

In the present specimen the fur was greyish above, without any rufous tint; in the var. *kirkii* the upper surface was tinged with rufous; in the third example, considered to be the typical form, the fur above was of a deep rufous. Besides the coloration, no other differences of importance were noted in these three specimens; and the conclusion arrived at was that *Galago monteiri* was little, if anything, more than a pale variety of *Galago crassicaudata*. It would be desirable, however, to get additional specimens of this Angolan form for further comparison.

The following papers were read:—

1. NOTES ON THE CHEIROPTERA OF JAMAICA. BY THE LATE MR. W. OSBURN. COMMUNICATED BY P. L. SCLATER, M.A., PH.D., F.R.S., SECRETARY TO THE SOCIETY.

[In these 'Proceedings' for 1861 (p. 63) will be found a paper by Mr. R. F. Toms on the Mammals collected in Jamaica by the late Mr. W. Osburn. Mr. Osburn died suddenly, at Raymond Hall, St. Andrew's, in Jamaica, the 21st of February 1860, after a residence of two years, devoted to the pursuit of natural history, in that island. The following notes on the Bats which he collected seem to be of great interest. They have been extracted from the MSS. of the deceased naturalist, which have been kindly placed at my disposal by Mr. Henry Osburn, his brother. The names and numbers of the species are those employed by Mr. Osburn. I have added what I believe to be the correct name of each species in a foot-note.—P. L. S.]

1. NYCTINOMUS *, sp. ?

" Mahogany Hall, 30th October, 1858.

" I caught two specimens of this Bat in the house after dusk: they were easily knocked down. One, very like them, only about half as large again, I got out of an old cocoa-nut palm in the garden. Unfortunately it was destroyed by ants. I was inclined at first to think it a full-grown specimen of this species; but the capture of two smaller ones successively at different places, under the same circumstances, makes it probable that it was quite different: when caught, they bit fiercely at the hands. When disturbed, it would make a rapid 'bub-bub-bub,' a dull sound, as if produced by lips, the effort jerking the whole body at each repetition. This sound was produced by its being partially covered with a glass. It had, I afterwards found, only one cry, 'click-click.' "

" Mahogany Hall, 3rd December, 1858.

" These little Bats are extremely common here, making their way in through chinks of the shingles. This specimen, when caught, had the feet and wrist covered with cobwebs taken in his passage. They generally appear from half-past five to six o'clock, directly after sun-down, and occasionally appear up to ten o'clock, but not in such numbers. They again make their appearance in my bedroom before

[* *Nyctinomus nasutus*, Spix; Toms, *l. c.* p. 68.—P. L. S.]

dawn. The beating of their wings, with the occasional squeaking call, is quite familiar to me as the first sound of morning. I kept one in confinement for two days. It would eat nothing—not even drink. It uttered the ‘click-click’ with a gaping mouth, if disturbed, the whole body being jerked. The ear shaded the eye when alive, and was a little raised when touched. I could not by any sharp sound produce the vibrating motion very discernible in *Arctibeus carpolegus* under a neighbouring glass. I took off the tumbler, and put in its place a bell-shaped lamp-shade. The Bat instantly seemed aware there was an opening at the top; for, instead of lying perfectly motionless as under the tumbler, it woke up immediately, and made violent efforts to thrust his head under the receding rim; when that would not do, it tried to hook its claws into the glass and climb to the hole: a constant vibrating motion of the nose, as it raised its head, was visible the whole time.

“The volar membrane folded very completely behind the forearm, and so as to form a much more serviceable fore leg than appears to be the case with *Arctibeus*. This specimen was a male: reproductive organs conspicuous; testes large. There were only three incisors in the upper jaw, two lateral, longer than single middle—an accidental formation doubtless; lower incisors had edges level and doubly notched; molars jagged and double-edged; first pair of lesser molars very minute.”

“Rowington Park (Vere), 28th March, 1859.

“Vast numbers of these little Bats inhabit the shingled roof of this house. It is an unusually favourable place for observing them. The rooms are ceiled. A store-room without ceiling communicates directly with the roof, whence a view can be obtained of a large part over the ceiling of the other rooms. A crack in the boarding that crossed a gable let in sufficient light for easy observation, and was besides of great importance to the Bats as their principal avenue of communication with the outer world. I often observed them during the day exactly as Goldsmith’s line expresses, ‘Lazy bats in drowsy clusters cling;’ for, what seems surprising, notwithstanding the extreme heat of the situation—shingles exposed to the sun (and it was disagreeably hot and confined where I stood, 12 or 15 feet below), the Bats clung in complete clusters. I counted fourteen little heads in a mass about the size of a turnip. But they are not all asleep: now and then a wing is stretched with drowsy enjoyment; and the luxury King James thought too great for subjects, and ought to be reserved for kings, is largely indulged in by Bats. First one and then another wakes up, and, withdrawing one leg and leaving himself suspended by the other alone, adroitly uses the foot at liberty as a comb, with a rapid effective movement dressing the fur of the under part and head—an action far from ungraceful. The foot is then cleaned quickly with the teeth or tongue, and restored to its first use. Then the other leg does duty. Perhaps the hairs with which the foot is set may aid to this end. I often have seen them do this in confinement; and probably the numerous Bat-flies with which they are infested may be the cause of extra dressing. It is

impossible to imagine a more perfect or effective comb than the little foot thus used makes; and I would here remark on the extreme sensitiveness of these little animals. I have often been painfully impressed with the amount of suffering some of my experiments were causing, by observing their fretful impatience: a Bat, with its wing broken, its bright little eye glazed with coming death, would resist the first touch and hum of a mosquito, and exhaust its dying efforts to escape the annoyance.

“A little after sundown, and, from the room below, the roof seems alive with movement; there are squeaks and a shuffling scuffle over the boards. From the place of observation before alluded to, it is too dark to see plainly the Bats within, though their little forms may be traced scrambling eagerly up the boards of the gable till they arrive at the chink, when they become quite plain against the evening sky without, as they go over the edge, their elbows and ears in the action being particularly prominent. From without, or the window below, we can see them shoot off with great rapidity (so that I have heard disputes as to whether they are Bats or Swallows) and dart after their insect-supper with the most intense enjoyment, far over the neighbouring trees and pastures. I would remark that there is a distinction in the mode of flight of these Bats and our *Hirundo pæciloma*. This is, that whilst the arc formed by the tip of the Swallow's wing is as much above as below the body, the wings being as far apart when fully raised as when fully depressed, in the Bat the wings scarcely rise above the level of the body, and meet apparently below. I do not mean this is universally the case. I do not think the frugivorous Bats do it; but it is very apparent in some of the insectivorous Bats when going at a great rate; and as I knew this species by tracing their course as they shot from their roosting-place, it must be noted as one of the most remarkable for this. Their exit during March was about half-past six o'clock. About eight to nine o'clock they returned. It is then they are so particularly annoying to the inhabitants of even the most carefully kept Jamaica houses. The great majority return to the roof; but one or two vigorous little fellows come into the room, and flap about in the most unmeaning way. Nothing is more remarkable than the agility with which a dozen, in the early part of the evening, skimmed and glided by every article of furniture. But now they bang themselves against the ceiling and walls, drop on the table, get up again, when the cat, by jumping, catches them a pat, and they fall on the floor, not much hurt, to judge by their liveliness; for Grimalkin, having performed the feat, sits down, her paws tucked under, and gravely watches the hurry of the alarmed Bat shuffling over the floor. They disturb the harmony of the evening by becoming the occupants of, and making an escapade beneath, a gentleman's coat-collar, or a great sensation by getting entangled hopelessly in a lady's hair, and bite more furiously than effectively during the process of release. They remain very active all night, scampering and shuffling about their ample quarters. For several nights the noise was so great, I attributed it to rats; but the Doctor assured me there were none—it was these little animals

alone; and I found he was right. I do not know at what time they again start for their morning meal; but they return between five and six in the grey of the morning.

"At Mahogany Hall, and many other houses where they are numerous, the squeaks and rush of the long, narrow volar membranes, as half-a-dozen circle round his room, are the first sounds of morning that fall on the occupants' ear.

