What Kind Of Bee?

Larry Connor

It is a good time to cover a subject that some beekeepers ask me about and many more WANT to ask – *What kind of bees do I have inside my hive?* Here is a letter I received in December. It sets up the rest of this article –

Dear Dr. Connor,

I had the pleasure meeting you at the WAS conference in Healdsberg CA in August 2009 at which time I purchased several Wicwas Press publications. I have been enjoying reading them and learning a lot. I have to admit that I am not an academic but I am fascinated by science and nature. Gardening and beekeeping keep me quite busy, not to mention my four-year old son.

Anyway, I started beekeeping by jumping in and collecting my first colony out of somebody's wall. That colony is my strongest. I have attached some photos and I am wondering if you are able to identify WHAT KIND of bees I have. Can anybody (any expert) identify a bee type just by looking at it? Or does the DNA have to be looked at?

All I know about my bees is that they lived in the wall of these people's house in El Sobrante for probably six years before the neighbor contacted me through a post on Craigslist for free bee removal. I learned a lot from doing this and other removals, but I learned more from reading your book Increase Essentials. I think I will focus on collecting swarms this spring and try some queen rearing for requeening. I live in the city of Berkeley so I am a little limited on space, but I'd like to have a whole bunch of hives.

I tend to write too much so I'll just leave it at that and remind you that I just really want to know what kind of bees I have. Oh and my guess is Italian, because they don't produce a lot of propolis around the entrance (as seen on page 12 of Rearing Queen Honey Bees).

My fellow beginner beekeeper friends are wondering why some bees are so pale (yellow almost grey) and others have a lot of black? Is this a developmental/age characteristic that changes as bees grow older? Or is it just genetic like having kids with different color hair?

Thanks for your help.

Sincerely,
Alice Rosenthal
Berkeley, CA

PS Can you tell me anything else about my bees from the photo?

Here was my reply to Alice –

Hi Alice

With a few noteworthy exceptions (Russian, certainly Carniolians) most stocks in the U.S. are a mixture of several races or subspecies of Apis mellifera L. The subspecies is shown by the third part of the Latin name. For example, Apis meliffera carnica Pollmann is the Carniolian subspecies or race of honey bees. (The name following the Latin is the person who first described this species or subspecies) Beekeepers often market certain races, but in North America they may have poor parentage records and/or no control over the drone population. I like to think that we have North American bees, for what it is worth.

I will get back to you (I hope) with a more detailed answer, but DNA is the only defining technique, although certain Europeans use wing dimensions and vein angles for separation. It is a science loaded with lots of variables.

What might be more useful is a summary of the behaviors of these bees, since certain races have unique behavioral traits.

Enjoy your bees and your son. Does he have his own bee suit?

Larry

Here is my 'more detailed' reply to Alice's questions. It is a good letter to base an article upon, and gives me a chance to express my thoughts on a number of issues. Alice provided photos of the queen and her bees, and after tweaking them in Photoshop I am absolutely sure they are honey bees, *Apis mellifera* L. (No surprise there). But I will not guess which race or races make up their genetic heritage but feel sure there are undoubtedly several present. There is some variation in the appearance of the worker bees (Alice's friend noted that some of the bees were 'pale' which I take to mean they are a light yel-

"You want them to be Italian, call them Italian."

low-grey in color. Several races have grey in their color pattern, including *carnica* and *caucasia*. In the photo I see more yellow with the whitish-grey bands, so this just adds to the confusion.

Color variations in workers reflect the multiple mating of drones to the queen. In turn, if you produce daughter queens from such a queen, you would expect to find considerable variation in the color and banding of the resulting daughter queens. Even if the queen came from a pure race of bees like Italian (*ligustica*) or Carniolian (*carnica*), that had been carefully maintained by instrumental insemination, in most of North America their naturally mated daughters would not produce pure Italian or Carniolian workers. Instead they would be crosses between the mother line and whatever hodge-podge of drones found in the area where they were mated. Unless using an island or remote mountain valley, it is unlikely that a single beekeeper would be able to control the drones in the roughly six mile radius (a land area over 72,300 acres) that queens and drones will fly for sex.

Bee Sex Essentials reviews the number of drones that mate with queens and more about reproductive biology. But for the local beekeeper, just imagine all the colonies in your six-mile radius. When I think about the full range of colonies around the Farm (72,300 acreage is a Lot of real estate!), I recognize that any queens mated there are likely to encounter drones from a wide range of colonies – packages from Georgia and Texas, nucs from Georgia and Florida, and full-sized colonies kept in areas of the South where African colonies have been found. That does not make the colonies African, but it does mean that some of the drones may carry genes from the African bloodline.

For commercial queen producers, there has been a color game going on for decades. I have observed queen breeders sort through their colonies (commingled and never kept apart from each other) to find a queen that is either yellow enough or dark enough to serve as the breeder queen for their customers that want Italian (yellow) or Carniolian/Caucasian (dark) queens. Well maybe they will look for some grey queen for their Carniolian customers. My point better be pretty clear by now – queen color and genetic heritage have little to do with each other.

