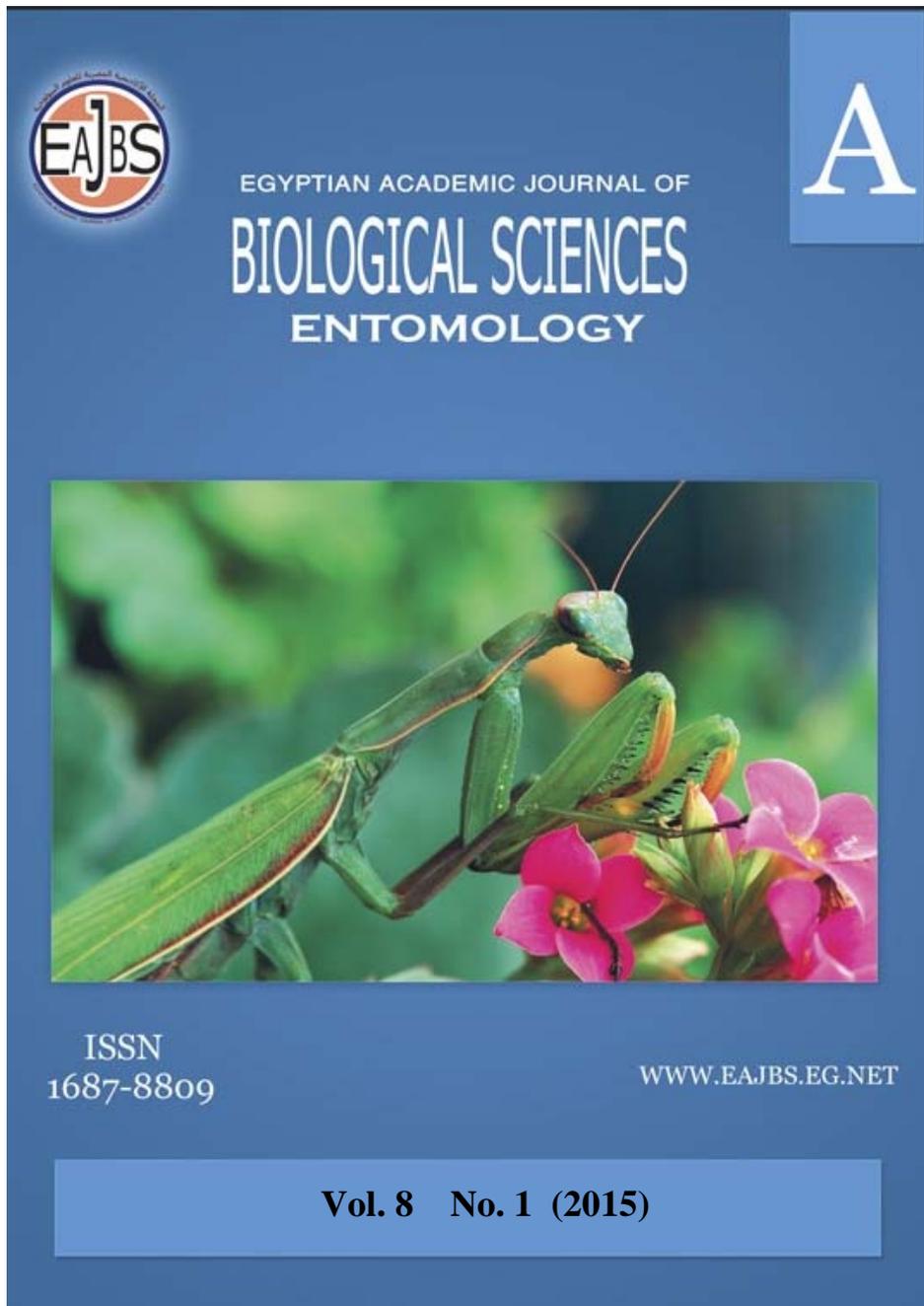


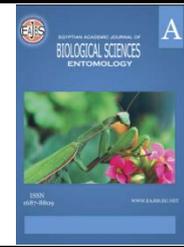
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Insects in ancient (Pharaonic) Egypt: a review of fauna, their mythological and religious significance and associated diseases

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ABSTRACT

Based on the available and scattered reports, this article reviews the insects that were known to ancient Egyptians (butterflies and moths, honey bee, locust, praying mantis, beetles, ants, flies, mosquitoes, bed-bugs, fleas and head lice). The mythological and religious significance and associated diseases (malaria, filariasis, leishmaniasis and plague) of such insects were also included. The present status of the medically important insects and their borne diseases in modern Egypt were discussed. In conclusion, in spite of the large variety of insects occurring in Egypt at present, only few have been represented and named in ancient Egypt.

INTRODUCTION

Ancient Egypt (Map) as a general historical term broadly refers to the civilization of the Lower Nile Valley between the First Cataract and the mouths of the Nile Delta, from *circa* 3300 B.C. until the conquest of Alexander the Great in 332 B.C (NEW, 2009). The history of ancient Egypt proper starts with Egypt as a unified state, which occurred sometime around 3000 B.C., though evidence indicates a developed Egyptian society may have existed for a much longer period.

Many insects tormented (plagued) the ancient Egyptians throughout their long history (IAE, 2007). The ancient Egyptians held certain insects in special respect Apart from the beetle worshipped as *Atem* (*Atum*, *Atoum*; the creator god of Heliopolis- Note1) and the flies representing tenacity (persistence) and courage, Egyptians respected also other insects as butterflies which were portrayed for their beauty and bees that kept for their honey (AEB, 2007). Many other insects: lice, fleas, bed-bugs and mosquitoes were mostly nuisance for ancient Egyptians but their potential for causing harm was only partially recognized. There was little to do about such pests apart from praying to the gods, such as the fertility god *Min* (protector of crops), or *Isis* as guardian of life. On the other hand, insects such as grasshoppers, praying mantises were present in ancient Egypt.

The Grain weevils (since the Old Kingdom) and grain beetles (since the early New Kingdom) also occurred in ancient Egypt (Eva Panagiotakopulu, 2003) and destroyed significant amounts of stored cereals. Bacon beetles (Family: Dermestidae), checkered beetles (Family: Cleridae), lesser mealworm beetles, cockroaches, snout beetles and others were found in tombs, where they caused damage to the food offerings and the mummies. But apart from occasional drawings showing those pests being pierced by some weapon, and a few spells, there was little anybody could do against them (Eva Panagiotakopulu, 2003). This article reviews the most common insects occurred in ancient Egypt and their mythological and religious significance to the ancient Egyptians. In addition, remedies against such insects and diseases associated with the medically important ones were also reviewed.