"This species is extremely common: half a dozen may often be found behind pictures in houses not much disturbed by housemaids. Chinks in stairs and fittings are very common refuges; and during the day they cling to them with such tenacity, they must be much injured if a stick is used before they can be got out. I have not yet met with it but in houses."

2. ARCTIBEUS, sp.

[See no. 12.—P. L. S.]

3. ARCTIBEUS CARPOLEGUS*.

"Mahogany Hall Cave, 24th November, 1858.

"Three; all females. This large species I found inhabiting this cave in great numbers, the beating of their wings making a murmuring sound when disturbed. They flew towards the roof, only occasionally coming within reach of the net. They were very unwilling to venture out into the light: I did not see one. The floor of the cave was strewn here and there with the kernels of bread-nut (*Brosimum*), which had sometimes germinated into young blanched trees on the thick deposit of dung."

"Mahogany Hall, 2nd December, 1858.

"Returning to the cave to-day, I found it still occupied by great numbers of this species—though reduced, to what they were the other day. My servant easily caught two with the ring-net. They seemed stunned with the shock; for I took them out of the net quite motionless and with all the muscles rigid, so that I had the opportunity of closely examining the position during flight. The back was perfectly flat and on a level with the wings, which were tense, slightly arching downwards towards the tips, like a bird's. Held against the light, the branching of the blood-vessels was a very beautiful sight. The interfemoral was perfectly flat and tense, kept so by the calcarea being stretched at right angles with the leg; the toes stretched wide apart. I never before realized how thoroughly fitted for flight these creatures are. On placing them in my botanizing-tin, their struggles to regain liberty were violent.

"On bringing them home, one of them escaped, and gave me a tedious chase, from his keeping in the apex of the high roof, occasionally hitching himself up, head downwards. As I cautiously advanced the net, he showed his sense of danger by elevating the head a little, whilst the little round ears underwent a constant and very

[* *A. perspicillatus* (Linn.); Tomes, *l. c.* p. 64.—P. L. S.]

rapid motion as if vibrating, and, what made it more curious, each independently of the other. It had a very curious effect, like a person rolling his eyes different ways. The nose-leaf had also a motion, but slighter. It looked as if he were feeling for sound and smell, to ascertain the nature of the attack. When placed under a glass, the same motion would take place on any sharp noise being made near him, which, however, he paid no attention to when repeated. Every now and then he would raise his head, agitate his ears; and I could then see a great motion in the nose-leaf preparatory to another violent effort to escape. It uttered no sound whilst under my observation, only opening its mouth and showing its formidable teeth, but would not bite. But whilst in the cave, I heard a loud cry several times repeated; and one which escaped, on being caught again, uttered a loud scream very like a rat. It is no proof of the silence of Cheiroptera that they utter no sound in confinement."

"Montego Bay, 16th May, 1859.

"A picturesque little cave, close to the town, I found abundantly inhabited by this and another species (no. 12). The cave was not deep, though there were dark passages from it. This species, however, is by no means so particular about a thoroughly obscure retreat as many other species. They were here reposing in light sufficient for me to shoot them. The floor was strewn with berries the negroes call cherries, but which I presume to be the fruit of *Cordia collococca*. They were all munched, leaving only a small portion of pulp attached to the skin. Of the young of this Bat I did not observe anything remarkable; it sucked my finger by gently nipping the portion of flesh taken up with its little flattened milk-incisors, but held on firmly by the hooked teeth."

"Kinross, Trelawny, 25th May, 1859.

"One example, a male. It was hardly a cave where I obtained the specimen. The steep wall of rock had been at its base hollowed out for 8 or 10 feet, leaving an overhanging mass 20 feet from the ground. When I first saw the recess, I felt convinced it was not dark enough for Bats, though a flock of *Hirundo paciloma* were hovering with alarmed twitterings, or peeping from their clay-built nests. A heap of dried seed, berries, husks, with some fresh ones on the top, showed the Bats were there. Amongst these last were gnawed fragments of unripe mangoes, and large pieces of the soft-scented fruit of the Rose-apple (*Eugenia jambos*). These last, I suspect, had not been plucked whole, but torn off in fragments. A swarm of a species of *Sphex* were hovering over the decaying mass, catching the insects which fed upon it. The Bats were at first nowhere visible; but I at length discovered them in some deep narrow crevices and water-worn holes in the roof. I fired, and they proved to be of this very common species. It certainly does not seem such a lover of darkness as the generality of the family; one of the species (*A. jamaicensis*) roosts among the foliage of trees, or is subumbral. A

swarm of ants were busy carrying off piecemeal a young sucking Bat which had fallen."

"Johnston Pen, Trelawny, 4th June, 1859.

"This *Artibeus* inhabits in great numbers these extensive caves, once used as sugarworks. I did not thoroughly explore them, as my ammunition fell short. It is also to be found in great numbers in the western cave of the adjoining estate, Harmony Hall. It has a loud, harsh screech, constantly heard, when in captivity, towards evening, and during the day when at liberty and it is disturbed in its gloomy abode. It seems a kind of alarm; for it is repeated every now and then, only by single individuals, and is accompanied by a general flapping of scores of leathery wings.

"Aquatta Vale (Metcalf), 11th November, 1859.

"This Bat (so common in the caves of St. James and Trelawny), I had always noticed, particularly haunted the entrances of caves, or caves of small depth, though often, as at Mahogany Hall, those where the light was wholly excluded. Its habits, however, in this respect are very curiously affected by the geological formation of the country it inhabits. In Metcalfe the transition shale, of course, never forms caves; and the strip of limestone along the sea-board is too marly, so far as I know it. A total change therefore takes place in the habits of the Bat. I found them at Aquatta Vale clustering under the fronds of the cocoa-nut palm, so thickly and in such numbers that at a single shot I brought down twenty-two, while many flew off and took refuge in the neighbouring trees. Their food seems principally the pulp of the young jelly cocoa-nuts, as they are called. I was shown one or two in which a large hole had been nibbled through the still soft husk, large enough to admit the body of the Bat. The question arises, whether this might not have been by the rats, as I have no proof; but I am at present inclined to attribute it to the Bat, as the trees were very lofty (60 or 70 feet high), and I never heard of rats being detected among the fruit. The hole, I observed, was nibbled next to the foot-stalk; so that doubtless the Bat rested on the fruit whilst perforating it. This would confirm my previous remarks, that these animals do not even principally feed whilst flying, but reclining in some position. The stomachs of several I examined were bilobed and internally reticulated by folds, but perfectly empty. The large intestine contained a yellow juice, among which many small seeds passed out at the anus on pressure, and which I suspect were those of the Fustic (*Morus tinctoria*).

"[Since writing the above, I learn that rats are very frequently seen up the cocoa-nuts. I am inclined to think, therefore, that these nibbled the holes, and not this Bat, whose incisors are so manifestly ill adapted for gnawing through 3 or 4 inches of round soft husk.]"

"Dover (Metcalf), 29th November, 1859.

"The above doubt is pretty nearly dissolved by a fact mentioned to me by Mr. Prosser, an engineer at present employed on the

estate. Whilst sitting at the window of the overseer's house, towards dusk, his attention was attracted by a flapping among the fronds of a cocoa-nut close by. A large white Owl (*Strix*) was struggling with something amongst the bunches of nuts, and, after many efforts, dragged out a rat, with which he slowly made off."

4. LASIURUS RUFUS*.

Expanse 9 inches; length from nose to insertion of tail $1\frac{1}{2}$; tail $1\frac{5}{8}$ longer than the body, membrane extending to the tip; length of forefinger $2\frac{3}{8}$; ear from base to tip, front, $\frac{1}{16}$; thigh $\frac{1}{2}$, nearly; leg, to calcaneum, 1; calcaneum $\frac{9}{16}$.

On the muzzle a ridged lobe, with a projecting point, between nostrils; lower lip large, and below this a thin projecting lamina; ears large, round, coming down below rictus, enclosing eyes, which are very minute; hair fringing edge of upper lip, very long, and increasing as it approaches corner of mouth, so as to resemble a moustache; head round; reproductive organ conspicuous. A male.

Colour a beautiful dormouse-yellow, paler below; fur soft and long; volar membranes black, much wrinkled. Length of intestine (and stomach) 3 inches; tongue attached by under surface.

"Mahogany Hall Cave, 24th November, 1858.

