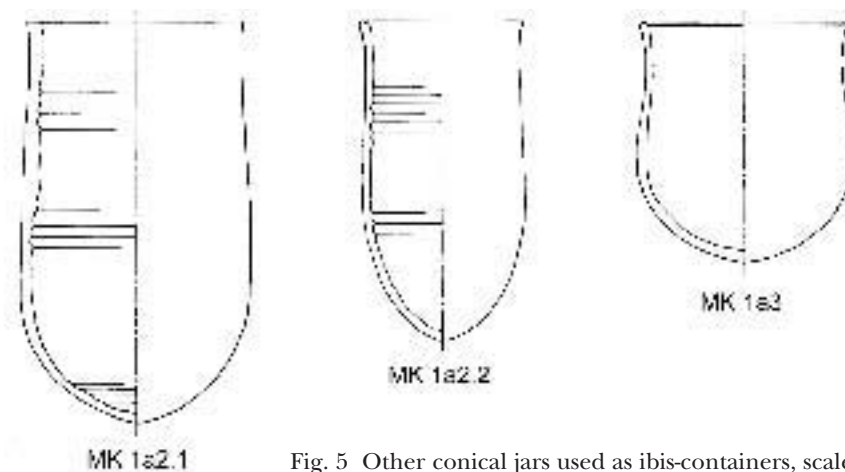


Fig. 5 Other conical jars used as ibis-containers, scale 1:10

### The storage vessels

Throughout the entire period of occupation bird mummies have been stored in containers made of wood, limestone or burnt clay (Fig. 3), whereby two types of deposition (**A**, **B**) can be observed in the galleries. Type **A** refers to the burying of single, conceivably “high status” ibises in sarcophagi made of limestone and, at a later stage, of wood – some of these being manufactured and painted elaborately – or in coffins of burnt clay, the latter containers serving for individual ibises of perhaps a “lower status”. Type **B** refers to depositions of several birds in one vessel. Whereas the containers with one individual exhibit more or less the same shape during the entire period they were in use, i.e. from the end of 30<sup>th</sup> Dynastie onwards, the morphology of the vessels containing more than one bird varies considerably.

As to the depositions of type **A**, some of the containers made from burnt clay were carefully hand-made (MP), while others were wheel-thrown (MS) and finished by hand. Both hand-made and wheel-thrown clay coffins were partly or completely covered with gypsum plaster. In addition, an ibis head with its beak turned forwards or backwards had been modelled on some of these coffins. The hand-made clay coffins, with their abrupt transition from body to base, resemble the limestone coffins, but some of the wheel-thrown containers also have a faint resemblance to the limestone sarcophagi.

As to the depositions of type **B**, the overwhelming majority of the sacred birds were buried in clay vessels of varying size, accomodating from three up to seven but occasionally up to 20 birds in one pot. In the oldest parts of the catcombs, i.e. in Gallery D, and occurring exclu-

sively there, the form of the vessels resembles that known from elsewhere in Egypt: conical jars with a minimal diameter at the rim and with two or four vertical handles (named MK 3 and MK 4 in Fig. 4). Similar types from other sites in Egypt are dated from the 22<sup>nd</sup> to the 26<sup>th</sup> Dynasty. Thus, the dating of the oldest part of the galleries into the 26<sup>th</sup> Dynasty is in accordance with the morphology of the pottery. The MK pots were filled exclusively with bundles containing macerated bones of birds (for details see below).

Similar vessels with a direct rim but without handles (named MK 1, Fig. 5) are more difficult to date and they often occur in the oldest part of the galleries, but they can be found in the more recent parts as well. In some ways they form the transition to the beaker-shaped pots. The latter were probably manufactured already by the end of the 26<sup>th</sup> Dynasty, and their shape was especially adapted to the needs of ibis burials. The beaker-shaped vessels (named MB 1 and 2, Fig. 6) with a height varying between 27 and 75 cm were produced in great quantities until well into the Macedonian Period. A unique form of the beaker type (MB 0, Fig. 7b) resembles the hand-made cuboid coffins used in earlier times for individual burials (MQ 2, Fig. 7a). Originally the beaker-shaped pottery yielded bundles containing macerated bird bones (Fig. 8), in later stages they were filled with mummies soaked slightly with chemicals (Fig. 9, top).

In Macedonian or early Ptolemaic times a new type of ibis containers replaced the beaker-shaped vessels, the so-called egg-shaped vessels. They range in size from 30 to 60 cm in height (designated ME 2 to ME 3, Fig. 10) and occur in a variety of forms. Like the beaker-shaped pots, the sealing of the earliest, wide-mouthed egg-

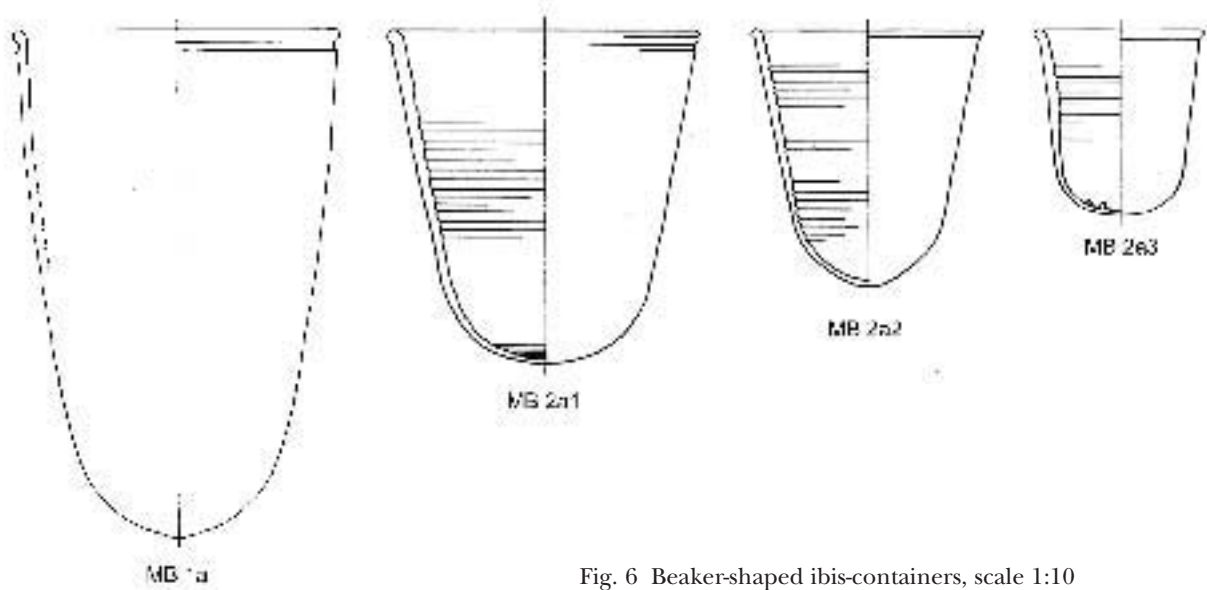


Fig. 6 Beaker-shaped ibis-containers, scale 1:10

shaped vessels was done with linen and gypsum plaster. During the reign of Ptolemy II at the latest the pots show a ledge inside the mouth and are now sealed with bowl-lids. The latter vary only insignificantly in shape and size, the most common types being SD 2 (or SD -2) and SD 3 (or SD -3) (Fig. 11). The lids were plastered onto the opening of the pot with their bases turned up (designated SD 1 to 4) or down (designated SD -2 to -3, Fig. 11). Both types occur during the entire Ptolemaic period, but the number of vessels with the bowl-lid base turned up increases in the course of time. All these ibis-pots are made of Nile silt containing sand and some fine straw, and all of them were filled with chemically treated bird mummies showing an almost complete black appearance (Fig. 9, bottom).

The vessels from type MK and MB were sealed with linen and gypsum plaster (LP, Fig. 12 left). There is only one exception: In Ptolemaic times, when ME types were in use, sometimes small beakers occur which have been closed with bowl-lids (MB 1 b2, Fig. 13). Such ibis pots contain only one mummy and are well known from Saqqara. The vessels from type ME were usually closed with bowl-lids (Fig. 12, right) except for the very early ME-types which were sealed with linen and gypsum plaster (Fig. 12, middle). This change in the sealing of the ibis pots may have been done for purely economic and practical reasons. One can imagine that the use of bowl-lids led to a considerable saving of linen and gypsum which were both much more expensive than pottery. The bowl-lid with its base turned up fitted well to the opening of the pot, so that only a thin ring of gypsum plaster was needed. Moreover, the closure was more reliable. In contrast, when the beaker pots were closed with linen and plaster and stored one on top of the other, the covers of the bottom pots were inevitably crushed by the weight of those put above.

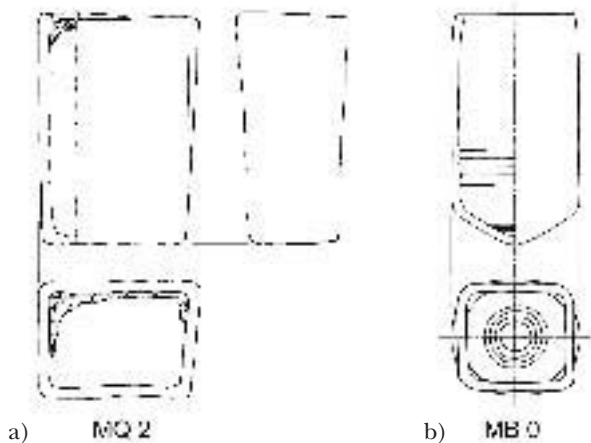


Fig. 7 Ibis-coffins type MQ 2 and MB 0, scale 1:10

Looking at the distribution of the different pottery types in the chronologically distinct parts of the galleries, clear parallels can be found if the bird containers in or near the ritual chambers that are dated by the names of kings and other objects are considered: the oldest part of the necropolis is Gallery D, whereas Gallery A represents the youngest part. Although the catacombs have been heavily disturbed at several occasions, so that few pots are found in their original posi-

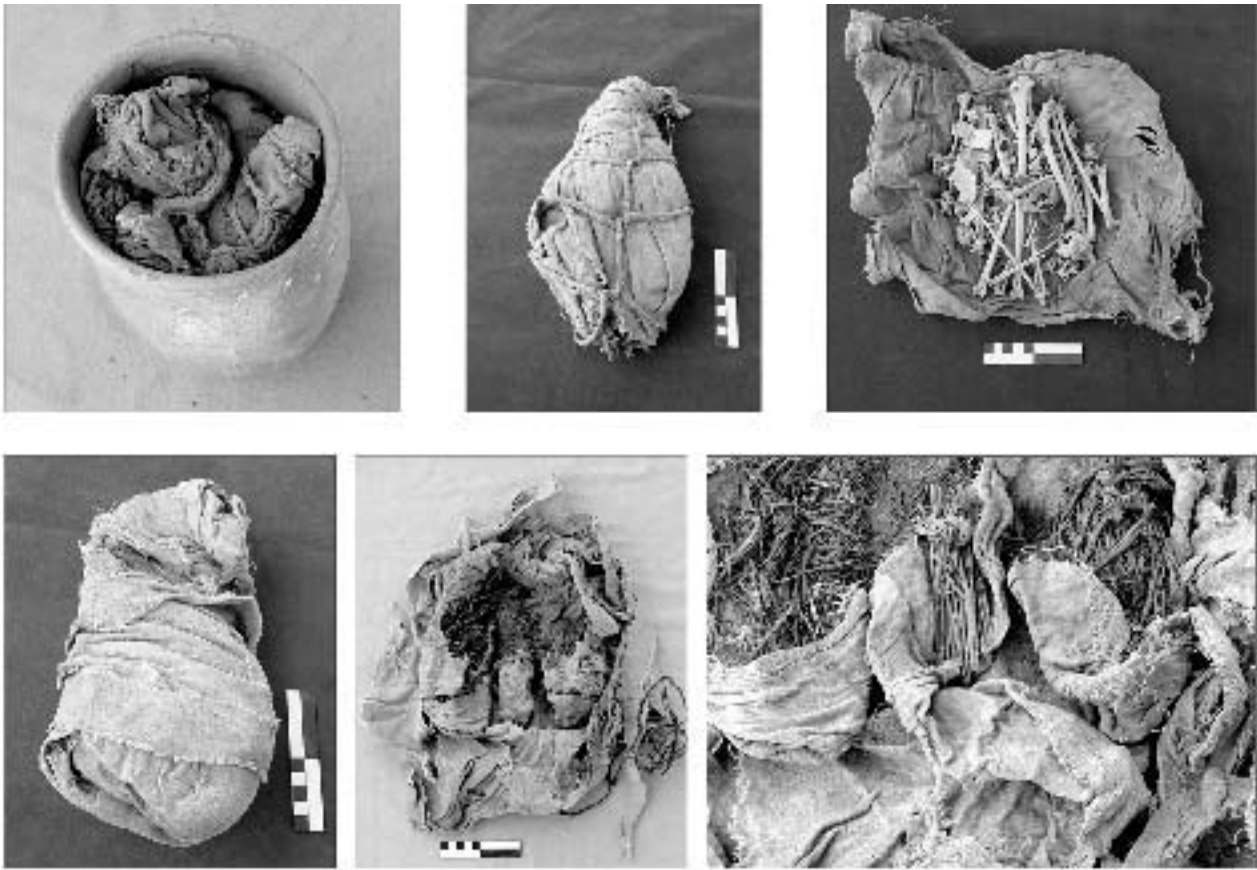


Fig. 8 MB-vessel with bundles

tions, we are convinced that it is still possible to produce a reliable chronology based on the different types of bird containers (Fig. 14). This is due to the fact that the majority of the vessels

have not been moved more than a few meters from their original placements.

#### The bird mummies

From our study it becomes obvious that even the scantiest remnants of bird carcasses as well as eggs and nest-material are present, implying that it was the duty of the cult servants of the ibis organisation to collect every dead bird or part thereof in or near their homesteads. All materials were handed over to the so-called *taricheutai* (embalmers). They were responsible for the cleaning of the bones and their wrapping with linen bandages. At a later stage of use of the necropolis, *in toto* mummification of sacred birds was achieved using chemicals (see below). The mummification of birds with their muscles and feathers instead of straightforward maceration may have started already during the last indigenous dynasty. The appearance at Tuna el-Gebel of large numbers of “classical” ibis mummies (Fig. 15), in which the bird’s head and beak are put on its chest and its feet folded away under the body, can be dated to the reign of Ptolemy I (309–283 BC).

