THE SIJU CAVE, GARO HILLS, ASSAM.

PART I.

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(Plates I, II.)

INTRODUCTION.

Although a large amount of work has been done on the faunas of the caves of Europe and N. America, little has hitherto been attempted on this subject in the Oriental Region. The caves that exist in Southern Asia are, so far as is known, not of large size, many of them are situated far from the main lines of travel, and the little faunistic work that has been carried out has not revealed the existence of peculiarly adapted cave-animals, such as have been found in other parts of the world. It is, perhaps, for these reasons that the faunas of Indian caves have hitherto been investigated only in a sporadic manner; such knowledge as we possess is for the most part limited to isolated records and descriptions of species collected in a haphazard manner and no concerted investigation of any single cave has yet been attempted.

In Burma and the Malay Peninsula caves are more numerous than in any part of India proper, a fact which is to be explained by the greater abundance of limestone, and our knowledge of the fauna of these caves has been admirably summarized by Dr. N. Annandale and Dr. F. H. Gravely.[1]

Caves also exist in the limestone of Assam but they appear to be less numerous than in Burma and our knowledge of their fauna has hitherto been extremely scanty; the Siju cave, with which this paper is concerned, is probably the largest. In other parts of India caves of any size are very few in number and we have no knowledge whatever of the fauna they may possess.

The existence of a large cave at Siju has been known for many years. Mr. T. D. LaTouche, formerly of the Geological Survey of India, penetrated it to a considerable distance in the year 1881, and has kindly given us a copy of his notes on the subject (see pp. 8, 9); but it had evidently been explored to its furthest limit at a still earlier period (see footnote to p. 8). In 1919 Mr. R. Friel, I.C.S., then Deputy Commissioner of the Garo Hills, visited the cave and made a small but extremely interesting collection of the fauna. Among other animals he discovered a freshwater prawn with eyes less than half the normal size and a long-legged Reduviid bug not hitherto known to science.

We visited Siju during January and February 1922, at a period when the underground stream to which the cave owes its origin was at its lowest, and spent about three weeks in examining the cave-fauna and topography. Our thanks are due to Mr. J. C. French, I.C.S., Collector of Mymen-

[1] Annandale, Coggin Brown and Gravely, *Journ. Asiat. Soc., Bengal* (n.s.) IX, p. 391 (1914).

singh, and to Mr. N. E. Parry, I.C.S., Deputy Commissioner of the Garo Hills, for the help they gave us in making arrangements for the somewhat difficult journey from rail-head to Siju village. We wish also to express our appreciation of the services rendered by Mr. R. A. Hodgart, Zoological Collector; without his energetic assistance our results would be much less complete than they are.

TOPOGRAPHY.

In general character the Siju Cave may be described as an underground water-course running in a tunnel of nummulitic limestone, with chambers or caverns—often of considerable dimensions—at various points in its course. The floors of the caverns are always covered with angular limestone slabs which have fallen from the roof and are, for the most part, at any rate, above flood-level.

The direction of the cave, speaking generally, is north-west. It extends to a depth of about three-quarters of a mile and, so far as we were able to discover, admits daylight only by the entrance.

A plan of the cave, which we made with the help of a prismatic compass and an Abney level is shown on plate I; for convenience of reproduction it is divided into three sections. To the Garos the cave is known by the name of "Dobakhol" which means "the Cave of Bats."

The mouth of the cave is situated in a cliff on the right bank of the Someswari river, between the villages of Upper and Lower Siju, in Lat. 25°21′ N. and Long. 90°41′ E. It is about 85 ft. above the dry-season level of the river and approximately 950 ft.[1] above sea-level. The path which leads to the mouth lies up the boulder-strewn course of the stream to which the cave owes its origin.

The entrance (Plate II, figs. 1, 2) is a passage about 350 ft. in length, 28 to 35 ft. in breadth and 22 to 25 ft. in height. The floor, which is nearly horizontal, is composed of fine gravel with occasional stones. The stream issues from a narrow tunnel on the western side of the inner end and flows at no great speed to the mouth, where it disappears temporarily beneath large boulders. The course of the stream, as will be seen from the plan, is somewhat complicated and probably alters from season to season; on the occasion of our visit it was for the most part not more than 2 ft. deep, but in some of the pools and in the side-tunnel was as much as 4 ft. The entire passage is no doubt flooded in the rainy season. In the walls there are numerous vertical fissures, some of which extend to a considerable depth, and between the fissures, throughout the whole length of the entrance passage, there is a thick horizontal shelf of rock from 6 to 8 ft. above ground-level. This shelf, which is shown in the photographs on Plate II, is no doubt to be explained by water action and differences in the hardness of the rock. The stream must at one time have flowed at a higher level in a narrower channel and it was not until it had cut its way through the hard layer of which these shelves are composed that it was able to hollow out the broader passage beneath them. Daylight may be reckoned to extend to about 150 ft. from the entrance, from 150 to 350 ft. is the region of twilight and beyond 350 ft. is total darkness.

[1] For this figure we are indebted to officers of the Hydro-electric Survey of Assam.

At the inner end of the entrance-passage is a spacious cavern inhabited by large numbers of bats (*Cynopterus sphinx gangeticus*). It is nearly 250 ft. in length, 70 ft. in greatest breadth and at least 50 ft. in height, the roof as in most of the other caverns being perfectly flat. The floor is heaped with slabs and boulders which have fallen from the roof and is consequently much higher in many places than the level of the stream, which here runs in a narrow side tunnel. The only water in the cavern itself is a small rivulet which enters from a fissure in the north-eastern wall and forms a few small pools before joining the main stream. At the inner end the cavern forms a *cul-de-sac* and is heaped with boulders to a considerable height; at the further limit the air is intolerably stuffy and the place otherwise rendered unendurable by swarms of bat-parasites. The nauseating smell of bats pervades the whole cavern. The floor was at one time thickly covered with bat-guano, but the supply has been exploited commercially and little now remains. The ground is, however, richly manured and supports an abundant fauna.

