VIII. *On the Power of Sarracenia adunca to entrap Insects. In a Letter to Sir James E. Smith, Pres. Linn. Soc., from James Macbride, M.D. of South Carolina.*

Read December 19, 1815.

SIR,

YOUR remarks on the œconomy of the *Sarraceniæ* in your *Introduction to Botany*, led me to think of making this communication; and I was emboldened to undertake it from having observed in your prefatory remarks on the study of this science, a spirit of peculiar liberality and disinterestedness. My object is to lay before you the result of my observations on the insect-destroying-process carried on by the tubular leaves of these plants.

It will hardly be necessary to inform you that the *Sarracenia flava* and *S. adunca* (*S. minor* of Walter, and *S. variolaris* of Michaux,) grow in the flat country of this state in great abundance. With the latter my experiments have been chiefly conducted. If, in the months of May, June, or July, when the leaves of these plants perform their extraordinary functions in the greatest perfection, some of them be removed to a house and fixed in an erect position, it will soon be perceived that flies are attracted by them. These insects immediately approach the fauces of the leaves, and leaning over their edges appear to sip with eagerness something from their internal surfaces. In this position they linger; but at length, allured as it would seem by the pleasure of taste, they enter the tubes. The fly which has thus changed its situation, will be seen to stand unsteadily, it totters for a few seconds, slips, and

and falls to the bottom of the tube, where it is either drowned, or attempts in vain to ascend against the points of the hairs. The fly seldom takes wing in its fall and escapes; but this sometimes happens, especially where the hood has been removed to assist observation. In a house much infested by flies, this entrapment goes on so rapidly that a tube is filled in a few hours, and it becomes necessary to add water, the natural quantity being insufficient to drown the imprisoned insects. The leaves of the *S. adunca* and *S. rubra* of Walter might well be employed as fly-catchers; indeed I am credibly informed they are in some neighbourhoods. The leaves of the *flava*, although they are very capacious, and often grow to the height of three feet or more, are never found to contain so many insects as the leaves of the species above mentioned. The spreading fauces and erect appendices of the leaves of this species render them (I suppose) less destructive.

The cause which attracts flies is evidently a sweet viscid substance*, resembling honey, secreted by, or exuding from, the internal surface of the tube. On splitting a leaf it may readily be discovered in front, just below the margin, and in greatest quantity at the termination of the *ala ventralis*. From the margin, where it commences, it does not extend lower than one-fourth of an inch. During the vernal and summer months it is very perceptible to the eye and touch; and although it may be sometimes not discoverable by either, yet the sensation of sweetness is readily perceived on applying the tongue to this portion of surface. In warm and dry weather it becomes inspissated, resembling a whitish membrane.

* This substance it seems was noticed by Bartram the younger (see the Preface to his Travels). I was entirely ignorant of his conjectures respecting it, until long after I had proved their correctness.

The falling of the insect as soon as it enters the tube is wholly attributable to the downward or inverted position of the hairs of the internal surface of the leaf. At the bottom of a tube, split open, the hairs are plainly discernible pointing downwards; and as the eye ranges upwards they become gradually shorter and attenuated, till at, or just below, the surface covered with the bait, they are no longer perceptible to the naked eye, nor to the most delicate touch. It is here that the fly cannot take a hold sufficiently strong to support itself, but falls. The inability of insects to crawl up against the points of the hairs I have often tested in the most satisfactory manner. Spiders descend into the tubes, to prey (I suppose) on the entrapped insects, and ascend with impunity; but this is performed, as I have witnessed, by the assistance of their threads. Also a small species of *Phalæna** appears to take shelter in these tubes during the day, and is enabled to ascend; but by what contrivance I am at a loss to conjecture, unless it be by some peculiarity of structure in its feet.

In the putrid masses of insects thus collected, are always to be seen one or more maggots in a very active state. To account for their presence, and to ascertain the insect to which they belonged, I was long unable. The mystery was however unveiled in the following manner: While watching attentively some tall tubes of the *S. flava* growing in their natural situations, in order to discover whether other insects as well as flies were attracted by the bait above described, a large fly caught my attention: it passed rapidly from one tube to another, delaying scarcely a moment at the faux of each, until it found, as it should seem, one

* This *Phalæna*, which is about half an inch in length, may be described by saying it is divided transversely into three equal parts; the first division including the head is black; the second dirty white, or yellow; the third is like the first: Larva a greenish geometra.

suitable

suitable to its purpose; then hanging its posterior extremity over the margin, it ejected on the internal surface of the tube a larva with a black head, which immediately proceeded downwards by a brisk vermicular motion. This viviparous musca was more than double the size of the common house-fly, had a reddish head, and the body hairy, and streaked grayish. I had often noticed it before among the *S. aduncæ*, but could never ascertain its object; the hoods probably obstructing my view.

That insects may be found in these tubes which were not allured by the bait, I have well ascertained. At the time that I discovered the origin of the larvæ, I observed a beetle (*Scarabæus carnifex*, a herd being near) in its flight strike against the erect appendage of the *S. flava* and fall into the tube. In the leaves of the *S. adunca*, growing on the margin of a large pool, I once observed the fragments of a large *Gryllus* and several *Gyrini*. These and similar appearances have led me to suspect that our large *Nepa**, an extremely voracious insect, may occasionally use these tubes as storehouses. The hooked feet of this last insect would doubtless enable it to ascend against the inverted pubescence.

What purposes beneficial to the growth of these plants may be effected by the putrid masses of insects, I have never ascertained; but I learn from a hint given in the article *Dionæa*, in Rees's *Cyclopædia*, that it has been discovered that the air evolved is wholesome to the plants. I once entertained a suspicion that this air might be of such a deleterious nature as to cause the precipitation of the insects exposed to it, but I have long since relinquished it as entirely groundless.

* Very nearly allied to *Nepa grandis* of South America. It is very strong, and often destroys the Spring Frog. It inserts the claws of the two fore-feet into one of the frog's hind legs, and with the claws of its hind feet it grapples rice-stubble, or some aquatic plant; the frog unable to disengage itself becomes exhausted by struggling.

The above observations were chiefly made in 1810 and 1811, and have been communicated to several persons, but never to my knowledge made public. From an examination which I made to-day on a leaf of the *S. flava* about half grown, I am led to suspect that the surface, where the fly stands so unsteadily, and from which it finally drops down to the bottom of the tube, is either covered with an impalpable and loose powder, or that the extremely attenuated pubescence is loose. This surface gives to the touch the sensation of the most perfect smoothness. The use of a good microscope will determine this point.

I am, &c.

St. Stephen's Parish, Charleston District,
South Carolina, April 11, 1815.

JAMES MACBRIDE.

IX. *Obser-*