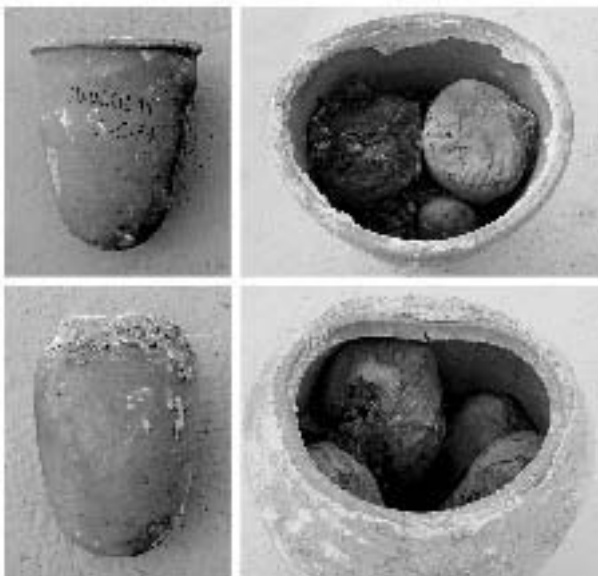


Fig. 9 Ibis-vessels type MB and ME with mummies



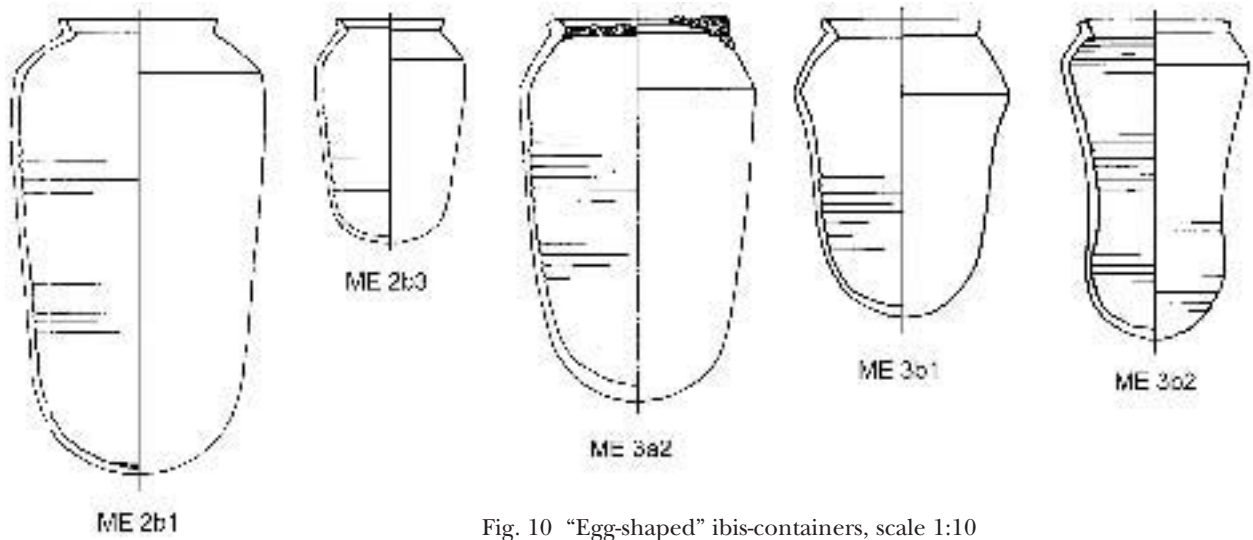


Fig. 10 “Egg-shaped” ibis-containers, scale 1:10

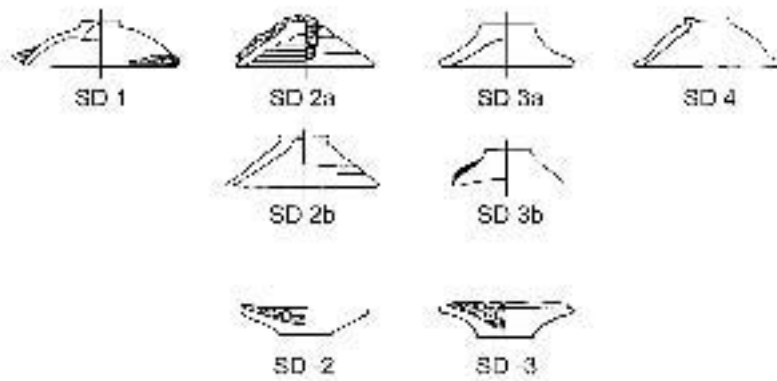


Fig. 11 Bowl-lids for sealing ibis-vessels, scale 1:10

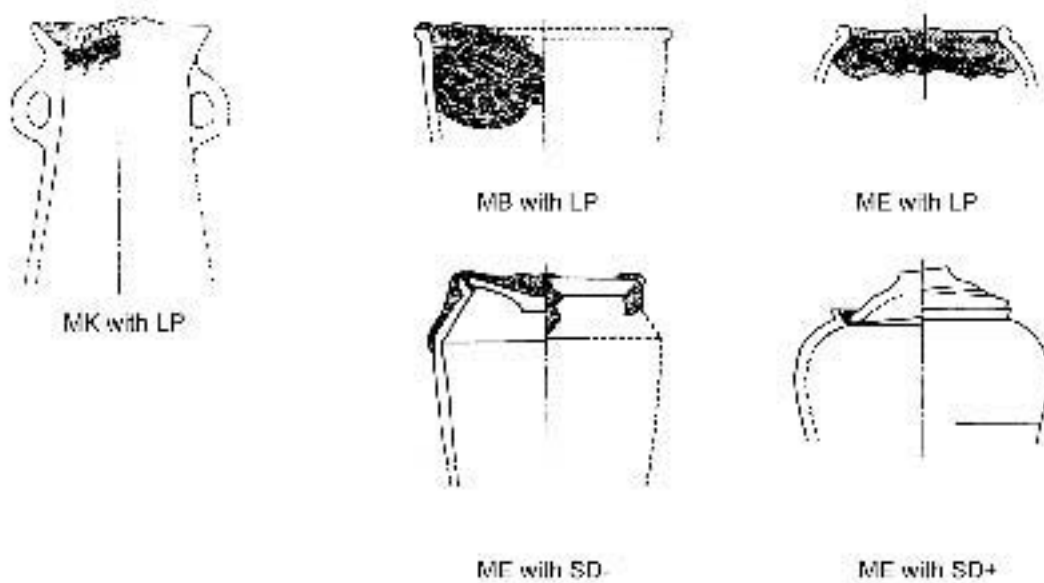


Fig. 12 Sealing types of ibis-vessels, scale 1:10



Fig. 13 MB-vessel with bowl-lid for one mummy, scale 1:10

From 380 BC onwards the increasing number of local feeding places for sacred birds in the cultivated areas and flood plains along the Nile finally led to the installation of new burial places elsewhere in Egypt. These local sanctuaries also offered an official priestly service in front of new cult statues, showing outside the image of a new god Osiris-Ibis, then the god Osiris-falcon and so on. Eventually, every animal cemetery became an Osirian hill, topographically separated from the human graveyard. Despite this, even in Ptolemaic times, cult ibises from temple sites in other parts of Egypt were still sent to Tuna el-Gebel. They were handed over to the local responsables and their delivery noted by the scribe of the local ibis organisation.

After their arrival at the “house of waiting”, a building in the necropolis area, the mummies were put in large pottery containers, except for particularly valued ibises, which were placed in sarcophagi of wood or limestone (Fig. 16). A special group of cult servants then carried the jars and sarcophagi containing the gods, i.e. the deified animals, into the side branches of the necropolis. Before their deposition in cemeteries the animals had to be ritually deified in a ceremony called the “Opening of the Mouth”. At least in Ptolemaic times, the mummies underwent this ceremony a second time in a room immediately in front of the entrance to the galleries, as well as a treatment with holy oils. As will be seen, there is no evidence whatsoever at Tuna el-Gebel that pilgrims and/or visitors of the temple area participated actively in the delivery and/or subterranean deposition of the deified animals, as it is generally assumed in scientific literature, e.g., for the ibis catacombs at Saqqara.

**AVIFAUNAL REMAINS AND METHODS OF ANALYSIS**

**Sampling procedures**

From the survey of the animal necropolis early in the 1980s it turned out that with very few exceptions all contexts had been seriously affected by human activities in the past. However, sampling of materials for scientific analysis was still possible

	MK	MB	ME <sup>LP</sup>	ME <sup>-</sup>	ME <sup>+</sup>
26 <sup>th</sup> dynasty					
30 <sup>th</sup> dynasty					
Alexander Ptolemy I Ptolemy II					
Roman period					

bone bundles  
 turpentine mummies

Fig. 14 Chronological distribution of the main types of ibis-vessels



Fig. 15 Gallery C–Branch A-33. A “classical” Sacred Ibis mummy



Fig. 16 Gallery B–Branch E-23. Painted sarcophagus with Sacred Ibis

since many jars with their contents had been displaced over relatively short distances, while in some cases side branches still contained closed vessels *in situ*. As such, sampling in this subterranean network of galleries was not unproblematic. Besides the risk of catacomb roofs and walls

collapsing, the fact that each step or other movement produced clouds of very fine dust in spaces with an *a priori* low oxygen concentration made working far from easy. Many branches, moreover, are completely filled with pots (Fig. 2), necessitating (painful) robbing on top of (broken) vessels

GL of diaphysis in mm	Humerus	Femur	Tibia	Metatarsus II–IV	c. age in days
Neonate	27–30	27–30	32–50	21–25	1–2
Infantile	30–50	30–35	50–75	25–35	2–14
Infantile–juvenile	50–70	35–50	75–90	35–60	15–35
Juvenile	70–100	50–60	90–120	60–85	36–50
Subadult <sup>a</sup>	> 100	> 60	> 120	> 85	50–70 (90)
Adult <sup>b</sup>	> 113	> 63	> 133	> 90	> 90

Table 1 Age classes in Sacred Ibis bones based on their Greatest Length (GL)

<sup>a</sup>Proximal articular end of the tarsometatarsus in fusion or fused but all three metatarsi still not fused proximally.

<sup>b</sup> Proximal articular end of the tarsometatarsus completely fused.

in order to reach the deeper, presumably more intact parts of a branch.

As to sampling, pots considered to contain materials *in situ*, be it bird bundles (Fig. 9), ibis eggs (Fig. 17), “classical” mummies (Fig. 15) as well as accumulations of bird bones probably collected already in ancient times from mummies that had fallen apart (Fig. 18), were taken to the surface for analysis. Besides, bird bones found lying near broken pots or originating from mummies destroyed through past human activities were also collected in case they showed pathologies or a morphology different from that in *Threshiornis*. In case larger accumulations of non-ibis remains were detected near particular features such as cult chambers, sieving of bulk samples was carried out in order to maximise our knowledge about the avifauna associated with these features. As has been said, a conservative estimate of the number of individuals deposited in the catacombs is over one million birds, of which in the frame of this project less than 0.4% could be analysed!

#### *Species identification*

Following the regulations of the Supreme Council of Antiquities in Egypt all animal finds recovered during archaeological work had to be studied on the spot. Identification to the genus or species level was carried out with the aid of atlases illustrating the morphology and bone size of closely-related members of different bird families, including the Pelicanidae (LORCH 1992), Ardeidae (KELLNER 1986), Ciconiidae (GRUBER 1990), Anatidae (BACHER 1967; WOELFLE 1967), Accipitridae (OTTO 1981; SCHMIDT-BURGER 1982), Phasianidae (ERBERSDOBLER 1968; KRAFT 1972),

Columbidae (FICK 1974) and Strigidae (LANGER 1980). In addition, skeletons of birds housed in the State Collection of Anthropology and Palaeoanatomy, Munich, were brought to Tuna el-Gebel for comparison. Problematic specimens were photographed in order to facilitate their identification in Munich.

#### *Bird osteometry*

In the case of related bird genera bone measurements may allow for a specific identification. All complete skeletal elements were measured following the international standard as proposed by VON DEN DRIESCH (1976/1999). For pragmatic reasons not all the Sacred and Glossy Ibis bones collected could be measured. A full account of the osteometric data obtained on the bird remains lies beyond the scope of this paper and will be published at a later stage.

Since many bird species show a clear sexual dimorphism – males are larger than females in most water birds, while females are larger than males in birds of prey and owls – bone size can be used to sex birds.

In a single bird species, body size may vary through time. In order to test variation in size, large series of measurements are necessary. At Tuna el-Gebel this is the case for the two species of ibis and the Kestrel.

#### *Ageing of Sacred Ibis*

The avifaunal assemblage studied mainly consists of remains of adult birds with an occasional juvenile individual, except for the Sacred Ibis, which is the only species in which all age classes are well represented, from unfertilized eggs to birds in different embryonal stages, neonates, chicks, juve-



Fig. 17 Gallery B–Branch A-2. Broken pottery jar still containing at least 30 eggs of Sacred Ibis wrapped in linen

niles, subadults and fully-grown individuals. It is well known that in birds the time span of body growth is very short, and this also applies to the Sacred Ibis: after hatching the birds remain in the nest until *c.* day 14 of their life, at first brooded, later shaded by standing adults. Between day 14 and 21 they leave the nest and congregate into loose flocks but are still fed by their parents. Around day 21 the young ibis reaches *c.* 30–50 % of the adult's body size. From day 35 of their life onwards the birds become capable of some flight. At this stage their legs still show broadened tarsal joints indicating that the distal articulation of the tibia (ontogenetically the proximal row of the tarsal bones) and the proximal articulation of the metatarsus (ontogenetically the distal row of the tarsal bones) are still unfused. It is said that on day 50 at the latest the ibis leaves the colony (URBAN 1982, 201 f.). However, at this stage of life the tarsal joint is not yet fully developed, i.e. the articular ends of the tibia and the metatarsus still show clear fusion-zones; besides, the three metatarsals which in adults are completely fused are still separated proximally. 90 days is considered an absolute minimum for the skeleton of the Sacred Ibis to be fully developed.

We have tried to correlate the biological data described above with the osteological and osteometric data obtained on *Threskiornis* bones, though the data presented in Table 1 must be considered tentative.

## RESULTS

The following results are based on the analysis of a minimum of 3744 bird individuals and at least



Fig. 18 Gallery C–Branch A-30. Accumulation of bones from a single pottery jar. The assemblage contains the remains of at least 20 individuals pertaining to three bird and one fish species, namely Sacred Ibis *Threskiornis aethiopica* (16), Glossy Ibis *Plegadis falcinellus* (2), Reed Cormorant *Phalacrocorax africanus* (1) and Nile puffer *Tetraodon fahaka* (1)

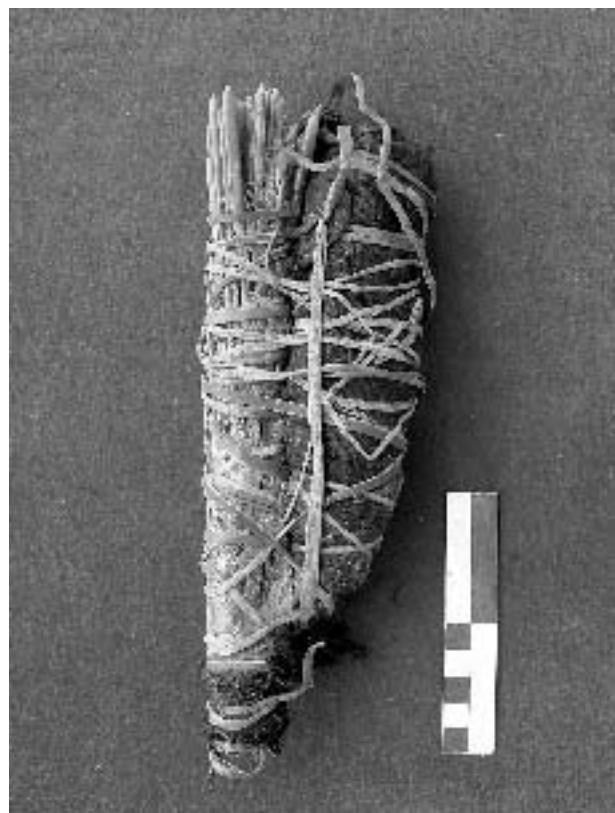


Fig. 19 Gallery C–Branch D-4. Bundles with feathers of Sacred Ibis wrapped in plant material and linen

	Scientific Name	English Name	German Name	Status	MNI
1.	<i>Podiceps cristatus</i>	Great Crested Grebe	Haubentaucher	A	1
2.	<i>Pelecanus crispus</i>	Dalmatian Pelican	Kraußkopfpelikan	W	1
3.	<i>Pelecanus onocrotalus</i>	White Pelican	Rosapelikan	W	1
4.	<i>Phalacrocorax carbo</i>	Cormorant	Kormoran	A	1
5.	<i>Phalacrocorax africanus</i>	Reed Cormorant	Riedscharbe	A	15
6.	<i>Anhinga rufa</i>	Darter	Schlangenhalsvogel	A	9
7.	<i>Ardea cinerea</i>	Grey Heron	Grau- od. Fischreiher	M	7
8.	<i>Ardea purpurea</i>	Purple Heron	Purpureiher	M	3
9.	<i>Egretta alba</i>	Great White Egret	Silberreiher	W	3
10.	<i>Egretta garzetta</i>	Little Egret	Seidenreiher	M	14
11.	<i>Egretta gularis</i>	Reef Heron	Küstenreiher	A	3
12.	<i>Bubulcus ibis</i>	Cattle Egret	Kuhreiher	W	3
13.	<i>Nycticorax nycticorax</i>	Night Heron	Nachtreiher	S/M	5
14.	<i>Ixobrychus minutus</i>	Little Bittern	Zwergdommel	S/M	1
15.	<i>Botaurus stellaris</i>	Bittern	Rohrdommel	M	2
16.	<i>Platalea leucorodia</i>	Spoonbill	Löffler	W	4
17.	<i>Plegadis falcinellus</i>	Glossy Ibis	Brauner Sichler	R/W	226
18.	<i>Threskiornis aethiopica</i>	Sacred Ibis	Heiliger Ibis	A	2676
19.	<i>Ciconia ciconia</i>	White Stork	Weißstorch	M	12
20.	<i>Ciconia nigra</i>	Black Stork	Schwarzstorch	W/M	3
21.	<i>Mycteria ibis</i>	Wood Ibis	Nimmersatt	A	1
22.	<i>Ciconia abdimii</i>	Abdim's Stork	Abdimstorich	A	3
23.	<i>Anastomus lamelligerus</i>	Open-billed Stork	Klaffschnabelstorch	A	6
24.	<i>Anser anser f. domestica</i>	Domestic Goose	Hausgans	R	2
25.	<i>Alopochen aegyptiacus</i>	Egyptian Goose	Nilgans	A	1
26.	<i>Anas platyrhynchos</i>	Mallard	Stockente	W	1
27.	<i>Anas acuta</i>	Pintail	Spießente	W	2
28.	<i>Anas clypeata</i>	Shoveler	Löffelente	W	1
29.	<i>Aythya nyroca</i>	Ferruginous Duck	Moorente	W	1
30.	<i>Haliaeetus albicilla</i>	White-tailed Sea Eagle	Seeadler	A	4
31.	<i>Haliaeetus vocifer</i>	African Fish Eagle	Schreiseeadler	A	4
32.	<i>Milvus migrans</i>	Black Kite	Schwarzmilan	R/M	26
33.	<i>Elanus caeruleus</i>	Black-shouldered Kite	Gleitaar	R	29
34.	<i>Circaetus gallicus</i>	Short-toed Eagle	Schlangenadler	M	3
35.	<i>Accipiter nisus</i>	Sparrowhawk	Sperber	W	49
36.	<i>Accipiter brevipes</i>	Levant Sparrowhawk	Kurzfangsperber	W	7
37.	<i>Accipiter gentilis</i>	Goshawk	Habicht	A	10
38.	<i>Buteo lagopus</i>	Rough-legged Buzzard	Rauhfußbussard	A	1
39.	<i>Buteo rufinus</i>	Long-legged Buzzard	Adlerbussard	R/W	12
40.	<i>Buteo buteo</i>	Buzzard	Mäusebussard	R/W	5
41.	<i>Hieraaetus fasciatus</i>	Bonelli's Eagle	Habichtsadler	W	1
42.	<i>Hieraaetus pennatus</i>	Booted Eagle	Zwergadler	W	2
43.	<i>Aquila heliaca</i>	Imperial Eagle	Kaiseradler	W	18
44.	<i>Aquila pomarina</i>	Lesser Spotted Eagle	Schreiadler	W	12
45.	<i>Neophron percnopterus</i>	Egyptian Vulture	Schmutzgeier	S	1
46.	<i>Torgos tracheliotus</i>	Lappet-faced Vulture	Ohrengeier	M	4
47.	<i>Aegyptius monachus</i>	Black Vulture	Mönchsgeier	W	1
48.	<i>Gyps fulvus</i>	Griffon Vulture	Gänsegeier	R	10

