"THE EUROPEAN WOOL CARDER BEE"
and Its Affect on the Disappearance of Honey Bees

aka: "Cotton Bee," "Shaver Bee"
"The Butcher Bee"*[appellation by T.M. Allen]
Scientific name: Anthidium manicatum L. (Linnaeus)
Family: Megachilidae (Leafcutting bees)
Order: Hymenoptera (Bees, Wasps, Ants, & Sawflies)

Full Report
by Terrance M. Allen, S.C.E. / October 16, 2013

Most information and data is based on this author's personal scientific observations and field notes. Many passages are identified to clarify original and unpublished work of TMA. Other passages are identified to credit other researchers' works, references relied upon, or to support new information presented.

"Scientific (or Latinized) names" are used throughout in order to identify particular species, as "common names" are misused and confused with others in different parts of the world.

INTRODUCTION

The European Wool Carder Bee (EWC Bee), Anthidium manicatum L., is reported to be a recent introduction to North America, having entered the United States, first collected in Central New York State, in 1963. It is considered by most entomologists to be a new species to our continent. It was probably brought in by accident in wood pallets or masonry [refs: 1, 5 & 8]. The female EWC Bee builds its nests in these types of materials in pre-existing hollow cavities or crevices, or tubular holes or tunnels or burrows (as those made by wood boring beetles in dead trees or branches). Other sources mention that the EWC Bee was intentionally introduced from Europe to North America for its proficiency for pollinating alfalfa grown for seed [ref: 3]. Alfalfa, a deep-rooted European leguminous plant, is widely grown for hay and forage and used as a main source of food for cattle, horses, and other livestock. Although they attend fields of alfalfa, honey bees are not efficient pollinators of alfalfa [ref: 5].

The European Wool Carder Bee is known to occur throughout Europe, and the Mediterranean border of North Africa and Western Asia. It is established in Brazil, Argentina, Uruguay, the Canary Islands, and in New Zealand (in 2006). The EWC Bee, as of 2009, is now established throughout North America from New York to California and the southern regions of Canada. Many of these locations throughout the world, including Europe (England/U.K. & France), countries around the Mediterranean Sea, North America (including British Columbia), and southwestern China, are experiencing and reporting the mysterious disappearance of European Honey Bees, a condition labeled as "Colony Collapse Disorder" (CCD). My research finds the EWC Bee has not been reported in Australia [refs: 2 & 15], which is unaffected by the disappearance of honey bees or CCD. My investigations show there is a correlation between the appearance of the European Wool Carder Bee and the disappearance of the European Honey Bee. [TMA]

A Summary of:
THE EUROPEAN WOOL CARDER BEE - BIOLOGY, LIFE HISTORY, & BEHAVIOR

Unable to directly confirm the life history of the EWC Bee, and with minimum written information on this species to rely on, except for the five years I have observed and recorded notes about this bee, along with previous studies I have done on other solitary bees, including carpenter bees, I will try to postulate and summarize the biology and life cycle of this bee.

A relative of the leafcutting bees, in the family Megachilidae, the European Wool Carder Bee is a "solitary" bee. The female EWC Bee oviposits one egg at a time in individual tube shaped cells or "capsules" placed end to end, the same as other leafcutting bees and carpenter bees practice. Note: carpenter bees chew and excavate their own custom-sized nesting tunnels in solid "dead wood" (in dead tree branches or stacked firewood, porch-posts, or in the wood frames, including "redwood," of buildings). Comparatively, leafcutting bees usually occupy existing cavities or tunnels of the proper size in wood, although, they too can dig out holes or burrows in soil and soft rotting wood. There are 682 different species of leafcutting bees of the family Megachilidae in the U.S. and Canada; more than 250 species have been described in California alone.

The European Wool Carder Bee cells are lined with fibrous or "woolly" plant material scraped, combed, or "carded" from leaves, stems, or soft bark of plants and trees by the use of the formidable five-toothed mandibles of the female bees. Their nesting tunnels can easily be identified as they are "plugged" with a tuft of hairs [ref: 2]. The EWC Bees' nests are small and most likely short, 6-inches or less in length, (most nearly similar to a short oversize drinking or soda straw). The nest may consist of a single tube or side by side parallel galleries, and more than likely contains fewer than two-dozen to thirty cells each containing a single bee larva. Dissimilar to honey bees and social wasps (such as hornets and yellowjackets), large colonies are not produced by the EWC Bee.

