XV. *Chermes Lacca.* *By* William Roxburgh, *M. D. of* Samulcotta. *Communicated by* Patrick Ruſſell, *M. D. F. R. S.*

Read May 19, 1791.

SOME pieces of very freſh-looking lac, adhering to ſmall branches of Mimoſa cinerea *, were brought me from the mountains, on the 20th of November, 1789. I kept them carefully in wide-mouthed cryſtal bottles, ſlightly covered; and this day, the 4th of December, fourteen days from the time they came from the hills, thouſands of exceeding minute red animals were obſerved crawling about the lac and the branches it adhered to, and ſtill more were iſſuing from ſmall holes on the ſurface of the cells. By the aſſiſtance of glaſſes, ſmall imperforated excreſcences were alſo obſerved, interſperſed among theſe holes, two, regularly, to each hole, crowned with ſome very fine white hairs, which being rubbed off, two white ſpots appeared. The animals, when ſingle, ran about pretty briſkly; but, in general, on opening the cells, they were ſo numerous as to be crowded over one another. The ſubſtance of which the cells were formed cannot be better deſcribed, with reſpect to appearance, than by ſaying it is like the tranſparent amber that beads are made of. The external covering of the cells may be about half a line thick, is remarkably ſtrong, and able to reſiſt injuries: the partitions are much thinner. The cells are in general irregular ſquares, pentagons, and hexagons, about an

* Lac, on this coaſt, is always found upon the three following ſpecies of Mimoſa; 1ſt, a new ſpecies, called by the Gentoos Conda corinda; 2d, Mimoſa glauca of Kœnig; and, 3dly, Mimoſa cinerea of Linnæus.

eighth

eighth of an inch in diameter, and a quarter of an inch deep: they have no communication with each other. All thoſe I opened, during the time the animals were iſſuing from them, contained in one ſide, and which occupied half the cell, a ſmall bag, filled with a thick red jelly-like liquor, replete with what I take to be eggs. Theſe bags, or utriculi, adhere to the bottom of the cells, and have each two necks, which paſs through perforations in the external coat of the cells, forming the before-mentioned excreſcences, ending in ſome very fine hairs.

The other half of the cells have a diſtant opening, and contain a white ſubſtance, like ſome few filaments of cotton rolled together, and a number of the little red inſects themſelves crawling about, ready to make their exit. Their portion of each cell is about a half; and, I think, muſt have contained near one hundred of theſe animals. Other cells, leſs forward, contained in this half with one opening, a thick, red, dark blood-coloured liquor, with numbers of exceedingly minute eggs, many times ſmaller than thoſe found in the ſmall bags which occupied the other half of the cells. Several of theſe inſects I obſerved to have drawn up their legs, and to lie flat; they did not move on being touched; nor did they ſhew any ſigns of life upon the greateſt irritation *.

Dec. 5. The ſame minute hexapodes continue iſſuing from their cells in numbers.

Dec. 6. The male inſect, I have found to-day, at leaſt what I think is ſuch. A few of them are conſtantly running about, and over the little red inſects, (which I ſhall now call the female) moſt actively: as yet they are ſcarce, not more, I imagine, than 1 to 5000 females, but they are four or five times their ſize.

* It will appear in the ſequel, that theſe were on the point of transformation into the pupa ſtate.

To-day the female inſects continue iſſuing in great numbers, and move about as before.

Dec. 7. The ſmall red or female inſects, are ſtill more numerous, and move about as before. The winged or male inſects, are ſtill very few, but continue active. There have been freſh leaves and bits of the branches of Mimoſa cinerea, and Mimoſa intſia, put in to them. They go over them indifferently, without ſhewing any preference or inclination to work, or to copulate. I opened a cell, from whence I thought the winged flies had come, and found ſeveral (eight or ten) ſtruggling to ſhake off their incumbrances. They were in one of thoſe utriculi mentioned before, which end in two mouths, ſhut up with fine white hairs; but one of them was open for the exit of the flies; the other would, no doubt, have opened in due time. This utriculus I found now perfectly dry; and could plainly ſee it was divided into minute cells, by exceedingly thin membraneous partitions. I imagine, before any of the flies made their eſcape, it might have contained about ſixteen or twenty. In the minute cells, with the living flies, or from whence they had made their eſcape, were ſmall dark-coloured compreſſed grains.