Table 2 Bird species present in the Galleries D, C and B of Tuna el-Gebel, their frequency and their present-day status in Middle Egypt (A = Absent from Middle Egypt; M = Migratory visitor; R = Resident; S = Summer visitor; W = Winter visitor)

	Scientific Name	English Name	German Name	Status	MNI
49.	<i>Circus aeruginosus</i>	Marsh Harrier	Rohrweihe	M	23
50.	<i>Circus cyaneus</i>	Hen Harrier	Kornweihe	W	20
51.	<i>Circus macrourus</i>	Pallid Harrier	Steppenweihe	W	7
52.	<i>Circus pygargus</i>	Montagu's Harrier	Wiesenweihe	M	21
53.	<i>Falco cherrug</i>	Saker Falcon	Würgfalke	W	13
54.	<i>Falco biarmicus</i>	Lanner Falcon	Lannerfalke	R	20
55.	<i>Falco peregrinoides</i>	Barbary Falcon	Wüstenfalke	R	8
56.	<i>Falco subbuteo</i>	Hobby	Baumfalke	W	10
57.	<i>Falco vespertinus</i>	Red-footed Falcon	Rotfußfalke	W	9
58.	<i>Falco naumanni</i>	Lesser Kestrel	Rötelfalke	W	23
59.	<i>Falco tinnunculus</i>	Kestrel	Turmfalke	R/W	249
60.	<i>Alectoris barbara</i>	Barbary Partridge	Felsenhuhn	A	1
61.	<i>Coturnix coturnix</i>	Common Quail	Wachtel	R/W	3
62.	<i>Grus grus</i>	Common Crane	Kranich	W	9
63.	<i>Porzana parva</i>	Little Crake	Kleines Sumpfhuhn	M	1
64.	<i>Gallinula chloropus</i>	Moorhen	Grünfüßiges Teichhuhn	R	1
65.	<i>Fulica atra</i>	European Coot	Blässhuhn	W	2
66.	<i>Vanellus vanellus</i>	Lapwing	Kiebitz	W	1
67.	<i>Vanellus spinosus</i>	Spur-winged Plover	Spornkiebitz	R	1
68.	<i>Limosa lapponica</i>	Bar-tailed Godwit	Pfuhschnepfe	A	1
69.	<i>Gallinago media</i>	Great Snipe	Doppelschnepfe	M	1
70.	<i>Burhinus oediconemus</i>	Stone Curlew	Triel	R	1
71.	<i>Pterocles senegallus</i>	Spotted Sandgrouse	Tropfenflughuhn	R	2
72.	<i>Pterocles coronatus</i>	Crowned Sandgrouse	Kronenflughuhn	R	1
73.	<i>Pterocles exustus</i>	Chestnut-bellied Sandgrouse <sup>a</sup>	Braunbauchflughuhn	R	1
74.	<i>Columba livia</i>	Rock Dove	Felsentaube	R	2
75.	<i>Tyto alba</i>	Barn Owl	Schleiereule	R	5
76.	<i>Bubo bubo</i>	Eagle Owl	Uhu	R	6
77.	<i>Asio flammeus</i>	Short-eared Owl	Sumpfohreule	W	17
78.	<i>Athene noctua</i>	Little Owl	Steinkauz	R	15
79.	<i>Otus scops / Otus brucei</i>	Scops Owl / Striated Scops Owl	Zwergohr-/Streifeneule	W/R	1
80.	<i>Caprimulgus europaeus</i>	European Nightjar	Ziegenmelker	M	1
81.	<i>Caprimulgus aegyptius</i>	Egyptian Nightjar	Pharaonenziegenmelker	S/M	2
82.	<i>Caprimulgus nubicus</i>	Nubian Nightjar <sup>b</sup>	Bajudaziegenmelker	S	1
83.	<i>Coracias garrulus</i>	Roller	Blauracke	M	1
84.	<i>Upupa epops</i>	Hoopoe	Wiedehopf	R	2
85.	<i>Galerida cristata</i>	Crested Lark	Haubenlerche	R	6
86.	<i>Hirundo rustica</i>	Swallow	Rauchschwalbe	R/W	8
87.	<i>Motacilla alba</i>	White Wagtail	Bachstelze	W	1
88.	<i>Passer hispaniolensis /Passer domesticus</i>	Spanish Sparrow / House Sparrow	Weidensperling/ Haussperling	W/R	3
89.	<i>Rhodopechys githaginea</i>	Trumpeter Finch	Wüstengimpel	R	1
90.	<i>Corvus corone cornix</i>	Hooded Crow	Nebelkrähe	R	6

Table 2 continued: Bird species present in the Galleries D, C and B of Tuna el-Gebel, their frequency and their present-day status in Middle Egypt (A = Absent from Middle Egypt; M = Migratory visitor; R = Resident; S = Summer visitor; W = Winter visitor)

<sup>a</sup> From Gallery A2

<sup>b</sup> From Gallery A

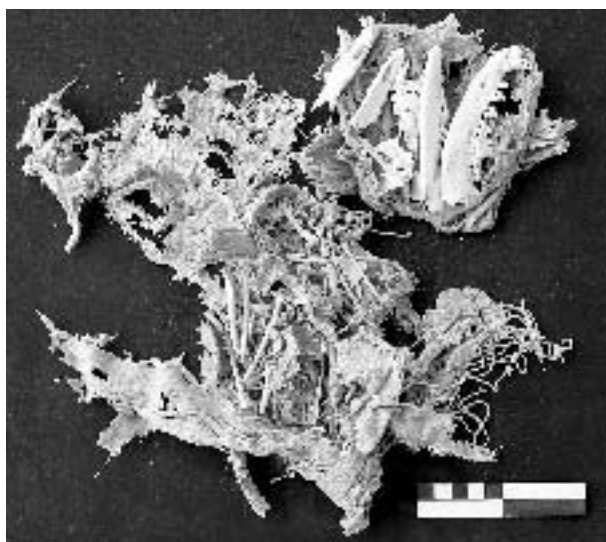


Fig. 20. Gallery C–Branch D-16a. Bundle with a partial skeleton of a Sacred Ibis, a complete skeleton of a Kestrel and the upper and lower jaws of a medium-sized Dog

239 bird eggs (Fig. 17), to which can be added 90 bundles or mummies containing exclusively feathers (Fig. 19) and/or nest material. Though many bird bundles and mummies had been removed from their original niches and jars by past human activities, we feel confident that the samples produced in the course of five seasons of intensive survey work allow us to draw a comprehensive picture of the avifauna deposited in the necropolis.

### Topographic distribution of the bird taxa in the galleries

#### General notes

An overview of the bird taxa identified is given in Table 2. As in our previous work dealing with the primates from Tuna el-Gebel, only distinct rooms and more or less undisturbed branches have been sampled in a more exhaustive way. Besides bird remains wrapped in bundles (Fig. 8) or complete bird mummies (Fig. 15), the study material also comprised parts of birds from bundles that had fallen apart and had been placed in new vessels already in antiquity (Fig. 18). Besides isolated mammal bones, the latter may contain the osseous remains of up to 60 bird individuals. Thus, in more than half of the features analysed, the counts in the tables will refer to the Minimum Number of Individuals (MNI) recognised in a sample, whereas in the other cases it was possible to establish the real Number of Individuals (NI).

It is noteworthy that the bird bundles seldom

contain complete bird skeletons, sometimes even to the point that only a single skeletal element is present. In other cases the embalmer included a wing or a foot or a skull of a second bird. In one case a bundle even yielded, besides an incomplete Sacred Ibis skeleton, the skeleton of a Kestrel, together with the upper and lower jaws of a medium-sized Dog (Fig. 20). Moreover, if from its outward appearance a bird mummy looked as if it would contain a complete individual, this was not always the case.

With the change in techniques of embalment (see below) it became possible to conserve birds *in toto*. Among these are the Sacred and Glossy Ibis as well as birds of prey and songbirds (Roller, Hoopoe). However, besides ibises almost no other bird species known to be associated with aquatic habitats, e.g., pelicans, cormorants, darters, herons, storks, geese, etc., has been mummified *in toto*. Their respective mummies consisted in either a wing or a leg, or both wings or legs, or the tip of the bill or some vertebrae.

#### Gallery D

In Gallery D, the oldest part of the necropolis, bird remains have been collected in branches D–D-1 to D–D-5, in D–D-8 and D–D-9 and in D–D-14 (Fig. 1). A total of 23 taxa could be identified (Table 3). Remains of the Sacred Ibis make out 85 % of the assemblage. All age classes are represented with adult birds predominating. To these can be added a bundle containing a single (broken) egg with a well-developed embryo and two pottery jars yielding 30 eggs each (all from D–D-2). In the latter macroscopically visible fetal bones were absent. Provided we are not dealing with unfertilized eggs or with eggs taken out of nests that had been abandoned by the parents, their collecting must have taken place at an early stage of hatching, and the question arises whether the eggs have been removed intentionally from those ibis nests containing more than one egg, since normally only one individual will survive. In the Gallery D assemblage the Glossy Ibis *Plegadis falcinellus* is represented by 32 adult birds and the Kestrel *Falco tinnunculus* by nine individuals. The other bird taxa are represented by a single individual each (Table 3).

All the bird specimens collected in Gallery D had been macerated and the cleaned bones wrapped with linen. 17 bundles just contained ibis feathers and/or plant remains used for nest material.



	Species	Age class	NI/MNI
1.	Sacred Ibis	adult	323
	Sacred Ibis	subadult	10
	Sacred Ibis	juvenile	12
	Sacred Ibis	inf.-juv.	10
	Sacred Ibis	infantile	6
	Sacred Ibis	neonate	1
	Sacred Ibis – egg		61
2.	Glossy Ibis	adult	32
3.	Kestrel	adult	9
	Unidentified small Egret	adult	2
4.	Great Crested Grebe	adult	1
5.	Unidentified Pelican	adult	1
6.	Cormorant	adult	1
7.	Reed Cormorant	adult	1
8.	Little Egret	adult	1
9.	Spoonbill	adult	1
10.	Abdim's Stork	adult	1
11.	Domestic Goose	adult	1
12.	Black Kite	adult	1
13.	Black-shouldered Kite	adult	1
14.	Sparrowhawk	adult	1
15.	Hen Harrier	adult	1
16.	Lanner Falcon	adult	1
	Unidentified Falcon	adult	1
17.	Hobby	adult	1
18.	Red-footed Falcon	adult	1
19.	Common Crane	adult	1
20.	Moorhen	adult	1
21.	Lapwing	adult	1
22.	Short-eared Owl	adult	1
23.	Crested Lark	adult	1
	Total		426 (+61)

Table 3 Taxonomic diversity and frequency of birds sampled in Gallery D, to which 17 mummies containing only feathers or plant materials should be added. The ratio Sacred Ibis : Glossy Ibis is 11–12 : 1

#### Gallery C, branch C–D

The survey of passage C–D produced a MNI of 345 birds belonging to 27 different taxa as well as 14 eggs of Sacred Ibis wrapped in linen (Table 4). In this assemblage the remains of Sacred Ibis constitute 77.3 % of the sample analysed. Compared to Gallery D the proportion of juveniles and younger individuals is relatively high, namely 32.1 %. 22 bundles contained only ibis feathers and/or reed grass; the latter were excluded from the counts in Table 4.

As noted for Gallery D the bones had been

	Species	Age class	NI/MNI
1.	Sacred Ibis	adult	180
	Sacred Ibis	subadult	13
	Sacred Ibis	juvenile	33
	Sacred Ibis	inf.-juv.	9
	Sacred Ibis	infantile	16
	Sacred Ibis	neonate	14
	Sacred Ibis – egg		14
2.	Glossy Ibis	adult	28
3.	Kestrel	adult	16
	Kestrel	inf.-juv.	1
4.	Reed Cormorant	adult	2
5.	Black-shouldered Kite	adult	2
6.	Sparrowhawk	adult	2
7.	Marsh Harrier	adult	2
8.	Lesser Kestrel	adult	2
	Unidentified Falcon	adult	2
	Unidentified Falcon	juvenile	1
9.	Common Crane	adult	2
10.	Egyptian Nighthjar	adult	2
11.	Crested Lark	adult	2
	Pelican – egg		1
12.	Darter	adult	1
13.	Grey Heron	adult	1
14.	Night Heron	adult	1
15.	Little Egret	adult	1
16.	Bittern	adult	1
17.	White Stork	adult	1
18.	Black Stork	adult	1
19.	Mallard	adult	1
20.	Black Kite	adult	1
21.	Steppe Buzzard	adult	1
22.	Lappet-faced Vulture	adult	1
23.	Black Vulture	adult	1
24.	Griffon Vulture	adult	1
25.	Rock Dove	adult	1
26.	Hoopoe	adult	1
27.	Trumpeter Finch	adult	1
	Total		345 +(15)

Table 4 Taxonomic diversity and frequency of birds sampled in Gallery C, branch C–D, to which 22 mummies containing only feathers or plant material should be added. The ratio Sacred Ibis : Glossy Ibis is 9–10 : 1

macerated and cleaned, though for the first time one observes traces of a blackish, somewhat sweet-smelling substance, which must have been added during treatment. Conceivably the pieces of linen cloth in which the bones were wrapped had been soaked in bitumen or oil of turpentine. This procedure not only reduced the risk of post-

	Species	Age class	NI/MNI
1.	Sacred Ibis	adult	113
	Sacred Ibis	subadult	14
	Sacred Ibis	juvenile	14
	Sacred Ibis	inf.-juv.	13
	Sacred Ibis	inf.	21
	Sacred Ibis	neonate	5
	Sacred Ibis – egg		3
2.	Glossy Ibis	adult	14
3.	Kestrel	adult	12
4.	Sparrowhawk	adult	6
5.	Black-shouldered Kite	adult	5
6.	Reed Cormorant	adult	4
7.	White Stork	adult	4
	White Stork – egg		1
8.	Lesser Kestrel	adult	4
9.	Saker Falcon	adult	3
	Unidentified bird of prey	adult	3
10.	Short-eared Owl	adult	3
11.	Levant Sparrowhawk	adult	2
12.	Lanner Falcon	adult	2
13.	European Coot	adult	2
14.	White Pelican	adult	1
15.	Darter	adult	1
16.	Purple Heron	adult	1
17.	Night Heron	adult	1
18.	Cattle Egret	adult	1
19.	Spoonbill	adult	1
20.	African Fish Eagle	adult	1
21.	Black Kite	adult	1
22.	Short-toed Eagle	adult	1
23.	Buzzard	adult	1
24.	Long-legged Buzzard	adult	1
25.	Marsh Harrier	adult	1
26.	Hen Harrier	adult	1
27.	Hobby	adult	1
28.	Red-footed Falcon	adult	1
29.	Spur-winged Plover	adult	1
30.	Hooded Crow	adult	1
	Total		261 + (4)

Table 5 Taxonomic diversity and frequency of birds sampled in Gallery C, branch C-C, except for the birds of prey collected near the entrance of C-C-4 (see Table 6). To these numbers 16 mummies containing only feathers or plant material should be added. The ratio Sacred Ibis : Glossy Ibis is 12-13 : 1

depositional bacterial decomposition of the linen bandages, but probably also the intense stench that is inherent even in carefully macerated and cleaned bones.

Species	NI/MNI
Black Kite <i>Milvus migrans</i>	14
Black-shouldered Kite <i>Elanus caeruleus</i>	3
Sparrowhawk <i>Accipiter nisus</i>	9
Levant Sparrowhawk <i>Accipiter brevipes</i>	2
Goshawk <i>Accipiter gentilis</i>	7
Rough-legged Buzzard <i>Buteo lagopus</i>	1
Buzzard <i>Buteo buteo</i>	2
Long-legged Buzzard <i>Buteo rufinus</i>	6
Imperial Eagle <i>Aquila heliaca</i>	5
Lesser Spotted Eagle <i>Aquila pomarina</i>	5
Griffon Vulture <i>Gyps fulvus</i>	1
Marsh Harrier <i>Circus aeruginosus</i>	12
Hen Harrier <i>Circus cyaneus</i>	8
Pallid Harrier <i>Circus macrourus</i>	2
Montagu's Harrier <i>Circus pygargus</i>	14
Saker Falcon <i>Falco cherrug</i>	3
Lanner Falcon <i>Falco biarmicus</i>	3
Barbary Falcon <i>Falco pelegrinoides</i>	3
Hobby <i>Falco subbuteo</i>	3
Lesser Kestrel <i>Falco naumanni</i>	3
Kestrel <i>Falco tinnunculus</i>	37
Barn Owl <i>Tyto alba</i>	1
Eagle Owl <i>Bubo bubo</i>	3
Short-eared Owl <i>Asio flammeus</i>	9
Little Owl <i>Athene noctua</i>	4
Total	161

Table 6 Taxonomic diversity and frequency of diurnal and nocturnal birds of prey (exclusively adults) sampled at the entrance of chamber C-C-4 (chapel of Thot) in Gallery C

Parallel to Gallery D the second most frequent species is the Glossy ibis, followed by the Kestrel. One bundle from C–D-8 containing an undamaged pelican egg is noteworthy. In passage C–D, bundles yielding bones, feathers and occasionally intestines have been noted in the two ibis species and sometimes also in other taxa. Complete non-ibis individuals include a Buzzard *Buteo buteo vulpinus*, a Black Kite *Milvus migrans*, and a juvenile Kestrel *Falco tinnunculus*, put in a bundle together with a Trumpeter finch *Rhodopechys githaginea* from C–D-1, two Kestrels, a Black-shouldered Kite *Elanus caeruleus*, a Bittern *Botaurus stellaris* (skull missing), a Hoopoe *Upupa epops* and an Egyptian Nightjar *Caprimulgus aegyptius* from C–D-4, a Sparrowhawk *Accipiter nisus* from C–D-16, an Egyptian nightjar from C–D-16a and a Crested Lark *Galerida cristata* from C–D-17. All other non-ibis finds consist of single bones or incomplete skeletons.

