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The Hive Tool and Smoker

Flip through any beekeeping equipment catalogue and you will be overwhelmed by the huge diversity of equipment available to beekeepers. There are gadgets, gizmos, must-haves, useful tools, and equipment about which one is left to scratch their head and wonder what the purpose actually is. I enjoy getting the various companies' equipment catalogues yearly just to see what new gadgets beekeepers have invented and coerced the equipment companies to sell. Beekeepers are ingenious and their creativity spawns some really good ideas.

Though you may not know it, I am three articles deep into a four-part series on beekeeping equipment. In March, I reviewed the basic parts of the Langstroth hive. I wrote about personal protective equipment in April. I am going to continue the four-part series on beekeeping equipment by discussing what I believe to be the two most important tools in the beekeeper's arsenal. These gadgets are simple, as most of the best inventions are. They are also indispensable, veritable "must haves" for every beekeeper. They are, of course, the hive tool and smoker.

Hive Tool

One of the things I like about beekeeping is that we are, for the most part, so literal with our equipment nomenclature. Consistent with this tradition, the "hive tool" literally is a tool that we use in/on the hive. In its most basic form, the hive tool is a flat piece of metal that is curved at a 90° angle on one end (the "scraper" end) and widened/flattened on the opposite end (Figure 1). There may be a hole in the tool close to the scraper end that can be used to pry nails out of wood. The genius of this tool is its sim-

licity in design but usefulness in function.

Hive tools are used by beekeepers principally to pry supers apart, leverage frames out of the supers, and scrape wax/propolis/whatever from various hive components. Most of the hive tool's function is derived from the fact that bees use propolis, the beekeeper term for the plant exudates, resins, and saps that bees collect and use inside the hive. Bees glue supers together, frames inside hives, etc. using propolis. The product is so sticky that a hive simply could not be taken apart and frames removed without

the prying abilities of hive tools. Make no mistake: this is a job for the hive tool. Accept no substitutes. Over the years, I have used butter knives, screwdrivers, etc. to work colonies. All pale in comparison to the hive tool in durability and functionality. Hive tools are the biggest steal among all beekeeping equipment. They are economical and essential. How often can we say that about something?

Of course, people are always trying to improve upon the basic hive tool design. I have seen long hive tools, skinny hive tools, fat



Figure 1: The hive tool. Note the curved end (right side of tool) and the flat end (left side of tool). Many hive tools have a hole close to the curved end that can be used to pull nails. This hive tool is quite special. It is the hive tool I started using when I was 12. I have never used another one with my own colonies.

hive tools, strangely-shaped hive tools, and more. Personally, I am old fashioned when it comes to using hive tools. However, I have discovered that beekeepers usually most like what they originally used. So, feel free to use the more modern tools.

Other points to consider when using hive tools:

- Hive tools are EASY to lose, or so I am told. Personally, I use the same hive tool I have had since I was 12. However, most people I know go through hive tools at the same rate that they go through toilet paper (a lot, people). Buy more than one. Keep one in your truck, one with your suit, one with your toolbox, one under your pillow, etc. You will thank me if you do.
- Put your hive tool into your pants pocket, bee suit pocket, or something similar while working bees. My philosophy is that my hive tool ALWAYS goes into my back right pocket while working bees. I never put it on the ground, on the hive, in the truck, etc. Most of today's bee suits have special pockets for hive tools. I have even seen work belts that have magnetic strips onto which one can magnetically attach their hive tool.
- If you elect to keep your hive tool in your back pocket, put it curved side down, sharp end up and out of the pocket. Putting it curved side down keeps it in the pocket; otherwise, the curved side pointing out of your pocket makes it top heavy and likely to fall out of your pocket. Pointing the sharp end away from the body when the hive tool is in your pocket is insurance against ham punctures. 😊 Do not forget to remove the hive tool from your pocket once the work is done and before you sit down. I know a lot of beekeepers who slice up their truck seats because they forgot to remove the hive tool from their pocket.
- Hive tools are easy to sterilize (put them into a lit smoker) and clean (use another hive tool to scrape off the wax/propolis). You should do both often.
- Some people sharpen both ends of their hive tools yearly. I do not find this to be a necessary task.
- In case you have forgotten – BUY MORE THAN ONE!

