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## Some Scientific Results of Two Visits to Africa

By

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(With fourteen plates including two paintings, and four text figures.)

The present paper embodies some of the results of two trips to Africa. The first of these was when the Ministry of Education permitted the writer to accept the Kenya Government's invitation to the first Pan-African Prehistoric Congress at Nairobi in January 1947, the journey both ways being by air. The second visit was when the Ministry decided that the National Museums of Ceylon should participate in the University of California's African Expedition, contributed the equivalent of ten thousand dollars towards the expedition, and sent the writer as Ceylon's official delegate. On this occasion the writer worked in the Fayum area of the Libian desert and joined the advance party of the expedition which proceeded in four U. S. Army trucks to Lake Victoria and Lake Rudolf. The photographs taken by the writer were with a Zeiss Ikon camera 4.5 lens on 120 film, usually panchromatic.

This paper is divided into (a) Narrative, (b) Geological correlation, (c) Faunistic routes, (d) Prehistoric man, (e) Fossilization, (f) Pleistocene fossils of hippopotamus, (g) and elephant, (h) Catadromus fishes, (j) Reptiles, (k) Mammals, (l) Some African races, (m) Acknowledgments, (n) References to literature, (o) Explanation of plates.

### Narrative.

The aerial trip from Colombo to Nairobi was fascinating. Ceylon's masses of green trees and white foam line above her fringing reef, together with her submarine ridges and channels were connected to the arid south Indian plain, by the chain of islands of Rama's bridge which showed as a line of white dots as the breakers foamed over their shallows. In the Madras area are numerous ruined 'tanks' similar to those of Ceylon for they are so connected that water flows through them from river to river. Once outside Ceylon, semi-desert conditions commence and increase to desert conditions as one flies westward.

Although there are several large Indian rivers even these pass through arid country with only scrub forest. This aridity is probably largely due to man clearing away the primeval jungle and thereby checking the heavy rainfall resulting from forest covered hills. The unprotected land surface is also washed away making the country infertile. An accumulation of such denuded sand is the enormous delta of the Indus river to cross which the plane requires about half an hour. The delta is a net work of streams but apart from a few mangrove swamps and some areas inhabited by man, it is barren, affording a striking contrast to the delta of the Nile. Stronger aridity affects the land further westward and the mountains seen along the shores of Baluchistan and Iran are largely flat-topped and barren. The waters of the Gulf of Oman present wonderful underwater scenes in varying shades of blue, yellow and green. There are ridges, mountains, valleys and crevasses which become clearer in the Persian Gulf, while dark tracts indicate beds of pearl oysters in the vicinity of Bahrein Island. This Island is also the centre of many petroleum reservoirs and dark oily patches over much of the desert show that petroleum is abundant in the area that is next traversed, namely, from Basra in Iraq over the Syrian desert into Trans-Jordania. The plane rises gently, then descends into an enormous gash in the earth. At the bottom lies the famous Dead Sea where the water is so salt that it stings when taken into the mouth. The Dead Sea is the northern end of the Great Rift system of enormous cracks which extend from the Sea of Galilee through the Dead Sea, Red Sea, and Abyssinia, down a series of lakes to the Zambesi river.



This enormous rift is 30 to 50 miles wide and over 4,000 miles long.

Travelling out of Cairo one passes groups of the world famous Pyramids which are no larger than Ceylon's dagabas, but built of large blocks of sand stone. The desert near the valley of the Nile with its fantastic ridges and peaks of various shades affords a wonderful sight. The thick carpet of vegetation covering the surface of the Nile in the Sudd area towards Juba is also of much interest. The desert is a vast net work of extinct streams and lake beds and as one flies southwards the land surface becomes darker and more rugged. From time to time the Nile disappears and reappears, as the plane flies across its bends. The sandy waste gives way to feeble thorn scrub, as the plane passes Lake Rudolf which is also in the Rift system, while from here southwards the mountains display many extinct craters and the land surface is seamed with great cracks. Green forests begin to occur and eventually snow covered mountains. Flying in the bright, hot sunlight, snow is a strange sight but the enormous heights reached by the east African mountains enables them to retain it perpetually. For example Mount Kenya is 17,000 feet high and Kilimanjaro is 19,565 feet, and it is rumored that carcasses of buffalo, leopard and rhinoceros occur frozen hard upon some of these snow capped peaks. This might mean that these animals inhabited the peaks at a time when the latter were free from snow, and that the snow cap developed suddenly.

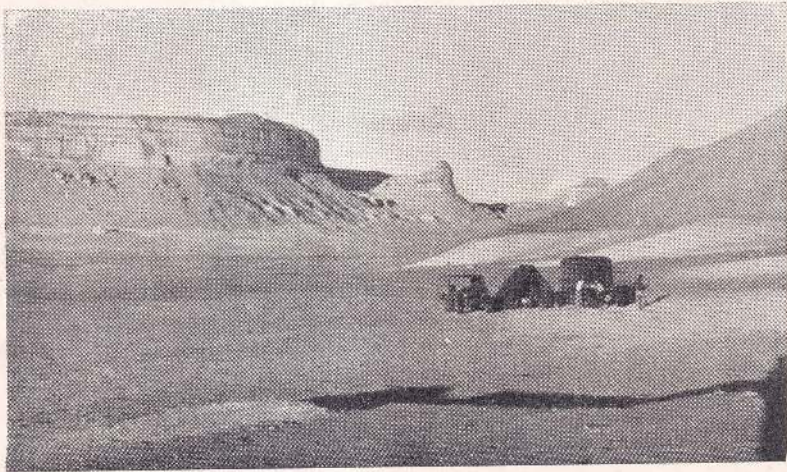
During the first Pan-African Prehistoric Congress in January 1947, an invitation was issued by Mr. Wendell Phillips of the University of California to the writer to participate in the University of California's African Expedition. Details were settled later and it was arranged that the National Museums of Ceylon should contribute a sum of ten thousand dollars towards the expedition and receive a share of the fossils secured. The writer left Ceylon by air on October 16, and joined the northern branch of the expedition at Cairo, on October 18th. Within a few days this party proceeded to the base camp at Kom Oshim at the site of the old Koronis in the desert area to the west of Fayum village and to the north of the salt lake Birket el Qurun.

Cholera was raging and the water in most wells was contaminated. Our water supply however was supposed to be pure, but it was treated with Halozone tablets. The nearest village, that is Fayum, was about 12 miles off, and our isolation was in itself a protection; but the father of the man who served us at table died of cholera six days after he had received an anti-cholera injection. The servant returned to the village, buried his father and resumed work a week later. This was at the base camp 12 miles west of Fayum village where all the trucks and most of the staff congregated; the field camp was about 30 miles further west and out on the plateau of the desert.

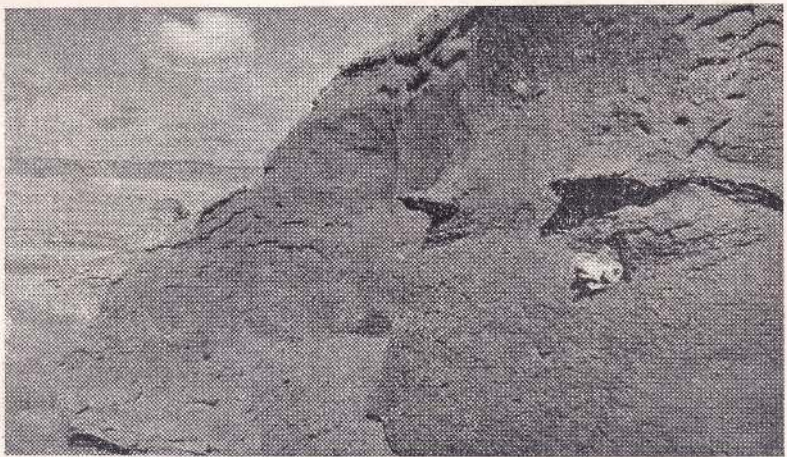
The scientific staff consisted of Professor V. L. Vander Hoof of Stanford University, Dr. R. Denison formerly of Dartmouth University, and myself as paleontologists, Dr. H. S. B. Cooke, former lecturer in Geology at the University of Witwatersrand, S. Africa, as Geologist, Dr. S. A. Huzayyin, professor of geography at Farouk I University, Alexandria, as Prehistorian, and Captain George C. Russel of the U. S. Army as Geographer. About a week after work commenced Prof. Vander Hoof left for America.

A preliminary trip was made into the desert and a route of ascent discovered up the steep escarpment of Eocene fossiliferous beds near Qasr-el-Sagha. The plateau had been worked by Beadnell of the Egyptian Geological Survey in 1905 and later by the German expedition under Margraf and lastly by Walter Granger of the American Museum of Natural History. Consequently all the larger fossils that lay at the surface had been collected, which made our task difficult as we had to prospect for fossil beds that lay under the sand. This was usually done by walking about ten or fifteen miles daily and searching for fragments of fossil bone at the surface and erecting a pillar of stones near each find. Very often a fragment of bone about one centemetre square or less was the first indication of the existence of fossils in an area that appeared blank. Searching in the vicinity presently revealed other fragments which became more numerous as one approached the fossil. Following up the trail of fragments resembled tracking a wounded animal by its blood spoor, only here one did not know whether the prize would be something extremely valuable or utterly worthless. It is this element of chance that keeps the fossil hunter working at fever pitch all day long in spite of the terrible blinding white glare of the desert, and its aridity.

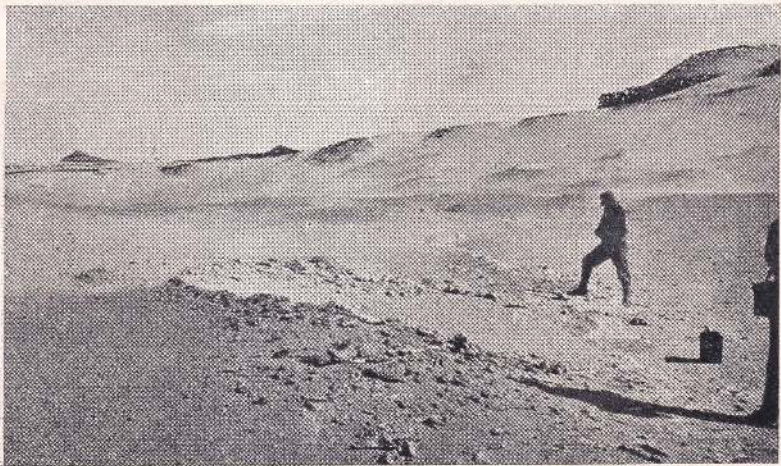




a



b



c

In the valley of fossil whales, East Libian desert.







While hunting for fossils in the area about 10 miles from the base camp at Kom Oshim on several occasions we came across recent human skeletons. In one the dried flesh and skin were still intact and emitted very little odor. Another was a woman's. Her skeleton with flesh on in places lay in a stone chamber in some ancient ruins at Qasr-el-Sagha in the desert.

The police officer at Fayum suspected that many of these skeletons were results of murder and stated that it was dangerous to be caught alone by Bedouins who would not scruple to kill a man for the clothes he wore.

After spending several weeks on these fossil beds of the plateau above the escarpment Dr. R. Denison, two U. S. Marines, Capt. G. G. Edwards, Tech Sergeant Charles Evans, and I drove about fifty miles further into the desert in a W. S. W. direction in two trucks into the area discovered by Beadnell which is full of fossil whale skeletons of lower Oligocene age. These skeletons are many hundreds of miles from the sea today, but the fact that about twenty lay within a radius of one mile from our camp shows that even 35 million years ago schools of whales committed race suicide by stranding themselves as does the False Killer Whale today off the shores of Ceylon and a few other countries. (Plate I b, c.)

For many miles we drove upon remains of sea animals such as nummulites and fossil oysters, and cephalopods while parts of saw fishes and turtles, were common. The saw fishes were peculiar in that some of them only possessed a few small teeth near the tip of the saw. In this part of the desert one had to travel over fifty miles to get to water, but while hunting for fossils I captured a living snake a species of *Psammophis*. The only water that it could utilize would be the morning dew which is apt to be heavy during certain months. On returning to camp I left Denison and joined Dr. Huzyyin, our prehistorian, who was collecting stone implements in the Pleistocene lake bed that lay about 6 miles from the base camp at Kom Oshim. The first morning Dr. H. B. S. Cooke, our Geologist, drove Huzyyin and myself in a truck to these lake deposits. En route we passed a heap of bones of a large animal. I wished to stop and collect them as they appeared to be fossilized. Cooke however remarking that they were bones of a recently dead camel motored on, and after depositing us at a point three or four miles further afield returned to camp. Leaving Huzyyin and his man to collect stone implements I walked back to examine the bones. They were those of a hippopotamus, and among them were numbers of stone implements ranging from large choppers made by sharpening the edges of pebbles, to thin slivers of flint with sharp edges. I soon discovered several other skeletons along the same contour in the depression. About two or three miles away on a series of ridges, were the stone age settlements discovered by Caton Thompson. Some of these had artefacts of three or more culture phases, namely, a mesolithic, two neolithic, a predynastic and early dynastic ones. At one place in the sand was a pot full of fresh water mussels just where it had been set to cook by its neolithic householder who had evidently fled before the sudden onslaught of some marauding tribe.

Neolithic man had also set fire to the extensive reed beds that once flourished in this area, for large tracts contained ashes of such fires which were mistaken for his kitchen sites.

Towards the close of the Egyptian phase of collecting work Denison joined me at the base camp and we generally went out in the same truck. He worked the Qasr-el-Sagha beds while I continued on the lake beds. It was about this time that we encountered Egyptian desert wolves. These animals are reputed to have dragged soldiers out of their tents at night during the war; they are almost twice the size of an Alsatian dog, dark grey, long haired and thick set.

Once Denison dropped a labourer and myself at the lake beds near H. M. King Farouk's duck reserve in the desert and drove twenty miles further off to the escarpment. When returning for us that evening he met four wolves which refused to move although he drove close up to them, and he stated that he half expected to find the skeletons of myself and my companion as we were unarmed. However I saw no wolves until some weeks later. While Wendell Phillips and I were prospecting near King Farouk's wild duck reserve a wolf came



down to drink. Since Phillips possessed a revolver I suggested that we should ride it down and shoot it. As our truck stuck in the sand from time to time the animal outpaced us and escaped by descending an escarpment.

On 30th December, 1947, six of us left in four trucks for Lake Rudolf. Out in the Libian desert of the Fayum area there are small isolated tracts of vegetation which can scarcely be termed oases although harboring interesting assemblages of animal life. In the lower scrub are trails left by various sand lizards, snakes, birds and rodents intermixed with those of herbivorous mammals such as gazelle, and carnivores such as jackals, desert wolves and hyaenas. When travelling southwards towards the Sudan these sub-oases reveal palms among their vegetation, while ostrich and leopard are reputed to be among their fauna. Adjacent to these sub-oases are tracts of loose sand, and the trucks of the expedition generally ran into them thereby losing much time winching each other out and prospecting for a motorable path. The term 'sand ford' is here suggested for the motorable paths across these 'lakes' or 'streams' of loose sand. Directly the leading truck stuck the others would slow down, diverge widely, and test the margin of the loose 'sand lake' until a sand ford was struck. Then they would return, winch out the leading truck and cross the sand lake along the 'ford'. This was not always easy, and sometimes several hours were wasted.

Such sand lakes afford no obstacle to camels but they are a serious impediment to heavy trucks especially in the flat desert but in ascending escarpments, the vicinity of beds of extinct streams or waddies frequently afforded the firmest sand for trucks to travel upon. Camping for the night or 'night stopping' in the desert was as follows. Everyone assisted in taking out the cooking outfit, bedding and lamps, for we had no servants. Thereafter all helped with the cooking and washing up of dishes and plates. The camp cots were usually placed close together, and next morning after breakfast the trucks resumed travel. In mosquito infested country, nets were either attached to the trucks and cots or to trees, but no fires or precautions were taken against wild animals.

On January 7th while travelling from Luxor to Assuan we passed through thick lacustrine or deltaic deposits carved into a series of ridges by stream action and tilting. These exposures should yield fossils and prehistoric artefacts. In this area the towns of Coptos and Kom Ombo were the old depots where African elephants were rested after being collected from further south for the armies of the Ptolemys who attempted to use them in checking the Asian elephants from Syria which proved so formidable a weapon in the hands of their foes, the Seleucids. (Baikie p. 683.)

On 13th January the party left Assuan with a guide and followed the western route across the desert. After proceeding 20 miles we saw two dead camels. The skin was more or less hairless and yellow, while the flesh had dried hard in the carcasses which were more or less entire, but age and weathering had made the teeth so brittle that they broke when touched, showing that the animals had probably died several years ago. About three miles further lay four more carcasses and further on eight more, then a solitary one. All had the neck bent back with the jaws agape and most of them were facing Assuan showing that they were a Caravan bound for that city which had evidently run out of water. No more dead camels occurred until we were about 30 miles from Wadi Halfa when we saw two carcasses with their heads directed towards Wadi Halfa. As some of the carcasses revealed a gash in the belly it is probable that the riders had attempted to save themselves by drinking whatever moisture remained in the stomach cells of their camels. It is unlikely that they fared any better than their animals and were probably buried by subsequent caravans.

On the morning of 14th January we crossed the Tropic of Cancer and came across a number of fragments of opalescent fossilized timber. Large monadnocks of Nubian sandstone of Cretaceous age loomed black against the yellow desert sand. That night we camped 10 miles above Wadi Halfa under a ridge in the desert which was full of hyaena and gazelle tracks.

On the 15th morning we entered the settled area. Reed houses were built by the poorer classes, while the wealthier people built large fort-like ones of mud. On approaching Wadi



Half a noticeable feature is the shrill bark of the dogs which is very different to the deep voices of the dogs further north which they resembled externally. On 21st January we left for Khartoum stopping at Abu Hamid and Berber and reached Atbara on the 23rd. The men here wore turbans and the women a saree with a fold over the head. We passed through Shendi and Meroe and reached Khartoum on January 25th which we left on 30th January. We lost our way in the desert missing Kosti and night stopped in the scrub near Umm Ruabba west of Selina. For the first time we heard a leopard coughing some distance from camp. This is the only sound emitted by the African leopard which does not 'bouk' or 'saw' when hunting as does its Ceylon relative.

1st February we moved to Rashad in the Nuba mountains and commenced encountering baobab trees, tall cactus, francolin, guinea fowls and hornbills very similar to the lesser hornbill of Ceylon. 3rd February we were still at Rashad and Denison, Cohen and I visited Falatta village where the Nubas still live in the Neolithic age. The goats of this area are very small as are the fowls which possess dark legs, flat combs and grey feathers. 4th February travelled to Tellodi about 10 degrees north latitude and encountered a number of ground hornbills *Bucorvus abyssinicus*. They were thicker set and heavier than *Bucorvus cafer* of Kenya and usually occurred in twos or threes, not in flocks of ten or twelve as does the latter bird. The long tailed pygmy dove *Oena capensis* (Linné) also commenced appearing. The people here are blue black and most of the men are naked, while the women only wear a short span cloth. 5th February travelled to Tongol. The pygmy dove was less distinctly marked than the ones near Tellodi. We camped in savannah country and were nearly trapped in a grass fire which came upon us at about 3 A.M., when awakened by the distant crackle of flames we saw a wall of fire about four or five miles long blazing towards us. After making fire gaps by burning fresh areas and extinguishing them with wet sacks we waited for the fire to approach closer then attempted to check it with wet sacks, but after 5.30 A.M., were forced to drive off to safety. Flocks of marsh harriers, kestrels, egrets, and small birds hovered above in the smoke clouds or walked near the flames seizing insects and other small animals driven out by the fire. 6th February reached Malakal resthouse. We stayed here until 9th February and at the junction of the Sobat tributary with the White Nile near Doleib Hill saw hippopotamus tracks in the papyrus and also the puffer fish *Tetraodon fahaka* Hasselquist.

The Nile perch is said to reach a weight of 240 lbs. here. 10th February we left Malakal and while crossing the Sobat ferry saw the villagers fishing. Their catch was *Tetraodon fahaka*, *Polypterus bichir*, the electric fish *Gymnarchus niloticus*, a large Chromid resembling *Tilapia*, two species of Characin, *Lates niloticus* and the cat fishes *Clarias* and *Mystus*. The fishermen were all naked and many employed the cast net. Here *Lates* and other fishes are said to die in large numbers every October when the rainy season commences. We travelled along the road to Bor. The area is heavy swamp for several months annually but was now dry and full of *Ampullaria* snail shells. The pin tailed pygmy dove *Oena capensis* here was orange tinted under its tail. We encountered several herds of Tiang antelope, a few dik-dik and small carnivores. We passed about 50 flocks of doves, each flock consisting of several hundred birds. The presence of the sickly hued 'fever trees' with their smooth silvery green trunks commenced indicating the haunt of the malaria mosquito. Both the men and women of this area are usually naked. We missed the resthouse and camped for the night in the scrub jungle. February 11th travelled toward Wau. All this area is apparently under water for about five months in the year, for the plain was littered with shells of *Anodon* and a sinistral snail known locally as 'Than Akiamps', and of *Ampullaria* which is known as 'Unwat Akiamps'. As we approached Duk Fainyal and neared Kongor a *Planorbis* snail known as 'Amal Akiamps' occurred together with the other snails and we also encountered our first herd of giraffe. These last differ subspecifically from the Kenya giraffes. We night stopped two miles south of Kongor. After this point the sinistral snails disappeared. February 12th we travelled to Bor along a track of dried mud heavily pitted with elephant footprints and littered with their dung which is less spherical and more cylindrical than in the Asiatic animal. The spring of a truck snapped forcing us to proceed very slowly. At 5 P.M. we passed a cattle kraal containing about 500 head that were tethered



and being fumigated with burning cow dung to dispel the mosquitoes which arose in dense clouds<sup>1</sup> after 6 P.M. We night stopped in the bush between Tanbe and Tirakeka about 70 miles north of Juba. February 13th we reached Juba. February 17th left Juba and night stopped in the jungle. February 18th travelled on to Gulu in Uganda. The women now began to show unusually pendulous breasts unlike those further north. The officer of the Public Works Department stated that six of his labourers had been carried off by lions within the past two months. A man would go out about fifty yards into the bush usually between 7 and 8 A.M., a sudden scream and a rustle of the bushes indicated his fate.

The trip northward to Lake Rudolf afforded a striking change in the type of scenery. The party entered mountainous country with tropical rain forest, the trees possessing straight columnar trunks which did not throw out branches until at a height of about 60 feet above ground level. At Kitale an expedition from the Swedish University of Upsala that was collecting vertebrates linked up with our party and travelled with us to Lake Rudolf.

The descent into the rift near Moroto afforded a very fine view of this valley. The flat country at its bottom was semi-desert with thorny scrub. The termite hillocks here were of unusual shape, rising like chimney stacks to heights of about 20 feet (Plate XII. fig. e). In certain areas there were innumerable termite mounds as far as one could see. These appear to originate around the root of a tree, after the tree dies the termites build up the dead trunk and the mound persists as a chimney stack after the tree has been destroyed by the termites.

As we approached the Turkana area the brushwood shelters of these semi-Hamitic nomadic tribesmen with their encircling thorn walls began to appear and eventually we reached Lodwar the capital of this area. After spending the night in the open scrub about a mile from this village we travelled to Arambourg's camp site twenty miles further on at Muruaret hill which is half way between Lodwar and Lake Rudolf. The temperature here was 105 degrees to 110 degrees Fahrenheit. Although the area looked unpromising, fossils were discovered in red tuff. Parts of teeth and limb bones of a rhinocerotid which is said to differ from *Aceratherium* in possessing a horn, teeth of mastodonts, small suinae, rodents and hyracoids as well as testudines, crocodilians and fish vertebrae mostly of *Lates*, were the chief finds. The writer's discovery of a completely mineralized conical bovine horn core 116mm. long with a basal diameter of 42mm. and registered as No. T. 352, from the surface at Muruaret hill on 20 March 1948, suggests that these fossils are not Miocene as is generally believed but Pleistocene and of the same age as those at Olduvai Gorge.

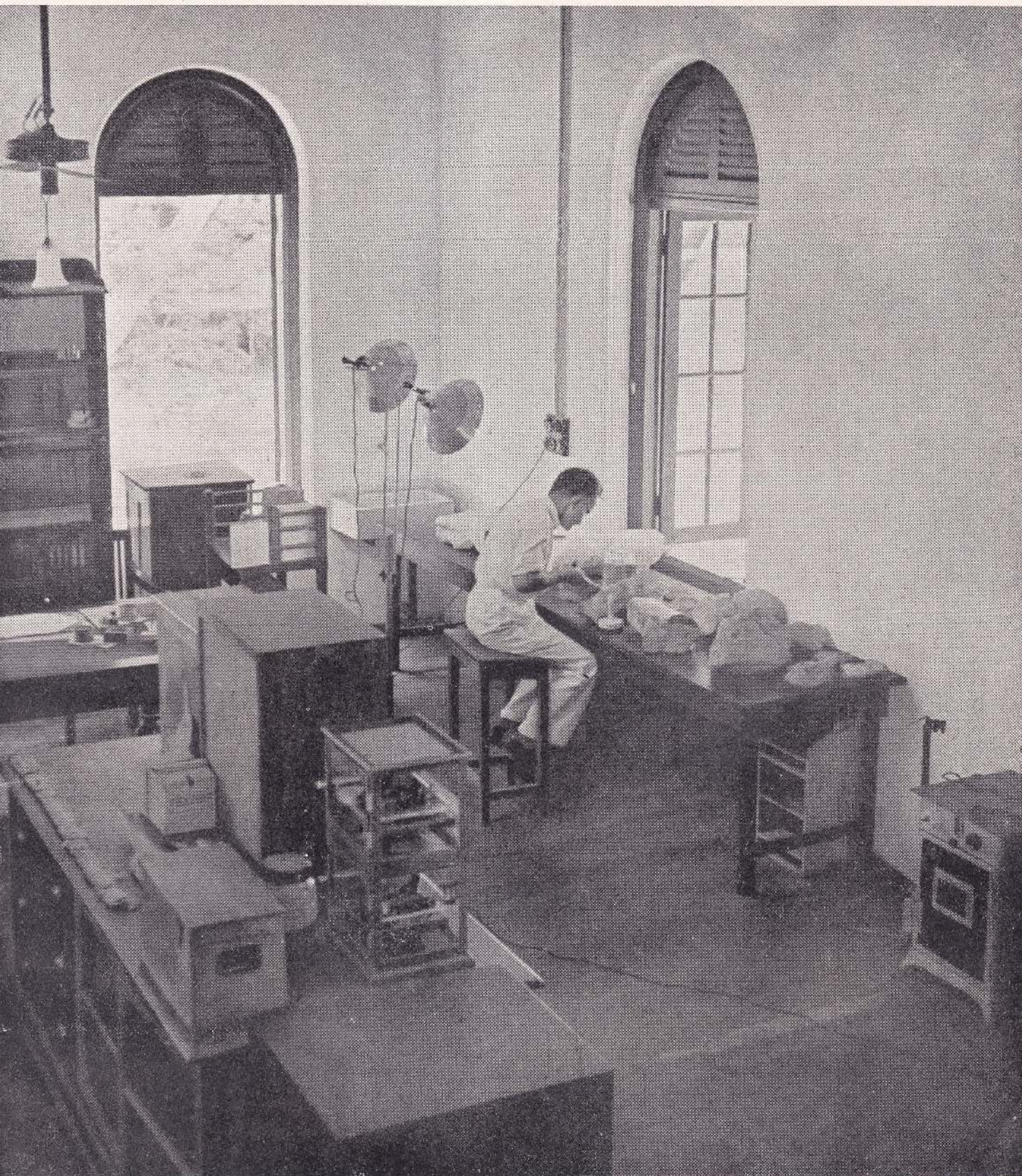
It was while hunting for such fossils that several mounds of boulders were noticed by the writer. Dr. B. Lundholm of the Upsala party had also been struck by them while out shooting birds. The possibility of their being prehistoric graves was discussed by the two of us and although all the members of the California University expedition except Wendell Phillips were very skeptical and the view was expressed that they were merely natural accumulations of boulder drift, excavation proved them to be graves. (Plate III). Lake Rudolf which lay about 25 miles eastward was visited on about four occasions.

The lake with its waters saline with sodium carbonate presented a striking spectacle after the glare of the desert. Enormous numbers of water fowl such as goose, teal, duck, flamingo, pelican and cormorant abounded, while crocodiles floated lazily about a hundred yards from where we bathed during each visit. An occasional hippopotamus was also noticed while the pygmy dove *Oena capensis* abounded in the palms near the mouths of rivers that were now completely dry. These rivers occasionally fill up with water during a rain storm and a wave of foam and flotsam 8 feet high rages down these long dry channels into the lake. In this area it was also strange to hear the nightingale singing at night. It is probably a local race of the bird so well known in Europe.

Fossil collecting at Lothidok Hill was fruitful. Here the red band of tuff showed clearly for about three miles (Plate VI., fig. b). Above it and below it were beds of extinct races of the

<sup>1</sup> Dr. L. S. B. Leakey informed me that an early 18th century European traveller in Abyssinia has recorded that the Abyssinians had warned him to avoid mosquitoes as they transmit malaria.





The fossils under study by P. Deraniyagala in the Colombo Museum Laboratory.







fresh water oyster *Aetheria elliptica*. Some were discovered by the writer at a height of about 300 feet above the level of the plain. A fossil turtle five feet long and three feet wide was discovered by Denison but it was so heavily embedded in the tuff that he failed to extract it. A few days later Cooke discovered what eventually proved to be a more or less complete rhinocerotid skull firmly embedded in the red tuff near Muruaret hill. It was being excavated at the time I returned to Nairobi in March 1948 prior to flying back to Ceylon. From Nairobi the writer was able to visit Neri, the Athi river and Kijabe escarpment through the kindness of Mr. C. Kirparam. Colobus monkeys in lichen festooned trees of the chilly Lobelia containing jungles of Neri afforded a welcome change from the sand storms and heat of Lake Rudolf. These cool mountain forests were infested with rhinoceros, elephant and buffalo, and their tracks were common.

The following is a list of the towns and villages at which the expedition halted during its trip southward, and is exclusive of the numerous occasions when it spent the night either in the open scrub jungle or in the desert.

TABLE I.

1. El Fashn	12. Juba
2. Assyut	13. Gulu
3. Luxor	14. Kisumu
4. Assuan	15. Nakuru
5. Wadi Halfa	16. Nairobi
6. Atbara	17. Njoro
7. Shendi	18. El Doret
8. Khartoum	19. Kitalé
9. Rashad	20. Lodwar
10. Talodi	21. Muruaret Hill
11. Malakal (Kongor and Bor)	

#### Geological Correlation.

*The Pleistocene epoch.*—Attempts at geological correlation of African deposits usually result in equating various Eurasian fossil horizons to African ones of similar appearance. This procedure has led to much confusion, for it should be noted that there yet survive in Africa animals such as baboons, hippopotami and giraffes which became extinct in Eurasia in Quaternary times; it is also known that *Equus*, *Bubalus*, the Hippopotamidae, gazelles and Giraffidae entered Africa after appearing in Eurasia. Prehistoric lithic industries associated with them in Africa are thus obviously younger than their Eurasian counterparts.

The persistence in Africa both of animals that became extinct in Eurasia in Pliocene times and of lithic cultures resembling either the paleolithic or the neolithic, together with the relative lack of lateritization of tropical African beds containing that continent's oldest stone implements and fossils, indicate that equating them to Eurasian ones of similar shape results in geochronological error. Further misleading factors in assessing age are produced by the strong vulcanicity that raged in various parts of Africa from time to time even up to within a century ago, the tectonic movements usual to such action, and the advanced degree of mineralization of relatively young fossils subjected to water heavily charged with volcanic products. All these important factors are generally overlooked in a geochronological estimation of this continent where remarkable changes occur with even more remarkable abruptness and frequency.

The failure of a number of widely separated colonies of similar animals to develop even subspecific differences reveals how recent some of these extensive geological changes are. For example the Sahara became a vast desert so recently that even the beds of the smaller streams that once existed in it are relatively unaltered by weathering while a number of Abyssinian fishes, the Nile crocodile, the Egyptian cobra and puff adder exist unchanged on the other side of the Sahara in North-West Africa; the Abyssinian ground hornbill *Bucorvus abyssinicus* also exists unchanged in West Africa. The presence of remains of fishes, hippopotami and



crocodiles in the Sahara, *e.g.*, at Tazili-Azer, the persistence of living crocodiles in oases, *e.g.*, Darfur, the presence of former Neolithic settlements in what is now desert, when coupled with the failure of living animals separated by so vast an extent as the Sahara desert to evolve even subspecific differences, clearly indicate that the North African homogeneous animal population was separated only recently into isolated colonies by the development of this desert. Several of the terrestrial so-called Miocene deposits of Africa are most probably Pleistocene and only those that can be correlated with marine miocene fossils such as *Ostrea virleti* Deshayes, the fish *Labrodon*, &c., can be accepted as truly Miocene.

The occurrence in Africa of mammals that are known to be Miocene forms in Eurasia cannot be accepted as incontestible evidence of such age in Africa, especially when bovine fossils such as horn cores of antelopes mineralized to an equal degree as those of the so-called Miocene forms occur together with the latter. In view of this it is here suggested that most of the African fossil deposits that are generally regarded as Tertiary are actually no older than Quaternary, while the deposits of human lithic artefacts are also younger than the ages assigned to them at present. The fact that Africa with its wealth of conditions favourable for supporting human existence, continues to be far more sparsely populated than Eurasia and more backward in the progress of civilization, would appear to indicate that the former continent was invaded by man so recently that he has not had sufficient time to spread and develop. Africa's earliest true humans are more advanced than those of Eurasia, and there is a greater gap between Africa's earliest humans and her ape men than that existing between the early humans and ape men of Eurasia. This should not be the case if Africa were the original centre of human evolution. It is also not improbable that the Pithecanthropiinae of Asia are not true Hominidae but should be placed together with the Australopithecinae in a separate family, that was hunted and eaten by early man resulting in their remains occurring in association with human artefacts.

The entry of *Homo* into Africa is probably well after early Pleistocene times and might have been along either one or both the routes mentioned on page 8.

The Pleistocene of Africa appears to differ from that of Eurasia in containing Miocene and Pliocene faunistic elements which apparently persisted in Africa long after becoming extinct in Eurasia, there being no reason for assuming that these forms had become extinct simultaneously both in Eurasia and in Africa.