	Species	Age class	NI/MNI
1.	Sacred Ibis	adult	50
	Sacred Ibis	subadult	3
	Sacred Ibis	juvenile	6
	Sacred Ibis	inf.-juv.	1
	Sacred Ibis	infantile	5
	Sacred Ibis	neonate	1
	Sacred Ibis – egg		21
2.	Glossy Ibis	adult	6
3.	Kestrel	adult	4
4.	White Stork	adult	1
5.	Black Kite	adult	1
6.	Black-shouldered Kite	adult	1
	Total		79 +(21)

Table 7 Taxonomic diversity and frequency of birds sampled in Gallery C, branch C-B, to which 12 mummies containing only feathers or plant materials should be added. The ratio Sacred Ibis : Glossy Ibis is 11 : 1

#### Gallery C, branch C–C

In passage C–C we collected 261 birds belonging to at least 30 taxa (Table 5). *Threskiornis* mummies make up to 69 % of the assemblage, all age classes being represented. In C–C-6 an ibis mummy containing an egg of a stork (*Ciconia* sp.) was found. 16 mummies yielded exclusively feathers or plant materials and one mummy contained numerous small snails (*Cleopatra bulimoides*), which presumably represent the stomach contents of an ibis. Complete non-ibis mummies have been found in C–C-8 (*Elanus caeruleus*, *Accipiter nisus*, *Circus aeruginosus*), C–C-11 (*Falco tinnunculus*, *Accipiter nisus*) and C–C-22 (*Falco tinnunculus*). As usual most species other than ibis are very incomplete.

At the entrance of the Ptolemaic decorated baboon chamber C–C-4 we found a large number of bones of diurnal and nocturnal birds of prey, together with numerous pieces of linen torn apart. Conceivably these mummies had been placed originally to the side of the entrance of the baboon chamber. The avian assemblage collected in front of C–C-4 contained 161 individuals of 25 species of diurnal birds of prey and four species of owls (Table 6).

Table 8 Taxonomic diversity and frequency of birds sampled in Gallery C, branch C-A, to which 14 ibis-shaped and three falcon-shaped mummies containing but feathers should be added. The ratio Sacred Ibis : Glossy Ibis is 11-12 : 1

	Species	Age class	NI/MNI
1.	Sacred Ibis	adult	550
	Sacred Ibis	subadult	15
	Sacred Ibis	juvenile	70
	Sacred Ibis	inf.-juv.	8
	Sacred Ibis	infantile	28
	Sacred Ibis	neonate	1
	Sacred Ibis – egg		71
2.	Glossy Ibis	adult	51
	Glossy Ibis	juvenile	4
3.	Kestrel	adult	32
	Kestrel	subadult	1
	Kestrel	juvenile	5
4.	Sparrowhawk	adult	8
5.	Lesser Kestrel	adult	5
6.	Lanner Falcon	adult	4
7.	Common Crane	adult	4
8.	Reed Cormorant	adult	3
9.	Little Egret	adult	3
10.	White Stork	adult	3
	Unidentified bird of prey	adult	3
11.	Spanish or House Sparrow	adult	3
12.	Open-billed Stork	adult	2
13.	Night Heron	adult	2
	Unidentified Falcon	adult	2
	Falcon – eggs		4
14.	Darter	adult	1
15.	Grey Heron	adult	1
16.	Great White Egret	adult	1
17.	Cattle Egret	adult	1
	Unidentified Egret	adult	1
18.	Spoonbill	adult	1
19.	Black Stork	adult	1
	Unidentified Stork	adult	1
20.	Domestic Goose	adult	1
21.	Pintail	adult	1
22.	Black Kite	adult	1
23.	Black-shouldered Kite	adult	1
24.	Lesser spotted Eagle	adult	1
25.	Lappet-faced Vulture	adult	1
26.	Griffon Vulture	adult	1
27.	Pallid Harrier	adult	1
28.	Hobby	adult	1
29.	Common Quail	adult	1
30.	Great Snipe	adult	1
31.	Short-eared Owl	adult	1
32.	Little Owl	adult	1
33.	Nightjar	adult	1
34.	Roller	adult	1
35.	Swallow	adult	1
36.	White Wagtail	adult	1
	Total		832 + (75)

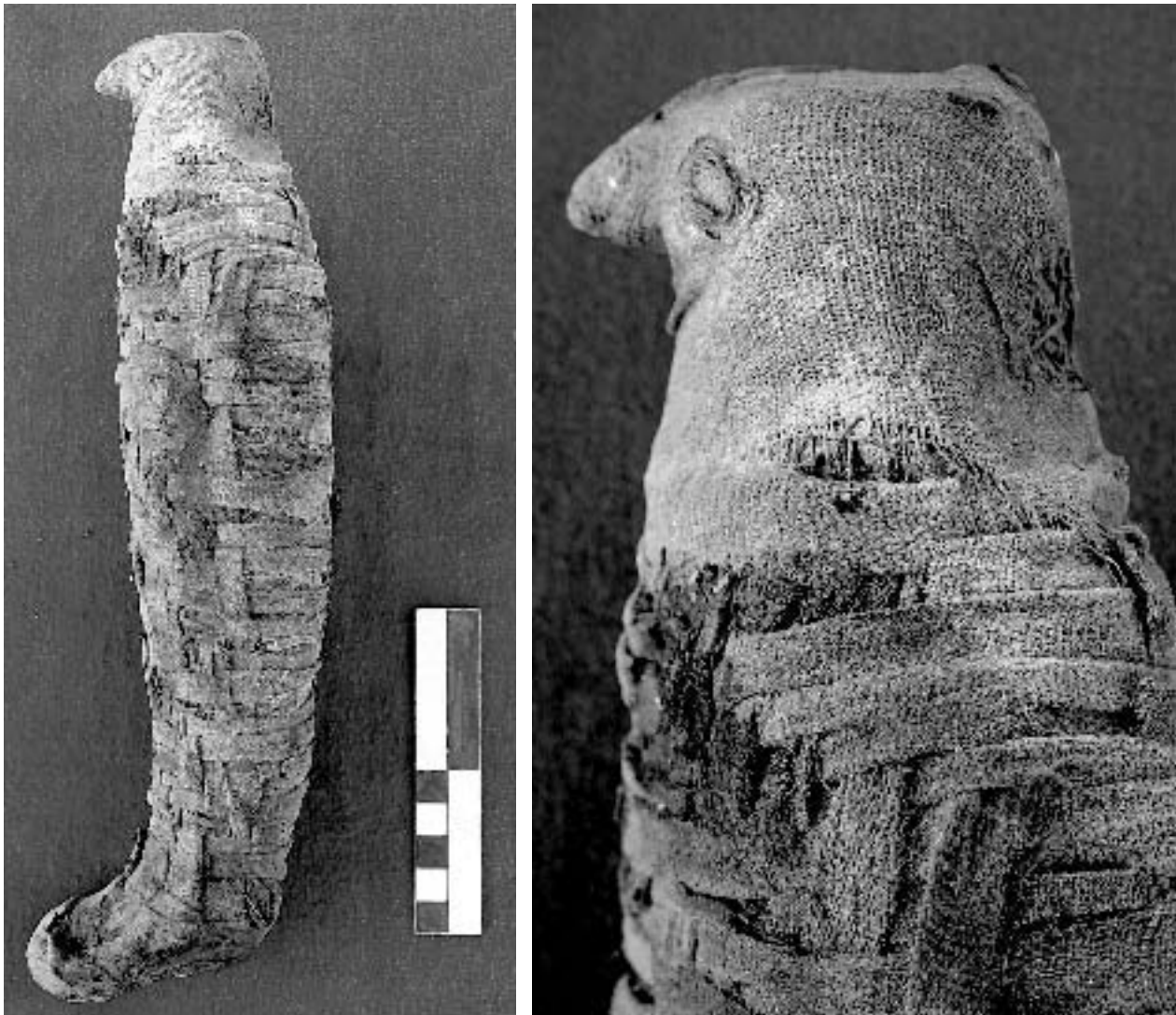


Fig. 21. Gallery B, between Branches A-7 and A-9. a) Osirian-shaped falcon mummy with b) a detail of its head showing the linen eye

#### Gallery C, branch C-B

In passage C-B little survey work was done and only 79 bird mummies representing six different species have been collected (Table 7). 83.5 % of the sample belongs to *Threskiornis*. All mummies were heavily soaked with turpentine or bitumen. Twelve “classical” ibis mummies only yielded the birds’ feathers. Three mummies containing a Kestrel skeleton each were shaped in the form of a falcon-headed god by the embalmers (Fig. 21a, b), which is a representation of the god Osiris-Falcon and not of Horus, as is generally claimed.

#### Gallery C, branch C-A

From passage C-A a large assemblage yielding 832 specimens belonging to at least 36 taxa has

been retrieved (Table 8). Remains of the Sacred Ibis constitute 76 % of the sample, those of the Glossy Ibis (6.6 %) and Kestrel (4.6 %) being clearly less numerous. The presence of immature Glossy Ibis is noteworthy since it implies that not only *Threskiornis* but also *Plegadis* bred near Tuna el-Gebel.

The contents of 71 ibis mummies (including 14 individuals showing the “classical” shape) and of four falcon-headed mummies consisted of eggs. In addition, three medium-sized falcon-shaped mummies were collected containing nothing but blackish-brown feathers which could not be identified as to genus or species but are thought to be derived from falcons. One ibis mummy of classical shape appears to have been made exclusively of linen cloths soaked in tur-

	Species	Age class	NI/MNI
1.	Sacred Ibis	adult	386
	Sacred Ibis	subadult	35
	Sacred Ibis	juvenile	44
	Sacred Ibis	inf.-juv.	21
	Sacred Ibis	infantile	13
	Sacred Ibis	neonate	1
	Sacred Ibis – egg		c. 40
2.	Glossy Ibis	adult	42
3.	Kestrel	adult	30
4.	Sparrowhawk	adult	6
5.	Little Egret	adult	4
6.	Griffon Vulture	adult	4
7.	Reed Cormorant	adult	2
	Reed Cormorant	juvenile	1
8.	Grey Heron	adult	3
9.	Black-shouldered Kite	adult	3
10.	Imperial Eagle	adult	3
11.	Montagu's Harrier	adult	3
	Unidentified bird of prey	adult	3
12.	Hooded Crow	adult	3
13.	Reef Heron	adult	2
14.	White Stork	adult	2
15.	Abdim's Stork	adult	2
16.	Black Kite	adult	2
17.	Lappet-faced Vulture	adult	2
18.	Saker Falcon	adult	2
19.	Barbary Falcon	adult	2
20.	Spotted Sandgrouse	adult	2

	Species	Age class	NI/MNI
21.	Darter	adult	1
22.	Purple Heron	adult	1
23.	Night Heron	adult	1
24.	Great White Egret	adult	1
25.	Little Egret	adult	1
26.	Cattle Egret	adult	1
	Unidentified small Egret	adult	1
27.	Bittern	adult	1
28.	Spoonbill	adult	1
29.	Black Stork	adult	1
30.	Open-billed Stork	adult	1
31.	Shoveler	adult	1
32.	White-tailed Sea Eagle	adult	1
33.	African Fish Eagle	adult	1
34.	Levant Sparrowhawk	adult	1
35.	Buzzard	adult	1
36.	Long-legged Buzzard	adult	1
37.	Booted Eagle	adult	1
38.	Lesser Spotted Eagle	adult	1
39.	Marsh Harrier	adult	1
40.	Hen Harrier	adult	1
41.	Lesser Kestrel	adult	1
42.	Barbary Partridge	adult	1
45.	Rock Dove	adult	1
46.	Egyptian Nightjar	adult	1
47.	Crested Lark	adult	1
48.	Swallow	adult	1
	Total		652 + (40)

Table 9 Taxonomic diversity and frequency of birds sampled in Gallery B, branches B–A, B–C and B–D, except for the birds of prey collected near the entrance of B–A-22/24 (see Table 10). To these numbers 5 mummies containing only feathers should be added. The ratio Sacred Ibis : Glossy Ibis is 11–12 : 1

pentine, which raises the question about its original contents, if any. As in the other parts of the necropolis, most of the non-ibis finds consist of single bones or incomplete skeletons, except for some mummies collected in C–A-1 (*Hirundo rustica*; the small mummy was wrapped together with the fragmented remains of an unidentified medium-sized bird of prey), C–A-6 (falcon-shaped mummy *Falco tinnunculus*), C–A-12 (small round mummy containing *Falco naumanni*) and C–A-29 (*Falco tinnunculus* and *Falco naumanni*, both falcon-shaped).

#### Gallery B, branches B–A, B–C and B–D

The MNI calculated on the basis of the bird remains collected in passages B–A, B–C and B–D is 651, representing 48 taxa (Table 9). Excluded from Table 9 is an accumulation of bones of birds

of prey and owls found opposite the so-called Chamber of Teephibis (B–A-22/24). Here 146 individuals belonging to 30 different species could be evidenced (Table 10). The state of preservation of these mummies is deplorable, the remnants of which being found scattered near the entrance of the chamber. Due to this circumstance it was largely impossible to assign the isolated specimens to single individuals.

In some branches of Gallery B the bird bone material is preserved very badly due to a fire. Though the fire did not destroy the pottery jars, there must have been considerable heat development, with temperatures surpassing 600° C. This can be deduced from the contents of the pots, yielding very tiny fragments of burnt linen cloth and small heaps of calcified greyish-whitish bones and bone ashes (cf. WAHL 2001).

Species	NI/MNI
White-tailed Sea Eagle <i>Haliaeetus albicilla</i>	2
African Fish Eagle <i>Haliaeetus vocifer</i>	2
Black Kite <i>Milvus migrans</i>	4
Black-shouldered Kite <i>Elanus caeruleus</i>	3
Short-toed Eagle <i>Circaetus gallicus</i>	2
Sparrowhawk <i>Accipiter nisus</i>	7
Levant Sparrowhawk <i>Accipiter brevipes</i>	1
Goshawk <i>Accipiter gentilis</i>	3
Long-legged Buzzard <i>Buteo rufinus</i>	3
Bonelli's Eagle <i>Hieraaetus fasciatus</i>	1
Booted Eagle <i>Hieraaetus pennatus</i>	1
Imperial Eagle <i>Aquila heliaca</i>	8
Lesser Spotted Eagle <i>Aquila pomarina</i>	2
Egyptian Vulture <i>Neophron percnopterus</i>	1
Griffon Vulture <i>Gyps fulvus</i>	1
Marsh Harrier <i>Circus aeruginosus</i>	5
Hen Harrier <i>Circus cyaneus</i>	5
Pallid Harrier <i>Circus macrourus</i>	2
Montagu's Harrier <i>Circus pygargus</i>	4
Saker Falcon <i>Falco cherrug</i>	3
Lanner Falcon <i>Falco biarmicus</i>	7
Barbary Falcon <i>Falco pelegrinoides</i>	2
Hobby <i>Falco subbuteo</i>	1
Red-footed Falcon <i>Falco vespertinus</i>	6
Lesser Kestrel <i>Falco naumanni</i>	6
Kestrel <i>Falco tinnunculus</i> – adult	39
Kestrel <i>Falco tinnunculus</i> – subadult	6
Kestrel <i>Falco tinnunculus</i> – juvenile	5
Barn Owl <i>Tyto alba</i> – adult	2
Barn Owl <i>Tyto alba</i> –juvenile	1
Eagle Owl <i>Bubo bubo</i>	3
Short-eared Owl <i>Asio flammeus</i>	1
Little Owl <i>Athene noctua</i> – adult	6
Little Owl <i>Athene noctua</i> – juvenile	1
Total	146

Table 10 Taxonomic diversity and frequency of diurnal and nocturnal birds of prey sampled near the entrance of chamber B–A-22/24 (chamber of Teephibis) in Gallery B

Complete individuals other than ibis have been recovered from B–A-7 (two falcon-shaped *Falco tinnunculus* and one falcon-shaped *Elanus caeruleus*) and B–C-9 (a falcon-shaped *Falco cherrug* mummy).

Two femora from B–A-2a and one humerus from B–C-7 are of particular interest. These three bones belong to the Reef Heron *Egretta gularis*, a heron species inhabiting coastal areas.

#### Gallery B, branch B–E

The survey work in Gallery B, branch B–E produced a Minimum Number of Individuals of 842 from 50 different bird taxa (Table 11). Like the assemblage from passages B–A, B–C and B–D, the bulk of the bird bones is very fragmentary, with many pottery jars containing calcinated bones. Only exceptionally could bones from the same individual be brought together.