MATERIALS AND METHODS

The available published and unpublished reports on insects that were known to ancient Egyptian, their mythological and religious believes and associated diseases were collected and reviewed. In addition, several web pages were accessed since 2009. The primarily objective was to prepare a course by the first author for undergraduate students at the Department of Entomology, Faculty of Science, Ain Shams University, Cairo which was lectured starting from 2009 till present. In this article, the present situation of the reviewed insects and diseases they transmit to the Egyptians were added and discussed.

RESULTS

Insect Fauna

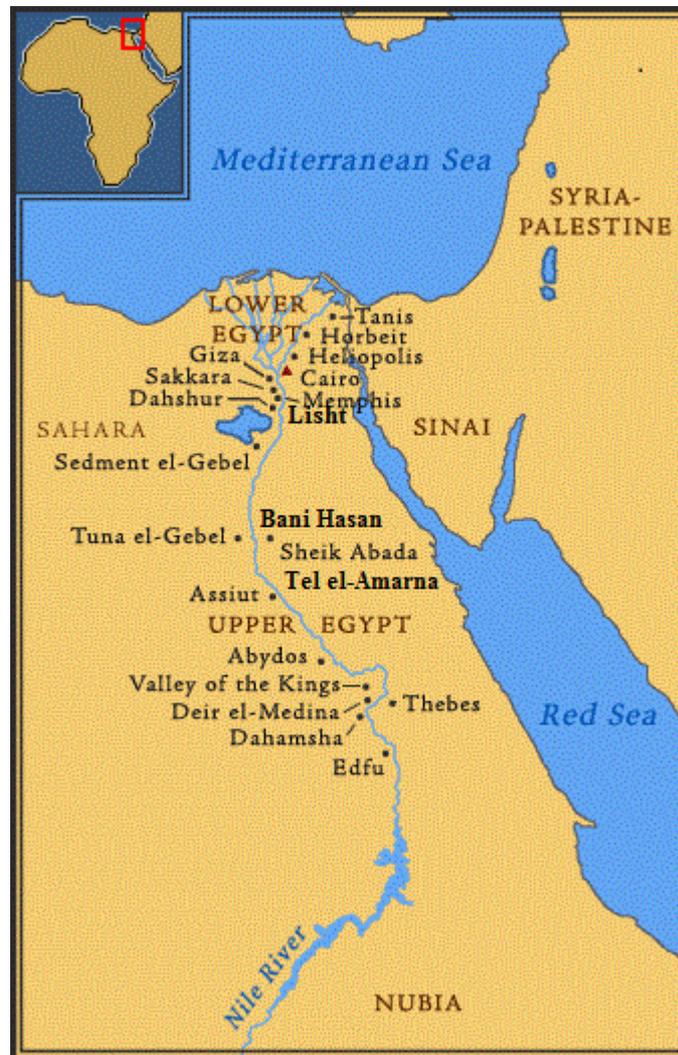
Butterflies and Moths

Butterflies may be among a small number of creatures apparently not having any mythological and religious significance. Still, they were quite often represented in hunting and fishing scenes, apparently for their beauty's sake (NIC, 2001a). Butterflies were often depicted in tomb paintings of river-bank scenes throughout the Old and New Kingdom periods (2686-1069 B.C.). Some of these paintings show great attention to details so that a particular species of butterflies still represented in the present-day fauna and which can be easily recognized (Kendall, 2009a). The most frequently species depicted on these ancient reliefs is the large monarch butterfly, *Danaus chrysippus* (Eva Panagiotakopulu, 2003) which is a close relative and very similar in appearance to the familiar monarch or milkweed butterfly, *Danaus plexippus* of North America and occasionally found in parts of northern Africa and Europe (Kendall, 2009a). Also, there were jewelers using butterfly motifs. Silver bracelets with semi-precious stones inlays in butterfly patterns were found in the tomb of the queen *Hetepheres* (NIC, 2001a) [thought to be the mother of *Khufu* and the wife of the 4th Dynasty Pharaoh *Sneferu* (2613-2589 B.C.)] and now in the Museum of Fine Arts in Boston, USA. In addition, several amuletic artifacts resembling butterflies have been found in excavations at the royal cemeteries at Lisht (el-Lisht), a village located on the west bank of the Nile, around 65 km south of Cairo.

Flies

In the ruins of *Akhetaten* (el-Amarna, Amarna was the city of *Akhetaten/Akhetaton* on the east bank of the Nile in the modern Egyptian province of Minya at 312 km south of Cairo) at least two species of fly have been identified, the

housefly, *Musca domestica*, and a flesh-fly of the *Sarcophagidae* family (Eva Panagiotakopulu *et al.*, 2010). It is generally thought that the fly in Egyptian mythology gave protection against disease or misfortune (Kendall, 2009a).



Map of ancient Egypt ([http:// www.nga.gov](http://www.nga.gov)) with some extra sites were added.

The Egyptians acknowledged the flies' persistence in the face of opposition. They were given in the form of large golden pendants (possibly horse fly *Tabanus sp.* which have quite a painful bite) to new Kingdom soldiers for their bravery in battles (NIC, 2001b) (Fig. 1). One of the best known examples is a gold chain with three pendants (Fig. 2) in the form of flies from the tomb of Queen *Ahhotep I* (c.1550 B.C.) and now in the Egyptian Museum, Cairo. In addition to these large fly pendants, relatively small ones are found on mummy beads. These smaller flies may be associated with the behavior of necrophagous flies. The Egyptians were likely associating their observations of insect behavior with mythical beliefs. During the mummification process, it was likely that flies would lay eggs on the corpse, larvae would develop and adults would emerge before the completion of the embalming process. Possibly, Egyptian priests observed flies leaving the corpse, before it was prepared for the afterlife and thought that the spirit of the dead person was leaving. It is hypothesized that in an effort to reunite the spirit with the body, the Egyptians placed small fly pendants on the mummy (NIC, 2001b). During the Old and Middle

Kingdoms flies made of gold, faience (glazed pottery; a ceramic material made from crushed quartz), glass or precious stones (Fig. 3) were worn as amulets called *ofef* (NIC, 2001b). The fly hieroglyph (Fig. 4) was used to represent the word *aff* (meaning 'a fly') or in later times (c.1550 B.C. onwards) as a symbol of bravery (Kendall, 2009a).