Sometimes leafcutting bees are considered to be pests, as they damage the foliage of plants, especially that of prize-winning roses, when cutting circular holes in the leaves and petals of flowers used to build and line their nests. Damage to the plants is usually cosmetic, but serious defoliation has been reported in some plantings in our western states. The EWC Bee, too, may slightly damage the leaves, stems, branches or trunks (causing wounds) of the plants and trees they scrape the plant material from used to build their nests. The wounds could be corrosive, gradually weakening or destroying the outer protective epidermal layers of the plant stems and branches. (Note: I have witnessed female EWC Bees scraping the bark from the trunk of the "bird of paradise tree," Poinciana =Caesalpinia gilliesii. TMA.) Yet, EWC and leafcutting bees aid in pollinating flowers in our gardens to our agricultural plantations.

Unlike most other familiar bees that carry pollen on their hind legs, the female EWC Bee collects pollen which is then carried on a brush of hairs (scopa) on the underside of her abdomen. Some pollen may adhere to her face or head and to the top of her thorax and her legs as she visits a boundless variety of flowers. The adult female bee prepares "beebread" or a pastelike loaf of bitter yellowish brown flower pollen and nectar which in turn is provided in each cell to feed her larval offspring for the duration of their development. The one-time provision, which has antibacterial and antifungal properties, does not spoil or ferment, and is quantity sufficient for each grub's maturation. The female EWC Bee plugs and deserts her nest after the last capsule-like cell is formed, filled with beebread, and the last egg is laid. The eggs are left to hatch, and the bee larvae feed and progress on their own. Unlike social bees and wasps, the female EWC Bee does not raise her young.

The bee larvae, in their individual cells, feed on the pollen provision, grow, and eventually transform into the pupal stage. They then emerge (termed "eclosion") from the pupa into adult bees (either male or female) completing their holometabolous metamorphosis (egg, larva, pupa, & adult stages). In reverse chronological order, the adult bee of the last egg laid in the last cell constructed by the female EWC Bee, would be the first adult to emerge at the nest opening where a plug of fibrous plant material has been placed. The adult bee of the second to the last egg laid is the second adult to emerge... and so forth, and so forth... until the adult bee of the first egg laid is the last to emerge from the tubular nest. Otherwise, the adult bee of the first egg laid in the first cell constructed by the female EWC Bee would have to chew and force its way through its brothers and sisters in their cells in order to reach the exit of the tubular burrow or nest. From the number of bees observed in the field, it is estimated that the male to female sex ratio is 50-50 or near equal.

Research has shown that in other solitary bees, adult female bees emerge from the first cells formed deeper in the nest, while adult male bees emerge from the later cells formed closer to the nest exit. The males, which are first to emerge from the nest, then wait outside of the nest for the females to emerge, with which they immediately mate. This may not necessarily be the case for the EWC Bees, as the male bees appear to mate frequently with the female bees throughout their adult lifespan.

In the spring, at the end of April, throughout May and early June, adult male and female EWC Bees appear from their overwintering stage. They look for and feed on the nectar of flowers. The male EWC Bees immediately scout out, locate, delineate, patrol, and defend their new found flower bearing territories. The male EWC Bee does not guard the flower-patch territories for himself, but to ensure that there are plentiful supplies of pollen and nectar in order to attract female EWC Bees into his domain(s). The female EWC Bees begin finding locations to build their own nesting sites. The males constantly feed on

nectar, mate with females, and continue to patrol and protect their territories. In turn, the female EWC Bees readily mate with male EWC Bees, construct their separate nests, and one by one, form each offsprings' maturation cells within their nests. The female EWC Bee supplies the necessary provisions (pollen and nectar beebread) into each capsule-like cell, constructing one cell at a time. She then oviposits a single egg in the cell, seals it with scraped plant fibers, then begins constructing the next cell. The eggs hatch, one per cell, into larvae, which in turn feed on the beebread, grow, and develop into pupae, remaining in their individual cells.
[for photographs, see refs: 7 & 8.]

The European Wool Carder Bee most likely overwinters as a pupa in the warm plant fiber-lined tubular nest in the protected hollow where it was built by the female EWC bee the previous year. From my observations and data, the bees eclose from the pupa into the final growth stage, the adult bees (both male and female), and emerge from the nest in early to mid spring. Later constructed nests with later developing larvae may even spend the winter in the larval stage in their nest cells, in a dormant or "hibernation" stage, and complete their pupation in the spring. This would mean that the adult bees from later broods could emerge in the late spring or early summer. The adult life and active mating, nest building, and patrolling behavior of the EWC Bee appears to continue through early to mid autumn, and maybe into early winter in warmer regions. But in general, the adult EWC Bees live for several months, from spring through autumn.