In the south-western wall of the cavern, at about 500 ft. from the entrance, there is a low arch, about 5 ft. high, by which access is obtained to the main stream and the inner parts of the cave. The stalactites shown in plate II, fig. 3 are found on the right-hand side immediately before one enters this arch. On reaching the stream a faint glimmer of daylight can be perceived through the narrow tunnel by which the water makes its exit. Progress at this point was rendered difficult owing to the fact that the water entirely filled the tunnel and was in places from $4\frac{1}{2}$ to 5 ft. deep. It was, however, possible to avoid the deepest parts by taking to a small L-shaped passage on the further side of the stream. The floor in this passage is bare rock and it is no doubt a water-course during the flood-season. Beyond this passage, up to a point 1,400 ft. from the mouth, the cave has the form of a tunnel and is quite straight, except for a short right-angle bend at about 850 ft. The tunnel varies in breadth from 12 to 28 ft. and, excluding a deep longitudinal fissure in the roof, is in most parts from 9 to 10 ft. in height; at 850 ft. from the entrance, however, it rises to 20 ft. and at 1,300 ft. to about 25 ft. At 775 ft. there is a small cavern heaped with boulders on the north-eastern side and between 1,300 and 1,400 ft. there is a dry side-passage on the same side, 30 ft. in width and 8 to 10 ft. above stream-level. The floor in this side-passage is mainly composed of fine sand deposited during the flood-season.

The floor of the main tunnel is for the most part covered with water from wall to wall. The greatest depth did not exceed 4 ft. at the time of our visit and it was possible to traverse the whole length without entering water more than half this depth. Between distances of 900 and 1,400 ft. from the entrance the river-bed is filled with water-worn stones and boulders, nearly all composed of gneiss. The fact that huge boulders of this material, sometimes as much as 8 ft. in length, should have been carried into the middle of a limestone tunnel, gives some indication of the tremendous force of the stream during the flood-season. The difference in level is very small and (without having made careful levelling observations) we estimate that the stream at 1,400 ft. is little more than 20 ft. higher than at the mouth.

At 1,400 ft. from the entrance the tunnel widens out into a cavern 70 ft. broad and from 40 to 80 ft. in height. The roof has here partially collapsed and the river-bed is completely choked, so that it is not possible to follow its course further; as noted below, however, the river is again found in the deeper parts of the cave.

On leaving the water-channel progress is possible only in a northerly direction by clambering over huge boulders towards the roof of the cavern. The route is a difficult one and we found it necessary to bring in a bamboo ladder to help us over some of the largest boulders. On reaching a height of about 80 ft. above stream-level at 1,400 ft. a passage 12 ft. broad and little more than $3\frac{1}{2}$ ft. high is found close under the roof and on creeping through this opening the largest cavern in the cave-system is entered. It is about 200 ft. long and nearly 100 ft. broad and we estimated that the roof, which appeared to be quite flat, was 70 ft. above the highest point we reached or 180 ft. above stream-level at 1,400 ft. The whole floor of this cavern is a tumble of huge slabs and boulders of limestone, some of them 20 ft. in length, which have fallen from the roof. According to the Garos a large fall, doubtless caused by an earthquake, occurred some 9 or 10 years ago. The limestone differs noticeably from that of the tunnel further back, for it contains layers of soft shale which have doubtless contributed in causing the extensive collapse which has occurred.

From the small opening mentioned above a way can be found over boulders and masses of slippery shale to a point about 110 ft. above stream-level at 1,400 ft. and from this onwards the ground trends steeply downwards. The air at the highest point is stagnant and very oppressive. A considerable amount of water drips from the roof at various points and at 1,775 ft. from the mouth a small stream falls straight down in the middle of the cavern from a height of about 90 ft. There is a pool near this waterfall, the water of which forms two streams that rapidly vanish among the boulders. This large cavern is not inhabited to any great extent by bats, though some were seen. The boulders are not covered with any thick deposit of guano and the fauna appears to be extremely scanty. This may be more apparent than real for it is impossible to collect satisfactorily in such a place.

At the inner end the cavern contracts to breadths varying from 25 to 40 ft. and the height diminishes to 8 or 10 ft. The floor is undulating and is composed mainly of boulders and stones. Just before reaching a point 2,000 ft. from the entrance a small stream crosses the cave. It issues from an elaborate series of small tunnels on the north-eastern side, forms a pool in the floor, and passes out in a south-westerly direction. The passage through which the stream flowed was too small and the water in it too deep to enable us to follow its course, but there can be little doubt that the stream eventually discharges into the main water-channel. The pool in the floor was at least $4\frac{1}{2}$ ft. deep in the middle with a muddy bottom and thick mud on the banks. A few inches below the surface of this mud we found vegetable debris which must, of course, have been washed in from some outside source.

The main passage continues beyond the stream and at 2,100 ft. from the mouth opens into a cavern 120 ft. long and 50 ft. broad,

partially filled with limestone slabs and boulders. At its further end the cavern is completely choked by these boulders. Few bats seem now to inhabit the cavern, but many must have done so in former times for the entire floor is covered to a depth of several inches with dry bat-guano, in appearance closely resembling ground coffee. Notwithstanding this fact the fauna is extremely poor.

Although this cavern is choked at its inner end it is possible to proceed further by taking to one of the parallel side-tunnels already mentioned. Through a small passage in the north-eastern wall entrance is obtained to a tunnel 7 ft. high and 4 ft. wide, oval in section, and with a floor of bare rock. This tunnel, together with another that lies parallel to it, no doubt forms a water-way in the flood-season; pot-holes were not uncommon and some still contained water. At 2,300 ft. from the entrance there is a deposit of fine mud, left when the flood-waters subsided, and beyond this a small pool at the point where the tunnel again opens into the main passage. It is here possible to proceed backwards for a short distance up a broad passage which was no doubt at one time continuous with the cavern at 2,200 ft. Our measurements show that this passage is choked for a distance of about 50 ft.

Proceeding further inwards, after passing two large rock pillars, a flat roofed hall, 35 ft. in height, 70 ft. long and 18 ft. wide, is entered. The floor is here covered with water-worn stones, mostly of gneiss, cemented in position with fine mud, and here and there are angular limestone boulders. A small tunnel on the south-western side runs parallel with this chamber and at the time of our visit was still full of water.

From 2,500 ft. onwards the course of the main passage changes. Hitherto it has been running almost without interruption in a north-north-west direction; here it abruptly turns to the west and with the exception of a few right-angle bends continues in this direction up to a point 3,050 ft. from the entrance. In this section the breadth varies from 8 to 15 ft. and the height from 15 to 30 ft. The floor is composed of water-worn stones firmly cemented in position, with occasional limestone boulders and in certain places with deposits of mud. The passage is no doubt full of water during the rainy season and, as will be seen from the plan, a number of pools still remained at the time of our visit.

