

Wingless and Wondrous: The Voluptuous Velvet Ants

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INTRODUCTION

Velvet ants (hymenopterans in the family Mutillidae) are in fact solitary wasps in which the wingless females are sometimes seen walking quickly about on the ground. Often large, notably hairy, and colorful, these insects are attractive exhibit animals for bug zoos of all sorts. Although very few details are known about the life histories of most species, and captive propagation is virtually unheard of, adults can live for a year or more.

There are roughly 8,000 species of velvet ants worldwide, of which approximately 435 species occur in North America. Diversity on our continent is highest in arid parts of the south and southwest. They range in size from an impressive inch and a half down to a miniscule quarter of an inch in length. Although the females may be conspicuous when spotted scurrying along, these insects are extremely difficult to follow and observe in the field, such that their interactions with each other and other insects remain largely unknown. There are very few dichotomous keys to velvet ants, and they include the need for magnification in order to examine over 20 different morphological features.

DIET

At all life stages solitary, adults of these insects are nectivores and are reported to visit flowers and, we may assume, extra-floral nectaries. (It is worth noting that Mellor, 1927 and Mickel, 1928 published work claiming that adult velvet ants of at least two species will attack and feed on other wasps and bees; this does not appear to be common practice for the family, however.)

In their larval form, all mutillids are ectoparasitoids that feed on the mature larvae or pupae of other insects. They are chiefly focused on eating other solitary hymenoptera, but certain species are known to specialize on pre-pupal or pupal Diptera, Coleoptera, Lepidoptera, Blattodea, and even some of the eusocial Hymenoptera (Brothers et al. 2000).

In some cases a given larva will feed on only a narrow range of host species – often only one – such that specialization in oviposition, and larval diet, is the purported norm among those mutillids. Yet in other species, it seems a range of hosts it utilized.

DEFENSES

Velvet ant stingers are things of beauty. Often very long when fully extruded from the tip of the abdomen, they are not only highly flexible, thus allowing the females to defend themselves no matter where they may be grabbed by a predator, but they also pack quite a wallop. I have not had the pleasure, but several colleagues and no small number of visitors to the museum where I work have given testimonials about the pain associated with a velvet ant sting. The largest species in the U.S., *Dasymutilla occidentalis*, is commonly called the red velvet ant, but in many parts of the south and eastern United States is also called “cow killer” because the sting so painful it’s said it could kill a cow. This is not the case, but for what it’s worth, a 1996 study put the LD₅₀ at 71mg/kg body weight. By way of comparison, the harvester ant, *Pogonomyrmex maricopa*, has an LD₅₀ of .12, and honey bees come in at 2.8 (Meyer, 1996). None of this, I suspect, lessens the pain of a sting, but it should be emphasized that, like most solitary wasps, velvet ants will not sting unless truly pressed.

While on the subject of stinging, which is a fine defense against insectivores, it’s interesting to count the other means by which velvet ants can ward off would-be attackers. Most sport warning or aposematic

colors to let predators know that approaching them is a bad idea (or, in the case of the males, this can serve as an effective bluff); both sexes are also equipped with moderately slippery hairs and an exceptionally hard and thick exoskeleton such that they can be both hard to hold and, if grasped successfully, hard to bite into; and they can stridulate and do so in response to being handled roughly. This stridulation likely serves to startle predators.

This array of defenses begs the question: what eats velvet ants? Retired Clemson University entomologist and mutillid expert Don Manley experimented in the southwestern U.S. using live velvet ants and a slew of vertebrate insect-eaters. The results, in brief, were that most animals would not even attack a female velvet ant when presented with one and presumably hungry, and of the few that attempted handling mutillids as prey, all gave up the cause quickly (perhaps from being stung, or maybe for other reasons). So here again we are left with another titillating mutillid mystery – what will eat a velvet ant?

It's worth reiterating that in the mutillidae the males have wings and the females are wingless. Since the stinger of an ant, bee, or wasp is a modified ovipositor, it follows that only females of any given species are capable of stinging. What this means, for the mischief-making field entomologist, is that one can capture a male hymenopteran, assuming it can be positively identified as such, and then handle it with impunity, all the while amazing those not in the know who would think you tough as nails in the face of a brutal and non-renting attack, as the stingless male thrusts the tip of his powerless abdomen at your fingers. To be fair, male velvet ants (and other types of wasps) may possess a sharpened process called a pseudo-stinger which, in hefty enough specimens, can jab with surprising...ouchy-ness. So, be prepared for that if you chose to mess around with larger male mutillids.

REPRODUCTION

Mating is evidently a very brief affair in nature, though in a captive setting and tight quarters, couples may remain *in flagrante* for prolonged periods (in this case, meaning the better part of the day). Having witnessed this personally, I still cannot say if the female was attempting to disengage but unable owing to the small confines. In any case, it appears that extended time in the act of mating is an artifact of captivity.

AREAS FOR RESEARCH

It is important to mention again that monitoring/observing mutillids in the field is very difficult, and this has resulted in 2 notable facts that continue to make this group full of wonder for the curious and ripe for study for the researchers out there: we only know the host species for the larvae of about 10% of all described velvet ants, and we do not know what both the male and female of the same species look like for numerous members of the family. Although in some cases male and female are patterned and colored similarly, many times the sexual dimorphism is marked both in this regard and with respect to size, and frequently it is the males that are the visibly larger sex (Mickel 1928). Historically, these cases of extreme sexual dimorphism have caused a lot of taxonomic confusion.