As the EWC Bee is native to Europe, a continent with a colder climate than most of the United States, it has adapted to much colder and harsher winters than we here in the states endure. The EWC Bee has already established itself in the southern portions of Canada, again where temperatures are a great deal colder than the southern portion of the U.S. Alternate or variable life cycles with early and later larval developmental stages would enhance and ensure the survival of the species in case of natural disasters or adverse weather conditions such as ice storms, extended winters, or late spring season frosts, and the like.

The nests have been constructed, the cells filled with provisions, the eggs laid and hatched, and the larvae have grown. The larvae will turn into pupae in the late fall or early winter where they will "hibernate," remaining in their individual capsule-like cells. The "miracle of transformation," the change from the pupa into the adult bee, takes place, and the life cycle begins anew. A new generation of EWC Bees will emerge in the spring. Reappearing annually, one generation of European Wool Carder Bees is produced per year.

[This inchoate and unconfirmed synopsis is based on observations, outlined later, of the EWC Bee and the life cycles and histories of similar bees and other insects. T. M. Allen.]
[see also refs: 6 & 15.]

A Summary of:
THE EUROPEAM HONEY BEE (EHB) - BIOLOGY, LIFE HISTORY, & BEHAVIOR

The European Honey Bees (EHB), Apis mellifera mellifera and Apis mellifera iberica (family: Apidae, order: Hymenoptera), were introduced to North America in 1607 [ref: 5]. In comparison to the European Wool Carder Bee, honey bees are "social" bees and live together in large colonies within a hive. "Wild" or "feral" colonies live in hollow tree trunks or other natural cavities (sometimes in undisturbed manmade structures, under buildings, in the dense foliage of trees, or even in abandoned automobiles). "Managed" (by humans) or "domesticated" colonies live in specially designed manmade box containers. Some say that there are an equal number of "wild" and "managed" honey bee colonies throughout North America.

The honey bee colony consists of three castes of bee, the workers, the drones, and the queen. Honey bee colonies are perennial, continuing for several years, with a single queen and thousands of honey bee workers overwintering in the hive. Drones are summer residents only.

A honey bee hive may contain 8,000 to 40,000 or more (some estimate up to 80,000) "sterile female worker bees" and hundreds of "male drone bees," all ruled by a single "queen bee." The queen bee may lay about 1,200 (and sometimes up to 2,000) eggs per day. Fertilized eggs develop into sterile female workers. Even though some female worker honey bees have been known to deceitfully lay an infertile egg or two in the colony's wax cells meant for the queen's oviposition only, other mindful worker bees destroy the unacceptable eggs before they hatch. (Some insects can lay unfertilized eggs, which hatch and develop; the development of unfertilized eggs is termed parthenogenesis and is quite common in the social Hymenoptera.)

The queen's unfertilized eggs develop into the male drones which do not remain in the colony for long and are forced out or eventually killed by the workers. The hive, depending on the size, contains 300 to 3,000 totally dependent "male drone bees." They live in the hive only in the summer months, being fed and cared for by the female worker bees, utilized by the queen only for insemination. Drone bees, though, can be kept on standby to mate with other queens in other hives. Once mating with a queen, the drone bee dies (as their sexual organs are expelled during coitus). Promiscuous behavior of the queen bee with many male drone bees helps to mix up the gene pool, allowing more genetic diversity, strengthening immunities, and ultimately helping honey bee colonies survive.

The average life span of an adult female worker bee is about six weeks. The queen bee lives for approximately one year, but can live for as long as two or three years. Honey bees are holometabolous, developing and maturing through the four stages of complete metamorphosis. Inside of the honey bee hive there are always eggs, larvae, pupae, and adult bees in different

stages of development. New adult bees including workers, drones, and sometimes a new queen, are always emerging from the pupae in their wax cells and replacing the older bees.
[Honey Bee Summary by T. M. Allen]

HONEY BEE BY-PRODUCTS

Honey bees produce honey, beeswax, propolis, and royal jelly, all valuable products utilized by humankind from early/prehistoric to modern man. Honey cannot be manufactured or synthesized by man. Honey is produced by honey bees by mixing flower nectar along with digestive enzymes and the bee's saliva in the honey stomach of the honey bee; regurgitated and dehydrated back at the hive, the nectar becomes concentrated and eventually turns to honey. Beeswax is produced by young worker bees in the hive from eight glands in their abdomen that secrete wax; it is used to build and repair the hive and seal the honey comb cells that store the bees supply of honey.

