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ON THE VERTEBRATES FROM THE CRETACEOUS
AND EOCENE OF EGYPT*

BY **F. Priem**¹.

PLATE X

SUMMARY. — I. *Cretaceous*. — Shark teeth. — Dipnoans: *Ceratodus humei* n. sp. — Pycnodont teeth. — Reptile teeth. — Vertebrates from the Cretaceous of Egypt and the Algerian Sahara. — II. *Eocene*. — Various fishes, reptiles and mammals. Ichthyological fauna from the Eocene of Egypt.

Recently Mr. Dr. W. J. Hume, director of the “Geological Survey” of Egypt, agreed to convey to me various remains from the Cretaceous and Eocene of Egypt preserved in the “Geological Museum” of Cairo. Here I study them along with other fossils from the Cretaceous and Eocene of Egypt, which Mr. R. Fourtau and Abbey P. Teilhard de Chardin sent me formerly. Most of the fossils from Mr. R. Fourtau are now found in the Muséum National d’Histoire Naturelle (paleontology collections, 1901-17 and 1902-4).

I. CRETACEOUS.

Scapanorhynchus raphiodon AG. sp. — Some teeth of this shark, so common in the Cretaceous of all regions, were found in the Cretaceous of Egypt. They come from (Museum 1902-4) the Santonian (lower Senonian) of Abou Roach and (1901-17) Berak el Gazal (Abou Roach)² (pl. X, fig. 8-10).

Lamna appendiculata AG. sp. — This species, also very common in the Cretaceous, is represented in the “Geological Museum” of Cairo.

A tooth (no. 14,736) was found in the Campanian (upper Senonian) phosphate bed in the environs of Quft (Upper Egypt). It is a crown fragment that seems to belong to the indicated species (pl. X, fig. 11).

Another (no. 14,738), from the Campanian phosphate bed of Ouadi Oum Hemaïet, Arabian Desert, is well preserved. It is a very slightly oblique tooth, with a tall crown and laterally pointed denticles that are well detached from the crown. I regard it as a lateral inferior tooth (pl. X, fig. 12).

Yet another (no. 3,628) from the Campanian phosphatic bed of Gebel Safarait, Sinai, was found in the matrix. It is seen from its external face. It is a large tooth lacking its extreme point. The crown is large and weakly oblique, with strong, pointed lateral denticles that are well separated from the crown and divergent. It is a lateral superior tooth. I name it *L. aff. appendiculata* (pl. X, fig. 13).

* Original citation: Priem, F. 1914. Sur des Vertébrés du Crétacé et de l’Éocène d’Égypte. *Bulletin de la Société Géologique de France* 14:366-382. Translated by Matthew Carrano, Department of Anatomical Sciences, Stony Brook University, June 2002.

¹ Note presented at the meeting of 4 June 1914.

² With the teeth of *Sc. raphiodon* from Berak el Gazal there is a tooth fragment of *Lamna?* and a very small, flat, biconcave fish vertebra, as well as some indeterminate debris.

Abbey P. Teilhard de Chardin conveyed these teeth, most often incomplete, to me from the Cretaceous "of the environs of Cairo," which seem to me must belong to the same species. With them were found some teeth of *Scapanorhynchus raphiodon* AG. sp. and also *S. subulatus* AG. sp., species equally widespread in the Cretaceous.

Lamna serra A. S. WOODWARD. — I refer to this species from the Cretaceous the highest of the teeth with double lateral denticles (Muséum 1901-17, pl. X, fig. 14-15) coming from the Campanian of Gebel Lift (Dachel Oasis)¹.

Some teeth of this kind were noted in the Farafrah chalk in the Libyan Desert by J. Wanner²; they were named by him (according to Zittel *in man.*) *Otodus serratus* AG. But the teeth from Maestricht thus named by AGASSIZ (Rech. Poiss. foss., vol. III, 1843, p. 272-273, pl. XXXII, fig. 27-28) have lateral denticles that are less elevated and instead form an angular crest that separates the true denticles from one another.

Lamna rapax? QUASS. — Mr. R. Fourtau conveyed to me one tooth (Muséum 1901-17) from the Campanian of Gebel Lift (Dachel Oasis) reduced to the crown; with a small lateral denticle and a fragment of the root (pl. X, fig. 16). The internal face bears strong striations that are not found at the base; the edges are trenchant, except near the base where they are rounded. This tooth seems to well approach those named *Lamna rapax* by Quass³.

Corax pristodontus AG. — This Upper Cretaceous species is represented at the Muséum (1901-17) by a tooth from the Campanian of Gebel Lift (Dachel Oasis) (pl. X, fig. 17).

Mr. R. Fourtau wrote me that numerous teeth of this species from the Upper Cretaceous of Egypt are found at the "Geological Museum" of Cairo.

I refer some small, crenulated teeth from the Upper Cretaceous of the environs of Cairo, previously conveyed by Abbey P. Teilhard de Chardin, to *Corax falcatus* AG.

I refer a small tooth conveyed by Mr. R. Fourtau, which was not deposited with the Muséum, to *Pseudocorax affinis* AG. It is a small, slightly crenulated tooth with a strong posterior notch determining a large denticle, while the base of the crown is prolonged anteriorly without forming a distinct denticle. The provenance of this tooth was not indicated, but it was probably found in the Santonian of Abou Roach.

Ceratodus humei n. sp. — From the Campanian phosphatic bed in the environs of Quft (Upper Egypt) come two teeth of *Ceratodus* preserved in the Geological Museum of Cairo (no. 14,737) (pl. X, fig. 18-19).

1st A left palatine tooth. It is triangular, convex on the internal border, and the external border is cut into five crests that are continued by their sides onto the oral face. The anterior crest forms the anterior edge of the tooth; crests 2 and 3 are broken at their end, like the last, but those that are complete are not crenulated. The oral face of the tooth is vermiculate, and strewn with small rounded alveoli. The dimensions are: length 34 mm, maximum width 20 mm.