At 3,050 ft. from the mouth the passage slopes gently downwards and opens at right angles into a tunnel with a stream flowing through it. In the time at our disposal we were not able to follow this tunnel down-stream for any considerable distance and it is indeed doubtful if we would have been able to do so owing to the depth of water. We consider it certain, however, that the river is the same as that which we left at 1,400 ft. Up-stream the river runs in a perfectly straight tunnel in exactly the same direction as that between 900 and 1,400 ft. Its course is full of water-worn pebbles, mostly of gneiss, and for a considerable part of its extent it is possible to walk on a smooth shelf of rock which exists at water-level on the north-eastern side. The tunnel is from 13 to 20 ft. in breadth and from 15 to 25 ft. in height; the water was nowhere more than 2 ft. deep and the fall in level is very slight.

At 3,550 ft. from the entrance the straight tunnel ends. The main stream enters it from the north-east side and to the south-west is a cavern

80 ft. long, 60 ft. broad and about 40 ft. high. The cavern is partially filled with blocks which have fallen from the roof, the floor so formed extending upwards at an angle of 25° Rather considerable streams flow on either side of the cavern and discharge into the main channels. A bat, *Hipposideros lankadiva*, is very abundant in this part of the cave-system; it seems, however, to rest by preference on the walls and roof of the main channel, overhanging the water, and this probably accounts for the very scanty deposits of guano which exist.

As will be seen from the plan there is an elaborate series of side-passages in this part of the cave. All these were situated well above the level of the river on the occasion of our visit; but they are no doubt flooded during the rainy season and in some of them small streams were still flowing. The main stream itself takes two right-angle turns and is in places at least 6 ft. deep. Progress is only possible by taking to the side-passages and the precise course of the main channel between 3,600 and 3,750 ft. is, for this reason, doubtful. At 3,800 ft. the stream is running due south in a tunnel 16 ft. broad and 18 ft. high. A little beyond this the tunnel trends to the west and diminishes in height and the end of the cave-system appears to be reached at 3,900 ft. from the entrance in a low, more or less circular chamber, partly filled with limestone boulders. From the walls of this chamber two streams emerge, the larger coming from a passage scarcely 3 ft. broad and containing a considerable depth of water.

Whether there is any way of proceeding further must remain a matter of conjecture: it is not impossible that an opening leading to further passages might be found if carefully sought for. It will be observed, however, that several separate streams join the main channel between 3,550 and 3,900 ft. The river has, in point of fact, broken up into a number of tributaries and this consideration leads us to believe that further progress, if possible, must be very limited.[1]

We may note here that the volume of the stream appears to be smaller in the entrance passage than in the deeper parts of the cave. We were not able to make precise observations on this point, but there is a possibility that some other passage exists through which part of the stream finds exit.

Mr. T. D. LaTouche, who visited the cave in 1881 when making geological investigations in the Garo Hills, has kindly allowed us to quote the following extract from his notes:—

> "In the nummulitic limestone near Siju there were several caverns, one of which was known to be of very considerable extent, as it had been explored some time before by Mr. Sanderson, then Superintendent of the Government Khedda.s, or elephant-catching operations, in the Garo Hills. With some difficulty I persuaded Bong, the head-man of Siju and two of his men to show me the place and invest gate it. The mouth of the cave, known to the Garos as Dobakhol,' the Bats' .Hole,' lies on the right bank of the Sume-

[1] Shortly after our arrival at Siju we were informed that an army officer had explored the cave some 40 or 50 years ago, had spent an entire day in it and had left a bottle at the furthest point he reached. At 3,900 ft. from the entrance we found a bottle wedged with stones in a crevice about 4 ft. above water-level. It was half-full of dirty water, with the cork driven inside and, if it had ever contained any record, the paper on which it was written had completely perished. An iridescent deposit on the outside of the glass appeared to indicate that it had been lying a long time in the position in which we found it.

sari, about a mile below the village of Siju, but is not easily discernible, as it is partly concealed by a mass of limestone fallen from the cliff above. Well provided with candles, we left Siju early one morning, and paddled down to the cave in a dug-out. Immediately on entering, the appropriateness of the Garo name became evident. We found ourselves in a huge chamber, the upper part of which was filled with great clusters of bats, hanging like stalactites, several feet in length, from the roof. As we brought in our lights, these clusters gradually dissolved, and presently the air was thick with bats, in such enormous numbers that it was with difficulty we made our way through them. The noise of their wings was deafening, like the roar of an express train, and the stench was simply appalling. But they extended only so far from the entrance as the daylight penetrated, and after fighting our way for some hundred yards we found ourselves free of them. Here a fresh difficulty presented itself, for a pool of water, too deep to be forded, barred our progress. We were all good swimmers, however, and Bong leading the way with a lantern we soon reached the inner end, and entered a second huge chamber, with a small streamlet trickling down its shingly floor. At the upper end of this chamber we found a passage which might have been artificially constructed, a tunnel some 7 or 8 feet in diameter, as perfectly circular in section as a town sewer, with beautifully polished walls, and quite straight. Down the centre of the floor of this ran a narrow channel, evidently cut by the stream during the dry season, when the water is low. At one or two points arched passages led off from this into similar tunnels on either side, one of which we involuntarily explored on our return. These passages extended for a very long distance, and we then emerged into a wider and much higher gallery, as high and broad as a railway tunnel, the floor of which was covered with loose fragments of limestone. There was a remarkable absence of stalactites or stalagmite here and in the other parts of the cave that we visited; from which I conclude that during the rainy season it must be more or less filled with water. So far as we went there was no change in the height and width of the tunnel, nor did there appear to be any branches on either side, and it kept a remarkably straight course. It was afternoon when I decided to turn back, and as we had entered the cave at about 7 o'clock in the morning, we must have penetrated it to a considerable distance. Our progress, however, was slow. I had taken off my boots in order to swim the pool, and was not so accustomed as the Garos to walking in bare feet, specially over such stony ground. Soon after we turned back, indeed, I twisted my foot on a loose stone, and would have fared badly if it had not been for Bong, who picked me up on his back, and carried me with the greatest ease till we came to the smooth passages. Midway down these we happened to take the wrong turning and did not discover our mistake until we had followed it down to a pool of water, exactly similar to the one at the true entrance, and had swum across when we found blackness in front of us instead of the dim twilight which should have been visible. It did not take long to find the correct road, however, and in due course we reached the bats' quarters, to find that, it being now fairly late in the evening, the place was almost deserted by them."

These notes are of considerable interest from a topographical point of view. The first pool that Mr. LaTouche and his companions were obliged to swim was presumably situated at about 350 ft. from the entrance but has now been reduced in size by the fall of boulders at 400 ft. The *cul-de-sac* which we found heaped with debris at 500 ft. was apparently an open passage forty years ago and we imagine that the circular tunnel, 7 or 8 ft. in diameter, through which Mr. LaTouche passed, must have connected with the "much higher gallery, as high and broad as a railway tunnel" at some point between 700 and 1,000 ft. as shown on our plan.[1] It is difficult to determine how far Mr. LaTouche penetrated, but it is extremely probable that the main water-channel was not choked at 1,500 ft. as it now is, and that he was able to follow it up without making the large diversion which we were compelled to take.