Honey bee by-products have long been and are currently used in everything from making candles and beeswax crayons, to wax coatings, varnish, sealants, lubricants and polishing products, to shoemaking, to lipgloss and chapstick, facial make up and cosmetics, lotions, potions, and creams, and in hair shampoos. They are used in sweeteners and syrups, salad dressings, to baked and cooked goods (pies, cakes, biscuits, cookies, breads, cereals, breakfast and energy bars, candies, and much more), ... honey baked hams, bar-b-que sauces, and even ice cream and yogurt, or the bee-pollinated fruits and other ingredients, including milk and dairy products (from our livestock fed alfalfa pollinated by honey bees and others). These are but a few of the valuable and necessary commodities, food, and everyday or frequently used products made possible by the honey bee.

Honey doesn't "spoil" easily as it contains natural antibacterial properties, preservatives, antioxidants and is slightly acidic. Medicinally, honey and propolis are used in the pharmaceutical industry for everything from allergy cures to internal ailments, and are included as important ingredients in commonly used medicines, including cough and cold syrups, sore throat pain reliefs, skin treatments, wound and burn remedies (antiseptics), and cancer aiding treatments, just to name a few! Australian doctors are now using honey as an agent to combat antibiotic-resistant bacteria.

Propolis, a substance that honey bees produce by mixing tree resins and their own saliva has antibacterial properties and is used as a natural health aid as an ingredient in toothpaste and as a medicinal substance in treating wounds. It is actually used by the honey bee to seal off gaps or unwanted holes in their wild and manmade hives and prevent the spreading of germs. If a small animal intrudes into the hive and dies, the bees, if they cannot push it out, use propolis to coat and seal the carcass, which prevents it from decomposing and bringing about further disease.

Royal jelly, a liquid that worker honey bees secrete from their mouths, also known as "bee milk," contains vitamins, proteins, and sugars. Young worker bees regurgitate royal jelly specifically for the queen bee to eat; they also feed royal jelly to a new larva for the purpose of rearing a new queen bee. Royal jelly spoils easily, but is still sold as a health supplement, although there is no scientific evidence of its nutritive value.

Overlooked by most in our "western world," honey bees provide a direct source of food for many people of different cultures around the world. Eating insects as edibles or cuisine, termed "entomophagy," served "au natural," dried or fried, baked or caked, breaded or cooked, many types of insects are raised for direct food consumption. The larvae and pupae of bees (and wasps) are frequently consumed by many people. They are high in protein and high in healthy fat. Insects are also high in vitamins and minerals. Some grocery stores now offer insect specialties for sale, and some restaurants even serve up insect delicacies on the menu here in the United States. [see ref: 14 for more "insect" food ideas.]

Honey bees, of course, did not evolve and do not make these bee by-products for man's consumption or use. But no other species of bee or insect provides the human animal with these bee by-products or the volume [of] which is required to sustain our current living standards, comforts and amenities, selfish expectations, and overall quality of life. We would live in an archaic and "sour society" without the honey bee [TMA].

HONEY BEE SERVICES

Honey bees, though, provide their greatest service to all species in the plant and animal kingdoms, through their thoughtless selfish act of collecting pollen (to feed the brood) and nectar from flowers in order to produce and store honey to feed themselves and their offspring (especially through the winter season, when flowering plants go dormant) for the purpose of perpetuating and continuing the survival of their own species. In so doing, they fortuitously provide the necessary pollination to ensure the propagation of all flowering plants and trees. [TMA]

Pollination, whether by wind or assisted by bees and other insects and animals, is the way advanced plants create seeds, which germinate and grow more plants, continuing and preserving their species. Although there are over 3300 other species of indigenous bees in North America, along with other pollinators including wasps, flies, beetles, butterflies and moths, and even hummingbirds and bats, it is the honey bees and bumble bees (both in the family: Apidae) that provide the vital service of pollinating man's commercial agricultural crops.

Some of the orchard fruits benefiting from honey bees' interactions include apples, pears, avocados, cherries, peaches, plums, nectarines, and citrus (i.e. oranges, tangerines, lemons,

etc.) and nuts (especially almonds, which are solely pollinated by honey bees, as the majority of native bees have not yet emerged from their overwintering stages at the time of blossom).