¹ This oasis is found in the Libyan Desert of Egypt not far from the frontier.

² See further, *Palaeontographica*, vol. XXX, 2nd part, 1902, p. 148, pl. XIX, fig. 29.

³ See further, *Palaeontographica*, vol. XXX, 2nd part, 1902, p. 313, pl. XXVIII, fig. 21-24.

2nd A right mandibular tooth. It bears four thick crests, not crenulated; the posterior edge is broken. Dimensions: length 36 mm, maximum width 20 mm.

In these teeth, the crests are inclined posteriorly as in *C. africanus* and *C. minutus* HAUG from the Albian beds of Djoua, near Timassânine (Algerian Sahara)¹, but the crests are not crenulated as in the Albian *Ceratodus*. It is known that in Recent *Ceratodus* from Australia (genus *Neoceratodus* F. DE CASTELNAU and P. GERVAIS = *Epiceratodus* TELLER), the crests are directed anteriorly, and there are six crests on each tooth; in *C. africanus* there are also six, and in *C. minutus* there are four. The Triassic and Jurassic *Ceratodus* rarely have more than five crests which are sometimes turned posteriorly. The Campanian *Ceratodus* of Egypt approaches these species above all, and I will name it *Ceratodus humei*.

According to the preceding information, it can be seen that *Ceratodus* is extended in Africa until into the Upper Cretaceous. It was the same in North America. In effect, Cope noted (but did not figure) two species from the Upper Cretaceous of Montana (*C. cruciferus* and *C. hieroglyphus*), of which one had teeth with 6 crests and the other 13¹.

Anomoeodus angustus AG. sp. (pl. X, fig. 1-7) — Under this name I note some isolated pycnodont teeth discovered by Mr. R. Fourteau. In the Turonian of El Gaa (Abou Roach) he found two elongated teeth (principal) and one nearly rhomboidal tooth plate from the lateral rows (Muséum 1901-17). Another elongated tooth (Muséum 1902-04) comes from the Santonian of Abou Roach. Some other elongated teeth come from the Santonian of Berak el Gazal (Abou Roach, 1901-17).

Reptiles. — In the “Geological Museum” of Cairo there are two teeth (no. 14,737) from the Campanian phosphate bed in the environs of Quft (Upper Egypt). They are slender, pointed, conical, curved and strongly grooved, and the lateral faces present a trenchant edge. One of them is massive, the other much more slender. These are reptile teeth, and according to our colleague Mr. A. Thevenin, lecturer at the Sorbonne, they belong to plesiosaurs.

Some other teeth at the “Geological Museum” (no. 14,735, pl. X, fig. 22-25) come from the Campanian phosphate bed of Ouadi Oum Hemaïet (Arabian Desert). There are four thick, smooth teeth with anterior and posterior carinae: 1st a short tooth; 2nd a longer, hooked tooth; 3rd a longer one with a broken point, whose anterior and posterior edges are trenchant; 4th a low, wide, compressed tooth with trenchant edges, whose upper worn part also forms a trenchant crest. At the base of the thick internal face there are several short folds. According to Mr. A. Thevenin, they are probably mosasaur teeth, but the fourth large tooth is remarkable and has no analogue up to now.

Summary.

The vertebrates from the Cretaceous of Egypt mentioned here are as follows:

¹ E. HAUG. Documents scientifiques de la Mission Saharienne (Mission Foureau-Lamy). *Paléontologie*, Paris, 1905, p. 819-821, pl. XVII, fig. 1-6.

¹ E. D. COPE. Description of some vertebrate remains from the Fort-Union beds of Montana. *Proc. Acad. Nat. Sci.*, Philadelphia, 1876, p. 259-260.

TURONIAN. — Pycnodont teeth (*Anomoeodus angustus* AG. sp.).

SANTONIAN (lower Senonian). — *Scapanorhynchus raphiodon* AG. sp.
Pycnodont teeth (*Anomoeodus angustus* AG. sp.).

CAMPANIAN (upper Senonian). —

ELASMOBRANCHS. — *Lamna appendiculata* AG. sp.
— *serra* A. S. WOODWARD.
Corax pristodontus AG.¹

DIPNOANS. — *Ceratodus humei* n. sp.

REPTILES. — Plesiosaur and mosasaur teeth.

One must add to this list some other fossils studied by German geologists², for the most part from the Libyan Desert. Above all these are the materials recovered by K. Zittel during the Gerhard Rohlfs expedition into these regions in 1873-1874 (species left by Zittel in manuscript). They are:

CAMPANIAN (Abou Roach) and UPPER SENONIAN
(Farafrah, Dachel, Chargeh, etc., in Egypt and also west of the Egyptian frontier in the Great Sandy Desert).

ELASMOBRANCHS. — *Scapanorhynchus raphiodon* AG. sp.
Oxyrhina mantelli AG.
Myliobatis sp.
Notidanus microdon AG.
Lamna serra A. S. WOODWARD (non *Otodus serratus* AG.).
Otodus biauriculatus WANNER (ZITTEL man.³).
Oxyrhina mantelli AG.
Corax pristodontus AG.

The Santonian (lower Senonian) of the environs of Gizeh furnished Dr. G. Schweinfurth with some large compressed teeth with a high, thick and folded base. They were attributed by W. Dames (*Sitzungsber. Gesell. naturf. Freunde Berlin*, 1887, p. 67-72, fig. 1-2 and p. 137) to a new teleost genus that he named initially *Titanichthys* and then (this name being preoccupied) *Gigantichthys pharao* n. sp.

¹ Moreover, there are *Scapanorhynchus subulatus* AG. sp., *Corax falcatus* AG. and *Pseudocorax affinis* AG. sp. from an unidentified bed in the Cretaceous of the environs of Cairo. These fossils probably come from the Santonian of Abou Roach.