One classical ibis mummy was manufactured exclusively of *Threskiornis* feathers, whereas four falcon-shaped mummies contained feathers from unknown species. Complete or almost complete non-ibis mummies were found in B–E-1 (falcon-shaped *Falco biarmicus* mummy), B–E-6 (*Circus cyaneus*), in the gangway between B–E-9 and B–E-11 (falcon-shaped *Falco tinnunculus* mummy), in B–E-14 (falcon-shaped *Circus aeruginosus* mummy), B–E-17 (two *Falco tinnunculus*, calcinated, in two pots), B–E-23 (*Gyps fulvus* mummy, destroyed) and B–E-23f (anthropomorphic *Circaetus gallicus* mummy).

The presence in B–E-2 of a tibiotarsus of *Egretta gularis* is noted.

#### Skeletal size and sexual dimorphism

From the ornithological literature, we know that male *Threskiornis* possess longer and heavier bills than females and this criterion can be used to sex the birds unequivocally (URBAN 1982, 200; LOWE & RICHARDS 1991) (cf. Table 12). Sexing is also possible using the length of the long bones of the wings and legs, but there is considerable overlap in size between the sexes (LOWE & RICHARDS 1991). This observation is paralleled in the post-cranial ibis remains collected from Tuna el-Gebel, which shows a more or less clear bimodal distribution depending on the skeletal element selected for analysis. Fig. 22 shows a clear clustering of the tarsometatarsal measurements into two groups, a smaller (female) and a larger (male) one, with a considerable overlap, though. Since this sample (N=125) has been taken randomly from different

	Species	Age class	NI/MNI		Species	Age class	NI/MNI
1.	Sacred Ibis	adult	477	20.	Griffon Vulture	adult	2
	Sacred Ibis	subadult	48	21.	Marsh Harrier	adult	2
	Sacred Ibis	juvenile	55	22.	Pallid Harrier	adult	2
	Sacred Ibis	inf.-juv.	19	23.	Saker Falcon	adult	2
	Sacred Ibis	infantile	29	24.	Lesser Kestrel	adult	2
	Sacred Ibis	neonate	3	25.	Common Quail	adult	2
	Sacred Ibis – egg		22	26.	Common Crane	adult	2
2.	Glossy Ibis	adult	49	27.	European Coot	adult	2
3.	Kestrel	adult	40	28.	Crested Lark	adult	2
	Kestrel	subadult	1	29.	Hooded Crow	adult	2
4.	Sparrowhawk	adult	10	30.	Dalmatian Pelican	adult	1
5.	Black-shouldered Kite	adult	10	31.	Purple Heron	adult	1
6.	Swallow	adult	6	32.	Little Bittern	adult	1
7.	Little Egret	adult	2	33.	Great White Egret	adult	1
	Little Egret	juvenile	2	34.	Reef Heron	adult	1
	Unidentified small Egret	adult	4	35.	White Stork	adult	1
8.	Hen Harrier	adult	4	36.	Wood Ibis	adult	1
	Unidentified small Harrier	adult	4	37.	Egyptian Goose	adult	1
9.	Open-bill Stork	adult	3	38.	Pintail	adult	1
10.	Lesser Spotted Eagle	adult	3	39.	Ferruginous Duck	adult	1
11.	Short-toed Eagle	adult	3	40.	White-tailed Sea Eagle	adult	1
	Unidentified bird of prey	adult	3	41.	Black Kite	adult	1
12.	Lanner Falcon	adult	3	42.	Long-legged Buzzard	adult	1
13.	Hobby	adult	3	43.	Levant Sparrowhawk	adult	1
	Unidentified Falcon	adult	3	44.	Barbary Falcon	adult	1
	Unidentified Falcon – egg		1	45.	Red-footed Falcon	adult	1
14.	Short-eared Owl	adult	3	46.	Little Crake	adult	1
15.	Little Owl	adult	3	47.	Crowned Sandgrouse	adult	1
16.	Darter	adult	2	48.	Barn Owl	adult	1
17.	Reed Cormorant	adult	1	49.	Scops Owl or Striated Scops Owl	adult	1
	Reed Cormorant	juvenile	1		Unidentified small Owl	adult	1
18.	Grey Heron	adult	2	50.	Hoopoe	adult	1
19.	Imperial Eagle	adult	2		Total		842 + (23)

Table 11 Taxonomic diversity and frequency of birds sampled in Gallery B, branch B-E, to which one “classical” ibis and four falcon-shaped mummies containing exclusively feathers should be added. The ratio Sacred Ibis : Glossy Ibis is 13 : 1

Measurement	Sex	Mean	Variation	sd
Length of bill	♂	180.3	163-198	8.03
	♀	151.0	130-163	6.71
Length of wing	♂	578.2	563-597	6.21
	♀	562.8	543-593	6.61
Length of tarsus	♂	102.1	94-113	3.89
	♀	90.7	85-106	4.76

Table 12 Bill-, wing- and tarsus-lengths in mm of modern Sacred Ibis from South Africa; males N=40, females N=53 (LOWE & RICHARDS 1991; Lowe, pers. comm.)

parts of the galleries, we feel confident that male and female ibises have been deposited in more or less equal numbers. Obviously the sex of the birds did not play a decisive role, except for the birds placed individually in sarcophagi and wooden chests, which are almost exclusively large males.

Focusing on the size of the Sacred Ibises deposited at Tuna el-Gebel, the animals appear large compared to their modern relatives living in South Africa. Although the data base of LOWE and RICHARDS (1991) is not entirely compatible with ours since obtained on unmacerated specimens, the “Length of the tarsus” measurements present-

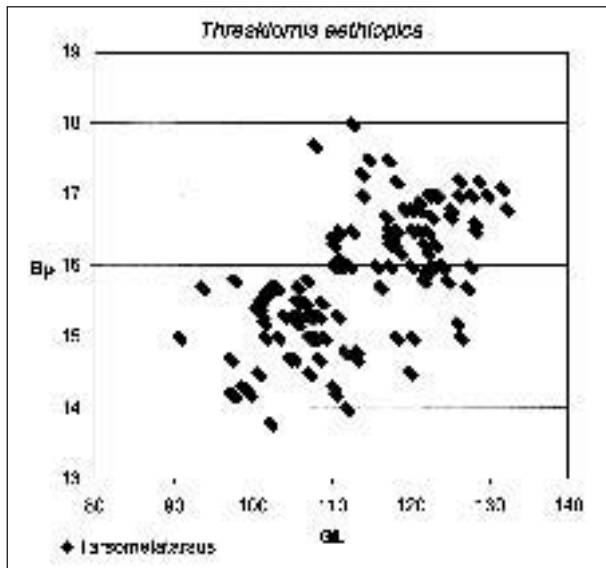


Fig. 22. *Threskiornis aethiopicus*. Tarsometatarsus Greatest Length (GL) versus Greatest proximal Breadth (Bp). See text for explanation

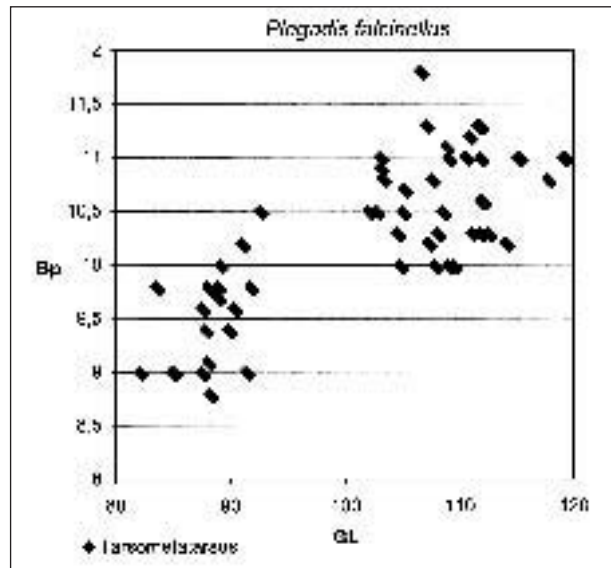


Fig. 23. *Plegadis falcinellus*. Tarsometatarsus Greatest Length (GL) versus Greatest proximal Breadth (Bp). See text for explanation

ed by these authors roughly corresponds to the “Greatest Length of the tarsometatarsus” taken by us. In our sample the variation of the tarsometatarsus’ Greatest Length varies between 90.5 to 132 mm, as opposed to a range of 85 to 113 mm measured by Lowe (see BOESSNECK & VON DEN DRIESCH 1987, 65) (Table 12). When comparing the tarsometatarsus values of Tuna el-Gebel Sacred Ibis with the tarsus lengths of modern ibises from sub-Saharan Africa (URBAN 1982, 200; males: 100–116 mm, N=3; females: 94–103 mm, N=5), and from Sudan, Zaire and Zambia measured by LOWE and RICHARDS (1991), the comparably large size of *Threskiornis* at Tuna el-Gebel is confirmed. As such, ancient Egyptian ibises stood taller than their modern relatives.

Contrary to the Sacred Ibis, the tarsometatarsal values of the Glossy Ibis allow for unequivocal sexing (Fig. 23). Interestingly, the ornithologists BAUER and GLUTZ VON BLOTZHEIM (1966, 442) do not mention such a dimorphism and group all “tarsus lengths” of *Plegadis* together (85–110 mm). In contrast, URBAN (1982a, 193) states that there is a clear sexual dimorphism in *Plegadis falcinellus* and illustrates this on the basis of the lengths of the tarsus in modern males (101–113 mm; mean 107; N = 18) and females (82–90 mm; mean 86 mm; N = 13). Our data set (N=66) suggests a range of 102–119 mm in males (N=47) and of 82–92.5 mm in females (N=19), which overlaps well with the tarsus lengths given

by URBAN. It is noteworthy that most other long bones of the Glossy Ibis skeleton do not show such a clear dimorphism as the one found in the tarsometatarsus, with the exception of the femur. Contrary to the Sacred Ibis, the size of the ancient Egyptian Glossy Ibis corresponds largely to that observed in modern *Plegadis*. With respect to the Kestrel *Falco tinnunculus*, the animals frequenting ancient Tuna el-Gebel compare well in size to those living in Egypt today.

Provided large series and/or complete skeletons are present, it is possible to sex other bird taxa too, e.g., harriers (*Circus*). All in all the osteometric data obtained on the bones of the non-ibis taxa do not reveal any significant difference in size between the individuals recorded from ancient Tuna el-Gebel and those surviving to date in Egypt and adjacent countries.

### Osteopathological findings

In contrast to the primates deposited in Tuna el-Gebel, whose skeletons exhibit a considerable number of pathologic conditions (VON DEN DRIESCH *et al.* 2004, 245ff.), the number of (macro)anatomically visible manifestations of pathological lesions in bones of birds is very low and certainly does not surpass 0.5 % in the bird bone sample studied. Fractures of limb bones are the most common lesions. The bone elements most frequently affected are humerus (Fig. 24), tibiotarsus and tarsometatarsus. In the radius,





Fig. 24 Gallery C–Branch D-17. *Threskiornis aethiopica*.  
Humerus with healed fracture

ulna and femur fractures seldom occurred. Some of the long bone fractures did not heal, i.e. both ends remained separated leading to considerable callus formation. One such case is worth describing in detail. It concerns a well-macerated skeleton of a Sacred Ibis from Gallery D, whose left humerus was fractured and did not heal during life due to movements of the wing. The embalmer of this individual was obviously aware of this condition, so he decided to dress the humerus with a bandage in order to join the broken ends, although the bone had shortened considerably as a consequence of the fracture.

In many cases, healing of fractures went along with a sideward deviation of the bone's axis, often combined with a reduction of the bone's length (Fig. 24). No doubt, if a humerus was fractured, flying became difficult. A much better prognosis is offered in the following case: during the process of healing a broken radius underwent almost no *constrictio ad longitudinem* because the undamaged ulna stabilised it. No doubt, all these different kinds of limb bone fractures, whether healed or not, did not mean automatically that the birds were in acute danger, given the high esteem and protection offered to them by the cult servants. However, such birds may not have been capable of long-distance flight anymore and likely remained in suitable biotopes in Middle Egypt for the rest of their life.

Whereas in the primate assemblage of Tuna el-Gebel, metabolic disorders of the skeleton due to malnutrition have been noted in many individuals (VON DEN DRIESCH *et al.* 2004), we could not find an indication that such problems also occurred in the sacred bird population.

## DISCUSSION

In the subterranean galleries of Tuna el-Gebel the remains of at least 3744 birds (426 in Gallery D, 1678 in Gallery C and 1640 in Gallery B) plus 239 bird eggs and 94 bundles or mummies containing only feathers and/or reed grass (nest material) were sampled. This is a relatively small amount considering the fact that the original number of birds and eggs deposited may easily surpass one million individuals. Only a few spots in the galleries have been sampled more rigorously, e.g., the areas in front of the cult chambers. On the other hand, some branches of the galleries could not be sampled because of the danger of collapsing of the surrounding rock strata.

### The techniques of embalmment

As already noted during our study of the monkey remains, there is a shift in embalming techniques through time. In Saite times the preparation and conservation of sacred birds involved three major steps: first, burying the dead bird in the soil to get rid of the soft tissues by natural processes such as bacterial decomposition; second, unearthing the specimens after a certain period of time, the length of which being a matter of experience, followed by the removal of the remaining soft tissues; and finally, wrapping the bird in several layers of linen cloth. It is interesting to observe that these bundles seldom contain complete ibis skeletons and that the species' feathers, eggs and nest materials were wrapped up separately (Fig. 8, bottom; Fig. 17, 19). Probably the dead birds were first plucked and the feathers wrapped up in one or several bundles. Due to the different steps involved, it can be assumed that in most instances the remains of a single bird ended up in different bundles. Sometimes several smaller bundles were found wrapped together to form a single, larger bundle, but there is no evidence that the contents of these composed bundles come from the same individual. In sum, we noted that the bird bundles vary considerably not only in size but also in shape (Fig. 8), from almost 'formless' objects to anthropomorphic bundles.

Once deified the cult servants placed the bundles into beaker-shaped pots which were then closed by gypsum plaster. For a short period people also used jars that were closed with a pottery lid, more precisely at the beginning of the reign of the Ptolemies. Rarely the cult servants placed bronzes, fayence amulets or also papyrus material into the jars together with the bundles. A series of about 15 vessels of similar shape with the identical names of a scribe, originating from a branch in passage C–D and containing bones of ibises and herons, are the only pre-Ptolemaic examples of jars with inscriptions. Selected single birds seem to have been placed in limestone and later wooden sarcophagi (Fig. 16) or in coffins made from clay only a short time before the Ptolemies. Exceptionally in a Saite side branch a rectangular limestone sarcophagus with a short hieroglyphic invocation of Thot was found, but unfortunately the contents of this container had been removed.

Conceivably straightforward maceration of specimens caused problems of conservation, bundles suffering post-depositional destruction due to mechanical stress (weight pressure) or as a result of micro-organisms, such as (an)aerobic bacteria. These and other problems could explain the major change in embalming procedure from the Persian period onward. As a conservation measure the *taricheutai* now added small quantities of bitumen or oil of turpentine to the linen bandages before wrapping up the macerated bones. This procedure left blackish traces and patches on the surface of the bones.

Further advances in embalming techniques become obvious during the reign of Ptolemy I (304–284 BC). By using much larger quantities of bitumen or oil of turpentine, maceration became unnecessary. This new procedure enabled the embalmers to preserve the body of a sacred bird almost completely, including the animal's feathers, muscles, tendons and most of its viscera. In specimens mummified this way we even had the opportunity to evaluate the contents of some muscle-stomachs *in situ*. In the latter we often found smaller accumulations of shells of the freshwater snail *Cleopatra bulimoides*, obviously one of the favourite food species of the Sacred Ibises living in Tuna el-Gebel.

In the course of the Ptolemaic period chemicals were applied increasingly more intensively, resulting in a total blackening of the mummies inside (Fig. 9, 15). Hand in hand with this change

in embalming technique one observes the introduction of different storing vessels (see above). For the first time beaker-shaped vessels (Type MB) and egg-shaped pots (Type ME) will be used to store the “classical” ibis-mummies.

As to the shape of the mummies at Tuna el-Gebel, those of birds of prey generally exhibit an anthropomorphic form, mostly with a nicely formed head containing the real beak of the bird of prey, and two eyes made from linen (Fig. 21a, b). The bird's wings were folded on the side of the body, which shows extended feet and toes (see also LORTET & GAILLARD 1903, Figs. 59 f.). To shape the feet of the mummy to produce a typical Osirian-shaped mummy, a lot of linen was used.

Since anatomically different from birds of prey, ibis mummies clearly exhibit another shape. In order to reduce the overall length of the mummy the neck was bent so that the animal's head and beak were resting on its breast, while the lower legs were folded away and placed under the wings (see also LORTET & GAILLARD 1903, fig. 64). After soaking the bird with chemicals it was wrapped in multiple layers of linen, the outer layers sometimes being woven so as to form beautiful patterns (Fig. 25).

The fine ibis mummies with an application, showing an Abydene symbol of Osiris, a figure of Ptah or Thot seated, are mostly found in the earlier Ptolemaic and possibly also pre-Ptolemaic parts of the galleries. Their precise function or use at the Egyptian festivals remains unclear for the moment. In any case, even in the later Ptolemaic branches of the necropolis we discovered mummies with lengths of up to 80 centimetres with gilded wooden beaks, which had been laid on top of the uppermost layer of pottery jars once the branch was completely filled.

### The size of the Sacred Ibis

As mentioned afore, ornithologists use a number of measurements to document the size of (living) birds (e.g., Table 12), but only the “Length of the tarsus” is of use if we want to compare this information with the osteometrical data collected in the frame of our study. From a statistical point of view, only species present in large numbers can be considered in this respect. One interesting case is the Sacred Ibis, since there is little doubt that *Threskiornis aethiopica* from Tuna el-Gebel stood taller than all modern populations of Sacred Ibises recorded from sub-Saharan Africa (s. above).

