

THE BUSINESS END... (Christian Autotte, Québec, Canada)

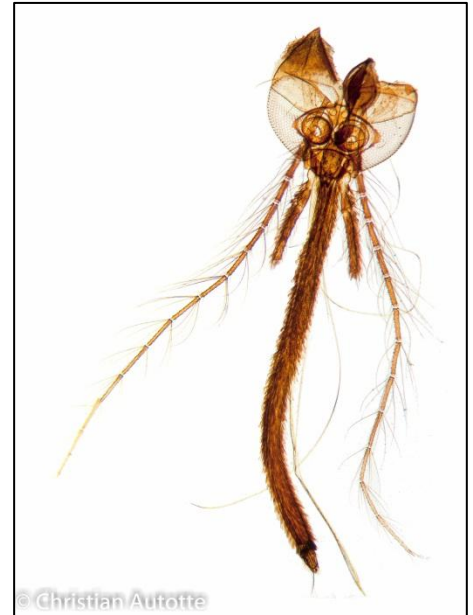
When it comes to bugs, their business end can be diametrically opposed depending on the particular beast. With those who sting to feed, the business end is, quite logically, their mouth parts. On the other end, the business end used for defense is often at the opposite end. And that's pretty much the end of it....

I am fascinated by the various business ends of insects and have collected several specimens, either by buying commercially made slides or by making my own. Let's start with a common example known from everyone around the world: the mosquito.

Like that of any biting insect, the mouth parts of a mosquito are a lot more complex than they may appear at first sight. Far from being a simple hollow tube that could suck blood, the mouth parts are made up of no less than seven individual elements. Starting from the outside, we first find a pair of **maxillae**; their end is shaped like a steak knife, serrated and used to cut through the skin. They are so sharp and small that their action cannot be felt by the victim of a bite.

Next in line is a pair of **mandibles**. While the maxillae cut through the skin, the mandibles will push the skin apart to make way for the **labrum** and **hypopharynx**. These two are the actual hypodermic needle that sucks blood. The tip of the labrum actually looks remarkably like a hypodermic needle; it is also equipped with sensors that detect blood and can home in on small capillaries. It is shaped like a gutter; to make a hollow tube it works in conjunction with the hypopharynx, which fits on top of the gutter like a long lid.

All these fragile parts need protection. They are sheathed by the **labium**, the part we can see when looking at a mosquito. If you observe a mosquito while it's biting, you may see the labium folding back to allow the business end of the mosquito to do its job. At the very tip of the labium is the **labella**, which contain sensors that will help the mosquito find a good place to bite.



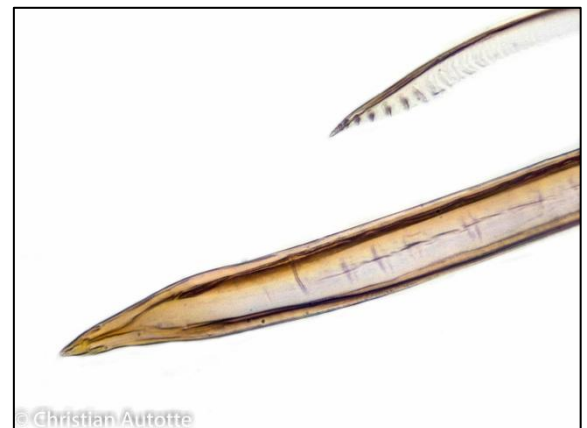
Female mosquito head, with mouth parts hidden in their sheath, the labium, except for the labrum on the right.



The labella. Below it we glimpse the edge of a mandible with its serrated edge. At the very tip, the labrum is sticking out. 100x.



From the top: the labium, tipped with the labella. Below it is one of the mandibles; note the serrated tip. At the bottom, the hypodermic needle of the labrum. 100x.



At the top is a mandible. At the bottom, the labrum; I think that the hypopharynx is in place on top of the labrum, but it far from a certainty. 200x

Living in Canada, I am all too often the food source of a lot more than mosquitoes. One of the more aggressive is the deerfly. You can often hear them buzzing around your head, going round and round, and then you don't hear them anymore.... That's usually when you can feel their painful bite on your back or shoulder.