*The Rift system.*—Some knowledge of the Rift System is essential for the proper understanding of the changes that have occurred in Africa's fauna including man. This system extends from the Zambesi in the south to the Sea of Galilee in the north. Its exposures reveal important fossil deposits and sections of former land surfaces, and it was populated by stone age man who was apparently attracted by the game that abounded near its lakes, some of which contain fishes whose closest relatives occur in the Nile and Indian Ocean. The system comprises (a) the *Southern rift* which is about 800 miles long and 30 to 50 miles wide, which commences near the Zambesi and Lake Nyassa, (b) the *Eastern rift* which is about 650 miles long and 20 to 30 miles wide and includes Lakes Eyasi, Manyara, Natron, Navisha, Magadi, Baringo and Rudolf, (c) the *Western rift* which is about 850 miles long and as wide as the Southern rift, and (d) the *Northern rift* which extends *via* the Red Sea as far as the Dead Sea and Sea of Galilee in Palestine.

The system apparently originated in Jurassic times or somewhat earlier as a result of undulating earth movements and block and trough faulting. By Miocene times large rifts were in existence and subjected to uplift and volcanic activity which buried large areas of the surface altering the drainage pattern. By Mid-Pleistocene times numerous lakes existed in the rift valley and further rifting appears to have established temporary connexions between the lakes and in places, with the Indian Ocean. Some of these connexions were possibly blocked off by volcanic material, *e.g.*, the former drainages of Lake Eyasi, Manyara, and Natron are thought to have been so affected by material from the volcanoes Ngorongoro and Kilimanjaro (Dixey). In the eastern rift is Lake Naivasha which once drained out through Njorowa gorge in Gamblian times. In this gorge are prehistoric obsidian mines. Two thousand feet above the present lake



are Mid-Pleistocene lake deposits upon the Kinangop plateau, where obsidian points, scrapers, and ring stones occur. Acheulean amygdaloids or hand axes are also frequent at the edge of the old Kamasian lake in the seasonal river gravel that entered the lake at Kariandusi near Lake Elmenteita. The Mau escarpment has yielded remains of Aurignacian man from Gamble's cave which together with Enderit rift displays three phases of the Gambian and Makalian pluvials, while at Nakuru is a series of neolithic mounds.

The most remarkable of the fossil exposures in the rift system is Olduvai gorge (Pl. VI., figs. *d*, *e*) which lies to the north of lake Eyasi and extends into the Balbal depression. Five horizons are known of which the most interesting is the fourth; much of this bed which is of volcanic tuff was probably deposited under water during the Kamasian pluvial of Mid-Pleistocene times. In it is a remarkable assemblage of extinct animals together with Chelles-Acheulian amygdaloids. At Olorgesalie the Kamasian lacustrine deposits of Mid-Pleistocene age yield an abundance of Acheulian amygdaloids and fossils from a series of land surfaces separated from each other by lake clays. (Pl. V., fig. *a*). Lake Rudolf which lies in the northern section is one of the most interesting in Africa, both on account of its fauna as well as the fossil deposits and prehistoric human culture phases that occur upon them. The lake is 1,350 feet above sea level but its old beaches reveal that it was once 350 feet higher than today and possibly less deep.

The sediments that accumulated in it are now exposed as strongly tilted beds of red, yellow and grey tuff and the lake's sand spits and old beaches with their characteristic flattened pebbles are clearly discernible. The fact that numerous dried up rivers once supplied this lake with water suggests that the fall of its level is partly if not mainly due to the drying up of these rivers as a result of decreasing condensation. The Lothidok hills which are of volcanic origin reveal much faulting (Fuchs). The most fossiliferous layer consists of red volcanic tuff, while adjacent to these and indicative of flowing water are conglomerates, containing large pebbles of pegmatite, felspar and plagioclase. Interbedded among these are other beds of laval origin which suggest that intermittent eruptions assisted in the extinction and fossilization of the animals now occurring in these deposits, while numerous fresh water molluscs akin to existing species testify to the fact that these beds were formed under water. Most noteworthy among these is the fresh water oyster *Aetheria elliptica* which occurs as different races at the various levels at which the water stood. These range from the present lake level to 300 feet above it, e.g., on Lothidok Hill.

#### Faunistic Routes.

Interchange has played an important part in the formation of Africa's fauna, for both Asian as well as European assemblages of animals have entered the continent periodically. The continuous distribution of certain animals from Africa to Ceylon when contrasted with the remarkable discontinuous distribution of others that are restricted to Africa and Ceylon suggest two routes, namely a constant northern one overland and a temporary southern one along a series of fluctuating archipelagoes. These two routes can be represented by an ellipse passing from Ceylon through India and Asia to Africa drawn as a line but thereafter continued as a dotted line through Madagascar, enclosing the various archipelagoes, and thence back to Ceylon.

(1) The evidence for the overland route is as follows :—

##### *Paleontological.*

(a) The entry of Rhinoceri into Africa from Eurasia during Miocene or more probably Quaternary times.

(b) The entry into Africa of the Asian buffalo *Bubalus*, *Equus*, antlered giraffes, large sheep-like animals, the gazelles, and the hippopotamus during the Quaternary.

##### *Zoological.*

(a) The climbing perches or Anabantidae, the snake-headed fishes or Ophicephalidae, the spiny eels or Mastacembelidae, the large carp-like Tor and the Labeos, ranged either from Asia to Africa or *vice versa*.



(b) The scaly geckoes of the genus *Teratolepis* ranges from North Africa through Arabia into India along the Saharo-Scindic tract and down to Ceylon but no further east.

(c) The saw-scaled viper *Echis carinata* ranges from North Kenya via the Saharo-Scindic tract to Ceylon.

(2) The evidence for the fluctuating archipelagic route is as follows :—

#### Paleontological.

(a) The presence of extinct and living pleurodirous testudines in Africa and Madagascar, and the occurrence of such fossils in India.

(b) The presence of fossils of gigantic land tortoises in Africa and in India and the survival of such tortoises in the Seychelles and Mascarene Islands.

(c) The extinct, subfossil, broad-snouted *Crocodylus robustus* Grandidier, of Madagascar has as its closest relative the living *Crocodylus palustris* Lesson, of India and Ceylon.

#### Zoological.

(a) The spread of fresh water fishes of the family Cichlidae from Africa to Madagascar, Ceylon and South India where the genus *Ectopoma* exists as two species. No others occur in Asia.

(b) The soft terrapins with femoral flaps, subfamily Cyclanorbiinae, are restricted to the lakes of Africa, Ceylon, India and Burma. The hard terrapins or Emydidae appear to have failed to enter Africa.

(c) The so-called limbless skinks of the subfamily Acontiinae have their least specialized species in Ceylon and the more specialized ones in Madagascar and South Africa. The subfamily is restricted to these three countries.

(d) Two snakes appear to have migrated westward from Asia but failed to reach Africa. *Aspidura trachyprocta* Cope exists in Ceylon and the Maldives, while the genus *Polyodontophis* occurs in south east Asia, Comoro Island and Madagascar.

(e) The fact that the Ceylon races of both the swamp crocodile *Crocodylus palustris* Lesson, and the cobra-di-capello *Naja naja* Linné are less specialized than those of India suggests that the direction of their spread was from south to north, while the fact that the related *Crocodylus robustus* is Madagascan lends support to the view that these animals did not enter Ceylon over the mainland of Asia.

Isolation of colonies of a species of animal in various areas along its former route of migration eventually results in the evolution of a series of subspecies.

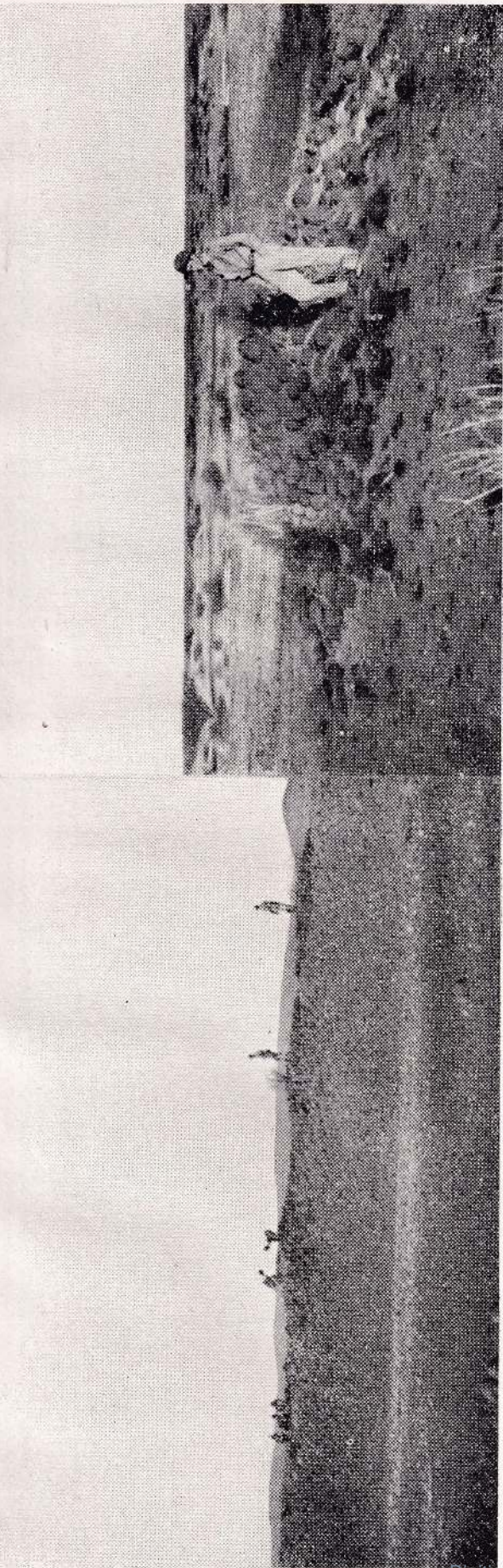
Various barriers such as deserts, mountain ranges, rifts, rivers, and impenetrable disease belts akin to those produced today by sleeping sickness, yellow fever, malaria and tick borne diseases, were and are strong factors in effecting such isolation in Africa. Doubtless they shifted in response to fluctuations of climate, vulcanicity and tectonics after being constant sufficiently long to enable an isolated colony of any species either to evolve subspecific characters or to resist extermination or hybridization by keeping out invaders. Many African animals, for example the lion, hippopotamus, elephant and giraffe, have reacted to such isolation by evolving subspecific differences in various parts of Africa, while Man also has differentiated into relatively pure and hybrid races, according to the accessibility of the area inhabited.

The rapidity with which geo-physical conditions alter in Africa is probably unequalled on any other continent. Large areas of forest have altered into desert and *vice versa* with remarkable abruptness as a result of tectonic movement, volcanic action and rifting, and the water system of no area appears to have been constant for any lengthy period.

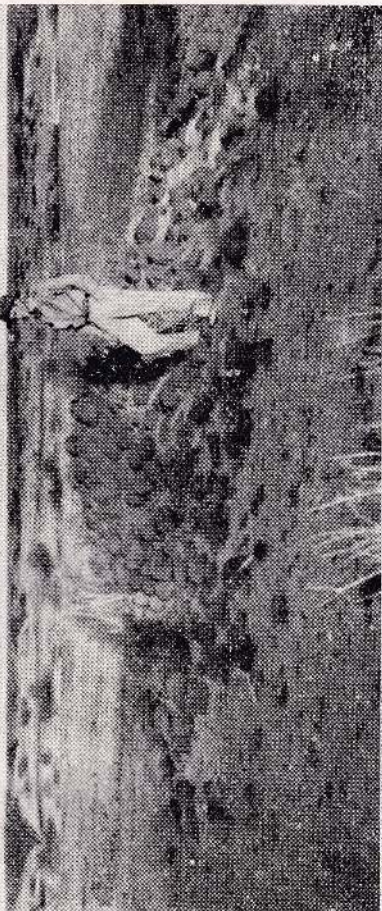
#### Prehistoric Man.

*Burials.*—A number of mounds of boulders that occur around the base of Muruaret hill between Lodwar and Lake Rudolf in the Turkana district were regarded as stone age burial tumuli by the writer. On March 22nd 1948, when Wendell Phillips, the leader of the





a



b



c



d

The Prehistoric graves discovered by P. Deraniyagala at Muriaret Hill, Lake Rudolf.







expedition, visited the camp for the first time the writer drew his attention to them and suggested excavation, although others of the party considered the mounds mere natural accumulations of boulder drift and did not favour the proposal. (Phillips 1948, *b, c, d.*)

However that afternoon the writer selected two typical graves about a quarter of a mile to the west of the camp and assisted by Phillips commenced excavation. One yielded human bones after a couple of hours and next morning the other members of the party assisted in clearing away the boulders and the exposed limb bones were photographed (Plate III., fig. *c*). Thereafter the writer worked with Phillips and an African laborer on the second grave which also revealed traces of a skeleton. The following morning being the writer's last at camp he was busy packing his clothes, but another member of the expedition worked at the first grave and exposed the skull, which the writer photographed "in situ" a couple of hours before leaving for Nairobi (Plate III., fig. *d*).

There are two or possibly three types of burial tumuli.

(*a*) *Grouped tumuli* comprising several graves forming longitudinal series along the crests of ridges (Plate III., fig. *a*). Each tumulus is about 1.5 metres high, 4 metres in diameter and is formed of boulders about 30 cm. by 20 cm. in size, while sprinkled around the mound are white quartz pebbles 8 to 10 cm. long, and quartz flakes. Fine, brown, windblown dust had percolated between the stones. The boulders were in contact with the skeleton which was fractured as a result. The corpse was buried in volcanic ash in a flexed posture, its arm bones being the first to be uncovered in exhumation (Plate III., fig. *c*). The skeleton lay upon its right side and faced eastwards, and was 40 cm. from the top of the tumulus.

(*b*) *Solitary tumuli* (Plate III., fig. *d*) occurred upon the white sand of dried up stream beds. These tumuli were considerably larger than the "grouped" ones being 2 metres high and about 6 metres in diameter while the boulders also were considerably larger than in the other type of tumuli. There were no white quartz flakes among the boulders. As the bones lay in compacted greyish sand which protected them from the boulders it is possible that the corpse was either laid upon a heap of sand and covered with volcanic ash and sand prior to heaping boulders over it, or laid upon the sand of the dried river bed, covered with volcanic ash and more sand, and protected by boulders. When the level of the surrounding surface dropped subsequently as a result of erosion, some of the boulders rolled down to the eroded ground level around the base of the mound. Consequently the corpse that was once at ground level came to be about a metre above it. It lay in the centre of the mound if viewed in section and the skeleton was not in contact with the boulders from which it was protected by the sand around it.

In some graves the protecting boulders appear to have disappeared either through natural causes or human agency, but the compacted sand held the skeleton together.

The large solitary tumuli are probably those of tribal personages of the first magnitude, the grouped ones being those of lower rank, while corpses of commoners were probably left out in the bush as is the general practice among the Turkanas today. The solitary skull (Plate III, fig. *d*) that was examined when in situ, by the writer appears intermediate between modern and Palestinian man and is here briefly described as a new and younger race of Palestinian man. (Keith, A.— 9 July 1932 *Illustrated London News*.)

### ***Homo palestinus turkanus*. ssp. nov. (Plate III., fig. *d*).**

The skull is allied to *Homo palestinus* Keith, from which it differs in the greater slope of the ascending mandibular ramus, the lesser prognathism, and the stronger malar bones.

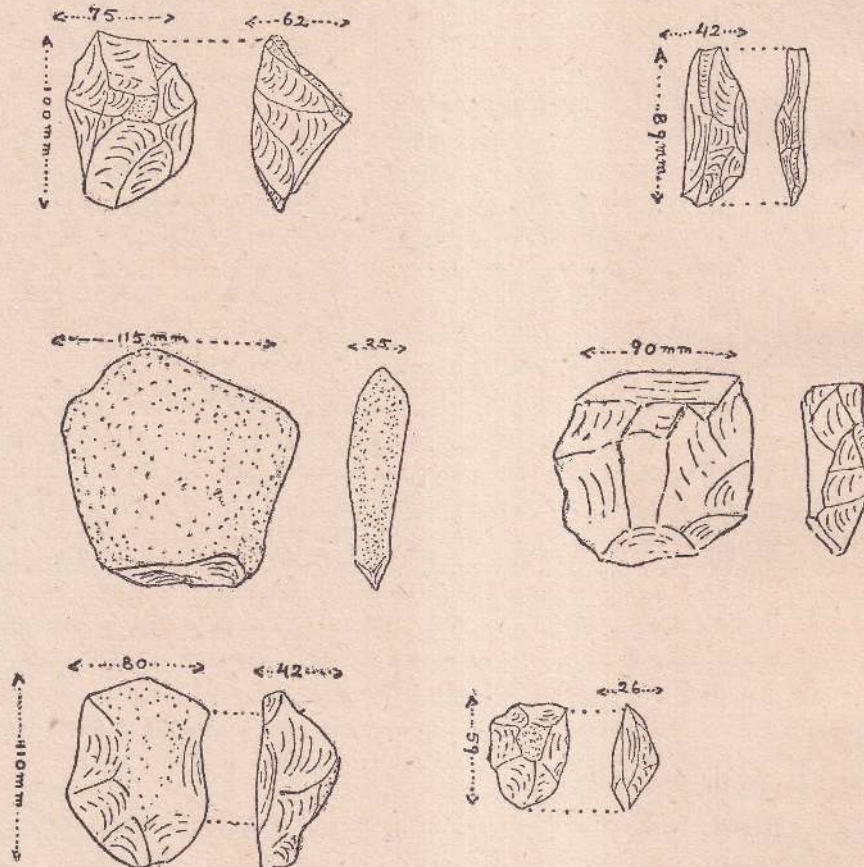
The high mandibular ramus shows that these humans are not essentially negroid. The skull is moderately hypsicephalic and the supraorbital torus is sufficiently pronounced to attract attention; the skull walls were also thicker than in modern man; the mental prominence is moderate. The teeth are badly worn, several molars being worn down to their necks. The bite is of the edge to edge type.



*Type.* Plate III., fig. *d*; the skull of a male about thirty five years of age to judge from the sutures.

*Horizon.* In the grouped graves at the foot of Muruaret Hill (Map 1 : 500,000 Moroto. E. A. F. No. 1570. Zone H.) in the Turkana district, half way between Lodwar and Lake Rudolf in East Africa.

The stone implements in the vicinity appear to be a mixture of a Turkana phase of the Wilton Culture comprising flakes, lunates and points of jasper, chalcedony and flint, mixed with developed Levallois artefacts (Fig. 1.)



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Fig. 1. Stone implements of developed Levallois technique from the surface near the Mesolithic graves at Muruaret Hill, Lake Rudolf. Their dimensions are indicated in millimetres.

The fact that the skeleton was in volcanic ash suggests that volcanic activity was prevalent at a not very distant date prior to the burial, while the location of these graves far above the present lake level suggests that the burials occurred when that water level was much higher than at present, possibly during the Makalian pluvial.

These facts when taken into consideration together with the relationship of the skull itself and the contemporary human lithic culture suggest a mesolithic age for these burials.

The following information was sent to me after I returned to Ceylon.

Master Sergeant James Houle of the U. S. Marine Corps states in a letter I received in September that after the excavation of the second grave selected by me (Pl. III fig. *b*) was completed it was seen that "the body was in the familiar folded fashion. The head was to





a



b



c

Neolithic illustrations pecked upon the rocks at Abka, at the Second Cataract of the Nile  $\times \frac{1}{4}$ .







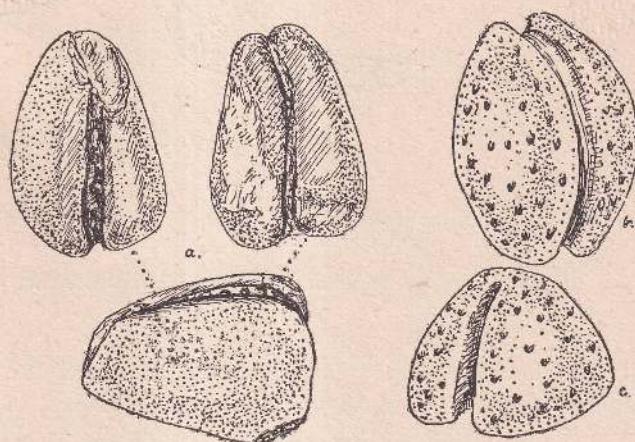
the east, the knees drawn up. Hands were together and under the skull. It was fossilized but the ground immediately around the skeleton was much darker than the other sandstone".

Houle discovered the third skeleton which he states was "about 300 years east of the camp in the old river terrace. I was going after a gazelle and saw a small portion of the skull exposed. A few finger bones were exposed as were the knee bones. We went after him and found some fine stone crescents with him". Dr. H. B. S. Cooke the geologist informed me that there were "four artefacts were in a small group near the pelvic region" and considers them "Magosian or early Wilton and thus Mesolithic rather than Neolithic".

*Dispersal:* (a) The degree of similarity between the Sohan paleoliths of India and the Kafuan ones of Africa is paralleled by the neolithic artefacts, for pitted pebble hammers and celts almost identical with those of Ceylon occur from India to Africa. Specimens were secured for the first time from Egypt after a special search was made for them in the Fayum at the instance of the writer, and they belong to Caton Thompson's Fayum B culture phase. Recently A. J. Arkell the Archaeological Commissioner of the Sudan has secured specimens near Khartoum and L. S. B. Leakey has found them in the Wilton and Smithfield culture phases of East Africa.

(b) Entry into Africa of stone age races using such artefacts was probably along the Nile. Periodic floods of that river appear to have forced them to camp at certain passes such as the second cataract at Abka to await the subsidence of the river. While waiting they left their engravings of men and animals upon the waterworn rocks (Plate IV.). The animals frequently depicted were crocodile, oryx, gazelle, giraffe, rhinoceros and elephant. Some of the elephants they figured there resemble certain neolithic drawings of Ceylon (Deraniyagala) for the fore quarters are elevated, the hind quarters shortened, and the rump elongated unduly (Deraniyagala 1948c). As the hind quarters are high in the African elephant, the Abka drawings appear to have been executed by Asian immigrants who either failed to appreciate this conspicuous difference between the elephants of the two continents, or inadvertently reverted to their former method of drawing elephants.

(c) The next point of interest is the paintings in the rock shelters at Kisesi in Tanganyika (Plate V). The Abbé Henri Breuil who examined them during the Pan-African Pre-historic Congress expressed the opinion that they were more primitive than any found further south in Africa, and this opinion supports the view that these prehistoric 'aspects' had spread from north to south.



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Fig. 2. Prehistoric stone ear stretchers. a from Ravanella cave, Ceylon. b Turkana ear stretcher. c Kikuyu ear stretcher. b and c are modern African ones.

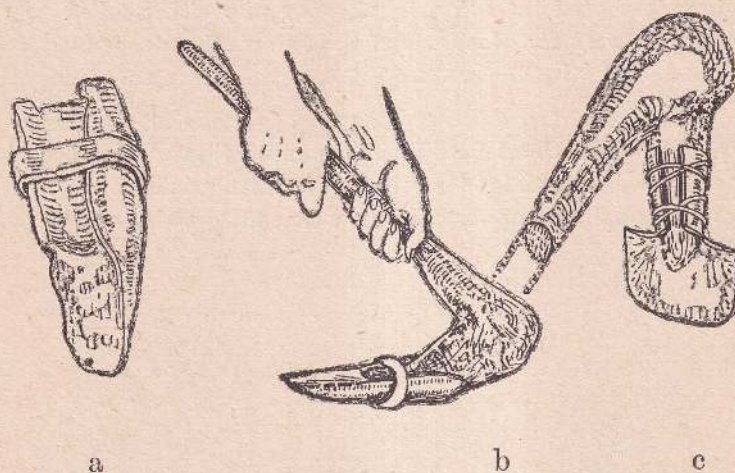


(d) The discovery in Ceylon of a prehistoric stone ear stretcher which is a cruder form of the ones in use today by tribes in Kenya, (Fig. 2) also supports this view. However the identity of the Ceylon race is in doubt. Relict negrito races exist in parts of Southern Asia and skulls excavated near Cairo at Maadi by Prof. Mustafa Amer, Bey, resemble those of Bushmen. The only complete prehistoric skull bone from Ceylon is a frontal which agrees with this type, being small and thick, with a heavy but diffuse brow ridge. It is possible that the African drawings are the works of such people who had emigrated from Asia.

(e) The use of red ochre by negroid races in Africa, Malaysia, and Tasmania and the fact that this pigment is common in neolithic excavations in Ceylon and was smeared upon the cerebral surface of the frontal bone mentioned above, when coupled with the fact that the Kadirs of South India file their incisor teeth into points, appear to confirm this view. However since there are non-negroid races in the Saharo-Scindic area that dye their hair red when it bleaches with age, and since there are also non-negroid Indian races who formerly elongated their slit ear lobes by inserting ear-stretchers of wood or terracotta and wore a series of forearm bangles and one on the biceps, it is possible that they introduced the use of red pigment on the hair, of ear stretchers and such bangles, to the Negroids.

(f) The discovery of skeletons in Mesolithic deposits of Guzerat in the Scindic area of India, which are akin to the Hamitic-Negroids of North East Africa (Sankhalia and Karve 1945) and the fact that such a skeleton was discovered by the writer in a burial tumulus in the Turkana area west of Lake Rudolf, (Plate III.) is further evidence supporting the view that some of the African races originated in Asia.

(g) Such migrations were probably frequent, and the fact that beads of quartz, chalcedony, jasper and agate resembling Asian ones occur suddenly in the neolithic deposits of Africa indicate their introduction by emigrants from Asia. (Deraniyagala 1947.)



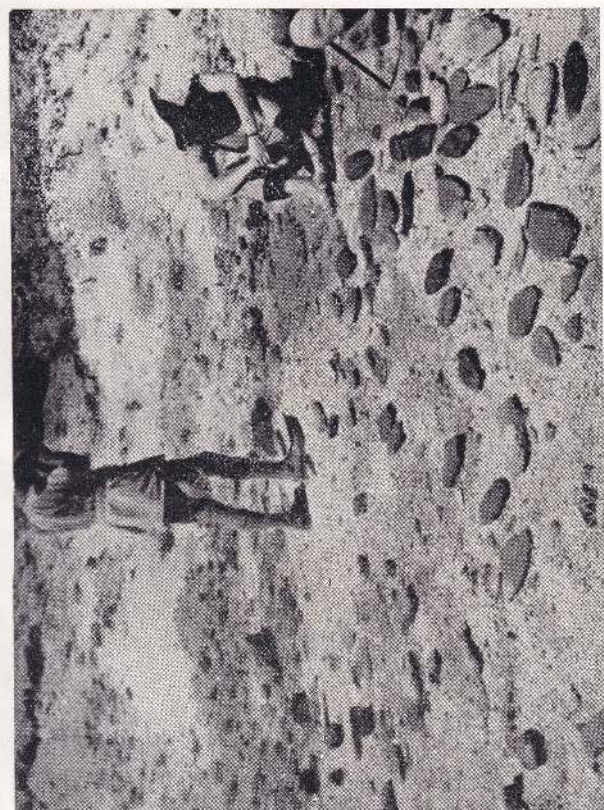
P. Deraniyagala, del.

Fig. 3. Iron celts from Ceylon and the Nuba mountains Africa  
(a) is Colombo Museum No. 42-63-185, A ferrolithic iron celt from gem sand from a depth of nine feet at Dorakada Kumbura, Palnadulla, Ceylon,  $\times \frac{1}{2}$   
(b), (c) Hafted iron celts now in use at Falatta village in the Nuba Mountains, Sudan.  $\times \frac{1}{2}$

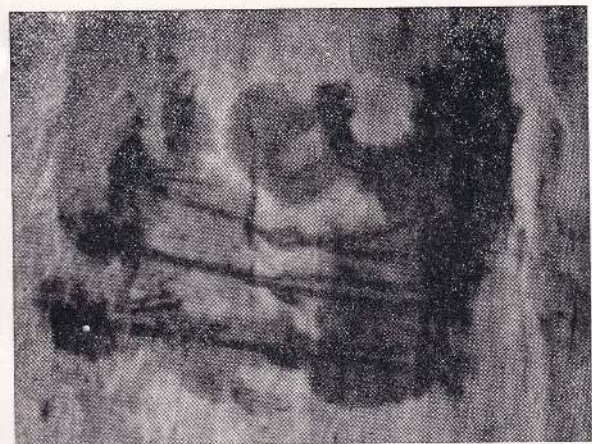
(h) Further support to the view that these migrations were from east to west, is lent by the existence at Falatta near Rashad in the Nuba mountains of the Sudan, of iron celts identical with those dug up from gem pits in Ceylon and assigned to Ceylon's ferrolithic era (Deraniyagala 1947c).

The Afronegro-Hamites of this area are still in the stone age in many respects. Each family possess a series of three grinding pits hollowed out in the communal rock slab. These hollows are about a foot long, six inches wide and one or two inches deep and are utilized for

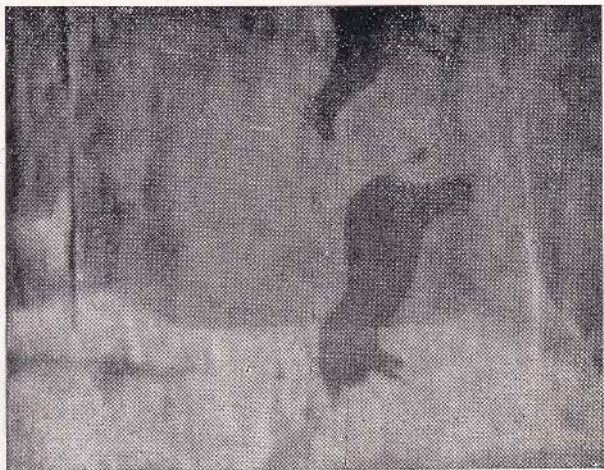




a



e



f



b



c



d

Visits to Olorgaailie and Kisesi during the first Pan-African Prehistoric Congress in January, 1947.













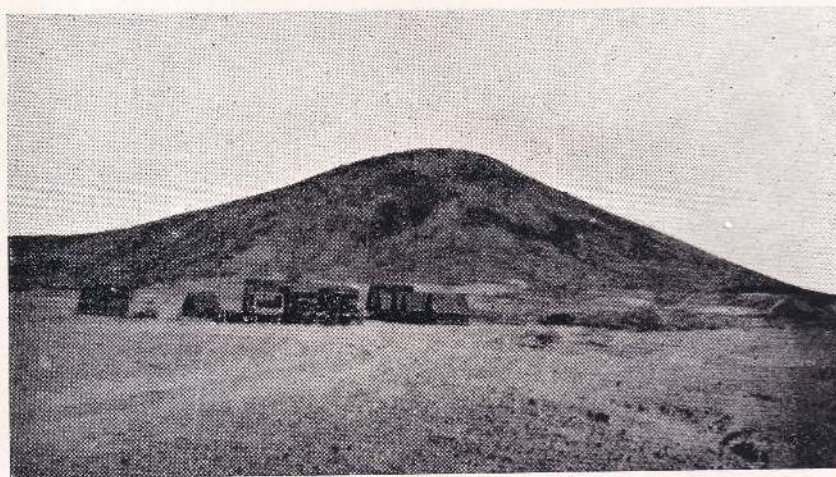
a



b



d



c





grinding red ochre and grain with a pebble grinding stone. (j) In this area the abandoned terraces of millet plantations form patterns upon the mountain side that are identical with those upon the 'patanas' of Ceylon which are regarded as traces of former neolithic plantations. It will thus be seen that in Africa there still persist animals and lithic human culture phases that are now extinct in Eurasia.

### Fossilization.

The principal types of fossil deposits investigated in Africa are

- (a) Marine deposits of Eocene and Oligocene,
- (b) Fluvio-Marine deltaic deposits of Eocene and Oligocene age,
- (c) Lacustro-volcanic deposits of Miocene and Pleistocene age,
- (d) Lacustrine deposits of Quaternary and Holocene age.

Fossils collected in the Libian desert fall under categories (a), (b) and (d), those at Lake Rudolf and Olduvai belong to (c).

#### I. Libian desert.

(a) *Marine* (1) The Upper Eocene beds of Qasr-el-Sagha escarpment generally showed heavy mineralization and fossils were richest where coprolites and certain marine shells such as *Turritella* occurred.

(2) The Lower Oligocene beds of the Valley of Whales (Plate I.) showed the ground so strewn with *Nummulites* as to convey the impression that they had replaced the sand. Other marine shells such as oysters, snails such as *Turritella*, and shells of nautiloids are common, and amongst them occur teeth of elasmobranchs and the saws of various *Pristids* together with carapaces of marine testudinata and skeletons of whales.

(b) *The fluvio-marine* lower Oligocene beds above Qasr-el-Sagha escarpment (Plate VI. fig. a) revealed fossiliferous areas on level ground, in the ridges, in beds of extinct streams, and in some buttes of sand and marl. Fossils lay in different types of soil and no hard and fast rule could be drawn regarding how best to locate them. Some of the smaller fossils occurred in compacted yellow sand under a bed of white sand at a depth of one metre, others occurred in reddish brown almost chocolate colored sand, and yet others in white sand; frequently the sand was highly saline and at times a crust of salt was encountered. The depths at which fossils occurred were from a few cm. to about 150 cm. beneath the surface. If the bed dipped into a hill side then the depth was considerably greater. Generally fossils occurred in the vicinity of the trunks of silicified wood that were massed together in certain places, especially in the vicinity of old waddies or dried up stream beds, while the presence of crocodile coprolites were also an indicator. Beside them occurred fossils of such (1) mammals as ancestral elephants, sirenians, hyracoids, hyaenodonta, and *Arsinothierium*, (2) reptiles such as testudines and crocodilians, (3) fishes as seen by sharks teeth, rays teeth and spines. This suggests that trees swept down by the river dammed up the courses of delta streams, and in the pools thus formed, carcases of mammals collected and attracted testudines and crocodiles from the fresh water and also estuarine sharks and rays.

(c) *Fresh water fossils* such as cat fishes, Nile perch, soft terrapin, crocodile, elephant, hippopotamus, buffalo, antelope, gazelle, and equine are fairly common in dried up lake deposits in the Libian desert, and with them occur human stone age artefacts of the Pleistocene and Holocene.

#### II. East Africa.

(d) *Fossils in tuff* are the product of primary or secondary deposition in water which is subsequently choked up with volcanic products.



(1) The beds to the west of Lake Rudolf near Muruaret and Lothidok Hills in the Turkana district appear to have accumulated in a shallow Pleistocene basin in the eastern section of the Rift system. These deposits show the effects of periodic volcanic activity and tectonic movement.