Smoker

People have been using smoke to calm bees for thousands of years. There are early cave/cliff paintings of honey robbers holding smoldering plants, pots, and other such items. It is not fully known when smoke was first used to work with bees or even how its usefulness was discovered. However, it is undeniable that smoke has been an important part of honey hunting and beekeeping for a long time.

How does the smoker work? Great question. I have heard many answers to this question. Many people feel that smoke

causes bees to gorge on honey, perhaps because they “fear” a fire is coming and are preparing to leave the nest. However, I have smoked the mess out of colonies before and could not get them to leave their nests. If it is fire preparation, they are either lousy at knowing when to go or have a super high threshold for smoke. I grew up being told (1) it was preparation for fleeing a fire and

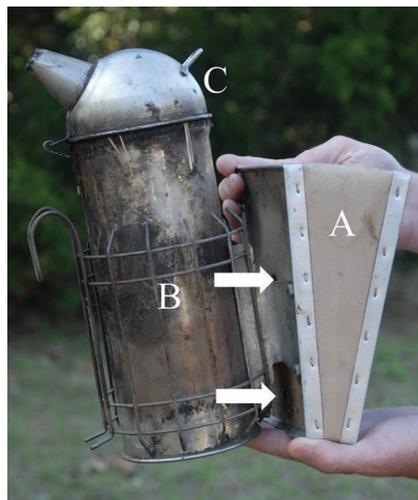


Figure 2: The smoker. (A) bellow, (B) smoker body or firepot, (c) lid with nozzle facing up and to the left. The bellow contains an upper valve hole that pulls air in when the bellow is relaxed (upper arrow on bellow) and a lower valve hole that pushes air out, into the bottom of the smoker body (lower arrow on bellow). This smoker has a protective wire shield that helps stop the user from touching the smoker body.



Figure 3: The open smoker. The lid of this smoker has been opened and the metal grate removed from the bottom inside of the smoker body. This grate creates airspace between the bottom of the smoker body and bottom of the fuel, if inserted correctly with the legs of the grate facing down. Over time, this area can fill up with ashes/soot from old fuel, thus impacting smoker function. The grate needs to be removed and the ashes dumped periodically.

(2) that full bees could not fly well, hence they could not sting you. I believed this for a long time until I thought through the logic of both statements (i.e. why would they gorge to leave a fire if gorged bees are too heavy to fly?). I have heard other variations of the gorging scenario as well (for example, engorged bees are not inclined to sting – which may be true – seems like a good project). Do not misunderstand me: bees do appear to gorge on food stores when smoked. I just do not believe we fully know why.

A more likely explanation concerns a masking of bee communication abilities by the volume of smoke pumped into the nest (though, I have seen no research to support this idea either). Bees communicate principally through pheromones, or chemical smells, that they must perceive with their antennae. A colony gearing up for a defensive response produces alarm pheromone. Smoke may mask the alarm pheromone or occupy the bees' sensory receptors, thus minimizing the defensive response. Smoke may “cover up” the alarm pheromone, much the same way cologne or bathroom spray works for us.

Like the hive tool, the smoker is a beautifully simple device. It is composed of 4 main parts (Figures 2 and 3): the bellow, the body (or firepot), the funnel-shaped lid, and the internal grate. When the bellow is squeezed, air is forced out a small hole in the bottom of the bellow through a small hole in the back of the smoker body (Figure 2). The air is forced up through the smoker body and out the nozzle in the smoker lid. Air is pulled into a hole at the top of the bellow when the bellow is relaxed. I have outlined in Figure 4 the steps of successfully lighting a smoker. A well-lit smoker is only an asset, though, if it is used correctly.

The correct use of a smoker, i.e. how much to smoke a colony, is a learned art that is refined over time. Here are some helpful hints. (1) Smoke the colony BEFORE opening it and before the colony has initiated a defensive response. It is hard to subdue some colonies with smoke once the defensive response has started. (2) Smoke can be directed into the colony entrance, or entrances depending on the quality of your equipment 😊, and just under the colony lid. (3) Use an appropriate amount of smoke. What is the appropriate amount? Read the bees to make the decision about how much smoke is necessary. If the bees are mounting an attack, USE MORE SMOKE. If they are not trying to sting you, there is no need to smoke them heavily. Interestingly enough, I work with many new beekeepers and the most common problem is an under-use, rather than overuse, of smoke. (4) Some beekeepers wait a few minutes to go into the colony once the colony has been smoked. I rarely do, but it can help when working a colony known to be defensive. (5) Lightly smoke each frame before removing them from the colony during inspections (2 or so “half puffs” of smoke are usually sufficient). (6) Personally, I like to lightly smoke colonies when I return frames, supers, and lids

to the colonies. This moves the bees out of the way and minimizes potential bee death.