Other commodities and staples pollinated by honey bees include strawberries and other berries (i.e. blueberries, cranberries, thornless boysenberries, etc.), squashes, pumpkins, watermelons, lettuces, tomatoes, broccoli and other vegetables, cotton, countless other field crops, even livestock feed (the sources of man's meat and dairy products).

Honey bee pollination is also needed for community and backyard vegetable and garden plantings along with cultivated and landscape flowers. Do not forget all of the naturally occurring indigenous and wild botanicals from the Atlantic to the Pacific Oceans. Upon its introduction to North America in the early 1600's, the European Honey Bee readily adapted and accepted its new role and conquered the new land along with its introducer, European man.

It is the European Honey Bee that relandscaped the North American Continent into the land we know and prosper from today. The honey bee is the only pollinator that can be manipulated, mass transported, and used to insure the propagation of modern man's massive agricultural industry. In conjunction with pollination, the honey bee is our only source of honey and beeswax, the honey bee by-products which are harvested on a large exacting scale. Honey bees are indispensable to the current diet, health and well-being, and survival of man. [TMA]

NEGATIVE ASPECTS OF THE HONEY BEE

Honey bees, termed "white man's flies" by the Native American Indians, are feared by many. Their self-defensive poisoned daggers (stingers), are responsible for more human fatalities each year than all other venomous insects (excluding disease transmitting mosquitoes), arachnids (including spiders and scorpions), and vertebrates (including snakes) combined. It is estimated that 40 to 100 people in the United States die each year from insect stings. Victims (man or animal) of a female (only the female bees, wasps, and ants can sting) worker honey bee sting, or multiple stings, can suffer or die from anaphylactic shock or allergic reactions to the bee toxin.

Honey bees, compared to wasps and ants, can sting only once, as the bee dies soon after the stinger is inserted into her victim. The stinger and poison sac is unavoidably "ripped" from the bee's abdomen at the moment of the stinging incident, as the stinging dagger remains anchored into the victim's skin by the use of microscopic barbs. But the stinger's poison sac's involuntary muscles continue to pump the acidic venom into the wound of the victim. The stinger itself is actually the modified ovipositor (used to lay eggs) of the female gender, and is usually withdrawn into the abdomen when not in use.

Honey bees, highly adaptable themselves, are able to fly in cool and hot temperate regions. Most insects, especially larger ones, being cold blooded (poikilothermic), require high temperatures in order to warm their flight muscles so they can fly. In colder conditions, honey bees can warm themselves up by huddling together, "vibrating" their wings or "shivering," sharing their body heat, raising their internal body temperatures, thus making it possible to fly and continue their chores of collecting pollen and nectar. Oppositely, on exceptionally hot days, by regurgitating some of the nectar from their crop, out their tongues (proboscises), resulting in the evaporative cooling of the head and thorax, honey bees are able to cool their body temperatures; this allows them to fly at remarkably high temperatures, even on days with temperatures up to 115-degrees Fahrenheit! In general, they are more successful than bumble bees and other indigenous bees in colder regions, humid tropical localities, or in extreme desert environments. Because of these and other abilities to adapt and thrive in so many environs with differing climates, honey bees have become superior competitors themselves, and have the tendency to displace native bees in many parts of the world.

Another Negative Aspect of the Honey Bee:
THE AFRICANIZED "KILLER" HONEY BEE (AHB)

The Africanized Honey Bee (AHB) is the insect most feared by the majority of inerudite people. There exists only one true species of honey bee, Apis mellifera Linnaeus, which includes several recognized races; races are designated by the third word in the scientific name -- it is the subspecies or "race." These races can interbreed and reproduce. As stated previously, under "The European Honey Bee - Biology, Life History, & Behavior," the European Honey Bees, Apis mellifera mellifera and Apis mellifera iberica, were the first races of honey bees introduced to North America. Here in North America, another race of honey bee has been intentionally introduced, the Italian race, Apis mellifera ligustica, a much more docile race of honey bee that remains calm around humans.

But it is the African race of honey bee, Apis mellifera scutellata (=adansonii), that has invaded North America and secured the reputation as "The Killer Bee." Because of its aggressive behavior of guarding and defending its hive, mainly from being "robbed" of its honey reserves by animal predators (and prehistoric or early native man), it belligerently drives off intruders from and around its hive. The bees begin swarming and launching an all out attack, responding to "alarm pheromones" released by the first stinging "guard" bees. Hundreds or more additional individual female worker bees, from within the hive, reacting to the pheromones, each report, able to sting the intruder only once, but with an overwhelming number of bees and omnipotent ferocity, can kill an animal or human in the process. In African forests, the stings from multiple bees have even been reported to drive large African elephants away from the AHB

beehive locations. The attacking swarm of Africanized Honey Bees may even chase menacing intruders up to one-quarter of a mile away from their beehive.