(2) The Pleistocene deposits exposed at Olduvai gorge in the southern aspect of the Rift system are also similar. The richest of the five horizons there is the fourth which is a greyish tuff containing a rich assemblage of animals and Chelles-Acheulian amygdaloids.

The low mineralization of even Eocene and Oligocene vertebrate remains from the Fayum desert when compared with the high mineralization of much younger fossils of Pleistocene age from Olduvai, and the Omo beds of Lake Rudolf suggests that the advanced mineralization of these latter is due to water heavily charged with mineral salts from volcanic deposits.

*Fossils collected in Egypt.*

A list of some of the fossils collected by the writer from the Egyptian phase of the work of the expedition is as follows:—The indentifications are tentative.

TABLE II.

Number.	Name of the fossil.
16 ..	Eosiren scapula
17 ..	Eosiren calva
20 ..	Moeritherium right mandibular fragment with M.— 1 - 3
22, 23 ..	Barytherium vertebrae
96 ..	Hippopotamus left mandible with canine and incisor
113 ..	Distal half of Eosiren humerus
114 ..	Left mandible of Eosiren
115 ..	Tomistoma mandible, snout, coracoids, scutes
116 ..	Tomistoma mandible and symphysis
117 ..	Tomistoma mandible
118 ..	Atlas, axis and other vertebrae of a large mammal
126 ..	Brain cast of a mammal
127 ..	Brain cast of a mammal
141 ..	Arsinotherium mandible fragment with teeth M.— 2 3
156 ..	Right lower jaw of a Phiomia in plaster
227 ..	Humerus of Arsinotherium in plaster
239, 240, 241 ..	Mastodont teeth
242 ..	Tooth of an Arsinotherium
244 ..	Part of the jaw of an Anthacothere with one tooth
250 ..	Tusk of a proboscidean
390 ..	Nautiloid shell
402 ..	Turtle carapace (Birket Q. series, whale valley)
405 ..	Part of skull of Doruodon whale
403 ..	Pristid saw (Whale valley)
406 ..	Prozeuglodon whale vertebra
407 ..	Skull and lower jaw of Prozeuglodon in 8 pieces



Number.	Name of the fossil.
419	.. Hippopotamus skull in plaster jacket (from $4\frac{1}{2}$ miles north of Kom Oshim)
420	.. Hippopotamus skull and 2 halves of a mandible in three jackets (Locality ditto)
423	.. <i>Loxodonta africana</i> elephant, a piece of lower jaw in plaster ; in situ in lake beds (Locality ditto)
424	.. Large Turtle in plaster jacket ; collectors Deraniyagala and Denison Bed 24 of Beadnell S. 33 (S.W.)

### Pleistocene Fossils.

Descriptions of some of the Pleistocene fossils are now set down, and these deal with the *Hippopotamidae* and the African elephant *Loxodonta africana*.

#### *Hippopotamidae.*

No attempt has been made to correlate the various *Hippopotamidae* of Africa with the numerous lithic culture phases of that continent. Before attempting to do so it is necessary to study the different so-called species. The first feature of such a study is the presence of a large and a small species contemporaneously in various areas, during different phases of the Pleistocene.

Their specific descriptions are usually as fragmentary as the fossils upon which they are based and the only character that is clearly stated is that the animal is either smaller or larger than the one previously known from that area, but there is no method of distinguishing it apart from others of similar size and geological horizon occurring elsewhere in Africa. It is probable that several of these so-called new forms are synonymous with others and simplification of the nomenclature will facilitate the correlation of the members of this family with the pluvials and human stone age industries of Africa.

(a) The earliest name conferred upon a small African species was in 1876 when Gaudry described *Hippopotamus hipponensis* from isolated teeth from the lower Pleistocene of Bone in Algeria. In 1926 Hopwood conferred the name of *Hippopotamus imaguncula* upon fragmentary teeth of a small species from the Kaiso beds of Uganda, and in 1944 Arambourg who had secured skulls of a small species of hippopotamus from the Omo area at Lake Rudolf described it as *Hippopotamus protoamphibius*. Since all three belong to the Kageran pluvial period of Africa it is not improbable that these three names have been conferred upon a single species of small hippopotamus that ranged over the northern half of Africa.

In accordance with the law of priority, Gaudry's name is here employed, but owing to vagueness of description both by himself and by Hopwood it is possible that ultimately Arambourg's name might be regarded as valid.

(b) A similar situation has arisen regarding the larger species. In the Kanam beds of East Africa occurs a large hippopotamus of Kageran pluvial age which persists into the Kaiso beds. These beds belong either to the closing phase of the Kageran pluvial of the lower Pleistocene, or to the inter pluvial between the Kageran and the lower Kamasian pluvial of middle Pleistocene times.

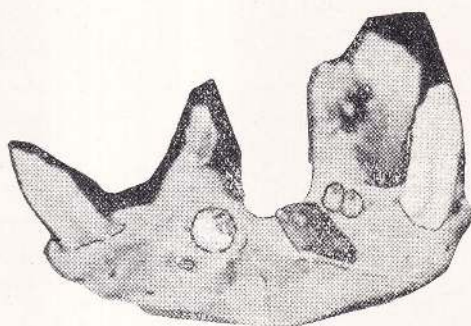
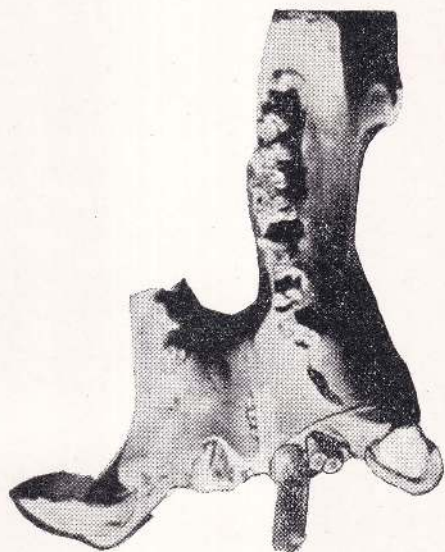
This hippopotamus also is only known from a few isolated fragments and has been named *Hippopotamus amphibius kaisensis* by Hopwood in 1926. Leakey in a letter to the writer has expressed the opinion that the animal might prove to be a race of *Hippoleakius gorgops* (Dietrich) which is probable in view of the fact that the latter is the only large species known from East Africa during middle Pleistocene times. The emended name for *kaisensis* is here accepted as *Hippoleakius gorgops kaisensis* (Hopwood).



TABLE III.  
*Pluvials, Hippopotamidae and lithic cultures of Africa.*

		<i>Hippopotamus amphibius</i> ssp. <i>Choeropsis liberiensis</i>	Africa W. Africa	Neolithic
4. Holocene—(2) Nakuran wet phase (1) Makalian wet phase				
3. Upper Pleistocene—Gamblian Pluvial		<i>Hippopotamus amphibius</i> ssp. <i>Hippopotamus hipponensis</i> ssp. <i>Prechoeropsis pharaonensis</i>	Africa Egypt Gen. et sp. nov. Egypt	(3) Aterian N. Africa (2) Wilton (1) Smithfield  (3) Kenya Stillbay E. Africa (2) Kenya Capsian (1) Kenya Levalloisian  S. Africa (1) Fauresmith
Middle Pleistocene—Kamasian Pluvial		? <i>Hippopotamus</i> ? <i>amphibius</i> <i>robustus</i>	S. Africa	U. Kamasian (3) Acheulian
		<i>Hippolekius gorgops gorgops</i> <i>Hippopotamus hipponensis</i> ssp.	E. Africa  N. and E. Africa	L. Kamasian (2) Chelles-Acheulian (1) Oldowan  Hand ax or Amygdaloid culture
1. Lower Pleistocene	(2) Upper Kageran Pluvial	<i>Hippolekius gorgops kaisensis</i>	Kaiso beds  Kanam beds	Kafuan Pebble culture
	(1) Lower Kageran Pluvial	<i>Hippopotamus hipponensis</i>	Algeria, Morocco, Egypt, Omo, Kaiso	





The holotype of the new hippopotamid genus and species *Prechoeropsis pharaohensis* Deraniyagala  $\times \frac{1}{4}$ .







In elucidating the sequence of human stone age cultures, fossils of the family Hippopotamidae are more important than those of other animals since their presence and absence indicate the fluctuation of the periods of heavy condensation, the so-called pluvials, each species being an important index to a different stone age culture phase, and of value in tracing its age and duration.

In view of the importance of this family it is proposed to deal with it at some length. The family Hippopotamidae first occurs in the Pliocene of Burma and in Asia exists only as the extinct genus *Hexaprotodon* characterized by the possession of six lower incisors. A generically unidentifiable extinct form is known from the top of the middle Pleistocene of Syria and of Palestine, while in Europe and Africa there also appears the genus *Hippopotamus* with four upper and four lower incisors. In Africa there are three other genera. Two of these namely *Prechoeropsis* and *Choeropsis* retain many characters of *Hexaprotodon* and reduce the number of lower incisors to two, *Prechoeropsis* doing so after the animal becomes adult; the third genus *Hippoleakius* appears to have evolved from *Hippopotamus*-like ancestors and is the most specialized member of the family.

In the genus *Hexaprotodon* the orbit is low and located about midway in the total skull length in the early species, but becomes elevated and shifts backwards lengthening the muzzle and shortening the calva in the more recent ones which display a simultaneous shortening and widening of the mandibular symphysis, and a reduction of the second lower incisor teeth, e.g., *H. namadicus* and *H. palaeindicus*. The tetraprotodont genus *Hippopotamus* Linné ranges over Europe as far north as Yorkshire in England, and all over Africa. Its origin is obscure.

The general external resemblance of the skull of *Hippopotamus* to the more advanced species of *Hexaprotodon* at first sight suggests that the former is directly derived from the latter genus. Closer study however reveals a difference in the contacts of the lacrymal bone, the symphysis does not shorten and widen proportionately with the elongating muzzle and raised orbits, while it is the third lower incisors that are suppressed and not the second as in *Hexaprotodon*. The other tetraprotodont genus is *Hippoleakius*. The contacts of its lacrymals are variable but in many respects this is the most specialized genus of the family.

The two partially diprotodont genera are the living *Choeropsis* Leidy, with two incisors in the lower and four in the upper jaw, and the extinct *Prechoeropsis* gen. nov. which possessed a hexaprotodont mandible until it lost its permanent first pre-molars, after which it became diprotodont by the loss of the second and third incisors.

The genus *Prechoeropsis* known from a single mandible shows what incisors were suppressed in *Choeropsis*, a genus in which the convex interorbit, median position of the orbits in the head length, position of the lacrymal, and other characters suggest a closer affinity to *Hexaprotodon* than in the case of *Hippopotamus*.

#### Key to the Genera of the Family Hippopotamidae.

##### (a) Six lower incisors.

- (1) All six incisors permanent—*Hexaprotodon*.
- (2) Only first incisors permanent—*Prechoeropsis* (Plate VII.).

##### (b) Four lower incisors.

(1) lacrymal constantly touching nasal, orbit usually closed, total skull length is  $3\frac{1}{2}$  times calva length, canines not flared—*Hippopotamus* (Fig. 4. b).

(2) lacrymal either touching or separated from nasal, orbit open, total skull length is  $4\frac{1}{2}$  times calva length, canines strongly flared—*Hippoleakius* (Fig. 4. a).

##### (c) Two lower incisors.

- (1) Two incisors in youth and in old age, trefoil pattern of molars vague—*Choeropsis*.
- (2) Six incisors in youth, two in old age, trefoil pattern of molars distinct—*Prechoeropsis* (Plate VII.).



**Hexaprotodon** Falconer et Cautley

*Hippopotamus (Hexaprotodon) sivalensis* Falconer et Cautley 1836 Asiatic Researches Vol. XIX, page 40.

Length of calva contained two and three quarters to three and a half times in total skull length. Lacrymal separated from nasal by frontal touching maxillary. Orbit open posteriorly and either level with horizontal plane along the top of the nasal bones or elevated above it, and situated at the middle of the skull length or somewhat posterior to that point. Inter-orbital space flat or concave. Six upper and six lower incisors; curvature, compression and fluting of the lower canines relatively feeble or moderate, the external curvature of a lower canine is frequently about one third the circumference of a circle. Length of mandibular symphysis contained 0.87 to 1.78 times in its length. Second lower incisor reduced at times; trefoil pattern in worn molars may be either somewhat vague or distinct.

*Genotype.* *Hippopotamus (Hexaprotodon) sivalensis* Falconer et Cautley 1836.

From the Pinjor level of the Shivalik Hills, India; Lectotype in the British Museum.

*Size.*—Equal to or slightly smaller than the living *Hippopotamus amphibius* Linné.

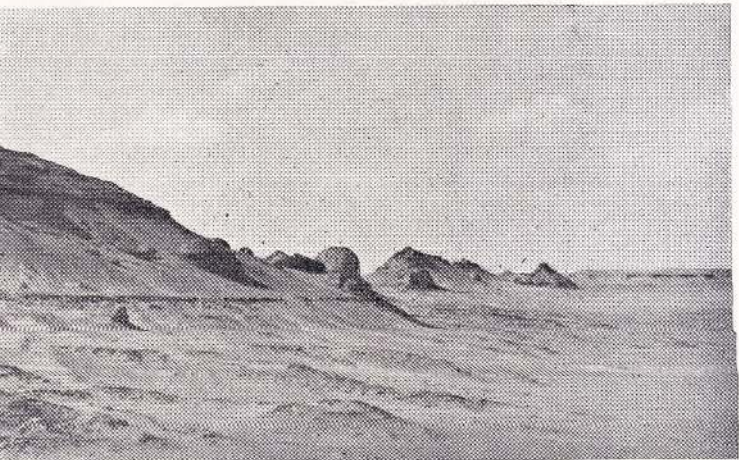
*Distribution.*—This is the only genus known from southern and eastern Asia (east of Syria). Seven or eight extinct species are known from the Pliocene, Pleistocene and subrecent deposits of India, Ceylon, Burma, and Java. A single species is reputed to occur in North Africa, but its generic position is disputed (Hooijer 1946). A single species *Hexaprotodon pantanellii* Joleaud occurs in Europe in what are now regarded as Pleistocene deposits (Hooijer 1946).



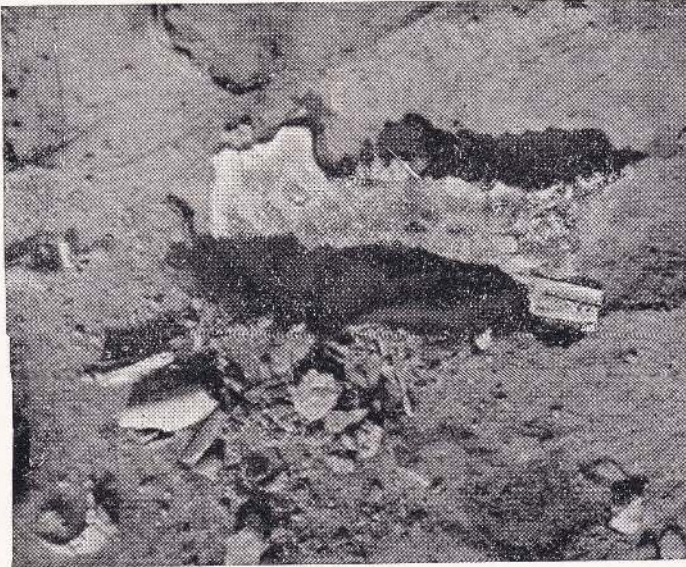
P. Deraniyagala del.

Fig. 4 (a) Reconstruction of *Hippoleakius gorgops*. (b) Head of *Hippopotamus amphibius* to scale. Principally based upon the illustrations in *Stone Age Africa* by L. S. B. Leakey and E. Colbert's description.

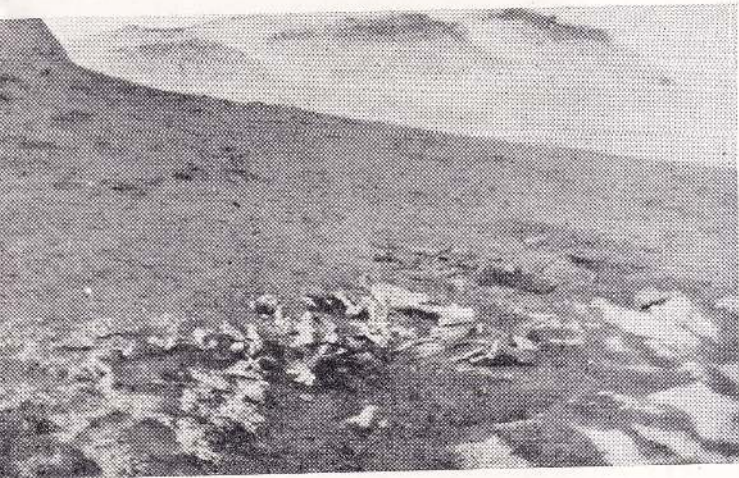




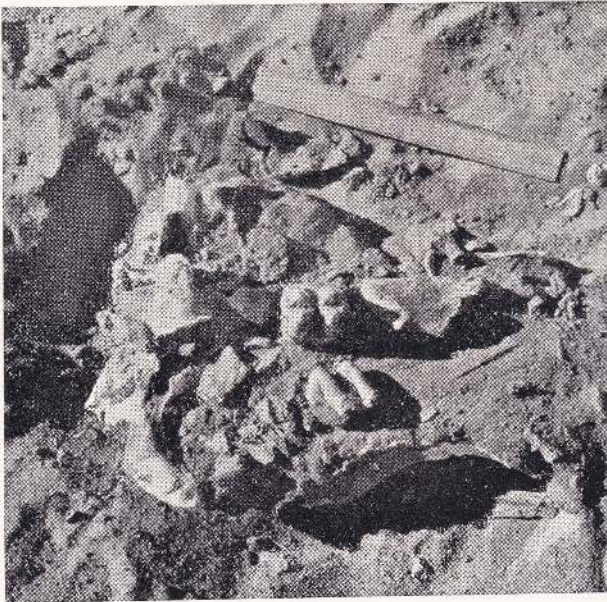
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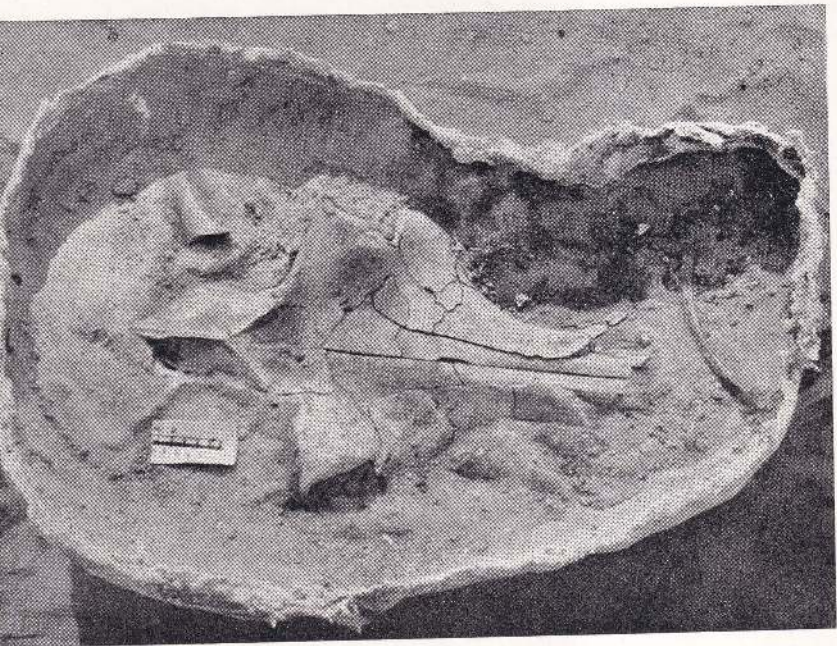
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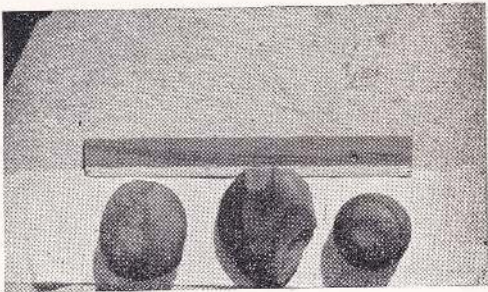
b



c



d



f

Relics of a neolithic hippopotamus hunt discovered by P. Deraniyagala in the Libian desert.







## Hippopotamus Linné

*Hippopotamus amphibius* Linné 1758 Syst. Nat. ed. x.

*Hippopotamus (Tetraprotodon) amphibius* Falconer et Cautley 1836. Asiatic Researches vol. xix p. 51.

Length of calva contained three and a half times in total skull length. Lacrymal touches nasal separating frontal from maxillary. Orbit usually completely closed, the horizontal plane along the top of the nasal bones passes through its middle. Interorbital space concave. Orbit situated posterior to the middle of the total skull length. Four upper and four lower incisors; lower canines moderately compressed and strongly fluted, the external curvature of each is more or less semicircular. Length of mandibular symphysis contained 2.25 times in its width. Third lower incisor occasionally present in foetal jaw but suppressed in adult. Trefoil pattern on worn molars is distinct.

*Genotype*.—*Hippopotamus amphibius* Linné 1758 from the Nile Valley Africa.

*Size*.—Only inferior to *Hippoleakius gorgops* (Dietrich). Some extinct species are pygmies, others are larger than the living form which also exists as about five races in Africa.

*Distribution*.—Western Asia in the middle Pleistocene of Syria and Palestine; Europe as far north as Yorkshire in England (Pleistocene); Africa (Lower Pleistocene to Recent) one living and four or five extinct species.

## Hippoleakius Deraniyagala

(Fig. 4 a)

*Hippoleakius gorgops*: Deraniyagala, 1947. J. Royal Asiatic Soc. (Ceylon Br.), Vol. 37, No. 104, pp. 226-229, fig. 2 and 1947 National Museums Administration Rept. (Ceylon).

Length of calva contained four and half times in total skull length. Lacrymal either touching nasal or separated from it by frontal touching maxillary. Orbit open posteriorly and placed far back on skull. Horizontal plane along top of nasals passes below bases of orbit and of calva respectively, both of which are strongly elevated. Interorbital space deeply concave. Jugosquamosal arch shorter and more vertical than in other members of this family. Four upper and four lower incisors. Canines strongly fluted and widely flared and probably projected beyond the lips in life. The trefoil pattern on worn molars is distinct.

Dietrich's reconstruction of this species from a badly damaged skull is amazingly close to the actual thing although many considered it grossly inaccurate. The subsequent discovery of better preserved skulls figured by Leakey in "Stone Age Africa" and by Hopwood in the "Natural History Magazine, Vol. III." show that the calva should be shorter and more elevated than in the reconstruction. On page 1434 of Osborn's "Proboscidea" Vol. II., Colbert has drawn attention to the extremely elevated orbits, constricted, elongate muzzle, and widely flared canines, while information kindly supplied by Miss D. M. A. Bate and Dr. A. Tindell Hopwood of the British Museum that the position of the lacrymal is inconstant and that the orbit is open posteriorly, confirm the view that this form does not belong to the genus *Hippopotamus*.

*Genotype*.—*Hippopotamus gorgops*. Dietrich, 1928, Rest Wiss. Erg. Oldoway Exp. n.s. 3 Leipzig. Type locality Olduvai gorge, Tanganyika.

*Size*.—The largest member of the family and in many respects the most specialized although retaining several primitive characters.

*Distribution*.—From the middle and upper Pleistocene of Tanganyika, and East Africa. A single extinct species. *Hippopotamus kaisensis* Hopwood is probably an Ugandan race of this species.

## Genus Choeropsis Leidy

*Diprotodon* Duvernoy 1849, C.R. Ac. Sci. Paris, Vol. XXIX.

*Choerodes* Leidy 1852, Proc. Ac. Sci. Phila.

*Choeropsis* Leidy, 1853, Proc. Ac. Sci. Phila (ser. 2), Vol. II.

Length of calva contained about two and three quarter times in total skull length. Lacrymal separated from nasal by frontal touching maxillary. Orbit closed posteriorly, the



horizontal plane along the top of the nasals passing over it. Interorbital space convex. Four upper and two lower incisors; the curvature, compression and fluting of the lower canines less pronounced than in *Hippopotamus*. Trefoil pattern on worn molars vague.

*Genotype*.—*Hippopotamus liberiensis* Morton 1849, J. Ac. Sci. Phila. Ser. 2, Vol. 1, p. 232. Type in the Museum of Academy of Natural Sciences, Philadelphia, U.S.A.

*Size*.—The smallest living member of the family and the most long legged.

*Distribution*.—West Africa.

### A New Genus and Species of Hippopotamus.

A fossil mandible, No. 4718 in the Government Geological Museum at Cairo, was examined with the kind permission of Dr. O. H. Little, Director of the Geological Survey of Egypt. The jaw belonged to a small species of hippopotamus. The fact that it had shed its first premolars and the second and the third incisors of the right side showed that it was adult. Interesting characters were the vestigial size and transient nature of the second and third incisors and the large size of the first which nearly equals the canine. The sockets of the shed incisors showed that they were no larger than the remaining ones which in all probability would have followed suit. The second incisor was partially above the third, and both were at a higher level than the first. The animal apparently commenced life with a hexaprotodont mandible which abruptly altered to the diprotodont or *Choeropsis* form shortly after shedding its first premolars, and possibly before the last molars came into wear, for these are unworn in the fossil. The molars were almost as highly specialized as in *Hippopotamus* which proves that this form is not the direct ancestor of *Choeropsis*. This fossil is now made the holotype for a new genus and species which are described below.

### *Prechoeropsis* gen. nov.

(Plate VII.)

An extinct genus of small Hippopotamidae. Six mandibular incisors which reduce to two after the first premolars are shed. First incisors and canines enlarged and subequal in size; the second and third incisors vestigial, transitory, subequal and placed at a higher level than the first incisor, the second being more or less above the third; canines moderately compressed and well fluted, molars more or less akin to these of *Hippopotamus*, the proportions of the symphysis also resemble that genus. The trefoil pattern is distinct in worn molars.

*Genotype*.—*Prechoeropsis pharaohensis* sp. nov.

*Horizon*.—Upper Pleistocene.

### *Prechoeropsis pharaohensis* sp. nov.

(Plate VII.)

An extinct species considerably smaller than the living *Hippopotamus amphibius* Linné, known from one imperfect lower jaw. The exposed lengths of the subequal second and third incisors are about one third the length of the exposed part of the first incisor; canines moderately compressed, well fluted and with a lateral groove. The second incisor is placed somewhat above the third; both are inclined more vertically than the first to which they are closer than to the canine. The length of the symphysis is contained 2.23 times in its width.

*Type*.—Registered No. 4718 of the Government Geological Museum at Cairo, Egypt, a mandible with the right body broken off behind the premolars. The specimen was dredged up by H. Humphreys from Bahr-el-Baghar from a depth of  $3\frac{1}{2}$  metres in clay, in the middle delta of the Nile, South of Cairo. (Plate VII.)



*Dimensions.*

Width of symphysis.....	290 mm
Length of symphysis .....	130 mm
Depth at middle of mandibular body .....	120 mm
Length of tooth line.....	230 mm
Straight height of canine above jaw .....	88 mm
Straight length of first incisor above jaw.....	88 mm
Straight length of each of two small incisors above jaw.....	28 mm
Height of crown of 3rd premolar .....	45 mm

TABLE IV.

## Reduction of mandibular incisors in the Hippopotamidae

Name	Reduced incisors	Enlarged incisors	Adult incisors	Juvenile incisors
<i>Hexaprotodon iravaticus</i> ..	0	0	3/3	3/3
<i>Hexaprotodon sivalensis</i> ..	0	0	3/3	3/3
<i>Hexaprotodon namadicus</i> ..	2nd	0	3/3	3/3
<i>Hexaprotodon palaeindicus</i> ..	2nd	1st and 3rd	3/3	3/3
<i>Prechaeropsis pharaohensis</i> gen. et. sp. nov. ..	2nd and 3rd	1st	3/3 to 1/1	3/3
<i>Chaeropsis liberiensis</i> ..	0	1st	1/1	1/3, 1/2 or 1/1
<i>Hippopotamus amphibius</i> ..	3rd	1st	2/2 or 2/3	3/3 or 2/2
<i>Hippopotamus hipponensis</i> ..			? 2/2 or ? 3/3	
<i>Hippoleakius gorgops</i> ..	0	? 1st	? 2/2	?

The Egyptian fossils secured by the expedition belong to a race of *Hippopotamus hipponensis* Gaudry. Parts of twelve skeletons were examined from the dried up lake beds about three miles to the north and north-east of the saline lake Birket Quarun near Fayum and south of the Qasr-el-Sagha escarpment.

The beds consist of greenish marl overlain by compacted sand. At some points along the margins of the lakes, erosion has produced a series of hummocks or buttes; about ten feet below the tops of some of them is a layer of bones, artefacts and pottery of Neolithic age. (Plate VIII., a). In many places this material has weathered out and fallen on to the sand below, where it lies mixed up with the more recent predynastic artefacts. In situ in the compacted sand and shale are bones of various animals such as fishes, terrapins, crocodiles, bovines, the African elephant and hippopotamus. Other animals known from surface finds are pig, gazelle, and an equine, possibly a zebra or, wild ass. The bones either occur in situ in the marl and in the compacted sand, or when weathered out, in the loose sand above, which is possibly wind blown. They might have accumulated throughout pre-neolithic, neolithic, and post-neolithic times until with the desiccation of the lake, the country could no longer support such a fauna.

The water living hippopotamus would be affected readily by such changes and be exterminated by man when the diminishing lakes failed to provide it with a safe refuge.



The skeletons of hippopotami are either more or less articulated indicating natural death, or broken up, the bones being disarranged (Plate VIII.) and the teeth scattered instead of lying together, while limb bones split longitudinally indicate that this was done by human hunters and not by large carnivores. (Plate IX., figs. 1, 2). Among these broken bones and in their vicinity lie a variety of stone artefacts, and pebbles brought for manufacturing them, while the fact that no charred bones have been recovered suggests that the hunters were raw meat eaters and in the neolithic rather than in the predynastic culture phase where the science of cooking was advanced. Although the lakes had become too small to afford the hippopotamus a refuge from hunters, they sufficed to support predynastic human settlements in an area which eventually became the desert it is today.

The stone artefacts belong to several phases of the Neolithic as well as of Predynastic age and can be grouped into killing weapons and butchering implements. Among the former are various types of arrow heads both simple and barbed. Among the latter are depressed pebbles as large as a man's fist, that have been fashioned into choppers (Plate IX., 9-13), various sphaeroid hammers (Plate VIII., fig. f.), and a variety of flake and blade artefacts.

The hippopotamus was apparently exterminated from this area by a raw-meat eating neolithic race and towards the end of its presence here the hunters utilized the series of buttes that had been formed near the lake margin, to ambush it, for all the skeletons have been noted only from the vicinity of these buttes.

The fact that these lake deposits are over twenty miles west of the Nile suggest that they were either fed by a western tributary that no longer exists, or that the river itself has shifted this distance eastwards.

This study of the hippopotamus remains in the Fayum desert suggests that—

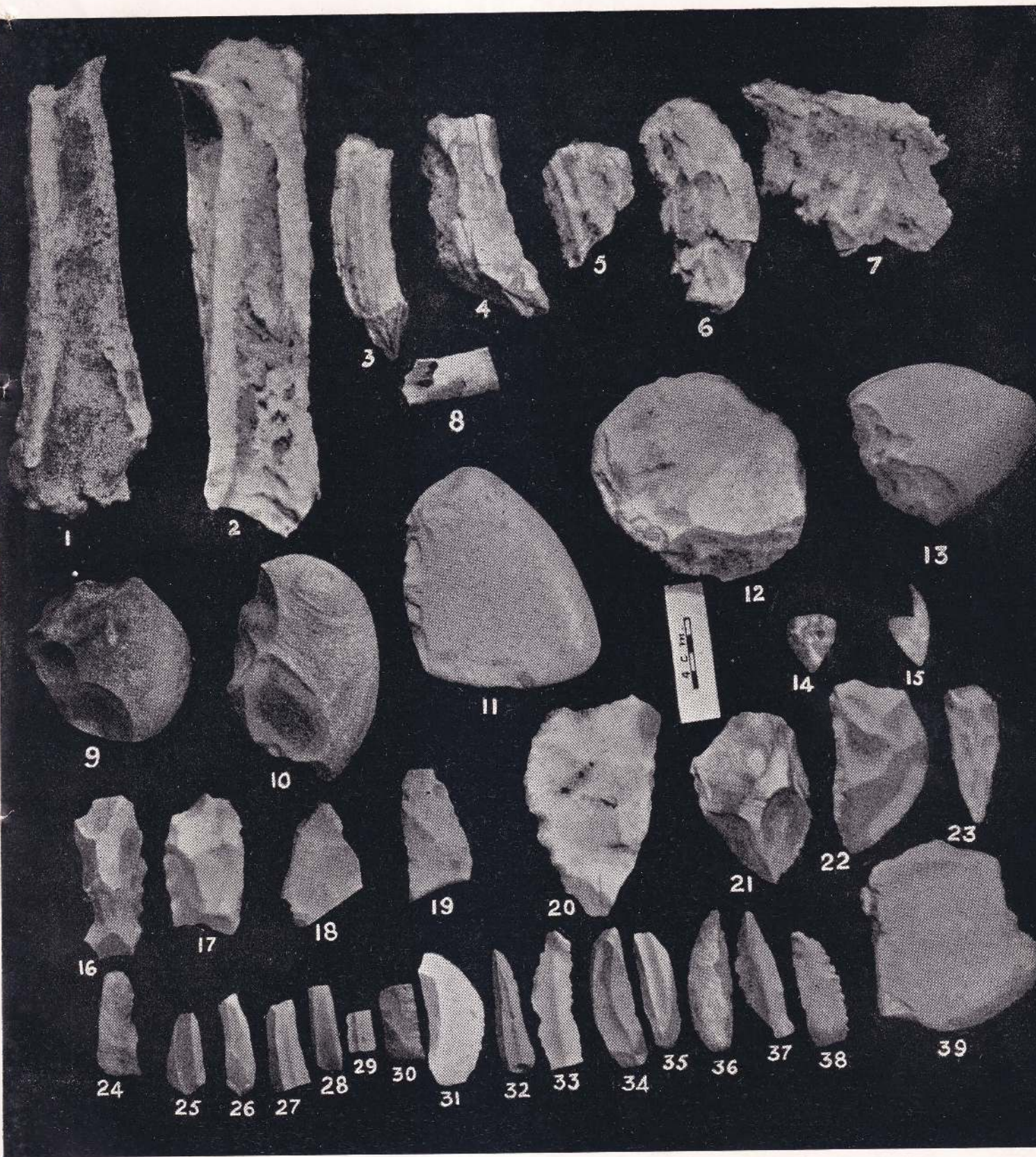
- (1) it was exterminated by a raw-flesh eating Neolithic race.
- (2) Towards the close of the Neolithic the hunters killed it most easily when it passed near or between the buttes bordering a part of the lake margin. (Plate VIII., a).
- (3) Simple and barbed stone arrow and harpoon heads were among the weapons employed in dispatching the animals. (Plate IX., figs. 14, 15.)
- (4) The butchering of the carcass was mainly by use of large cleavers and choppers fashioned from pebbles, conveyed to the spot after the animal was killed. (Plate IX., 9 to 13.)
- (5) The meat was cut into smaller pieces with the finer blade and flake artefacts.
- (6) The marrow was probably extracted by knocking off the head of a limb bone, planting it erect in the sand and either striking it at that end with a cleaver or by placing a cleaver on this end and hitting the latter with a hammer, thus splitting the bone longitudinally. (Plate IX., 1, 2.)
- (7) Lastly the skeleton, including the teeth, was utilized for fashioning bone implements.