While mosquitoes are very delicate in their feeding the same cannot be said of deerflies. The insects are bigger, their mouthparts are bigger, and they go aggressively after your blood. They make a cross section cut through the skin with their mandibles and maxillae, then inject anticoagulant saliva in the wound and simply suck the blood seeping out. After several tries, I managed to produce a good permanent slide (below) with the mouthparts spread open. When you look at the mandibles up close, you cannot help being impressed by the serious weaponry involved in inflicting a simple bite...



© Christian Autotte

The Deerfly...



© Christian Autotte

...and its mouthparts... (30x)



© Christian Autotte



© Christian Autotte

Mandibles full of teeth, 200x and 400x.

Not all biting flies are so big and aggressive. In Canada we have a near microscopic fly commonly known as No-See-Ums, as you can hardly see them. In French, we also call them “brûlots”, a reference to the burning sensation their bite can deliver; it feels like someone is touching you with a red-hot needle point.



© Christian Autotte

No-See-Um at 40x. The red tint in the abdomen could very well be traces of blood... maybe my own....



© Christian Autotte

No-See-Um mouthparts, 400x



© Christian Autotte

Mounted No-See-Um on a fingertip.

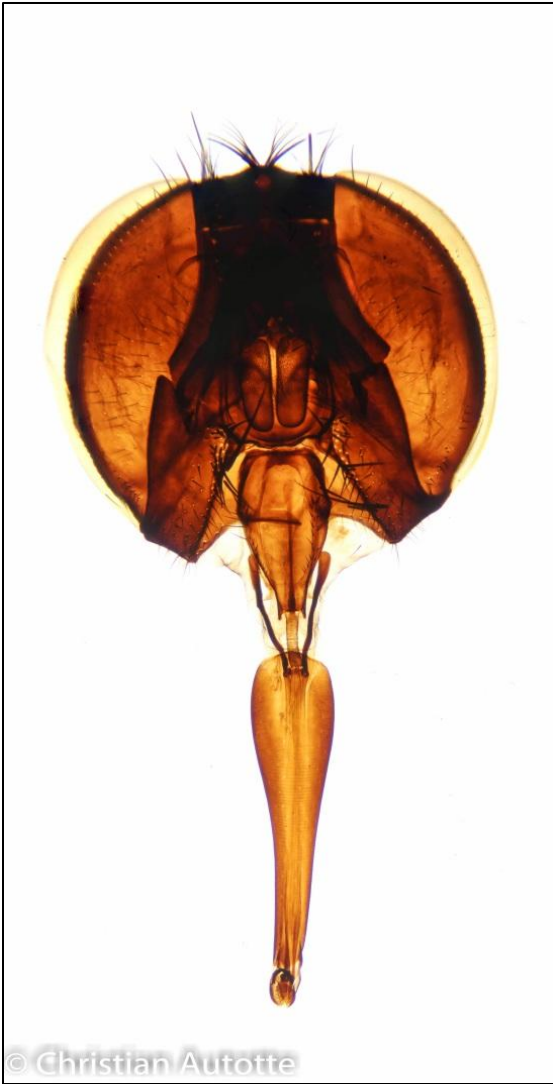
On a last summer outing I was the frequent victim of these tormenting little monsters, so I decided that a fitting revenge would be to make a few permanent mounts. I did nothing fancy: after “gently” killing the bug with a fingertip, I placed the fly on a clean slide. Once a few of them had been collected, a drop of mounting fluid (Elmer’s Glue and glycerin) and a cover slide sealed the deed. The resulting slide is quite acceptable.

In spite of their diminutive size, the flies pack an impressive biting apparatus. It is far too small for me to separate it in its individual components; nevertheless we can see the saw edge, which I assume to be mandibles, on each side of the proboscis.



© Christian Autotte

No-See-Um head, 200x



© Christian Autotte
Stable Fly head. Assembled from four pictures shot at 20x

Another specimen in my slide collection is a stable fly head, so called because they are commonly seen in stables as they feed on the blood of horses and cattle. While my current pictures cannot show much detail in the structures of the mouthparts, we can still distinguish some serious teeth typical of these biting insects. I guess I'll have to work some more with this specimen to try and coax more details out of it. Otherwise, I will visit a stable somewhere and find my own fly to work with....



