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ANIMAL AND MAN IN BIBLE LANDS

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period the Wadi Natrun formed part of the delta of the Nile. In the gallery forests of the river there lived many kinds of monkeys (*Libypithecus, Semnopithecus, Aulaxinuus*) and three species of otters (*Lutra*). A baboon (*Papio*) and probably also some coneys inhabited the rocks, whilst in the steppes we find: many ungulates (*Hipparion, Sus, Hippopotamus, Camelid, ?Libytherium, ?Hippotragus, Tragelaphinae, Mastodon*), carnivores (*Hyaenid, Machaerodus*), a hare and the ostrich. Some of the steppe forms even seem to be specifically identical with Pikermi forms, such as *Hipparion gracile*.

The Quaternary shows, of course, a typical Ethiopic fauna (*Hippopotamus, Giraffa, Bubalus, Elephas*). This important independent evidence of the Egyptian fossil beds confirms the autochthonous development of some groups in Africa, such as coneys and some monkeys, dugongs, *Amblypoda* and *Artiodactyla Bunosenelenodontia*, crocodiles (*Tomistoma*), and perhaps even the mastodonts, together with many primitive forms of rodents, carnivores, bats and insectivores. Two possibly northern forms appear in the L. Miocene (*Trionyx, Atelodus*). The bulk of the ungulates and carnivores, etc. of the Pliocene fauna was, however, formed by the Pikermi fauna shifting southwards. The fluviatile fauna of the Nile, such as represented for instance by fish or molluscs, was African in character since Cretaceous times and did not change its Ethiopian character since.

1. 23. THE FAUNAL HISTORY OF PALESTINE IN THE PLEISTOCENE

We must ask the general reader to have some patience for a few more pages, to follow into some technical details of the splendid recent researches of the late Miss D. A. BATE, which permit us to draw a picture of the Pleistocenic faunal changes of this country. Her rare achievements are due to much patience and persistence as well as to the careful excavations of Miss GARROD, R. NEUVILLE, a.o. We have to trace the facts in their historical sequence in order to come to the proper understanding of these faunal changes.

In most of the older descriptions of the prehistoric faunal developments of Palestine the presence of a real cold-period is assumed for Palestine, which was based on certain botanical and zoological fossils from the Lebanon and from Palestine. Signs of large glacier-morains in the Lebanon and the existence of a fossil flora of beech, hazel, elm and large-leaved oak were explained by FRAAS (1878) and ZUMOFFEN (1926) as indicators of a northern, boreal invasion during the glacial age. Yet all these plants are still thriving today in N. Syria and S. Anatolia. A similar interpretation was given to the Mousterian station of Adlun near Beirut, where bones of *Rhinoceros tichorhinus, Bison priscus, Dama mesopotamica, Equus caballus, Sus scrofa*, and *Capra primigenia* abounded. DAWKINS (Tristram 1884) assigned some bones of the Lebanon as "probably" belonging to reindeer and elk. These are now recognised as certainly belonging to the fallow deer or to one of the two other deer which certainly lived in Palestine. None of the later, much more extensive discoveries and excavations revealed any indication of the presence of those northern animals here. Accordingly the supposed longhaired Siberian rhino (*Rhinoceros tichorhinus*) is certainly a wrong identification of the heat-loving *Rh. hemitoechus*. In view of our much extended knowledge of prehistoric animal remains from Palestine, Transjordan and the Lebanon, we find no justification for the assumption of a general period of cold with massif intrusion of boreal plants and animals. The extreme scarcity of truly boreal elements (Angara-component) among recent plants and animals of this region decidedly supports this negative palaeontological evidence.

More serious is the claim of BATE (1937) of the occurrence of a typically humid tropical fauna during an adequate clima-period in the middle of the Pleistocene. This opinion is supported by the discovery of bones of the following mammals: *Megaderma watwat*, a now

purely palaeotropical genus of bat; *Hyaena crocuta*, the spotted hyena, now inhabiting Africa south of the Sahara, and which spread on the Pleistocene from W. Europe to China; *Phacochoerus garrodae*, a wart hog. This genus has the same recent and Pleistocene distribution as the spotted hyena. And the hippo, *Hippopotamus amphibius*, which retained a distribution north of the Sahara along the Nile and in Little Africa until historical times. This problem will be discussed later. The oldest animal relics are the bone-bearing beds of Bethlehem, which have not yet been worked out properly (Bate 1941). The bones show relationship with the Pliocene and comprise a *Hipparion* (or *Equus*), a *Stegedon* (or *Elephas*), *Rhinoceros cf. etruscus, Bos sp.* and an antelope. Together with these bones, some of which are suspected of having been split (STEKELIS), a number of flints was discovered, which were supposed to represent very archaic human artifacts of the Lower Palaeolithicum. By most authorities they are regarded, however until further material is available as natural products without human interference (PETTON-THOMPSON).

The dating of *Hemibos palaestinus*, which was discovered by Dr. N. SHALEM 31 m deep in the soil, when a well was bored near Gedera is not yet settled. Only three more species of *Hemibos* are known, all from the Upper Siwalik strata of N.W. India, which may belong either to the late Pliocene or to the early Pleistocene. The Palestine species shows more marks of progression than any of the Indians forms (great breadth of the frontals; well spaced and widely divergent horns), and so it must have belonged to a Pleistocene wave of eastern immigrants, perhaps the same wave which brought the arni-buffalo, the gaur and the wisent to ancient Mesopotamia.

The oldest strata of the Mt. Carmel caves (BATE 1937) which contain bones are associated with an Upper Acheulean industry. To Miss BATE their fauna suggests a hot and damp, even a tropical climate. This stratum (Tabun F) almost exclusively contains extinct, mainly small mammals (Bate 1943 p. 816):

Megaderma watwat (11 individuals)	*Apodemus caesarianus* (16)
Crocidura samaritana (50)	*Apodemus sp.* (large; 2)
Talpa chthonia (7)	*Mesocricetus aramaeus* (67)
Spalax sp. (6)	*Allocricetus jezreelicus* (56)
Philistomys roachi (3)	*Cricetulus sp.* (5)
Microtus sp. (1)	*Gerbillinae* (4)
Arvicanthis ectos (24)	*Dama mesopotamica* (1)
Leggada sp. (3)	*Gazella sp.* (3)

Two genera: (*Philistomys*, a muscardine ancestor of *Eliomys*, and the hamster *Allocricetus*) are extinct today. The other extinct species are all more primitive and generalised in character than the recent forms. Only *Spalax, Microtus, Cricetulus* and *Dama mesopotamica* have possibly survived till our days. Yet the first three may, when more material will be available, well prove to be species of their genera, other than the recent ones. The gazelles certainly were totally different from the present gazelles of the country.