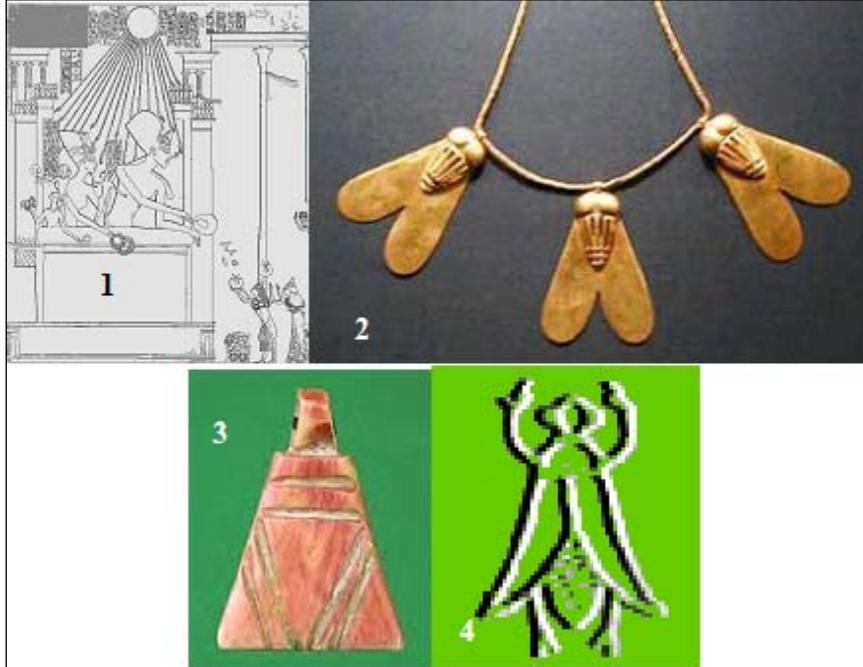


Fig. 1: Akhenaten and his family, standing in a window of appearances, are showering officials with the gold of valour. (Source: The rewards of military life. The scribes' view of the soldier's life in Lepsius, *Denkmäler aus Aegypten und Aethiopien*.<http://nefertiti.iwebland.com/building/>).

Fig. 2: Large golden fly pendants. (Source: El-Dorry, M. The Golden Fly of Valour. Arab World Books. <http://www.arabworldbooks.com/egyptomania/jewels.html>).

Fig. 3: A fly amulet from the Late Period (c.250 B.C.). This example (29 mm long) is carved from pink agate and has a suspension loop at the top to hang on a necklace (Source: NIC, 2001b).

Fig. 4: Fly hieroglyph (Source: NIC, 2001b).

Mosquitoes.

Mosquitoes are common pests in tropical and subtropical countries, in places where there is a lot of standing water. In Egypt the infested regions are the Fayoum and the marshy parts of the Nile Delta and Valley. To the ancient Egyptians mosquitoes were a nuisance rather than a deadly danger. The *Satire of the Trades* (Adolf, 1927 and Manniche, 1989) describes the lot of people working in the pools and ponds of the Delta as follow: "*The reed-cutter travels to the Delta to get arrows; when he has done more than his arms can do, Mosquitoes have slain him, Gnats have slaughtered him, He is quite worn out*". Malaria, spread by the *Anopheles* mosquito was endemic in ancient Egypt (NIC, 2004 and Ziskind, 2009). The malaria vector, *Anopheles pharoensis* may come from Egypt. Fresh ben oil or the uses of a net were considered efficient against mosquitoes.

Bed-Bugs and Fleas

The desiccating conditions of the Egyptian desert provide excellent media for the preservation of biological materials. The vertebrate and plant remains from tombs are well known (Eva Panagiotakopulu and Buckland, 1999). Bed-bugs *Cimex lectularius*, are first mentioned in a 2nd millennium papyrus (NEW, 2009). Eva Panagiotakopulu (2003) a paleoentomologist at Sheffield University in England

discovered some bugs when excavating garbage dumps at a workmen's village at el Amarna. Also well-preserved specimens were recovered. Although separation of *C. lectularius*, from *C. columbarius*, the pigeon bug, is difficult on the fossil material (Fig. 5). The Amarna specimens provided the earliest record of an association between man and this ectoparasite.

Fleas (*Pulex irritans*, the human flea), were also among the parasites that Eva Panagiotakopulu (2003) found at el Amarna in workmen's village.

Head Lice

Head lice have been with mankind for a very long time. The Egyptians shaved the heads of their small children to reduce the incidence of head-lice (Kendall, 2009a) while the body shaving of the priests may have been of traditional significance rather than a question of hygiene. There are records where lice have been identified in mummy hair from ancient Egypt. Palma (1991) discovered seven head lice (egg, nymph and adult) from a debris found among the fine teeth of a wooden comb (Fig. 6) excavated in Antinoë- Note2 (located 10 km south of Bani Hassan, Minya Governorate, Map) and dated between the fifth and sixth centuries A.D. The comb is kept in the collections of the National Museum of New Zealand since 1914.

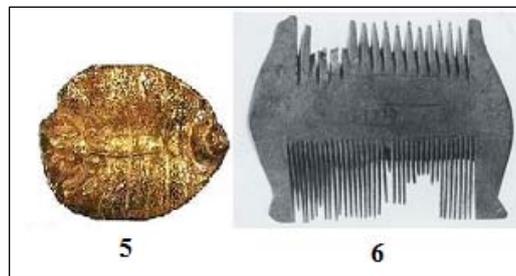


Fig. 5: Fossilized bedbug, Tel el Amarna (Source: Eva Panagiotakopulu and Buckland , 1999).

Fig. 6: Wooden comb from Anitnoë, Egypt, dated between the fifth and sixth centuries A.D. (Source: Palma, 1991).