"Whilst in the cave catching the large *Artibeus*, occasionally a little Bat would fly among them, so nimble I could not catch it. It was only on going out that I discovered them clustering like bees in a little recess with a high domed roof. They seemed driven here by the larger Bats. It is a remarkable characteristic of Bats that thus large numbers of different species should inhabit different caves or parts of caves. This little Bat flew out with great facility, parties of five or six scudding along the steep face of the rock without, as if seeking for a hiding-place. It was here I shot one, 2nd December 1858. Returned to the cave for fresh specimens, though about two o'clock not a single individual of this species was there."

"Oxford Cave, Manchester, 22nd February, 1859.

"Seven males, four females. The difference in the colour of the fur is so great, varying from brownish grey to yellowish chestnut, that I give measurements of an individual of each shade:—

"Brown. Expanse 9 inches; muzzle to base of tail $1\frac{1}{2}$; tail $1\frac{1}{2}$; forearm $1\frac{3}{8}$; carpus, to tip, $2\frac{1}{4}$.

"Chestnut. Expanse $8\frac{3}{4}$; muzzle to base of tail $1\frac{1}{2}$; tail $1\frac{5}{8}$; forearm $1\frac{5}{16}$; carpus, to tip, $3\frac{1}{4}$.

"Brown. First digit $1\frac{6}{8}$; leg and foot $1\frac{3}{8}$.

"Chestnut. First digit $1\frac{6}{8}$; leg and foot $1\frac{3}{8}$.

"Dental formula:—M. $\frac{6-6}{6-6}$, C. $\frac{1-1}{1-1}$, I. $\frac{4}{6}=38$.

[* Mr. Tomes (*l. c.* p. 65) refers this species to *Natalus stramineus*, Gray, of the continent of America; but Dr. Peters informs me that, though it belongs to the same genus, it is clearly distinct specifically, differing not only in its smaller size, but also in its dentition. It should therefore stand as *Natalus lepidus*, being the *Nyctiellus lepidus* of Gervais.—P. L. S.]

"Molars. Three larger jagged; three lower pointed.

"Canines. Lower have a second much shorter point in front of larger.

"Incisors. Upper pointed; each pair of one lateral and one middle, placed apart by a space equal to that occupied by each pair. Lower deeply double-notched, very minute.

"Mr. Gosse (Nat. Soj. p. 280), from whose account I have partly named this little Bat, says, 'Long tail; an ample interfemoral, which is clothed on upper surface with rufous hair, like body,' by which, I conclude, is meant, the hair was like the fur of the body in being rufous, *not as to quantity*; for in my specimens a few hairs are sparsely sprinkled over the interfemoral, but thicker on the tail and calcanea."

5. CHILONYCTERIS, sp.*

"Sportsman's Hall Cave, 30th November, 1858.

"Two males, one female. In great numbers in this large cave. My servant caught, with a long net, a dozen whilst we were there. They flew in swarms along the roof. I know nothing of its habits."

"Sportsman's Hall Cave, 15th December, 1858.

"Two males, one female, stuffed; one in spirits, injured in bringing home; four males, one female.

"Intestine 6 inches; stomachs contained several minute fragments of insects much comminuted.

"Dental formula:—M. $\frac{5-5}{5-5}$, C. $\frac{1-1}{1-1}$, I. $\frac{4}{4}$ = 32.

"Upper middle incisors, one deep notch.

"I got about a dozen of these little Bats alive. The journey home must have had all the horrors of the middle passage; for I found several dead, evidently bitten in pieces by the rest. I suspected a very lively fruit-eating Bat (no. 6) of the chief slaughter. I placed the survivors in a box, with bobbin-net over it, so as to observe them. They were not particularly active, merely jumping up constantly to escape, but not running much. They clustered head downwards, during the day, in any dark and sheltered corner, making every now and then, especially when leaping, a sibilant bird-like chirp, very different from the 'click' of *Molossus*. This noise much increased at about a quarter past five p.m., when their activity commenced and renewed efforts to escape. The wings fold very completely, so as to leave forearm free whilst resting. The ears are then pointing forwards; they have a rapid and constant motion, but confined to their tips, and principally backwards and downwards.

"I let one fly to observe it, and the calcanea are stretched firmly backwards so as to keep the interfemoral tense and flat. At first they were very sulky, and would eat nothing. The second day my attention was called off; and the third morning I found several dead from hunger, with the remains of fæces (which they had eaten) in their mouths.

[* *Chilonycteris osburni*, Tomes, P. Z. S. 1861, p. 66.—P. L. S.]

" I took out the two survivors, and my regrets for the sufferings I had caused were in part allayed by the eagerness with which they sucked up the water I presented them with from the feather of a pen. They licked with the tongue, the jaw moving all this time with an action like chewing. Some water having got spilt over the muzzle and face of one, it combed these parts over with the hind paw very adroitly, putting it forward under the forearm, in this way the face all round front of ear, especially the long whiskers round muzzle. The movement of the leg was very rapid, almost too quick for the eye to follow. It afterwards licked the paw, as if to clean it in its turn. I have observed precisely the same habit in *Molossus* (no. 11) and *Macrotus* (no. 8). I found a dead moth in the window, which neither ants nor spiders seemed to have attacked. It did not notice it at first; but on looking a minute after, I had the gratification of seeing wings sticking on lips, the body having disappeared. Of flies, bees, &c., I caught for him he took no notice, merely shaking them off impatiently. I forgot to mention that fragments in the stomach appeared to be those of Coleoptera principally; but the contents of the stomach of Bats are so comminuted, it is often difficult to recognize them. Out of eleven whose sexes I have noted from this cave, eight were males, three females. This species (by far the most numerous) occupied one entrance and the centre of the cave. It was near the opposite entrance I caught no. 6 and no. 7."

" Oxford Cave, Manchester, 22nd February, 1859.

" This species was not nearly so numerous here as the others; the specimen I skinned had a curious brindled appearance, with a yellowish tinge I have not observed before."

6. *MONOPHYLLUS REDMANII*, Leach*.

" Sportsman's Hall Cave, 30th November, 1858.

" One male, one female. This curious species I found (with no. 5) in a large cave at the summit of the steep hill that overlooks Sportsman's Hall Works. It was not nearly so numerous as its companion: for a dozen of the other, I only got two specimens of this. As they were killed at the time, I had no opportunity of examining habits; but the tongue, protruded in death, attracted my attention. I thought the use of this curious member might be accounted for by the hypothesis that it sucks night-blowing flowers, as the Humming-bird those of the day."

" Sportman's Hall Cave, 15th December, 1858.

" It was principally to procure specimens of this little Bat I undertook a second expedition to the cave. Notwithstanding we went twice through its whole length, and saw fifteen or sixteen Bats, I only caught a single specimen of this species. It was creeping down the side of a large domed hollow in the roof when the boy put the net over it. Several Bats, on being taken out of the bag,

[* Cf. *Tomes, P. Z. S.*, 1861, p. 64 & p. 87, pl. xv.—*P. L. S.*]

were most cruelly mauled and killed. From the fierceness with which this little fellow bit my fingers, drawing blood from the back of my hand, he seemed the chief assailant. Its activity when first taken out of the bag was beyond anything I had seen with Chiroptera, running round the box by a series of little jumps, with almost the quickness of a mouse, and jumping with all the agility of a bird. On placing it beneath a glass after its first efforts had a little subsided, I saw its tongue projected very rapidly to the board. It seemed to me to be using an additional sense to ascertain the nature of the unusual substance on which it was resting. It frequently stretched its neck and head upwards, the nose-leaf and round ears in motion, as if trying to ascertain whether there were an aperture above, its bright little eyes peering with eagerness, and panting like a mouse. The motion of the ears was by sudden jerks, and often alternate one to the other, as in *Artibeus carpolegus*. The motion of the nose-leaf was a rapid contraction and dilatation. The activity especially commenced at a quarter past five p.m. The likeness of the pencilled tongue to that of the *Trochilidæ* suggested to me that this little Bat in the same way probed night-blowing flowers. Towards evening I got some of the large drooping flowers of *Datura arborea*, in which I first ascertained were some minute insects. It took no notice of them so long as I watched it. In the morning I found the large stamens bitten off, but it was lying across the flower. It then, for the first time, occurred to me that the powerful teeth that scratched my hand could not have been intended for masticating minute insects.