Apart from *Megaderma* relations to the tropics are suggested by *Arvicanthis*, a genus now entirely confined to the Ethiopian kingdom with penetration into Egypt along the Nile, and by *Leggada* which at present shows a palaeotropical distribution. The Palestine form (Bate 1942 p. 484), whilst related to the present Ethiopian group of the genus, shows affinities to a fossil species from India. The species of *Apodemus* are of special interest, as—together with two more species from higher layers—they show specific differences within the range of the same three groups of *Apodemus* (the *sylvaticus-, flavicollis-* and *mystacinus*-group) which still inhabit N. Palestine and Syria now. This is a good example of an

autochthonous evolutionary process of Pleistocenous mammals on Palestine soil. The abundance of hamsters suggests a steppe environment, or at most a dry Mediterranean one. The presence of *Talpa chthonia,* a relative of the small mole of S. Italy and Yougoslavia (*T. romana*), suggests Mediterranean conditions. *Leggada* could well have lived in a dry steppe, together with the gazelles. *Dama, Apodemus, Microtus, Spalax,* and gerbilles ask for no climatic changes. *Arvicanthis,* the field rat of Egypt, was certainly bound to hygrophilous habitats, such as swamps or river banks, which even recently were still available.

Thus we cannot agree with Miss BATE that the climate of Tabun F was a tropical one. Possibly it was more humid than today, but even for this assumption we fail to see an urgent need from this faunal assemblage. The small tropical mammals were on the verge of extinction. This fact may eventually justify the conclusion that a more tropical climate existed, for some time at least, during the end of the Pliocene.

The following level (Tabun E) with its Micoquean (Upper Acheulean) civilisation had also a hot and humid climate, growing drier towards the end. The following animals are mentioned from it by BATE (1937, 1942, 1943):

Myotis cf. baranensis
Rhinolophus cf. ferrum-equineum
Crocidura samaritanus
Crocidura katinka
Hyaena prisca
Canis cf. lupaster
Vulpes vinetorum
Felis cf. pardus
Spalax sp.
Hystrix sp.
Sciurus cf. anomalus
Philistomys roachi
Ellobius pedorychus
Microtus mc-cowni
Microtus cf. guentheri
Microtus (Chionomys) machintoni
Apodemus caesareanus
Apodemus levantinus
Apodemus sp. 3.
Apodemus sp. 4.
Rattus (Mastomys sp.)
Mus camini
Cricetulus demetros
Gerbillinae
Hippopotamus amphibius
Sus gadarensis
Capreolus capreolus
Dama mesopotamica
Capra sp.
Alcelaphus sp.
Bos sp.
Gazella sp.
Equus caballus cf. przewalskii
Equus hemionus
Procavia cf. syriaca
Rhinoceros cf. hemitoechus
Elephas sp.

Megaderma, Talpa, Leggada and the three hamsters of Tabun F have become extinct. *Dama* decreases, whilst gazelles grow more abundant. None of the animals of this list suggest a tropical climate. Most of them fit well into a Mediterranean or a steppe climate. *Hippopotamus* and the large pig *Sus gadarensis* live in hygrophilous habitats, which were present, as above mentioned. The hartebeest (*Alcelaphus*) lived in the steppes with wild horses of the Przewalski-type, widely spread in Europe and Asia in the Upper Palaeolithicum, and with a big and plump wild ass of great size, resembling the kiang of Tibet, and very different from the slender horse-like onager of recent days. The climatically neutral *Rhinoceros hemitoechus* kept them company and the elephant probably was a remnant of the southward drift, unless it was identical with the Indian elephant, which survived at the upper Euphrates and perhaps the Orontes until historical days. The presence of *Chionomys* and of *Ellobius* suggests a mountainous region with fairly cold winters. *Hystrix, Sciurus, Microtus guentheri, Capreolus, Capra,* and *Procavia* (porcupine, squirrel, vole, roe deer, ibex,

coney) lead to the recent fauna whilst *Hyaena prisca* is the earlier eco-variant of *H. hyaena.*

The layers of the Lower Levalloiso-Mousterian civilisation (Tabun D and C and Skhul) contain remnants of (Bate 1937, 1942, 1943):

Myotis cf. baranensis
Crocidura katinka
Crocidura samaritanus
Erinaceus sharonis
Hyaena crocuta
Hyaena prisca
Canis cf. lupaster
Vulpes vinetorum
Vulpes vulpes
Vormela peregusna
Ursus mediterraneus
Felis cf. libyca
Felis pardus
Hystrix sp.
Philistomys roachi
Ellobius pedorychus
Microtus guentheri
Microtus (Chionomys) machintoni
Apodemus caesareanus
Apodemus levantinus
Apodemus spp. 3 and 4.
Mus camini
Cricetulus demetros
Gerbillinae
Hippopotamus amphibius
Sus gadarensis
Phacochoerus garrodae
Capreolus capreolus
Cervus elaphus
Dama mesopotamica
Capra sp.
Alcelaphus sp.
Bos sp.
Gazella sp.
Equus hemionus
Equus cf. hydruntinus
Rhinoceros hemitoechus
Procavia cf. syriaca.

The climate is drier than with the earlier layers, but hygrophilous habitats for *Hippopotamus* and *Sus gadarensis* are amply available. Gazelles rapidly increase and *Dama* is continuously reduced in numbers. *Crocidura samaritanus, Myotis, Erinaceus sharonis, Philistomys* and *Arvicanthis* are dying out in layer E. *Vulpes vinetorum, Ellobius, Cricetulus demetros,* three species of *Apodemus, Mastomys,* rhinoceros, hippo and *Phacochoerus* towards the end of Tabun D. *Phacochoerus* is now limited to tropical Africa, as is the group of *Rattus (Mastomys)* to which the fossil species from Palestine belonged. This *M. coucha*-group "may be one of the primitive lines that may have given rise to *Mus* on one hand, or part of *Rattus* on the other" (ELLERMAN 1941, p. 169). A fossil representative of this group was found in the earlier Siwalik layers in India. BATE (1942, p. 483) states about *Mus camini* that it represents "a stage of development or specialisation between that of *M. minotaurus* from Crete and recent forms". *Microtus mc-cowni* is possibly a primitive ancestor form of the *M. guentheri*-group. Interesting are the two shrews, each of which possibly was a step towards the two recent species: *Crocidura katinka* towards *C. portali,* and *C. samaritanus* towards *C. russulus* (Bate 1937). The three subsequent forms of hedgehogs, however, (*Erinaceus sharonis, E. carmelitus, E. auritus*) have no relation to each other. We have our doubts about Miss BATE's identification of *Canis lupaster* with the recent jackal (1937, p. 177). This wolf-jackal is regarded as a different species, but it is still an open question. The fox *Vulpes vinetorum* is a very primitive canide, which may eventually be attributed to another genus. From the two bears, the smaller *Ursus mediterraneus* belongs to a group widely spread over Mediterranean islands in the Pleistocene. The rather big representatives of *Ursus arctos,* which appear intermittently since layer E, are probably the ancestors of the recent *Ursus arctos syriacus,* which may have developed during the Aurignacian. We suggest that the bones of the small wild cat may be ascribed to *Felis s. libyca* instead of

P. s. sylvestris. Another interesting addition is *Equus cf. hydruntinus*, a small ass, probably related to the African wild asses. Entirely unidentified is the wild cattle of all layers. *Bos primigenius* and a species of *Bubalus* (aurochs and buffalo) are certainly represented, and other species were probably also present. But the bad state of the bones of these big mammals only leads to an exceptional determination.