Other notable smoker information:

- Moses Quinby invented the first “modern” smoker in 1873.
- Do not over-smoke colonies, especially when honey is being produced. Smoked honey does not taste good and it will cost you a honey show 100% of the time. I was taught that placing wet grass on top of the smoker fuel in the smoker body will filter out some of the burnt debris (ashes and soot) that exits the smoker every time you squeeze the bellow.
- Smoke disrupts hive behavior, though bees seem to return to normal behavior within a relatively short period of time after being smoked (often within 30 minutes).
- Some people use various types of smoker fuels in an attempt to calm bees more than smoke alone ordinarily does, or perhaps to control bee pests such as *Varroa*. I do not believe this is a safe practice, either for the bee or the beekeeper. Smoker fuel should be untreated and as natural as possible [pine straw, hay, wood chips/pellets, dried herbivore feces (cow/horse patties), rotten wood, etc.]. Be wary of burlap, bailing twine, etc. Many of these may contain chemicals that, when burned, are released and may harm the bees.
- Smokers can cause fires! Be careful where you rest and lite them. I kept a lit smoker in the back of my truck on the return trip home from my first apiary. I melted my veil and burned up my bee suit, all because the lit smoker was touching the cloth in the back of the truck. I also caught the ground in my apiary on fire by lighting a smoker on the ground in the dry grass. I recommend lighting smokers on non-flammable surfaces (the tailgate of a truck, in a wheel barrow, etc.). I also recommend purchasing and using one of the various smoker boxes sold by the beekeeping equipment/supply companies. This box will hold a lit smoker and keep it out of contact with flammable objects. I suggest plugging the exit hole in the smoker lid when traveling down the road with a lit smoker in the back of a truck. The airflow past and through an uncorked smoker causes it to smoke profusely, convincing everyone behind you that your vehicle is on fire. Plugging the lid usually keeps the passing drivers from honking/flashing their lights at you.
- I keep my smoker upright when I want it to remain lit, such as while working an apiary. I turn it on its side when I am ready for it to stop smoking. This will put the fire out and preserve the remaining fuel in the smoker until next time you light it. The quickest, safest way to stop a smoker is to open it and dump the remaining fuel/coals on

pavement, bare ground, or in the water. You should take care to ensure that the fire is out before leaving the unspent fuel/coals.

- The body of a lit smoker burns everything it touches, including fingers, bees, pant legs, etc. Many modern smokers have “shields” on them that keep the user from touching the hot smoker body (Figure 2). Such smokers are worth the investment.
- Speaking of investment, go ahead and buy a large smoker. They hold more fuel and last longer in the field. You might as well get it right the first time.

You may say you only have 1 colony. My reply: every beekeeper starts with one colony...and how many stay there?

- When smokers run out of fuel, the resulting smoke is thin and gray. If care is not taken, puffs on the bellow can shoot embers or sparks out of the nozzle, thus being a potential fire hazard.
- Smokers go out if not started properly (see Figure 4). Puff, puff, puff the bellow. Do this regularly when the smoker is in use. I often use my foot to puff the smoker bellow while working colonies if the smoker is packed really tight, i.e.

HONEY BEES 101: THE “AFRICAN” HONEY BEE

African races of honey bees all belong to the same species, called the western honey bee or *Apis mellifera*. This species is distributed in Europe, the Middle East, and Africa. African races of *A. mellifera* occupy nearly the entire African continent, except desert areas where there is not enough forage to support honey bee populations. Interestingly, there are races of African honey bees that have been found to inhabit oases within vast deserts.

There are many, maybe 2 dozen or more, races of African honey bees. Probably the most known outside of Africa is *Apis mellifera scutellata* or “the African bee”. This is the “killer bee” of the press and it is the one African race present in the Americas. I say “the African bee” because there are many races in Africa. Our common name for the bee implies that there is only one and that we have it. This is unfair to the other African honey bee races, which are amazing in their own right.

I am quite partial to African races of honey bees in general because I did my PhD in South Africa and continue to research the honey bees there. African honey bees are remarkable. They are quite diverse and usually very different behaviorally from the European races of honey bees that we use in our beekeeping operations. I list some generalizations about African bees below. Of course, any generalized list is susceptible to exceptions, but the traits below are those typically associated with the many races that inhabit the beautiful continent.