© Christian Autotte
Stable Fly mouthparts, 200x

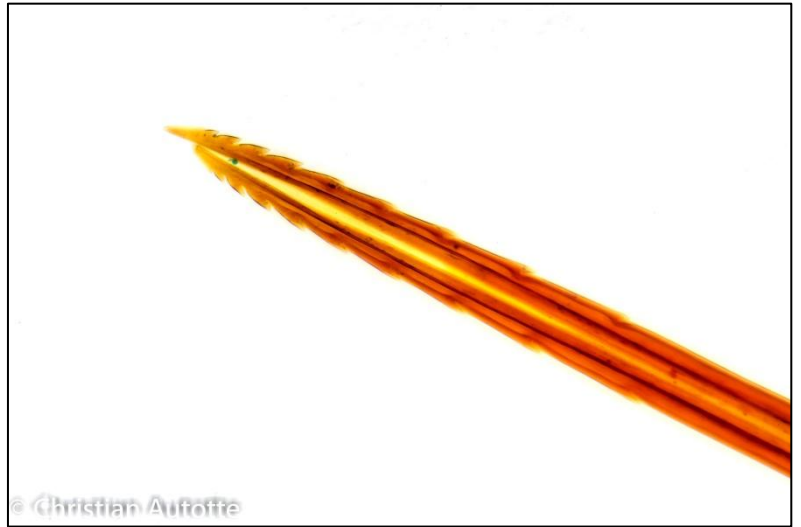
Not surprisingly, blood feeders are not the only insects in need of piercing mouthparts. In a slide I made with the empty skin molt of an aphid, we can see the sharp serrated tip of a mouthpart the insect used to pierce plant tissues and feed on their sap. The problem is similar, how to get through a tough outer layer to get to the juicy part, so the solution evolved with remarkable similarities.



© Christian Autotte
Aphid mouth parts from empty skin. Stack of 9 pictures, 100x

At the other end of many insects is the part they may use for defense: the stinger. Only members of the hymenoptera have them: wasps, bees, and ants. All other insects that sting to defend themselves, like water boatmen and skaters, use mouthparts normally used for feeding.

It is well known that bees, especially domestic bees, sting only once: their sting remains embedded in the skin and is often pulled out along with the venom sac, which keeps on pumping venom while the bee is dying. Those bees usually live in colonies counting thousands of individuals, so the loss of a few bees is inconsequential. By leaving their sting implanted in the aggressor of the colony, the bee is insured of inflicting the maximum amount of damage; even if it is killed or dies on its own, the venom reach its mark.



Bee stinger, showing backward pointing barbs, 100x



Wasp stinger, 40x

Since wasp colonies are smaller and contain generally no more than a few hundred individuals, each wasp is more precious to the group. So wasps evolved a smooth stinger which cannot remain implanted in the skin of its victim. The wasp can sting repeatedly, and while doing so it attracts other wasps with alert pheromones so that the attack can literally be deadly. A few years ago, the mayor of a small locality in Quebec was killed when she accidentally bumped in a large wasp nest; the combined sting of dozens of wasps caused an anaphylactic shock. Even people who are not known to be allergic to bees and wasps venom can die if stung too many times. Knowing this, I took a lot of precautions when I set out taking pictures of a large bald-faced hornet nest at my cottage. DO NOT TRY THIS AT HOME!!!

But what about wasps? Contrary to bee colonies which can last for years, wasp nests are short lived and last only one season. At the end of summer, a wasp colony produces several reproductive male and female. Those will mate and the new queen will then spend the winter hidden away under bark or in some other secluded retreat. The remaining wasps in the colony enjoy a brief “retirement”, feeding on flowers and rotting fruits, until the first killing frosts seal their fate.



Bald-faced hornet nest. One wasp is adding a layer of paper around the nest entrance.

Next summer, I hope to examine more insect mouthparts in details. Stinging mouth parts for sure (aphids and some species of true bugs, Hemiptera), but also biting mouth parts, like those of crickets and grasshoppers. Of interest could also be the ovipositors of some insects that lay their eggs in wood or plant tissues. I suspect that they should also be full of teeth in order to drill through hard wood...

An excellent and complete description of the mosquito mouth parts can be found on the following site:

<http://www.mosquitomagnet.com/articles/how-mosquitoes-bite>

I also urge everyone interested on the subject to read the excellent article (with fantastic pictures) by fellow Canadian Anthony Thomas describing the mouthparts of horse flies in the following Micscape article:

<http://www.microscopy-uk.org.uk/mag/artapr12/at-HorseFlyhead.pdf>

Comments to the author Christian Autotte welcomed, email:

cautotte.9001 AT videotron DOT ca

Published in the February 2020 issue of Micscape magazine.

www.micscape.org