The following layer (Tabun B, Wad G; Upper Levalloiso-Mousterian) shows a faunal break. The faunal assemblage more and more shows its modern aspect. Many species have disappeared in the earlier two layers, yet only few new species are added. *Dama* increases again, which points to a heavier rainfall. The tropical assemblage, with the exception of *Hyaena crocuta*, has disappeared for good (Bate 1937):

Hyaena crocuta
Canis cf. lupus
Vulpes vulpes
Felis pardus
Spalax sp.
Hystrix sp.
Gerbillinae
Sus sp.
Capreolus capreolus
Cervus elaphus
Dama mesopotamica
Capra sp.
Bos sp.
Gazella sp.
Equus hemionus
Equus cf. hydruntinus
Procavia cf. syriacus

For the Natufian (Wad B) Miss BATE's recent analysis of the antelopes shows that all gazelles were not only specifically different from those of our days, but even belonged to a different group, the *G. granti*-group, now living in East Africa. To the same faunal element belonged the water buck KOBUS. Other, smaller gazelles lived with them in Natufian Palestine, the identification of which was not yet possible. *Dama*-bones are becoming rare, whilst those of gazelles abound. A large, probably domesticated dog (*Canis familiaris matris-optimae*) has made its appearance, together with the long-eared hedgehog (BATE 1937, 1940, 1943):

Erinaceus carmelitus
Erinaceus cf. auritus
Hyaena crocuta
Canis familiaris cf. matris-optimae
Vulpes vulpes
Meles meles
Martes cf. martes
Vormela peregusna
Ursus cf. mediterraneus
Felis cf. maniculata
Felis pardus
Spalax sp.
Lepus sp.
Sciurus cf. anomalus
Microtus guentheri
Mesocricetus sp.
Gerbillinae
Sus scrofa var.
Capreolus capreolus
Cervus elaphus
Dama mesopotamica
Capra sp.
Alcelaphus sp.
Bos sp.
Gazella decora
Gazella esdraelonica
Gazella arista
Kobus cananites
Equus caballus cf. przewalskii
Equus hemionus
Procavia cf. syriaca

We have omitted a special discussion of the Aurignacian layers (Wad F-C), which are almost identical with the Natufian layers. *Hystrix, Ursus arctos* and *Canis lupus* are the only additions, whilst amongst the antelopes only *Gazella arista* is represented.

Dr. STEKELIS has kindly put at our disposal a list of the faunal assemblage of another Mt. Carmel cave (Abu 'Usba) from an early neolithic station (det. Dr. G. HAAS). This station is highly interesting. Apart from a number of Natufian animals, which survived until our days, a certain number of recent forms has been recorded at Abu 'Usba for the first time (*Gazella arabica, Mus musculus, Apodemus* in its recent species, *Cricetulus migratorius, Acomys cahirinus*, and others). This first record does, of course, not preclude the presence of the species at a much earlier date. Still more important is the survival of some now extinct Natufian species in the Neolithicum of Mt. Carmel. Such forms are *Erinaceus samaritanus*, the spotted hyena, *Gazella decora* and *G. esdraelonica, Capra ?primigenia*, two species of wild cattle, a big ass, and *Sciurus anomalus*. We must however observe, that the dating of STEKELIS is doubted by others.

The discoveries in other caves, such as Zuttiyeh, Umm Qatafah, Shukbah, Kebarah, Emireh, a.o. show that the fauna of the Mt. Carmel caves was not a local one, but was widely spread in every layer over the country. This strengthens the conclusion that real and important faunal changes have occurred. This conclusion is incontestable in view of the latest studies of Miss Bate on the gazelles, hamsters and mice. We may expect that future research will extend the period of existence for a number of species. But the fact that the early Pleistocene, especially among the smaller mammals, showed a high divergence from the present fauna and that almost all the species of those groups which are still represented by various forms in the recent fauna, have more generalised and primitive characters, is well established.

Another group of animals which permits analysis through the cave strata are terrestrial molluscs (BATE 1937 p. 224, Avnimelech 1937 p. 81). No change in the species is observed. The following species were found:

Leucochroa candidissima
Calaxis saulcyi
Chondrula septemdentata
Ericea olivieri
Helicogena cavata
Helicogena figulina
Euparypha seetzeni
Levantina caesareana (and var.)
Levantina hierosolyma
Petraeus fouroussi
Petraeus labrosus
Petraeus syriacus
Theba olivieri

All these species still occur today. But from the changes in the size of the *Levantina*-species from the excavations of R. NEUVILLE, Avnimelech (1931, p. 91) draws the conclusion that the climate of the Upper Palaeolithicum resembled that of the present day as regards temperature and humidity. He assumes that the early Mesolithicum was characterized by a climate warmer and drier than that of today. This latter conclusion conflicts with the supposition of a more humid climate assumed by Miss BATE.

Bird relics are rare and limited to the caves of Zuttiyeh (BATE 1927, p. 28) and of Umm Qatafah (VAUFREY in NEUVILLE 1931). The list of the determined species, all from the Upper Acheulean and the Levalloiso-Mousterian, is as follows:

Turdus sp.
Sturnus vulgaris
?Pycnonotus sp.
Cypselus melba
Apus ?affinis
Athene noctua
Aquila sp.
Gyps fulvus
Gallus sp.
Columba oenas
Columba livia
Coturnix coturnix
Perdrix sp. (? Alectoris)
Phasianus hermonis

All these birds still live in the country, with the exception of the Hermon pheasant, which much resembles some Miocene pheasants from Europe. Pheasants are also known from the Lower Pliocene of Pikermi. At present the pheasant living nearest is *Phasianus colchicus* from the N.E. corner of Anatolia, living in a rather humid climate in dense forests. With regard to *Gallus sp.* judgement must be postponed until more material will be available. Consequently the bird relics give us very little indications with regard to climatic changes.

The same holds good for the reptiles of the Levalloiso-Mousterian. They are represented in the Mt. Carmel caves by a big *Trionyx* and by a *Crocodilus*. *Trionyx nilotica* occurred still recently in the coastal rivers of the country, and *Crocodilus niloticus* has disappeared from the Zerka river only at the beginning of this century. Other caves contained *Emys ?orbicularis, ?Coluber sp.*, frogs and toads, all still surviving in this country.