² JOH. WANNER, ARTHUR QUASS, EDGAR DACQUÉ, Die Faunen der oberen Kreidebildungen in der libyschen Wüste. *Palaeontographica*, vol. XXX, 2nd part, 1902-1903. JOH. WANNER, Die Fauna der obersten weissen Kreide der libyschen Wüste, 1902, p. 147-151, pl. XIX, fig. 28-33. — A. QUASS, Die Fauna der Overwegschichten und der Blätterthone in der libyschen Wüste, 1902, p. 312-321, pl. XXVII, fig. 16-27. — E. DACQUÉ, Mittheilungen über den Kreidecomplex von Abu Roash bei Cairo, 1903, p. 389.

³ Dr. Wanner said, p. 149, that west of Dachel on the edge of the Great Sand Sea, the soil is covered with fish teeth of which the most common are *Otodus biauriculatus* and the large *Lamna megalodon*. This last species is cited without an author name; it is probably *Lamna rapax* QUASS (ZITTEL man.)

It is now known that this genus must be merged with the genus *Onchosaurus* P. GERVAIS (= *Ischirhiza* LEIDY) from the Upper Cretaceous of Europe and North America. It must be regarded as indicating a precursor to the esocids (pikes). Thus, today the teeth in question are called *Onchosaurus (Gigantichthys) pharao* DAMES sp.

BEDS WITH *Exogyra overwegi* developed in the vicinity of the Dachel Oasis and other localities in western Egypt, and also in the Great Sandy Desert west of the Egyptian frontier¹.

ELASMOBRANCHS. — *Strophodus pygmaeus* QUASS. (ZITTEL man.).
Lamna libyca QUASS. (ZITTEL man.).
— *rapax* QUASS. (ZITTEL man.).
— *smilodon* QUASS. (ZITTEL man.).
Otodus biauriculatus WANNER (ZITTEL man.).
Oxyrhina mantelli AG.
Corax pristodontus AG.

TELEOSTS. — Pycnodonts (isolated teeth)².
Ancistrodon libycus DAMES
(Pycnodont incisors?)
Protosphyraena libyca QUASS. (ZITTEL man.).
Plethodids (bones of this group of fish close to osteoglossids and represented also in the Upper Cretaceous of England and the United States.).
Stephanodus splendens ZITTEL³ (sparid teeth).
Problematicum ZITTEL (man.) (tooth with incomplete crown).

REPTILES. — Mosasaur teeth. Turtle plates.

It is seen that the Upper Cretaceous of Egypt has furnished fossil fishes such as elasmobranchs that are very widespread in the Cretaceous of other regions: *Scapanorhynchus raphiodon*, *Oxyrhina mantelli*, *Lamna appendiculata*, *Otodus sulcatus*, *Corax pristodontus*, and some characteristic species. There are also characteristic teleosts such as *Stephanodus splendens*. The genera *Ancistrodon* and *Onchosaurus (Gigantichthys)* are represented in the other regions. A remarkable fact is the presence of the genus *Ceratodus* whose descendants are found today only in Australia, but whose last representatives are perpetuated until near the end of the Cretaceous in Africa and North America. This genus becomes extinct in Europe during the Jurassic¹.

The reptiles include turtles, plesiosaurs and mosasaurs.

¹ These beds, often considered Danian, would represent the upper part of the Maastrichtian (uppermost Senonian). See E. HAUG, *Traité de Géologie*, vol. II, 1908-1911, no. 2, p. 1336.

² Teeth from the Cretaceous of Gassr Dachel communicated by Zittel to W. DAMES (*Zeitsch. der deutsch. geol. Ges.*, 1883, p. 663, pl. XIX, p. 6-8).

³ K. A. ZITTEL, *Handbuch der Paläontologie*, vol. III, 1888, p. 298 to 310.

¹ *Ceratodus phillipsi* AG., Bathonian of England.

If the Cretaceous of Egypt is compared to that of the Algerian Sahara (Djoua beds near Timassânine), there are some points of resemblance, although the Djoua beds are probably Albian². Indeed, the following vertebrate fossils are found there:

- ELASMOBRANCHS.* — *Otodus* vertebra.
Platyspondylus foureaui HAUG. (vertebrae resembling those of *Pristis*).
- DIPNOANS.* — *Ceratodus africanus* HAUG.
— *minutus* HAUG.
- TELEOSTS.* — ?*Saurocephalus* sp. teeth.
Onchosaurus (Gigantichthys) numidus
HAUG. sp.
Vertebrae.
- REPTILES.* — Fragments of turtles. Fragments of dinosaurs.

The genera *Ceratodus* and *Onchosaurus*³ are found there, as in Egypt.

II. EOCENE.

I have already had the opportunity on several occasions to occupy myself with the Eocene vertebrates of Egypt⁴. I only have to describe here several fossils that are mostly from fishes.

Myliobatids. — My colleague Mr. D. E. Pachundaki conveyed to me in 1912 some fish fossils from the Eocene north of Birket el Qarun (Fayoum) recovered by Mr. Markgraf. There are more or less complete lower and upper dentitions of *Myliobatis* sp. and small lower dentitions of *Myliobatis latidens* A. S. WOODWARD.

Rajids. — Our colleague Mr. Abbey Pierre Teilhard de Chardin formerly sent me¹ a great amount of debris of fish fossils which I have studied. I must mention notably some poorly preserved teeth from the upper beds of Mokattam which seem to belong to rajids.

² E. HAUG, *loc. cit.*, p. 814-923, pl. XVI-XVII.