March 26, 1790, I found ſome branches of the ſame ſort of Mimoſa, with numbers of the minute red hexapodes, mentioned in December (ſeemingly in their pupa ſtate), adhering to them. They are of various ſizes, from half a line to a line and a half in length. I found many of the large ones empty. They have a round opening at the lower end, with a ſmall round operculum, or lid, which now looſely covers the empty huſk or ſhell: the inſide of theſe is lined with a ſmall white membrane; others were ſtill ſhut, ſome were opening, and ſome half open, with the inſects projecting more or leſs, and ſoon extricating themſelves entirely.

I opened

I opened ſome of the middle-ſized, and found they contained a thick, deep blood-coloured liquid; others, ſtill larger, put on the appearance of the fly, which was ſoon to iſſue, retrograde.

Deſcription of the male lac inſect in its perfect ſtate.

It is then about the ſize of a very ſmall fly, and exceedingly active; the larva and pupa ſtate, I am as yet unacquainted with.

Head obtuſe; between the eyes a beautiful, ſhining green.

Eyes, black, very large in proportion to the animal.

Antennæ, clavated, feathered, about two-thirds the length of the body; below the middle, an articulation, ſuch as thoſe in the legs.

Mouth: I could not diſtinctly ſee it.

Trunk, oval, brown.

Abdomen, oblong, length of the trunk and head.

Extremities. Vide p. 232.

Legs, ſix; with them it runs briſkly, and jumps actively.

Wings, four, membranaceous, longer than the abdomen, incumbent; the anterior pair twice the ſize of the poſterior.

Tail, none.

Deſcription of the female lac inſect.

Larva, red, very minute, requiring a good lens to diſtinguiſh its parts.

Head, ſcarcely to be diſtinguiſhed from the trunk.

Antennæ, filiform, bifid, hairy, length of the inſect.

Eyes: in the back part of the trunk are two minute elevations, which may be they.

Mouth,

Mouth, on the middle of the breaſt, between the firſt pair of legs, which the little animal projects on being injured, otherwiſe it cannot be ſeen.

Trunk and *Abdomen*, oblong, compreſſed, tapering equally towards each end, croſſed with twelve annular ſegments, margins very flat, and ſeem to be marked with a double line.

Extremities.

Legs, ſix, running, does not jump.

Wings, none.

Tail, two ſlender white hairs, as long as the antennæ, with a white point, which may be called the rump, between them.

Pupa: the duration and peregrinations of the larvæ ſeem very ſhort and confined; for, in a few days after iſſuing from their cells they fix themſelves on the ſmall, but hard, woody branches of the tree they were produced on; it ſeeming impoſſible that they can in this ſtate tranſport themſelves to any other. About the end of December, or beginning of January, they have done iſſuing from their cells, and are ſticking faſt to the branches, regularly with their heads towards the extremity of the branch. The legs, antennæ, and tail, are now entirely gone. Their progreſs through this ſtate is ſlow, requiring about three months. Soon after they have ſettled themſelves, they become covered with a hard, brittle, garnet-coloured cruſt, ſimilar to the lac of which the cells are made, but of a brighter colour. They retain only a rude reſemblance of their former ſhape. About the end of March they have acquired three or four times their original ſize; a ſmall, round lid or cover is now obſerved at the lower part, which opens, but does not always fall off, and gives a retrograde paſſage for the fly, now in its perfect ſtate.

The

The inſect in its perfect ſtate is rather ſmaller than the male, of a brighter red colour, and leſs active.

Head, ſmall in proportion to the body, pointed.

Eyes, very minute.

Antennæ, filiform, not articulated as in the male, ſpreading, ſomewhat ſhorter than the inſect.