Freshwater shells are deposited in good series in the gravel of the Lisanstrata of the Upper Jordan Valley from the Upper and Middle Pleistocene. They have been studied by Picard (1934). These Lisan facies are rich in forms and individuals of a few *Melanopsis (M. laevigata, M. costata)*, which still abound. Giant forms of *Melanopsis laevigata* or of *Theodoxia macrii* are ascribed to hydrological rather than to climatic factors. *Planorbis, Bythinia, Bythinella, Pyrgula, Limnaea* are essentially identical with the present-day occupants. The disappearance of *Ancylus*, occurring in these deposits, was regarded as a proof of the extermination of an earlier cold-loving fauna. Our discovery (Bodenheimer 1935, p. 32) of *Ancylus fluviatilis* in the Papyrus-thickets of the Upper Jordan refuted this assumption. Picard (1937, p. 60) also discovered *Vivipara syriaca* and *V. angularis* in Acheulean strata, and their discovery in recent niches is highly probable. Unions from the same provenance showed forms of present occurrence. Whilst Picard (1934) first believed in the influence of cold and warm periods, he (1937, p. 60) came to the conclusion later that freshwater molluscs do not offer any proof of the theory of the intrusion of a cold-loving fauna; on the contrary they point to the persistence of conditions from the Pliocene, with considerable hydrological changes, of course, in the Jordan Basin, brought about by rain fluctuations.

Marine shells in caves date from the end of the Lower Levalloiso-Mousterian to the bronze age. They served as ornaments and their inhabitants as food. The list of these shells until the end of the Mesolithicum, found in relation to man, runs as follows (Bate, 1937, p. 224):

Arca noe
Cardium ?deshayesi
Cardium rusticum
Cardium edule
Columbella rustica
Conus mediterraneus
Cypraea moneta
Dentalium dentalis
Dentalium vulgare
Dentalium cf. aratorum
Donax trunculus
Glycimeris pilosus
Glycimeris violacescens
Laevicardium crassum
Nassarius ?costulatus
Nassarius gibbosulus
Osilinus turbinatus
Ostrea crenulifera
Patella caerulea
Pecten jacobaeus
Pinna sp.
Thais haemostoma

Cypraea moneta and *Ostrea crenulifera* are now living in the Gulf of Oman, the latter in the Red Sea as nearest place of occurrence. The other species, apart from *Dentalium cf. aratorum*, are still common Mediterranean forms.

Miss Bate (1932, p. 277) mentions *D. aratorum* together with the foreign *Siphoria*

luzonica from Natufian layers in an Athlit cave. The former species (Bate 1937, p. 225) is now regarded as a special, probably extinct species. Avnimelech (1937, p. 82) found a number of *Dentalium* in other Natufian deposits excavated by R. Neuville (*D. rectum, D. vitreum, D. vulgare var., D. rubescens, D. entale, D. dentalis*). Most of these species are not Mediterranean today, and are either fossil or came from the Red Sea. Another Red Sea shell is *Nerita maritima*, whilst *Nassa (Arcularia) sp., Glycimeris violacescens* and *Cardium tuberculatum* are still Mediterranean forms. It is more probable that the Red Sea shells were brought here by human traffic than their being contemporaries of ancient Red Sea shells in the Pleistocene Mediterranean Sea.

As prehuman faunal changes depended on and coincided with climatic changes to a high degree, we now must consider the evidence for such changes. Before entering into this discussion, however, we wish to point out again that the remnants of none of the Pleistocene layers justify the assumption that the vegetal aspect of Western Palestine—and to this area alone our discussions are limited—has radically changed since the early Pleistocene: Mediterranean territories and steppes were both represented. The geographical situation easily explains the absence of a pure desert fauna, which nobody would expect to find nowadays on Mt. Carmel, at Zichron Yaakob, in Upper Galilee or on the western slopes of Judaea. The extensive swamps of the coastal plain, behind the dunes or in the Emek Yesreel—drained only recently by Jewish colonists—would have offered favourable conditions to the hygrophilous "tropical" group (hippo, wart-hog, *Sus gadarensis, Arvicanthis*). Fluctuations in the spread of Mediterranean maqui and steppes certainly occurred, but never to the extent that one expelled the other entirely or almost entirely from our area (See Table 1 on pp. 26 and 27).

The careful investigation of Miss Bate suggests some faunal breaks. A greater one is assumed at the end of layer Tabun B, when almost all now tropical hygrophilous animals disappeared together with *Vulpes vinetorum, Eliomys* and *Rhinoceros*. The tropical animals may have died out in consequence of an extended drought. This means that they could stand the normal, but not the extreme climate of the country. They probably could still live in the country where suitable niches were still available, as they are even today in some parts of the Jordan Valley. And *Ellobius*, a typical inhabitant of dry steppes, was certainly not exterminated in consequence of the same causes. Similar faunal breaks occurred at the end of the periods Tabun F, E and D. Also the great difference of the Natufian antelope fauna from that of our days puts us before new embarrassing problems. Further research will teach us if these faunal breaks were really as abrupt as they appear in the light of the excavations of the Mt. Carmel caves. In general the analysis shows that in the early Palaeolithicum many of the present rodents were represented by other, and always by more primitive forms. *Microtus guentheri* and *Spalax ehrenbergi* are almost the only mammals which since then survived unchanged. More remarkable is the fact that the Natufian and even part of the Neolithic gazelles are not our present forms, but others, showing intimate connection with recent forms of the savannas of E. Africa. It should not be assumed, however, that faunal instability was so strong in all or even in most animals. With evertebrates and reptiles the formation of the recent species was essentially ended during the Tertiary. In fishes and birds most changes during the Quaternary concern race formation, but speciation only to a very limited degree.

Miss Bate (1943, p. 815) has made an interesting attempt to correlate the development of the small generalised mammals into the more specialised recent forms to indirect consequences of climatic changes. She comes to the conclusion, for instance, that "the smaller size and less highly modified incisors of *Mesocricetus aramaeus* of Tabun are in great contrast to the very powerful teeth with flattened anterior surfaces of recent species, and suggest that

TABLE 1

The mammals from the Palaeolithicum of the Mt. Carmel caves (from D. M. A. BATE).

I: Tabun G, II: Tabun F, III: Tabun E, IV: Tabun D, V: M. Shkul + Tabun C, VI: Tabun B, VII: M. Wad C-F, VIII: M. Wad B.