“There was another bird with a pencilled tongue familiar to me, *Tanagrella ruficollis*; and this was a frugivorous bird. Might not this protractile tongue be for the same purpose of sucking juicy fruits? That this was the right hypothesis seemed the more probable, as then the similarity of its short round ears and nose-leaf to those of other frugivorous Bats would be accounted for. I then recollected that the yellow pulp I found in the stomachs and intestines of two former specimens was in appearance precisely like that I was familiar with in the alimentary canal of *Tanagrella* and *Euphonia*. It was unlucky this did not occur to me before, as the captive was already much fatigued with confinement and inflammation at the wrists. I offered it orange, but it took no notice. A little water, the night before, was all it had had. This it sucked up by repeated projections of the tongue a little beyond the muzzle, and with a satisfied purring noise. Towards evening it was more lively, and it accidentally got off and gave me a long chase. Flight seemed to refresh it. I then tried orange again, and had the pleasure of seeing the tongue protruded out of the groove of the lower jaw, whilst it certainly licked up a little of the juice; and there was a slight action of the body, like that of an animal feeding. But it was much exhausted, and it was only by close watching I could detect these movements. Every now and then there was an impatient toss of the head, which made me long doubtful of its really feeding; but I think it was that, in the unnatural attitude of feeding, some of the juice got into the nostrils and

incommoded it. After killing it, I found a little orange-juice on the tongue, which still further confirms my suspicions. Still the whole was not completely satisfactory. In the agonies of death it protruded the tongue to its full extent, and I had the opportunity of observing the complete manner in which it is set with bristles."

"Oxford Cave, Manchester, 22nd February, 1859.

"In this immense cave, whose winding galleries cannot be less than a mile in length, I procured no less than five species of Bats, but all well known to me.

"This little Bat was not uncommon; and at the end they positively swarmed like bees, crawling by dozens on the wall within reach.

"Of this species I brought away twenty-three males, and eleven females, which were all pregnant. There was a considerable difference in the shades of grey, some much more silvery. I immediately tried them with orange-juice, but they took little notice of it. One licked or rather lapped with his long tongue a little water. I put his muzzle into the water; but it shook its head to be rid of it, and, protruding its long tongue, licked up nose-leaf and over the whole of face to forehead, as if thoroughly to dry it. The next morning I tried again. They then licked water greedily, either off my finger or when held over it, protruding the tongue an inch or more. There was no chewing action, as with some Bats; it was simply a very rapid licking. I tried orange; they licked it, but not so eagerly as water. One bit at the orange. I saw nothing to show it likely to be their usual food. They voided urine when handled.

"There are some very large glandular bodies on each side the neck, close to the angle of the jaws, communicating (?) with one another, situated higher up, near the ear. I could not trace the ducts: are they glands for secreting saliva? In the muscles along the radius for moving the digits of the wing, and indeed in its whole muscular system, there is a great contrast between this little Bat and No. 7. It is also much more active on a flat surface, and much more tenacious of life. No. 7 has a much less developed muscular system, only jumps from the ground, and soon dies in confinement; yet its flight is very rapid. No. 6, however, is a very powerful little Bat, whatever food its long tongue may be adapted for.

"Several taken were pregnant females. Mammæ lateral; nipples broad. Foetus:—Fore foot (wing rather) very like a five-clawed bird's foot, with a thin transparent web connecting four toes. This singular appearance was caused by the very small development of the four volar digits, whereas the thumb was disproportionately large—as long as the rest. Hind foot also disproportionately large. The tongue protrusible, like that of the adult, but not bristled. There is a series of fine transverse striæ across it. Towards the tip, two large blood-vessels follow the margin and meet at the extreme tip. No teeth; but on the gums rounded projections where they are coming through, three on each side. On upper jaw one large lump

where (deciduous) canine will be, and two a little behind, near position of lesser molars. Three on each side, lower jaw, in same situations."

7. MORMOOPS BLAINVILLII, Leach *.

Expanse $12\frac{1}{4}$ inches; muzzle to tail $2\frac{1}{4}$; tail $1\frac{1}{8}$, free $\frac{3}{8}$; forearm $1\frac{3}{4}$; first digit $2\frac{1}{4}$; fourth digit $2\frac{1}{8}$; thigh $\frac{3}{4}$; tibia to calcaneum $1\frac{3}{8}$; calcaneum $\frac{3}{4}$; foot $\frac{3}{8}$. Length of interfemoral $1\frac{3}{4}$; beyond tip of tail, when expanded, $\frac{5}{8}$ (?).

Muzzle flat, depressed; skin of sides of face connects muzzle with ears by a series of folds concealed by silky moustache. Upper lip obsolete in front, foliated behind with a single indent. Lower lip expanded into a thin broad cordate lamina, with a short foot-stalk between the lobes warted. Below this, and attached perpendicularly and transversely to its under surface, two thin, membranous, but broad lobes, like clerical bands. These are carried backwards, with sinuous folds. Thirdly, below this last, and attached to their under surface, two thin folds of skin, one to the under surface of each band. These are carried back on their respective sides, with one deep indentation near centre of their course, then continuing backwards and upwards till they reach the fold which connects lower ear with muzzle.

Ears united with skin at sides of face, so as to contain the eye. Eyes about size of a pin's head, bright, and both at same time visible on front view. Ears somewhat lunate, or perhaps rather the shape of some bivalve shells; tips brought forward and doubled on themselves before meeting over forehead. The external ear is furred, and the long silky fur of head extends over forehead, meeting the long moustache. The head thus appears disproportionately large, and the ears imbedded or plunged in it, so that only a narrow rim of membrane is visible above the fur externally.

Tongue fleshy; when in mouth, furrowed with about six transverse plicæ.

Dental formula, M. $\frac{5-5}{6-6}$?, C. $\frac{1-1}{1-1}$, I. $\frac{4}{4}=34$ (?).

Molars jagged (there appear three lesser molars in lower jaw).

Incisors, upper, middle, one notch; lateral minute, leaning towards them. Lower level; each two notches.

Intestine 4 inches. Stomach empty.

Volar membrane semitransparent, and tissue so thin it dried almost before I had finished preparing the specimen; much wrinkled, between elbow and hand, into angular plicæ like shagreen. Nerves of interfemoral very beautiful when held against light; one central in line of tail, giving off at right angles pairs of branches like a pinnate leaf. Fur bright chestnut, above rather paler; very long, silky, and soft. Round the shoulders it is longer, so as to form a narrow frill longer than rest.

[* Cf. Tomes, in P. Z. S. 1861, p. 65.—P. L. S.]

"Sportman's Hall Cave, 15th Dec. 1858.

"It was at the opposite entrance of the cave to that we entered, and among some Bats that, terrified by our intrusion, were flying in the daylight, that my servant caught the first specimen I had seen of this very extraordinary little Bat. On returning, he caught another in the interior. A drawing will hardly convey an idea of the odd form of this curious animal, whose round head, the long fur of which nearly conceals the feathers, and its bright little eye make it look more like a fish than an animal. Then such of the features as are visible are so excessively foliated by meandering laminae of skin as to be scarcely recognizable. Seen in profile, the thin muzzle and lower lip form a mouth very fish-like; and often in the vertical profile the foliations of the chin are the most prominent, so that when it moved the jaw I fancied it like a caricature of a mumbling old woman. It is evidently congeneric with No. 4. It is not only similar to it in colour in the moustache which fringes sides of face, but also in the extreme fragility and thinness of its whole structure. The light was visible through the roof of the open mouth; and the molar membranes dried like damp paper. This is in great contrast to the firm well-strung frame of *Molossus*, as well as to the loose flabby make of *Macrotus waterhousii* (No. 8). During life I observed only a very slight motion of tips of ears at any sharp sound. Tail was curled upwards, so as to carry the interfemoral with it; this was caused by the calcanea bearing up the interfemoral. Femora long; so that when reposing the knees were above the back, like a grasshopper's. It jumped to escape, and opened jaws when touched; but did not bite, or utter any sound. It seemed very delicate, and was dead by the next morning, though the rest of my captives were as lively as ever."

"Oxford Cave, Manchester, 22nd Feb. 1859.

"Five males, twelve females (none apparently pregnant).