³ I have had the occasion to see at the Muséum various fragments reported from the same region of Timassânine by Mr. du Passage, attached to the Foureau mission (Catalog, Paleontology, 1907-10). There I recognized the bases of *Gigantichthys* teeth, some shark vertebrae with well-shown concentric circles resembling the vertebrae of *Pristis* (probably from the genus *Platyspondylus*), and debris from the claw of a theropod dinosaur. Moreover there is debris of more recent age, perhaps Recent; granulated cranial plates and spines from a silurid and tooth fragments from a ruminant.

⁴ F. PRIEM, Sur les poissons de l'Eocène du mont Mokattam (Egypte) et note sur *Propristis* DAMES du Tertiaire inférieur d'Egypte. *B. S. G. F.*, (3), XXV, 1897, p. 212-232, 3 text-fig. and pl. VII. — Sur des Poissons fossiles éocènes d'Egypte et de Roumanie, *Id.*, (3), XXVII, 1899, p. 241-253, pl. II. — Sur des Poissons de l'Eocène moyen d'Egypte, *Id.*, (4), V, 1905, p. 633-641, 14 text-fig. — Sur des Vertébrés de l'Eocène d'Egypte et de Tunisie, *Id.*, (4), VII, 1907, p. 412-419, 2 text-fig. and pl. XV-XVI.

¹ This is my colleague who, in my 1907 publication, is designated under the name Mr. P. Teilhard, professor at the college of Sainte-Famille in Cairo.

Pristids. — Mr. Pachundaki sent me some rostral pristid teeth belonging to diverse species from the middle Eocene north of Birket el Qarun (Fayoum), recovered by Mr. Markgraf. Certain among them, of large size, should be attributed to *Pristis ingens* STROMER; others to *P. fajumensis* STROMER², *Pristis* sp. and *Amblypristis cheops* DAMES.

Abbey Teilhard de Chardin sent me a rostral tooth of *Pristis* sp. from the upper Mokattam.

Scylliids. — I have designated and figured under the name *Ginglymostoma fourtaui* some rousette teeth found in the Eocene of Egypt.

Here I figure a tooth from this species (fig. 1) presenting ten denticles on each side of the median point. It was conveyed to me by Abbey Teilhard de Chardin, and came from an undefined bed in the Eocene of Mokattam.

Lamnids. — Among Mr. Pachundaki's fossils whose provenance is indicated above, there are fairly numerous lamnid teeth belonging to the following species:

Oxyrhina desori AG., *Oxyrhina* sp., *Lamna vincenti* WINKLER sp., *Lamna* aff. *aschersoni* STROMER sp. (ZITTEL man.)¹.

From the Eocene of Fayoum, the Abbey Teilhard de Chardin conveyed to me a very worn tooth that could belong to *Carcharodon auriculatus* BLAINVILLE sp., and Mr. Pachundaki sent me a tooth with denticles less separated from the main point than in *C. auriculatus*; I name it *Carcharodon* aff. *turgidus* AG.; another slender and straight tooth of the same provenance recalls *C. angustidens*; I name it *C.* aff. *angustidens*.

Carchariids. — Among those conveyed by Mr. Pachundaki are found several inferior and superior teeth of *Carcharias* aff. (*Aprionodon*) *frequens* DAMES sp. and also some teeth of *Galeocerdo contortus* GIBBES sp.

From the upper beds of Mokattam comes a tooth of *Hemipristis curvatus* DAMES (Abbey Teilhard de Chardin).

² I have figured, *loc. cit.*, 1905, p. 636-637, fig. 6, a rostral tooth under the name *P. schweinfurthi* DAMES sp. It is very probably from *P. fajumensis* STROMER. I have described, *loc. cit.*, 1877, p. 228 and following, fig. 1-3, a rostrum that I identified with *Propristis schweinfurthi* DAMES sp., by referring it to the genus *Pristis*. According to Dr. E. Stromer, this rostrum does not belong to Dames's species but to another that he named *P. fajumensis*.

E. STROMER, Die Fischreste des mittleren und oberen Eocäns von Ägypten, I Teil: Die Selachier, A. Myliobaten und Pristiden, *Beitr. Pal. geol. Osterr-Ung. und des Orients*, vol. XVIII, 1905, p. 49-50. According to the author (p. 55), *Propristis schweinfurthi* is the rostrum of the pristid whose rostral teeth are called *Amblypristis cheops*.

¹ This manuscript species of Zittel (*Otodus aschersoni*) is from the lower Mokattam. Stromer figured under the name *Otodus* cf. *aschersoni* a tooth from the beds of Birket el Qarun (*loc. cit.*, I Teil: Selachii, B. Squaloidei and II Teil: Teleostomi, A. Ganoidei. *Beitr. Pal. geol. Osterr-Ung. und des Orients*, LXVIII, 1905, p. 171, pl. XV, fig. 13-14). Debris from the lower Mokattam (P. Teilhard de Chardin) seems to be a large, flat denticle from *L. aschersoni*.

I have figured (*loc. cit.*, 1877, p. 213-214, pl. VII, fig. 4, a tooth from Mokattam under the name *Lamna verticalis* AG. According to Mr. Leriche (Poissons éocènes de Belgique, *Mém. Mus. roy. H. N. Belgique*, vol. III, 1905, p. 125), it was a lateral tooth from the lower jaw, probably of *Odontaspis ?crassidens* AG., sp. I noted, *loc. cit.*, 1905, p. 633-634, some poorly preserved teeth from Gebel Kibli el Ahram and Kasr el Saga under the name *Od. verticalis*; there could be *Od. crassidens* instead of *L. verticalis*, at least in Kibli el Ahram, and a mixture of the two species in Kasr el Saga.

Pycnodonts. — They are represented by some isolated teeth of *Pycnodus* sp., and in particular I refer to this genus some fairly tall, blunt teeth that could be from the prehensile incisors. One of these teeth is represented here (fig. 2). The pycnodont teeth come from Mokattam (Abbey Teilhard de Chardin), above all the upper beds. That which is represented is from an unidentified level.