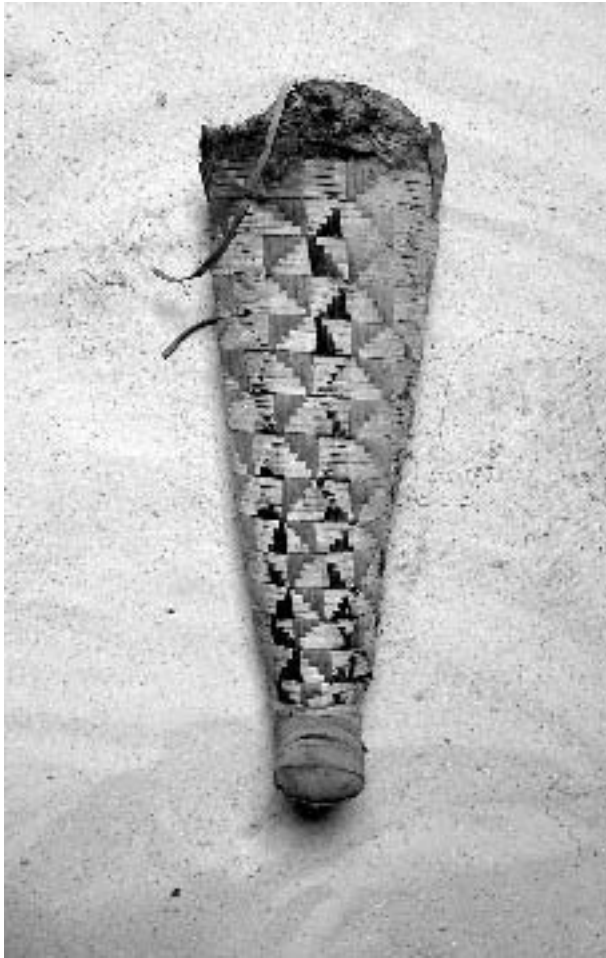


Fig. 25 Gallery C–Branch D-17. Coffier-wrapping of a bone bundle

Already a century ago LORTET and GAILLARD (1903, 173f.) noted this difference in size and offered the following explanation: “*Peut-être le plus grand développement des membres postérieurs chez l’ibis ancien était-il dû à l’existence particulière de cet oiseau dans l’Égypte pharaonique. D’après les récits des historiens, l’ibis vivait alors respecté de tous les habitants. Confiant dans la sécurité complète dont il jouissait, ils s’avançait, se multipliait jusque dans les villes, se nourrissant sur le bord des canaux et peut-être de quelques lacs disparus depuis. L’ibis s’était peu à peu habitué à cette vie au point de rester en Égypte, paraît-il, dans un état de demi-domesticité. Chez cet oiseau pourvu d’une nourriture abondante, marchant plus qu’il ne volait, il semble naturel de trouver les membres postérieurs, et peut-être même le corps entier, plus développés que chez les ibis actuels traqués par les chasseurs, obligés de se déplacer constamment à la recherche de leur nourriture.*”

Whether the larger size of the Sacred Ibises living in Egypt resulted from the extremely

favourable living and feeding conditions going along with their particular status remains unclear. Perhaps the *Threskiornis* population of Tuna el-Gebel represented a larger subspecies, but this issue cannot be addressed anymore as Sacred Ibis became extinct in Egypt toward the end of the 19<sup>th</sup> century (GOODWIN 1986).

#### Geographic distribution of bird taxa

In Table 2 the present-day distribution in Middle Egypt of the birds identified from the animal necropolis has been compiled. Many bird taxa still occur in Egypt today, be it as residents, migrants or summer and/or winter visitors. However, in the past centuries, a number of taxa have disappeared from the indigenous (Middle) Egyptian avifauna (cf. GOODWIN 1986).

#### *Great Crested Grebe*

The Great Crested Grebe *Podiceps cristatus* is widely distributed in Europe, where it prefers fresh or brackish water for feeding and breeding. In contrast, its present-day African distribution is discontinuous because since 1950 the species became extinct in some former haunts due to fishing methods. In Egypt it largely disappeared after the Aswan dam was put into operation. To date, BROWN (1982, 88) and LLIMONA and DEL HOYO (1992, 193) note its presence in the Nile Delta and its absence in aquatic habitats south of Cairo.

#### *Pelicans*

The two pelican species identified in Tuna el-Gebel, the Dalmatian Pelican *Pelecanus crispus* and the White Pelican *Pelecanus onocrotalus*, are mentioned in the relevant literature as being winter visitors to Egypt (HEINZEL *et al.* 1977, 30). Nowadays pelicans are rare visitors, but before the construction of the Aswan dam the Egyptian Nile valley offered a variety of habitats where these birds could live. If not being delivered to Tuna el-Gebel from elsewhere in Egypt, the presence of a pelican egg in Gallery C–D-8 suggests that from time to time pelicans may even have bred on the shores of the Hod Tuna.

#### *Cormorants and darter*

Two species of cormorants (Phalacrocoracidae) and one species of darter (Anhingidae) have been recognised in the Tuna el-Gebel bird bone assemblage. According to URBAN (1982, 108 ff.) none of these species occurs in Middle Egypt

today. In contrast, ORTA (1992, 345) mentions Egypt as a winter residence of the Cormorant *Phalacrocorax carbo*. Since the diet of this species mainly consists of fish, which the bird obtains by diving, the Hod Tuna may have offered an ideal habitat. The present distribution range of the Cormorant extends from Europe to East and South Africa. It is absent from North Africa. No doubt, living conditions must have been more suitable in the Nile valley in antiquity.

The Reed or Long-tailed Cormorant *Phalacrocorax africanus* is a resident species in Africa, distributed widely in aquatic biotopes associated with freshwater lakes, slow-running rivers and floodplains, mainly south of about 18° North, from Mauretania and Senegal to Sudan and Ethiopia south to the Cape (URBAN 1982, 117). To date, its most northerly range is the Central Sudanese Nile valley north of Khartoum, thus given the different environmental conditions prevailing along the ancient Egyptian Nile, its presence in Tuna el-Gebel is not extraordinary.

Today the Darter or Snake-head *Anhinga melanogaster* (resp. *A. rufa*) is restricted to Africa south of the Sahara (URBAN 1982, 120; ORTA 1992, 361). However, towards the end of the 19<sup>th</sup> century AD, Darters were still breeding in the Faiyum and in the Nile Delta (MEINERTZHAGEN 1930), so their presence near ancient Tuna el-Gebel is not surprising. Remains of *Anhinga melanogaster* in prehistoric and pharaonic Egypt are recorded at different occasions, e.g., from the Middle Kingdom Temple of Satet in Elephantine/Aswan (BOESSNECK & VON DEN DRIESCH 1982, 96), from 5<sup>th</sup> millennium BC Merimde-Benisalame in the western Delta (VON DEN DRIESCH & BOESSNECK 1985, 67), and from the New Kingdom levels at Tell el-Dabca in the eastern Delta (BOESSNECK & VON DEN DRIESCH 1992, 36).

#### *Heron, egrets and bitterns*

The most common species of egret encountered in Egypt today is the Cattle Egret *Bubulcus ibis*, which frequents the cultivated areas along the Nile in search of food. A rare visitor to Egypt is the Little Egret *Egretta garzetta*, which occurs as a migrant. All other members of the family Ardeidae recorded in Tuna el-Gebel are still confined today to suitable habitats in Egypt, such as the area of the 1st Nile Cataract near Aswan. In parts where the Nile current is not too strong, we still could observe in the 1990ies species such as the Grey Heron *Ardea cinerea*, Great White Egret *Egret-*

*ta alba*, Little Egret *Egretta garzetta*, Night Heron *Nycticorax nycticorax*, Little Bittern *Ixobrychus minutus*, and Paddy heron *Ardeola ralloides*. The marshy environment of ancient Tuna el-Gebel obviously provided favourable living conditions for herons as well as other aquatic species. We consider it a matter of chance that the Paddy heron has not been found in the assemblage.

Of particular interest is the presence of the Reef Heron *Egretta gularis* among the mummified birds. MARTINEZ-VILALTA and MOTIS (1992, 412) consider *Egretta gularis* a subspecies of *Egretta garzetta*, but differences in the dimensions and relative slenderness of their bones allow for a clear separation and may therefore indicate a species status. *Egretta gularis* is a resident in a variety of coastal habitats along the West African coast and along the coasts of the Red Sea, the Gulf of Aden and the Indian Ocean. URBAN (1982, 153) mentions that the species occasionally breed inland on lakes in the Rift Valley and the Upper Nile. It therefore cannot be entirely excluded that the Reef Heron once occurred near ancient Tuna el-Gebel. If not, it must be concluded that the remains collected in Gallery B come from birds that were delivered to Her-mopolis Magna, though their exact origin cannot be traced for the moment.

#### *Sacred Ibis and Glossy Ibis*

In ancient Egypt Sacred ibises were residents as well as migratory birds, the latter visiting the country during the Nile flood to breed. According to Meinertzhagen (1930, 438) the French scientist and traveller Savigny still observed single birds or sometimes parties of eight to ten at the beginning of the 19<sup>th</sup> century. He adds: "They do not come near Cairo where the country is too dry and too densely inhabited". While Sacred Ibises are partial to marshy environments (Fig. 26) and flood plains (KUMERLOEVE 1968, 230; URBAN 1982, 200), the growing impact of man on the natural landscape in the course of the 19<sup>th</sup> century, in particular the construction of large drainage channels in order to better control the annual flooding, certainly resulted in a decline of suitable habitat for the Sacred Ibis, which by the end of the 19<sup>th</sup> century had disappeared from Egypt (GOODWIN 1986).

At present *Plegadis falcinellus* is a Palearctic winter visitor in Egypt. Before c. 1980 the species was known as a resident, but later records are missing (URBAN 1982, 194). Most of the Glossy



Fig. 26 *Threskiornis aethiopica* in swampy habitat, Amboseli National Park, Kenya. © Michael Sutor 2004

Ibis bones identified in Tuna el-Gebel must come from winter visitors since the overwhelming majority of the remains represent adult birds.

#### Storks

While the two palearctic stork species, i.e. the White Stork *Ciconia ciconia* and the Black Stork *Ciconia nigra*, still cross Egypt today in larger flocks to spend the winter in Equatorial Africa and further south, the other three stork species recognised in the faunal samples are confined to Africa south of the Sahara. These include the Wood Ibis or Yellow-billed Stork *Mycteria ibis*, the African Open-billed Stork *Anastomus lamelligerus*, and the White-bellied or Abdim's Stork *Ciconia abdimii* (BROWN 1982, 174, 176, 180). Their presence furnishes additional proof for the favourable living conditions for larger water fowl in ancient Middle Egypt.

To the foregoing species we can add the Marabou Stork *Leptoptilos crumeniferus* and the Saddle-billed Stork *Ephippiorhynchus senegalensis*, the geographic range of which overlap well with that of *Anastomus lamelligerus* (BROWN 1982, 185, 187), and may therefore have occurred too. It is

probably due to chance that these two large stork species were not recorded.

#### Geese and ducks

Compared to the many species of geese and ducks depicted in ancient Egyptian Art (HOULIHAN 1986, 53ff.; BOESSNECK 1988, 94ff.), anatids appear underrepresented in the bird bone assemblage studied. Perhaps the lake side with its colonies of large water birds and with humans, straying dogs and jackals roaming the area in search of dead birds may not have been very attractive for geese and ducks; the latter, in particular, feel quickly disturbed. On the other hand, ducks and geese may have been frequent in the region but simply not collected by the cult servants for particular reasons (see below). Throughout Egypt's (pre)history anatids play an important role as food animals, as is illustrated by the relative abundance of their remains in sites such as Tell el-Dab'a (1800–1500 BC) and Tell el-Maskhuta (6<sup>th</sup> cent. BC to 200 AD) (BOESSNECK 1986, 1988, Tab. 11).

The presence of domestic Goose is evidenced by a humerus from D–A-9 and a tarsometatarsus

found in a jar containing a large accumulation of ibis bones in C–A-30. Similar to the domestic Goose, the Mallard *Anas platyrhynchos*, Pintail *Anas acuta*, Shoveler *Anas clypeata* and Ferruginous Duck *Aythya nyroca* are represented by isolated bones from single individuals (Tables 4 ff.). The Egyptian Goose *Alopochen aegyptiaca*, once widespread in the Nile valley, is now confined to southern Upper Egypt (Lake Nasser), where it is still fairly common (NEWMAN 1982, 238).

#### Diurnal birds of prey

Most of the birds of prey identified in the necropolis are winter visitors and migrant birds, but some of them are residents (see Table 2). Thirty different species have been identified so far. Of these the resident Kestrel *Falco tinnunculus* is the most numerous. Then follows the Black-shouldered Kite *Elanus caeruleus*, which is also a resident in Middle Egypt. Other taxa that are relatively common include the Black kite *Milvus migrans*, the Sparrowhawk *Accipiter nisus*, the Long-legged Buzzard *Buteo rufinus*, the Imperial Eagle *Aquila heliaca*, the Marsh Harrier *Circus aeruginosus*, the Hen Harrier *Circus cyaneus*, and the Lanner Falcon *Falco biarmicus*.

The Black Kite occurs in two subspecies: *Milvus migrans migrans*, a Palaearctic breeder migrating south in winter, and *Milvus migrans aegyptius*, which breeds in Egypt. The latter is somewhat smaller in size than the former, which can be illustrated using bone measurements. Both subspecies have been identified in Tuna el-Gebel.

The Buzzard *Buteo buteo* is represented by the smaller subspecies *Buteo buteo vulpinus* (Steppe Buzzard), a Palaearctic migrant from northern and eastern Europe. In Egypt it is abundant in its winter quarters (BROWN 1982, 396). The subspecies *Buteo buteo buteo*, today essentially confined to western and southern Europe, is reported a scarce winter visitor to NW-Africa, with few birds reaching Liberia, which is the extreme south of its actual zoogeographic range. From our data, however, *B. b. buteo* occasionally visited Middle Egypt in antiquity. A third buzzard species, the long-legged Buzzard *Buteo rufinus* is represented in Egypt by two subspecies. The larger *Buteo rufinus rufinus* migrates from South Europe and the Near East across Egypt to its winter grounds in Lower and Middle Egypt, while the smaller *Buteo rufinus cirtensis* breeds in North Africa (MEINERTZHAGEN 1930, 394 ff.; ETCHÉCOPAR & HÜE 1967, 130). As to our sample, difficulties arose to assign the *Buteo*

bones to one of the (sub)species mentioned and to separate them from *Buteo buteo vulpinus*, although according to WEICK (1980, 114, 116) there are clear differences in size, e.g., in the length of the wings (in mm):

Species	<i>B. vulpinus vulpinus</i>	<i>B. vulpinus rufinus</i>	<i>B. buteo buteo</i>
♂	405–451	415–531	365–577
♀	433–490	395–425	355–597

We were successful in assigning some of the *Buteo* bones to subspecies but without being able to sex them due to the considerable size overlap.

Some other taxa of birds of prey merit closer consideration. Of the two species of *Haliaeetus* that have been identified, the White-tailed Sea Eagle *Haliaeetus albicilla* is absent from present-day Africa, except from some rare vagrants in North Africa (Tunisia). It is a rapidly declining and threatened species in most of its known range, the Mediterranean population almost being extinct (BROWN 1982, 315). The presence of some skeletal elements of this European species indicates that from time to time White-tailed Sea Eagles found their way to Middle Egypt. In contrast, the second species, the African Fish Eagle *Haliaeetus vocifer*, which today is confined to the large marine and freshwater lakes south of the Sahara, may have been a resident of the ancient Hod Tuna. This bird species has been identified in other pharaonic sites in Egypt, e.g., in Elephantine (BOESSNECK 1988, 93).

Neither the Goshawk *Accipiter gentilis* nor the Rough-legged Buzzard *Buteo lagopus* belong to the actual avifauna of Egypt. The distribution of the first species is holarctic, the subspecies *Accipiter gentilis arrigonii* being resident in NW-Africa (BROWN 1982, 390), with population numbers increasing in winter because of visiting migrants. HEINZEL *et al.* (1977, 74) record the species as a winter visitor to Palestine. Thus, it is possible that in antiquity the wintering grounds of the Goshawk extended well into Egypt, if we interpret the occurrence of seven individuals at the entrance of chamber C–C-4 and of three individuals in front of the Chamber of *Teophibis* correctly. The Rough-legged Buzzard is a vagrant from Europe to North Africa and in recent times has been observed in Libya once (BROWN 1982, 400). Its presence in Tuna el-Gebel is evidenced by a single individual from C–C-4 (Table 6).

Unlike the Palaearctic Griffon Vulture *Gyps ful-*

*vus*, which breeds in the Nile Delta and in Sinai, the Eurasian Black Vulture *Aegyptius monachus* is a very rare winter visitor to Egypt (BROWN 1982, 331, 335). In contrast, the African Lappet-faced Vulture *Torgos tracheliotus* has been recorded as a breeding bird in Israel and as a winter visitor to Egypt (HEINZEL *et al.* 1977: 82), although its main range extends from East and Central Africa to the south. In Tuna el-Gebel, one Black vulture (Table 4), four Lappet-faced Vultures (Tables 4, 8f.) and ten Griffon Vultures (Table 4, 6ff.) could be identified.