The material secured or examined in the desert was as follows :—

Site I.—4½ miles north of Kom Oshim.

- (a) A skull minus the lower jaw, found lying in the loose sand above compacted sand and with a part of the skeleton broken into bits, possibly by weathering, lying close by.
- (b) A skull with lower jaw, limb bones, pelvis, lumbar and sacral vertebrae in situ in the compacted sand above the marl.
- (c) A skeleton broken into fragments in loose sand with stone artefacts lying among them.
- (d) A skull in the loose sand.
- (e) Scattered limb bones.





Fossil Hippopotamus remains and neolithic artefacts from the Libian desert. The bone (1, 2) had been split for its marrow  $\times \frac{1}{2}$ .  
Collected by P. Deraniyagala.







Site II.—Near site T. of Caton Thompson (1934) S. E. V. 40.

- (f) A split limb bone, upper and lower tusks and some vertebrae and ribs in compacted sand.
- (g) A molar and part of jaw in a butte.
- (h) Several limb bones and vertebrae lying in the sand with stone artefacts.
- (j) Ditto.
- (k) Ditto.

Site III. Hummocks below Qasr el Sagha.

- (e) Mandible in compacted sand.
- (f) Femur in compacted sand.

#### *Asian Hippopotamidae.*

The correlation of hippopotamid fossils with various stone age culture phases in Asia is as follows :—

(1) *Upper Pliocene*—the smallest and most primitive member of the family in Asia is *Hexaprotodon iravaticus* F. et C. of the upper Pliocene of Burma. No human culture phase occurs with it.

(2) *Lower Pleistocene*—no artefacts occur with the Indian *Hexaprotodon sivalensis*, the Javan *Hexaprotodon simplex* of the basal lower pleistocene or with *H. koenigswaldi* of the top lower pleistocene.

(3) *Middle Pleistocene*.—I. The earliest Indian artefacts (a) the Pre-Sohan is above the Boulder Conglomerate which possesses derived fossils of *Hexaprotodon sivalensis*. These are of basal middle Pleistocene age by which time *H. sivalensis* was evidently extinct and North India unsuitable for hippopotami. (b) The early Sohan occurring with *Hexaprotodon namadicus* in the basal middle Pleistocene of peninsular India is the first undoubted record of artefacts and hippopotami occurring together and this association persists into the upper middle Pleistocene when *Hexaprotodon namadicus* is replaced by *Hexaprotodon palaeindicus*.

II. The earliest Javan artefacts are of the Patjitanian chopping tool culture which occurs with *H. namadicus* in the Trinil horizon.

III. The earliest Burmese artefacts are of the Anyathian culture of middle pleistocene age. Since *H. namadicus* is first known from the middle Pleistocene of India, then occurs in the middle Pleistocene of Java, it is reasonable to suppose that it occurs at some level of the middle Pleistocene of Burma which it would have to traverse in spreading to Java. The only hippopotamid fossils known from Burma however are of upper Pliocene and possibly lower Pleistocene age.

(4) *Upper Pleistocene*.—I. The Hippopotamidae had become extinct in India when the late Sohan and Madrasian culture phases were prevalent.

II. In Java the Ngandong culture is of the same age as what is considered to be a highly specialized Javan race of *H. namadicus*. While it is not improbable that this species persisted in Java after its extinction in India, it is more probably a local race of *H. palaeindicus* to which the trivial name *javanicus* might be applied. The semblance of the fossils associated with hippopotamid ones in Ceylon, to the Pinjor ones of the lower Pleistocene of India, suggests that the Ceylon hippopotamus might be of that age. On the other hand the fact that stone implements occur in association suggest that it is of middle Pleistocene age or younger, since it is only during the middle Pleistocene that the earliest stone cultures of India, Burma and Java commenced. In view of this it is proposed to assign a middle Pleistocene age to the early stone age of Ceylon which is the *Ratnapura Culture Phase*, but it is not improbable that the hippopotamus out lived this phase and persisted into Ceylon's neolithic, namely, the *Balangoda Culture Phase*.



### A New Race of African Elephant.

The African elephant *Loxodonta africana* (Blumenbach) had been subdivided into eighteen races until Glover Allen (1939) reduced them to four. Travelling from Cairo to Nairobi however enabled the writer to examine a large collection of tusks with the Game Warden of Khartoum and a smaller collection with the Game Warden of Nairobi, as well as two young elephants from the Bor area and the Belgian Congo respectively that were at the Khartoum Zoological gardens, and to discuss elephants with several big game hunters of the Sudan and of Kenya. The conclusion is here reached that some of the races sunk by Allen should be revived, and further that there are others awaiting description.

The present northern limit of the African elephant is in the Sennar area about 15 degrees north latitude, but there is reason for supposing that it inhabited the foot hills of the Atlas mountains during the Roman-Carthaginian Wars, 264 B.C. The two northern races at 15 degrees north latitude are *L.a. cyclotis* (Matschie) of the Cameroons and French Sudan, and *L.a. oxyotis* (Matschie) of the upper reaches of the Atbara river. The occurrence of *Loxodonta africana* as a fossil in Egypt was first mentioned when molars collected by Miss Caton Thompson were tentatively identified by D. M. S. Watson, but hitherto no description has been published to show that actually the elephant is *Loxodonta africana*.

While examining the vicinity of one of Caton Thompson's sites for neolithic stone implements the writer discovered that the makers of these implements had ambushed several elephants and hippopotami within a few hundred metres of an old lake bed. In one instance he discovered a fossil elephant mandible more or less complete, the greater part of the cranium with two second molars and also a humerus (Plate X.). Unfortunately the expedition had exhausted its supply of solvent for the shellac, consequently only a section of the mandible could be prepared for collection but so imperfectly was it shellaced that by the time it reached Ceylon the dentine, cement, and enamel of its teeth were reduced to small fragments. A part of one molar that had been partially hardened however survived the journey, as did most of the jaw bone, and these suffice to prove the specific identity of the elephant. Fortunately photographs and a few measurements were taken of the teeth and cranium "in situ" and these are now given (Plate X.).

Travelling southwards up the Nile the writer was informed that bulls of the desert elephants of Darfur oasis possess such poor tusks that they resemble females. This information was first supplied by—

Colonel Mohamed Badrān officer commanding the 7th Infantry Battalion at Assuan who had spent fifteen years in the desert and is a well known sportsman stated that the elephants he had encountered were divisible into animals from :—

- (a) *Darfur*.—Small eared, large sized, short tailed animals with such short tusks that the males resemble females and are often mistaken for such.
- (b) *Bahr-el-Gazel*.—Large eared, medium sized, long tailed animals with good tusks.

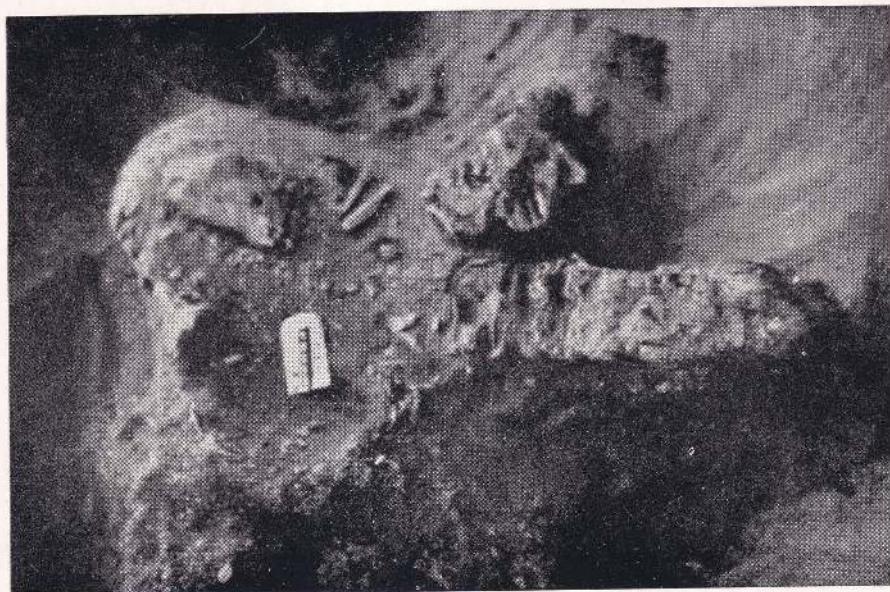
As the writer travelled up the Nile he obtained confirmation of the former statement from other reliable sources. These are as follows :—

Mr. Wordsworth the registrar of Co-operative Societies at Wadi Halfa stated that he had heard from Mr. I. Owen, the District Commissioner at Torit, that he had shot short tusked elephants at Darfur. He also stated that the elephants of the Torit District were small.

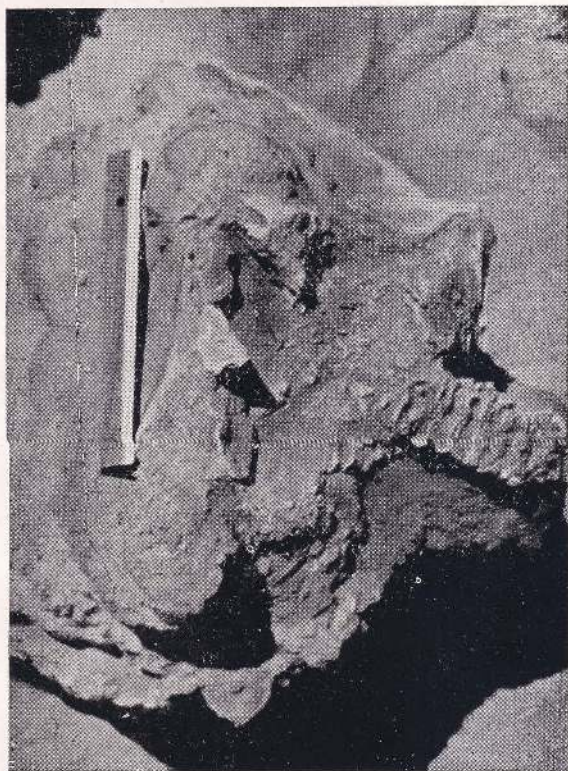
Lieutenant-Colonel W. A. H. Forbes, the Game Warden at Khartoum, stated that the elephants along the Sobat and White Nile possessed large tusks and that those of the drier areas such as Darfur and along the Blue Nile possessed small tusks.

Mr. A. J. Arkell, the Archaeological Commissioner at Khartoum, who had spent many years in Darfur stated that there was only a single herd of about 19 individuals there and that they all possessed small tusks. He also added that the hyaena of North West Darfur is a dark bluish grey with faint black stripes, and that the pools in the oasis there harbor crocodiles. This latter statement about the hyaena suggests that it has evolved subspecific characters as a result of isolation and the elephants appear to have acted similarly.

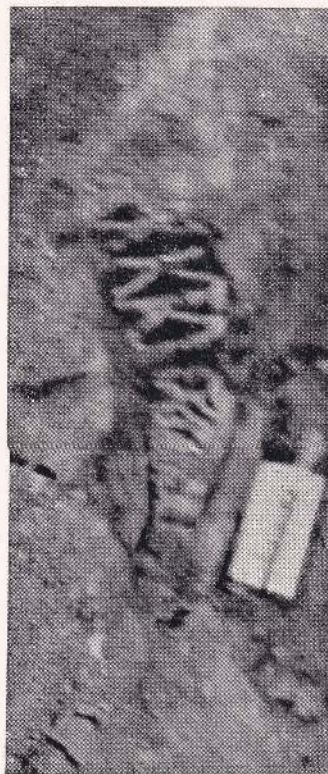




a



b



c

The skull and the holotype mandible of the new race of elephant, namely, *Loxodonta africana pharaohensis* photographed in situ in the Libian desert.







It will thus be perceived that information from places so wide apart as Assuan, Wadi-Halfa, and Khartoum, and from widely different sources, agree that the Darfur elephants are weak tusked. The following four subjects furnish additional support for the view that the extinct elephants of at least a part of the Anglo-Egyptian Sudan were characterized in this manner:—

- (a) Out of about twenty neolithic engravings of elephants pecked upon the rocks of Abka at the second cataract of the Nile, only about five show tusks.
- (b) The elephant roughly depicted in an Egyptian noble's tomb at Elephantine island at Assuan is both short tusked and short tailed.
- (c) The solitary fossil tusk fragment secured in the Fayum lake deposits is only 73 mm. in diameter. (Reg. No. F 495).
- (d) No fragment of tusk was found alongside the fossil humerus, cranium and mandible (Plate X., *a, b*) discovered in the Fayum. The patterns of wear of the folds in the lower molars (Plate X., *c*) were more triangular than is usual in other races of *Loxodonta africana*.

The measurements of this fossil skull and teeth show that the Egyptian elephant was of ordinary size. The above evidence is scanty but suffices to show that the extinct elephant of Egypt is entitled to subspecific rank and the trivial name of *pharaohensis* is here conferred upon it.

***Loxodonta africana pharaohensis* ssp. nov.** (Plate X).

An extinct race of *Loxodonta africana* (Blumen.). Tusks poorly developed, possibly wanting in some individuals, the pattern in the molar crown shows more lamellae worn into triangles than in other elephants. This is the most northern race of *Loxodonta africana* being separated by seven degrees of latitude from *L. a oxyotis* of the Atbara's upper reaches.

*Dimensions.*—Thickness of mandible at second molar 137 mm., width of second molar 50 mm. (Plate X., fig. *c*), thickness of enamel at its worn crown surface 3 mm. In a length of 10 cm. along the worn surface of this molar there are four and a half folds. The lengths of the median longitudinal axis in each triangle of wear were 14, 20, 20, and 25 mm. respectively. The posterior edge of each of these triangles was either straight or concave in posterior view. One of the disintegrating upper molars (Plate X., figs. *a, b*) was ? 190 mm. long, 80 mm. wide, with four and a half folds in a 10 cm. length of worn crown surface, depth of tooth exclusive of roots 80 mm., distance from back of molar to back of skull 230 mm., width of back of skull 480 mm.

*Type.*—A left mandibular body with ramus, No. F. 423 of the collection made in the Fayum desert by the writer when participating in the University of California African Expedition (Plate X., fig. *c*). The specimen was so badly damaged in transit to the Colombo Museum that only the triangular patterns of three worn folds of the second left molar, a quantity of fragments of the molar and a part of the third molar and the jaw bone exists. This mandibular body is 600 mm. long, the width of the top of the ramus being 260 mm.

*Horizon.*—The mandible (Plate X., fig. *c*) and humerus lay in compact olive colored marl, under compacted sand. About a metre beyond lay the cranium (Plate X., fig. *a, b*) covered by loose wind blown sand, embedded in compacted sand, and resting directly upon the marl out of which it had weathered. These fossils lay in the limnetic zone of the upper Pleistocene lake beds in the Fayum desert in Egypt (Plate XI.). The other fossils in this zone were a hippopotamid, buffalo, antelopes, pig, and a small equine, while further out towards the centre of the former lake there were shells of bivalves such as ? *Anodon*, fishes such as cat fishes and *Lates*, the terrapin *Trionyx*, and *Crocodylus*. This association of animals suggests a period of heavy rainfall towards the close of the Pleistocene which gradually gave way to arid conditions during the Holocene. All these animals appear to have been eaten by neolithic man during the Fayum "A" and "B" culture phases. It is not improbable that the Egyptian elephant ranged from the Nile to the Atlas mountains and from the Mediterranean to the tropic of Cancer, persisting into historic times near the Atlas mountains. The so-called fossil *L. cornaliae* Aradas from Sicily probably belongs to one of the 140 elephants the Carthaginians took there in 258 B. C.



### Fishes.

The fresh waters of Africa contain two genera of fishes that elsewhere are only catadromous and marine.

The existing view is that these fishes entered African waters *via* the Nile, but since all their relatives are either marine or catadromous it is evident that the African species would not have adapted themselves to an entirely fresh water existence if they could have gone down to the sea to spawn, as would have been the case had they come up the Nile. Further militating against the prevalent view is the absence of these fishes or any of their relatives from the Mediterranean which is the only source from which they could have entered the Nile to colonize Africa. The only explanation for this unique fresh water adaptation of two otherwise catadromous and marine genera, is :—isolation from the sea. Such isolation could have been effected if the parent stock had entered the Rift system from the Indian Ocean.

The first of the two genera now dealt with is *Lates* Cuv. et Val. which is only found in the fresh waters of Africa, the Persian Gulf, the estuaries and rivers of India, Ceylon, Burma, Malaya, China, East Indies, Philippines, Japan, Oceania, and Western Australia. In Africa this genus possesses species in the Nile, in the lakes Tanganyika, Albert and Rudolf which form a crescent partially encircling Lake Victoria; and also in the water systems of the Congo, Volta, Niger, and the Senegal rivers. Its fossils occur in Lake Edward. Its absence from Lake Victoria suggests that either this lake came into being after the genus had spread westward across the above mentioned crescent of lakes, or that lake Victoria was unconnected with the Rift system and inaccessible, or that the lake had dried up and later reverted to its lacustrine condition.

The subfossil remains of *Lates* from Lake Edward show that either changes in the water or drought exterminated the fish from this lake and this possibly also occurred in others, thereby effacing the trail of *Lates* over much of its former range in Africa. The genus exists as a single catadromous Indo-Pacific species and seven entirely fresh water forms restricted to Africa. So great is their resemblance to one another that it would be more appropriate to regard them all as races produced by a series of relatively recent isolations of a single species in Pleistocene times. In this connexion the intergradation of the lateral line scale counts of the various forms is enlightening.

#### TABLE V.

(a) The Indo-Pacific form is :—

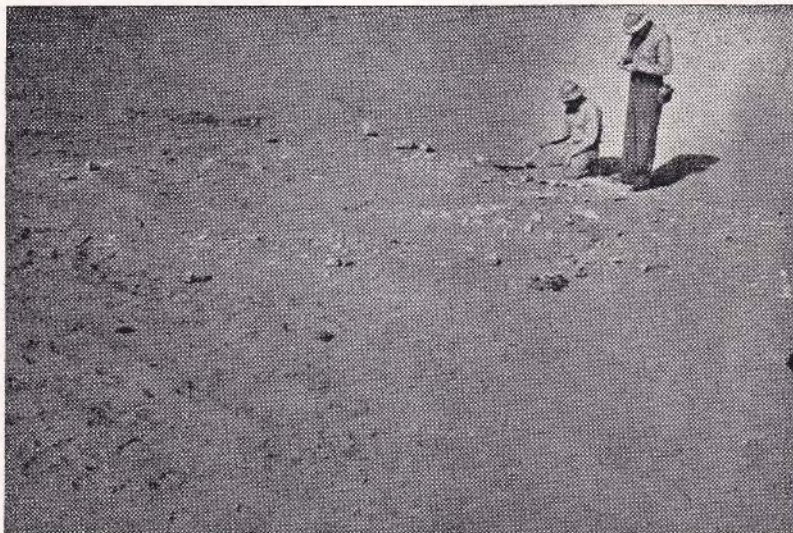
*Lates calcarifer*—LL 52–60.

(b) The African forms are :—

1. *Lates niloticus niloticus* of the Nile—LL 60–80.
2. *L. niloticus longispinis* Lake Rudolf—LL 65–71.
3. *L. niloticus rudolfianus* Lake Rudolf—LL 68–75. (Plate XII., figs. b, d.)
4. *Lates albertianus* Lake Albert—LL 75–80.
5. *Lates macrophthalmus* Lake Albert—LL 75–85.
6. *Lates microlepis* Lake Tanganyika—LL 100–110.
7. *Lates angustifrons* Lake Tanganyika—LL 100–150.

The presence in Africa of two Indian Ocean fishes that have become catadromous is to be expected; but the view that they entered *via* the Nile is untenable with the fact that subsequently they have evolved into purely fresh water species. The suggestion is here put forward that when the parent stock of these two marine fishes were beginning to develop catadromous tendencies they entered the Rift system which possessed connexions with the Indian Ocean at the time. The Rift system next isolated itself and eventually formed a series of isolated units in which these fishes became purely fresh water forms and later entered the Nile. So recently did this occur that these African fishes have not altered much from the Indian Ocean stock.





a



b



c

Relics of a Neolithic elephant hunt discovered by P. Deraniyagala in the Libian desert.







The second genus is *Tetraodon* Linné. In the Indo-Pacific countries it possesses a few catadromous species, but as in the case of *Lates*, in Africa it has evolved a purely fresh water species, namely *Tetraodon fahaka* Hasselquist.

All the other catadromous tetraodons are of small size being about 3 to 6 cm. long. But *Tetraodon fahaka* of the Nile as seen from specimens examined at the mouth of the Sobat tributary, is about 20 cm. long. This species also occurs in Lake Rudolf where according to Copley it is only about six centimetres and thus resembles the catadromous species of the Indo-Pacific. Its closest relatives appear to be *Tetraodon cut-cutia* Ham. Buch. of India and Ceylon and *T. palembangensis* Bleeker of Borneo, Sumatra and Thailand. The Lake Rudolf form is here regarded as new race and is designated :—

***Tetraodon fahaka rudolfianus* ssp. nov.**

*Type*.—The illustration figured by H. Copley in fig. 26 on Plate 8, of his "A Short Account of the Fresh Water Fishes of Kenya".

*Locality*.—Lake Rudolf.

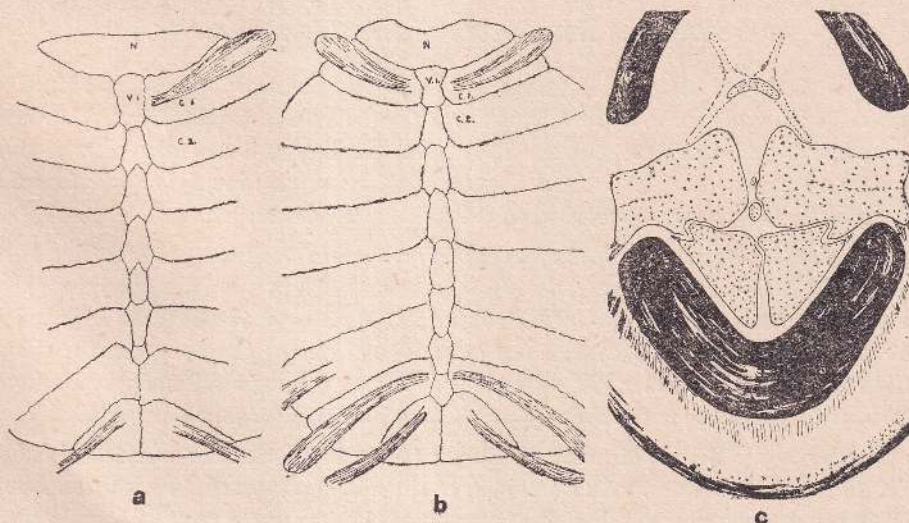
This small, comparatively unmodified race from Lake Rudolf suggests that the fish has spread from the Indian Ocean to the Rift valley and from thence into the Nile, where it has evolved a large race.

***Trionyx triunguis* (Forskal)**

*Testudo triunguis* Forskal 1775 Descrip. Anim. p. ix.

This is one of the largest members of the superfamily Trionychoidea and occurs in the water systems of the Nile, Congo and Sengal rivers and in Lake Rudolf, West Africa, the Gaboon and Gambia.

The examination of about twenty carapaces and skulls, and about six plastrs, of young and adolescent specimens, and of the complete corselet, head and foot of a freshly killed adult showed differences from the existing descriptions of specimens from the Nile. (Boulenger 1889.) As a result of this examination the Lake Rudolf terrapin is regarded as a separate subspecies.



P. Deraniyagala del.

Fig. 5. a and b internal surfaces of two carapaces and c external surface of the 'type' plastron of *Trionyx triunguis rudolfianus* ssp. nov. figured in Pl. XIII. fig. c.

In the carapaces the second rib should slightly overlap the posterior of the nuchal bone, and is incorrectly drawn. N = nuchal bone, VI = first neural, CI = first costal.



**Trionyx triunguis rudolfianus** ssp. nov.

(Plate XII., Fig. c.)

Differs from the "forma typica" of the Nile in that (a) the eighth costal plates are not always completely contiguous mesially, being often partially separated anteriorly by the last neural, (b) In some specimens however the seventh costals are almost completely contiguous, (c) there are more than four plastral callosities in some adult specimens. For example the "type" (Plate XII., fig. c and text fig. 5 c) possesses the following—one entoplastral, two hyo-hyoplastrals, two xiphiplastrals, two umbilicals.—Neurals eight or seven.

*Type*.—The complete corselet, head, and foot of an adult from Ferguson's Gulf, Lake Rudolf. The specimen was kindly secured for the writer by the District Commissioner of the Turkana area, Mr. L. E. Whitehouse, the day after it had been slaughtered in March, 1948. As there were no facilities for transporting the specimen to Ceylon the writer presented it to the Swedish Museum of Upsala's Zoological expedition which was then with him. A photograph of the specimen (Plate XII., c) a sketch of the plastron (text fig. 5 c) and measurements were secured. The last are as follow :—

Straight length of entire carapace .....	70 cm.
Straight length of bony carapace .....	41 cm.
Straight width of entire carapace .....	54 cm.
Straight width of bony carapace .....	40 cm.
Total length of plastron .....	48 cm.
Length along bony elements of plastron .....	40 cm.
Width across bony elements of plastron .....	48 cm.
Skull length 18 cm., skull width 11 cm., basal width of mandible 3 cm.	

*Paratypes*.—(a) A carapace of an adolescent specimen 370 mm. long and with the eighth neural partially separating the eighth costals. (b) A plastron of another adolescent with four plastral callosities. (c) Three adult crania and one broken mandible, in the Colombo Museum collection.

*Type locality*.—Ferguson's Gulf, Lake Rudolf, Africa.

**Probable New Races of Nile Crocodile.**

The Nile Crocodile known as "Timsaah" in Egypt and as "Mamba" to the Turkanas of Ferguson's Gulf at Lake Rudolf ranges from the Nile to the Cape, and also occurs in Madagascar, Syria and until recently in Palestine. In Egypt it is now almost unknown, below the second cataract. The animal is generally known as *Crocodylus niloticus* Laurenti although originally this name was applied to a South American caiman.

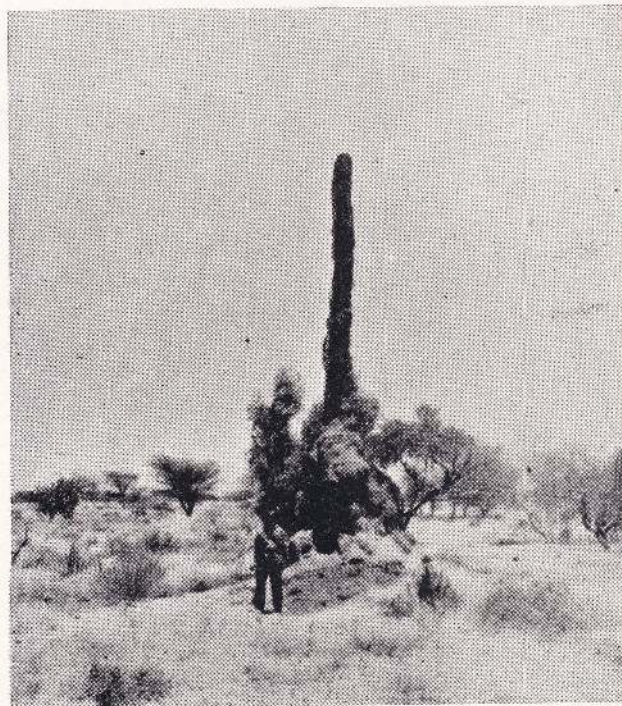
An examination of two Nile specimens from Wadi Halfa and Assuan, three from Ferguson's Gulf in Lake Rudolf, and one from Lake Victoria revealed that the Nile specimens should be regarded as a race apart from those of Lake Rudolf, while even in the East African lakes the statement of Worthington (1932a) that the crocodiles of one of them are smaller than in the others, being less than 8 feet in length, suggests that these small crocodiles of lake Baringo might be a subspecies to which the name *Crocodylus niloticus worthingtoni* might be applicable.

According to the British Museum Catalogue (1889) the dorsal scutes of the Nile Crocodile are in 16 or 17 transverse series. An adult skin at the headquarters of the Southern Area Camel Corps at Assuan, and another at Wadi Halfa possessed 17 transverse rows of dorsal scutes each. Two adult skins from Lake Rudolf made available to me by Mr. L. E. Whitehouse and an adolescent skin kindly presented to me by Mr. A. L. Griffith of Lodwar showed that one of these possessed 15 and two of them 16 transverse dorsal rows, while Mr. H. W. Parker informs me that three Lake Rudolf specimens now in the British Museum and numbered D. E. F. in Table VI. possess 16, 16 and 17 rows whereas 12 other African specimens possess 17 and one 15.





a



e



b



c]

d









A tentative key to the two races is as follows :—

**KEY**

1. Dorsal scutes usually in 17 transverse rows, median rows of ventral scutes not enlarged  
..... *Crocodylus niloticus niloticus*
2. Dorsal scutes usually in 15 or 16 transverse rows, median rows of ventral scutes enlarged  
..... *Crocodylus niloticus pauciscutatus* ssp. nov.

***Crocodylus niloticus pauciscutatus* ssp. nov.**

*Type locality*.—Lake Rudolf, East Africa.

*Type*.—The skin of an adolescent from Lake Rudolf presented by Mr. A. L. Griffith, the Assistant Superintendent of Police, at Lodwar, Turkana district, East Africa.

Colombo Museum specimen No 7. . . . .

The dimensions of the type skin are as follows :—Total length 161 cm., axilla to groin 37 cm., width of skin at midbody 45, width of six dorsal scutes of sixth row is 14 cm., tail 83 cm. The skin had been removed by cutting along the mid ventral line, the head and the distal part of the tail is missing. Bounding the four enlarged nuchal scutes are two others on their right and left respectively. The dorsal scutes are in fifteen transverse rows from the neck to above the back edges of the thighs. The contiguous dorsal scutes are arranged in 3/3 longitudinal series. Ventrally the two median rows are noticeably larger than the others. The specimens examined were three skins and several adult skulls. The crocodiles of Lake Rudolf appear to attain to a length of twelve feet, possibly fourteen and seldom attack man.

There are 5 premaxillary teeth on each side, the fifth maxillary tooth is the largest, the symphysis ends at the fourth or fifth mandibular tooth, the splenial bone ends about one and a half orbit lengths behind the symphysis (Plate XII., fig. c), both the two median dorsal as well as ventral longitudinal rows of scales are enlarged; these are generally 15 or 16 transverse rows of dorsal scutes and transverse row or "collar" of enlarged scales across the base of the throat; the number of transverse rows of ventral scales from collar to vent is 29 or 30; the number of paired caudal verticils is about 14 to 11, of unpaired ones about 20, there are 11 or 12 transverse rows of small abdominal scales, and the scutes bordering the cluster of 4 large nuchal scales is one or two on each side.

**TABLE VI.**  
***Crocodylus niloticus pauciscutatus* ssp. nov.**

Specimen.	A	B	C (type)	In British Museum		
				D	E	F
Number of transverse dorsal scute rows	15	16	16	16	16	17
Number of transverse ventral scale rows from collar to vent	29	30				
Number of transverse rows of belly scales	11	12				
Number of paired verticils	21	22	19			
Number of unpaired verticils	20	12+?	15+?			
External nuchal scutes	1/1	2/1	2/2			
Paired scales between paired verticils of tail	14	11	14			
Abdominal transverse scale rows		12				



### The Camel.

*Camelus dromedarius* Linné, the single humped camel is the only species in Africa, the two humped form although known to the ancient Assyrians has not established itself in this continent.

The elliptical nucleated blood corpuscles, and various primitive anatomical characters of the animal are no less peculiar than its external shape. Its depressed tail possesses a fringe of elongate hair along its lateral margin and a less marked median fringe running above the vertebral line. The peculiar bladder-like distension of the side of the tongue which is blown out of the side of the mouth by males during the season of sexual activity is also remarkable. This was observed in the first week of January among the Beshari type camels of the Southern Area Camel Corps at Assuan. At this time the males are very ill tempered, constantly gurgling, blowing out the sides of their tongues, slobbering, attempting to bite, and refraining from food.

African camels from the Mediterranean sea to about 15 degrees North latitude are larger, heavier built and have the apex of the hump directed more forwards than the southern ones, and are divided into three categories (1) the *Zibidiya* for meat, (2) the *Mansooriya* for burden, and (3) the fleet *Beshari* for riding.

The Besharis are subdivisible into five, according their areas and each of these subdivisions possesses its own brand mark. These subdivisions are (1) Ham d'Orab, (2) Al Yab, (3) Shen ater, (4) Am rab, (5) Keli Waou.

A good Beshari should possess a long neck, straight, erect hump, and the knee or hock be located midway up the leg.

The Sudanese camels south of 15 degrees North latitude usually appear to be darker, lighter in build, and with shorter hair than the true Egyptian ones, while the apex of the hump is not directed forwards.

Camels live on unbelievably thorny and prickly desert vegetation and are generally given water once every third day; if they are permitted to drink daily they sicken and die. Camel flesh is somewhat coarse and stringy if the animal is adult but that of a calf is very well flavored.

Camel milk is peculiar in that it curdles when added to tea or coffee, the butter is exceptionally rich and the clarified butter is peculiarly granular with a flavor very different from that of cow or buffalo ghee. The camel appears to have been domesticated since the second millenium.

### The Soudanese Greyhound.

(Plate XII., Fig. a.)