Ancistrodon. — Some teeth of *Ancistrodon* similar to those that I have studied come from the upper Mokattam (brought by the same colleague): *A. armatus* P. GERVAIS sp. *A. armatus* (var. *fourtaui* PRIEM and var. *teilhardi* PRIEM). I attribute an incomplete tooth (lacking the root) found at the “Geological Museum” of Cairo to *A. armatus* P. GERVAIS sp. (pl. X, fig. 26). It comes from the Middle Eocene, Lutetian, of Mokattam, in the Qayt-bay quarries (no. 14,740).

Sparids (brought by Abbey Teilhard de Chardin). — Some conical (anterior), rounded and flat (molar) teeth of sparids, perhaps the genus *Chrysophrys* are from the lower Mokattam; there is also a tooth of *Trigonodon laevis* PRIEM¹ from Mokattam (upper beds and an unidentified bed).

Scombrids. — Scombrids are represented in the Eocene of Egypt by some isolated teeth. I have already noted, in 1899, some rootless teeth from the Kafr el Ahram locality that are slightly convex on both faces and have weakly convex trenchant edges. I called them *Saurocephalus fajumensis* DAMES. They probably should be attributed to a scombrid of the genus *Cybiium* under the name *Cybiium* sp².

It is doubtless the same for a conical tooth plate, striated at the base on both faces; the internal face is slightly convex and recurved toward the inside (“Geological Museum” of Cairo, no. 14,740). Lutetian of Mokattam, Qayt-bay quarries (pl. X, fig. 27).

Trichurids. — Fishes close to scombrids and remarkable for their compressed teeth, bearing a small half-iron lance barb, genera *Lepidopus*, *Trichurus*, etc., are designated under the name trichurids and lepidopids. There are some analogous teeth in fishes of the Cretaceous genus *Cimolichthys*, and I have designed some teeth from the Middle Eocene of Gebel Kibli el Ahram under the name *Cimolichthys?* sp¹. They should probably be attributed to a trichurid.

It is the same for some teeth from an unidentified Mokattam bed (Abbey Teilhard de Chardin), of which one is figured here (fig. 3).

Gymnodonts. — Mr. Pachundaki showed me several *Diodon* dentitions from the Middle Eocene north of Birket el Qarun (Fayoum). The Abbey Teilhard de Chardin conveyed to me some plate fragments and also an entire masticatory plate with both

¹ In connection with the genus *Trigonodon*, replace the note (2) in my publication of 1897, p. 211 by this one: figure 7 of plate 67 represents a tooth of *Trogonodon serratus* P. GERVAIS, sp.

² F. PRIEM, *loc. cit.*, 1899, p. 245, pl. II, fig. 18-19. — A. S. WOODWARD, *Catalogue of the Fossil Fishes in the British Museum*, part IV, 1901, p. 115.

¹ F. PRIEM, *loc. cit.*, 1905, p. 637-638, fig. 9.

principle tooth rows and the marginal teeth (pl. X, fig. 28) from an unidentified Mokattam bed. I refer all these remains to *Diodon hilgendorfi* DAMES sp.

Silurids. — The “Geological Survey” of Cairo has conveyed to me (no. 5,792) a fossil that appears to be a spine from a large silurid. It comes from the Auversian or lower Bartonian escarpment north of Birket el Qarun (“Geological Museum” of Cairo, no. 5,792). It is a wide, robust fragment with rugose lateral faces. The posterior face is wider than the anterior face. There is a fissure separating the spine into two symmetrical parts. The point and base are lacking. It does not appear to have a posterior groove there, because one is not seen toward the top where the posterior edge is preserved. It is probably a spine from a large silurid² (pl. X, fig. 29).

Reptiles. — The Abbey Teilhard de Chardin conveyed to me a crocodile vertebra and tooth debris from the middle Mokattam. Two crocodile teeth had already been conveyed to me previously from the upper Mokattam, and a piece of turtle carapace from the lower Mokattam³.

*Mammals*¹. — A tooth is found in the “Geological Museum” of Cairo (no. 5,807) that was conveyed to me (pl. X, fig. 30). It comes from the Auversian or lower Bartonian escarpment north of Birket el Qarun. This tooth is slender, pointed and rootless, with a nearly circular cross-section. It is curved and strongly grooved, with the grooves not going up to the top, which bears a wear facet: there is a slight carina in front. This is probably an anterior tooth from an ungulate.

Fishes from the Eocene of Egypt.

Here I give the list of fishes from the Eocene of Egypt. They mostly come from the beds of Mokattam, Kafr el Ahram, and those of Birket el Qarun and Kasr el Saga in the Fayoum, and as a result come from the Lutetian and Auversian (lower Bartonian)².

² See for the silurids found in the Kasr el Saga beds, E. STROMER, Nematognathi aus dem Fajum und dem Natronthale in Aegypten. *Neues Jahrb. f. Min. Geol. Pal.*, 1904, Bd. I, p. 3-7, pl. I. — See also L. NEUMAYER, Zur vergleichenden Anatomie des Schädels eocäner und rezenten Siluriden.

Palaeontographica, vol. LIX, 1912, p. 250-288, 5 text-fig. and pl. XXVI-XXIX.

³ F. PRIEM, *loc. cit.*, p. 417, pl. XV, fig. 27. See for the reptiles and mammals of the lower Tertiary of Egypt, C. W. ANDREWS, *A Descriptive Catalogue of the Tertiary Vertebrata of the Fayum, Egypt*. British Museum, London: 4th ed., 1906, 324 p., 98 text-fig., frontispiece and 26 pl. — The reptiles include crocodylians, chelonians and snakes. — See also for the turtles, E. DACQUÉ, Fossil Schildkröten Aegyptens. *Geol. und Pal. Abhandl.*, N. F., Bd. X, Heft 4, 1912, p. 275-337, 19 text-fig., 4 maps, pl. XXXVI-XXXVII.