Honey Bee

Wild or domesticated bees (*Apis mellifera*) were appreciated for their honey, the main sweetener for many food stuffs. The ancient Egyptian bees may have been more aggressive than the Italian bee, which has become the dominant variety in modern times (NIC, 2007). The agricultural, nutritional and medicinal value of the bee and its honey was important in Egypt from pre-dynastic times onwards. Attractively, Northern Egypt (the land stretching from the Delta to Memphis- Note3, Map) was known as "*Ta-bitty*"(the land of the bee) and Lower Egypt was known as "*Per-bit*" (the house of the bee) (Gough, 2009). Throughout ancient Egyptian history the bee has been strongly associated with royal titles as demonstrated by the fact that King *Menes* (*Min, Mena, Meni*; the first king of Egypt and founder of the First Egyptian Dynasty), was called "the Beekeeper"; a title recognized to all subsequent Pharaohs. An image of the bee was even positioned next to the King's cartouche (Fig. 7) as one of Pharaoh's titles "*Bee King*", and the shelter in which *Osiris* was worshiped was the *Hwt bjt*, the house of the bee (Gough, 2009). The Egyptologist, Wallis Budge (Gough, 2009) confirmed the bees' importance in Egyptian mythology that contains countless references to the bee; including the belief that bees were the tears of the god *RA* (The sun god of Annu or Heliopolis, Map). The bee is featured notably in many Egyptian temples (Fig. 8), including for example, the pillars of Karnak, the Luxor obelisk now erected on the Place de la Concorde in Paris (NIC, 2007) and on the Rosetta stone. Moreover, temples kept bees in order to satisfy the desire of the gods for honey. Bees are portrayed on the walls of Egyptian tombs and offerings of honey were routinely

presented to the most important Egyptian deities. Indeed, honey was the ‘nectar of the gods and Egyptian physicians valued its medicinal value in many important procedures, *i.e.* they practiced Apitherapy. The bee hieroglyph (Fig. 9) was used to represent the word *bit* (meaning 'bee' or 'honey', or the royal title 'King of Lower Egypt' or 'King of the North') (Gough, 2009).



Fig. 7: The Bee, next to the signature of *Hatshepsut*, the 5th Pharaoh of the 18th Dynasty (Source: Insects and Society: Other Symbolic Insects. Iowa state University, Department of Entomology, <http://www.ent.iastate.edu/dept/courses/ent211/history/symbols>).

Fig. 8: Bee hieroglyph-Luxor © Kenneth J. Stein (Source Insects and Society: Other Symbolic Insects. Iowa state University, Department of Entomology, <http://www.ent.iastate.edu/dept/courses/ent211/history/symbols>).

Fig. 9: Hieroglyph inscription nesw-bit ('he of the sedge and the bee'), which was part of royal titles from the 1st Dynasty onwards and translated as 'King of Upper and Lower Egypt'. It was used as a prefix to the throne name (prenomen) of the Pharaoh king (Source: Kendall, 2009a).

Beekeeping was practiced in Egypt for thousands of years (before 3000 B.C.) according to bee expert Eva Crane (Gough, 2009). The main centre of bee-keeping was Lower Egypt with its extensive cultivated lands, where the bee was chosen as a symbol for the country. Honey was regarded as a symbol of reappearance and also thought to give protection against evil spirits. Small pottery flasks, which according to the hieratic inscriptions on the side originally contained honey, were found in the tomb of the boy-king, *Tutankhamun* (commonly referred to as *King Tut*). The first official mention recognizing the importance of honey dates from the first dynasty. The oldest pictures of bee-keepers in action are from the Old Kingdom in Niuserre's sun temple (at Abu Ghurab about 10 km southwest of Cairo) where bee-keepers are shown blowing smoke (Fig. 10) into hives as they are removing the honey-combs. After extracting the honey from the combs it was strained and poured into earthen jars (Fig. 11) which were then sealed. Honey treated in this manner could be kept for years. Cylindrical hives (Fig. 12) from the tomb of Babasa (at Asasif, just outside the entrance to Hatshepsut's temple at Deir el-Bahri, Luxor), dated to the 7th century B.C., were made of clay and stacked on top of each other in rows up to eight high and a total of about 500 hives, with those on the outside were left empty as insulation against the heat (NIC, 2007).

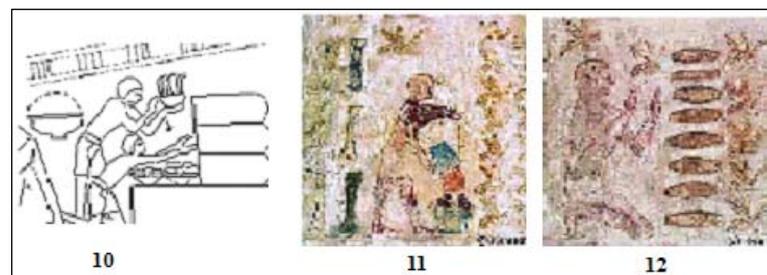


Fig. 10: The standing bee-keeper produces smoke, while the one kneeling removes the combs from the back of the hive. (Line drawing after a picture in the tomb of Rekhmire, 18th dynasty) (Source: NIC, 2007).

Fig. 11: Pouring of honey into earthen jars. Photo courtesy Kenneth Stein (Source: NIC, 2007).

Fig. 12: Bee hives, tomb of Pabasa (25th dynasty). Photo courtesy Kenneth Stein. (Source: NIC,

2007).

Honey was frequently mentioned in medical Smith and the Ebers Papyri and was even a vital ingredient in Egyptian wine and beer. This linked the beer to commerce, for beer was often used as a form of wages. In fact, promises of honey from husband to wife were included in marriage contracts, and even the Pharaoh *Ramses III*. (The last great Pharaoh, the second ruler of the 20th Dynasty and the last native Egyptian to sit on the throne of Egypt) offered up 15 tons of honey to the Nile God *Hapi*, in the 12th Century B.C (Gough, 2009).

Locust (Grasshopper)

Grasshoppers were used to represent soldiers because armies typically attack in large numbers so that ancient Egyptians easily associated outbreaks of grasshopper populations with attacking armies. In the battle of Kadesh inscriptions, *Ramses II* described the armies of his Hittite enemies as follows: “*They covered the mountains and valleys and were like locusts in their huge number*” (Lichtheim, 1980) and in the Pyramid Texts “*the flight of the locust is of greatest consequence: it can even hide the sun*” (IAE, 2007). The particular grasshopper species used as a motif by the ancient Egyptians was probably either the desert locust (*Schistocera gregaria*) or the migratory locust (*Schistocerca migratoria*), both of which were probably common in the rich agricultural land bordering the Nile. Sudden plagues of these insects in ancient times no doubt caused much destruction of grains and other food crops, just as they do today. Most of the locust (or grasshopper) amulets and seals (stamps) so far discovered are similar to those of the scarab beetles, with a flat base usually inscribed and pierced through for threading on a string or wire so that they could be worn, possibly to ward-off locust plagues. The locust hieroglyph quite simply refers to the insect itself, although in certain contexts it appears to mean 'great numbers of individuals', for example on a wall in the temple at Medinet Habu near Luxor there is an inscription (Fig.13) which reads: '*battalions will come like the locusts*'. The locust appears in hieroglyphic texts, for example, the word *snehem* (meaning 'locust' or grasshopper) (Kendall, 2009a).