- Many races of African bees are more defensive than their European cousins. This is due to many reasons, possibly including the way humans have interacted with them over the ages. For example, beekeeping was the norm in Europe while honey hunting was more common in Africa. The former tends to produce gentle bees (who wants to keep defensive bees), while the latter could work the other way.
- African races of honey bees tend to use copious amounts of propolis.
- Many African honey bee races are resistant or show some tolerance to some of the pests/pathogens that plague European honey bees.
- African honey bee races are well-adapted to warm climates (tropical, subtropical, arid, semi-arid) and tend to do poorly in temperate ones. They tend not to be able to cluster as well in winter.
- African honey bees are “runnier on the combs”, meaning that they quickly leave the combs when the hive is opened, and are “flightier”. The latter describes their propensity to take to the air when the hive is opened. Both behaviors have their advantages (it is easy to inspect combs unoccupied by bees) and disadvantages (they can crowd the hive walls, making it difficult to find the queen).
- Many African honey bee races abscond readily in response to limited resources, disturbance, and pests/pathogens. This can make the colonies hard to work due to the risk of promoting absconding.
- African honey bee nests tend to be smaller than those of European honey bees. Consequently, they store less honey. They also will more readily nest in the ground and in less-protected cavities (or even no cavities at all).

It is, of course, hard to overgeneralize about honey bee races distributed over a continent as large as Africa. In fact, it is the bee’s diversity in Africa that I appreciate most about African bees. Some notable races include: *capensis* (an amazing bee, in the southern tip of the African continent), *scutellata* (the “killer bee” of the Americas), *lamarckii* (the Egyptian bees), *nubica* (Nubian honey bee), *adansonii* (west African bee), and *intermissa* (north African bee). There is something surreal about working honey bees in an area where they are native. Africa exemplifies this since most beekeepers use wild-caught colonies and do not invest heavily in breeding programs or splitting hives. Consequently, the honey bees of Africa are about as unspoiled as you get with *Apis mellifera*. All beekeepers should have the pleasure of working bees in Africa.

Figure 4: Steps of lighting a smoker.



(l) Step 1: Place a small amount of fuel into the bottom of the smoker (A). (r) Step 2: Hold and light a small amount of fuel (B).



(l) Step 3: Lightly place the burning fuel into the smoker and puff the bellow 3-4 times to make sure the fuel stays lit (C). (r) Step 4: Lightly add more fuel to the smoker. DO NOT OVERPACK. Puff the bellow 5+ times (D).



(l) Step 5: Repeat Step 4, two – four times until the smoker is full, BUT NOT PACKED, with lightly added fuel (E). (r) Step 6: Puff the bellow many times (10+ times) until a plume of thick, white smoke roles out of the smoker (F).

Step 7: Add more fuel, this time packing the fuel as tightly as you can. When steps 4 and 5 are done well, you can pack as much fuel as you want/can into the smoker body. I often use my hive tool to pack the fuel tight (E). It is always a good idea to add paper, straw, wet grass, etc. to the top of the fuel if using wood chips or pellets that can spill out of the lid if the smoker turns on its side. *Remember, fires need oxygen AND fuel.* Most beginners give the smoker too much fuel, too quickly, and fail to puff the bellow enough. A properly lit smoker should omit a volume of smoke similar to that shown in (G).



has a lot of fuel. This is because my hands are busy working the colony, but my foot is available to make sure the fire is getting adequate amounts of oxygen.

- Many beekeepers prefer to work colonies without smoke. Of course, how one keeps bees is up to the individual, but I recommend always having a lit smoker present while working a colony. You simply never know how

a colony is going to respond to being worked on any given day.

If you have kept bees for any length of time, you know that smokers and hive tools are the left and right arms of the beekeeper. I strongly recommend buying a good smoker and hive tool at the beginning of your beekeeping endeavor.

As a closing note, I believe many of us fail to realize the creativity and excessive amounts

of tinkering and refinement that went into the everyday items we use and enjoy. The same is true of smokers and hive tools. For example, any quick perusal of smoker history will send you on a delightful journey through the evolution of a tool beekeepers use every day, one whose sole job it is to make smoke, and one that makes our interaction with bees possible. Likewise, the hive tool is simple in design, but there is no other tool like it. Both make beekeeping enjoyable.

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