¹ I have described, *loc. cit.*, 1907, p. 417-418, pl. XVI, fig. 1-3, a sirenian mandible from the upper Mokattam, *Protosiren fraasi* ABEL. — See equally for the sirenian fossils of Egypt, O. ABEL, Die eocänen Sirenen der Mittelmeerregion, Erster Theil: Der Schädel von *Eotherium aegyptiacum*. *Palaeontographica*, vol. LIX, 1913, p. 289-360, 5 text-fig. and pl. XXX-XXXIV.

² The lower part of the Mokattam is Lutetian; the upper beds of the Mokattam are often considered upper Lutetian, but they seem to represent Auversian (lower Bartonian). The beds of Birket el Qarun are the same age as the upper Mokattam. The beds of Kasr el Saga (or Qasr el Sagha) come from above and are themselves surmounted by Oligocene (Tougrian) fluvio-marine beds. See E. HAUG, *Traité de Géologie*, vol. II, fasc. 3, 1914, p. 1503 and 1556.

LUTETIAN (lower Mokattam).

ELASMOBRANCHS.

- MYLIOBATIDS. — *Myliobatis toliapicus* AG.
— *striatus?* BUCK. (= *M. edwardsi* DIXON).
— *latidens* A. S. WOODWARD.
— *pentoni* A. S. WOODWARD.
— *elatus* STROMER.
— *mokattamensis* STROMER.
— sp. (spines)
Aëlobatis sp. (chevrons).
- PRISTIDS. — *Pristis* aff. *ingens* STROMER (var. *prosulcata*).
— aff. *lathamii* GALEOTTI.
- SCYLLIIDS. — *Scyllium?* sp.¹
— g. et sp. indet. (STROMER)
- LAMNIDS. — *Oxyrhina desori* AG.
— aff. *sillimani* GIBB (= *O. aegyptiaca* JAEKEL
ms.)
Alopecia? sp.
Lamna verticalis AG.
— aff. *aschersoni* ZITTEL ms. STROMER sp.
(= *L. macrola* STROMER non AG.²).
— *vincenti* WINKLER sp.
— (*Odontaspis?*) *crassidens* AG.
Odontaspis elegans AG. sp.
— *cuspidata* (var. *hopei*) AG. sp.
Carcharodon auriculatus BLAINV. sp.
— aff. *turgidus* AG. (= *C. aegyptiacus* JAEKEL,
ms.).
— aff. *angustidens* AG.
- CARCHARIIDS. — *Carcharias (Aprionodon) frequens* DAMES.
— (*Prionodon*) n. sp. STROMER.
Galeocerdo latidens AG.

It is the Birket el Qarun beds that furnished diverse fish remains to W. DAMES (Ueber eine tertiäre Wirbelthierfauna von der westlichen Insel des Birket-el-Qurûn in Fajum (Aegypten). *Sitzungsb. d. K. preuss. Akad. d. Wiss. zu Berlin*; phys. math Cl., vol. VI, 1883, p. 129-152, pl. III). Correct the volume number to read VI instead of IV in my publications of 1899, p. 243 (at the bottom of the page) and 1905, p. 634, note 2.

¹ It is a small tooth of *Scyllium?* that was conveyed to me by Mr. Fourteau. It comes from the lower Eocene of the Arabian chain, near Sohag.

² See (in addition to the cited publications of E. STROMER) E. STROMER, Haifischzähne aus dem unteren Mokattam bei Wasta in Egypten. *Neues Jahrb. für Min. geol. Pal.*, 1903, Bd. L, pl. 41, pl. I.

—*aegyptiacus* (JAEKEL ms.) STROMER.
Alopiopsis? aff. *contortus* GIBBES sp.
Hemipristus curvatus DAMES.
Vertebrae of indeterminable sharks (Thebes,
lower Eocene?).

TELEOSTS.

PYCNODONTS. — *Pycnodus mokattamensis* PRIEM.
— *variabilis* STROMER.
— sp.
— sp. (cutting teeth).
Ancistrodon armatus P. GERVAIS sp.³

APODS. — *Mylomyrus frangens* A. S. WOODWARD.

PLEURONECTIDS. — *Solea eocenica* A. S. WOODWARD.¹

XIPHIIDS (rostra). — *Glyptorhynchus (Caelothynchus) gigas*
A. S. WOODWARD².

PERCIDS. — *Perca (Smerdis?) lorenti* H. VON MEYER³.

UPPER LUTETIAN OR AUVERSIAN.

(upper Mokattam, Kafr et Ahram, Gebel Ghiouchy, Birket el Qarun, etc.)

ELASMOBRANCHS.

MYLIOBATIDS. — *Myliobatis dixonii* AG.
— *latidens* A. S. WOODWARD.
— *fraasi* STROMER.
— sp. (chevrons).
— sp. (spines).
— aff. *lateralis* AG. (spine).
Aetobatis aff. *irregularis* AG.

³ In my publication, *loc. cit.*, 1907, p. 415, line 27, instead of *Ancistrodus*, read *Ancistrodon*.

¹ These two species of sole and eel come from the Eocene limestone of Tura between Heluan and Cairo. A. S. WOODWARD, On a fossil sole and a fossil eel from the Eocene of Egypt. *Geol. Mag.*, Dec. 5, vol. 7, 1910, p. 402-405, pl. XXXII.

² This species was found in the rock of the great Sphinx (A. S. WOODWARD, *Catalogue of the Fossil Fishes in the British Museum*, part II, 1891, p. 122).