[1] The small cavern heaped with boulders at 775 ft. was undoubtedly at one time the entrance to a passage.

It is thus clear that the topography of the cave is subject to very considerable alteration. In places where the rock is less hard the stream has been able to hollow out ever-widening caverns in the limestone until in course of time an earthquake brings down a portion of the roof. Such a fall if extensive, may completely choke the water-channel and cause the stream to take to side-passages similar to those which we found at 2,000 ft. When these are sufficiently enlarged a repetition of the process must again occur. The considerable falls of rock in the cavern at 500 ft. have clearly diverted the water-channel and the same thing on a much larger scale has no doubt occurred between 1,500 and 3,000 ft. The long dry passages which are a feature of this section were almost certainly excavated by the main stream, but the latter has been completely diverted from its original course by the enormous mass of boulders which has fallen between 1,500 and 1,700 ft.

It is interesting to note that the bats which formerly inhabited the entrance hall now live in the cavern at 500 ft.

GEOLOGY.

The entire cave so far as we examined it is formed in nummulitic limestone and the late Mr. E. Vredenburg of the Geological Survey of India to whom we submitted specimens of the rock kindly informed us that the nummulite is either *N. laevigatus* or *N. perforatus*. The formation is middle Eocene, whereas that in which the Burmese caves occur is Permo-carboniferous.[1] It does not of course follow from this fact that the cave at Siju is of later origin than those in Burma.

The layers of soft shale which occur in the limestone at about 1,600 ft. from the entrance have already been noticed in our account of the topography. The straight course of the tunnel with its rectangular bends indicates that the stream has followed the jointing of the rock.

There is gneiss in the neighbourhood of Siju, but in our experience it occurs in the cave only in the form of water-worn pebbles and boulders in the stream-bed. The presence of large boulders of this material in the section between 600 and 1,200 ft. is not easy to explain. Possibly the stream once skirted the gneiss formation and possibly it still does so in the unexplored section of tunnel lying between 1,500 and 3,100 ft. The pebbles of the same rock between 3,200 and 3,500 ft. must have been introduced into the main channel by some of the tributaries which probably touch the gneiss at points which we were unable to reach.

The only stalactitic formations that we found are those situated at 500 ft. from the entrance and shown in Plate II, fig. 3. At several points, however, more particularly between 500 and 800 ft. from the entrance, there are masses of travertine with delicately ribbed or honey-combed surface, deposited by flood-water pouring into the cave through fissures. Of these masses that on the south-eastern side of the *cul-de-sac* at 500 ft. is much the largest. The scarcity of stalactites and other recent calcareous deposits is probably due to the floods which sweep through the cave in the rainy season; it is a feature in which the Siju cave differs markedly

[1] See Coggin Brown, *Journ. Asiat. Soc. Bengal* (n.s.) IX, p. 399 *et seq.* (1914).

from many of those in Burma and the Malay Peninsula and even in other parts of Assam.

Air Currents and Temperatures.

In the Jalor caves in Siam, probably owing to the fact that there are apertures in the roofs of many of the larger caverns at some distance from the entrance, a strong wind blows outwards at certain times of the day and inwards at others. We found no such wind in the Siju cave and though the air no doubt circulates to some extent it always appeared to be quite still. Even at the inner extremity the air was not particularly oppressive, though, as we have already noted, it became hot and stagnant as soon as one ascended in the large caverns to any considerable height above the level of the main water-course. Some of the small streams which we met possibly originate above ground and the presence of vegetable debris in the mud at 2,000 ft. from the entrance indicates that this is true of at least one of them. In the dry season the small tunnels through which these streams flow perhaps afford passage to air as well as water.

The air temperature at stream-level appeared to vary regularly with the depth : at 500 ft. we found it to be 21·0°C., at 2,000 ft. 23·4°C. and at 3,600 ft. 25·8°C. At the highest point of the cavern between 400 and 500 ft. the air temperature was 26·8°C. and in a similar position at 1,600 ft. it was 26·4°C. The temperature of the water of the main channel was 22·1°C. at the entrance and 22·8°C. at 3,600 ft. In the stream at 2,000 ft. the temperature of the water was 23·2°C. and in small pot-holes of still water at 2,100 ft. it was 23·7 We made no observations on the humidity of the air which was no doubt high.

Fauna of the Cave.

The topography of the Siju Cave has no doubt exercised a great influence on the fauna which inhabits it and, as will be realized from the foregoing account, the locality is not one in which any large number of species is likely to occur. During the rainy season the greater part of the cave must be flooded and the torrents which pour through its narrow tunnels must make access to the inner parts extremely difficult. Even in the dry season the water often fills the whole breadth of the tunnel and must form an impassable barrier to many species. The caverns on the other hand are mostly above flood-level and many of them contain deposits of bat-guano ; they may be expected to afford food and shelter to those animals which have been able to reach them, providing a safe retreat during the flood-season and a centre from which further immigration may be attempted.

To an active aquatic fauna the cave should present no obstacles and we had hoped that the perennial stream which flows through it would have yielded species of great zoological interest. In this we were in a large measure disappointed for the only aquatic animal which shows adaptations to cavernicolous conditions is the prawn *Palaemon cavernicola* which had previously been discovered in the cave by Mr. R. Friel.

In other respects the fauna is perhaps more abundant than might have been anticipated consisting so far as we were able to discover of the 102 species mentioned in the following list.

LIST OF THE FAUNA OF THE SIJU CAVE.