Species	I	II	III	IV	V	VI	VII	VIII
CHIROPTERA:								
Megaderma watwat		+						
Myotis cf. baranensis			+	+				
Rhinolophus sp.			+					
INSECTIVORA:								
Crocidura samaritana		+	+	+				
Crocidura katinka			+	+				
Erinaceus sharonis				+				
Erinaceus carmelitus							+	+
Erinaceus cf. auritus								+
Talpa chthonia		+						
CARNIVORA:								
Hyaena crocuta						+	+	+
Hyaena prisca			+	+	+	+		
Canis cf. lupaster			+	+	+			
Canis cf. lupus						+	+	
Canis familiaris matris optimae								+
Vulpes vinetorum			+	+	+			
Vulpes vulpes cf. palaestina				+	+	+	+	+
Meles sp.							+	+
Martes cf. martes							+	+
Vormela cf. peregusna					+	+	+	+
Ursus arctos							+	
Ursus arctos cf. mediterraneus				+	+	+	+	+
Felis libyca							+	+
Panthera pardus			+	+	+	+	+	+
RODENTIA:								
Spalax sp.		+	+	+	+	+	+	+
Hystrix sp.			+	+	+	+	+	
Lepus sp.							+	+
Sciurus cf. anomalus							+	+
Philistomys roachi		+	+	+				
Ellobius pedorychus			+	+	+			
Microtus mc cowni			+					
Microtus guentheri		+	+	+	+	+	+	+
Murinae		+	+	+	+			
Cricetinae		+	+	+	+			
Gerbillinae		+	+	+	+	+		
UNGULATA:								
Hippopotamus amphibius			+	+	+			
Phacochoerus garrodae					+			
Sus gadarensis			+	+	+			

Species	I	II	III	IV	V	VI	VII	VIII
Sus scrofa							+	+
Capreolus capreolus			+	+	+	+	+	+
Cervus elaphus					+	+	+	+
Dama mesopotamica		+	+	+	+	+	+	+
Capra sp.			+	+	+	+	+	+
Alcelaphus sp.			+	+	+		+	+
Gazella sp.		+	+	+	+	+	+	+
Bos sp.			+	+	+	+	+	+
Equus caballus			+	+	+	+	+	+
Equus hemionus			+	+	+	+	+	+
Equus cf. hydruntinus					+	+		
Rhinoceros cf. hemitoechus			+	+	+			
Procavia cf. syriaca			+	+	+	+	+	+
Elephas sp.			+					

this change is due to an alteration of environment from a mild climate with plentiful soft vegetation to one of drier conditions with a harder vegetation." This interpretation, which agrees with the general climatic trend as proposed by this writer, supposes a safer background of knowledge on the modelling effect of the environment than we have today.

That climatic fluctuations have occurred during the Pleistocene is certain. It is equally certain that these fluctuations mainly took place in periods of rainfall and were only of little range in temperature. PICARD (1937, p. 70) points out that "from a palaeo-geographical point of view the Pluvial period is not only a phenomenon of the Pleistocene, but of the whole Post-Miocene epoch."

Perhaps the most lucid comparison of the pleistocenous climatic fluctuations of all belts of the northern hemisphere has been given by the late S. A. Huzayyin (1940). We reproduce here his survey table (see following page).

Whilst we are still uncertain about the extent to which these geological rain fluctuations ranged in the most humid and the extreme dry periods, we must warn the reader to give too liberal an interpretation to the meaning of cool and warm in the three southern belts. The difference was probably not more than a very few centigrades. This is well illustrated by the fact that just the first Pluvial in the Lower Pleistocene (= Diluvium) with its great accumulation of "tropical" animals in Palestine, is classified in Huzayyin's table as predominantly cool.

The following main conclusions are proposed:

1. Since the beginning of the Pleistocene only minor fluctuations of temperature, but more important ones of rains have occurred.
2. Since the beginning of the Pleistocene Mediterranean maqui and steppes areas were prevailing in Western Palestine, whilst the extent of both these territories has mutually fluctuated.
3. The fauna of the Mt. Carmel caves is not a local fauna. All other excavations from Northern and from Western Palestine reveal the distribution of the fauna of every period all over that area.
4. The fauna of Palestine has undergone considerable changes during the Pleistocene. In many small mammals we find generalized and primitive characteristics at the beginning of that period, as compared with the recent species of the same genera or groups. Even the mesolithic and part of the neolithic gazelles show a very different aspect from those of our days. The three present species of *Apodemus* are represented in the Lower Pleistocene

TABLE 2

Correlation of the major climatic belts in prehistory (after S. A. HUZAYYIN).

Geological phase	Equatorial belt	Saharo/Arabian belt	Mediterranean belt	Northern belt
Recent	Very recent oscillations	Desiccation with minor oscillations		Cooling
	Makalian wet phase	Neolithic: warm(?), wet	Probably warm, wet phase	Warmest optimum
Late or Post-Diluvium	Dry	Desert conditions	Gradual desiccation	Transition
Upper Diluvium	Two Gamblias with drier interval	Pluvial II (2-3 submaxima), pretty cool	A pluvial phase with wet and dry subphases	Later glacials. Würm I + II.
Middle Diluvium	Interpluvial, with volcanic activity	Interpluvial. Dunes a.o. aeolic formations. Also volcanic activity.	Prob. dry interval with volcanic activity, at least during Monastirian transgression	Riss/Würm interglacial
Lower Diluvium	Kanesian pluvial, first rel. cool, then warm and rel. cool again. Major physiographic phase.	Pluvial I., first rel. cool, then warm and rel. cool again.	Sea regression cool and wet	Riss glacial
			Tyrrhenian transgressian, very warm water, prob. warm, wet	Riss/Mindel interglacial
			Sea regression, cool and wet	Mindel glacial
Prediluvium	Prepluvial	Prepluvial. Gradual oncoming of rel. cool and wet conditions	Milazzian and Sicilian phases, cold and cold waters.	Mindel/Günz interglacial Günz glacial

by vicariant more primitive forms of the same groups. A few 'recent' species, such as *Dama mesopotamica, Cervus capreolus, Microtus guentheri, Procavia syriaca,* lived in the country since the Upper Acheulean. Others, as *Spalax, Capra, Bos,* a.o. lived in this country for the same time, but perhaps in species differing from those of our days.

5. To which extent wolf, badger, marten, hare, and the other new forms of the Upper Levalloiso-Mousterian (Tabun B) are really late immigrants, and exactly at which date and from where they immigrated, or if they were present at an earlier period, must await elucidation by future research.

6. Also a reliable correlation of the climatic fluctuations to the faunal changes is still impossible at the present stage of our knowledge. Whilst the main faunal changes probably coincided with changes of the climate and were caused by them, only suggestions are possible at present.

1.3. EARLY MEN IN PALESTINE

1. 31. LIFE AND HUNT OF THE MT. CARMEL MAN

Recent research (NEUVILLE, GARROD, BATE, KÖPPEN, STEKELIS, HUZAYYIN, ALBRIGHT, PERROT, a.o.) has made it possible to establish a fairly reliable chronology of early man in the Middle East.