Fig. 13: The hieroglyph inscription *snehem* (reading the symbols top to bottom and left to right, ignoring the determinative locust: *s-n-eh-em*) (Source: Kendall, 2009a).

Praying Mantis

During the excavations at Deir el Medina at Luxor, Bruyère (IAE, 2007) discovered a small, somewhat anthropomorphous coffin made of clay which contained the remains of a praying mantis wrapped in linen. Although there is an ink drawing of praying mantis on a papyrus (Fig. 14), these insects are rarely mentioned in the texts.

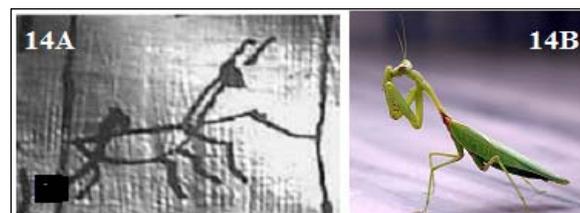


Fig. 14 A: Ink drawing of praying mantis on a papyrus (Source: AEB, 2007),
 B: Praying Mantis (Source: http://www.flickr.com/photos/dieu_et_mon_droit/)

In Book of the Dead- Note4 version, the translation of *Abyt* has been interpreted to mean 'dancer' and in another version of the passage an *Abyt*-bird is apparently referred to: *I have gone to the king passing by my house. It was the praying mantis which came to fetch me* (IAE, 2007).

Scarab (Dung) Beetle

Africa is a home to a number of dung beetle species that perform a vital ecological task by recycling the dung of herbivores. Egypt was never populated by large herds of wild herbivores such as the case in the east African plains. Therefore the numbers of dung beetles were much lower, and yet this insect caught the eyes of the Egyptians (Lichtheim, 1976). It is generally accepted that the sacred scarab beetle of Egyptian mythology originated from the species *Scarabaeus sacer* (Kendall, 2009a) (Fig. 15). The dung-beetle because of its 'miraculous' emergence from the ground (Lichtheim, 1980), the ancient Egyptians believed that the scarab beetle came into being of itself from a ball of dung (the idea of self-creation) (Kendall, 2009a) and was associated and identified with the self-created *Atem* (NIC 2001d) [the creator-god, *Khepri* a sun-god *Ra* "Re"] (Fig. 16) who associated with resurrection (reappearance) and new life (meaning 'he who has come into being' or 'he who came forth from the earth') (NIC 2001e). Just as the beetle pushed its ball of dung (Fig. 17) across the earth and made it disappear into the ground, so *Khepri* in the form of a scarab beetle, it was thought, rolled the solar disc across the sky from east to west each day (Kendall, 2009a). Hence, the scarab became an important symbol of creation, resurrection and everlasting life in the religious mythology of ancient Egypt. Small jars and coffins containing dried (mummified) scarabs were often placed in Egyptian tombs as part of their ancient funeral means to ensure everlasting reappearance.



Fig. 15: *Scarabaeus sacer* (actual size 25-30 mm long) (Source: Kendall, D., 2009b).

Fig. 16: *Khepri*, in the form of a scarab beetle, Tomb of *Ramses I* (Source: Ancient Egyptian Mythology: <http://www.egyptianculture.net/Gods/Gods.aspx>).

Fig. 17: Adult scarab beetle rolling its ball of dung to a suitable place for burial (Source: NIC, 2001e).

The term 'scaraboid' is often used to describe a seal or amulet which has the same ovoid shape as a scarab, but may have its back carved in a form other than that of a scarab beetle (Kendall, 2009a). Huge numbers of scarab amulets (or seals) (Fig. 18) were produced, either carved in stone or molded in glass or faience and served as protective amulets. The flat underside of such scarab amulets was often decorated with geometric patterns or hieroglyphic inscriptions. Scarab amulets were sometimes set into decorative pieces of jewelry, but more often they were pierced for threading on a simple cord necklace (NIC 2001e).



Fig. 18: Two examples of scarab amulets or seals inscribed on the underside with hieroglyphs, including a scarab glyph (left) and a flying-scarab glyph (right). The scarab on the left (11 mm long) is from the Late Period (c.500 B.C.), whereas that on the right (25 mm long) is much older and from the reign of Rameses II (1279-1213 B.C.). Both these amulets are pierced long ways to hang on a necklace, as typical of many scarab amulets (Source: Kendall, 2009a).

There were also a number of unpierced funereal types, such as the 'winged scarab' (nearly always made of blue faience and often incorporated into the bead net used to cover mummies) (Kendall, 2009a) and the 'heart scarab (Fig.19 A, B) usually placed on the chest of the mummified bodies of deceased people in their coffins and tombs as a symbol of resurrection and new life (Kendall, 2009b).



Fig. 19A: Two examples of funereal scarabs: 'winged scarab' (left) made of blue faience with pierced holes for attachment to the outer covering of a mummified body (age unknown, span 150 mm); 'heart scarab' (right) carved in stone, this example uninscribed and unpierced, and would be placed on the chest of a mummified body under its coverings (c. 900 B.C., 45 mm long) (Source: Kendall, 2009a).

B: Heart Scarab of *Hatnofer*, c. 1466 B.C.; Dynasty 18, reign of *Hatshepsut*; New Kingdom, Western Thebes, Rogers Fund, 1936 (36.3.2) (Source: Met museum website, http://nefertiti.iwebland.com/religion/body_and_soul.htm#body).

During the embalming the heart was not removed together with the other interior organs and a scarab was inserted into the mummy's bindings right above the heart in an attempt to prevent it from speaking out against its owner. Heart scarabs were often inscribed with texts from the 30th chapter of the Book of the Dead. The scarab and flying-scarab hieroglyphs (Fig. 20) were used in Egyptian texts to represent the name of the creator-god, *Khepri*, and also to represent the word *kheprer* (meaning 'flying beetle' or 'sacred scarab' itself) and the word *kheper* (or *kheperu*) (Kendall, 2009a) meaning 'become (s)' or 'manifestation (s) of...'(Shaw and Nicholson, 1995). The scarab hieroglyph often appears in the prenomen (one of the five titles and names) of the Egyptian Pharaohs like that of the famous boy-king, *Tutankhamun* (Fig. 21) (Budge, 1978).