"There is a great difference in the shade of the chestnut-colour, which varies from a sandy buff to deep reddish brown.

"Dental formula, M. $\frac{5-5}{6-6}$, C. $\frac{1-1}{1-1}$, I. $\frac{4}{4} = 34$.

"Molars. Upper, three larger much jagged; two lesser, first minute; second large, canine-like. Lower, three larger, much jagged; three lesser.

"Incisors. Upper, middle large, plain, like human; lateral minute, leaning towards them. Lower edges of all four level; each bi-notched.

"The muscular system of this Bat is not nearly so powerful as that of No. 6, but it flies with great agility and rapidity. The only house I ever knew them enter was Freeman's Hall, where, notwithstanding the room was small and low, I had a long chase. I never saw them do anything on a flat surface but jump up. They soon die in confinement, and rarely survive the passage in the bag home. I observe that after death the volar membranes and forearm dry very rapidly; so that unless specimens are prepared immediately, these parts cannot

be arranged, even though putrefaction has not yet commenced in the stomach."

"Freeman's Hall, 21st July, 1859.

"One of these Bats entered the house this evening; and though the room is small and very low, it was only after a long chase I succeeded in taking it, from its extreme rapidity and agility of wing. At length it was completely tired out, and allowed me to take it by hand. I placed it under a candle-shade, where it made constant efforts to escape by jumping. It easily took wing off a flat surface, and its efforts to escape during the night broke some of the phalangeal bones; but, notwithstanding, on the cover being removed, after one or two efforts it succeeded in jumping out at the top. It refused flies I caught and offered it, shaking its muzzle at them with evident dislike; but it drinks greedily. The tongue was protruded; but the water taken up by it and the foliations of lips was sucked in with the head raised, by an action very like chewing."

8. *MACROTUS WATERHOUSII* *.

Expanse $14\frac{1}{4}$ inches. Length, to insertion of tail, $2\frac{3}{4}$; tail $1\frac{1}{4}$, free $\frac{1}{4}$ th length of forearm. First digit $3\frac{1}{2}$; fourth digit $2\frac{3}{4}$; ear up front $1\frac{1}{4}$, up back $\frac{7}{8}$; nose-leaf $\frac{1}{4}$; breadth of ear $\frac{5}{8}$; knee to calcaneum $\frac{7}{8}$; calcaneum $\frac{3}{8}$; foot $\frac{1}{2}$; intestines 8; stomach capacious, containing a yellowish mass with fragments of harder parts of insects interspersed. I recognized two short legs, with powerful double claws attached. These, from what I subsequently observed, I have reason to believe were those of Orthoptera.

Dental formula, M. $\frac{5-5}{6-6}$, C. $\frac{1-1}{1-1}$, I. $\frac{4}{4}$ = 34.

Incisors. Upper, middle large, edges rounded; lateral minute, only visible with glass. Lower, one notch each; all edges level.

Molars. Large, jagged. Canines long.

Nose-leaf an isosceles triangle, apex rounded off, pubescent; nostrils oblique. Nostril-lobes large: outside these, on each side, five warts, from each of which springs a long hair. Ears large, capacious, erect, with apertures directed forward, transversely wrinkled inside. Skin of scalp so loose that fur will pull back, and leave merely bare skin over skull behind raised skin which connects inner edges of ear-bases. Interfemoral forked by calcanea, being stretched backward, shorter than extended foot. Teats lateral, flattened or compressed; so that young holds in its mouth a broad projection, not a mere round dug. Lacteals large; exuded milk on pressure. No cranial ridge. Muscles of forearm small, compared to those of *Arctibeus carpolegus*. Thighs, hardly any muscle. Bones, soft volars thin; whole structure much more delicate and loose than in *A. carpolegus*. Fur fluffy, loose, long, easily disarranged. Volar membrane extending along whole anterior edge of forearm, and, leaving only half thumb free, connects it beyond with first digit. Eyes large, bright.

Young male:—

[* Cf. *Tomes, l. c.* p. 65.—P. L. S.]

Dental formula, M. $\frac{2-2}{2-2}$, C. $\frac{1-1}{1-1}$, I. $\frac{4}{6}=22$.

Incisors. Upper hooked backwards; lower not hooked; edges level. Canines strongly hooked backwards. Molars hooked, set at wide intervals, in place of true lesser molars. The fangs of these little teeth passed in straight lines down the external surface of gum, but were not imbedded in its centre as usual. They were quite traceable with a glass beneath the skin. Intestine $4\frac{3}{4}$ inches; reproductive organs very conspicuous. Skull bare of muscles. Feet large and much developed.

“Brampton Bryan, 17th Dec. 1858.

“My friend Mr. Farquharson, the overseer of this property, took me to a cave not far from the house. The mouth is in an angle of perpendicular rock, which, through a narrow aperture, leads to a circular space with a vaulted roof, as smooth as if chiselled, evidently once at a level with the sea, and worn by the vortex each billow sent into it. A strong smell announced the presence of Bats, which the boy, who went in first with a torch, soon gave notice of. In a short time we caught ten, and all, I saw, of the same species. It proved to be a particularly interesting one, which seems to be *Macrotus waterhousii*, from Mr. Gosse's description, the first of the kind I have met with on this side. They proved, with one exception, all females; and of these nine, seven had young of differing ages, but about half-grown, clinging to them. They were easily caught, dropping into the net or flying heavily, manifesting by no means the activity or terror of other species. On taking them out of the bag, one of the females was dead. The tenacity with which the young clutched the dead mother with feet and arms, and the eagerness with which it burrowed its snout in fur to search for the accustomed nutriment, were as affecting as the picture of the “Dying Doe.” Another female, living, had still the young clinging to her; and the usual position seemed, that the dug was held by the hooked teeth, and the fur or even thigh of opposite side grasped by feet, so that the position of the young Bat was diagonally across the mother's belly; but I observed them clinging in many other directions to the belly, but never to the back, except one I placed with a female under a glass: it then clung to her in every manner, burrowing its snout into the fur of the back for the nipple, groping and clinging with ludicrous energy. I carelessly omitted, before placing this female with the young, to ascertain from her nipple whether she was giving suck; it was only after killing her I found she was not. This may account for the savage manner in which she treated the foundling, biting it and holding the head between her teeth. But still the instincts of the little animal were too strong for any pain to alter, and it clung till death relaxed its hold. On examining the stomach of this female I found it full of coagulated blood, part of which was entering intestine; I could account for its presence in no other way than by supposing that she not only left the marks of her teeth on the head of the young, but actually sucked the blood like a vam-

pire. I could induce neither old nor young to take anything, though I tempted the first with water and the latter with milk. The one under glass made efforts to escape by jumping; but the existence of the volar membrane along the front of wing makes the forearm very unserviceable as a leg. There was a slight motion of the ear forwards on any sharp sound, but none of the rapid vibratory movement seen in *A. carpolegus*. Those in the box with gauze over it jumped a little, and then clung in a dark corner in a heap. The young were deserted, and remained quietly hanging from gauze. They bit fiercely, but could not draw blood, though I held them in my hand at once. Their forearms seemed little adapted for walking: three or four hours on a flat surface had made the wrists inflamed and sore. They uttered no noise, merely opening the mouth menacingly. The young, on being set at liberty, clambered about till they got hold of some object, and then hung quietly head downwards. From this and their desertion by the old ones in the box, I conclude they are sometimes left hanging under circumstances of danger. They opened the mouth threateningly when approached, and every now and then uttered a very acute sibilant chirp, not loud, though audible at a great distance, especially to animals whose external organs of hearing are so developed. This I take to be the call for the mother, as they never uttered it when she was within reach. On being hung against the wall, they made no attempt to move from the spot. On being taken into the hand, they clung to it. I found one climbing to the palm of my hand, even when turned downwards; so that the little Bat hung to it as to the body of the mother: I could not shake it off. It was perfectly secure even when I swung my extended arm round as quickly as possible, and, what was more curious, without the sharp claws penetrating the skin. I covered one of the young, which had strayed from the rest, in my hands. It felt cold, and seemed to like the warmth; for it searched with its nose for the nipple, making a purring noise, very like what *Chilonycteris* (No. 5) does on receiving water.

"They seemed roused to unusual activity about dusk, and became quiet at about 10 p. m.