The Lower Palaeolithic fauna included *Rhinoceros hemitoechus, Hippopotamus,* some wild cattle, camel wild horses and asses, the bear, (cave-) lion, porcupine, spotted hyena and striped hyena (*Hyaena cf. priscus*), leopard, red and fallow deer, gazelle, ibex, coney, vultures, rock partridge, owl, jay and doves (NEUVILLE 1934). Man may have appeared as long as 200.000 years ago in Palestine. The first settlers apparently belonged to the Pre-Neanderthal men, who followed the East-Asiatic *Pithecanthropus* of Java and China, who developed over half a million years ago. These older races have left no anthropological traces in Palestine. During the oldest and longest part of the lower stone age, the Chellean period, surface stations of stone artifacts have been found only, none of them in caves. The oldest cave deposits of human origin appear in Palestine (Mt. Carmel, Galilee) in the later Acheulean, here called Tayacian, about 150.000 years ago. The first of these discoveries was made by NEUVILLE in the cave at Umm Qatafa. ALBRIGHT (1940, p. 90) ascribes the penetration into caves to the harder climate of the Acheulean contemporaneous with the beginnings of the third glacial period of Europe. It is, of course, equally possible that at that date cave-dwelling Neanderthalians first settled in Palestine. The Acheulean was followed by the Micoquean and the Levalloiso-Mousterian. The skeletons of Mt. Carmel and of Galilee, estimated to date back at least 100.000 years belong to that period. At this time cave-dwelling had become a habit and so no conclusions may be drawn from this fact as to the climate of the period. The exemplary analysis of Miss D. M. A. BATE permits us to follow the main changes of the fauna on and around Mt. Carmel. The caves were inhabited by men. No big carnivores could have lived there together with them. Apart from the smallest mammals, such as mice and shrews, and from some bats, which shared the caves with man, most animal remains are of game animals, serving as human food. In some layers the bones are usually broken, as man delighted in their marrow. Gathered fruits and roots completed his diet. Fire was probably known since the oldest cave-dwellers and before.

The very comprehensive analysis of Mt. Carmel man by MCCOWN and KEITH (1939) showed that all mid-Pleistocene men of Palestine were of one type. This type, however, showed a much higher physical variability than is observed in any human population of our days, with many tendencies to and transitions from Palaeanthropic to Neanthropic man. The theory that this variability is due to hybridization is rejected, as no fossil remains of Neanthropic man from these layers have been produced together with true Palaeanthropic Neanderthalians. The tendency of the Mt. Carmel people to diverge into two types is also regarded as being due to an evolutionary divergence of Neanderthalian and modern man from a common human stock. It is therefore assumed that the Mt. Carmel people are not the actual ancestors of the Cromagnons, but Neanderthaloid collaterals or cousins of the ancestors of that type. The fossil remains of the real proto-Cromagnons will probably be discovered still farther to the east. It may be assumed that a progressive and conquering

and often occur together with lions. KELLER (1909, p. 288, fig. 93 a, b) recognised the Tibetan goa (*Procapra pictivaudata*) with unhorned females and the sharp terminal curvation of the male horns on an old Assyrian hunting relief. The dama gazelle (*G. dama*) is rare on ancient Egyptian monuments.

The common oryx of the ancients is the sabre-horned oryx (*Oryx leucoryx*) of North Africa, less so the straight horned Arabian oryx (*O. leucoryx*) of the deserts and steppes of Arabia, Syria and Mesopotamia. The addax antelope (*Addax nasomaculata*) has only recently become extinct in Egypt, where it was hunted as well as kept in captivity after having been tamed. Another antelope (*Antilope cervicapra*), now restricted to India, abounds in old Mesopotamian representations, together with oryx and gazelles. The form of the horns suggests that even more than one form may have lived there. The N. African hartebeest or bubal antelope (*Alcelaphus buselaphus*) is often mentioned from Egypt and Libya, where it is extinct today (FLOWER 1932 p. 437). OPPIAN probably refers to this antelope (*Cynegetica* 2 : 300): "The antelope again is less in stature than the fallow deer: less than the fallow deer but far mightier than the gazelle: bright of eye, lovely in colour, cheerful of aspect. Straight from the head spring the long branches of its horns but aloft they bend again toward the back with curved points. Above all others doth this race love its own home and its accustomed lair and its dear dwelling in the glades. Even if hunters bind it with twisted ropes and carry it straightway to other regions and far away in the glens leave it there to its freedom, easily doth it come to the sweet home where it used to dwell and endures not to wander as a stranger amid aliens. Not then to men alone is their native land dear, but even in the hearts of the dappled wild beasts is instilled a desire of home."

The wild goat (*Capra hircus*), the ancestor of the domestic goat and still living in the Taurus, the Kurdish and the Cretean mountains, as well as the ibex (*Capra ibex nubiana*), which still survives in S. Palestine, the Sinai and S. Egypt, are both common on old monuments. Both are characterised by their goat beard. But as their different main characters, the more compact rump of the ibex and the different shape of the horns, are often badly neglected in the representations, it is often difficult to distinguish them. In Egypt as well as in the Kilwa rock-carvings, of course, on account of the zoogeographical absence of the wild goat this point gives no difficulty. They are common animals in ancient art everywhere throughout the Middle East. (OPPIAN, *Cynegetica* 2 : 338 ff.).

On the eastern high-plateau of Anatolia and of Armenia the arkal sheep, still inhabiting the Transcaspian steppes (*Ovis orientalis vignei*) abounded. It is the ancestor of all domestic sheep living now in the Middle East, as is the Asiatic mouflon (*Ovis orientalis*) still living in Persian mountains. A few of the Barbary sheep of N. Africa (*Ammotragus lervia*), still survive in Africa Minor. All of them are not uncommon in old representations.

The wild cattle of the ancient Middle East will be repeatedly discussed in the following chapters. Here we will just give the taxonomic arrangement of the wild and domesticated cattle of this region:

1. The arni buffalo (*Bubalus bubalus*) is well represented in some documents of oldest Mesopotamia and India, perhaps also of predynastic Egypt. Today it is restricted to India and the rest of the Oriental kingdom. The arni is the ancestor of the 'jamus', the domestic buffalo.

2. We may just mention the powerful N. African, now extinct, *Bubalus antiquus,* of whom many rock-carvings in N. Africa are preserved, as connection with the cattle from the Kilwa rock-carvings may be possible.

3. The gaur (*Bos gaurus*), another Indian kind of wild cattle, is mentioned here, because

HILZHEIMER has demonstrated its existence in early monuments from Mesopotamia, from which both the gaur and the wild arni disappear at a very early period.

4. The aurochs (*Bos primigenius*) is the most important kind of wild cattle of ancient days. It is the *'rimu'* of Assyria, the *'rem'* of the Bible, and even from Egypt ancient hunting scenes are preserved, which do not occur after the Old Kingdom. This is doubtless the wild ancestor of all our native cattle and the zebus, with the exception of the buffalo. It is rumoured that a few aurochsen may still be living in some remote valleys of the Kurdish mountains.