CAPTIVE CARE, AND DISPLAY

In our line of work (insect zoos and museums), we are in the market for bugs that are large, colorful, active, or that can be housed in groups. The bigger velvet ant species actually fit all four of these criteria! But because they are solitary, one cannot expect to find hordes of mutillids in a single day. That said, good spots and banner days can yield displayable numbers of these insects. At Audubon Butterfly Garden and Insectarium, there is a small but permanent velvet ant exhibit in our "Louisiana Swamp" gallery that ideally houses 9 or 10 female *Dasymutilla occidentalis* at a time. We take field trips to collect these girls but also solicit guests to collect on our behalf, if they mention seeing velvet ants in good

numbers, and we also have a stable of about 10 folks to whom I annually send an April or May email reminding them that we have no end of need for this species.

Because they can live over a year, it usually works to gather up what we can between May and October and maintain our velvet ants until the following spring or summer, but this can be dicey if mortality is high or if the collecting season is weak. My target is to hit Halloween day with a full exhibit and at least 24 velvet ants in our lab that will serve both as “back ups” and as insects we can use at one of our 3 live animal presentation areas.

Caring for and displaying velvet ants is not difficult. They seem to do well with both plain water and any number of sweet liquids including sugar water, artificial nectar (such as the commercially produced Bee Happy), honey, grape juice, and orange. I recall someone years ago suggesting that pollen may be taken by wild velvet ants and provide useful amino acids, the suggestion being that captive specimens would do well if offered same. In my experience, even a diet of nothing but a 1:4 sugar water mixture will sustain velvet ants for many months.

When resting (sleeping, if you will), velvet ants will often curl their bodies, rest on their sides, and for all purposes appear dead. Do not be fooled! If you were to scoop one up very quickly into a wad of paper, you may not see it “wake up,” and you could toss a living insect into the trash by accident. Almost as sad would be to pick up the suspected dead wasp only to be stung once it revives itself. If you see a velvet ant that you are unsure about, do the childish thing – poke it with a stick. That is to say, find a suitable object with which to gently prod the insect. If you’re short on mutillid experience, you will be surprised more than once at how often your surely-passed-away critter begins walking around.

Mutillids will hide if you allow it, but there is no physiological imperative for them to do so, and combat among individuals is very rare. As such, it is recommended that a display made for these insects be sparsely furnished. A thin layer of sand or similarly dry and light-colored substrate with a couple of twigs for climbing and perching is not unattractive and allows visitors to your facility to observe a fabulous insect that most people know nothing about.

COLLECTION

Collection of velvet ants is traditionally a matter of sight hunting in appropriate habitat. There is no magic trick of the trade that allows a given collector to hit a sure thing, and the very nature of this insect’s foraging – either constantly on the move or well-hidden and motionless for many minutes at a time – make it a hard target. Open terrain with hard-packed, sandy, dry soil is generally good to sample. Richer and more moist substrates covered with dried pine needles or leaves can also be productive, but the insects are much harder to spot and track. One web site suggests that nocturnal movement is so great as to make a type of pitfall trap under a simple florescent white light successful. Some state that tracking male velvet ants as they search for a mate can lead you to a female. If trying to find females by following low-flying males, keep in mind that unless you see a significant mass of males both airborne and groundborne in a small space, you are likely to be searching for a girl just as long as the winged fellows before you find one.

If you see a female velvet ant, it is useful to already have a container in hand, for the moment you dig into a vest or backpack to fetch something, the bug is likely to disappear. What is common and frustrating is, if you make an unsuccessful attempt at capture, the velvet ant will duck into some leaf litter, zip under a small plant and...vaporize. On many occasions I have marked the exact point where I last saw a velvet ant taking cover, directly under my nose, and created a zone 2 feet in diameter around the spot, clearing every bit of plant matter and even digging into the ground, only to find that, in addition to being enthralling on account of their looks and biology, mutillids are also magicians who have mastered the disappearing act.

COMMENTS ON IMAGES USED IN CONFERENCE PRESENTATION

The images used with the preceding material during the 2014 Invertebrates in Education and Conservation Conference in Rio Rico, Arizona included an intriguing series of photos from the internet showing a wasp in the genus *Bembix* returning to a nest site with a tabanid fly at the same moment that a female *D. occidentalis* appears to have been trying to excavate an older burrow (perhaps belonging to the same wasp). Of interest is that the wasp never lets go of the fly its holding, nor does it engage with the velvet ant; and the velvet ant assumes a presumably defensive posture as it faces the other wasp, yet it ends up simply walking away from the site. This “non-confrontation” by both parties and simultaneous “giving up” on the mutillid’s part is curious.

A series of photos of mutillids from tropical parts of the world was used to illustrate, in a very small way, the lovely diversity of this family of insects.

Finally, an image was used from a paper entitled “Repeated evolution in overlapping mimicry rings among North American velvet ants” (Joseph S. Wilson et al). This paper examines 6 different mutillid phenotypes occurring in North and Central America and shows multiple species that closely resemble one another within each phenotype. The suggestion is that Mullerian mimicry has evolved in several instances in the family, which in and of itself is fascinating, but I used additional images to show that in southeast Arizona one can find 4 of these 6 phenotypes occurring within a relatively small area encompassed by Cochise, Pinal and Santa Cruz counties (and this set of Mullerian mimics may well be findable within only two or just one of these counties).