Long haired as well as comparatively short haired greyhounds are known from countries such as Irak, Persia, Afghanistan and India while ancient Egyptian sculptures in mastabas and pyramids represent short haired greyhounds with large erect ears and tightly curled tails seizing antelope about 2000 B.C. However no dog which is almost identical with the common greyhound has yet been recorded from outside Europe, and the present discovery of such a breed indigenous to the Sudan is of unusual interest since it is probably the parent stock of the so-called European animal. The fact that the tribes of the area where it occurs employ the famous ancient Roman military tactic of forming a "testudo" with their shields, e.g., the Shulla or Shiluk tribe, suggests that there was intercourse between the Romans and themselves and that these dogs were exported to Europe possibly during the Ptolomaic period and later.

The breed ranges from the vicinity of Shendi about 20° N. latitude on the Nile, to that of Talodi about 10° N. latitude. The best specimens occur near Meroe and el Duein.

The dogs stand about 50 cm. at the shoulder and weigh about 60 lb. The build is more or less identical with the European greyhound. The height of the limbs is more or less equal to the length of the body, the chest is narrow in front and deep in lateral view, the loins are strongly arched, the distal third of the tail is curled, the ears are small or of moderate size.



and either erect or semi-erect, the muzzle is pointed and the coat short. The color is reddish brown or fawn and grey with or without red or brown blotches, no blacks or pure whites were noticed. The eyes, nose and lips are black. Only one or two pups are born to a litter.

Their owners do not trouble to feed them, the dogs subsisting upon whatever small mammals such as hares and jerboas they contrive to catch in the desert and upon the chaff winnowed off the millet used as food by their owners. The fact that the dogs have to depend upon their speed to secure their daily food has evolved and will maintain this character.

On several occasions they raced up to the expedition's trucks that were moving at 35 miles per hour and followed them with ease for one or two miles. On one occasion a dog kept up with a truck that was moving at 37 miles per hour. In running they move in long bounds covering 8 to 10 feet at each and with the head and neck stretched out between the extended fore legs at each bound, not raised above them as in ordinary dogs. Out of about 200 dogs seen none showed any skin diseases.

These dogs are the ordinary village animals of this area and are erroneously termed Pi-dogs by the foreign residents.

### African Races.

The following is a brief description of certain features of interest in some of the African races encountered during the journey from Egypt to Lake Rudolf. The Negroid races which are easily distinguishable from others by their frizzly or kinky hair probably originated in southern Asia and possibly Europe from which area they were pushed out or absorbed by invaders from the north while even those that had migrated into Africa display such admixture with non-negroids that they are divisible into two broad groups.

### Negroids.

Negroids are characterized by possessing frizzly hair, thick lips, small wide ears, smooth, rounded foreheads, short head hair and scanty body hair. They range over the southern Indo-Pacific and Africa, and are subdivisible into (a) the larger Negroes, and (b) the smaller Negritos. In Africa are also non-negroid immigrants, *e.g.*, Hamites from Asia. Traces of kinkiness in their hair show that they possess an infusion of Negroid blood slight though it may be in some. Negroids are known to have occupied Africa and parts of Asia, Australia and Europe and have been subjected to considerable admixture with other races. They are least mixed in Africa and most so in Europe where their racial features are no longer readily recognizable. The African Negroids are here termed Afronegroes and Afronegritos, the Asian ones Asinegroes and Asinegritos, and the Australian negroids are similarly designated by the prefix Australo.

(a) The *Afronegroes* are purer than the *Asinegroes*, but possess a number of races with a strong Hamitic admixture. These are here termed *Afronegro-Hamites*, others are the *Bantus* of west, central and south Africa. The *Asinegroes* and *Asinegritos* all possess other south Asian blood and the fact that their legs are more slender than in the *Afronegroes* is possibly due to the latter cause, although climatic conditions may be largely responsible for this in both southern Asian and in *Asinegroid*. The *Asinegroids* are mainly the Papuans, Melanesians, and the Andaman negritos while a submerged negrito strain exists in the hill tribes of South India.

The skin pigmentation of the first racial groups varies from yellow to blue-black and although this is partly due to climate, in some instances it also indicates that lighter colored non-negroid races played a part in their origin while the slender legs of some of these African races suggest relationship to south Indian races. (Hammerton.)

The Negroid races are generally regarded as backward, but admixture of their blood with that of some of the so-called modern civilized races has produced a number of men of outstanding capabilities, and Africa's contribution to modern art, sculpture, music, dancing and sport throughout the world is more important than is generally realized. Such developments however generally occur outside Africa, for many African races have either



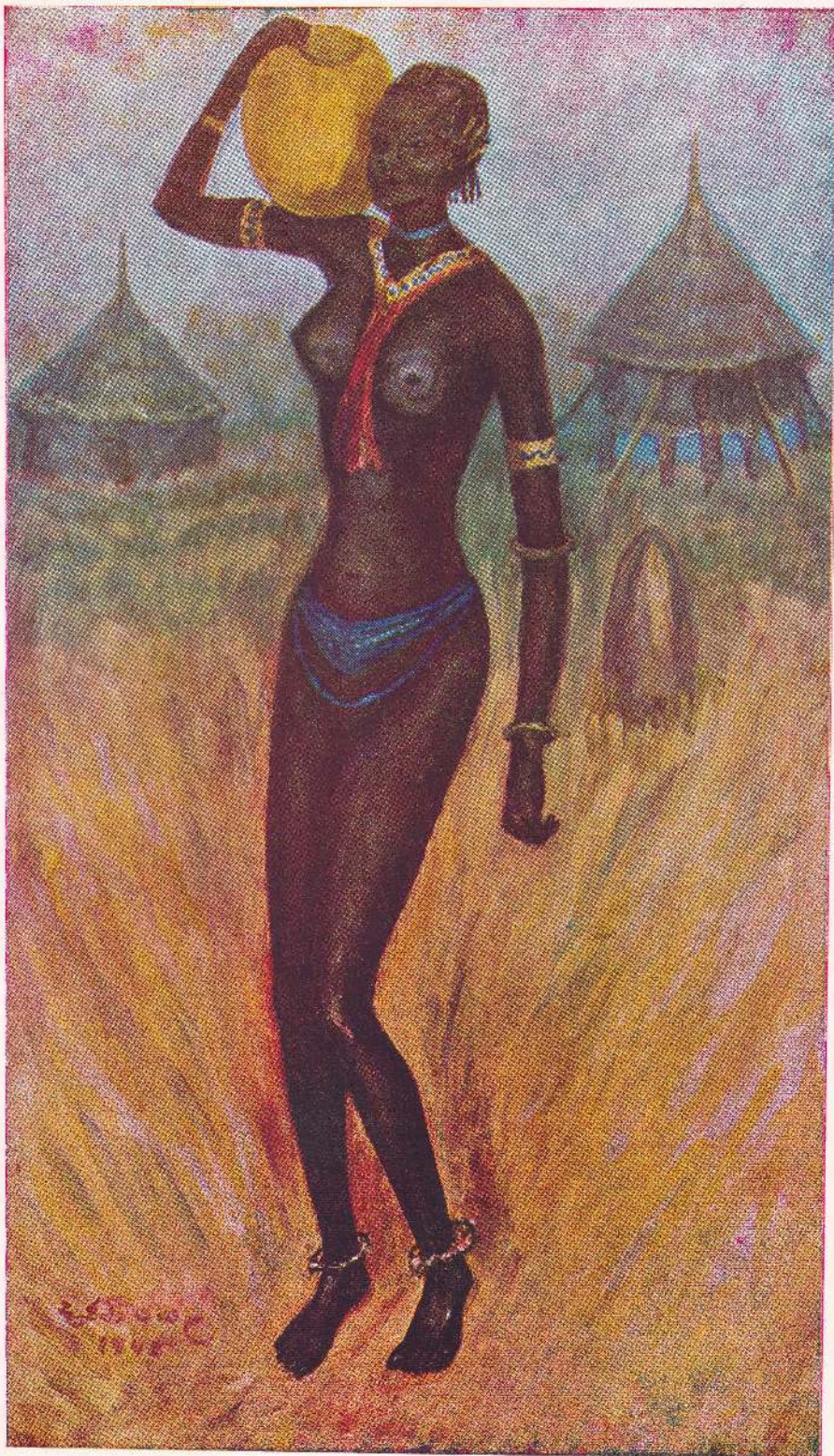
refused to learn from their conquerors or been segregated by them and consequently retrogressed, although a few are beginning to absorb modern methods which should enable them to survive. Belonging to the former category are the Masai, while the Kikuyu are an example of the latter. At a Kikuyu wedding the writer attended near Nairobi in March, 1948, the proposer of a toast stated that when the first white men came into Kenya his tribe after staring at the curious color of the foreigners ran home, hurriedly slaughtered sheep and rubbed the fat in their eyes as an antiseptic; yet unlike in other parts of Africa, in barely fifty years Kikuyu and English officials had met together at this Kikuyu wedding and were on the best of terms. The Kikuyu are now the most progressive of the east African tribes and are beginning to handle their economic and political problems with as much ability as European and Asian races.

Up the Nile from Tonga towards Malakal and southwards are a number of Afronegro-Hamitic races who are all so devoted to their herds that their social systems are closely interwoven with cattle keeping. Wives are purchased for about 30 head of cattle and a murderer is fined about a 100 head of cattle. The men of such tribes as the Nuer and Shulla are usually naked but the women wear an apron or cloth fastened round the waist, among the Denka however men and the unmarried girls, are naked (Plate XIII.), the married women generally wear a short apron. These tribes not only dye their hair red but often bleach it by employing a mixture of cow dung ash and cattle urine which also straightens the hair to some extent.

The *Shulla* or Shilluk are one of the more war-like of these tribes. The men weave into their hair, portions of hair owned by their fathers and grandfathers and wear it as a disc on each side of the head or as a single large one at the back. The Shulla of all ages wear spiked or serrated-edged bracelets for use in combat, and boys of ten and eleven frequently injure one another seriously and are brought in for treatment to the American mission at Doleib Hill near Malakal. Such fighting, bracelets are worn by most of these Afronegro-Hamitic races, tribes such as the Suk and Turkana near Lake Rudolf substituting a knife edge for the spikes on the bracelet. It is interesting to note that the Negritos of the Pacific islands also wear similar spiked bracelets made of sharks teeth. The Shulla grip of a spear is unusual, the thumb being outstretched along the spear haft. A Shulla dance is noteworthy. The orchestra comprise a couple of trumpets made by inserting a kudu horn into a gourd which acts as a resonator, drums and a choir of four girls, who were encircled by the dancers, while a choir of older women stood outside. The women emitted a series of yodels and whoops which are modulated into trills and other modifications of sound generally indulged in by vocalists. These tribes however achieve such modulations not so much by their larynx as by rapidly palpitating upon their lips with three outstretched fingers as the sound emanates.

The modulated noises thus produced by finger palpitating resemble the varieties emitted by a trained singer, and lack of intensive practice alone makes the African production less pleasant to the ear, but no whit less interesting. These yodels are audible for about two miles, on still nights. The dancers painted with red and yellow ochre and ashes and carrying their spears, flat hide shields, throwing sticks and light wooden cylindrical shields dance round the orchestra, leaping, wheeling, stamping and charging. At the end of a charge they form what the ancient Romans termed a "*Testudo*" tortoise of their shields. The front rank of shield bearers drop on one knee placing the lower ends of their elliptical shields upon the ground, the second rank standing behind them places the lower edges of its shields upon the tops of the first row of shields thereby forming a protecting wall about eight or nine feet high behind which the dancers continue to stamp, leap and fence. Each shield bearer peers out now from the right of his shield, now from the left feinting with the spear poised for hurling and shifts his body from side to side to avoid presenting a stationary target to the enemy. Suddenly the "*Testudo*" gets up, the dancers form a wedge behind it and the whole troop charges protected by the "*Testudo*". After this dance another less war-like exhibition was given of the dance introduced to Ceylon in the 17th century as the Kafferinyāva by the Portuguese who had learnt it in Africa. A naked Shulla warrior about six feet two inches tall, armed with a knobkerry and his partner a woman wearing a short cloth were the performers.





A Denka girl. Painted by P. Deraniyagala.







*Denka*.—They inhabit the upper reaches of the White Nile, which is largely the swampy "sudd" area, between 8 degrees 30 seconds and 7 degrees 30 seconds. There are several sub-tribes. The sub-tribes from Malakal to Bor are tall and slenderly built, the Bor Denkas are more robust. Both sexes are generally nude the unmarried women wearing a tightfitting belt of blue beads around the belly and at times one additional string hanging loosely across the pubic area (Plate XIII.). The sides or the entire head are shaven. The four lower incisors are removed. Both sexes scarify themselves by making three or four slanting cuts on either side of the forehead. They are the shapeliest women seen in Africa by the writer.

The houses are usually on poles, and the women and children sit under them grinding grain, weaving baskets and seeing to other work. They have large herds of long horned cattle mostly crossed with Indian humped cattle to which they are devoted. Some of these bulls have one horn bent artificially and colored red. They never kill their cattle for food, utilizing only those that die. In the old days when favourite bulls were captured by raiders the Denkas are reported to have redeemed them with their wives or daughters (Hambly). Denkas are unusually good at long distance walking and running and appear to perspire from the head only, unless the exercise is particularly arduous and prolonged.

*Turkanas* inhabit the area to the west of Lake Rudolf and bounded by the Sudan on the North and Uganda on the West. The tribe is subdivided. Some of the subtribes always slaughter bulls by spearing them on the left flank while others spear their bulls on the right. A Turkana passes through four grades (a) boys who have not speared a bull, (b) boys who have speared a bull, (c) warriors, (d) old men. Young warriors periodically live in the bush with unmarried girls and the latter are said to resent strongly being regarded as their wives. The Turkanas subsist mainly upon raw blood and milk or meat supplemented with berries and roots; the single meal is partaken of at about 5 P.M. The few who cultivate millet utilize it. But raw blood plain or mixed with milk is the general diet. The blood is drawn from any sheep, goat, donkey, camel or bull by a professional bleeder who uses a small bow and arrow. The arrow does not leave the man's fingers and is partly shot partly jabbed by hand into the jugular vein and rapidly withdrawn (Emley). The wound is plugged with cow-dung and mud.

Turkanas eat raw liver and spleen and only the horns and teeth of an animal are discarded. The Lake Rudolf Turkanas roast and eat even the hide of adult crocodiles and nothing is wasted; while the large *Trionyx triunguis* terrapin is a delicacy. During the famine season which occurs annually the wife of each family unhusks with her teeth and chews into a paste the hard nuts of a species of palm and collects this in a pot to be partaken of by the rest of the family. As a result of this the women wear their teeth down very rapidly.

Turkanas carry small stools wherever they go and employ them as seats and as head rests when they sleep. They wear a knife edged flat bracelet and a knife edged plate like a knuckle duster on the middle finger. The dead are left out in the bush, only headmen and grandmothers being interred with the stool of the deceased and some food. (Plate. XII c, d.)

*Masai*.—The Masai are generally considered to have originated as a Dravidian-Hamitic cross with subsequent negroid admixture, and are among the most intelligent of African races. They exist as several sub-tribes and are but a remnant of what was one of the most powerful warrior races of Africa which had as its boundaries the Nandi plateau, the southern end of Lake Baringo and slopes of Mount Kenya on the north down to latitude 6° south, its eastern boundary being the Tana and Rufu rivers, the western being the Sotik and Lumbwa highlands along the eastern edge of the basin of Lake Victoria.

The men are unusually shy and apt to giggle in a most effeminate manner while their slender fingers with "filbert" nails and slim build add to this impression. Their lips are thinner, their noses finer and higher, the hair longer, the ears larger, and the skin color lighter than in the neighboring races. Their arms are relatively elongate. The men are generally about six feet in height. As a race their teeth are bad. They file a notch between the first pair of upper incisors, pluck their eyebrows, stain their head hair with grease and red pigment and wear it either as a single cone or as several small ones, and also with a forelock. (Plate XIV.).



A Masai passes through four grades, namely, a boy or el-aiok, youth or el-barnode, warrior or el-moran, and old man. A warrior only marries after completing his fighting period, but the el-moran are permitted to have unmarried girls in their camps. (Hammerton). The women are well shaped and generally pleasant featured; the heads of married women are completely shorn and their legs ornamented with heavy bracelet like coils of wire from ankle to knee.

The Masai warrior's spear is one of the most business-like in Africa. Three feet of sword-bladed head of soft iron are connected to a slender iron haft by a grip of wood. A short sword about one and a half feet long and about three or four inches broad is worn on the right hip. The curved hide shield which is hairless, possesses a curved wooden grip for the left hand, and is about four feet long, two and a half feet wide, and painted externally with the tribal pattern in red, white, black and yellow.

Essentially a pastoral tribe, much of their social structure is built around fighting and cattle ceremonial. Their cattle are very different from the usual African humpless, long-horned Gala breed and is largely of Indian origin being humped animals.

The staple diet is raw blood extracted by puncturing with a blocked arrow the jugular vein of living cattle, and raw milk. Meat and milk are never taken together at the same meal. Milk is never boiled for fear of bad luck to the herd, and a bull that has been bled is rested for about three or four months before being bled again. The Masai are devoted to their cattle fiercely resenting any interference. For example during the last war District Commissioner Grant auctioned the bull of a Masai youth in accordance with the existing English war legislation, although the owner protested. No sooner was the bull auctioned than the Masai flung his spear with such force at Grant that it passed completely through him.

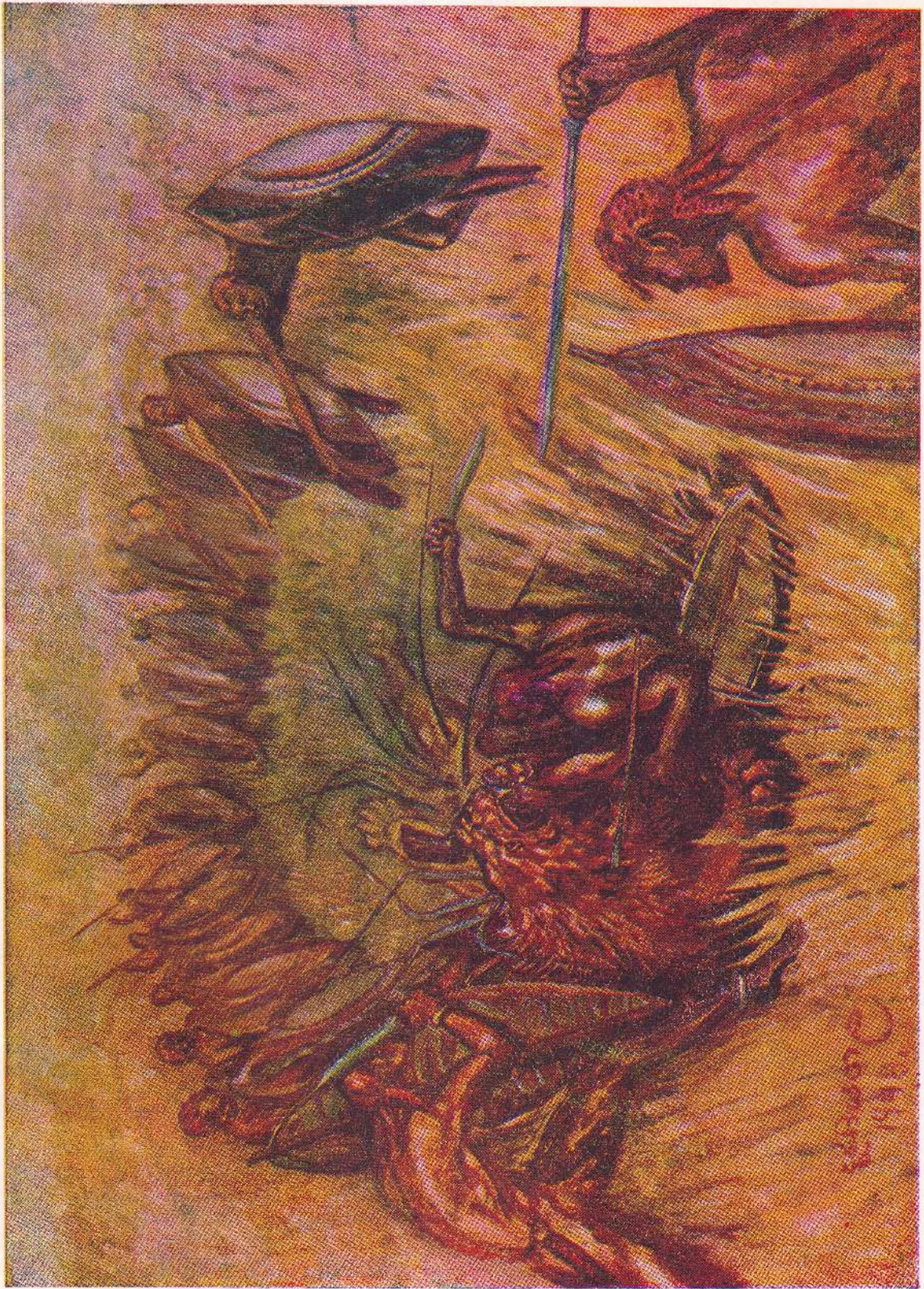
Regarding themselves primarily as a warrior race they scorn either to work or to hunt for food, although lion hunting as a means of winning honor is a popular pastime. (Plate XIV.).

They employ as serfs the Dorobo tribe to hunt for them, and the el-Konono as smiths. Fiercely independent although badly afflicted by malaria (de Mello) and worse diseases, they refuse to work for the English who have attempted to check their warlike nature by forbidding them their large shields and restricting them to reserves, although here they are permitted to retain their spears and swords for defending themselves and their herds against attacks by lions and leopards. In lieu of a shield the modern Masai is forced to use his left arm wrapped in his leather mantle; if his spear cast fails to stop the lion he fends it off with this arm while using his sword with his right. Left arms crippled as a result of such encounters are by no means uncommon.

Their warrior cult is still far from dead. Little boys watching their herds will vie with one another in burning themselves as tests of valor and proudly exhibit their wounds. In former days a youth eager to achieve early recognition as an el-moran was said to persuade two others to join him in hunting a lion. When the lion charged one of them he flung his spear at it and if its rush was unchecked knelt down behind his shield. The weight of the lion knocked him over on to his back with the shield over him whereas had he been upright the shield would have left his hand during the fall. Covering himself as best possible from the lion's attack he awaited assistance from his two comrades. Generally one of the party was killed or crippled for life.

In an organized lion hunt of today the men are naked, the discs are taken out of their elongated ear lobes which are fastened up, and they sally forth singing a war song in their staccato voices. A line of about a hundred beaters drives the lion towards the twenty or thirty spearmen to whom shields have been issued for the occasion. These spearmen rapidly ring the lion and close in on it. No man is expected to throw his spear until within about thirty feet of the quarry. The final scene is short and swift. As the long bladed, soft iron spears flash into the lion they bend into hooks impeding his charge through the long grass to strike down one or more of his foes, who after hurling their spears use their swords. The result is one or more injured Masai and a dead lion, pin-cushioned with spears. (Plate XIV.).





A Masai Lion hunt. Painted by P. Deraniyagala







After a kill the warriors display mass hysteria and Her Excellency Lady Moore who had attended such a hunt informed me that the Masai all danced and shouted frenziedly around the dead lion while the mauled el-moran with two of his fingers dangling by shreds of skin, and with blood spouting from deep claw and tooth wounds, danced as frenziedly as the others, and had to be held down forcibly by some of the spectators and given first aid, a service which was nearly rewarded by spear thrusts from his maddened comrades who eventually fell on the grass with eyes rolling, foaming at the mouth, and twitching. After a short interval they recovered and quietened down. According to Mr. L. E. Whitehouse the Masai treat a man mauled by a lion by plastering the wounds with cow dung, while the sole diet of the patient until he recovers, is raw milk colored pink with raw blood.

### Early Indian Colonists.

Three or four Asian nations had spread to Africa either overland or by travelling from archipelago to archipelago and *via* Madagascar, or by both routes, many centuries before Europeans entered the Indian Ocean. The best known colonists of the former category are the Arabs and Hamites, of the latter the so-called Malays who made Madagascar their headquarters. The Indians appear to have employed both routes. In the Anglo-Egyptian Sudan I was informed that the Indians had introduced the tamarind tree there and that this name meant the "Indian date" *Tamar*=date, *Hind*=India. The domination of the Indian Zebu blood with its humped character from the Sudan to Tanganyika over the indigenous humpless African cattle is also eloquent testimony of the early advent of the Indians and the extent their influence has spread, while Indian words appear in the vocabularies of several African tribes, *e.g.*, the Masai. The early Indian colonists apparently introduced not only their cattle and the tamarind, but other trees such as the mango and coconut palm as well as cloves and spice trees. Ancient Indian ruins are also reputed to occur at Gedi, Malindi and Lamu while ancient lingam stones which are purely Indian occur at various places, *e.g.*, one is said to exist in the ancient temple about 40 yards from the sea across the ferry at the Old Port, Eastern point, Mombasa. Indian clay water pipes are also reported from Gedi, and the majority of the ancient homes in these coastal towns including Mombasa and Zanzibar, are also known to be of the ancient Indian three or four storied type.

It is also interesting to note Trader Horn's description of the corpse of a long dead Asian miner trapped by a fall of earth in an ancient Rhodesian mine shaft as possessing a high forehead, long hair and a bowl for washing the gem sand (Lewis p. 66). This description is more applicable to a miner from the famous mining areas of peninsular India rather than to a Malay as Horn suggests. In Ceylon too the tradition persists of the visit of the Mukkaru miners of India with their bowls, to the Island's gem areas, and they evidently plied their craft far afield.

It may also be recollected that when Vasco-da-Gama first entered East African waters in November, 1497 A. C. he secured an Indian pilot from one of these colonies. Other suggestions of early Asian colonization in Africa are the presence of archaic sets of holes cut in the rocks of Uganda by an ancient people. Such sets also occur in Ceylon and were probably used for gaming (Wayland 1920). Antique beads secured by Mrs. E. Goodall by sifting the sand at the Zembawa ruins in Southern Rhodesia also showed a remarkable resemblance to ones obtained similarly from Ceylon (Deraniyagala 1947 *a, c.*), while the columnar series of forearm bracelets so popular in Africa are identical with those depicted in seventh century frescoes in Ceylon and India.

### Acknowledgments.

I wish to express not only my gratitude to Mr. Wendell Phillips, Leader of the University of California Expedition for inviting me to participate in the expedition and for many courtesies during my stay in Africa but also to record my appreciation of his skill in organizing the expedition. I also wish to congratulate Dr. H. B. S. Cooke, our Geologist, who led the advance party from Egypt to Lake Rudolf on the expeditious manner in which he accomplished his task and cordially thank Dr. Robert Denison, my fellow Paleontologist, for helpful advice



and assistance in "jacketing" and "lifting" several fossils I discovered. I conclude by extending my warmest appreciation and thanks to all my fellow members of the expedition, whose pleasant companionship greatly alleviated the long, spine-jolting drive over desert and dried swamp, exhausting tramps in the desert in quest of fossils, and months of isolation.

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I also wish to acknowledge the assistance I received from the following in securing material for the preparation of this paper—Her Excellency Lady Daphne Moore for several helpful suggestions in preparing the painting of a Masai lion hunt (Plate XIV.) and for kindly placing at my disposal her notes on such a hunt which she saw in Kenya, to Dr. L. S. B. Leakey for valuable information regarding Hippopotami and stone age cultures in Africa, Mr. L. E. Whitehouse for information on the Masai and the Turkana, Mr. A. L. Griffith for presenting me with the type specimens of *Crocodylus niloticus parvicutatus*, Lieut. Colonel W. A. H. Forbes, the Game Warden at Khartoum, for information regarding elephants and for permitting me to examine a collection of tusks in his charge, Mr. O. Myers for showing me over the Neolithic representations of animals and men pecked on the rocks at Abka, Miss. D. M. A. Bate of the British Museum of Natural History, for information regarding certain matters pertaining to extinct hippopotami, Dr. G. S. Myers of Stanford University, California, for reference to literature pertaining to the fish Lates, and Mr. Chunilal Kirparam of Nairobi for information regarding Indian architectural ruins in Africa.

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### Explanation of Plates.

Plate I.—In the Valley of fossil whales, East Libian Desert, 50 miles west south west of Qasr-el-Sagha Photographed by P. Deraniyagala, November, 1947).

Fig. (a) The tent and two trucks of the paleontological party consisting of the two paleontologists Robert Denison and P. E. P. Deraniyagala, and two U. S. Marines, Captain G. G. Edwards and Tech. Sergeant Charles Evans.

Fig. (b) The fossil vertebra of a whale weathering out of the sand-stone cliff. A geological hammer is placed at the right end of the vertebra. Discovered by P. Deraniyagala.  $\times \frac{1}{3}$

Fig. (c) The fossilized skeleton of a whale about 45 feet long weathered out of marine deposits in the desert. Discovered by Tech. Sergeant C. Evans who is standing beside it.



Plate II.—Some of the Egyptian fossils being studied by P. Deraniyagala in the Colombo Museum laboratory.

Plate III.—Prehistoric grave tumuli discovered by P. Deraniyagala in March, 1948, near Muruaret hill in the Turkana area to the west of Lake Rudolf. (Photographed by P. Deraniyagala).

Fig. (a) Three grouped tumuli with two men working on the first grave and a man standing on each of the second and third graves.

Fig. (b) A solitary tumulus with Wendell Phillips beside it.

Fig. (c) The first bones exposed in the grouped grave at (a). A geological awl and brush are placed below each bone.

Fig. (d) The skull of the grouped grave at (a) lying on its right side and facing eastward.  $\times \frac{1}{5}$

Plate IV.—Neolithic illustrations pecked into the water worn rocks on the upper terraces at Abka at the second cataract of the Nile. Several types of illustrations of varying age occur. Some are superimposed upon others, while yet others have the necks and heads of other animals subsequently added. (Photographed by P. Deraniyagala, January, 1948).  $\times \frac{1}{5}$

Fig. (a) Giraffes, antelopes and men.

Fig. (b) Antelope, ibex and ostriches.

Fig. (c) Antelope, dogs and ostriches.

Plate V.—Photographs taken by P. Deraniyagala during the First Pan-African Prehistoric Congress in January, 1947.

Fig. (a) Mrs. L. S. B. Leakey seated beside some of the paleolithic amygdaloids at the paleolithic dwelling site she discovered at Olorgasailie in the Masai reserve of the Rift Valley.

Fig. (b) L. S. B. Leakey instructing a visitor who is on his back, tracing a stone age painting in a rock shelter at Kisesi, Tanganyika.

Fig. (c) The Abbé Henri Breuil on the left, L. S. B. Leakey on the right, each with a cigarette are examining prehistoric paintings at Kisesi rock shelters.

Fig. (d) The Abbé Henri Breuil with S. A. Huzayyin of Cairo (with black hair and immediately above him) examining prehistoric paintings at Kisesi.

Fig. (e) Highly stylized human figures painted by prehistoric man in the rock shelters at Kisesi.

Fig. (f) Realistic monochrome paintings of antelope painted by prehistoric man in the rock shelters at Kisesi.

Plate VI.—Differences in terrain. (Photographs by P. Deraniyagala).

Fig. (a) The hills of Qasr-el-Sagha in the Libian desert (Fayum desert) in Egypt. Fluvio-marine fossiliferous beds of Oligocene age.

Fig. (b) Lothidok hill to the west of Lake Rudolf in the Turkana district. The fossiliferous red bed of volcanic tuff of Pleistocene age is shown cropping up at the bottom and extending from the right lower corner of the photograph up to the middle of the left margin. Four men are just below this red bed, two of them are in white shirts.

Fig. (c) The Camp at Muruaret Hill, west of Lake Rudolf.

Fig. (d) Olduvai gorge famous for its Pleistocene fossil deposits.

Fig. (e) Left to right Miss Dorothea Bate of the British Museum, Wendell Phillips of the University of California, and L. S. B. Leakey, Curator of the Coryndon Museum, Nairobi, searching for fossils at Olduvai gorge in January, 1947, during the First Pan-African Prehistoric Congress.

Plate VII.—Holotype mandible of *Prechoeropsis pharaohensis* Deraniyagala, genus et species novus in the collection of the Geological Survey of Egypt. Photographed by P. Deraniyagala through the courtesy of the Director of the Geological Survey of Egypt.  $\times \frac{1}{4}$

Fig. (a) The mandible in occlusal view. The left first incisor is of normal size, the second and third incisors are greatly reduced. The right first incisor equals that of the left but has been broken off. The second and third incisors have dropped out naturally and a depression marks their sockets.

Fig. (b) An anterior view of the mandible showing the greatly reduced second and third left incisors.

Plate VIII.—Remains of races of *Hippopotamus protoamphibius* ssp. Arambourg, and of the elephant *Loxodonta africana* (Blumenbach) that had been hunted and eaten by neolithic man. They were discovered by P. Deraniyagala in the lacustrine deposits of the Fayum desert in November 1947. Photographs a, b, and f by P. Deraniyagala; photographs d, c, and e by Tech. Sergeant Charles Evans of the U. S. Marine Corps.

Fig. (a) The series of buttes of compacted sand and marl that fringe the marl deposit of the lake bed in its final phase.

Fig. (b) Bones of a hippopotamus slaughtered by neolithic hunters at the foot of a sandy butte. Three other buttes in the background.

Fig. (c) The palatal view of a hippopotamus skull in situ. A foot ruler alongside.

Fig. (d) The dorsal view of fig. (c) after it had been plaster jacketed and "lifted". A six centimetre scale alongside.

Fig. (e) The left mandibular body of a hippopotamus in situ. A six centimetre scale alongside.

Fig. (f) Three pitted pebble hammers of the Fayum B culture phase discovered in the vicinity of the neolithic feasts off hippopotami. A special search was made for them at the request of the writer. The spheroidal hammer to the right of the photograph was discovered by a Gufti Reis, the other two were found by the writer in December 1947. They are very similar to the pitted pebble hammers of the Balangoda culture phase of Ceylon. A foot ruler lies alongside.

Plate IX.—Hippopotamus remains together with neolithic stone implements found in association with them in the Libian desert (Fayum area).  $\times \frac{1}{4}$

Figs. 1 and 2. A hippopotamus limb bone split longitudinally for its marrow by man.

Figs. 3 to 6. Fragments of hippopotamus canines.

Fig. 7. A fragment of hippopotamus jaw with a premolar.

Fig. 8. A piece of fossil papyrus.

Figs. 9 to 13. Choppers made from pebbles.

Figs. 14 and 15. Arrow heads.

Figs. 16 to 38. Blades, flakes and points of Fayum A and B culture phases.