5. The wisent (*Bison bonasus*) with its rich wool on the front part of the body is marvellously modelled on a very old Persian sculpture from Susa, and bones have been discovered up to the Lebanon. He died out a long time before the aurochs. He is an inhabitant of forests, still living in the mountains of the Caucasus.

Undoubtedly, this abundance of species of wild cattle in the historical era is surprising, all traces of which have by now disappeared.

Elephants are amply dealt with in the text and will therefore be dismissed here (cf. also OPPIAN, *Cynegetica* 2 : 489 ff.). The Indian elephant (*Elephas maximus*) and the African elephant (*Loxodonta africana*) were introduced in a later period. The former lived in the swamps of the Upper Euphrates and perhaps of Antiochia until the beginning of the first millennium B.C. The Numidian elephant perhaps still lived in very early times in eastern Egypt.

The one-horned Indian rhinoceros (*Rhinoceros unicornis*) is found in old Indian reliefs of the oldest Indus-valley cultures. It appears only on two old Mesopotamian seals from about 2500 B.C., only to reappear on the black obelisk of SALMANASSAR. ALEXANDER's expeditions made it widely known throughout the Hellenistic world. A painting was found in the Marissa tombs. The oldest authentic description of the two-horned African rhinoceros (*Diceros bicornis*) is made by ATHENAIOS (5 : 201c), when describing the pompous animal procession of PTOLEMAEUS PHILADELPHUS in Alexandria. Later some were brought to Rome, where DIO CASSIUS (55 : 27) describes an arena fight between an elephant and an African rhino in 5 A.D. A counterpart of SALMANASSAR's Indian rhino is one of the African species in a relief at Pompeji (KELLER, 1909, p. 388, fig. 135), which competes in impressiveness with the famous drawing of DÜRER. OPPIAN (*Cynegetica* 2 : 551 ff.) describes it: "The (Indian) rhinoceros is not much larger than the bounding oryx. A little above the tip of the nose rises a horn dread and sharp, a cruel sword. Charging therewith he could pierce through bronze and with its stroke could cleave a mighty cliff. He attacks the elephant strong though it be and many a time lays so mighty a beast dead in the dust. On his yellowish, hairy brows and on his back dense spots show darkly. All the breed are males and a female is never seen. Whence they come I know not." We must also mention here the curious fact that the Alexandrine Jews, who translated the Septuaginta, rendered the Hebrew *rem* (wild cattle) into *rhinoceros,* perhaps under the impression of the early fables on the unicorn, through unacquaintance with wild cattle, and the impression left by the first African rhinos shown in Alexandria.

The wild boar (*Sus scrofa*), the wild ancestor of domestic pigs, of course, was common everywhere, except in the desert and the dry steppes. The wild form is apparently not represented by the ancient Egyptians, whilst some lively hunting scenes are preserved from ancient Mesopotamia. Its hunt was often sung by poets (cf. OPPIAN, *Cynegetica* 1 : 76, 309; 2 : 332, 457, 465). Many beautiful sculptures and paintings on mosaic pavements of wild boars exist from the Greek to the Byzantine periods.

The hippopotamus (*Hippopotamus amphibius*) was well-known from and in Egypt,

2.3. THE ANIMAL IN THE LIFE OF ANCIENT EGYPT

2. 31. THE DOCUMENTS ON CHANGES IN THE FAUNAL COMPOSITION

The title of this chapter is not well chosen. We do not intend to give a survey of the fauna of ancient Egypt, but merely to give some documentation on those animals which have disappeared from the country since the palaeolithic. Animals common then as now will therefore not be mentioned. The Tertiary history of the Egyptian fauna has been sketched out before (p. 23). We only remind the reader that the early Quaternary fauna—at least of Upper Egypt—is a typical savanna fauna, with giraffes, hartebeests, elephants, hippos, etc., the last remnants of the southward drift of the ancient Pikermi fauna. For the study of the fauna of recent Egypt a number of splendid publications are available. Among them may be mentioned those about mammals (J. ANDERSON, 1902; S. S. FLOWER, 1932), about birds (E. MEINERTZHAGEN-M. NICOLIS, 1930); about reptiles and amphibians (J. ANDERSON, 1906; S. S. FLOWER, 1932); about fishes (C. GAILLARD, 1928).

The remnants of the savanna animals still lingered in Upper Egypt all predynastic and early dynastic times. M. HILZHEIMER (1926, *et alia*) has earned much commendation for his careful analysis of the early archaeological documents. The status of some of the monkeys is uncertain. The hamadryas (*Papio hamadryas*), appears—apart from other figures—in a marvellous series on the obelisk of Luxor (Louvre), praying to the sun. BREHM points out that many peoples of the East-African steppes and of Abyssinia have chosen their hairdress after that of the hamadryas. DÜMICHEN has described the sacredness at which the animal was held in ancient Egypt. The hamadryas, as well as Anubis-baboon, babuin and *Erythrocebus pyrrhonotus* are still living in the Sudan. It is certain that in dynastic times they were introduced in large quantities into Egypt. This does not exclude that some of these species were still inhabiting Upper Egypt in predynastic times.

A nice illustration of the Ethiopian hedgehog (*Parechinus aethiopicus*), still occurring in the Sudan, has been published by DÜMICHEN from the tomb of PTAHHOTEP (2500 B.C.): A pair coming out of the earth, one devouring a locust.

Lions were common at least until the Middle empire. AMENOPHIS III published a special nuptial scarab announcing that until that day he had killed over hundred lions, not necessarily all in Egypt. The lion hunts of the Egyptian kings found a monographer in WIEDEMANN (1926). The spotted wild dog (*Lycaon pictus*), used for hunting gazelles in the third millennium B.C., then replaced by the dog, disappears and now lives south of the Sahara. The gennet, now extinct, appears in some of the ancient marsh scenes. The mention of the otter by HERODOT may be a mistake.

The most conspicuous changes have taken place in the ungulates. TUT-EN-KHAMON (1350 B.C.) and RAMSES III (1180 B.C.) were among the last which hunted wild asses in Egypt. HILZHEIMER (1926 p. 151) comes to the conclusion that a wild grey ass (*Equus asinus*), a subspecies different from the Nubian and from the Somali asses, inhabited all N. Africa in alluvial times. A beautiful illustration is found in a mosaic of *Hippo Regius* (Bone) in Algeria. The N. African ass had the shouldercross (perhaps even doubled) of the Nubian and the colour and the leg striation of the Somali ass.