	Distance from mouth of cave in feet.
MAMMALIA.	
Chiroptera.	
Cynopterus sphinx gangeticus K. Andersen.	400—500
Hipposideros lankadiva Kelaart	800—3,600
Rhinolophus lepidus subbadius Blyth	0—300
Rodentia.	
Mus nitidus nitidus Hodgson	450, 1,400—3,600
Carnivora.	
Felis sp.	0—3,900
PISCES.	
Psilorhynchus sucatio (Ham. Buch.)	300—600
Barbus hexastichus McClelland	0—600, 2,000
Barilius bendelisis (Ham. Buch.)	300—600
Barilius barna (Ham. Buch.)	300—600
Danio aequipinnatus (McClelland)	300—600
Nemachilus sp.	0—100, 1,700
Ambassis nama (Ham. Buch.)	300—600
Ophiocephalus gachua (Ham. Buch.)	300—600
BATRACHIA.	
Rana (*Hylorana*) *afghana* (Günther)[1]	900
Megalophrys sp. (tadpole only)[1]	0—350
MOLLUSCA.	
Gastropoda.	
Paludomus blanfordiana Nevill	0—500
Melanoides pyramis (Hutton) (shell only)	3,600
Opeas gracile (Hutton) (shells only)	3,600
Opeas cavernicola, sp. nov.	450—500
CRUSTACEA.	
Decapoda.	
Paratelphusa (*Barytelphusa*) *falcidigitis* Alcock	0—2,400
Palaemon hendersoni de Man	0—3.200
Palaemon cavernicola, sp. nov.	550—3,600
Isopoda.	
Porcellio assamensis, sp. nov.	0—450
Philoscia dobakholi, sp. nov.	800—3,600
Philoscia sp.	800—1,200
Cubaris cavernosus Collinge	300—3,800
ARACHNIDA.	
Tartarides.	
Schizomus sijuensis, sp. nov.	2,500, 3,500—3,600
Araneae.	
Scytodes semipullata Simon.	1,000, 2,100, 2,400
Theridion rufipes Lucas	100—500
Vendilgardia assamensis, sp. nov.	300, 1,000
Heteropoda robusta, sp. nov.	0—2,400
Chernetidea.	
Chelifer (*s. l.*) 1 or 2 spp.	400—500, 2,100—2,200
Opiliones.	
Metassamia septemdentata, sp. nov.	400—500, 800—1,200
Sijucavernicus kempi, gen. et sp. nov.	1,000, 1,800—3,800
Acari.	
At least 4 spp.	450—500

[1] N. Annandale det.

List of the Fauna of the Siju Cave—*contd.*

	Distance from mouth of cave in feet.
Myriapoda.	
Diplopoda.	
Trachyiulus mimus, sp. nov.	2,000—2,200, 3,600
Chilopoda.	
Lamnonyx diversidens Silvestri	350—500
Himantosoma typicum Pocock	2,150, 3,600
Cryptops kempi, sp. nov.	450
Paracryptops indicus, sp. nov.	350—450
Thereuonema reconditum, sp. nov. ...	400—500, 2,100
Insecta.	
Thysanura.	
Machilid (1 damaged spec.)	0
Collembola.	
Cyphoderopsis, sp. nov.[1]	450—500, 800, 3,500—3,600
Lepidocyrtus, 2 spp. nov.[1]	0, 100—500
Paronella sp. nov.[1]	0
Orthoptera.	
Pycnoscelus surinamensis L.	350—400
Speonemobius decoloratus, gen. et sp. nov. ...	0
Larandopsis choprai, gen. et sp. nov. ...	0, 500
Kempiella longipes, gen. et sp. nov. ...	200—3,600
Dermaptera.	
Forcipula borellii, sp. nov.	300—500
Chelisoches morio F.	0, 400—500
Timomenus lugens Bormans	0
Rhynchota.	
Metrocoris nigrofasciatus Distant	300, 400, 2,000
Myiophanes kempi, sp. nov.	350—500
Bagauda cavernicola Paiva	350—500
Heleocoris sp.	200
Diptera.	
Ramphidia sp.	2,000
Limnophila (*Troglophila*) *cavernicola*, sp. nov.	3,600
Atrichopogon cavernarum, sp. nov. ...	100—500, 1,700
Haematopota annandalei Ricardo	1,200
Pegomyia kempi, sp. nov.	450—800
Limosina ornata de Meijere	450—500.
Limosina notatipennis, sp. nov.	400
Limosina tenebrosa, sp. nov.	200
Phyllomyza tenebrosa, sp. nov.	450—500
Idypaspistomyia latipes Meigen var. ...	400
Conicera kempi sp. nov.	400—500
Hercostomus praetentans, sp. nov.	450
Nycteribia (*Acrocholidia*) *exesta* (Speiser) ...	400—3,600
Eucampsipoda hyrtli, Kolenati	400—500
Streblid, sp. indet.	400—500
Lepidoptera.	
Pyralis manihotalis Guénée	100—500
Tinea pyrosoma, sp. nov.	450—500
Tinea antricola, sp. nov.	400—500, 1,200, 2,150, 3,600
Coleoptera.	
Tachys micraulax, sp. nov.	100—500
Abacetus lucifugus, sp. nov.	100—350, 3,550
Anaulacus fasciatus Schm. Goeb.	500
Anchista binotata Dejean	350—500
Philonthus annandalei, sp. nov.	100—300
Philonthus kempi, sp. nov.	100—300
Lithocaris vilis Kr.[2]	100—300

[1] These species will be described by Prof. G. H. Carpenter in a future number of this volume.

[2] M. Cameron det.

List of the Fauna of the Siju Cave—*concld.*

	Distance from mouth of cave in feet.
Insecta—*contd.*	
Coleoptera—*contd.*	
Oxytelopsis pseudopsina Fauv. [1]	450—500
Orectochilus sp. [1]	100—400, 2,100, 3,600
Megapenthes vespertilionis, sp. nov. ...	400
Carcinops 14-*striatus*, Steph.	400
Cercyon sp.	450
Euxestus parki Woll.	500
Holoparamaecus sp.	400
Palorus erilis Mars.	550
Diaclina rufotincta Fairm.	400
Hylophilus kempi, sp. nov.	400—500, 800, 2,000
Hymenoptera.	
Neontsira typica, gen. et sp. nov. ...	100—450
Triglyphothrix striatidens Emery ...	400
Oligochaeta.	
Enchytraeus cavicola, sp. nov.	500
Drawida troglodytes, sp. nov.	2,000
Megascolides antrophyes, sp. nov. ...	2,000
Dichogaster bolaui (Mich.)	350—500
Glyphidrilus spelaeotes, sp. nov.	2,000, 3,000

For assistance in the compilation of this list we are indebted to our colleagues in India and to authorities in Europe and America and we wish here to express our thanks to those who have so generously devoted their special knowledge to the examination of the material we collected. Without their co-operation a very large proportion of the species we obtained would have remained undetermined and our results as a whole would have been lacking in authority. In Part II of this paper reports on most of the constituent parts of the fauna will be found.[2] The names of those who have identified species not mentioned in Part II are given as footnotes to the preceding list.