"18th Dec.—In the morning one of the young ones dead. It had been killed by hæmorrhage in consequence of penis being bitten off. Though dead, it was still hanging to the muslin over the box by the hind legs. The young and females were all separate, young hanging from muslin, and females crouching sulkily in a corner. One of the young sucked in greedily little drops of milk I put to its muzzle, eagerly searching on my fingers for a nipple. He took several drops in this way till some got into his nostrils and incommoded him. Putting two young on the table together, they took each other for the mother, poking each other with their noses, and rolling about clinging together in a most grotesque way. Two of the females drank drops of water presented to them on a feather, eagerly protruding the pointed tongue a quarter of an inch beyond the muzzle, with an action like chewing. They were, with one night's confinement, too weak to fly.

"To give the two females and two young I did not require a chance of escape, I left them on an object against the wall. They all shuffled off, and hung head downward on the bare plaster. So perfectly at ease were they, that I noticed one of the young ones comb the fur of the belly, with the adroit action common with Bats, with one hind paw, while it remained suspended by the other. Both young constantly uttered the acute click on any movement near them, as if calling the mother.

"19th December.—Only one young one remained suspended to plaster this morning. I hope the rest got off, and were not carried away by rats. It was very weak. I got a bit of washleather, and, screwing it up, made a kind of nipple, soaking it with warm milk. It instantly seized it and sucked it dry. I could not withdraw the leather on account of the hooked teeth. In trying to give it more, a little got into the nostrils and stopped all further experiments. So admirably are the hind paws adapted for suspending the animal from the slightest inequalities of a surface, that I found I could easily suspend this little Bat, after death, by simply drawing the claws downwards for a little against the plaster, when they hooked themselves. This suspension, like the roosting of a bird, requires no muscular exertion at all. The odour of this species is stronger than that of any I have met with.

"27th December.—Returning to-day from Hampstead, I stopped to examine a very similar cave to the Brampton Bryan one on the roadside. A Bat flew from a dome within to the deeper recesses. As it was the only one, I could not feel certain of the species, but it looked like this one. On the floor of the cave was a heap of what I took at first to be dry leaves mixed with Bats' dung; on examining it, it proved to be a heap of the wings of large Orthoptera. Many were broken, but I found no limbs or bodies. Did these Bats bring them in?"

"Cave in Portland Ridge (Vere), 31st March, 1859.

"Males yellowish; females dark grey; some females show both tints in patches. Reproductive organs very conspicuous. This was the only species I found in these magnificent caves, and they were in no great numbers. They inhabit houses sometimes, but always the cellars, below ground, never the roofs—as, for instance, at Mount Pleasant, St. Elizabeth's, where they are numerous."

"Mount Pleasant (St. Ann's), Jamaica, 14th June, 1859.

"My host, in an open verandah, showed me a number of spirits on the wall, on examining which I could detect seeds of the fustic berry (*Morus tinctoria*) sticking to the wall in the dried pulp by which they were surrounded. These, he said, were, to his great annoyance, produced by the Long-eared Bat (*Macrotus*). They came in at night, hitched themselves up, when a chewing might be distinctly heard, and then these splashes on the wall. One let the wings and legs of a large grasshopper drop. Another annoyed him by making the lofty curtain-frame of a bed his perch: the jalousies

being left open, he would drop the fragments of his feasts on the bedclothes and sleeper below. A friend near was so annoyed in the same way that he procured bird-nets, used over fruit-trees, from England, as a protection. The berries Dr. Rose particularly mentioned were the fustic (*Morus tinctoria*), the breadnut (*Brosimum alicastrum*), and the rose-apple (*Eugenia jambos*).

"I did not myself see the Bats; but their long ears and their habit of entering houses make it extremely probable that this is the species."

"Mount Pleasant, St. Ann's, 4th October, 1859.

"I found this species abundant at the entrance of the large cave near Dry Harbour."

9. CHILONYCTERIS GRISEA, Gosse *.

"Freeman's Hall, 19th January, 1859.

"Two males. Reproductive organs conspicuous. These specimens were brought to me by a boy, who, seeing them fly about, had knocked them down. I instantly recognized their likeness to no. 5, so as evidently to be included in the same genus. The measurements seem to agree with Mr. Gosse's 'Owl-faced Bat,' as well as the description, in all points of form and colour; I have therefore provisionally so termed it."

"Oxford Cave, Manchester, 29th February, 1859.

"One male; three females. Expanse $11\frac{1}{2}$ inches; muzzle to base of tail 2; tail 1, tail free $\frac{1}{4}$; forearm $1\frac{7}{8}$; carpus, to tip, $2\frac{7}{8}$; 1st digit $1\frac{7}{8}$. Dental formula:—M. $\frac{5-5}{5-5}$, C. $\frac{1-1}{1-1}$, I. $\frac{4}{4}$ =32.

"Molars consist of three larger and two lesser each side, larger much jagged."

"Incisors. Upper, middle, one deep notch; lateral minute, leaning towards them. Lower, two-notched; all edges level. Tongue will project $\frac{1}{4}$ inch beyond muzzle."

"These two species of *Chilonycteris* (no. 5 & no. 9) differ considerably in size. Besides this, the raised warty points on each side the nostrils are much more prolonged in no. 9 than in no. 5."

10. NOCTILIO MASTIVUS †.

"Long Hill, St. Elizabeth's, March 1859.

"One skin. This skin was presented to me by Mr. Maxwell; shot here a short time before my arrival. It was so large that at first it was taken for a Pya Dove. One was shortly before captured at Falmouth, and excited a good deal of newspaper wonder, being considered by the quidnuncs a vampire. The teeth certainly are very formidable. I saw that specimen in spirits, and was unable to judge of the very considerable shrinking of the body of this specimen in drying."

[* *Chilonycteris quadridens*, Gundlach: Tomes, *l. c.* p. 65.—P. L. S.]

[† *Noctilio americanus*: Tomes, *l. c.* p. 68.—P. L. S.]

11. *MOLOSSUS FUMARIUS* *.

“ Shettlewood (St. James), 14th May, 1859.

“ Three skins; males. The roomy roof of this house inhabited by great numbers of this little Bat. My bed-room so offensive with their peculiar odour, I was obliged to have every window left open at night. This odour is probably stronger at this, the breeding-season, than at other times. They kept, so far as I could observe, the same hours as our other species. Their apertures of egress were under the eaves outside, the room being ceiled within; but little parties of a dozen or more would fly in, take an excursion round the room, and soon disappear in the fading light of evening and the grey of dawn. I sent up a man outside, who got me four or five quarts of these Bats. They were all males, the reproductive organs very conspicuous, and the gular gland humid and swollen, opening on pressure like two lips, and a very active circulation visible through the internal skin when this opened, giving the appearance of inflammation.

“ They made no noise, scrambled about very actively when taken out of the bamboo-joint which contained them, but made no attempt to fly.”

“ Windsor (Trelawny), 30th May, 1859.

“ I went this morning, accompanied by a negro with an axe, to cut down some of the tall headless trunks of lightning-smitten cocoa-nuts that still kept their place in the ranks of the beautiful avenues of these noble palms marshalled along the roadside and the course of the little river that meanders through the valley. I gave directions particularly to fix upon a stem in which a Woodpecker, of some generations perhaps, had drilled a hole. It was an immense trunk, sounder at the bottom than I anticipated, and took good thwacks and many to cut it half through, though the decayed top trembled at every stroke. It fell, breaking into dozens of crumbling pieces: ants and wood-boring larvæ in abundance; but no Bats. We then tried another near the road, among the fallen fragments of which I found three males, all of this species, stunned by the fall. The negroes then recollected another trunk near their village, where, they reported, dozens flew out every night. It was an immense stem. An ants' nest was attached to it halfway up. Many holes, of various sizes, pierced the hard exterior near the top. It was evidently of great age. It was broken into fragments by the fall, and among them a perfect hetacomb of these little Bats, scattered into two distinct heaps, corresponding to a higher and lower story in the tree. There must have been at least 150 or 200 altogether. The heap which occupied the upper hole were exclusively males; those in the lower, females in large proportion, though there seemed a male here and there among them. On the ground corresponding to the position immediately beneath each heap, scattered on the grass or partially contained in fragments of the trunk, was a quantity of powder looking like very coarse snuff: this, on examination under

[* Tomes, *l. c.* p. 68.—P. L. S.]

the lens, proved to be entirely composed of fragments of the harder portions of insects; a portion at the surface was agglomerated in the usual form, but by far the largest part completely disintegrated and dry. Those not dead crawled actively on the grass, climbed upon clothes; one little fellow I captured between my coat and waistcoat. Their object was evidently to escape the light. They bit fiercely at my fingers, and drew blood with the sharp little canines, and made a squeaking bird-like chirp when put into the bag. Several got up from the grass for a few inches, but soon fell again after hovering with great exertion; when thrown three or four feet from the ground, flew easily. I noticed that with this species, when thus flying by day, the arc of the stroke was about a sextant, as much above the body as below. Several of the females were pregnant with one foetus."