Fig. 39. A Potsherd, possibly Predynastic.



Plate X.—A fossil skull of the Egyptian race of the African elephant *Loxodonta africana* (Blumenbach) from the compacted marl of the lake beds in the Fayum desert. Discovered by P. Deraniyagala in November, 1947. (Photographed by P. Deraniyagala).

Fig. (a) A palatal view of the skull 'in situ' showing the occiput to the left of the photograph and the left and right upper molars. A six centimetre scale alongside.  $\times \frac{1}{4}$

Fig. (b) The same as fig. (a) after shellacing. A foot ruler alongside.  $\times \frac{1}{4}$

Fig. (c) The second and third left lower molars with a six centimetre scale on white paper. Cracks in the compacted marl show in the left corner of the photograph. This is the holotype.  $\times \frac{1}{4}$

Plate XI.—Remains of a neolithic feast off an elephant that had been slaughtered as it came to a now vanished lake in the Fayum desert. Discovered and photographed by P. Deraniyagala in November 1947.

Fig. (a) The white fragments are the broken up elephant skeleton among which were also teeth of a large bovine possibly a buffalo. Seated is Wendell Phillips, standing is W. F. Albright. The black lump in the foreground in line with Phillips are choppers fashioned from pebbles by the neolithic hunters. These choppers are shown enlarged in fig. (b) where a six centimetre scale is in the foreground.

Fig. (c) Left to right are W. F. Albright, W. Phillips and three Gufti workmen. In the distance are about eight buttes of compacted sand which fringe the former lake. The track left by a truck is on the right.

Plate XII.—A Sudanese greyhound and photographs from the Turkana district. (Photographs a to d by P. Deraniyagala).

Fig. (a) A Sudanese greyhound from near Shendi. Note the deep chest, arched loins and curled tail tip.  $\times \frac{1}{10}$

Fig. (b) Two Kikuyu camp men with three skulls of adult *Lates niloticus rudolfianus* from Ferguson's gulf, Lake Rudolf.

Fig. (c) A Turkana holding the type corselet of a soft terrapin *Trionyx triunguis rudolfianus* ssp. nov. with its plastron towards the observer. A skull of *Crocodylus niloticus pauciscutatus* lies on the sand.

Fig. (d) Two Turkanas holding a moderate sized *Lates niloticus rudolfianus*.

Fig. (e) A termite hillock with P. Deraniyagala in the foreground.

Plate XIII.—A Denka girl of the Wau area with a calabash. A conical mud grain horde in the foreground, a platform hut and an ordinary one in the background. Painted by P. Deraniyagala.  $\times \frac{1}{9}$

Plate XIV.—A Masai lion hunt. This painting is based upon a personal study of the Masai and descriptions of such hunts by onlookers. Painted by P. Deraniyagala.



## On the Occurrence of "Odontolite" on some Bovine Teeth.

By

B. A. R. CANDAPPA, B. Sc, (Madras)

Odontolite has not so far been reported from Ceylon, considering the fact that it is quite rare, as it occurs only on the bones and teeth of extinct animals. There is also the possibility that this mineral may have been mistaken for a variety of Turquoise, or for Lazurite, which it closely resembles in colour and appearance.

Six fragments of bovine teeth, now in the possession of the Ratnapura National Museum<sup>1</sup> displayed a peculiar azure blue colouration. Examination with a hand lens revealed the true nature of this colouration which at first appeared to be an incrustation of a blue clay like material. On examination of the lateral aspect of these teeth with a hand lens the mineral Odontolite was seen as blue, minute, prismatic, crystals, transparent to translucent, the crystals themselves being arranged in no regular manner, although an incipient stellate grouping of the crystals was evident. In the apical aspect of the teeth their original organic structure is retained, even though the substance of the teeth has been replaced entirely by the mineral. Pseudomorphism is thereby exhibited within certain limits.

Records at the museum show that these teeth were found in a gem pit at Haldola in Kuruwita, in the black Illama or pay gravel, at a depth of sixteen feet from the surface. The nature of the overlying strata is as follows :—

Humus .....	6 ft. thick
Illama .....	1 ft. (barren)
Red Earth .....	3 ft.
Leaf Bed .....	3 ft.
Fine Sand .....	3 ft.
Black Illama .....	1 ft. (fossiliferous)
Thickness .....	17 ft.

The composition of Odontolite is somewhere around  $H_{16} E_3 P_2 O_{11}$ . However it is generally agreed that it is a hydrous phosphate of iron. From this and from the nature of the overlying beds an origin for Odontolite can be deduced without a vestige of a doubt. Leaching in of iron solutions from overlying beds has attacked the dentine of the teeth with the resultant formation of iron phosphate. Another fact that strongly lends support to this view is that the enamel of the teeth being of hard resistant material is left unattacked by the iron solutions. The source of the iron is without doubt from the ferruginous Red Earth layer carried down to the fossiliferous Black Illama by percolating solutions. A double decomposition reaction between the iron solutions and the calcium phosphate of the dentine is the only possible explanation for the formation of this mineral.

Though Odontolite is found in fossil teeth, all fossil teeth do not contain Odontolite, which goes to show its rarity as well as the fact that a source for the iron must be available in the vicinity.

Odontolite from other countries is a source of ornamental stone with a hardness of 5 on Moh's scale, and with a varying specific gravity. The species of Odontolite now under discussion has an inferior hardness, i.e., between 2 and 3. Inasmuch as the specific gravity may vary with the nature and kind of tooth undergoing decomposition and alteration, there is room to believe that hardness may also vary and need not as a rule be constant. The occurrence of

<sup>1</sup> My thanks are due to the Acting Curator of this Museum for having kindly allowed me to study the specimens.



Odontolite as far as we have already seen is entirely confined to primitive *Bos*<sup>1</sup>. However Herbert Smith mentions the bones and teeth of the Mastodon as another source. Examination of some Elephant molars did not reveal a tendency towards the formation of Odontolite. From this it can safely be inferred that this mineral can be formed from the bones and teeth of primitive animals, provided the following conditions are satisfied :—

- (1) A sufficiently long interval of time.
- (2) Fossilization without silicification.
- (3) Easy accessibility to percolating iron solutions.
- (4) Availability of iron solutions.

It was mentioned earlier that Odontolite could easily have been mistaken for Turquoise, for which reason it is referred to as Bone Turquoise. As Turquoise contains copper it tends to darken with Ammonia, and this serves as a good test to identify it from Odontolite. Lazurite on the other hand is easily recognized by the fact that it evolves  $H_2S$  with dilute Hydrochloric acid. The organic nature of Odontolite and its occurrence at all times along with the bones and teeth of extinct animals, is an unfailing property of this mineral.

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<sup>1</sup> At the time of completing this article a lower jaw bone of an animal was found in a gem pit, which showed a complete alteration into Odontolite.



## Cuckoo Problems In Ceylon.

By

W. W. A. PHILLIPS F.L.S., M.B.O.U.

### Introduction.

A study of Mr. E. C. Stuart-Baker's "Cuckoo Problems", published in 1942, discloses the fact that there is still a very great deal that remains unknown concerning the breeding of the majority of Indian Cuckoos; but, even so, considerably more factual knowledge of the parasitical forms is available in India than here in Ceylon. The Cuckoo group is, undoubtedly, a very difficult one to study in detail, especially in a country, like Ceylon, which is largely densely afforested and in which the Cuckoos mostly confine themselves to the forest areas in the more secluded districts, generally far removed from the homes of those students of nature who would wish to study them. Even so, a few observers in Ceylon have been able, from time to time, to gather together a little knowledge which is of great interest and which forms a basis of fact upon which further study may be built.

The object of the present paper is to bring up to date and place on record the sum total of our present knowledge of all the various parasitic forms of Cuckoos which are known to occur in Ceylon and to indicate where further research is most desirable in order to elucidate the many problems that still remain to be solved in connection with these birds.

If we include that rare wanderer the Emerald Cuckoo, the parasitic Cuckoos in Ceylon number eleven species belonging to eight genera. Some of them are migrants which are with us only during the period of the North-East Monsoon—corresponding more or less to the Winter of temperate climates; these mostly arrive in Ceylon during October or November and leave again, on their Northward migration, during March or April. They do not breed in Ceylon. The majority of our Cuckoos are, however, believed to be resident and to breed with us—though of most species very few eggs or young have yet been discovered.

The following eleven forms, which occur or are known to have occurred in the Island, receive attention in this paper:—

- (1) *Cuculus canorus*. The Asiatic (European) Cuckoo.  
Status. Straggler or infrequent Winter visitor.
- (2) *Cuculus poliocephalus poliocephalus*. The Small Cuckoo.  
Status. Uncommon Winter visitor.
- (3) *Cuculus micropterus micropterus*. The Indian Cuckoo.  
Status. Resident?—possibly a partial migrant.
- (4) *Hierococcyx varius*. Common Hawk-Cuckoo.  
Status. Resident—possibly a partial migrant.
- (5) *Cacomantis merulinus passerinus*. The Plaintive Cuckoo.  
Status. Common Winter visitor.
- (6) *Penthoceryx sonneratii waiti*. The Ceylon Banded Bay Cuckoo.  
Status. Resident.
- (7) *Chalcites maculatus*. The Emerald Cuckoo.  
Status. Rare Straggler.
- (8) *Surniculus lugubris stewarti*. The Ceylon Drongo-Cuckoo.  
Status. Resident.
- (9) *Clamator jacobinus taprobanus*. The Ceylon Pied Crested Cuckoo.  
Status. Common resident.
- (10) *Clamator coromandus*. The Red-winged Crested Cuckoo.  
Status. Winter visitor, in small numbers.
- (11) *Eudynamis scolopaceus scolopaceus*. The Koel.  
Status. Common resident.



### Acknowledgments.

In the writing of this paper, I have received great assistance from many notes furnished by Mrs. Cicely Lushington, Mr. G. M. Henry and Mr. R. West, all members of the Ceylon Bird Club, and I have referred constantly to the following publications.

- Cuckoo Problems, by E. C. Stuart-Baker (1942).
- Fauna of British India. Birds. Vol. IV., by E. C. Stuart-Baker (1927).
- Nidification of Birds of the Indian Empire. Vol. III., by E. C. Stuart-Baker (1934).
- Birds of Ceylon, by Captain W. V. Legge (1880).
- Birds of Ceylon, by W. E. Wait (1931).
- Avifaunal Survey of Ceylon, by Hugh Whistler (1944). *Spolia Zeylanica*. Vol. 23, parts 3 and 4.
- Comments on Ceylon Birds, by Dr. S. Dillon Ripley (1946). *Spolia Zeylanica*. Vol. 24, part 3.

I have also received much help, in connection with the loan of specimens, from Mr. P. E. P. Deraniyagala, the Director of the National Museums of Ceylon.

### *Cuculus canorus* subsp.

#### The Asiatic or European Cuckoo.

Although Cuckoos of the *canorus* group, the Common Cuckoos of Europe and Northern Asia, visit Ceylon occasionally during the Winter months, there appears to be only one Ceylonese specimen available for examination—viz., an old specimen collected in Dickoya, in the Hills of the Central Province, in 1897. This specimen has been determined as belonging to the Asiatic race, *telephonus*, which breeds in Northern and Central Asia, as far South as the Himalayas, and winters (according to Stuart-Baker) throughout India and the Indo-Chinese countries to South China, the Malayan Archipelago, the Moluccas and New Guinea and also wanders into Palestine and South-East Africa. It seems most probable that this is the only race of *canorus* that visits Ceylon but fresh specimens are greatly desired to confirm this supposition.

The visits of this Cuckoo appear to be very erratic and infrequent but, most probably, they are more frequent than is suspected as, owing to the small number of competent observers, the majority of our visitors must be overlooked and go unrecorded. Legge (p. 223) records two specimens—one captured by Layard in the old Botanical Gardens at Kew, Colombo, and the second by Bligh at Harangalla Patanas, Kotmalie, on 7th October, 1873. Wait (p. 204) adds a third to the list, viz., the specimen obtained in Dickoya in 1897 which is still in the Colombo Museum collections, and has been determined as belonging to the race *telephonus*. Only one other record can be added to this list; in November 1927, one was sent to me by Mr. J. P. Blackmore. This bird had killed itself, on a misty evening, by flying against the lighted windows of Le Vallon Bungalow, Galaha. Unfortunately, this specimen was not preserved. It was probably on migration at the time of its death and had recently arrived in Ceylon. It is remarkable that all the records of the occurrence of this Cuckoo, in Ceylon, are from the Kandyan or Western aspects of the hills of the Central Mountain cluster, from altitudes of between 2,500 and 4,500 feet—with the exception of Layard's specimen which is thought to have been newly arrived on the coast.

Further specimens of this Cuckoo are awaited in order to determine the race with more certainty. They should be looked for, especially, on the Western aspects of the Hills, during the Winter period. There is no question of this Cuckoo remaining to breed in our Hills and, as far as is known, it is silent when it is with us.



## **Cuculus poliocephalus poliocephalus** Latham

### The Small Cuckoo.

That the Small Cuckoo is also an irregular Winter visitor to Ceylon, has been established beyond a doubt. Its appearances are frequent but erratic; in some years several may be seen but in other years none. There are eight specimens in the Colombo Museum collections and one was secured for the Avifaunal Survey in 1938. All these specimens were collected during the period September to April, the earliest dates recorded being one at Anuradhapura on the 3rd September, 1914, and one at Kumbalgamuwa on the 10th September, 1931. It would appear, therefore, that this Cuckoo is one of the earliest migrants to reach the Island. The majority of our visitors arrive in immature plumage but the Avifaunal Survey specimen, which was secured at Kitulgala on the 2nd November, 1938 and was examined by the late Mr. Hugh Whistler, was an adult female, in plumage indistinguishable from the adult male. Stuart-Baker describes the call of this Cuckoo as "a not very musical 'pi-pi, pi-yu' the scale of notes ascending". It is very rarely, however, that it is heard to call in our forests.

The breeding range of the Small Cuckoo is given by Stuart-Baker as "from Gilgit and the Afghan frontier through the Himalayas and mountains of Central and North China to Japan", while it winters "South to Ceylon and over practically the whole of India, the Indo-Chinese countries and Malay Peninsula and South China".

Whistler (p. 212) remarks that "Wait's account (2nd ed. p. 205) of the plumages of this species is misleading. His stage two is the juvenile plumage and his stage three is the adult hepatic female".

## **Cuculus micropterus micropterus** Gould

### The Indian Cuckoo.

Hitherto, the Indian Cuckoo has been regarded as a rather rare migrant to Ceylon. Legge (p. 229) writes of it "This Cuckoo arrives in Ceylon during the month of October; but apparently its numbers are extremely limited, as but comparatively few examples have ever been recorded from the Island. Kelaart speaks of it as a mountain species of rare occurrence and found in Dimbulla; Layard did not meet with it. Holdsworth writes that "the only two examples he met with were obtained in half cultivated land in low country near Colombo". These were probably in migration to the hills at the time they were killed. I have shot it in Kottawe forest, near Galle, and have seen it in the same district on another occasion. It probably affects the subsidiary hills in the South-West of the Island as much as any other part of the low country. I met with a Cuckoo, which I did not procure, but which I identified as belonging to this species, in the forests between Anuradhapura and Trincomalee; and Captain Wade, of the 57th Regiment killed an immature individual at Nalanda at the North base of the Kandyan ranges; in addition to which I have seen it in the collection of Messrs Whyte & Co. the specimen having been procured in Dumbara. *It is doubtless a commoner species in reality than it appears to be, but, being a denizen of the forests, escapes nearly all observation during the period of its visits*". (The italics are mine). Wait (p. 206) also states "said to be rare in Ceylon, and apparently a migrant".

In the Colombo Museum collections there are three of these Cuckoos but unfortunately all are old, unsexed and without data labels; a female was procured at Nilgala (Uva) on the 2nd March, 1939, however, for the Avifaunal Survey and Dr. Dillon Ripley obtained an adult ♂ and ♀ and an immature ♀ at Embilipitiya (Sab) in January and February 1944. Furthermore, a ♂ was collected for me, while calling from the top of a tall tree, near Vakari, in the Eastern Province, in February 1947.

These specimens (*i.e.*, those of which we have the data), it will be noted, were obtained during the North-East Monsoon period, so they give support to the theory of Legge and others that this Cuckoo is but a Winter visitor.



There can be no doubt, I think, that it is a local migrant to the Hills of the Central Province where one or two specimens have been obtained, but whether or not these visitors are migrants from the Indian peninsula or from the forest areas of the South and East of Ceylon, or of both classes, we are not yet in a position to give any definite opinion.

Let us now examine the evidence to support the more recent theory that some, at any rate, of the Indian Cuckoos, found in Ceylon, are residents and not migrants. It is now definitely established that the hitherto unidentified author of the loud, far-carrying "Captain Philpots" call is this bird. Several observers have recently identified the author and, in February last, a ♂ was shot, in my presence, while it was calling from a tall tree-top. The "Captain Philpots" call may be considered, therefore, as proof of the presence of this elusive Cuckoo in the heavy forest areas where it is so difficult to catch a glimpse of the bird itself. From about Christmas time to April and May, this call is a feature of many of the more secluded forest areas in the Eastern and Southern Provinces and also in some of the North-Eastern districts of the Central Province. Especially during March and April, the cry is so persistent as often to become annoying. At Padaweya tank, to the North of Trincomalee in the Eastern Province, an Indian Cuckoo haunted our camp, during the last week in March, calling loudly and most persistently, not only for hours every morning and evening, but intermittently throughout the whole of the moonlight nights—yet we never once saw the author. This very persistent calling certainly indicates residence and territorial acquisition for only one bird calls, normally, in each given area, though answering calls may sometimes be heard in the far distance. I feel convinced that only a resident, breeding bird would call so persistently and so loudly; moreover the call has been heard, though less often, towards the end of May and even later, in June and August, when all migrants have long since returned Northwards.

Of actual breeding in Ceylon we have, as yet, little definite evidence and what little evidence there is, is of an unsatisfactory nature.

Stuart-Baker (Cuckoo Problems p. 59) stresses the fact that, in spite of the Indian Cuckoo being so common in India, very little is known of its breeding habits, "quite possibly because evolution has advanced so far that the eggs have evaded detection even by human beings". He goes on to state that two types of eggs of this Cuckoo have now certainly been correctly identified: The one, a blue egg, very similar to the blue egg laid by the Asiatic Cuckoo and the other one exactly like the eggs of the birds of the genus *Dicrurus*—the Drongos—so alike in fact are the latter type of eggs that "detection *in situ* was almost impossible for human beings". Of 19 Indian eggs, believed to have been laid by this Cuckoo and now in Stuart-Baker's collection, 13 of the blue type have been laid in the nests of the following birds:—

Simla Streaked Laughing-Thrush ( <i>Trochaloxyton lineatum griseiventris</i> )	..	5
Himalayan Paradise Flycatcher ( <i>Tchitrea paradisi leucogaster</i> )	..	1
White-browed Fantail Flycatcher ( <i>Rhipidura a. aureola</i> )	..	1
Grey Ouzel ( <i>Turdus unicolor</i> )	..	1
Golden Bush-Robin ( <i>Tarsiger chrysæus</i> )	..	1
Himalayan Blue Chat ( <i>Larvivora cyanea brunnea</i> )	..	1
Indian Bush Chat ( <i>Saxicola torquata indica</i> )	..	1
Kashmir Crowned Willow-Warbler ( <i>Acanthopneuste r. reguloides</i> )	..	1

and 6, of the Drongo type, in the nests of Grey Drongos (*Dicrurus leucophaeus*), Black Drongo (*D. macrocerus*) and the Paradise Flycatcher (*Tchitrea p. paradisi*), while several young Indian Cuckoos have also been met with in Drongo's nests.

In addition, an egg, believed to have been laid by this Cuckoo, has been found in a Golden Oriole's nest. Sixteen of these eggs, average 281 mg. in weight and  $24.4 \times 19.00$  mm. in size.

Here in Ceylon, Mr. E. C. Fernando, of the Colombo Museum, met with a young Cuckoo being fed by a Black-headed Oriole (*O. xanthornus ceylonensis*) on a morning in April, 1937, at Kumbulgamuwa in the Mulhalkelle district of the Central Province. Unfortunately, he did not collect the Cuckoo, so its certain identification must remain doubtful. He, however, thought it was a young Small Cuckoo (*Cuculus p. poliocephalus*). This is most unlikely as the Small



Cuckoo is undoubtedly a migrant; it is much more likely that it was a young Indian Cuckoo, although it may have been a young Banded Bay Cuckoo. Indian Cuckoos were calling in the neighbourhood, at the time the young one was seen, and, as it is described as being too big for a Plaintive Cuckoo and the bands on its breast far too thick, it is more likely to have been a young Indian Cuckoo than any other species.

Then, on December 28th, 1940, I found three eggs in a Black-headed Oriole's nest, in a glade near Godapotugala in the jungle country some 15 miles South-West of Kantalai, in the Eastern Province. It is a most exceptional occurrence to find three eggs in a nest of this Oriole, so I examined them with great care and, when blowing them, came to the conclusion that one of them, similarly marked but slightly smaller and rounder than the other two and with a harder and thicker shell, was a Cuckoo's egg. This egg weighs 617 mgs. and measures  $25.7 \times 19.0$  mms. Again, the Indian Cuckoos were calling very persistently in the immediate vicinity and it is possible that this is an egg of this Cuckoo, although the authorities at the British Museum (Natural History) do not agree with me, in this.

Of the species given as fosterers of the Indian Cuckoo in India, only the White-browed Fantail Flycatcher, the Paradise Flycatcher and the Drongo occur in the areas, in Ceylon, where the Indian Cuckoo is believed to breed. Of these—

The Ceylon White-browed Fantail Flycatcher (*L. a. compressirostris*) generally breeds during March, April, May and June.

The Ceylon Paradise Flycatcher (*T. p. ceylonensis*) breeds during April, May, June and July.

The Pale White-bellied Drongo (*D. caerulescens insularis*) during March, April and May.

and The Ceylon Racket-tailed Drongo (*Dissemurus paradiseus ceylonensis*) another possible fosterer, during April and May.

while the Ceylon Black-headed Oriole (*Oriolus xanthornus ceylonensis*) nests from November to May.

It is probable, therefore, that the Pale White-bellied Drongo is likely to prove to be the regular fosterer of this Cuckoo, in Ceylon, while any of the others may be parasitised occasionally. All nests of these birds should be very carefully examined, for the eggs or young of this Cuckoo, wherever (from their calls) the Indian Cuckoos are known to inhabit the area. The Cuckoos' eggs will, probably, be found to be so very similar to the fosterers' that they can be distinguished only with the greatest difficulty but the young can, of course, be identified, at any age by their zygodactylous feet.

The possibility of two forms of this Cuckoo occurring in Ceylon, the one resident and the other migratory, cannot be overlooked. The critical examination of further specimens and their comparisons with Indian specimens may show that we have a resident race, distinguishable from the mainland form. Whistler (p. 212) examined a ♂ taken at Nilgala (Uva Province) on 2nd March, 1939, and on comparing it with Himalayan breeding birds, found that "it agrees with them well except that it has the head and neck somewhat greyer and brighter, a difference doubtless attributable to the fresher winter plumage", while Dr. Dillon Ripley withholds comment, giving only the measurements of a ♂ and ♀ collected for him at Embilipitiya (Southern Province) in January and February. Additional specimens, collected during the period May to September and further information on the breeding of this Cuckoo, are greatly desired.

### **Hierococcyx varius Vahl**

#### **The Common Hawk-Cuckoo.**

Although Legge (p. 241) believed "this noisy Cuckoo" as he called it, to be a Winter visitor arriving in October, it has now been proved, definitely, that many (if not the majority) of our Hawk-Cuckoos are residents that breed in the Hills of the Central Province and do not



migrate. To Mrs. Cicely Lushington and Mr. R. West belong the credit for establishing this fact. Firstly, in January 26th, 1946, Mrs. Lushington saw a pair mating in a grevillia tree on a Tea Estate (5,700 ft.) in the Agrapatanas district; then on the 22nd April of the same year, Mr. R. West shot a young, but fully grown, juvenile being fed by Common Babblers (*Turdoides striatus striatus*) on Rookwood Estate (5,500 feet) in the Hewaheta District. Again this year (1947), on March 30th, Mr. Lushington met with a fledgling Hawk-Cuckoo, with a short tail and unable to fly well, on another Estate in the Agrapatanas district and, on May 5th, Mrs. Lushington watched another juvenile being fed by its foster parents (Common Ceylon Babblers) on Waverley Estate, in the same district. The last was fully developed and strong on the wing. From this evidence, we may deduct that our resident Hawk-Cuckoos mate, after much noisy calling, very early in the year and eggs are laid about February and March, the usual fosterer being the Common Ceylon Babbler (*Turdoides s. striatus*). This agrees well with the habits of this Cuckoo in the plains of India where the usual fosterers are birds of the *Argya-Turdoides* group. In India, however, (South West and Northern Central) most birds breed, according to Stuart-Baker (Nidification Vol. III. p. 349), "in May and June or in late April but in Bihar and Bengal many birds lay in March".

The egg does not appear to have been found in Ceylon, yet (unless there are some in Stuart-Baker's collection) but it is well known in India. It is a deep glossy-blue egg of one type only, which does not vary. Stuart-Baker (Cuckoo Problems p. 75) states "This Cuckoo everywhere lays eggs of this same intense blue and lays no other kind of egg, anywhere. So consistently is the Common Hawk-Cuckoo parasitic on *Argya* and *Turdoides* that it may be said to be parasitic only upon them from Ceylon to the base of the Himalayas" and on page 76, "so close is the resemblance between Cuckoo's and fosterer's eggs that it is impossible for an expert Oologist to differentiate between the eggs of the fosterer and the parasite without weighing and testing the texture".

Sixty-six eggs (Indian) of this Cuckoo, average  $430 \cdot 1$  mg in weight and  $25 \cdot 21 \times 19 \cdot 23$  mm. in size.

It is curious that, while the Common Hawk-Cuckoo in India, is "essentially a Plains bird" in Ceylon it appears to be essentially a highland species! Only very occasionally has it been noticed in the low-lands and, on these few occasions, the individuals met with have been presumed to be on migration. It would seem most probable, therefore, that two races of this Cuckoo occur in Ceylon (a) a resident form, breeding in the Hills and (b) a migratory form, arriving in small numbers from India about the beginning of November and leaving again about March and early April. The migratory form appears also to inhabit the Hills during its stay in Ceylon. The resident form is very local in its distribution. It is resident in certain localities in the Dimbulla, Dickoya, and Hewaheta Districts, of the Central Province, at altitudes of 3,500 feet and above and, when breeding is over, may possibly be found, together with the migratory form, anywhere in the Hills. In the Uva Hills, it is not so common and it is doubtful whether it breeds to the East of Nuwara Eliya. In the localities where it breeds, it appears to form small associations of one or two females and three or four (or possibly more) males.

Whether or not the resident form can be separated from the continental, migratory form, in size or colour, is now undergoing investigation.\*

With regard to the calls of the resident form, Mrs. Lushington has sent me the following notes "The Hawk-Cuckoo starts calling towards the end of the year and is noisy until the burst of the South-West Monsoon (usually about the middle of May), becoming more or less silent with the advent of the wet weather. If the monsoon happens to be a light one, with a fair amount of sun, it will call until the end of June; after this, one occasionally hears a male calling for a short period on fine evenings. In April and the Spring of the year generally, it quite often calls at night".

\*Note.—Since the above was written, Mr. Macdonald, of the British Museum (Natural History), has stated in a letter that six specimens from Ceylon were compared with a series of Indian forms and "found to be darker in colour as a whole".



"The 'Brain-fever' note of the male is really more like the syllables 'too-trroo-yer' having a distinct roll in the second syllable; this is repeated with a rising inflection until one feels that the bird is going to burst! It also has a longer call, frequently heard. This consists of single notes that mount leisurely up the scale, sometimes coming down it again for a short way, and terminates with several repetitions of the 'too-trroo-yer' note. The females have a strident, trilling scream 'trrrrrrr trrrrrrr trrrrrrr'. This is heard most frequently at dusk and appears to be an invitation to the male. At times, the male utters a softened version of the female's scream". Often, this irritating call of the male Cuckoo—from which it derives the popular name "Brain-fever Bird"—leads to the bird's undoing. Many people cannot stand the cry and shoot the author whenever the opportunity occurs.

### *Cacomantis merulinus passerinus* Vahl

#### The Plaintive Cuckoo.

Although Wait (p. 209) states that "a few birds may possibly remain and breed in Ceylon, as the species is resident over the greater part of its range in India" it is now generally accepted that the little Plaintive Cuckoo is purely a migrant; no indication of its breeding, in Ceylon, has ever been discovered. It would appear, however, that, occasionally, a few may loiter in the Island, after the majority have returned to the mainland as there are, in the Colombo Museum collections, two female specimens, the one collected (if the data labels are reliable) at Situlpahuwa, on the 16th May, 1934, and the other at Colombo, on the 8th August, 1917—which would appear to indicate loitering. Commonly, however, the Plaintive Cuckoo arrives in Ceylon, often in large numbers, during October and leaves again towards the end of April. During its stay in the Island, it is widely scattered, chiefly throughout the Dry Zone, but it may also be found, in small numbers, in the Wet Zone and, (mainly while on passage) in the Hills to 4,000 feet.

In the Dry Zone, it prefers to haunt rather open bush country, clumps of scattered trees around irrigation tanks and cultivation, open thorn-jungle along road-sides and streams and park country. Often several may be seen in the same vicinity, as often as not greatly differing from one another in plumage. The plumage in this Cuckoo is very confusing to anyone not familiar with it, so I give here Whistler's excellent description of it (p. 213). "The adult male is, as is well known, a slate-grey bird with a variable amount of white in the region of the vent. The wings are plain, except for white on their inner webs. The tail is black with white barring, the black being much more extensive than the white. The adult female is certainly dimorphic. One phase is similar to the adult male but the slate-grey is not quite so pure, being striped in places with brown or grey. The other phase is hepatic. The upper parts, throat and breast are chestnut with obsolescent black barring; the abdomen is white with black barring; the wings are chestnut and black; the tail is chestnut and almost unmarked. The juvenile male is superficially similar to the adult male. The upper plumage is brownish black, with a variable amount of white in the region of the vent, and a variable amount of grey or faint rufous barring on the lower parts generally. The wings are plain except for white on their inner webs. The tail is black, more or less barred with white, the barring being unusually narrower and more frequent than in the adult; the white bars are sometimes tinged with rufous.

The juvenile female appears to be polymorphic and I recognize three main types:—

- (1) Similar to the juvenile male as described above.
- (2) Hepatic. This is superficially similar to the adult female of the hepatic type. The upper parts are chestnut-bay, heavily barred with black. The lower parts are white barred with black and more or less washed with chestnut on the chin and throat; wings bay and brown; tail chestnut more or less marked with black.
- (3) Intermediate. Upper parts banded bay and black; lower parts grey, barred with black and white and slightly washed with chestnut on the sides of the upper breast; vent white; wings plain as in type (1); tail barred as in type (1) but with rather more rufous.



The juvenile plumage is apparently moulted by a complete post-juvenile moult, into the fully adult plumage. One is tempted to assume that the grey type of juvenile female moults into the grey adult and that the hepatic type of juvenile female moults into the adult hepatic female; this may be so though I have not seen certain proof of it".

In India and throughout its range, the common fosterers of the Plaintive Cuckoo are, almost solely, small Warblers of the genera *Cisticola*, *Suya* (not found in Ceylon) *Orthotomus*, *Franklinia* and *Prinia*, so, should this Cuckoo ever breed in Ceylon, its eggs are most likely to be found in the nests of the following Warblers, all of which are common in various parts of the Low Country.

*Cisticola juncidis omalura*. Ceylon Fantail-Warbler.

*Orthotomus s. sutorius*. Ceylon Tailor-bird.

*Franklinia gracilis pectoralis*. Franklin's Ceylon Wren-Warbler.

*Prinia socialis brevicauda*. Ceylon Ashy Wren-Warbler.

*Prinia sylvatica valida*. Ceylon Jungle Wren-Warbler.

*Prinia inornata insularis*. Common Ceylon Wren-Warbler.

These Warblers lay eggs with white, pale pink, reddish-chestnut or blue grounds, generally more or less freckled, spotted or blotched with various shades of red or reddish-brown or sepia, while "the great majority of the Cuckoo's eggs are white to pale pink in colour, freckled, spotted or very rarely blotched with deeper red. A very small minority of eggs are pale green or green-blue, similarly marked". The average weight of 65 eggs is 106.9 mg., and the average size 19.29 × 13.39 mm. (Stuart-Baker, Cuckoo Problems, pp. 66, 67 and 202).

The call of this Cuckoo may frequently be heard in the early mornings and evenings, but in Ceylon it does not call persistently as the majority of Cuckoos appear to do in the mating season. This call has been interpreted as "a plaintive call of two syllables, the last one lengthened out "whi, whew-whi, whi, whew or Ka-weer, Ka-wee-eer".

### ***Penthoceryx sonneratii waiti* Stuart-Baker**

#### The Ceylon Banded Bay Cuckoo.

There appears to be only one form of Banded Bay Cuckoo, in Ceylon—the resident race which is "similar to the Indian race but very much darker above and more brown, less rufous; the tail feathers have more black, the rufous on the central pair being reduced to notches on the outer edges" (Stuart-Baker, Fauna, Birds Vol. IV. p. 159). The Ceylon race is very local in its distribution; although nowhere a common bird, it is scattered over the greater parts of the low country, especially in the Eastern Province, and in some districts of the Uva and Sabaragamuwa Provinces. During the North-West Monsoon, or Winter period, it frequently ascends into the Hills. I have seen a pair, calling loudly and chasing each other, during the last week in December, in the Bandarawella District (Uva) at 4,000 feet, and have often seen and heard it calling in the lower aspects of the hills of the Namunukula District. It is doubtful, however, whether it ever breeds at altitudes over 1,500 to 2,000 feet. From about the middle of December to late April, it is a very noisy bird. In the early mornings, till about 9.30 to 10 A.M., and again in the evenings, between 4 P.M. and dusk, it calls persistently, so its presence is easily detected. It is reputed to be rather a shy bird, but I have not found it so. I have, in fact, seen it in bungalow gardens, both in Colombo and in the Hills, and have not found it difficult to approach though, undoubtedly, it prefers secluded tracts of open jungle in which to live. As a habitat, it favours park country, open jungles surrounding secluded paddy fields and the sparsely cultivated country around large irrigation tanks and Chena clearings. It has a great liking for tall, dead trees and the tops of trees standing, isolated or in small clumps, a little way out in the open—from which commanding positions it will call incessantly during the breeding season.