#### *Common Quail and Barbary Partridge*

The Common Quail *Coturnix coturnix* is a resident species and a palearctic winter visitor to Egypt. Thus, its presence in Tuna el-Gebel is not surprising. It is said that at the beginning of the 20<sup>th</sup> century the species was heavily exploited by netting in the Nile Valley and Sinai, several million birds being taken annually (CROWE *et al.* 1986, 14).

In contrast to the quail, the Barbary Partridge *Alectoris barbara* is not indigenous to Egypt to date. The species is currently found throughout Morocco, North Algeria, Tunisia and most of coastal Libya, with a break in the centre which isolates the population confined to the Cyrenaica (CROWE *et al.* 1986, 21). Though in former times Barbary Partridge likely occurred in northwestern Egypt (GOODWIN 1986, 152), it is possible that in Ptolemaic times *Alectoris barbara* was traded to Egypt from the Western Mediterranean, as has been evidenced for the Barbary Ape *Macaca sylvanus*. So far a single individual of *Alectoris barbara* could be evidenced in Gallery B–A (Table 9).

#### *Crane*

The present-day African range of the Common crane *Grus grus* comprises Northwest Africa and the Egyptian and North Sudanese Nile Valley (URBAN 1986, 132). In this region it is a palearctic winter visitor whose principal wintering habitat in the Sudan is along the Nile, particularly between the Blue and White Niles. It is possible that during migration cranes frequented the Hod Tuna, eventually to spend the winter there. A total of five individuals has been recorded from Gallery D (1 individual), Gallery C–D (2 individuals) and Gallery B–E (2 individuals) (Tables 3, 4, 11).

#### *Rails*

Three species pertaining to the family Rallidae have been recorded in Tuna el-Gebel, i.e. the Lit-

tle Crane *Porzana parva*, the Moorhen *Gallinula chloropus*, and the Coot *Fulica atra*. The latter two are breeding and wintering in Egypt to this day, and can be observed frequently on large and small irrigation channels, and in the flood plains of the Nile. At present the Little Crane is a Palearctic migrant, but formerly it was a local resident to the Nile valley (KEITH 1986, 106, 122, 127).

#### *Charadriiformes*

The Stone Curlew *Burhinus oedipnemus*, both a resident and Palearctic migrant to Egypt (MACLEAN & URBAN 1986, 199) is much rarer than the Senegalese Thick-knee *Burhinus senegalensis*, which today inhabits most large towns in Egypt where it breeds on the roofs of high buildings. The Stone Curlew is represented in the bird assemblage by a single individual from Gallery B–A (Table 9).

The European Lapwing is represented by a single individual from Gallery D (Table 3). While the Nile Delta still offers an ideal winter habitat for the European Lapwing *Vanellus vanellus* (KEITH 1986, 281), its distribution may have extended further south in former times. A relative of the European Lapwing, the spur-winged Plover *Vanellus spinosus*, still is a very common resident bird and frequents the borders of the Nile and irrigated fields. One individual was found in Gallery C–C (Table 5).

According to PEARSON (1986, 310), the Bar-tailed Godwit *Limosa lapponica* does not belong to the actual avifauna of Egypt. But given suitable habitats in antiquity, this Palearctic bird could have spent the winter in Middle Egypt, taking also into account the many single records of the species in sub-Saharan Africa. *Limosa lapponica* could be evidenced in Gallery B–A (Table 9).

A similar situation as described for the Bar-tailed Godwit applies to the Great Snipe *Gallinago media*, whose present winter range in Egypt is restricted to the Nile Delta (PEARSON 1986, 303). This species too would have found suitable winter habitat near Tuna el-Gebel. A single Great Snipe individual has been recorded in Gallery C–A (Table 8).

#### *Sandgrouses and Rock dove*

Sandgrouses inhabit deserts and semi-deserts. They undertake long, daily journeys to drink, generally in the morning, and this behaviour might explain their presence at Tuna el-Gebel. Three species could be evidenced in the necropolis, i.e. the Spotted Sandgrouse *Pterocles senegal-*

lus, the Crowned Sandgrouse *Pterocles coronatus*, and the Chestnut-bellied Sandgrouse *Pterocles exustus*. All three species are now very rare in Egypt (MACLEAN & FRY 1986, 424, 430, 432), but conceivably they were much more abundant in former times.

In Egypt, the Rock Dove *Columba livia* is represented by the smaller subspecies *Columba livia gaddi* (Morel et al. 1986, 477). Given the heavy fragmentation of the *Columba* bones from Gallery C–D and Gallery B–A (Tables 4, 9), which are slightly larger than those of a comparative specimen of *C. l. gaddi* housed in the Munich reference collection, we could not decide whether we are dealing with a domestic pigeon, a feral pigeon or a wild rock dove.

### Owls

Three species of owls identified in the assemblage are resident in Egypt, namely the Barn Owl *Tyto alba*, the Eagle Owl *Bubo bubo*, and the Little Owl *Athene noctua*. Today the Pharaoh's Eagle Owl *Bubo bubo ascalaphus*, the subspecies inhabiting Egypt (KEMP 1988, 122), can still be observed breeding in the sandstone mountain range near Tuna el-Gebel. Because of its smaller size and differences in body proportions, markings and voice, KEMP (1988, 123) suggests the northern African *Bubo bubo* to represent a distinct species.

Together with the Little Owl *Athene noctua* (15 specimens), the medium-sized Short-eared Owl *Asio flammeus*, a winter visitor to Egypt, is the most common owl found in the subterranean galleries (17 specimens). Since *Asio flammeus* prefers open plains, rough hillsides, marshes and dunes, the species certainly found suitable habitat near ancient Tuna el-Gebel.

A single bone (tibiotarsus) of a very small owl species was identified in a collection of calcified bones from Gallery B–E (Table 11). As this bone was burnt it was not possible to determine whether it pertained to the Scops Owl *Otus scops* or to the Striated Scops Owl *Otus brucei*. According to KEMP (1988, 115 f.), *Otus brucei* is a very rare winter visitor to lower Egypt, while *Otus scops* is absent from the Egyptian Nile Valley but recorded in the Western Desert as a migrant.

### Nightjars

From the three nightjar species identified in Tuna el-Gebel (Table 2) only the European Nightjar *Caprimulgus europaeus* is recorded today as a visitor to the Egyptian Nile Valley on migration or as a

wintering bird (FRY & HARWIN 1988, 188). The ranges of the two other species, the Egyptian Nightjar *Caprimulgus aegyptius* and the Nubian Nightjar *Caprimulgus nubicus* are located much more to the south, *C. aegyptius* is found in Upper Egypt, *C. nubicus* in Central Sudan and the Sahelian zone (FRY & HARWIN 1988, 180, 184). Size differences enable a distinction between the three species, the Nubian Nightjar being the smallest and the European Nightjar being the largest species (HEINZEL et al. 1977, 184).

### Species richness and diversity

As mentioned earlier, the ancient Egyptians incorporated all living creatures in their pantheon, and assigned them to certain gods according to their colours, voices, sex, etc. It is therefore not surprising that our work in the galleries produced such a huge variety of species (Table 2). We are convinced that a large-scale excavation of the catacombs would produce an even higher taxonomic richness, including a good deal, if not most birds once frequenting the environs of Tuna el-Gebel. Already a century ago, LORTET and GAILLARD (1903, 113 ff.), while examining the mummified avifaunas from several places in Lower and Upper Egypt (Giza, Saqqara, Kom Ombo), drew attention upon the exceptional bird species richness in animal necropolises. Although they found less than half of the taxa recorded in Tuna el-Gebel, their avifaunal record contains bird species which – so far – could not be evidenced at Hermopolis Magna, e.g., the Honey Buzzard *Pernis apivorus*, the Osprey *Pandion heliaetus* or the Cuckoo *Cuculus canorus*, to name but a few.

This does, however, not alter the fact that in each assemblage of mummified animals a few species predominate. The latter seem to correspond in their outer forms to the forms of animal gods who were dominating the festivals at the main temple of their metropolis. In reality, however, there is a major discrepancy between the neutral aspect of the animal statue and the special colouring of the sacred animal living at the temple on the one side, and the species richness observed in an animal cemetery on the other side (see below).

For Tuna el-Gebel, it is beyond doubt that the deposition of huge numbers of *Threskiornis aethiopica* resulted from a state initiated policy of establishing protected feeding places for ibises at permanent water bodies. It also explains why in



the assemblage studied *c.* 80 % of the mummies identified pertain to the Sacred Ibis, while the second most frequent bird species is a close but smaller relative, the Glossy Ibis, with a similar long, curved bill. Within the different parts of the galleries, Sacred Ibises outnumber Glossy Ibises about 10 to 13 times (see above).

Another common faunal element at Tuna el-Gebel are the birds of prey, species associated with the falcon god on a standard pole and the mythological transformation of Horus into a falcon. The numbers of diurnal and nocturnal birds of prey, i.e. of species belonging to the cultic transformation of the gods between darkness and morning light, is an illustration of their theological importance for the transfer between earth and sky.

A peculiarity of the avian assemblage is the fact that except for some smaller bird species, such as *Caprimulgus aegyptius*, *Caprimulgus nubicus*, *Coracias garrulus* and *Upupa epops*, the only taxa being found mummified *in toto* are the two ibis species and the diurnal and nocturnal birds of prey. All the other bird taxa, be it pelicans, herons, egrets, storks, geese, ducks, cranes, coots, lapwings, sandgrouses, doves, and crows are represented by very incomplete individuals, for example a single wing or two wings; a single foot or both feet or part of the vertebral column. In most cases the bird's skull is missing. As such, this observation is difficult to interpret. Admittedly, a good deal of the mummified Sacred and Glossy Ibises is also incomplete, perhaps illustrating that the cult servants and the responsables for the *Ibiotropheion* looked for even the scantiest remains of dead birds lying around to secure them for mummification. Dead birds, like any other animal, would have been rapidly scavenged by foxes, jackals and hyenas as well as straying dogs and cats, and the more fragile parts such as the crania would have been especially vulnerable. So it is understandable that the people responsible for collecting the carcasses and parts thereof may have faced difficulties to collect all birds *in toto* and to recognise the species. However, they certainly would not have confused the carcass of a nightjar, a roller, a hoopoe or a swallow with that of a Sacred or Glossy Ibis. This raises the question how the servants managed to procure so many complete and intact ibises. Were these animals kept in enclosures with no access for scavengers? Or did people intentionally killed ibises from time to time? And how did they pro-

ceed to capture this variety of birds of prey, which range in size from small falcons to the imperial eagle? While these questions cannot be answered for the moment, it is a fact that the avifaunal record of Tuna el-Gebel is surprisingly rich, not in the least if compared to the present-day avifauna of the region.

The question to what extent species richness in the necropole may have varied though time is difficult to answer in view of the sampling procedures applied. Nevertheless, it cannot be entirely excluded that the number of taxa mummified increased with time, considering that the 1678 mummies collected in Gallery C pertain to 56 taxa, whereas the 1638 mummified specimens from Gallery B illustrate the presence of 70 taxa. However, in Gallery B we noted for the first time species such as the Barbary Partridge *Alectoris barbara*, Reef Heron *Egretta gularis* and Barbary ape *Macaca sylvanus*, i.e. species inhabiting the coastal regions of northern Africa. Their appearance in the faunal record may suggest that the delivery of (mummified) animals from Lower Egypt to Tuna el-Gebel was intensified during Ptolemaic times. This may, of course, have been the case with other bird taxa too, but since most of them are widely distributed throughout Egypt we face difficulties to trace their region(s) of origin.

Compared to two other sources informing us about the ornithology of ancient Egypt, namely the pictorial evidence (e.g., HOULIHAN 1986, BOESSNECK 1988) and the bird remains recovered from archaeological sites (e.g., BOESSNECK 1986, 1988), the avifauna recorded from Tuna el-Gebel is decidedly richer in taxa. Moreover, the spectrum of species present clearly differs from that depicted in ancient Egyptian art or identified in settlement refuse and graves. Houlihan's survey (1986) of the ornithology depicted in ancient Egyptian art and hieroglyphic writing, for example, records 73 bird taxa. Of course, many of these have also been recognised in the samples from Tuna el-Gebel, but there is a clear difference in scope: Anseriform birds (swans, geese, ducks) are among the birds most frequently depicted, with at least 14 species being evidenced. In contrast, in our samples anseriform birds are poorly represented totalling eight individuals from six species. On the other hand, species richness in diurnal and nocturnal birds of prey is very low in ancient Egyptian art and hieroglyphic writing (N=9; s. HOULIHAN 1986), compared to the 35

taxa recognised in our samples. In this respect, the title of HOULIHAN's work "The birds of Ancient Egypt" certainly is misleading, since the species depicted in art represent but a small segment of the ornithofauna exploited in the frame of food acquisition and ritual acts (see also BOESSNECK 1988, 1 ff.).

#### THE EMERGENCE OF ANIMAL NECROPOLES: RELIGIOUS AND POLITICAL BACKGROUND

The faunal richness and diversity evidenced at sites such as Tuna el-Gebel starts to alter traditional Egyptological scientific views about a growing popular animal cult in the Late Period, because it reveals important aspects of the subtle theological thoughts and religious practises behind the use of sacred animals, not recorded until now. In the frame of this paper, however, it is only possible to draw a rough sketch of these practises (see also KESSLER & NUR EL-DIN 2005). As such, the religious cycle included not only the animal statues in towns and necropoles and the animal standards, but also the transformation of the Egyptian High God into the shape of an animal, as part of the First Creation on the Egyptian Primeval Hill. This cycle, however, seems to be incomplete without the ritual and processional appearance of the corresponding sacred animal, because the ritual use of the latter guaranteed the immortality of the re-birth of all gods and the king. Thus, the animal cemetery as an integral part of a complex cultic institution would certainly explain the interest of the Egyptian State to create numerous animal breeding places and cemeteries, in particular also from an economic viewpoint. The systematic installation of ibis- and falcon-organisations (DE CENIVAL 1972) in all temples of the metropolis and their necropolis areas in Egypt not only added new gods in form of animal statues to the Egyptian Pantheon, it also resulted in *en masse* inscriptions into the central ibis- and falcon-organisations of people living in the villages and towns bordering the Nile. This is reflected by the abundant and common personal names of villagers mentioning the ibis and the falcon. Such *en masse* inscriptions were necessary to finance and maintain those in charge of the cult associations, mostly employees of the State and officers. The thousands of new cult institutions created all over Egypt were sold by the State to families of priests, providing money to the treasure of the State (KESSLER & NUR EL-DIN 2005, 143). The contributions of these cultic

groups seem to have been a major source of income for the benefit of the reigning elite. After the conquest of Egypt by Alexander the Great, the greek ruler Ptolemy I and his immediate successors wisely adopted this practise, which had been introduced in the entire country during the last indigenous dynasty. In the interest of the State Ptolemy I initiated new religious rules in demotic and greek language.

The new cult institutions also caused an integration of the different social strata and foreign ethnic groups living in Egypt, and brought together the Egyptian and Greek military units. With the greek *strategos* or *nomarchos* as formal head of the ibis- and falcon-organisations and the greek king as the pharaonic actor during the central State festivals, the political power of the greek dynasty and its economic dominance could be stabilized. Ibis and falcon as the most prominent animals of the kingly representation, visible as standards and animals during the Egyptian feasts of appearance, were transferred in form of statues to the traditional greek Serapeia and Iseia. Greeks and Egyptians thus joined each other during the Panegyptian Sokar-Osiris and Thot feasts, which united in a cyclic procession the temple with the town and the necropolis. In this respect, the burial places of the ibis and falcon must be interpreted as integrated and official parts of this all-Egyptian scenery, which included all gods and all sanctuaries of Egypt.

During the State festivals the gods resting in the *Ibiotapheion* and in all other animal cemeteries participated in the resurrection of Osiris and the enthronisation of the gods of the main temples during the following New Year festival. Consequently, the aim of installing new *Ibiotapheia* in all cemeteries of Egypt was not to fulfill a religious demand of common Egyptians, nor a hitherto unrecorded expression of a growing common or individual belief in the power of the moon god Thot or of the god Horus. The visits to the *Ibiotapheia* of Tuna el-Gebel were occasional, as a larger crowd may have been seen there only when the great processions coming from Hermopolis Magna visited the Osirian hill of the animal cemetery. The common Egyptian, who certainly was not allowed to enter such a remote and secret site like the sanctuary of Osiris-Baboon (and Osiris-Ibis), came there only as an inhabitant of the town of Hermopolis or as a member of his ibis association from the countryside, to get involved into the mystery of the resurrection

resp. rejuvenation of Osiris and Thot. There are neither traces of pilgrimage nor is there any archaeological or written evidence for visiting pilgrims from all over Egypt near or inside the *ibiotapheion*. All inscriptions and objects discovered inside the galleries of Tuna el-Gebel relate to the activities of the responsables of the ibis organisation, who had to take care of the institution. Moreover, not a single votive object showing a personal veneration of the new gods Osiris-Ibis and Osiris-Falcon could be found. The religious wish of a member of an Egyptian feast, embedded in his social unit, may have been the participation in the rejuvenation festivals, maybe profanely in the feast event and its provisions. The knowledge of the secret transformations between Osiris and Thot during the processions of the Thot festival to the main necropolis temple in Tuna-South or of the Osiris rites during the Sokar-Osiris festival remained a secret of ‘those over the secrets’.