The deer of the Egyptian monuments was long regarded as representing the Barbary deer (*Cervus elaphus barbarus*), which still lives in the mountain forests of the Atlas. Yet HILZHEIMER (1926 p. 152) has described it as a new form of fallow deer (*Dama schaeferi*). The last document of this deer is a head from the tomb of MENTU-HIR-HOPSET (19th Dynasty). The Egyptian fallow deer had no palmated antlers and a long face. The remainders of a unique recent specimen of this deer, probably from Tripolitania, has been found by HILZHEIMER in the Zoological Museum at Berlin. But no later illustration exists after the 19th Dynasty. The old illustrations (cf. PATON 1925 p. 13) strongly support HILZHEIMER's view. Thus the Barbary deer has, unless new discoveries would show otherwise, to be struck out from the list of ancient Egyptian mammals.

Some good reliefs of giraffes are preserved from the fourth millennium B.C., such as those on the cosmetic pallets of Menes (3200 B.C.). In these times the giraffe also appears as a hieroglyph. All later illustrations refer to giraffes offered as a tribute or as gifts from southern countries.

The figures of some gazelles, now living in the Sudan, such as *Gazella dama* and/or *G. soemmeringi*, occur on old monuments (cf. PATON 1925 p. 14). The North-African Hartebeest (*Alcelaphus buselaphus*) was not only found on monuments, but also as a mummy (LORTET and GAILLARD 1905 p. 14). All these species do not exist in Egypt any more. Documentation is presented about two other great mammals from N.W. Africa, but not from Egypt, so far: The *Bubalus antiquus*, a relative of the arni-buffalo, and a rhinoceros, related to the African *Diceros*.

The aurochs (*Bos primigenius*) certainly lived in early Egypt. This is the correct interpretation of HILZHEIMER of an animal in the tomb of SAHURE (fifth Dynasty), and of other animal illustrations. Whilst in the predynastic era the bulls have curved horns with tips turned inward, the later figures have lyre-shaped horns with tips turned outward. The aurochs was rare during the reign of THUTMOSE III. When the presence of a herd was announced to the king, he immediately embarked at Memphis, and after a night's travel, hurried by chariots to the place indicated. There, in a four days hunt, he killed 75 out of a herd of 176 aurochsen. This killing is described on a special hunting scarab (HILZHEIMER 1926 p. 159). The last document concerning the aurochs is a magnificent hunting scene of RAMSES III, chasing the bulls by chariot.

And, last not least, another important discovery of HILZHEIMER (1926 p. 140 ff.): The African elephant (*Loxodon*), which inhabited Numidia still at the Roman era, undoubtedly lived in Egypt. About seven, partly splendid reliefs and paintings of African elephants are known from early times until the end of the first dynasty. The elephant also occurred as a hieroglyph. For over 2000 years we then only find elephants introduced for carrying tributes in the representations, until the use of war elephants in Ptolemaic times brought the animal back to Egypt in large quantities.

MOREAU (1930 p. 58 ff.) has carefully gone through the bird list from ancient tomb decorations. He states that the highest standard in both execution and truth of life is found in the earliest dynasties. The decline begins with the fifth Dynasty, and after the twelfth only inefficient copies without inspiration are found. The following species have been identified from the monuments:

1. *Lanius collurio* (Red-backed shrike). Beni Hassan.
2. *Lanius nubicus* (Masked shrike). Beni Hassan.
3. *Phoenicurus phoenicurus* (Redstart). Beni Hassan.
4. *Hirundo rustica savignii* (Egyptian swallow). Common hieroglyph.
5. *Cotile rupestris obsoleta* (Pale Crag martin). Hieroglyph in Medum.

With them live birds of the size of deer, unable to fly, but running with the swiftness of an ostrich. Some hunt them with bows and arrows, others under cover of the skins of dead ostriches. They hide the right hand in the neck of the skin, and move it as the birds move their necks. With the left hand they scatter grain from a bag suspended to the side; they thus entice the birds and drive them into pits, where the hunters kill them with cudgels. The skins are used both as clothes and as coverings for beds. The Simi are at war with this tribe; they use antelope horns as weapons (16 : 4 : 11). Their blacker neighbours rarely live beyond 40 years, as the flesh of their bodies is eaten up by worms. They feed on locusts which south-west and west winds, when blowing violently in spring, drive in crowds into the country. The inhabitants catch them by throwing into the ravines materials which cause a great deal of smoke, when gently set on fire. The locusts, as they fly across the smoke, are blinded and fall down. They are pounded with salt, made into cakes, and eaten as food (AGATHARCHIDES and DIODORUS SICULUS (III : 28) mean that the locust's feeding habit causes a kind of winged louse to originate in the interior of the body). Above them extensive pastures were abandoned in consequence of multitudes of scorpions and galeodid-spiders (tetragnathi), which formerly abounded to so large a degree as to occasion a complete desertion of the place long since by its inhabitants (16 : 4 : 12). Near the straits are many hunting grounds for elephants.... The fish-eaters collect fish during the ebbing of the tide, which they cast upon the rocks and dry in the sun. When they have well broiled them, the bones are piled in heaps, and the flesh trodden with the feet is made into cakes, which are again exposed to the sun, and used as food. In bad weather, when fish cannot be procured, the bones of which they have made heaps are pounded, made into cakes and eaten, but they suck the fresh bones. Some also live upon shell-fish when fattened, which is done by throwing them into holes and stagnant pools of the sea, where they are supplied with small fish, and used as food when other fish are scarce. They have various kinds of places for preserving and feeding fish, from whence they derive their supply (16 : 4 : 13). The turtle-eaters live under the cover of shells which are large enough to be used as boats (either turtle Cafa paces, shells of *Tridacna,* or whale bones). They throw their dead as food to the fish, the tide carrying them away. Follow three islands: that of turtles, of seals, and of hawks. Follow some elephant grounds. When pools of rain water are dried up, the elephants dig holes with their trunks and tusks to find water. Near the promontory of Pytholaus (? Zeila) are two very large lakes.... The Otheris, a fresh water lake, is inhabited by hippopotami and crocodiles. On the margin grows papyrus. The ibis is seen near this place (16 : 4 : 14).

The coast from Deire abounds with elephants and ant-lions. The later have reversed genitals, a golden coloured skin, but are barer than the Arabian lions. The leopards there are of great strength and courage. The rhinoceros is hardly smaller than the elephant: not in length (from head to tail) as that seen by Artemidorus at Alexandria, but, judging from the one I saw, (a span less) in height. It had the size of a bull, the colour of a grey elephant, was shaped almost like a wild boar, especially the fore-head, except the front, which bears a hooked horn harder than any bone. This it uses as a weapon, like the wild boar its tusks. It also has two hard welts, like the folds of serpents, encircling the body from the chin to the belly, one on the withers, the other on the loins. This is what I saw myself. ARTEMIDORUS adds that the rhinoceros is particularly inclined to contend with the elephant for a place of pasture, thrusting its forehead under the elephant's belly and ripping it up, unless prevented by the trunk and tusks of his adversary. Giraffes (camel-leopards), breeding there, do not resemble leopards, for their variegated skin is more like the streaked and spotted skin of the fallow deer. The hind-quarters are so very much lower than the foremost