As with so many of our Ceylon Cuckoos, we have exceptionally little definite knowledge of the breeding of this bird; the egg appears never to have been taken (unless an egg that I took



from a nest of Palliser's Ant Warbler (*Elophrornis palliseri*) belonged to this Cuckoo—and a fledgling has been observed only once. The egg, referred to above, was found on April 7th, 1938, in a nest of Palliser's Ant Warbler, built in the top of a tea bush growing close to the jungle at Forest Hill (4,000 feet) division of Mousakande Group, Gammaduwa in the East Matale Hills. In addition to this egg (which was infertile) the nest contained a well-grown young Ant-Warbler. The egg was sent to Stuart-Baker who wrote, in a letter dated 28th November, 1939, "I sometimes go up to my egg room and gaze at the last egg you sent me, of *Elophrornis* and the more I gaze the more I am convinced that it is an egg of *Penthoceryx*. It agrees in no way with the former eggs of the Warbler which you sent me but does agree exactly with some I have of this Cuckoo. I really think the Cuckoo must have deposited her egg in the Warbler's nest. The weight is very great, 158 mgs., and makes it almost certain to be a Cuckoo's egg". On the other hand, I have neither seen nor heard a Banded Bay Cuckoo in the neighbourhood where the nest was found—so the identity of this egg must remain doubtful, although in colour and size it is very similar to a typical Cuckoo's egg as described below.

Regarding the fledgling, however, we have the testimony of a very careful observer and may accept the identification of both the young Cuckoo and the foster-parents as reliable. At Kahawatte, in the Ratnapura District, on October 4th, 1940, Mrs. Cicely Lushington saw a young Banded Bay Cuckoo being fed by an Orange Minivet (*Pericrocotus flammeus*). In a letter to me, dated the same day, she states "this morning I saw a young Banded Bay Cuckoo being fed by an Orange Minivet. I could hardly believe my eyes! They were low down in a young Albizzia and as I had my monocular with me, I could put the identity of the Cuckoo past a doubt. Only the hen Minivet fed it and this she did at frequent intervals. The Albizias are all swarming with Caterpillars now, so I suppose this is what they were feeding on.

The Cuckoo kept on uttering a peevish cry, rather prolonged and high pitched. It was the note that led to my finding it, as it was an unfamiliar call and I wanted to see what bird was uttering it. It is strange that this is the first fledgling Banded Bay Cuckoo that I have seen here, although it is quite a common bird in these parts".

Again on 26th February, 1946, I myself saw a cock Orange Minivet chasing away a Banded Bay Cuckoo, from a large tree growing in a ravine on the outskirts of some abandoned rubber on Galapitakande Estate, Namunukula, 2,400 feet in the Uva Hills; I could find no nest, however.

From this evidence, it would appear certain that the Orange Minivet is an occasional fosterer, although certainly not the usual. Which birds, then, are the normal fosterers of this Cuckoo, in Ceylon?

On the mainland of India, the eggs of the typical race of this Cuckoo have been found in a variety of nests. Stuart-Baker has, in his collection, 66 eggs of which 53 were taken in Assam. Of these, 33 are from the nests of the Nepal Quaker-Babbler (*Alcippe n. nepalensis*), 5 from nests of the Brown Bush-Warbler (*Tribura luteoventris*), 3 from Tailor-birds' nests (*Orthotomus sutorius sub-spp*) and 4 from Red-vented Bulbuls' nests (*Molpastes cafer sub-spp*) while the remainder were chiefly from the nests of various species of small Babblers. It would appear most probably, therefore, that the normal foster-parents of the Ceylon Banded Bay Cuckoo will prove to be one of our small Babblers or Common Bulbuls, the most likely being—

The Ceylon Black-fronted Babbler (*Alcippe atriceps nigrifrons*)  
The Northern Ceylon Black-fronted Babbler (*Alcippe atriceps siccatus*)  
and The Red-vented Bulbul (*Molpastes cafer cafer*)

while the following may prove to be occasional fosterers—

The Ceylon White-throated Babbler (*Dumetia hyperythra phillipsi*)  
The Ceylon Yellow-eyed Babbler (*Chrysomma sinensis nasilis*)  
The Brown-capped Babbler (*Pellorneum fuscicapillum sub-spp*)  
The Common Iora. (*Aegithina tiphia multicolor*)  
The Yellow-browed Bulbul (*Iole icterica*)  
The Black-capped Bulbul (*Pycnonotus melanicterus*)



The Ceylon White-browed Bulbul (*Pycnonotus luteolus insulae*)  
 The White-browed Fantail-Flycatcher (*Leucocirca aureula compressirostris*)  
 The Orange Minivet (*Pericrocotus flammeus*)  
 Pallisers Ant-Warbler (*Elaphrornis palliseri*)  
 and The Ceylon Tailor-bird (*Orthotomus s. sutorius*)

All nests of these species should be examined, most carefully, for eggs or young of this Cuckoo, whenever the Cuckoo is known to inhabit the area in which the nests are found.

As already stated, no authentic egg of the Ceylon race of the Banded Bay Cuckoo has yet been examined but the eggs of the typical race are thus described by Stuart-Baker (Nidification Vol. III. p. 352). "An oviduct egg is a broad oval in shape, the ground-colour a pale dull lilac, the whole surface with rufous-pink spots scattered profusely all over it" and another is "very similar but much browner". "Many eggs are exactly like the oviduct one above described, but they vary greatly. Some eggs are pure white speckled with deep purple-brown, deep lilac or pink; others are minutely freckled all over with dull neutral tint or reddish brown. Other eggs are closely assimilated to certain types of *Alcippe* eggs and, when type is laid with type, the resemblance is often extraordinary, though the texture is coarser and heavier, while at other times the contrast is striking".

The eggs average (approximately) 140 mg., in weight and  $20.5 \times 15.8$  mm. in size.

From its vigorous calling, it would seem likely that this Cuckoo generally breeds early in the year, in February, March and April but it is remarkable that the young one, seen by Mrs. Lushington, was observed on 4th October—so evidently some individuals breed later in the year.

The call, by which this Cuckoo makes its presence known in any area that it inhabits, is thus described by Mrs. Lushington. "The usual note is a pleasant, briskly uttered "tee-tyup—tee-tyup" repeated at short intervals and uttered from some commanding position such as the top of a bare or leafy tree. Like the Hawk-Cuckoo, it also has a long call. This goes slowly and rather laboriously up the scale, in single notes, but stops abruptly about halfway up, leaving the cadence quite unfinished. Occasionally one hears this Cuckoo utter a rich and soft "Kroo-Kroo-Kroo-Kroo" which I consider to be the note of the female. A spell of fine weather, at any time of the year, will induce this Cuckoo to start calling".

### **Chalcites maculatus** Gmelin

#### **The Emerald Cuckoo.**

The sole claim of the little Emerald Cuckoo, to be included in the list of Ceylon birds, rests, apparently, on the fact that the species was originally described from Ceylon. Whistler (p. 214) states "The inclusion of this lovely species in the Ceylon list depends solely on the fact that Peter Brown in his *New Illustrations of Zoology* (1776, p. 25, pl. XIII., fig. 2) recorded that his specimen of the "Spotted Curucui" had been sent to him from Ceylon by Governor Loten. Gmelin's name was based on this illustration and the type locality is therefore Ceylon. Doubt has been thrown on the correctness of the statement that Loten's specimen came from Ceylon but this appears unnecessary, not only because Cuckoos are noted wanderers but because there is a perfectly authentic record of this species at Adyar a few miles South of Madras, on 6th March, 1878".

No other specimen appears to have been seen in Ceylon, since the type was secured, but there is always a possibility that another wanderer will make its appearance, one day, during the North-East Monsoon period.

The Emerald Cuckoo is generally a hill bird, inhabiting the foot-hills up to 5,000 feet from Kuman to Eastern Assam in the Himalayas and the hilly country of Burmah and the Indo-Chinese countries to Hainan (Stuart-Baker, Nidification Vol. III. p. 353). It generally lays its eggs in the nests of the Indian Yellow-backed Sunbird (*Aethopyga siparaja seheriae*).



# *Surniculus lugubris stewarti* Stuart-Baker

## The Ceylon Drongo-Cuckoo.

The superficial likeness of the Drongo-Cuckoo to the Common Drongo is so truly remarkable that it is the cause of its presence being frequently overlooked. Personally, I always look upon this Cuckoo as being one of our commoner resident Cuckoos. Certainly, it is by no means rare in the localities that it favours—that is to say, locally over the greater part of the low country and—as a wanderer—in the Hills to 4,000 feet, during the dry weather period (July to September) when presumably it is not breeding. In the lower Hills of the Central and Uva Provinces, it often gathers into small scattered flocks or associations of under half a dozen individuals which may remain in a restricted area, on a Tea-Estate or the outskirts of a jungle, for a week or more, before moving on to another locality. Generally these Cuckoos are not shy birds and will allow a fairly close approach, so that they may be distinguished, on careful examination, by their darker under-parts and the white on the wings and tail, from the White-vented Drongo (*Dicrurus caerulescens*) which inhabits the same areas. The Ceylon form of this Drongo-Cuckoo is scarcely distinguishable from the mainland form and the typical form of Java, but I have retained the sub-specific name, in this paper, for convenience. It is a resident in the Island and is not known to migrate to the mainland although the same race occurs in South India.

During the breeding season, which appears to be from December until May, the Drongo-Cuckoo resorts more to large tracts of heavy forest. I have found it common in the Bibile District of Uva and in the forest areas of the Eastern Province generally, while Legge states that it is, "very common in the Three Korales and the country intermediate between that and Ratnapura" . . . . "in the Kurunegala and Puttalam Districts it is fairly represented and it occurs here and there, throughout the Northern forest tract at all times of the year, from the latter place across to Trincomalee, where it is not uncommon in the forests".

It is doubtful, however, whether it ever breeds in the Hills above about 1,000 feet, as it is seen only in the Low Country during the breeding seasons. Our knowledge of the breeding of this Cuckoo is, like that of so many of our Cuckoos, very scanty; but we have more definite information regarding it than we have of the Ceylon Banded Bay Cuckoo. Stuart-Baker (Cuckoo Problems, p. 74) writes "in regard to the Ceylon form of this Cuckoo I have only two eggs, one taken from the nest of the Ceylon Iora (*Aegithina tiphia multicolor*) and the other from that of the Ceylon Black-fronted Babbler (*Rhopocichla atriceps subsp.*). The eggs are exactly like those of the Iora and not unlike those of the Babbler. Both Wait and Stewart, who sent me these eggs, have seen young Cuckoos of this species in the nests of these birds and have taken other eggs, similar to those sent to me". Wait, referring to the eggs that he sent to Stuart-Baker, states (p. 211) "As the adults in their appearance closely mimic Drongos, it was for long supposed that this species deposited its eggs in the nest of the Drongo. It will be seen, however, that the fledgling is most unlike that of a Drongo, and I have lately obtained clear evidence that in Ceylon this Cuckoo lays in the nest of the Black-fronted Babbler (*R. atriceps nigrifrons*) as in May 1917, in the Puttalam District, a nest of this species was brought to me tenanted by a young Drongo-Cuckoo. Previous to this, Mr. E. C. Stuart-Baker had seen a strange egg taken by me from a Black-fronted Babbler's nest and had assigned it, tentatively, to this Cuckoo. This egg was taken in the Southern Province, also in May. I have also a similar egg, taken near Puttalam in December, 1918. In shape it is an elliptical oval, measuring .83 by .61 (inches.) The ground colour is white, with a very faint pink tinge, fairly profusely spotted with reddish-brown and dull inky purple. The Cuckoo may also possibly lay in the nests of the Bush Bulbul (*AE. tiphia zeylonica*)"—*AE. t. multicolor*.

From the above, it would appear most probable that, in Ceylon, the Drongo-Cuckoo normally resorts to the nests of the Ceylon Black-fronted Babbler (*A. a. nigrifrons*) in the Wet Zone and those of the Northern Ceylon Black-fronted Babbler (*A. a. siccatus*) in the Dry Zone, in which to deposit its eggs but, occasionally, it may also lay in the nests of the Common Iora (*AE. t. multicolor*). The Black-fronted Babbler is usually common in the localities where the



Drongo-Cuckoo is found, but the Iora is not very common anywhere and is probably only cuckold when a Babbler's nest is not available. Where these Cuckoos are known to be present during the breeding season, therefore, all nests of the Black-fronted Babbler and the Iora should be carefully examined for strange eggs or young.

In Java, the typical form of this Cuckoo lays in the nests of the Javan Rusty-vented Babbler, an egg that is described as "a rather deep rosy salmon pink marked with a few deep red-brown spots and twisted lines, looking as if the colour had been run, with others underlying of pale lavender-grey". I would appear therefore that the Drongo-Cuckoo lays more than one type of eggs, but whether or not more than one type is laid in Ceylon, remains to be proved by a further research. The only type found to date is described as grey-white, speckled and blotched with brown and with underlying marks of neutral tint and measuring about  $19.5 \times 14.7$  mm.

Out of the breeding season, the Drongo-Cuckoo appears to be rather a silent bird; I have never heard it call while it has been associating in scattered flocks in the lower hills, but, from December to April, it may frequently be heard, especially in the early mornings and evenings, calling loudly from the top of some high tree on the outskirts of the forests or in a clearing. Mrs. Lushington thus describes the call "it has a plaintive sequence of about seven clear notes, whistled in ascending scale "whip-whip-whip-whip-whip-whip-whip" and repeated at intervals again and again. It usually calls from the top of some thickly foliated tree, in which it keeps itself well concealed. It also has a long call of the same type as that of the Hawk-Cuckoo, but does not utter it often. It calls only when breeding or about to breed. Out of the breeding season, it is silent except for an occasional soft "chup".

### ***Clamator jacobinus taprobanus* Hartert**

#### The Ceylon Pied Crested Cuckoo.

Except in some of our urban and coastal areas, where the Koel is so abundant, the Pied Crested Cuckoo is the commonest of our lowland Cuckoos; it occurs locally, throughout both the Wet Zone and the Dry, and sometimes penetrates into the Hills to altitudes of nearly 4,000 feet. Undoubtedly, however, its stronghold is in the "tank" country of the North-Central Province and surrounding areas of similar terrain. Here, I have frequently met with numbers consorting in loose flocks while, on one notable occasion, near Kekirawa (N. C. P.) I counted nearly thirty feeding together on yellowish, hairy caterpillars which were stripping the foliage from the large, fan-shaped leaves of the lotus plants that covered the water in a small irrigation tank, surrounded by low jungle and chenas. The Cuckoos were flying close over the water and alighting frequently on the lotus leaves and stems to pick up the caterpillars.

Normally, however, this Cuckoo moves about in pairs or small parties, migrating from district to district or into the lower hills, in search of the caterpillars and other insects that form its normal food; it is unusual to see a single Pied Crested Cuckoo by itself, even in the bush-country and swamps that are its favourite haunts.

Like the Ceylon Drongo-Cuckoo, the Ceylonese form of the Pied Crested Cuckoo is doubtfully distinguishable from the South Indian typical form (*jacobinus*) but I have retained the name *taprobanus*, in this paper, for convenience sake and in order to indicate that my references are to the Ceylonese form only. Although so closely similar to, if not identical with, the South Indian race, there is no indication of any contact by migration with this race. Our Island bird appears to be purely a resident.

In contrast to the Cuckoos considered earlier in this paper, we have considerable knowledge of the breeding of the Pied Crested Cuckoo in Ceylon; its eggs have been taken, frequently, and the usual foster-parents are well known. Referring to this bird, Stuart-Baker (Cuckoo Problems pp. 81, 82) writes:—"This is a genus of which all the species, so far as is known, cuckold only birds whose eggs closely resemble their own and adaption is complete with the



evolution of a single type of egg for each species of Cuckoo" . . . . "Over the whole of the great Oriental range, this species lays blue eggs of a soft, fairly deep tint, varying very little in depth of colour. The surface is extremely smooth but not, as a rule, glossed, with a rather silky appearance and a curious susceptibility to stains because of its very porous character. These stains often draw attention to the egg as being that of a Cuckoo and not one of the normal fosterer's. Over the whole of its area from Ceylon to the Himalayas, with one exception, this Cuckoo places its eggs in nests of Babblers of the genera *Turdoides* and *Argya*, which nests may often contain one or more eggs of both the Pied Crested Cuckoo and of the Hawk-Cuckoo" and "the eggs . . . . are often very difficult to distinguish from one another but, generally speaking, the Pied Cuckoo's eggs are more spherical in shape and somewhat less glossy than those of the Hawk Cuckoo and Babblers". To which may be added Wait's description (p. 212) "They closely resemble the Babblers' eggs in size and colour, but are generally of a slightly different shade. They are broadly elliptical in shape, sometimes with rather square ends, the shell is hard, the surface smooth, satiny and slightly pitted, while the "white" is greenish instead of being colourless as in Babblers' eggs".

8 eggs of this Cuckoo average about 480.2 mgs. in weight and  $24.5 \times 19.3$  mm. in size.

Here in Ceylon, the eggs of this Cuckoo have never been found, as far as I am aware, in any other nests but those of the Common Ceylon Babbler (*Turdoides striatus striatus*) which is a common resident in all the areas where this Cuckoo abounds. Often several Cuckoos' eggs may be found in a single nest; Wait (p. 212) states, "I have several times found two of these eggs in one nest and three eggs have been taken" while I myself have met with two Cuckoos and three Babblers' eggs in the same nest, in the Kalutara District, in February. Although several Cuckoos' eggs may be laid in one nest, only one young Cuckoo survives; the others appear to be thrown out of the nest, together with the eggs or young of the Babbler, by the first-hatched or strongest young Cuckoo, but this is not yet proved. A number of observers have watched the young Cuckoo being fed by the foster-parents; not only do the pair of Babblers that have hatched out the young Cuckoo, feed it, but it is fed also by the other members of the troop. As soon as it is old enough to leave the nest, it joins the troop and is then fed by all and sundry and appears to have a wonderful upbringing. Troops feeding young Cuckoos have been observed even in Colombo gardens. The only record that I have, of two young Cuckoos being seen with one troop of Babblers, is the one sent to me by Capt. C. E. Norris. Writing on March 18, 1940, from the Kumbalagamuwa District (C. P.) he states, "I saw a Pied Crested Cuckoo being fed by Ceylon Babblers. It was fully fledged. Also there was another one with it which appeared to be older as its crest was more defined; also it was feeding itself. The young one continually followed the troop of Babblers, making a sort of mewing cry and fluttering its wings a lot. Both birds, I should say, had been reared by the same troop but in different nests because of the differences in age".

All the Cuckoos' eggs, that I have met with, have been found during the months of February and March, in the Kalutara District (W. P.) and May in the Kekirawa District (N.-C. P.) but Wait states that he has, "taken eggs from November to June and again in August" so the breeding season of this Cuckoo appears to be a very extended one; it will, in fact, most probably be found to breed intermittently throughout the year, though the most usual time is probably during the period March to May, when the majority of the Babblers have their nests.

Referring to the call of this Cuckoo, Legge (p. 247) writes, "it has a rather plaintive, not unmelodious call, uttered when perched on some low tree; but at the commencement of the breeding-season, Mr. Holdsworth writes "they are very noisy and incessantly fly from one place to another, one or more males apparently chasing the female and uttering their clamorous cries". Jerdon remarks the same fact, and says that the call, which the males utter at this time, "is a high-pitched metallic note," while Stuart-Baker (Fauna, Birds, Vol. IV. p. 169) writes "its call is a very wild metallic double note, not unmusical when the bird is in full voice, but very harsh at the beginning of the season. It also has a considerable number of unpleasant cackling and screamings, rather reminding one of the English Jay".



**Clamator coromandus** Linnaeus

## The Red-winged Crested Cuckoo.

The Red-winged Crested Cuckoo, one of the most handsome of the Cuckoos in Ceylon, appears to be a regular migrant, in small numbers, from North India. It certainly is not a common bird, as stated by Stuart-Baker, nor have I found it a rare bird as stated by Wait (p. 212). It appears to arrive in Ceylon during October and to leave again, on its Northwards migration, in March or April. I cannot find any grounds for the suggestion that some birds may stay with us, all the year round, in the Northern forest tract; it appears to be purely a migrant.

On arrival in Ceylon, it seeks the forest areas and is generally found in, or on the outskirts of, high forests and heavy jungle. It appears generally to remain in the lowlands, both in the Wet and in the Dry Zones, (chiefly in the latter) but occasionally it will wander up into the highland forests. I have seen one in the forests on the Bopats at over 5,000 feet and there are other records of its occurrence at lower altitudes.

According to Stuart-Baker (Nidification Vol. III., p. 357) this Cuckoo breeds in the Himalayas up to about 6,000 feet, during the period early April to the end of August. It lays blue eggs similar to, but larger than, those of the Pied Crested Cuckoo, generally in the nests of Laughing-Thrushes of the genera *Grammatoptila* and *Trochalopteron* and, in the Eastern Himalayas, in the nests of the *Garrulax* while an occasional egg has been found in a nest of the Bulbul and Quaker-Thrush.

The Red-winged Cuckoo appears to be silent while it is with us; I can find no record of any call ever having been heard in Ceylon.

**Eudynamis scolopaceus scolopaceus** Linnaeus

## The Koel.

Every Colombo resident knows, only too well, that disgustingly noisy bird, the Koel. More abuse is hurled at it than at any other bird in Ceylon; yet the Koel appears to be a comparatively recent arrival in Colombo! Legge, writing in 1880, does not mention it as being found in the city and states (p. 253) "in the Western Province, this parasitic Cuckoo breeds in May and June, laying nearly always in the nests of *Corvus leuallanti* (the Black Crow) and not in that of the smaller citizen species, as in India, for the simple reason that the latter does not inhabit the jungles to which the Koel resorts to rear its young". This observation of Legge's, is quite contrary to the present day customs of the Koel, in Colombo, so it is obvious that, during the last 60 years or so, the Koel has changed its habits, at any rate in the Colombo area, for it now largely cuckold the Grey House Crow (*Corvus splendens protegatus*) in that area and elsewhere on the coast.

Owing to the multitude of Crows, with which Colombo is infested, the Koel appears to be commoner there than anywhere else, but it is also a common bird, though somewhat local in its distribution, in almost all the coastal districts and throughout many inland areas in both the Wet and the Dry Zones of the low country. It has not yet, however, penetrated into the hills, to altitudes of more than a few hundreds of feet, though it may, very probably, follow the Crows into their mountain retreats now that the Black Crow has become so common in most districts, even in the highest hills.

The eggs of the Koel are well known and may be found without difficulty, if the nests of either the Grey House Crow (*Corvus splendens protegatus*) or the Black Jungle Crow (*Corvus macrorhynchos culminatus*)—(*Corvus leuallanti* of Legge) be searched in the areas where Koels are known to breed. The Koel's eggs are considerably smaller, shorter and rounder than the Crow's eggs; they are not unlike Crow's eggs in colour, but can be distinguished, without difficulty, by their size; they have "a pale stone, pale greenish yellow or yellowish-grey ground, profusely marked all over with blotches, freckles, specks and spots of reddish-brown but giving the prevailing impression of greenish eggs just as those of the Crows appear to do".

146 Koels' eggs average 658 mgs. in weight and  $30.6 \times 22.9$  mm. in size.



While Legge (p. 253) gives the breeding season, in Ceylon, as May and June, Wait (p. 215) gives June and July. In fact, however, the breeding season is more prolonged as Koels' eggs may commonly be found in the nests of the Grey House Crow during the second half of April and early May and in those of the Jungle or Black Crow from June until late in August. As the House Crow now continues to nest, in the Colombo areas, until September and October, it is quite probable that the Koels continue to lay until the nesting of the Crows is finished, but I have not met with eggs after August 27th or before April 10th.

Curiously enough, it is the exception to find only a single Koel's egg in a Crow's nest; usually there are several and there may be a number in each nest. Legge (p. 253) cites four nests of the Jungle (Black) Crow containing (a) 4 Crows and 4 Koels, (b) 5 Crows and 3 Ks, (c) 2 Cs and 4 Ks and (e) 2 Cs and 2 Ks, while Wait (p. 215) writes "as many as five Koel's eggs have been found in one Crow's nest and I have several clutches of four". I have not met with more than two Koel's eggs in a nest of the Grey House Crow, but in one nest of a Jungle Crow, which I found in the Kalutara District on August 1st 1923, there were no less than six Koel's eggs and two Crows! But this is not the record for Stuart-Baker (Nidification p. 358) writes "I have myself seen six or seven several times, while as many as thirteen have been recorded. These show quite clearly, by size, shape or tint that two or three and in one case, four birds have laid in the same nest in addition to the rightful owner".

That the female Koel sometimes removes one of the Crow's eggs at the time she deposits her own is certain. On May 2nd, 1943, on the Island of Karaitive, in Portugal Bay, I discovered a nest of the Grey House Crow containing one Koel's egg and three Crow's; next morning the nest contained two Koel's and two Crow's eggs and other similar instances have been recorded of the Crows' eggs decreasing in number while the Koels have increased. But apparently the Koel does not always remove one or more of the Crow's eggs, as I have met with two Koel's eggs in a Jungle Crow's nest containing the full complement of five Crow's and another with three Koel's and four Crow's, four being the usual complete clutch for the Crow, though sometimes five eggs are laid. Now, what happens to all the young ones when the eggs begin to hatch?—that is a question to which the answer is not yet definitely known. Several observers have seen both young Crows and young Koels in the same nest, yet only one Koel seems to survive ultimately. Stuart-Baker (Nidification Vol. III. p 357) writes, "I have *never* seen a young Koel eject either egg or young Crow or brother or sister Koel from the nest. On the other hand, I *have* seen Koels and young Crows in the same nest but within a few days but one young Koel was left in it. Sometimes also I have seen the remains of eggs and young birds under Crows' nests from which they have evidently been thrown out".

Discussing this question further, in "Cuckoo Problems", Stuart-Baker (p 157) writes, "On more than one occasion I found young Crows on the ground under trees in which there were nests containing young Koels and perhaps one or more young Crows. I used to believe that the birds thus found were thrown out by the young Koel, but now I think that in such cases the ejected birds were probably thrown out of the nests, or fell therefrom, during the constant quarrels which take place between the occupants". It seems most likely that the above quoted paragraph contains the true explanation of what takes place, for, here in Ceylon, I have seen half grown young Koels which have fallen or been thrown out from the nests. These, it would seem probable, have been pushed over the edge of the nest in the fight for food; gradually the weaker young, either Koel or Crow, are eliminated by starvation or being pushed out, until only one, the strongest Koel, survives—but further evidence on this point is most desirable.

The loud, high-pitched, aggravating cry "Ku-il, Ku-il" echoing throughout the residential quarters of Colombo, during the whole of the hot weather, is so well known and so heartily disliked that there are few people who do not hate the Koel.

To the highly strung or sick person, this cry seems to declare "You're ill, You are ill". One distracted lady, of my acquaintance, used to shake her fist and shout after the departing birds, "I'm NOT ill", "I'm NOT ill", "I'm NOT ill"! to ease her mind and convince herself



that the bird was not screaming at her personally. The "Ku-il, Ku-il" or "Koyo, Koyo" cry seems to be peculiar to the male, while the female has more of a loud discordant scream—but both are equally unpleasaant and annoying when heard at close quarters.

### Conclusion.

To sum up, although there are very many interesting matters yet to be elucidated, the chief points, on which further information regarding our Cuckoos and their habits is required, are as follows :—

*Cuculus canorus*. The Asiatic or European Cuckoo—from where do our migratory birds come and to which sub-species do they belong ?

*Cuculus micropterus micropterus*. The Indian Cuckoo.

Have we a resident breeding form of this Cuckoo in Ceylon ? If so, which are the fosterers ?

*Hierococcyx varius*. The Common Hawk Cuckoo.

It is now proved, beyond all doubt, that we have a resident race that breeds in the Hills. Is this race distinguishable, sub-specifically, from the migrant form—if we have also a migrant race ?

*Penthoceryx sonneratii waiti*. The Ceylon Banded Bay Cuckoo.

An authentic egg of the Ceylon race of the Banded Bay Cuckoo has not yet been obtained ; in which nests does this Cuckoo normally lay ?

*Surniculus lugubris stewarti*. The Ceylon Drongo Cuckoo.

Eggs, believed to have been laid by this Cuckoo, have been found in the nests of the Ceylon Iora and the Black-fronted Babbler. Is the latter the normal fosterer of this race of Cuckoo ?

*Clamator jacobinus taprobanus*. The Ceylon Pied Crested Cuckoo.

The eggs of this Cuckoo are well known and so is the normal fosterer. Several Cuckoos' eggs are often laid in one nest but only one young Cuckoo appears to survive. How are the others got rid of ?

*Eudynamis scolopaceus scolopaceus*. The Indian Koel.

The eggs of this noisy Cuckoo are also well known ; they are laid, during the hot weather, in the nests of both species of Crow. Normally, more than one Koel's egg is found in the Crow's nest ; sometimes six or more have been found, together with several Crow's eggs. Several young Crows and Koels have been seen in a nest but usually only one Koel reaches maturity. By what method does the surviving young Koel get rid of its competitors ?



## Some Mystacetid Whales from Ceylon

By

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(With One Plate and One Text Figure.)

The whale-bone whales known from Ceylon are assignable to three genera and three species. Accounts of certain whales washed ashore but which were destroyed or washed out to sea before examination suggest that a fourth species also exists. Ceylon's extreme southerly position and the vast tracts of more or less unbroken ocean that separate it from the nearest land masses to the south, west and east make it a passing point of large oceanic fishes such as bonitos, albacores, sail fishes, marlins, sword fishes, sun fishes, and the whale shark. Many of these are unknown from Indian waters. The oceanic turtle *Dermochelys coriacea* Linné, also appears to nest on Ceylon's shores more frequently than elsewhere, and whales appear to spend some considerable time off Ceylon during their migration to and from the Antarctic and Pacific. The frequency with which cetaceans strand themselves in Ceylon waters is of unusual interest and their suicidal behavior, as will be shown later, appears to be connected in some way with a reproductive urge.

### *Rachianectes glaucus* Cope

*Rachianectes glaucus* Cope, 1868, Proc. Acad. Nat. Sci. Philadelphia, p. 160.

#### Grey Whale

This species is generally considered to be restricted to Pacific waters north of latitude 20° north. The description sent by Mr. A. Irving of the Galle Light house of a living wounded bull whale that stranded itself off the Galle ramparts at 4 p.m. on November 2, 1936, is only applicable to this species. Mr. Irving who was familiar with whales in other seas stated that it was neither a toothed whale, nor a fin whale, nor a hump-back. Teeth were not noticeable. The animal was torpedo shaped, possessed a double blow hole, and its colour was a dark bluey grey dorsally, a darker grey ventrally. The measurements he secured were as follows:—Length to caudal notch 44 ft. 10 in., girth at flippers 18 ft., girth midway between flippers and flukes 15 ft. The animal was subsequently towed into deep water and released.

### *Balaenoptera acutorostrata* Lacépède

*Balaenoptera acutorostrata* Lacépède, 1804, H. N. Cétæ, p. XXXVII.

#### Little Piked Whale

On May 19, 1937, the photograph of an unusually small rorqual with a man standing beside it, was published in the daily press (Times of Ceylon). The photograph showed a very acute snout, baleen plates, and ventral pleats. The animal was stranded at Mannar to the north-west of Ceylon. The District Adigar kindly measured the specimen for the writer. Its measurements are as follows:—Total length 21 feet, girth 6 feet, width of flukes 3 feet 9 in., length of gape 3 feet, belly pleats on exposed side 29 (Probably about 52 in all).

### *Balaenoptera borealis* Lesson

*Balaenoptera borealis* Lesson, 1828, Hist. Nat. Gen. et Partic. Mamm. et Oiseaux, Cétacés, p. 342.

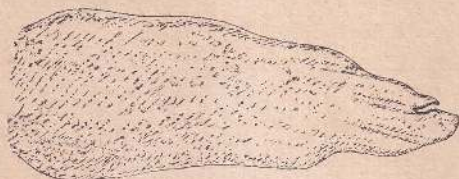
#### Rudolph's rorqual

Descriptions of specimens that have been washed ashore and destroyed before scientific examination, suggest this species which is known from Malayan waters.



**Balaenoptera sp.**

A cow whale-bone whale had stranded itself at Polhēna near Matara in the Southern Province. The dead carcass was examined on February 6th 1934. The whale bone was entirely black, there were thirty seven belly pleats on the exposed left side and they extended from the chin to the vaginal cleft. A gular carina was present. The gape ended about three quarters of a flipper length ahead of the base of the flipper, the tail was compressed and possessed a caudal notch. As the animal lay on its back it was impossible to ascertain whether a dorsal fin was present.



P. Deraniyagala. del.

Fig. 1. Right flipper of *Balaenoptera* sp. showing free end of second digit  $\times \frac{1}{10}$ .

The distal end of the second digit of the flipper was free; dermal grooves marked the positions of the first three digits.

The whale's dimensions were as follows:—Total length 49 ft. 8 in., girth anterior to flippers 22 feet, length of flipper 6 feet 10 in., width of flipper 2 ft. 6 in., length of free part of second digit 5 in., snout tip to axilla 17 ft. 7 in., axilla to vagina 17 ft. 7 in., vagina to caudal notch 13 ft. 8 in., width of flukes (tip to tip) 10 ft., depth at mid caudal peduncle 5 ft.

**Sibbaldus musculus** Linné

(Plate I)

*Sibbaldus musculus* Linné, 1758, Systema Naturae Ed. 10, Vol. 1, p. 76.