Fig. 20: Scarab and flying-scarab hieroglyph (Source: Kendall, 2009a).

Fig. 21: Prenomen of Tutankhamun, *Neb-kheperu-re* which means 'Lordly - manifestations of - Re' ('Re' being the sun-god) (Source: NIC, 2001e).

Buprestid (Jewel) Beetle

Scarabs were not the only beetles to capture the imagination of the ancient Egyptians. The buprestid or jewel beetle (Fig. 22) is another type frequently found in tombs and modeled as amulets for hanging on necklaces. The name 'jewel beetle' comes from the vivid metallic coloring of many species, displayed in delicate shades of bright shining green, gold and purple-red. Keimer (1938) suggested that the buprestid most likely depicted on artifacts by the ancient Egyptians was a species called *Steraspis squamosa*, a large beetle about 35 mm long as an adult, with a wood-boring larval stage that feeds on the tamarisk tree.

Pendants resembling them were made in pre-historic times. Artifacts were decorated with their shapes and a number of such objects were found in *Tutankhamen's* and Queen *Hetepheres'* tombs (AEB, 2007). Although the symbolism of buprestid amulets and other artifacts remains obscure, Kritsky (1991) suggested a possible religious significance because the wood-boring habit of the beetle could be linked to the *Osiris* myth. According to this myth, *Osiris* (lord of the underworld and afterlife) was tricked by his brother *Seth* and became trapped inside a tamarisk tree, eventually to be released and brought back to life when the tree was split open by *Isis*. In much the same way, ancient Egyptian carpenters may found buprestid beetles when they split logs to prepare boards for coffins, and so linked the emergence of these beetles from split logs to the myth. Thus, the buprestid amulets may have symbolized the rebirth of *Osiris* (Kendall, 2009a). Buprestid amulets were made of several substances, including gold, calcite and faience. A spectacular necklace trimmed with many golden buprestid beetle amulets, dating from the 6th Dynasty (2345-2181 B.C.), is on display at the Museum of Fine Arts in Boston, USA. An unusual use of the buprestid beetle motif can be seen on the bed-canopy of Queen *Hetepheres* in the Egyptian Museum, Cairo where golden buprestids decorate the pin-heads holding together the corner posts of the bed-canopy.

Elaterid (Click) Beetle

A third type of beetle apparently of mythological significance to the ancient Egyptians is the elaterid beetle (Family Elateridae, Fig. 23A), commonly called the click beetle (Tick, Snap) which are quite common in Egypt. Their name derives from the clicking sound they make when jumping through the air. Of the elaterid beetles known from Egypt, Keimer (1938) considered *Agrypnus notodonta* (Fig. 23B), as the most likely species represented in ancient carvings. Such beetle was associated with the protective goddess *Neith* (Lesko, 1999) (one of the oldest Egyptian god, believed that she was originally a goddess of war). Gold foil amulets dating to the early dynastic have been found at Nag ed-Deir (IAE, 2007) near the Valley of the Kings, Luxor. A few centuries later during the Old Kingdom a woman was buried with a necklace consisting of fifty gold elaterid beetles. Thus, although their precise symbolism is unclear, elaterids possibly had some religious or protective significance (Kendall, 2009a).



Fig. 22: Typical buprestid beetle (Source: Kendall, 2009a).

Fig. 23A: Typical elaterid beetle (*Agrypnus*) (Source: Kendall, 2009a).

B: *Agrypnus notodonta* (Source: <http://en.wikipedia.org/wiki/>).

Spider Beetles

The spider beetles (Order: Coleoptera, Family: Anobiidae) of the genus *Gibbium* (1.3 mm) are very difficult to distinguish, and the species *G. psylloides* (Fig. 24) and *G. aequinoctiale* have only recently been routinely separated. In modern Middle Egypt, *G. aequinoctiale* has been found infesting foodstuffs. *G. psylloides* has been recorded in houses, hotels, mills and granaries, infesting grains, bread, yeast, cakes, cotton, seeds, spices, wool and leather. Although the predominant species at Tell el-Amarna today is *G. aequinoctiale*, the large numbers of fossil specimens from pharaonic Amarna are all *G. psylloides* (Eva Panagiotakopulu, 2003).

Lesser mealworm beetle

Complete fossil specimen of the tenebrionid *Alphitobius diaperinus*, the lesser mealworm beetle was collected from the Workmen's Village at Amarna (Eva Panagiotakopulu, 2003.), where it occurs in large numbers in deposits cleared out of pigsties. The species is an omnivorous feeder, also associated with grain, flour, leather and bones. It is a voracious predator on other invertebrates, often feeding upon the maggots of the housefly, *Musca domestica*, and it is likely to occur as a secondary pest in animal materials such as mummies.

Ants

The Pharaoh ant, *Monomorium pharaonis* (Fig. 25) is believed to have come from Egypt. The name possibly arises from the mistaken tradition that it was one of the plagues of ancient Egypt in the days of the Pharaohs (HPC, 2009).



Fig. 24: *Gibbium psylloides* (The smooth spider beetle) (Source: <http://en.wikipedia.org/wiki/Beetle>).

Fig. 25: *Monomorium pharaonis* - Pharaoh's ant, Panamá photograph © Alex Wild 2007 (Source: <http://www.myrmeecos.net>).

Remedies

Few remedies against a number of pests are included in the Ebers Papyrus (Dollinger, 2000). While some of them are apparently effective, others seem to be based on magical thinking as for examples: (1) Household insects can be killed by washing the house with a solution of natron, (2) Fat of the Oriole is efficient in eradicating flies, (3) Fish eggs get rid of fleas, (4) Loose ash spread around a grinding mill kills flour eating insects, (5) Fat of the woodpecker is used against insect stings, (6) Fresh palm wine would protect against gnats, (7) You can protect yourself against the predation of kites (gnats) by planting an acacia tree and using proper incantations increases the efficacy of this means, (8) Fumigation of the house with incense and myrrh is recommended but was not affordable to many, (9) Amulets, sometimes in the form of a protective deity or others shaped like the pest itself, were hoped to ward off the danger, e.g. locust amulets which have been discovered in tombs, (10). The main effective means to keep the house free of vermin are to keep it clean and keep a cat, (11) Shaving the head of little children, greatly reduces the incidence of head-lice and (12) Personal cleanliness, as mentioned by Herodotus added to the well being.