### **The theological meaning of the Egyptian animal gods**

The theology behind the *Ibiotropheion* and *Ibiotapheion* was always kept as a religious secret and never explained to the public. Of course the common people vaguely knew about the close theological connection between the king and the gods, which was visualised to them not only during the New Year feast but also at the animal cemetery by the presence of statues of gods, king, animal gods as well as living animals. They were aware of the fact that both the king and the gods could transfer themselves into certain birds – the literary tradition knows spells like “becoming an ibis, falcon, goose, pelican, etc.” – to reach the sky by using the power of the birds and to get finally unified with the sky god. The theological meaning of the transformations of gods including the animal gods remained an exclusive knowledge, though.

Before the creation of space with the division of sky and earth, all birds of Egypt were already present in the landscape scenery of the Primeval Hill. On the Primeval Hill the animals assisted the reigning High God in his fight against the enemy god (Seth; Apophis). During this fundamental struggle between Good and Evil, the powerful ibis gods (Egyptian *ba*-forms) killed the snake forms (of Apophis). This made the ibis, against its true nature, a killer of snakes in antiquity. The combination of ibis and snake, com-

monly found in the *Ibiotapheion* of Tuna el-Gebel, shows both gods near each other, since in this particular context they cannot destroy each other anymore. The same reinversement of a natural antagonism can be seen in the combined wrapping of falcons and shrews and other animal pairs. Finally, the snake in front of the Egyptian ibis standard shows the two species together, reflecting the mighty power accompanying the enthronisation of king Osiris, the king on earth and of all reigning gods.

Depictions of ibises or falcons sitting on flowers or trees and found inside the animal cemetery on decorated slabs (e.g., C-C-17) also belong to the Primeval Hill scenery. Before the fight against the enemy god, however, lies the creation of the first ibis and falcon pair. Therefore the eggs of ibises, falcons, pelicans and others species found in the animal cemeteries have the same meaning as the depictions of one or of a pair of eggs on temple walls. They all belong to the landscape scenery of the First Creation. In this respect, the eggs of male and female birds are not symbols of an abstract idea about rebirth or recreation, as is often stated in literature, but are icons indicative of a secret ritual transformation. Isis, for example, could change into different birds species, both ibis and falcon being souls (*ba*-forms) of Isis (RAY 1976, 175 Index). The scenery of the Egyptian gods, humans and animals living together on the Primeval Hill is preceded by the cosmogony, the imagination how the *materia* of the cosmos was formed. From Edfu we know that the wings of a falcon formed the *materia*, whereas the ibis was part of the Hermopolite doctrine, in which the Primeval hill was formed out of the mud of the Primeval Ocean.

The powerful birds of the Primeval Hill had to be ritually transferred to the reigning sky god. The sun god, in turn, took the appearance of particular species, e.g., that of falcons, in order to use their power. On earth, the animal statues in the temple forecourts represented the visible power forms of the sky god. In Hermopolis it was the statue of an ibis, analogous to the falcon statue in Edfu. Greek authors report of an immortal Living Ibis which was kept nearby in a special cult building (HOPFNER 1913, 117). Its role was to guarantee the religious cycle analogous to the Living Falcon of Edfu. It is said that the living incorporation ibis of Hermopolis Magna had a blue tail. However, the representation of a god in form of a statue and the living incorporation ani-

mal had to be clearly distinct, since the two of them could not be identical for theological reasons.

Groups of living birds such as ibises, falcons and messenger birds (*sr*-birds) were used during the different Egyptian festivals of appearance and were shown at the window of appearance at the temples. Distinct messenger birds were held behind the head of the king during the coronation ceremonies (GOYON 1972). They were selected from their feeding places according to their colours. Until now, the ritual death of Sacred Ibises can only be postulated by analogy with other animal species. The deliberate killing of the powerful creatures (CHARRON 1990) during rituals and feasts (KESSLER 1991), selected on the basis of their special colouring (perhaps the purplish-brownish coloured Glossy Ibis?), was explained mythologically as a fight against the opponents of the reigning god on the Primeval Hill. Thus, to kill birds during offerings meant to kill enemies. However, also dangerous animals could be gods.

Given its important role, the living incorporation ibis at Hermopolis Magna was given an individual, religious name. The name of such an Ibis as Thotirdis, meaning 'Whom-Thot-has-given', was recently read on a limestone slab found in Gallery C near branch C-7. It may well be that the 'higher class' ibises deposited in limestone sarcophagi and originating from all over Egypt represent selected temple animals that had been offered during Egyptian festivals.

No doubt, the mass of birds buried at Tuna el-Gebel came directly from the Egyptian *Ibiotropheia* via the *Taricheion* to the area of the *Ibiotapheion*. There seems to be a uniform theology behind all individuals deposited there, regardless of their species and sex: All the different Egyptian bird species were part of the primeval scenery which had to be created permanently anew during secret rituals. The Egyptian avifauna was included because of the necessity to comprise all living creatures of the primeval events. Collectively they had to be transferred to the hidden and visible sky god. Therefore, all kinds of birds brought to the *Ibiotropheion* could be deified and become gods, because all living and dead creatures frequenting the feeding places were sacrosanct offspring of those species acting in the role of a god at the temples. Thus, from a theological viewpoint, every single bone and feather of any bird species found and collected by the

cult servants in the sacred areas of the *Ibiotropheia* could be deified and given life anew through religious rituals.

Following a certain scheme every bird species living in Egypt was attributed to a certain god, analogous to the Egyptian snakes and dogs, for which the lists have been preserved. Animal species were distinguished by their colours, e.g., the red colour belonging mainly to Seth, the white to Osiris, the black to the invisible, hidden gods (Atum, Neith), their voice or their sex, e.g., the females to Hathor, Neith or Isis, and so on. The most important living incorporation birds kept inside the temples appear to have been characterised by a distinct, multicoloured plumage, which set them apart from the majority of the species showing a less conspicuous plumage. Conceivably the Glossy Ibis (Egyptian *gm*-bird) may have played a theological role because of its purplish-brownish plumage, but we cannot prove this for the moment. Additional laws decreed by the Pharaoh probably ordered the burial of any ibis and falcon, wherever found: both birds were released as messenger birds to the sky during religious rituals to pronounce, e.g., the coronation of the king during the feast of Min. Such a context might explain why these and other species belonging to the group of messenger birds, such as the diurnal and nocturnal birds of prey, or those birds considered to represent migrants between darkness and light, such as the swallow and the nightjars, may have been buried preferentially *in toto* and also in higher numbers than has been done with other bird species, e.g., those frequenting the sacred lake environs sporadically as winter guests. Also the fact that bird taxa exhibiting special colours systematically are represented by more complete individuals in the galleries may suggest their killing in the frame of religious acts at certain feast days at the *Ibiotropheion*. We do not know, however, where and how the falcons and other messenger birds were kept.

The fact that very common birds like geese and ducks, representing forms of the enemy god Seth and offered at the temples by incinerating them, were not frequently buried inside the animal cemeteries is easy to explain and reveals the insider knowledge of the cult servants: The Egyptian *sr*-goose represented as a statue or visible on a sacred standard pole is indifferent as such, it does not represent a certain colouring nor a particular species. Moreover, to be used as

a messenger bird during a ritual, a common grey goose was considered unsuitable to fly up into the sky. Conceivably birds such as the Roller *Coracias garrulus* were selected, a species being recorded to take the place of the sr-goose during the feast of the god Min at Thebes.

### Sacred birds and daily life

In literature, the attitude of the common Egyptian to the living and dead sacred animal is still controversially discussed (e.g., IKRAM 2005, 10). Contrary to the common opinion and based on our research in Tuna el-Gebel, there is no evidence whatsoever for an intervention of the common Egyptian at any stage of the process from a bird corpse toward a deified mummy in a pottery jar. We are convinced that these gods were not handed over to the common people, except to those Egyptians belonging to the group of cult servants, who collected the animals, treated their corpses and transferred them to a building near the burial place, to be brought down into the galleries at a later stage by another group of servants, the “bearers of gods”. To assume that millions of pilgrims bought and/or brought their personal animal mummies as a form of a personal medium god – a model proposed until now to explain the presence of millions of mummies in the animal necropolises of Egypt – can hardly be valid for sites such as Tuna el-Gebel, not in the least because we have difficulties to imagine that this remote place was frequented yearly by ten thousands of believers (of Thot and Horus?) coming from all over Egypt.

Until now, the presence of so-called ‘fake’- or ‘pseudo’-mummies in many necropolises, i.e. of mummies containing a wing or a leg of an animal or even, at a first glance, nothing at all, has been explained in terms of fraud by lesser priests to meet the growing demand for bird mummies. Besides the possibility that certain organic materials, such as feathers or nest material, may have disappeared due to decomposition and will therefore be overlooked during macroscopic analysis or hardly visible when x-raying mummies, we are not aware of any prescription, even during Ptolemaic times, instructing the taricheuts to embalm sacred animals *in toto*. A demotic prescription in a papyrus from Saqqara ‘one god in one vessel’ has led to the erroneous belief of each vessel containing as a rule a single and complete ibis mummy. The prescription is a simple technical advice, valid perhaps only for

Saqqara, where a special type of a Ptolemaic pottery jar used for birds was produced. By no means can this be interpreted as evidence for the practice of pilgrimage.

From our work in the galleries of Tuna el-Gebel we know that not only the remnants of living animals and associated organic materials were wrapped. Also the statues and statuettes made of stone or wood as well as every bronze figure had been wrapped in linen by the cult servants (cf. KESSLER & NUR EL-DIN 2005, 151). The majority of bronzes and wooden figures belong to Osiris and his family. The second largest category of small finds consists of bronze or wooden ibis figures, either walking or squatting, and placed on a pedestal of wood. A third, smaller group of objects includes the various members of the Egyptian Pantheon, ranging from single gods, e.g., a figure of a walking bull (Apis bull or Thot-bull) or of a falcon on top of a baton and on a bronze Menat-collar, to highly theological combinations of different gods. In all cases the wrapping evokes the transformation of these gods from their Osiris-form to their resurrection, thus participating all in the destiny of Osiris. In this respect, the walking ibis commonly found is not at all a simple representation of Thot, deposited as a votive offering by a single believer, who visited the temple above the ibiotapheion to achieve direct communication with Thot. The wrapping of the ibis bronzes clearly shows that we are dealing with the god Osiris-Ibis! Hence all deified objects found inside the galleries are in the Osiris-form but will change their form during the feast events. We have demotic graffiti of the cult groups at the *Ibiotapheia* in Tuna el-Gebel and Thebes, who invoke a group of gods, Osiris-Ibis, Osiris-falcon and all the other resting gods, combined with the wish that their beautiful (nfr), i.e. rejuvenated, name may last for ever (CHAUVEAU 1991). This, however, does not illustrate an individual veneration of Osiris-Ibis by the “bearers of the mummies”. Behind the god and the wish of the people, one recognizes the everlasting religious rejuvenation cycle.

All in all, the finds from the galleries demonstrate that the transformations of Osiris during the Sokar-Osiris rites played an important role in the lives of the people participating in the feast processions, including the members of the ibis organisations and those of the entire necropolis area, who were bound to other lesser gods, as

well as to certain social groups and professions acting in the necropolis area. Only these people could lay down objects, including amulets and even material of the taricheuts, to participate eternally into the secret of the transformation and resurrection. The same is valid for the unification of Thot and Osiris during the feast of Thot, which surely was performed intensively by the ibis organisations as well. Finally, on the days of the feasts the members of the processions expected an individual advantage from their participation, an individual 'Heilserwartung'. The 'Giving of life' as mentioned on a few objects from the galleries, especially on bronzes, is not a simple formula or a short wish to the god Thot to give a believer in Thot simply life, whatever this means. In reality the 'Giving of Life' is a shortened multifunctional formula indicating the secret of the transformations when Thot visits his ancestors at the necropolis temple to get united with Osiris at the all-Egyptian feast of Thot, and when Osiris got resurrected at the Sokar-Osiris feast at the days before the New Year festival at Hermopolis Magna. The 'Giving of Life' also cites Thot as a creator of the cosmos, a religious act which took place when Thot arrived at the temple of the Primeval Hill to the south of the *Ibiotapheion*. Here, the 'Giving of Life' created the protective lesser gods, such as the ibis, the falcon and the other animals.

The increasing number of new gods in form of ibises, falcons and other birds during the Late Period cannot be taken as proof for a general individual interest of the common Egyptian in bird forms that were popular. The lesser gods were visible on earth in form of statues outside the sanctuaries and chapels, hence the administrative installation by the State of new *Ibiotropheia* and *Ibiotapheia* automatically multiplied their numbers. To the newly created *Ibiotropheion* with its living ibises was added the cult of the new god Living Ibis (MEGAHID & VITTMANN 2003), which was certainly visible outside the chapel of the *Ibiotropheion* in form of a statue of a walking ibis. Besides, there must have been other figurations of gods, like for example 'Thot of the place of birth', and surely also representations of the king in connection with the ibis god. Inside the chapel the responsible priest of the ibis organisation evoked, e.g. on the days of the oracle, the god Thot, who during the night saved the person appealing from the dangerous animals of the earth. In this respect, the Living Ibis must be seen

in analogy to gods like the Living Apis and the Living Baboon. Judging from inscriptions on sarcophagi at Tuna el-Gebel, it can be assumed that a flock of special ibises was kept and nourished at the temple of Hermopolis Magna, together with falcons and messenger birds. No doubt, the cult servants employed by the ibis-organisation were formally bound to this new god, but this does not mean that they venerated emotionally the Living Ibis instead of Thot. Interestingly, the god Living Ibis cannot be detected in personal names. Thus, despite their professional interest, there can be some doubt whether the cult servants had a profound respect toward the living sacred animals they constantly had to look after, particularly for feeding and in case of illness.

The function of the god Osiris Ibis, Osiris Falcon and other gods inside the Egyptian cemetery areas can be paralleled with that of gods like Osiris Apis and Osiris Baboon. The change between Living Ibis and Osiris Ibis and the rejuvenation of these lesser gods was part of the religious cycle, with the processions between the town and the necropolis, with its Primeval Hill site and the cycle of life and death of the sacred ibises at Hermopolis. Osiris Ibis, to be found in all Egyptian cemeteries, was at no time a god of an Egyptian personal piety. Nevertheless, there were a few people, probably the priest's family and some servants, who lived from the income generated by the installation of a "field of the Ibis", an absolutely necessary condition for establishing the cult of a new god.

The cult places for the lesser gods and their sacred animals were not only used during the feast days for the introduction, disappearance during darkness and reappearance of the rejuvenated god on earth, but played an important role for the common Egyptian during the 'weekly' feast days. Minor feasts with offerings were held every tenth day of the month, while at the end of each month there was a greater feast. During the night of the feast day the priest in charge of a community put oracle questions in front of the secret oracle god, given to him by members of his community. He could also take individual pleas (cf. SMITH 2002) to Thot (VITTMANN 1995) to the galleries to deal with inner needs and worries of single members of his cult group. The more important oracle places needed a special library, where oracle questions of higher stately importance could be solved, with the juridical advice written by Thot handed over to the appealing

priest who lived near the *Ibiotapheion* (NUR EL-DIN & KESSLER 1996).

Obviously a religious cycle was beginning and ending near a special statue of an ibis shaped god, named “It-says-the-face-of-the-Ibis” in Tuna el-Gebel (KAPLONY-HECKEL 1972) and in Thebes, in greek Teephibis (VOLOKHINE 2002). In order to fulfill the cycle a living ibis was kept there. The animal was interred in Tuna el-Gebel in a painted cult chamber (B–A-24), showing on the wall the (pseudo-)statue of an ibis squatting as Osiris-Teephibis-justified in front of the goddess Maat (KESSLER 1989, 203f.). The wall at the back contains a niche for an ibis burial. Again, Teephibis was not a god of personal veneration. Though we know of the existence of similar oracle gods, e.g., “It-says-the-face-of-the-Red” (flamingo), the question where exactly they were installed cannot be answered for the moment.

*The Ibiotropheion and Ibiotapheion from an economic viewpoint*

Many questions about the far-reaching consequences for the countryside because of the installation of many new *Ibiotropheia*, *Ibiotapheia* and other institutions, as well as their economic importance, still remain unanswered for the moment. One reason for this is the fact that the written sources will only mention these places when matters of the State are concerned, e.g., economic issues dealing with the fields. It is by chance that we are informed about the fields of the ibis, falcon and messenger birds near Edfu in Persian times (MEEKS 1972, 70–71). At the moment we can only guess the costs for the State to provide the embalmers with bitumen or linen. Probably in Persian times bitumen was imported from abroad. On the other hand, however, it can be safely assumed that the new institutions were profitable for the State. Conceivably, it was rather the State who pushed the common peo-

ple, often even whole villages, to join the local ibis organisation, and much less a personal decision of the common Egyptian. Moreover, their enrollment seems to have been hereditary. The peasants had to work for those in charge of the association, in later Ptolemaic times they even had to pay. The priests themselves obtained the cult job from the State administration against cash (KESSLER 1989, 163). In turn, they received certain food provisions from the fields of the ibis and – albeit never written down – gained a modest income from members of their associations who needed answers to their oracle questions.

To the east of the *Ibiotapheion* of Tuna el-Gebel we recently discovered a series of large administrative buildings, stretching about half a kilometer to the left and right of a broad road leading to the galleries. Two of these have already been excavated, revealing a similar architecture, with a tower-like building for storage purposes and some round silos for cereals as well as open courtyards for food preparation. Each complex had an own administrative quarter. Demotic and greek ostraca of mostly later Ptolemaic time evidence that in each of these complexes, the delivery of the State as well as the rations for the priests and other cult servants, responsible for certain lesser cult places, was administered by the central ibis organisation of the necropolis. Obviously we are dealing here with a cultural heritage of mixed Egyptian and Greek origin.

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