**Blue Whale**

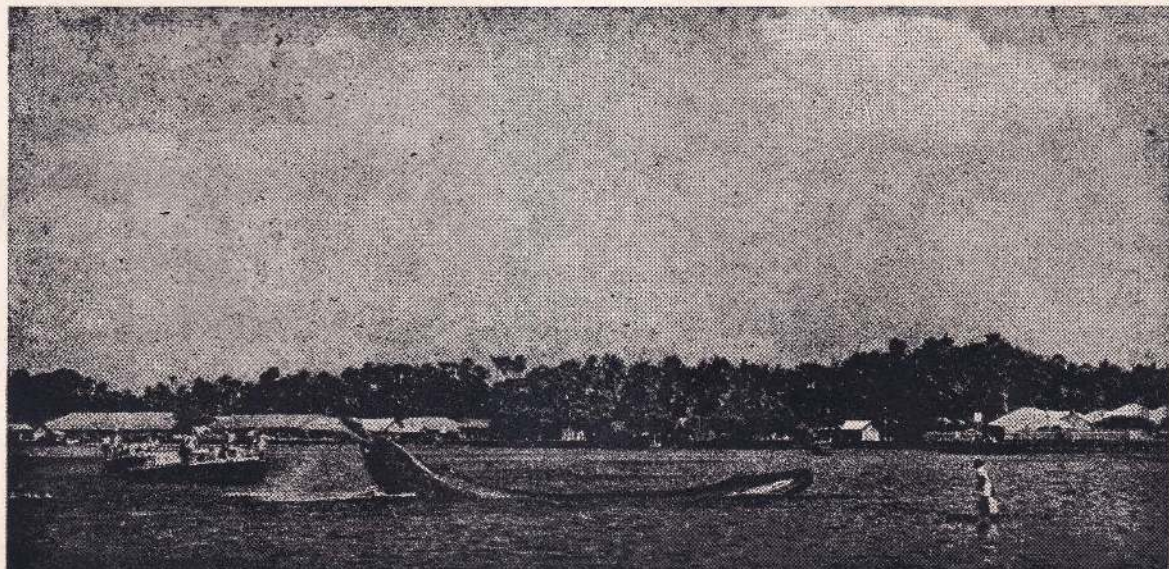
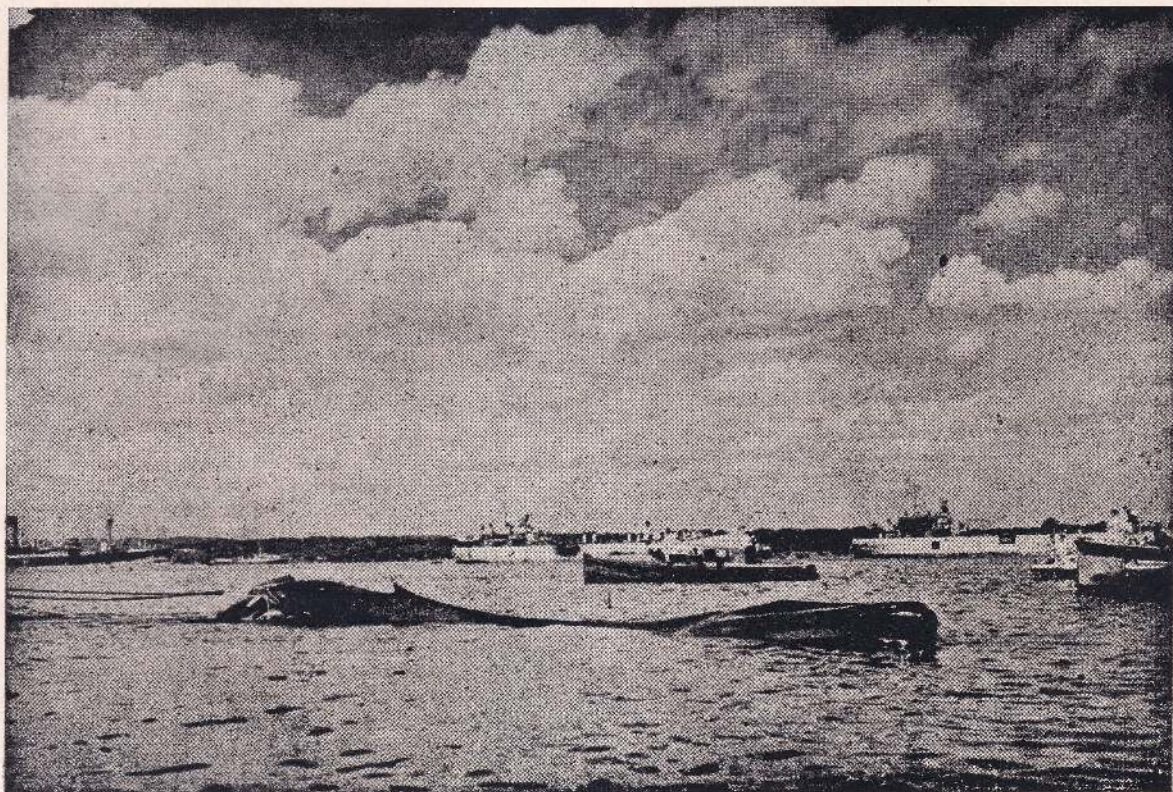
This species is common off Ceylon and carcasses are washed ashore at not infrequent intervals. The figure and description of a living bull that ran aground has been published in an earlier issue. (Deraniyagala, 1932). Since then about ten other instances of carcasses or stranded individuals are known as is also a single instance of this species calving close to land.

The following description is based upon photographs kindly supplied by His Excellency Vice Admiral Sir Arthur Pallisser, K.C.B., D.S.O., and upon information furnished by Captain E. A. Mount Haes, R.N.

The photographs show a small dorsal fin and that the distance from this fin to the commencement of the flukes is contained about four times in the distance from the fin to the tip of the lower jaw. These characters show that the cow is of the same species as the bull figured from Trincomalee in May, 1932 (Deraniyagala, 1932, Plate XI.). Captain Mount Haes stated that the length of the cow was 60 feet (carefully checked) and that its color was black.

The whale had run aground in four feet of water in Trincomalee harbour on January 23rd 1946. She blew at regular intervals and kept up an undulating movement from head to tail as if attempting to clear herself. Captain Mount Haes disregarding the risk he ran approached the animal, attached a rope to her flukes, and proceeded to shift her into deep water. Directly he succeeded the whale "sounded" and towed him in turn, forcing him to release the line. The animal then returned into comparatively shallow water within the inner harbor where





A female *Sibbaldus musculus* that gave birth in Trincomalee harbor, Ceylon







she gave birth next day. Once again Captain Mount Haes towed her out into deeper water and released her. This time she made for the open sea and other officers who saw her swimming off Round Island estimated her speed at 3 knots and entered this in the "log".

The two larger whales that commonly occur off Ceylon are the blue whale *Sibbaldus musculus* Linné and the sperm. Both are not infrequently washed ashore dead, and occasionally run aground alive, especially in the vicinity of Trincomalee and on the south-west and north-east coasts.

The abundance of whales and their proximity to land, off Trincomalee is particularly <sup>1</sup> noteworthy. Here the deep water lies unusually close to the shore. Several cetaceans have run aground in this area within the past fifteen years, the more notable instances being a bull blue whale that grounded aground itself in May, 1932, in Kottiyar Bay a few miles south of Trincomalee (Deraniyagala, 1932), and a school of 97 false killer whales that ran aground at Mudhur a few miles south of Kinniyai on 10th November 1934 (Deraniyagala, 1945).

The bull whale and the false killers all displayed the undulating action noticed by Captain Mount Haes, while the latter also resembled the present cow whale in persistently returning to the shallows after being towed out to sea. These killer whales did not give birth, but those of another school that ran aground at Kayts in the Northern Province on August 3rd 1929, did so (Pearson).

The present cow whale's action suggests that this suicidal behaviour of cetaceans might possibly be some form of reproductive urge, and not solely due to inability to realise that they should turn back when the water becomes shallow.

#### References to Literature.

DERANIYAGALA, P. E. P.—

1932.—A Stranded Blue Whale *Spolia Zeylanica* XVII. p. 55, one plate.

1945.—Some Odontoceti from Ceylon *Spolia Zeylanica* Vol. 24 pp. 113-121, three plates.

PEARSON, J.—

1931.—A Note on the False Killer Whale *Spolia Zeylanica* Vol. XVI. p. 199, one plate.

#### Explanation of Plate.

Plate I.—A stranded cow blue whale being towed into deep water at Trincomalee harbor on January 24, 1946.

Figs. 1 and 2.—The animal in side view. Fig. 3.—Is an anterior view showing the blow hole, dorsal fin and flukes successively.

<sup>1</sup> The Hump back *Megaptera nodosa* is known from a specimen taken at Quilon, Travancore, India, on Jan. 23, 1943.







## The Sigiriya Frescoes

By

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(With Four Plates and One Text Figure)

The art of Sigiriya occupies the prime of place among the pictorial art of early Ceylon. In a land rich in its variety and extent of its antiquities, the Sigiriya frescoes have exercised a fascination which is unique both as a work of art and in their link-up with the political history of the Island. The subject of the Sigiriya frescoes has received greater attention at the hands of both visitors and scholars than perhaps any other monument in Ceylon and continues to be an inexhaustible field of study. If therefore I add my contribution to a much discussed subject, it is because of their evident interest, viewing them more from an anthropological point of view than the archaeological, which at different times has received adequate attention at the hands of distinguished archaeologists.

**INTERPRETATIONS AND FUNCTIONS.**—What is the function of the Sigiriya art, what purpose, if any, does it serve, who are the figures represented in the frescoes? These and other questions arise in our minds, as we stand gazing at the figures in the rock pockets of Sigiriya. On the one hand we have the opinion that the figures represent apsaras or heavenly nymphs and their attendant maids, and on the other, the more prosaic view of Mr. H. C. P. Bell to whom the honour is due of having been the first to reveal them to an admiring world, that these portraits in colours represent the ladies of King Kasyapa's own household, and very probably, his wives and daughters who lived their lives in the isolated world of the Sigiriya fortress.

While these are the main trends of thought, art critics have expressed themselves more freely on the character and function of the art. In following these comments and opinions, what strikes us is the view predominating that these frescoes are sensuous and secular combining elegance of manner with a "penetrating sensuality"<sup>1</sup>. This is all the more remarkable, when it is at the same time upheld that the figures are representations of apsaras who are supposed to cast down a rain of flowers. In the action that is attributed to them, of raining or casting down flowers, there is little however to favour the sensual idea. So far as the opinion is concerned that they are "penetratingly" sensual, it is well to remind ourselves of the fact that a certain amount of sensuousness, or sensuality has formed part of the religious customs and observances of most countries, in the past. Conceding therefore that the Sigiriya frescoes are "sensuous" or even "sensual", the conclusion does not follow that they are necessarily "secular" and not religious.

**DIVINITY OR HUMANITY.**—Before however we examine further the purpose and function of these pictures, let us briefly review the pros and cons of the alternate interpretations of apsaras, as against human beings, or of divinity versus humanity. In favour of the interpretation of heavenly nymphs, is the circumstance that the figures are all cut off a little below the waist, and that this feature of the figures would be opposed to the idea of considering them as human beings. The aspect of the clouds out of which the figures appear to emerge, would seem to lend colour to the idea of the preternatural; and this obviously is the only factor indicative of such an interpretation. Nevertheless, it cannot be conclusive as against the human idea, for the interpretation either way, would ultimately depend on many other factors. From the point of view of the technology of the art, it would be obvious that the background of the clouds, was something determined by limitation of space and by the nature of the material—hard unyielding rock contours and undulating surface, on which the artist had to ply his art. The limitation of space produced the convention of the clouds. The delineation of the full figure was

<sup>1</sup> Coomaraswami, A.—*Mediaeval Sinhalese Art*, page 178.

Coomaraswami, A.—*History of Indian and Indonesian Art*, p. 163.



in the circumstance altogether out of the question, and the resulting cloud effect and the cut figures, would scarcely decide the issue. Nor do the clouds foregather round the figures, as we see in the group of apsaras in the contemporary Ajanta art, (Cave XVII.)<sup>1</sup>, where the apsaras are literally floating in space with fleecy clouds all about them and rising well above the figures. The intriguing factor indeed emerges that even while generally conceding the apsara idea, we cannot get away from earthly contacts, and linking the figures with the women of King Kasyapa's household, as we find Benjamin Rowland<sup>2</sup> doing when expressing his feeling that "certainly they are reflections of the beauties who made life pleasant in the court of Kasyapa". This indicates how impossible it is to sustain an exclusively apsara complex in regard to these figures, which are basically human. In a figurative sense, we may of course speak of them as heavenly, as though to heighten the picture of feminine beauty, as we see one of the old time scribblers at Sigiriya exclaiming,—“It is as if heavenly nymphs have descended on the earth!”

**THE GRAFFITI.**—This introduces us to the graffiti<sup>3</sup>, or the impressions of visitors through the ages, inscribed on the smooth parapet wall at Sigiriya. As Dr. Paranavitana points out, the identity of the women is a favourite theme of these versifiers, and many of them like Mr. Bell have come to the conclusion that the paintings are representations of the wives of King Kasyapa”. Based on this assumption is the graffiti speaking of “the Long eyed ones of the King, who being separated from their Lord, are worn with grief”; and “gazing forward, wondering where their lord had gone”, while yet another visitor has not stopped short of ascribing the grief of the ladies, to the “death” of their lord!, voicing the feeling that “the golden coloured ones appear as if they are hurling themselves down from the summit of the rock, being unable to console their hearts as, indeed, the King has died”.

**FUNCTION OF ART.**—If “the highest function of art is to express and communicate ideas”, what idea does Sigiriya art express and communicate? If Sigiriya art does nothing but express and communicate sensuous or sensual ideas, all our interest in the Sigiriya art would seem a waste, for Sigiriya art is truly great and could not possibly have been conceived or created to serve the sole purpose of exciting sensuous thought. Let us not persuade ourselves that Kasyapa was a wicked man and he could not therefore have had anything but sensuous or sensual ideas. On this point we are on rather firm ground, for we have the testimony of the chronicles<sup>4</sup> which tell us of the repentant life he led. Among the many meritorious deeds he did, to save himself, are the restoration of the Isurumuni Vihara which he named after himself and his daughter, endowing villages for its maintenance, founding monastic establishments at Isurumuni and Vessagiri Viharas, &c. He was at special pains to propitiate the Bhikkus, and to observe Buddhist precepts and practices, even including certain ascetic observances not ordinarily meant for lay people. Obviously therefore we may take it that he lived a sustained life in atonement of his Karma and made his best endeavour in preparation for the other world. And, as if to supplement the chronicles, we are left in Sigiriya the residence of the King, a pictorial record of frescoes as a legacy to posterity—a heritage we have long been striving to interpret.

**ART AND RELIGIOUS SYMBOLISM.**—The history of art reveals to us that all art was essentially meant to meet a definite human need. It was not a case of art for art's sake, as we hear today. Seldom or never, did man in early or even later stages of life, deliberately form an art or picture gallery for purely decorative purpose, and it could not have been otherwise with Sigiriya art. It is a far cry from the cave art of Aurignacian and Magdalenean times of the Old Stone Age, to the art of the rock pockets of Sigiriya. The cave art of the men of the Old Stone Age discovered in different parts of the world, has disclosed to view pictures of animal art—animals graphically represented, art which carries us to more than 50,000 years ago, in dark caverns and inaccessible places. These pictures have been the subject of much study and research<sup>5</sup>. The primary intention was not to form a picture gallery. The dominant motive was utilitarian, to control by a process of mimetic or sympathetic magic, the animals represented

<sup>1</sup> Griffiths.—The Paintings in the cave temples of Ajanta.—Cave XVII—60.

Wall painting in verandah D.

<sup>2</sup> Rowland, Benjamin.—The Wall Paintings of India, Central Asia and Ceylon. p. 85.

<sup>3</sup> Paranavitana, Dr. S.—Sigiriya Graffiti J. R. A. S. (Ceylon), Vol. XXXIV, No. 92, 1939.

<sup>4</sup> Geiger—Culawansa, I. Translation—1929, Chap. XXXIX., p. 43.

<sup>5</sup> Sollas, W. J.—Ancient Hunters and their Modern Representatives. Oxford 1915.



so as to improve the hunting prospects. Before setting out on a hunting party, magical rites would be performed over these pictures. It was believed that these rites operated on the representation of the animals, would react on the animals represented, and give the men control over the animals they hunted and on which depended their food supply. Sigiriya art may not be on all fours with the palaeolithic art of the cave man, but it gives us a cultural parallelism which has a meaning of its own as applied to Sigiriya art. Mr. Bell and Dr. Paranavitana have stressed the fact that "the paintings are not visible from the gallery, nor from any other point close to the gallery. No access of any sort existed in ancient days to the spot where the paintings are now", and visitors have been puzzled "why the ancients painted at such an inaccessible spot instead of selecting a place where their work could be seen and admired with greater ease". No satisfactory answer has been given to this question. We may take it that the Sigiriya frescoes are, where they are, not by accident, but by intention. These form the cream of Sigiriya art, in a sheltered recess, safe from decay by exposure to the alternating weather conditions, whereas the pictures on the surface of the rock, if there were any, are all mere patches of lime plaster.

To consider now the nature of the pictures, they are not of the class of the static representations ordinarily seen in picture galleries, but are scenes vibrating with life and action. It is a pageant on the move, the figures moving individually or in pairs, the mistress, leading closely followed by the maid with trays of offerings. The *dramatis personae* in this pageant of Lanka are advancing forward as if under the same stimulus, though in contrast to the animation of the mistresses, the maids have a more calm bearing. Not all however, of the figures are on the move. Some have definitely paused, not without cause. These figures are a study in expression. A notable example is the dignified lady of opulent proportions, rich in years holding a bud of the *Utpala* or the blue lotus, the *manel*, which she has obviously been opening petal by petal. (Plate II.). This lady has a staid maid behind her. Of single standing figures too we have a few, particularly the lady, also past her prime of life, with an *arali* flower in the right hand, and three lotus buds in the left.—Deep in reverie she stands, with the neck bent, the head drooping and eyes cast down. (Plate III.). The way in which the *arali* is held by the stalk between the thumb and the forefinger, as this and two other ladies are holding, cannot be more realistic. Scenes such as these, too numerous to detail, are deeply impressive, and easily comprehensible, as representations, not of heavenly, but of earthly life,—scenes the like of which can be seen at any Buddhist shrine today.

It is a feature of early art that it suggests more than it shows. It is deeply symbolic, expressing ideas by suggestive symbols. Sigiriya art is suggestive art, symbolic and suggestive of religious worship. The whole art is redolent of spiritual symbolism, symbolising the worship of the Buddha. In its essence the symbolism of Sigiriya art, is akin to the symbolism of the cave art of the Paleolithic man, for the Sigiriya art expresses and conveys religious worship by scenes of spiritual symbolism, dramatically represented.

FUNCTION OF SIGIRIYA ART.—The problem that has puzzled all observers, the painting of pictures on the Sigiriya rock "that was hard for men to climb", and in recesses where they were not meant to be seen, is now easy of answer. The intention was not decorative, not to form a picture gallery, but to symbolise in a vivid series of moving scenes, the realism and the ceremonials of the worship of the Blessed One. Thus viewed, the art of Sigiriya would easily be intelligible as a pictorial rendering of the feelings which animated King Kasyapa, and in harmony with his meritorious deeds in preparation for the world to come. If there is merit at all in symbolising the worship of the Buddha, there is more positive merit in representing his own wives and daughters in the act of offering ceremonial worship at the altar of the Blessed One. Thus visualised the art of Sigiriya would take on a definitely religious role, as much associated with Buddhist worship, and as much a cross-section of the Sinhalese culture of the time centering round the worship of the Buddha, as any other paintings extant in the Island. This then is the theme of Sigiriya, the idea that Sigiriya art expresses and communicates. Early art has been essentially and directly of a purposeful character, with a value of its own apart from its worth as a work of art. This distinguishes it from examples of modern art, produced as we hear it said, for "art's sake", or as an expression of the artist's "creative



faculties"—Sigiriya art is of value, not because of any benefit it conferred on the artist. Though it has acquired a traditional value to posterity, its value at the time of its execution, could not but have been personal to the man behind the scene, King Kasyapa himself,—for it needs little imagination to see in these pictures, the great idea of the King's supplicating divine intercession through the medium of these graphic representations of the worship of the Buddha,—much as the simple folks of the Old Stone Age, sought to get mastery over the animal world, through the medium of their colourful animal art.

At this stage, we may look at the figures from the point of view of *abhinaya* or the art of dramatic expression. That face is the index to the mind,—is as true as it is trite, the spirit of which is endeavoured to be realised in *abhinaya*, whether in the dance art or the dramatic art. Let us study the figures a little more closely. The head is not held high or erect, the body has a decided bent forward or a turn sideways; the eyes are cast down, with either a downward look or a side long glance. The eye lids are definitely narrowed, which gives the eyes the look of being half closed. To express in classical terms, the emotion pictured is typical of the dominant *bhava* or expression of *Karuna*, the mood of compassion, tinged with *shoka* or grief. The narrowed eye-lids with the side long glance, typical of the expression of compassion, would seem to be responsible for the "Mongoloid touch", or the "Chinese look" which writers have seen in some of the figures<sup>1</sup>.

**JEWELLERY AND DRESS.**—We may now turn our thoughts to the other and more external factors,—the jewellery, the decorations and the dress. To take the jewellery first.—The vogue in jewellery 1,500 years ago can well be studied from the Sigiriya figures which have a superabundance of decorations and adornments more lavish and elaborate than in the contemporary Ajanta art. While the decorative motifs in general follow the conventional Buddhist art of the time, there are distinctive features special to the art of Sigiriya, such as the variety of head dress within so limited a range of figures. The big central gem heightens the effect of the ornamental coronets. The head is so fully decorated that little of the hair is seen, having a few figures, in which the wealth of hair is not set off with a coronet, but is adorned with attractive flowers and floral creepers, or sprigs stuck in the hair, and showing out like plumes. (Plates II. and III.). Occasionally too, ringlets of hair intertwined with flowers adorn the frontal ridge. Hair rolled up in jata form arranged one above the other is also in evidence, the whole topped with the peaked coronet. The back of the head is not neglected either. Decorated with flowers profusely, this would suggest the *praveni*, or the type of hair plaited and hanging down the back, with flowers adorning the whole length. (Plate IV. a)

Ear ornaments are generally known by the name of *Kundalas* which are of different types. The simplest is crescent-shaped in the form of a curved ring. A common pattern is the roll of palm leaf which encircles the distended ear lobe, and are either of the same width as the rim of the lobe or slightly broader. In the Sigiriya frescoes we have both the patterns, the curved ring form which seems to pull down the ear lobe with its weight, and the circular roll of palm leaf. The latter is called the *talapatra*, considered very auspicious, as betokening a married lady. A development of the simple palm leaf, gives us the same form made in gold in the form of a scroll, the *swarna patra kundala*. This latter is possibly the type seen in the Sigiriya figures.

Of necklaces, we find as many as three, four or five adorning the figures, the number varying in different figures. It is remarkable that almost every figure has first a necklet, a string on which is strung three beads,—one central bead escorted by one rather smaller bead on either side. Plate IV. Fig. (a). This is typical of the form of the *tali*, the marriage symbol of all Hindu women. The *tali* is a single bead, the shape of which varies according to the caste and the region. The commonest form is the circular or oval bead with two smaller beads, one on either side. Certain Hindu castes in Tinnevely, use a flattened form with a star-shaped golden bead on either side, the whole necklet being termed, *chirakum taliyum*, or the wings and the *tali*. With some castes the *tali* takes a leaf pattern.—The *tali* is worn on a cotton strand, sometimes on a double strand, as we notice in some of the Sigiriya figures. In only two of the

<sup>1</sup> Devendra, D. T.—Guide to Sigiriya, p. 12.

Bell, H. C. P. Journal, R. A. S. (C.), Vol. XV., No. 48. 1897, p. 119.

Rowland Benjamin. The Wall Paintings of India, Central Asia and Ceylon. p. 86.



Sigiriya figures, including the figure of the dark coloured maid, do we not find this necklet. The tali is the unfailing symbol of a *sumangali* living with her husband. If the beads were meant to serve a purely ornamental purpose, a full string of beads would obviously have graced the neck, as seen in the Ajanta frescoes, and not just three beads or a single one or double. The presence of what looks unmistakably like a tali, would raise a number of interesting side issues, such as the survival of the tali in Ceylon, a distinctly Hindu trait. The presence of the tali as a marriage symbol in Ceylon, would indeed seem to be strongly indicated by the custom in the wedding ceremonies of the Sinhalese, which goes by the name of "tāli pili andavima", තැලි පිළි ගැන්වීම or the traditional custom of the bridegroom tying the *male* or the necklace round the neck of the bride, followed by the exchange of presents of wedding apparel. The simple tali would thus seem to have evolved in course of time, into the more showy necklace.

The most prominent of the other necklaces, is the *ashtika* (from Sanskrit "yashti"). The chief feature of this is the *padakama* or the central pendant bearing a large gem, with an edging of what appears to be pearls or gold globules. (Plate IV. Fig a). Below this principal necklace and just skirting it, we find a whitish broad necklace of several strings, possibly of close set pearl or even thick strands of cotton thread. In two of the figures another necklet is seen, between the tali and the *ashtika*. An interesting adornment seen in one only of the figures, is the ornamental pattern known as *vaikakshaka*, a decoration formed of two strands of garlands or pearl strings crossing each other in the form of a cross belt. It is seen in early sculptures of women at Bharhut and Amaravati. (Plate IV. (b) and Text. fig. 1). This adornment in the Sigiriya figure referred to may be traced on either side of the neck, below which it is completely hidden by the necklaces, until it emerges between the breasts into a gem set pendant. From the apex of the latter, two strings branch off on either side of the abdomen reaching down to the lower garment.



Fig. 1. Details of jewellery.

The big gem-set pendant in the necklace, and the gem-set crown are well matched, by the solid broad bracelets set with big stones, which embellish the wrist in all the figures. The type would seem to correspond to the pattern known as *phalaka valaya*. The forearm is fully covered with thin bangles bounded by another broad gem-set bracelet, just below the elbow.



Bracelets, as a decoration of the ladies symbolised the married status of the women and are indicative of a *sumangali*. Armlets are a prominent feature and grace the upper arm in all the figures. Seen in bold relief, they are obviously composed of closely set rows of pearls.

Before we take leave of the ornaments, let us not miss what would seem to be a minor adornment,—one that has a meaning, all its own. I refer to the *tilaka*, decorating the forehead of the women. In the Sigiriya figures, the *tilaka* or *pottu* (the urna of the classics) conforms to an elongated pattern. Viewed from a side it is just a line. (Plate IV. Fig. a). In the fuller form, a rhomboidal pattern, vertically elongated, is evident,—the traditional and classical form of the third eye of Siva, the form from which the *tilaka* or *pottu*, as we see it today has evolved. Though the *pottu* has come to be regarded as a feature of beauty, it was traditionally associated with wedding ceremonies in which the *pottu* has still a place of its own. This would seem to be yet another indication of the figures being of queens, of married status.

We may now pass on to a consideration of the drapery both upper and lower. It is not the case that the figures are clothed in nothing beyond ornaments. If any proof were needed of the presence of drapery, we have it in the pearl-set armlet which demarcates the margin of the sleeve of the upper garment. The latter is of extremely fine fabric, the form of which recalls the tight fitting half-sleeved *choli*. It is possible that cloth of superfine texture was favoured by the women of Sigiriya for daily wear, against the heat of the rock in the tropical sun. The drapery is indeed so fine that it almost clings to the body, and while draping the figures, it emphasizes the curves. The lower garment is not easy of analysis, as all that is pictured is the part round about the waist. Well secured at the waist, the lower garment gives us the artistic fan shaped fold or flap on one side. The central fold or band clearly seen below the waist, would support the idea of the garment being worn in the *Kachcha* mode, with the lower ends passed between the legs and tucked behind at the back,—a mode of dress which occurs in the Amaravati sculptures of the Andhra country. This mode of wear, produces regular folds which are clearly indicated by the striped effect. The distinctively striped garment is also conspicuous in the picturesque drapery of some of the figures. For another example of the *Kachcha* mode in early Ceylon art, we may turn to the dress of the lovers in the sculptured tablet at Isurumuniya temple at Anuradhapura. An interesting item of dress is the breast band worn by two of the maids. As a feature special to youthful maidens, the breast-band finds mention in *Selalihini Sandesaya* (verse 9). The only part of the body not covered by drapery is the abdomen on which, true to the conventions of the time, the artist has bestowed great skill, resulting in the extremely constricted waist, which so much appealed to the aesthetic sense of the ancients, as they did to the moderns of the later days.

CONCLUSIONS.—That the pictures are sensuous, we may easily concede, as indeed is any work of art which appeals to our sense of the beautiful. If Sigiriya art were not sensuous, it would not have been the triumph of art that it is. The visitor's impressions at Sigiriya as recorded in the graffiti bear eloquent testimony to the charm of the Sigiriya figures. The admiring visitors have all vied with each other in "hand-picking" the beauty spot as it strikes them, one praises the eyes, one the hand, one the slender waist, one the languid pose. But that is no reason to view the frescoes as purely sensuous, sensual and secular. To do so would be to miss the function of the Sigiriya art, its integrity and its realism. We have so long been accustomed to see in the pictures, nothing more than sensuousness or sensuality, that this would seem to have detracted from our interpreting them in any other light, or viewing them from that objectivity of approach, which it is essential to apply to all works of art.

To interpret the past in the light of the present is the method of Ethnology. No one who has seen the society ladies of Cinnamon Gardens with flowers and garlands proceeding for the worship of the Sacred Relics during the time of their exposition at the Colombo Museum in the summer of 1947, closely followed by their maids, with trays of offerings could fail to be impressed by the parallelism, which the Sigiriya representations bear to the women of the present day, on their way to perform religious worship.

PORTRAITS.—To view the figures as representations of the ladies of Kasyapa's court, is however not quite the same thing as to consider them "portraits". While we need not



associate the art of portraiture as practised by the ancients, with the technique of portrait painting of the present day, we have ample evidence to show that the early artists both in India and Ceylon widely and successfully practised the art of portraiture, and that in judging of the art products of the past, we are justified in considering them as faithful likenesses as possible, of the personages figured in paintings or sculptured in stone. Nevertheless the artists of old did not hesitate to introduce the art motifs of the day both to heighten the artistic effect as well as to be true to the art conventions and traditions of the time. In one at least of the South Indian frescoes—the painting of King Mahendravarman I in the Sittannavasal frescoes—the figure as represented, has been found to bear a close resemblance to the sculptured head of the same king at Mahabalipuram (<sup>1</sup>). The elements of portraiture in the Sigiriya art, have been analysed in detail by Mr. Bell to whose treatment of the subject we may profitably turn, for a fuller elucidation of the factors that favour the idea of the Sigiriya frescoes, as portraits.

**RACIAL.**—While we may agree with Mr. Bell (<sup>2</sup>) in considering the figures as portraits, we are unable to be in complete accord with his observations that “the type of features is Aryan—oval face, thick fleshy lips, but straight almost Grecian nose and forehead”. The early anthropologists were linguists, and several terms of purely cultural and linguistic origin, have come to be in general use to denote both peoples and their culture. Among such terms are Aryan and Dravidian. The progress of anthropology during the past few decades has made it clear that the use of these terms as applied to races, is unscientific and wrong, except in a cultural sense or as applied to peoples speaking languages belonging to the Aryan family of languages, peoples speaking these languages differing as they do in different parts of the world, in physical or somatic characters. The point to note therefore is that there is no one set of somatic characters, as is generally supposed, answering to an “Aryan type”, and therefore, to speak of an Aryan type of features is fundamentally wrong. What the principal categories of races are, within which peoples of Aryan cultural stock, have been classified, their distribution and their physical characters, &c., are questions that cannot be rightly discussed here. So far as the figures themselves are concerned, it is easy to speculate. But such speculation will not carry us far, for no racial study of any value can be based on these painted figures; apart from the circumstance, that for a proper racial study we should take note of the principles of racial classification and the criteria on which such classification is based, which obviously is more than can be attempted within the compass of this paper.

**AFFINITIES.**—The most striking factor about the art of Sigiriya, is its absolute isolation, nothing approaching it having been found within the Island either earlier as foreshadowing it or later as continuing its traditions. It has thus been an interesting speculation of scholars to look for affinities on the Indian soil. Such studies have found expression in at least one direction—the view which Benjamin Rowland propounded in the pages of his work, “The Wall Paintings of India, Central Asia and Ceylon” (page 83). His observations on the subject are of such evident interest that I make no apology to reproduce them:—“After the break-up of the Maurya Empire, Ceylon appears to have had a close connection, religious and artistic, with the Andhra kingdom on the south-east coast of the mainland. We can be reasonably certain that there was a school of painting in Ceylon at least as early as the school of sculpture. Just as the earliest statues in the Island are modelled after the types created by the Buddhist ateliers in the Andhra centres in the Kistna district, the now lost early painting probably stemmed from this same source. I am inclined to believe that the strong differences in style which we note between the later Sigiriya paintings and the Central Indian cycles at Ajanta and Bagh are accounted for by the fact that, even at this period (about 500 A.D.), it was the influence of South-eastern rather than Central India that shaped the style of the Sinhalese school of painting”.

These remarks of Benjamin Rowland are followed up by the more specific parallelism which he draws (p. 85) of the “resemblance of these ladies at Sigiriya to the maidens in the sculpture of Amaravati”. The distinction that he here makes, between “maidens” and

<sup>1</sup> Aravamuthan T. G. South Indian Portraits 1930—p. 14.

<sup>2</sup> Bell, H. C. P.—J. R. A. S. (C) Vol. XV. No. 48—1897, p. 119.



"ladies" is also not without its own significance. The maidens of Amaravati are "delicate, tender and creeper-like with tapering legs and arms long and slender"<sup>1</sup>, whereas the ladies of Sigiriya are rather heavy with an opulent and rich flavour, particularly so the matronly mistresses. Perhaps the strongest single factor repugnant to the apsara idea, is the variety of the figures represented in these pictures, women of varying age grades from "crabbed age" and "portly dames", to figures of youthful proportions. There was no idea of the artist of Sigiriya, conforming to any rigid canon of beauty. The women are figured as they are in life. Apart from this fundamental difference, the essential links between the two schools of art, are considerable. The artistic and effective grouping of the figures, the "soft form and the softer clothing", the slow and dignified movement, "the body contours rich in curves that undulate in large sweeps suggesting the full breasts and broad waist zone, with the waist lost between them", these descriptions are as true of the maidens of Amaravati, as of the ladies of Sigiriya, and testify to the great skill of the artists in the delineation of the feminine form. Reflections of the Amaravati tradition in other respects, may be seen in such details as the gem-set head gear, the dress, the jewellery and other decorative motifs such as the *Suvarna Vaikakshaka*, referred to elsewhere. The Amaravati school of sculptures covers a period of time extending from the Second Century B.C. to the Third Century A.D., and flourished under the patronage of the Kings of the Satavahana Dynasty.

My thanks are due to the Commissioner of Archaeology for facilities to study the Sigiriya art and for permission to reproduce the photographs of his department.

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<sup>1</sup> Sivaramamurti C., *Amaravati sculptures*, in the Madras Government Museum, 1942, p. 45.



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General view of Sigiri rock









Sigiriya Fresco.  
The Mistress (with the *utpala*) and the Maid.









In Meditation.









Lady with Necklet of Tali.

a



The Mistress (wearing the *Suvarna Vaikakshaka*) and the Maid.







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