³ This fish from Mokattam (freshwater marl) was described by H. V. MEYER, *Palaeontographica*, vol. I, 1851, p. 105-106, pl. XII, fig. 3. This is probably the same species that P. EGERTON noted. *Quart. Journ. Geol. Soc. London*, vol. X, 1854, p. 374-378, pl. XIII. Add this species to my list (*loc. cit.*, 1905, p. 641, line 2). — In my publication of 1899, p. 247 (at the bottom of the page) add a point of doubt after *Smerdis*.

— sp. chevrons.

RAJIDS. — Teeth.⁴

PRISTIDS. — *Pristis* aff. *ingens* STROMER.
Amblypristis cheops DAMES.⁵

NOTIDANIDS. — *Notidanus serratissimus* AG.⁶

SCYLLIIDS. — *Scyllium minutissimum* WINKLER, sp.⁷
Scyllium g. et sp. indet. STROMER.
Ginglymostoma fourtaui PRIEM.
— *blanckenhorni*? STROMER.

LAMNIDS. — *Oxyrhina desori* AG.
— sp.
Alopecias? sp.
Lamna verticalis AG.
— *vincenti* WINKLER, sp.
— *aschersoni* (ZITTEL ms.) STROMER sp.
(= *Otodus obliquus* DAMES non AG.).
— (*Odontaspis*?) *crassidens* AG.
Odontaspis cuspidata (var. *hopei*) AG. sp.
— *abbatei* PRIEM.¹
Carcharodon auriculatus BLAINV. sp.
— aff. *turgidus* AG.
— aff. *angustidens* AG.

⁴ The indeterminate percoid tooth that I described, *loc. cit.*, 1905, p. 638, fig. 10-11, is perhaps an anterior tooth from a rajid or scylliid.

⁵ One sees that according to Stromer, *Propristis schweinfurthi* is only another pristid rostrum whose rostral teeth are *Amblypristis cheops* DAMES. Following E. FRAAS, *Propristis schweinfurthi* is the anterior part of this rostrum and *Eopristis reinachi* STROMER from the Birket el Qarum beds is the posterior part (Säge von *Propristis schweinfurthi* Dames aus dem oberen Eocän von Ägypten. *Mitth. aus dem Kgl. Naturalien Kabinett zu Stuttgart*, no. 39, Sep. Abd. *Neues Jahrb. für Min. geol. Pal.*, 1907, Bd. I, p. 1-6, pl. I).

⁶ It is a piece of tooth coming from Darb el Fayoum (F. PRIEM, *loc. cit.*, 1905, p. 634).

⁷ According to M. LERICHE (*Mém. Mus. roy. Hist. nat. Belgique*, vol. III, 1905, p. 113 and p. 123), one of the teeth studied by Stromer is probably a carchariid tooth from the genus *Triacis*, and the other a tooth of *Scyllium minutissimum* WINKLER sp. A tooth initially attributed by Stromer to *Carcharias (Aprionodon) frequens* is a tooth of *Alopecias* sp. (M. LERICHE, Contribution à l'étude des Poissons fossiles du Nord de la France et des régions voisines, 1906, p. 220).

¹ There are some doubts for this species which I described, *loc. cit.*, 1899, p. 246-247, pl. II, fig. 26. According to E. Stromer, *loc. cit.*, I Teil, p. 171-172, this is a small defective tooth of *Odontaspis* or *Lamna*.

In the paleontology collections of the museum there are some fossils given by Delanoue (1867-12), including incomplete, smooth teeth of *Odontaspis (O. cuspidata?)* and shark vertebra coming from Thebes, left bank (lower Eocene?) among others. See J. DELANOUE, Note sur la constitution géologique des environs de Thèbes (*C.R. Ac. Sc.*, vol. LVIII, 1868, p. 701-707) followed by A. D'ARCHIAC, Remarques à propos de la communication de M. Delanoue sur les fossiles des environs de Thèbes, classification des couches qui les renferment, p. 707-713.

CARCHARIIDS. — *Carcharias (Aprionodon) frequens* DAMES.
— aff. *frequens* DAMES.
— (*Aprionodon*?) form 1. STROMER.
— — form 2. STROMER.
— — form 3. STROMER.
— (*Prionodon*) aff. *egertoni* AG. sp.
— — sp.
Triacis sp.
Galeocерdo aegyptiacus (JAEKEL ms.)
STROMER.
Alopiopsis? aff. *contortus* GIBBES, sp.
Hemipristis curvatus DAMES.
Vertebrae of indeterminate sharks.
Carchariid vertebra².
Ichthyodorulith.

CROSSOPTERYGIAN TELEOSTS.

Scales aff. *Polypterus* STROMER.

ACTINOPTERYGIAN TELEOSTS.

PYCNODONTS. — *Pycnodus* sp.
Ancistrodon armatus P. GERVAIS, sp.
— var. *teihardi* PRIEM.
— var. *fourtaui* PRIEM.

SCOMBRIDS. — *Cybiium* sp.

TRICHURIDS. — Teeth.¹

XIPHIIDS. — *Glyptorhynchus (Coelorhynchus)* sp.²

SPARIDS. — Indeterminate teeth (*Chrysophrys*? sp.).
Trigonodon serratus P. GERV. sp. (var.
aegyptiaca PRIEM.).

² This vertebra and the following ichthyorolith come from Kafr el Ahram (F. PRIEM, *loc. cit.*, 1899, p. 243).

¹ They are the teeth in question above and that were initially allotted with doubt to the Cretaceous genus *Cimolichthys*. W. DAMES also attributed with doubt (*loc. cit.*, 1883, p. 147, pl. III, fig. 11) some teeth from Birket el Qarun to the Cretaceous genus *Enchodus*. In my publication, *loc. cit.*, 1905, add *Enchodus* sp. after *Cimolichthys*? sp., p. 640 (penultimate line) and in note 2 on p. 638 (in connection with *Enchodus*) instead of: p. 12, read: p. 147.