Included in our list are certain species which should not be regarded as part of the cave-fauna proper. The tadpole of *Megalophrys* sp., the Thysanuran, the Collembolan *Paronella* sp., the cricket *Speonemobius decoloratus*, the earwig *Timomenus lugens*, the waterbug *Heleocoris* sp. and the three Staphylinid beetles *Philonthus annandalei*, *P. kempi* and *Lithocaris vilis* were found only in the entrance passage and do not appear to have succeeded in penetrating into regions of total darkness. Five other species, found much beyond the reach of daylight, appear to us to belong merely to the category of casual visitors. A large frog, *Rana* (*Hylorana*) *afghana*, was discovered sitting on the wall at a depth of 900 ft., the Tabanid *Haematopota annandalei* on a boulder near the water-fall at 1,775 ft., the Dolichopodid *Hercostomus praetentans* a 450 ft. and the two Tipulids *Limnophila* (*Troglophila*) *cavernicola* and *Ramphidia* sp. at depths respectively of 3,600 and 2,000 ft. These five species are all represented in our collections by single specimens.

[1] M. Cameron det.

[2] The reports on the Chernetidea, Acari, Thysanura and Collembola have not been received in time for inclusion in this paper. In his account of the Orthoptera and Dermaptera Dr. Chopard has also given records and descriptions of species from the Hsin Daung cave, Yawngwhe, S. Shan States, and from the Lakadong cave in the Jaintia Hills, Assam. Similarly Prof. Silvestri has included the description of a Myriapod from the Batu caves in Selangor.

Without further evidence we do not think they should be regarded as part of the cave-fauna, though we are unable to suggest how they came to occur in the situations in which we found them. The shells of the Gastropods *Melanoides pyramis* and *Opeas gracile* from 3,600 ft., were probably washed into the cave from some outside source.

The true cave-fauna thus consists of 86 species and of these only 33 penetrate beyond a depth of 600 ft. A considerable part of our collection consists of species which are known to occur in daylight and most of the hitherto undescribed forms resemble their outdoor relatives and are not modified in response to their peculiar environment. The number of species showing definite adaptation to cavernicolous conditions is extremely small.

Land Fauna.

We have already referred to the difficulties which must confront animals in their attempts at immigration into the cave and to the advantages that the large dry caverns may be expected to afford to those that have succeeded in overcoming these difficulties. Our collections illustrate the effects of these topographical influences, though there appear to be other undetermined causes which have prevented certain elements in the fauna from extending further inwards.

The fauna of the entrance hall (0-350 ft.) need not be considered at any length. The level floor is no doubt submerged every year when the stream rises and though—as we learn from Mr. LaTouche's note—it was once inhabited by bats, few now live there and any guano that may be deposited must be washed away in the flood-season. Apart from the few species (mentioned above) which do not enter total darkness, the fauna of the entrance hall consists of a number of forms also found in the cavern beyond; all these occur very sparingly.

The large cavern between 400 and 500 ft. contains a very rich fauna, as will be seen from the list of species on pp. 12-14; it comprises about 68 species. This community is a most interesting one, for though nearly all the species occur in daylight also there is little doubt that by far the greater number breed and spend the whole of their lives in the total darkness of the cavern. The explanation of the abundant life in this portion of cave is at once evident: it is the abode of myriads of bats (*Cynopterus sphinx gangeticus*) and the floor is in consequence richly manured with guano, a food supply which as Racovitza has remarked is "très recherchée par les cavernicoles." The cavern is also for the most part above flood-level and while comparatively easy of access from the entrance, no doubt affords to the fauna some measure of protection from the enemies it would meet outside.

Of the animals which feed directly on bat-guano the most important, as affording the main food supply of the predaceous section of the fauna, appear to be a brown mite, the cricket *Kempiella longipes*, the cockroach *Pycnoscelus surinamensis*, the moth *Tinea antricola*, the Histerid beetle *Carcinops 14-striatus*, the Tenebrionids *Palorus exilis* and *Diaclina rufotincta*, the mollusc *Opeas cavernicola* and the oligochaetes *Enchytraeus cavicola* and *Dichogaster bolaui*.

All these are abundant forms ; the mite occurs in incredible numbers under stones in places where the floor is moist and the oligochaetes are plentiful beneath the surface in the same situation. The cockroach swarms in light dry soil and the larvae of *Tinea antricola* are extremely common on rocks and boulders powdered with guano.

There is thus an ample food-supply for predaceous ground-living animals such as the Myriapoda, the earwigs, the Carabid and Staphylinid beetles and the ant.

Of the animals on the walls of the cavern the large Araneid *Heteropoda robusta*, which does not spin a web, presumably preys on the crickets and Opiliones, but in spite of its abundance we never saw it feeding. The Theridiid spider *Theridion rufipes* spins irregular webs across crevices and feeds mainly on the moths *Pyralis manihotalis* and *Tinea antricola*, both of which are also eaten by the two long-legged bugs *Myiophanes kempi* and *Bagauda cavernicola* which are common on the walls of the cavern. The bugs, however, also feed on other species. We found them eating the spider *Theridion rufipes* — possibly their main food-supply—and they also suck the young stages of their own species. The earwig *Chelisoches morio* was observed eating the Pyralid moth and this is perhaps its regular habit, for, unlike *Forcipula borellii*, it is generally found walking on the walls and on boulders.

The majority of the animals in the cavern seemed quite indifferent to light and, so long as they were not actually touched, paid no attention to a strong lamp placed quite near them. The Chironomid *Atrichopogon cavernarum*, the Muscid *Limosina ornata*, the moth *Tinea pyrosoma* and the flying Hylophilid beetle *Hylophilus kempi* were, however, definitely attracted by light.

The only animals in the cavern which exhibit any modifications which can be correlated with life in total darkness are the mollusc *Opeas caverincola*, the Isopod *Cubaris cavernosus* and possibly the moth *Tinea antricola*. The adaptations of these species are noted on pp. 20, 21.

The two bugs *Myiophanes kempi and Bagauda cavernicola* with their excessively long and slender legs and antennae present the appearance of true cave animals, but are evidently not specially adapted to life in such places. The former has been found near Tura in the Garo Hills, but is apparently rare outside caves ; the latter is at present known only from the Siju Cave, but will probably be found outside in course of time. The family and genera to which these species belong contain other non-cavernicolous species of similar colouration and with the same extreme length of leg and antenna. A parallel case is to be found in the long-legged centipede *Thereuonema reconditum*, except that similar related forms are much more abundant outside caves.

It seems as if these forms had at the time of their immigration found themselves already well adapted to cave life, perhaps by reason of their long appendages, and had therefore flourished in their new environment without special modification.[1] The evidence is all against the view that their modifications are a response to cavernicolous conditions.