"Mount Pleasant, St. Anne's, 14th June, 1859.

"The roof here is largely inhabited by Bats; Dr. Rose thought, by two species—a long-eared (*Macrotus*?) and a small one. Towards dusk I went out, anxious to ascertain what they were; but the little creatures were extremely cunning. Their place of egress was beneath the shingles of a low house. Though we could hear them scratching about, they always darted out at an unguarded point, and it was some time before the chaise-whip brought one down. It proved to be this species. There were no Long-eared Bats that I saw. I suspect my friend was mistaken."

"Freeman's Hall, 4th July, 1859.

"I observe, in looking over my specimens, that, besides the lips being fringed with ordinary stiff cilia, there is in the considerable space between the nostrils and edge of the lip a tuft of very singular bristles; they are very short and thick-set, and beneath the glass are seen to be spoon-shaped. I have no idea of the use of these, unless it be to aid in retaining struggling insects. Some cotton, I put the Bats in, was attached very firmly by the hooks."

"Windsor (Trelawny), 30th May, 1859.

On a foetus of this Bat I note as follows:—

"Milk-teeth not through, but in lumps on gum.

"Molars $\frac{0-0}{1-1}$, C. $\frac{1-1}{1-1}$, I. $\frac{2}{4}$.

"Molars in the position of anterior pair of false molars. Lower limbs most developed; two exterior toes on each foot largest; outer toes of each foot set on lower than the rest, like a thumb. Naked."

Stomach of adult a lengthened membranous sac, thin, and, when empty, with difficulty distinguished from intestine, except by its rather wider diameter. No trace of internal plicæ. Male distinguished by a large gular gland, $\frac{3}{16}$ in. in width. Made a loud chirping noise in captivity. Would not drink: rejected the flies I offered, and bit fiercely. The large size of the outer toe seems a distinction from *Nyctinomus* (no. 1). When about to bite, the ears are brought down; but they are ordinarily kept erect.

12. *ARCTIBEUS*, sp.? *

Dental formula, M. $\frac{4-4}{4-4}$, C. $\frac{1-1}{1-1}$, I. $\frac{4}{4}$ = 28.

Molars. Upper, two larger much flattened on crown, with an exterior jagged edge—posterior with one point, the other with two; false molars longer, with one point. Lower, two larger, with points on internal as well as external side; two false longer, with a single point.

Canines rounded.

Incisors. Upper, middle wedge-shaped, one notch; lateral minute or wanting. Lower of equal length, one-notched.

Tongue extensible about $\frac{1}{4}$ inch; posterior half with large papillæ, anterior half roughened, with asperities scarcely visible under the lens, but very perceptible to the touch. Muzzle to base (along back) 3 inches, muzzle to fork $3\frac{1}{2}$; tail 0; expanse $16\frac{3}{4}$; radius $2\frac{2}{5}$; carpus to tip $4\frac{1}{2}$; first digit $2\frac{5}{8}$; fourth digit $3\frac{1}{4}$; leg 2; foot $\frac{5}{8}$; calcaneum $\frac{1}{4}$. Interfemoral forked, when stretched out $\frac{5}{8}$ inch below body. Irides hazel; eyes large. Colour of fur leaden grey, brindled by each hair being whitest towards the tip.

“ Montego Bay, 16th May, 1859.

“ Four skins, among which two males and one female. In a cave close by the town, and of no great depth, I procured several specimens of this *Artibeus*. It was in great numbers, and associated with *Artibeus carpolegus*, of which there were a few. The floor of the cave was strewn with kernels, large seeds, &c.; and among the most recent were seeds, with a portion of pulp sticking to them, of the scarlet berries called by negroes ‘cherries,’ and which I believe are the berries of *Cordia collococca*. The fact of the two species being found together, and, above all, the colour of the fur of a young sucking Bat attached to the mother (undoubtedly *Artibeus carpolegus*) being of a leaden colour, long kept me in doubt as to the distinctness of the two species. I have however determined to enter them as such provisionally. I found males and females of both with the reproductive organs conspicuous, and evidently adults.”

13. *MONOPHYLLUS*†.

Dental formula (from prepared skull), M. $\frac{5-5}{5-5}$, C. $\frac{1-1}{1-1}$, I. $\frac{4}{4}$ = 32.

Molars small. Upper, two false—first minute, scarcely above gum, second the largest of the molars, with a single very blunt point; three true, first largest; this and second with the outer edge slightly hollowed, leaving two blunt points or tubercles, a small crown internally; third minute. Lower, two false—first a round, smooth, blunt cone or tubercle, second largest, the same; three true, as in upper jaw, hollowed so as to leave two blunt obsolete points in each (or tuberculated). These molars are evidently more adapted for holding than masticating.

Canines. Upper very long, powerful, sharp, dilated laterally

[* *A. brachyotus* (Pr. Max.), Tomes, *l. c.* p. 64.—P. L. S.]

[† *Phyllonycteris poeyi*, Gundlach; Tomes, *l. c.* p. 65.—P. L. S.]

into two cutting-edges, anterior edge sinuated. Lower rather smaller.

Incisors. Upper, middle pair diverging slightly, entire, blunt, like human; lateral minute, conical (or as a tubercle). Lower, edges forming a concavity between canines; lateral minute, truncated; middle still smaller, visible only with glass in recent, but with the eye in prepared skull; conical truncated. (It is over these last the tongue is, of course, protruded.)

Dental formula, milk teeth:—M. $\frac{2-2}{2-2}$, C. $\frac{1-1}{1-1}$, I. $\frac{4}{0}$ = 16.

Molars. Upper hooked; lower scarcely so. Canines excessively sharp, hooked backwards; upper largest. Incisors, upper middle broad, with one fine notch; lateral hooked.

Length to base of tail $2\frac{5}{8}$ inches, length to fork $2\frac{7}{8}$; expanse $12\frac{1}{2}$; radius $1\frac{2}{5}$, in others 2; thumb $\frac{1}{2}$; last phalanges $\frac{3}{8}$; index $2\frac{1}{8}$; carpus, to tip, $3\frac{1}{8}$; 4th digit $2\frac{1}{2}$; muzzle to ear $\frac{5}{8}$; knee to calcaneum 1 (nearly); foot $\frac{5}{8}$; calcaneum (minute) $\frac{1}{16}$; ear, back $\frac{1}{2}$, front $\frac{5}{8}$. Tongue, protrusible beyond muzzle, $\frac{5}{8}$ (it must have been more, I think), narrows towards tip more suddenly than with *Monophyllus redmanii*; covered with reversed prickles, which are especially long and bristle-like, on the edges of tip: large and full, tip narrowed, thinner, hollowed; when shortened and contained within mouth, thrown into two rows of oblique striæ or folds.

In the young the tongue had the same striæ, but only the tip was slightly extensible.

Description. Nose-leaf pentagonal; central lobe reduced to a small blunt point on the upper angle; seen under the lens to be covered with fine white hairs. Nostrils round; external lobe two series of conspicuous confluent warts, centres depressed and punctured for hairs, one series on each side, leaving a space behind, central lobe free. Lower lip split, and on each side a notched triangular wart; upper lip fringed with hairs; but scarcely any beard. Ears ample, points rounded; tragus lanceolate acute. Tail short. Thumbs, legs, and toes very long, the latter regularly decreasing from hallux, which is longest. Forehead low. Muzzle very long; colour a soft chestnut-yellow, paler beneath, each hair at its base white; volars, ears, and nose-leaf pale black. No cranial ridge. Caudal vertebræ 5 (?); intestine 14 inches long; stomach membranous, not reticulated, filled with a yellowish frothy pulp.

