



INSECT GASTRONOMY

EXPLORING TASTE, SCENT, AND TEXTURE

Words: Josh Evans Photos: Line Klein

IT TURNS OUT THEY'RE ALSO DELICIOUS. THEY BOAST A DIVERSE RANGE OF FLAVOURS, HUGE POTENTIAL FOR UMAMI TASTE, AND TEXTURAL QUALITIES THAT CAN BE NOT ONLY SNACKY BUT SUBLIME.

Josh Evans is a researcher at the Nordic Food Lab and correspondent of the Yale Sustainable Food Project.

The scales take a while to settle. The waves in the harbour are up, and the boat's got a healthy rock. When the measure wavers like this, I choose the meanest point and carry on. Sometimes taking weights here is our dirty child; so messy, yet you can't help but like it.

Luckily the motion does good for all the others; the vinegars, the sauces, the tinctures, the beer. There are barrels, jars, and bottles that fill cupboards and line the walls, their contents in various states of solid-liquid ferment. The rocking is a gentle agitation, the same effect, perhaps, as Madeira bettering as it crosses the equator, rolling back and forth in a warmed ship's hull.

But I am not working on wine today, or vinegar, or beer; no seaweeds or game meats, or wild plants; no pickles today of any sort. Today we're working with bugs, for the same pursuit of everything we do: diversity in deliciousness.

Insects have a lot going for them. They're nutritious. They're widespread and eaten the world over. And they've got some pretty potential when it comes to generating more sustainable animal proteins.

It turns out they're also delicious. They boast a diverse range of flavours, huge potential for umami taste, and textural qualities that can be not only snacky but sublime. In short, to consider them merely edible is an understatement; some of them are downright delicacies.

Ants are one of the most ubiquitous insect families on Earth. They are also one of the most aromatically diverse, which arises from the range of pheromones they produce to communicate with each other. It just so happens that we humans perceive these same volatile molecules as aroma – and ones we really like. Citrus, pine, coriander, leather, cinnamon, peach, wintergreen, vanilla – these smells are biochemical signals; ants smell good as a result of their eusocial nature.

Ants don't just smell good, they taste good too – most often sour from the formic acid they produce for defense. Pop one into your mouth, and they spray their acid, giving bright bursts of tang along with distinctive flavours. Formic acid even takes its name from ants, as it was first distilled into its pure form by English naturalist John Ray in 1671 from the common wood ant, *Formica rufa*, widespread throughout Europe.

Formica rufa is the ant most common in Danish forests too. We forage them from anthills in the summer and fall. They have a





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lemony taste with a bit of burnt sugar – like lemon rinds seared on the grill.

Green tree ants (*Oecophylla smaragdina*) are native to northern Australia and Indonesia, and have been consumed by indigenous people for thousands of years. On a recent trip to Australia, I was able to try some of them live. Unlike the wood ants, which we eat whole, the green tree ants are best enjoyed by taking the head between the thumb and forefinger and biting off the plump green gaster (the last section of the abdomen). It sings of sourness, with tart apple and light vinegar.

Honey ants are yet another beast entirely. They are not, in fact, a species unto themselves; rather, they are a polymorph of one of five genera of ants, also known as a plerergate or replete, whose role in the hive is to store food and water in their swollen abdomens, and distribute it in times of scarcity – perhaps why they are most readily found in dryer climates. *Camponotus inflatus*, a species found in Australia, has a valued place in indigenous gastronomy for its sweet nectar-filled body – well worth the labour of digging them up from the earth.

Ants aren't the only ones with these unique flavours. *Nauphoeta cinerea*, the wood cockroach, is decidedly different from the iconic household terror-bringer. No larger than your thumbnail, when roasted, it has the flavours of coffee and chocolate, malt and black mustard. *Megascolecidae spp.*, the humble earthworm, is somehow both the most surprising and most obvious in aroma and taste. It smells like beetroots and rich black humus. This is geosmin, the smell of earth, and it could not be clearer whence it comes. That old adage is true, and not just for humans: you do become what you eat.

Ants may be a source of sourness and aroma, more for spice than substance. Yet insects also excite us for their *umami* taste. Many insects, especially meaty orthoptera ('straight-winged', grasshopper-types) and the fleshy larvae of coleoptera (beetles of all sorts), are rich in protein, despite their unassuming stature. Many of these insects taste meaty and savoury as they are, fresh or cooked – but we can greatly enhance this *umami* taste through the fermentative breakdown of their proteins into amino acids, just as many other cultures around the world have done throughout history with fermented legumes and fish, cured meats, aged cheeses, and other cultured products.

Really this process began with fermented fish sauce. We were inspired by the ancient Roman fish sauces garum and liquamen and those of East and Southeast Asia like *nam pla*, *nước mắm*, and *shottsuru*. So we began making Nordic-style fish sauces by translating these techniques into a Nordic context.