Insect-Borne Diseases in Ancient Egypt

Malaria

Malaria is a widespread and potentially lethal infectious disease caused by parasites of the genus *Plasmodium* and is transmitted to humans through the bites of female *Anopheles* mosquito. Four species of *Plasmodium* are pathogenic to humans of which *P. falciparum* causes severe (malignant) malaria with undulating high fever.

Immunologic tests have been used to investigate the presence and incidence of malaria in ancient Egyptian mummies and confirmed the high prevalence of *P. falciparum* malaria in ancient Egypt (Miller *et al.*, 1994; Massa *et al.*, 2000; Brier, 2004; Nerlich *et al.*, 2008 and Talpalariu, 2008).

For thousands of years, traditional herbal remedies have been used to treat malaria. The historian Herodotus (484–425 B.C.) wrote that the builders of the Egyptian pyramids were given large amount of garlic, to protect them against malaria (Wikipedia, 2009). Garlic is still in use as an insect repellent (Katz *et al.*, 2008). *Sneferu*, the founder of the Fourth dynasty of Egypt, from around 2613 to 2589 B.C., used bednets as protection against mosquitoes and *Cleopatra VII* (69–30 B.C.), the last Pharaoh of Ancient Egypt, also slept under a mosquito net (Wikipedia, 2009).

Filariasis (Elephantiasis)

Lymphatic filariasis is thought to have affected humans since approximately 4000 years ago as artifacts from ancient Egypt show possible elephantiasis symptoms. Although there are no written records however, the swollen limbs of a statue of the Egyptian Pharaoh *Mentuhotep II* from about 2000 B.C. (Fig. 26) provide evidence that he was suffering from elephantiasis and a painting in the temple of *Hatshepsut* shows that the queen might even suffer from Elephantiasis (Cox, 2002). Preventive measures included prayers, various kinds of magic, and wearing of amulets.



Fig. 26: Statue of King *Mentuhotep II* in the Jubilee Garment (c. 2051-2000 B.C.) From Thebes, Deir el-Bahri (Source: <http://www.flickr.com/>).

Leishmaniasis

Leishmaniasis is a disease caused by parasites of the genus *Leishmania*. The infection is transmitted to humans through the bites of female sandflies and manifests mainly in three forms: visceral, cutaneous, and mucocutaneous. Visceral leishmaniasis or kala-azar, the often fatal form of the disease, is caused by *L. donovani*. This parasite was responsible for severe recent outbreaks in Sudan and other countries and thought to originate in East Africa. In their report, Zink *et al.* (2006) described the successful amplification of *L. donovani* DNA in ancient Egyptian and Christian Nubian mummies dating back to 4000 years. Beside the first proof for visceral leishmaniasis in paleopathology, they provided evidence that

leishmaniasis was present in Nubia in the early Christian period and that the organism also infected ancient Egyptians, probably because of close trading contacts to Nubia, during the Middle Kingdom. They analyzed 91 bone tissue samples from ancient Egyptian mummies and skeletons and 70 bone marrow samples from naturally mummified human remains from Upper Nubia. The Egyptian material derived from the Pre- to Early Dynastic site of Abydos- Note5 (n = 7; 3500–2800 B.C., Map), a Middle Kingdom tomb in Thebes (Luxor) West (42; 2050–1650 B.C.), and different tomb complexes in Thebes West, which were built and used between the Middle and New Kingdom until the Late Period (42; c. 2050–500 B.C.).

Plague

Plague is an acute, contagious, febrile illness caused by the bacillus, *Yersinia (Pasteurella) pestis* and transmitted by fleas of which the oriental rat flea, *Xenopsylla cheopis* is the most important vector. *X. cheopis*, is probably originated in Egypt, and has been distributed to all parts of the world in ships' cargoes during the second half of the 19th century. Moreover, the bubonic plague, or Black Death, may have originated in ancient Egypt, while most researchers consider central Asia as the birthplace of the deadly epidemics. Eva Panagiotakopulu (Walker, 2004), found plague bacillus in fossilized flea remains in ancient ruins in workmen's village at el Amarna. So that she believes that the plague may have begun in Egypt rather than Central Asia and thought that the plague epidemics originated in Egypt where the Nile rat, was the natural host of the flea. The black rats, which came into contact with Nile rats in the dirty cities, spread the flea and the plague, throughout much of the ancient world. In almost all cases, plague epidemics strike areas with poor and cramped living conditions, much like the “Workmen’s Village” section of Amarna where Eva Panagiotakopulu carried out her research. She is the first to look at fossilized insect remains in the ancient city and found a very high frequency of fossilized human fleas, bedbugs and other insects and parasites that “present a picture of squalid living conditions” in and around the workers’ houses (Sever, 2004).

DISCUSSION AND CONCLUSION

Apart from the insects mentioned in this review, other insects are known to exist in ancient Egypt for examples: (1) Grain weevils, *Sitophilus granarius*, known to have been present since the Old Kingdom, grain beetles such as the lesser grain borer, *Rhizopertha dominica*, and flour beetles, *Tribolium castaneum*, occurred in Egypt since the early New Kingdom at least (AEB, 2007) that destroyed significant amounts of stored cereals; (2) The ubiquitous lesser mealworm, *Alphitobius diaperinus*, which can carry health risks for humans and the tiny biscuit beetle, *Stegobium paniceum* that have been found in excavations at el Amarna (Panagiotakopulu *et al.*, 2010) and (3) Bacon beetles belonging to the family Dermestidae, checkered beetles (Cleridae), lesser meal worm beetles, cockroaches, snout beetles and others were found in tombs, where they caused damage to the food offerings and the mummies (AEB, 2007). In addition, other insects such as butterflies, grasshoppers, or praying mantises might serve as guides to the deceased on their journey to achieve eternal life (Maspero, 2003).

It is important to consider the present situation of those insects with medical importance and their associated diseases in modern Egypt.