[1] Instances of a precisely similar nature are met with in *Diestrammena*, an Orthopteron with very long antennae, and *Stygophrynus*, a Pedipalp with very long antenniform legs. Both these genera are found in caves in India and the Malay Peninsula, though neither occur at Siju.

The fauna of the deeper-lying parts of the cave is very limited and many species found in the cavern at 400 to 500 ft. have been unable to make further progress. There are for instance no mites beyond 500 ft., no cockroaches, earwigs, bugs or Hymenoptera, practically no beetles except the *Hylophilus*, no Diptera except the Chironomid *Atrichopogon cavernarum* and the Anthomyid *Pegomyia kempi* (the latter extending only to 800 ft.) and no Lepidoptera except *Tinea antricola*.

This striking diminution in the fauna is no doubt in a large measure due to the difficulty which many species have experienced in passing upstream through the long tunnel between 600 and 1,300 ft., but this explanation does not appear to account for all the deficiencies. Species which are habitually found on the walls of the outer cavern should have had no difficulty in penetrating further, yet only a single cricket has succeeded in doing so, and the earwig *Chelisoches morio* and the two long-legged bugs are entirely absent. To all insects which can fly, moreover, the topographical difficulties should have been of small account.

Another deterring influence may be a lack of food but this again does not afford an altogether satisfactory explanation. If bat-guano is the food-supply on which most of the species ultimately depend — and there is little doubt that it is — scanty deposits are available in the large cavern between 1,500 and 1,900 ft., while between 2,100 and 2,200 ft. an enormous supply is available, the entire floor being covered to a depth of several inches. Notwithstanding this fact the fauna of the latter cavern consisted only of one pseudoscorpion, the moth *Tinea antricola*, with occasional specimens of the long-legged Myriapod *Thereuonema reconditum*.

Excluding aquatic animals and those (mentioned on p. 14) which appear to be merely casual visitors, the terrestrial fauna of the inner parts of the cave, at distances exceeding 1,500 ft. from the entrance, consists of the following species :—

MAMMALIA.

Chiroptera.

**Hipposideros lankadiva* Kelaart.

Rodentia.

Rattus nitidus nitidus Hodgson.

Carnivora.

Felis sp.

CRUSTACEA.

Isopoda.

**Philoscia dobakholi*, sp. nov.

**Philoscia* sp.

Cubaris cavernosus Collinge.

ARACHNIDA.

Tartarides.

**Schizomus sijuensis*, sp. nov.

Araneae.

**Scytodes semipullata* Simon.

Heteropoda robusta, sp. nov.

Opiliones.

**Sijucavernicus kempi*, gen. et sp. nov.

MYRIAPODA.

Diplopoda.

**Trachyiulus mimus*, sp. nov.

Chilopoda.

**Himantosoma typicum* Pocock.

Thereuonema reconditum, sp. nov.

INSECTA.

Collembola.

Cyphoderopsis gracilis, sp. nov.

Orthoptera.

Kempiella longipes, gen. et sp. nov.

Diptera.

Atrichopogon cavernarum, sp. nov.

Nycteribia (*Acrocholidia*) *euxesta* (Speiser).

Lepidoptera.

Tinea antricola, sp. nov.

Coleoptera.

Abacetus lucifugus, sp. nov.

Hylophilus kempi, sp. nov.

OLIGOCHAETA.

**Drawida troglodytes*, sp. nov.

**Megascolides antrophyes*, sp. nov.

**Glyphidrilus spelaeotes*, sp. nov.

This list comprises only 23 species and the number is further reduced to 18 if we leave out of account the mammals, which are, of course, free to enter or leave the cave at will, the bat-parasite and the carabid beetle *Abacetus lucifugus*, of which a single chance specimen was found at the edge of the stream at 3,550 ft. The species which were found *only* in the inner parts of the cave and are absent from the cavern between 400 and 500 ft. are distinguished by an asterisk (*).

Aquatic fauna.

The aquatic fauna of the cave proved on the whole less interesting. than was hoped. It includes eight species of fish, one gastropod mollusc, three decapod custacea, two water-bugs and one gyrinid water-beetle. The only one of these that shows any sign of modification is the prawn *Palaemon cavernicola*; all the others belong to species also known from outside the cave.

Most of the fish in our collection were obtained by Garo fishermen, whom we brought into the cave for the purpose of catching them. Fish were not uncommon in the stream up to a depth of 600 ft. from the entrance but became much scarcer in the inner parts. Two species, however, *Nemachilus* sp. and *Barbus hexastichus* penetrate to a depth of at least 1,700 and 2,000 ft. respectively. Individuals of some of the species are paler than those obtained in daylight but the story we were told of a white cave-fish seemed to refer merely to slightly decolourized specimens of *Barbus hexastichus*, which appear almost white when seen in the water by lamp-light.

The conspicuously banded gastropod, *Paludomus blanfordiana*, is abundant in the stream which issues from the mouth of the cave and extends inwards to a depth of about 500 ft.

Of the three aquatic insects one is a water-bug of the genus *Heleocoris*, represented in our collection by a single specimen obtained in the stream in the entrance hall. The other two are the gerrid bug *Metrocoris nigrofasciatus* and a gyrinid water-beetle belonging to the genus *Orectochilus* ; both of these are surface forms and both are rare in the cave ; the former penetrates to a depth of 2,000 ft., while the latter makes its way to the extreme inner end. All three species occur commonly in the stream outside the cave-mouth.

Of the three Decapod Crustacea two, *Paratelphusa falcidigitis* and *Palaemon hendersoni*, are common Assamese species. Odd specimens of the *Paratelphusa* were found at various depths up to a maximum of 2,400 ft., mostly under stones in the stream-bed. *Palaemon hendersoni* is abundant in pools in the entrance hall, but is seen more and more sparingly as greater depths are reached. It was, however, found as far as 3,200 ft. from the mouth. The colour of cave-specimens is slightly paler than those from the stream outside, but no other appreciable difference can be detected.

The third Decapod, *Palaemon cavernicola*, is restricted to the inner parts of the cave and is of particular interest owing to its partial adaptation to cave life and as being the only true cavernicolous Decapod known from Asia. The nearest point to the entrance at which the species was found was in the small pool in the L-shaped passage at 550 ft. In the inner regions it appeared to be most abundant in the stream at 2,000 ft. and in the pools between 2,200 and 3,000 ft. It was perhaps equally common in the main water-channel, but was less easy to see owing to the surface ripples. The species was not infrequently taken in company with *P. hendersoni* and was slightly but quite definitely attracted by light. The specimens found in pools of still water were no doubt left there when the flood-water subsided. In such situations they evidently find difficulty in maintaining themselves and we frequently saw dead specimens being devoured by others. In the main stream at 3,500 ft. we once discovered a number of specimens eating a dead bat (*Hipposideros*).