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THERE IS A SLIGHT SWEETNESS, AND LINGERING SAVOURIES. THE TEXTURE IS BEYOND PALATABLE; IT IS LUXURIOUS. IT IS BOTH MORE DELICATE AND MORE SUBSTANTIAL THAN CAVIAR.



We focussed on herring and mackerel, small fish that are plentiful in northern Europe, fermenting the guts with salt and *kōji*, sometimes including the heads and bones. The salt prevents unwanted moulds and bacteria from overtaking the culture. The *kōji* is a traditional ferment from Japan – rice moulded with *Aspergillus oryzae*, the common enzyme-rich basis for miso, *shōyu*, sake, and others. Usually thrown away, the guts are in fact the best part for fermentation – they already contain loads of bacteria and enzymes that once digested food for the fish; now, they will digest the fish for our food. Then we will digest them. And then, in time, others will digest us.

After the fish sauces, we started exploring this general technique through other protein-rich substrates: peas, beans, nuts, and seeds of all description; hare, pheasant, venison, and other game meats; grasshopper, field cricket, meal worm, the larvae of bees, and wax moths. Many respond well. The insects are some of the best.

The first was a fermented sauce of grasshoppers (*Locusta migratoria*) and wax moth larvae (*Galleria mellonella*). We blitz the insects, keeping them rough, add in the *kōji* and salt, store in glass beakers with plastic against the surface to keep out the air, and hold at 40°C for at least six weeks – the longer the better. The salt kills the mould, while the enzymes begin to break down the proteins. Salt-tolerant lactic acid bacteria enter the mix. Other microbes may join the fray. The result is a fermented sauce with complex flavour and rich *umami* taste.

I thought the insect sauces would be comparable to those made from fish or meat; but they are entirely unto themselves. To me, the grasshopper/wax moth has the faint aroma of oyster sauce, a distinct nuttiness, and an underlying whiff of roasted fermented cacao. This is a technique we can try on all sorts of protein-rich ingredients – and with diverse, delicious results. It may take a few trials, but many ingredients just need a bit of experimenting before their delicious potential shows through.

Texture may play second string to flavour for what many people value most in delicious foods, but its importance becomes very apparent when we try making insects appealing to the Western palate. For many people, the hardest part of eating an insect is not taste or flavour, but rather the texture, along with the psychological factor of consuming the insect whole in its immediate, unabstracted form.

This is where the ingenuity of cooking comes into play. What are all the ways we can cook with insects, without actually putting a whole insect on the plate? These are useful foods for introducing people to the idea of eating insects, without, as it were, forcing it down the throat: baking bee larvae granola; blending wax moth into a mousseline; infusing crickets into broth with other aromatics. Alcohol is even better for this purpose: gin distilled with ants;





beer brewed with meal worms. We call these ‘gateway foods’ – foods in a form we readily accept, and the insect ingredients along with them.

For the whole insect, our biggest challenge remains the crunchy exoskeleton of many adult species – we must either remove it, render it crisp, or break it down. In many cases, we can think of it like the thin shell of small crustaceans, or the bones of littler fish – parts of the animal that have traditional uses just as much as the flesh, either cooked further, fermented, or eaten along with the whole creature. Many cultures, particularly those in Central and South America and Southeast Asia, fry or roast insects whole, crisping the crunchy, chitinous exoskeleton, composed of structural proteins and long polysaccharide chains, into something that shards and dissolves in the mouth.

Fermentation provides another strategy for dealing with the exoskeleton: instead of cooking or removing it, we can break it down physically, enzymatically, and metabolically, along with the flesh, to gain aroma and taste while alleviating the difficult texture. This was another goal of the fermented sauces – to enhance *umami* taste and develop complex flavour while sidestepping the exoskeleton entirely.

Yet not all edible insects have exoskeletons. Many common insects used for food are not adults, but are in other developmental stages. Some of the most common ones include wax moth larvae (*Galleria mellonella*), which we use in the *garum*; mealworms (*Tenebrio molitor*), which actually aren't worms at all but the larvae of the darkling beetle; and my favourite, bee brood, including eggs, larvae, and pupae (*Apis mellifera*), which is actually removed and discarded *en masse* by beekeepers as part of a strategy to control varroa mite populations in the hive.

The drone brood is removed whole in the comb, and right from the hive it is one of the most complex, bewilderingly delicious foods I know – still warm, the cells are full with fat white larvae that rupture delicately on the tongue, smooth and fatty, with faint flavours of honeydew melon, raw hazelnuts, avocado. There is a slight sweetness, and lingering savouries. The texture is beyond palatable; it is luxurious. It is both more delicate and more substantial than caviar. Many combs come peppered with cells full of moist bee pollen or dripping with warm honey. And then, it is simply ambrosial. ■