Mouth: I could not diſcover it diſtinctly.

Trunk, red, almoſt orbicular.

Abdomen, red, oblong, compoſed of twelve annular ſegments.

Extremities.

Legs, ſix, for running or jumping.

Wings, two, incumbent, longer than the abdomen, tranſparent.

Tail, two white hairs as long as the inſect.

With regard to the œconomy of theſe little animals, I muſt, for the preſent, be ſilent; having little more than conjecture to offer on that head.

The eggs, and dark-coloured glutinous liquor they are found in, communicate to water a moſt beautiful red colour, while freſh. After they have been dried, the colour they give to water is leſs bright; it would therefore be well worth while for thoſe, who are ſituated near places where the lac is plentifully found, to try to extract and preſerve the colouring principles by ſuch means as would prevent them from being injured by keeping. I doubt not but in time a method may be diſcovered to render this colouring matter as valuable as cochineal.

Mr. Hellot's proceſs for extracting the colouring matter from dry lac deſerves to be tried with the freſh lac in the month of October, or beginning of November, before the inſects have acquired life; for I found the deepeſt and beſt colour was procured from the eggs while mixed with their nidus.

His proceſs is as follows. Let ſome powdered gum lac be digeſted two hours in a decoction of comfrey root, by which a fine crimſon colour is given to the water, and the gum is rendered pale or ſtraw coloured. To this tincture, poured off clear, let a ſolution of alum be added; and when the colouring matter has ſubſided, let it be ſeparated from the clear liquor and dried; it will weigh about one fifth of the quantity of lac employed. This dried fecula is to be diſſolved or diffuſed in warm water; and ſome ſolution of tin is to be added to it, by which it acquires a vivid ſcarlet colour. This liquor is to be added to a ſolution of tartar in boiling water; and thus the dye is prepared.

In India comfrey roots are not to be had; but any other mucilaginous root, gum, or bark, would probably anſwer equally well. On ſome parts on the Coromandel coaſt, if not over it all, a decoction of the ſeeds of a very common plant (Caſſia tora of LINNÆUS), which is exceedingly mucilaginous, is uſed by the dyers of cotton cloth blue, to help to prepare the blue vat. It ſuſpends the indigo till a fermentation takes place to diſſolve it, and alſo helps to bring about that fermentation earlier than it otherwiſe would. The gum lac (or rather reſin) itſelf is known to be perfectly ſoluble in ſpirits of wine. The empty huſks which covered the pupa are alſo ſoluble in ſpirits, but without a very large proportion of the ſpirits is uſed, it ſoon becomes thick, like a jelly. Four grains communicated that quality to three drams of rectified ſpirits of wine. This jelly is very difficult of ſolution in ſpirits; a month has not effected it in a heat of from 80 to 90 degrees of FAHRENHEIT'S ſcale. The ſubſtance of which theſe huſks are compoſed, is an exudation from the larvæ themſelves, which becomes hard by expoſure to the air. The cells ſeem

to be made of a very different ſubſtance; what that is, and the manner in which they are made, remains ſtill to be diſcovered.

Explanation of the figures. Tab. VI.

1. A piece of lac on a ſmall branch of Mimoſa cinerea, natural ſize.

2. The outſide of the top of a cell, with its three openings; the white one with the hairs is ſtill unopened.

3. One of the utriculi for the male flies, with its two necks, which correſpond with the two upper apertures in fig. 2.

4. One of the eggs found in the utriculus, fig. 3. which produces the male flies.

5. The male fly in its perfect ſtate.

6. Small compreſſed dry grains, found in the cellulæ with the male flies. The laſt five figures are all much magnified.

7. A ſmall bit of a branch of Mimoſa cinerea, with the female inſects in their pupa ſtate, natural ſize.

8. One of the eggs which produce the female larva. They are always in that portion of the cell from whence the larva iſſues.

9. The female larva.

10. ——— pupa.

11. ——— —— with the lid opening, and the inſect protruding.

12. The female fly in its complete ſtate.

The laſt five figures are much magnified.