We failed to find any aquatic Isopods or Amphipods in the cave and the water everywhere was perfectly clear and without a trace of plankton. An attempt to hatch small crustacea from dry mud taken from the side-tunnel at 2,300 ft. proved a complete failure.

General Considerations on the Fauna.

In their valuable summary of our knowledge of the zoology of the caves of Burma and the Malay Peninsula,[1] Dr. Annandale and Dr. Gravely have drawn attention to the fact that the fauna is as a whole far less specialized than that of the caves of Europe and North America. This small degree of specialization is also a feature of the Siju fauna. The vast majority of the animals we collected belong to

[1] *Journ. Asiat. Soc., Bengal* (n.s.) IX, p. 422 (1914).

species which occur, or may be expected to occur in out-door situations and the few that do exhibit adaptation to cave life are only partially or incompletely modified. At Siju we seem to find a cave fauna in an early stage of evolution and we look in vain for the final results of environmental conditions, which in other parts of the world have yielded species of extreme zoological interest. From the low degree of specialization of the fauna it seems legitimate to infer that the cave is of comparatively recent origin.

One interesting feature of the fauna is the common occurrence in the cave of species which appear to be rare outside. The long-legged bug *Myiophanes kempi* may be cited as an instance and if we had sufficient knowledge of the relative abundance of other species shown in our list the same fact would almost certainly be evident in some of them also. There is thus some indication that the peculiar environment is extremely favourable to certain animals. This of course is not an exclusive feature of caves; it applies equally well to lagoons of water that is brackish or seasonally variable in salinity or to any situation in which the physical conditions are abnormal. Species which succeed in establishing themselves in an environment in which peculiar physiological adaptability is necessary for their existence are limited in numbers and, being able to survive under conditions in which the majority of their enemies and competitors would perish, are naturally in a favourable position to increase and multiply.

Classified on the lines which Racovitza has advocated[1] the fauna of the Siju cave consists principally of "Troglophiles." There are "Trogloxènes" also but most of these we have excluded from consideration (see p. 14) as not constituting part of the cave-fauna proper. Of true "Troglobies" there are few or none.

The only species in the cave which exhibit definite adaptation to cavernicolous existence are the following :—

Mollusca.

Opeas cavernicola, sp. nov., 450 to 500 ft. Of 100 living specimens examined 6 per cent show no trace of retinal pigment and the lens is apparently absent. In the remaining 94 per cent the lens is present; the retina is densely pigmented but, as seen from without, occupies a smaller area than in allied out-door species. The optic nerve is strongly developed in all the specimens and the eye, which apparently forms an efficient sense-organ even when without pigment, is actually larger than in the allied *O. gracile*.

Crustacea Decapoda.

Palaemon cavernicola, sp. nov., 550 to 3,800 ft. The cornea of the eye is reduced to less than half the normal size and shows no variation in dimensions. The usual black pigment is, however, present and in its microscopic structure the eye shows no signs of degeneration. The two distal optic ganglia are reduced in size but the proxinal ganglion is fully as large as in

[1] *Arch. Zool. expér. et gén.* (4) VI, p. 437 (1907).

prawns of similar size with normally developed eyes. The antennae and antennules show no excessive development. The colour is semitranslucent and whitish, without the pigmentation characteristic of allied out-door forms. It is perhaps significant that what pigment there is, apart from the eyes, is of a bright red colour. The eye is functional and the species is attracted by light.

Crustacea Isopoda.

Philoscia dobakholi, sp. nov., 600 to 3,600 ft. Almost white in colour with greatly reduced eyes.

Cubaris cavernosus Collinge, 300 to 3,800 ft. Eyes reduced but colour not abnormal.

The moth *Tinea antricola* in its pale colouration exhibits a certain modification but no structural peculiarities are apparent.

In spite of the remarks by Dr. Chopard on p. 81, we do not consider that the cricket *Speonemobius decoloratus* shows any marked adaptation to cave life. It was found at the entrance, in broad daylight, and apart from its pale colouration exhibits no significant characters.

Owing to our scanty knowledge it is not at present possible to make a detailed comparison of the Siju fauna with that of other Asiatic caves. The only species in our list which are known from other caves are :—

Cubaris cavernosus, described by Collinge from caves near Cherrapunji in Assam.

Chelisoches morio F. which is commonly found in other Assamese caves and in those of the Malay Peninsula.

Atrichopogon cavernarum, sp. nov., which is also known from the Batu caves in Selangor (see p. 107).

Tinea antricola, sp. nov., which is probably also found in the Moulmein caves in Burma (see p. 114).

If our list is compared with that of the fauna of the Burmese and Malayan caves compiled by Annandale and Gravely it will be found that only one species (*Ch. morio*) and very few genera are common to both. No true comparison is, however, possible, for the Burmese and Malayan caves have not been investigated with any degree of thoroughness and it may be expected that a number of Siju insects belonging to species with a wide range of distribution will in course of time be found in them.

In a few particulars the Siju fauna shows an interesting resemblance to that of the caves at Shimoni and Kulumuzi in tropical Africa examined by MM. Alluaud and Jeannal. The analogy lies entirely in the Arthropods : in the Myriapods in the occurrence of a species of *Lamnonyx* and in the insects in the abundance of a beetle of the genus *Hylophilus* and in the presence of long-legged bugs belonging to the genera *Myiophanes* and *Bagauda*. It is this last fact that is most striking, for bugs of these two genera, which are widely distributed in India in the open, have not been found elsewhere in Africa.

In the fauna of the Siju cave there are some very remarkable deficiencies. It might have been expected that small Gastropod molluscs such as *Hypselostoma*, *Opisthostoma* and *Ditropis*, which have been found in bat-guano in the Jalor caves, would also have occurred at Siju,

but though a minute search was made with this object in view none could be discovered. Another noteworthy deficiency is the complete absence of the large Pedipalps (*Stygophrynus*) which form a very striking feature of the fauna of the Moulmein and Jalor caves. The only Thysanuran we obtained was found in the entrance hall and no specimens were seen of the Phasgonurid (Stenopelmatid) genera *Diestrammena*, *Rhaphidophora* and *Tachycines*. One or other of these genera is to be found in the Jalor and Batu caves, in those of Burma and in all the Assamese caves which have hitherto been examined. In the Siju cave they are entirely absent, their place being taken by three hitherto unknown Gryllid genera.