Colony in the side of a house Alice removed. (Photo by A.Howell & A. Rosenthal)

Back in my Starline Program days, Dr. Bud Cale explained to me how one of the inbred lines was developed from a single Carniolian colony found in California (in the 1940s). Cale had the daughters of this queen out-crossed to yellow drones, and then selected for the yellow-est daughters grafted from these daughter queens. In just a few generations Cale had a bee that was essentially a yellow Carniolian, and he used it as one quarter of the Starline hybrid bee and one half of the instrumentally inseminated hybrid Cale 876 (the drone side). Color is pretty easy to select for, and a lot of beekeepers do it.

Back to Alice's queen. Many beekeepers report that the queens and bees found in unmanaged colonies are often dark in color. The general wisdom is that bees and queens in cooler parts of the country are often darker than those in the warmer part of the Continent. This reflects the physiological advantage of being light-colored in a hot sunny climate and the cost of being dark in that same region. But in the North this is reversed – the darker foragers and mating queens and drones are kept warmer by their dark pigment on cooler days. It is an example of localized selection for advantageous characteristics that impact immediate behavior.

Minor temperature differences within the brood area of the hive may influence queen color, with yellow queens being produced when the temperatures are very warm and dark queens being produced when the temperatures are cooler. The heat or cold outside the hive may impact the subtle developmental time of queens and drones in development.

Finally, there is a genetic mutation called the Cordovan gene, that is recessive, but when selected for in a bee breeding program produces a large, nearly all yellow queen and yellow drones. The mutation changes the black bands of the bees to cordovan yellow, and it appears best in a light colored subspecies.

Methods of identification

In my short email reply, I said that it is possible to determine the genetic background of these bees by using DNA samples, or by using features of the wing and other parts of the bee in a process called Morphometrics. This can be quite complicated, making measurements of characteristics like the length of the fore-wing, the width of the fore-wing, the number of hamuli on the wing (these are the tiny hooks that keep the wings together during flights) and the length of the tongue. Except for the number of wing hooks, these characteristics are highly heritable – they are measurable traits that are passed on from one generation to the next. Some European queen breeders base their entire stock on a specific morphometric profile (think of it as a morphological fingerprint), and determine that a colony is or is not a certain stock based on these measurements.

When studied as part of the geographical spread of honey bees around the Earth, these patterns are quite useful to see which subspecies are put into one of four groups: Northwest group (which includes *mellifera, sahariensis, major, iberica* and *intermissa*), the Southwest European group (includes *cecropia, carnica, ligustica, sicula, adami* and *caucasica*), the Middle Eastern group

(*caucasica, cypria, anatoliaca, persia, armenica* and *syriaca*) and the African group (*scutellata, adonsonii, lamarckii, yemenetica, littorea, monticola, unicolor* and *capensis*). This is of interest to all North American beekeepers since we have at least one of each of these four groups represented in the bees that have been or are kept on the continent. *Mellifera* is the called the common black European bee, the English, French or German bee. These bees show behavioral characteristics associated with North African bees – nervous behavior, irritability and considerable use of propolis. These bees are all but gone from North America, but were the first bees brought to the Americas.

Carnica is the bee of the Balkan Peninsula, extending from the Alps and Black Sea into the Ukraine. This subspecies is widely used in agriculture as a honey producer and pollinator. The New World Carniolian is from this bloodline. When saying the name of this race, keep in mind the Latin name: car-ne-ca. Thus Carniolian is said can-ne-o-lan.

Ligustica is the Italian bee, and is closely related to *carnica*. It has a good temper and is able to adapt to a wide range of conditions, making them good for the diverse habits and migratory tendencies of North American beekeepers. It is often credited as the bee that made modern beekeeping possible due to its mild temper, high brood rearing tendency and overall productivity. The other subspecies from the Southwest European group is *caucasica*. These bees have very long tongues and are good at high altitudes. It is gentle and a good honey producer. It uses propolis freely, often blocking the hive entrance, and may be very sensitive to *Nosema*.

Finally, *scutalatta* is the African subspecies in the Americas. It's highly defensive and swarms frequently making it less suitable for commercial beekeepers and unacceptable for urban small-scale colony holders.

In North America we use a simplified morphometric screening to determine if a colony is African or Africanized. Certain of the USDA Bee Labs are set up to screen samples of bees. Only the wings are used, and they are mounted onto microscope slides and the wing's image is projected onto a screen. The different wing vein measurements are then measured, put into a database where they are scored for characteristics typical of African or African-European hybrids.

Developmental differences

Alice asked if bees change colors as they age. If they do not lose their body hairs, the color of a two or three day post emergence bee will be the same when she dies. If the bee becomes a robber bee, and looses her body hairs in the process, she will look quiet different – much darker without the reflective body hairs. There are no robber bees evident in the photograph, reflecting the variation in the drones that mated with the queen.

You want them to be Italian, call them Italian!

As I look at the photo, I will let you call these bees Italian. They are a dominant type of bee in California, and there is a wide range of color patterns from yellow golden leather to rather dark. BC

Queen Rearing Essentials *by Dr. Connor is arriving at your local bee supply companies or can be ordered directly from the Wicwas Press website:* ***www.wicwas.com****. Join Drs. Connor and Dewey Caron for a four-evening Advanced Beekeeping course being offered in Comstock Michigan. Check the website for details.*