A total of 29 indigenous mosquito species of 5 genera (*Anopheles*, *Culex*, *Culiseta*, *Ochlerotatus* and *Uranotaenia*) are now present in Egypt. Of the anopheline mosquitoes, *Anopheles pharoensis* (allover Egypt especially in the north of the Delta)

and *An. sergentii* (in Fayoum and the oases of the Western Desert) are proven malaria vectors (Kenawy, 1988). *An. pharoensis* is the only vector responsible for *P. vivax* cases in the Nile Delta and *An. sergentii* is the main and the predominant vector in Fayoum and Western Desert oases (e.g. Siwa oasis) and responsible for *P. falciparum* transmission in Fayoum.

Malaria was endemic in almost all parts of the country however, by the end of 1998 till now no local cases were reported (Ministry of Health, 2000, Unpublished).

Only lymphatic filariasis caused by *Wuchereria bancrofti* now present in Egypt. *Culex pipiens* is the main vector (Harb *et al.*, 1993) and *Cx. antennatus* is also incriminated as a vector (Rifaat *et al.*, 1968). Filariasis has been endemic in Egypt for centuries (Southgate, 1979). Although the infection was considered to be almost eliminated and no longer a public health problem in the 1960s, resurgence of filariasis occurred in the 1980s. A study in some governorates of the Nile delta revealed that the prevalence of lymphatic filariasis increased from <1% in 1965 to >20% in 1991 especially in El Qalyoubia, El Menoufia, El Dakahlia and El Giza Governorates (Harb *et al.*, 1993). Recently, lymphatic filariasis is still circulating in El Sharqiya (Abdel-Hamid *et al.*, 2009), El Menoufia (Abdel-Hamid *et al.*, 2011a), El Ismailia (Abdel-Hamid *et al.*, 2011b) and Dakahlia (Abdel-Hamid *et al.*, 2013) Governorates in spite of applying the Mass Drug Administration (MDA) national program of Ministry of Health to eliminate lymphatic filariasis (Ramzy *et al.*, 2005 and El-Setouhy *et al.*, 2007).

At present, sandfly fauna comprises 21 species belonging to two genera: *Phlebotomus* (8 species) and *Sergentomyia* (13 species) (Lane, 1986) of which, the followings are the most important: (1) *Phlebotomus papatasi*, is the most common and wide spread species. It is the main vector of cutaneous leishmaniasis (*L. major*) (Morsy *et al.*, 1990) which is a common and an old disease in Egypt that is endemic in almost all parts of the country especially Sharqiya. Governorate and Sinai, (2) *P. sergentii*, is less common, and may be involved in transmission of cutaneous leishmaniasis and (3) *P. langeroni*, a vector of visceral leishmaniasis (*L. infantum*) (Doha and Shehata, 1992), a disease which was recorded for the first time during an outbreak in 1983 in El Agamy, Alexandria - North west Coast.

To-day, 35 species of fleas (order Siphonaptera) occur, of these 4 species are of medical importance, all belonging to family Pulicidae: *Pulex irritans* (Human flea), *Xenopsylla cheopis* (Indian Rat flea), *Ctenocephalides canis* (Dog flea) and *Ct. felis* (Cat flea). *X. cheopis*, the main vector of plague may derive from *Cheops (Khêops)*, a name of *Khufu*, the Dynasty ancient Pharaoh who ruled in the first half of the Old Kingdom period (26th century B.C.). Plague was known to be endemic in Egypt (Gratz, 1973 and Mafart *et al.*, 2004) however; no recent reports are available on the present situation of the disease in Egypt.

Infestation with head lice *Pediculus humanus capitis* (Pediculosis) is recently reported in some parts of Egypt (El-Basheir and Fouad, 2002; El-Sherbini *et al.*, 2008 and El-Bahnasawy *et al.*, 2012). It is common in crowded unclean sites as slum areas, schools and other places. Moreover, people who live and work in close proximity to louse-infested individuals may secondarily acquire lice even if they regularly wash their clothes and have good hygiene.

In conclusion, in spite of the large variety of insects occurring in Egypt at present, only few have been represented and named in ancient Egypt.

NOTES

1. **Heliopolis** ("City of the Sun" or "City of Helios"; 'Ēn Šhams, "Eye of the Sun") was one of the oldest cities of ancient Egypt, the capital of the 13th Lower Egypt. It is now found at the north-east edge of Cairo. Modern Heliopolis (Maṣr el-Gedīdah, "New Egypt"; now a part of and a district of Cairo. The settlement was established in 1905 by Baron Empain. http://en.wikipedia.org/Heliopolis_ancient, [http://en.wikipedia.org/wiki/Heliopolis_\(Cairo_suburb\)](http://en.wikipedia.org/wiki/Heliopolis_(Cairo_suburb))).
2. **Antinoë (Antinopolis, Antinoöpolis, Antinoopolis,)** was a city founded at an older Egyptian village by the Roman emperor *Hadrian* to commemorate his deified young beloved, *Antinous*, on the east bank of the Nile, not far from the site in Upper Egypt where *Antinous* drowned in 130 A.D. Today not much remains of the ancient city of Antinopolis. In its place, El Sheikh Ibada, a small mud village, and many newer structures and still remains of the Roman Circus and ruins of a few temples exist (<http://en.wikipedia.org/wiki/Antinopolis>).
3. **Memphis (Manf)** was the ancient capital of Lower Egypt. Its ruins are located near the town of Mit Rahina, 20 km south of Cairo on the west bank of the Nile. The modern cities and towns of Mit Rahina, Dahshur, Abusir, Abu Gorab, and Zawyet el'Aryan, south of Cairo, all lie within the administrative borders of historical Memphis. The city was also the place that marked the boundary between Upper and Lower Egypt (http://en.wikipedia.org/Memphis_Egypt).
4. The **Book of the Dead** is an ancient Egyptian funerary text, used from the beginning of the New Kingdom (around 1550 B.C.) to around 50 B.C. to describe the loose collection of texts consisting of a number of magic spells intended to assist a dead person's journey through the Duat, or underworld. The Book was placed in the coffin or burial chamber of the deceased, (http://en.wikipedia.org/wiki/Ancient_Egyptian_funerary_texts, http://nefertiti.iwebland.com/religion/body_and_soul.htm#body).
5. **Abydos** is one of the oldest cities of ancient Egypt, located about 11 kilometers west of the Nile, near the modern Egyptian towns of el-Araba el Madfuna and al-Balyana (Sohag Governorate}. The city was called **Abdju** in the ancient Egyptian language meaning "the hill of the symbol or reliquary", a reference to a reliquary in which the sacred head of Osiris was preserved.

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