² In my publication of 1899, p. 245, lines 20 and 25 instead of: *Coelorynchus*, read: *Coelorhynchus*.

— *laevis* PRIEM.

GYMNODONTIDS. — *Diodon hilgendorfi* DAMES sp.
— sp.

BARTONIAN? (Kasr el Saga).

ELASMOBRANCHS.

MYLIOBATIDS. — *Myliobatis* sp. chevrons.
— sp. spines.
Aetobatis n. sp. indet. (STROMER).
Fluvio-marine beds.

PRISTIDS. — *Pristis ingens* STROMER.
— *fajumensis* STROMER.
— aff. *fajumensis* STROMER.
Amblypristis cheops DAMES.

LAMNIDS. — *Oxyrhina desori* AG.
— sp.
Oxyrhina sp.? (aff. *O. nova*¹ WINKLER sp.).
Lamna verticalis AG.
— (*Odontaspis*?) *crassidens* AG.
Carcharodon aff. *turgidus* AG.
— sp. (cited by Andrews, fluvio-marine beds?).

CARCHARIIDS. — *Carcharias (Aprionodon) frequens* DAMES.
— (*Aprionodon*?) form 1. STROMER.
— — form 3. STROMER.
— (*Prionodon*) aff. *egertoni* AG. sp.
Hemipristis curvatus DAMES.

TELEOSTS.

SILURIDS. — *Fajumia schweinfurthi* STROMER.
Socnopaea grandis STROMER.

GYMNODONTS. — *Diodon hilgendorfi* DAMES sp.

It can be noted that the Lutetian proper and the upper beds of the Mokattam include numerous myliobatids and also some pristids. They contain lamnids including several species that are found at the corresponding level in Europe. The myliobatid

¹ They are small teeth from Kasr el Saga that I had the occasion to see (*loc.cit.*, 1905, p. 634).

species are more characteristic. There are also characteristic species of pycnodontids. Carchariids are abundant.

The two levels have many common characters from the point of view of the ichthyological fauna. On the other hand, the Kasr el Saga beds, less rich in fish remains, have several species of lamnids and carchariids in common with the preceding beds. They resemble the upper beds of the Mokattam and those of Birket el Qarun in the common species of pristids and gymnodonts. They are characterized by the presence of large silurids.

EXPLANATION OF PLATE X

- FIG. 1-2. — *Anomoeodus angustus* AG. sp. — Isolated principal teeth. Turonian. El Gaa (Abou Roach), Muséum, paleontology collection.
3. — *Id.* — Isolated principal tooth. Santonian. Abou Roach, same collection.
- 4-6. — *Id.* — Isolated principal teeth. Santonian. Abou Roach, same collection.
7. — *Id.* — Lateral row tooth. Turonian. El Gaa (Abou Roach), same collection.
8. — *Scapanorhynchus rhapsiodon* AG. sp. — Tooth viewed from the internal face. Santonian. Abou Roach, same collection.
- 9-10. — *Id.* — Teeth viewed from the internal face. Santonian. Berak el Gazal (Abou Roach), same collection.
11. — *Lamna appendiculata* AG. sp. — Fragment of tooth viewed from the internal face. Campanian. Phosphate bed in the environs of Quft (Upper Egypt). “Geological Museum” of Cairo.
12. — *Id.* — Lateral inferior tooth viewed from the internal face. Campanian phosphate bed of Ouadi Oum Hemaïet, Arabian Desert, same collection.
13. — *Lamna* aff. *appendiculata* AG. sp. — Lateral superior tooth viewed from the external face. Campanian, phosphate bed of Gebel Safariat, Sinai, same collection.
- 14-15. — *Lamna serra* A. S. WOODWARD — Teeth viewed from the internal face. Campanian of Gebel Lift (Dachel Oasis). Muséum, paleontology collection.
16. — *Lamna rapax?* QUASS. — Anterior tooth viewed from the internal face. Same provenance, same collection.
17. — *Corax pristodontus* AG. — Tooth viewed from the internal face. Same provenance, same collection.
- 18-19. — *Ceratodus humei* n. sp. — Campanian, phosphate bed in the environs of Quft (Upper Egypt). “Geological Museum” of Cairo. Teeth viewed from the oral face (fig. 18, left palatine tooth; fig. 19, right mandibular tooth), same collection.
- 20-21. — *Plesiosaur teeth*. Campanian, phosphate bed in the environs of Quft (Upper Egypt), same collection.
- 22-25. — *Mosasaur teeth?* Campanian, phosphate bed of Ouadi Oum Hemaïet, Arabian Desert, same collection.
26. — *Ancistrodon armatus* P. GERVAIS sp. — Incomplete tooth, lateral view. Middle Eocene, Lutetian of Mokattam, Qayt-bay quarries, same collection.
27. — *Cybiium?* sp. — Tooth viewed from the internal face, same provenance, same collection.
28. — *Diodon hilgendorfi* DAMES, sp. — Masticatory plate with marginal teeth. Middle Eocene, north of Birket el Qarun (Fayoum), Abbey P. Teilhard de Chardin.
29. — *Silurid spine* viewed laterally. Auversian or lower Bartonian, escarpment north of Birket el Qarun (Fayoum), “Geological Museum” of Cairo.
30. — *Anterior tooth of an ungulate mammal*. Same provenance, same collection.

All the elements are figured at natural size. The types of the plate and text figures were executed by Mr. J. Papoint, preparator at the Muséum.

FIGURE CAPTIONS

FIG. 1.— *Ginglymostoma fourtaui* PRIEM. — Tooth viewed from the external face at four times natural size. Eocene of Mokattam.

FIG. 2. — *Pycnodus?* sp. — Prehensile tooth, viewed in profile, natural size. Eocene of Mokattam.

FIG. 3. — Trichurid tooth viewed in profile at four times natural size. Eocene of Mokattam.