“ Harmony Hall (Trelawny), 4th June, 1859.

“ It is in the eastern cave on this estate this pretty little Bat abounds. The entrance is in a wall of rock shrouded by a thicket. The interior of the cave not very extensive, and not thoroughly dark. I had, at first, no light; but the noise of innumerable wings, and the heaps of fruit and droppings with which the floor was covered, showed it was densely inhabited. I fired my gun towards where the sound was loudest; had just light enough to pick up what fell, and on taking it to the entrance, saw this interesting species for the first time. When the light arrived, I was surprised at their immense num-

bers, flying about and swarming on the walls and roof like bees. They differ from some other Bats in settling on the walls low down, notwithstanding the alarm of the lights; and in this they are like *M. redmanii*, which I saw do the same thing at the Oxford Cave. Not one seemed to make an attempt to escape, which was the more remarkable as there was no hole for retreat in the cave, and it was nearly dark when I left it. I infer, therefore, that this species is very strictly nocturnal. I had a considerable number knocked down in various parts; but it appeared the only species inhabiting this cave. The sexes were pretty equal, and the number of young very great. No female, that I saw, had more than one young one. I picked from the floor bread-nut kernels and numbers of munched berries of clammy cherry (*Cordia collococca*). I found the captives brought home were seventeen, besides a few young.

“Those in the best condition I placed in a gauze-covered box. They bit fiercely, and not ineffectually, at my fingers, were extremely active, and ran about the box with great agility. One or two managed to get out, when I found they could run on the floor and rise to the wing with the greatest ease. After one or two turns round the room, they hitched themselves, raised the head a little, and moved the nose-leaf and ears alternately, in the eager inquiring way of *M. redmanii* and *Artibeus carpolegus*. All night I was disturbed with their violent efforts to escape. I congratulated myself I had taken the precaution to line the bottom with a good bed of silk cotton, for otherwise the inflammation produced on the wrists by their efforts renders them unfit for preservation. The loud bird-like chirps and squeaks were incessant. Next morning I found them much exhausted and quiet; they no longer bit at my fingers. A female with a young one had it still hanging to her breast; but another young, I had put in hap-hazard from a heap, was hitched up to the muslin by itself. I sent for a berry-laden branch of *Cordia collococca*, which I had seen strewn on the floor of the cave, but first took the precaution of letting them drink, lest an abnormal thirst, produced by their exertions or injuries, should make them take the juice. They drank eagerly, protruding the tongue—the lip, hollowed spoon-shape, and the bristles evidently taking up a great quantity. They would anxiously lick it off my fingers. When they began to refuse more, and shake their heads at it, I tried the berries; but, to my disappointment, they took little notice of them. A couple of hours afterwards I tried again, when it occurred to me to break the skin, so as to let some of the juice escape. The one I presented it to, after a little persuasion, began to lick the juice; he at last seemed to understand his new position, and licked away in good earnest. The tongue was rapidly protruded and drawn in again, and the juice and softer pulp cleared away with great rapidity. I noticed he was very particular in cleaning out the bit of loose skin of berry, and licked my fingers of the juice spilt on them, carefully cleaning out any that had collected under the nail. The sensation was not at all unpleasant, the tongue feeling soft and spongy, with a slight scratching from the bristles. I then got

another berry. The Bat was hanging from the edge of the box, its ventral surface against the side; and as I held the berry a little off, so as to see the action of the tongue, it had, whilst feeding, to bend the neck, so as to raise the head a little: this seemed to fatigue it. It therefore raised itself on one wrist, and turned round so that its back was against the box's side; but as it did not change the position of the feet, of course the legs crossed, the right foot now being on the left side, and *vice versâ*. In this odd position it seemed perfectly at ease, and went on licking at a fresh berry with great relish. Of course, only its chin was now visible to me. I then began gradually to lower the berry; it stretched first the neck and then the tongue to its full extent. I took it beyond reach, and then suddenly brought it close again. It seized it with its teeth savagely, and then shifted it to one side of the mouth, so that the long sharp canines of one side and the blunt molars held the berry, much as a dog will do when he wishes to bring the force of the molars to bear on a bone. This left room for the tongue still to be protruded; for, from the arrangement of the minute lower incisors in a concave, the molars can be nearly closed, so as to hold an object, and the tongue still have room for protrusion. The little body trembled with the eagerness of his actions. As the pulp and juice he could thus reach became exhausted, I expected he would drop it, and was prepared with another berry; but, to my surprise, he brought up the wrists to the muzzle, took the berry between them, gave it two or three energetic bites, and then held the berry off. So I now understood what the unusually long thumbs were for; for they applied themselves dexterously to the berry, held it firmly, and then, as it appeared to me, by a reverse action of the two wrists the berry was turned round, a fresh hold taken by the teeth, and the same licking process renewed, till the seed in the centre was cleaned of the pulp, all but the little bit which served for the last tooth-hold. It was then dropped, and the eager little muzzle raised for more.

"I supplied another, and soon I had a little heap of seeds, with bits of pulp attached, at the bottom of the box, exactly like those I found in the cave. A wounded Bat on the floor found some berries out and began to lick them. I next tried the female with a young one, with precisely the same result; only, notwithstanding her eagerness for food and evidently hungry state, it was affecting to see how constantly she stopped carefully to lick the little one at her breast, lest any spilt juice should soil it. When holding the berries in the wrists, their appearance reminded me much of monkeys. They now became very lively, evidently much refreshed by the meal, and began to snap at my fingers. I covered them up in darkness, which they seemed to want. On my return I found the young Bat which I had put in as an orphan had been taken by the other female, and was evidently sucking vigorously. It can hardly have happened that out of such a number I could have chosen mother and offspring by chance. Perhaps the old Bat, feeling the pressure of milk, in this way sought relief. The young were quite naked and blind, and

about two inches long, but clung with great tenacity. From a portion of umbilical cord still attached to one mother, I conclude one had only been born quite recently. I then took them and put them among the twigs of *Cordia*. They climbed about it, heads downwards, with the greatest ease. The length of the legs and toes, their muscularity, and the absence of any interfemoral or tail were all obvious advantages where this habit was constant, especially the power it gave them of turning as on a pivot, but without moving the feet. They twisted, within certain limits, like a body suspended by a string. They would thus follow a berry I moved; but they would not pluck any of the berries for themselves, seeming only anxious to get into a dark place. This I attribute to the unnatural hour of feeding. On placing them in the box, I found, after a short time, both mothers had crossed the legs in the attitude before mentioned, to avoid pressing the young against the side. I put them out of doors on a tree at some distance from the house. One attempted to return, doubtless to escape the light. It lit on a plastered wall, and, notwithstanding the incumbrance of the suckling, ran up the wall backwards by the legs with great rapidity (raising the body with the wrists so as not to rub the young) till it gained the shelter of the eaves, whence I hope it made a complete escape; for I left Harmony Hall that afternoon.

“From these observations I would infer that we have an explanation of the much greater muscularity of the frugivorous Bats, and their far less buoyancy, than the insectivorous; and further, of the use of the wrists in this Bat.

“The details on *Macrotus waterhousii* (No. 8), collected at Mount Pleasant, St. Ann's, in which we have a Bat entering houses for the purpose of hitching itself up in verandah or room to eat the berries from a tree in the garden, its insect prey, and finally the collections of fruit—from this and what I have noticed in the caves, I come to the following conclusion:—that the supposition that these Bats eat fruit on the wing is groundless, for it would manifestly be a difficult feat to use the teeth and to chew whilst flying; but that they hitch themselves up somewhere near the scene of action, where they can use their wrists and feed on their prize at ease. Their long legs seem well adapted for hitching themselves up among their food. The much greater muscularity of the limbs, their greater activity in running and using them, their long thumbs, are all adapted to climbing and holding fruit—a curious approach to the habits of the *Quadrumana*.

“When the first cold streaks of dawn warn the curious little animals away to their gloomy retreats, each Bat carries off a berry, and in the security of the cave finishes his meal at leisure. The outer toe has a great tendency to diverge at a considerable angle from the next during suspension.”



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