The sting of a single Africanized Honey Bee is no more toxic, and is actually less potent than the other races of European Honey Bees. Note that the Africanized Honey Bee cannot be visually recognized from other races of honey bees; DNA testing is required for positive identification of AH Bees.

Much has been reported and written about the Africanized "Killer" Honey Bee, so I will try to focus on this race of bees in regards to its relationship with the European Honey Bee. First, I want to express that the Africanized Honey Bee is not directly involved with the disappearance of our "domesticated" or human-kept European Honey Bees or CCD. The Africanized Honey Bees do not kill European Honey Bees. As the AHB is a more dominant strain, it has, though, interbred with and domineered the "feral" or "wild" honey bee colonies; it hasn't displaced or killed the "wild" European Honey Bees, it has simply "replaced" its genetic lineage into the "wild" population.

There are two ways in which the African Honey Bee replaces a hive of European Honey Bees. One is that an AHB queen bee, along with a band of aggressive workers, invades a docile hive and kills the reigning EHB queen bee. The new AHB queen bee immediately begins to lay her AHB genetic coded eggs, producing her own progeny in the hive. The remaining EHB workers unknowingly care for the new AHB brood. Within 6 weeks or more, the beehive has been replaced with the Africanized race of bees.

The second way a docile EHB hive is converted to an AHB hive is when a number of AHB drone bees (the males) forcibly mate with the wild EHB queen, incorporating the AHB genetic code into the next multi-generations of eggs being laid by the EHB queen. The EHB queen unknowingly lays eggs that are genetically "Africanized," each larva maturing into an aggressive worker honey bee. Again, within weeks, the EHB hive has been "replaced" with the Africanized race of bees. The EHB queen is then eventually replaced with a new AHB queen when the Africanized worker bees feed selected larvae royal jelly in preparation for a new queen.

Some beekeepers believe that by releasing and "flooding" the locals where they maintain their beehives with hundreds of "clean" or documented stocks of European Honey Bee males or drones, adding to the existing number of EHB drones already produced in the hive during the mating season, they can reduce the chances and abilities of incipient populations of Africanized Honey Bee drones from outcompeting, mating with the EHB queen, and taking over and replacing the European Honey Bee genetic lineage of their colonies with the African Honey Bee heredity.

Although the Africanized "Killer" Honey Bee is not directly involved with the disappearance of honey bees, it may be partially blamed for harboring and transmitting diseases or parasites (especially mites) that may affect European Honey Bees which it carries as it infiltrates new territories.

It has also been reported that the Africanized Honey Bee "has the potential to have a devastating impact on California's agricultural industry and to threaten public health and safety" [ref: 11]. It is expected that Africanized Honey Bees will eventually replace unmanaged or the "wild" colonies of European Honey Bees.

As of this report (in 2013), the Africanized Honey Bee has been in California now for about 18 years. Additionally, I must add that fewer people are actually killed by the Africanized "Killer" Honey Bees each year than by our less-aggressive races of European Honey Bees. Deaths are mainly due to the allergic reactions of a few and rare individuals, usually accidentally received from multiple stings of the Africanized Honey Bees.

As the Africanized Honey Bee evolved in the regions of warmer climates with more temperate conditions, it is generally believed that it will not be able to withstand and survive the colder temperatures or be able to overwinter in the freezing regions of our northern states in North America. The AHB, though, may be able to travel northward in spring and summer months, when temperatures are more conducive to its needs.

THE AFRICANIZED "KILLER" HONEY BEE IN RELATION TO THE EUROPEAN WOOL CARDER BEE

There is no doubt that the male European Wool Carder Bee will attack, maim, and destroy, if necessary, any female worker African Honey Bees that wander into his territory. African Honey Bees are not territorial or aggressive themselves when out foraging for pollen or nectar. The female worker African Honey Bees are also a bit smaller than the female worker European Honey Bees. So it would not be difficult for the male European Wool Carder Bee to overpower and defeat an African Honey Bee. The AHB is only aggressive in and near its hive and it is not usually aggressive towards other insects. The Japanese Hornet (discussed later), though, would face a challenge (when and if the two species ever coexist together in the same country) if it encounters or launches an attack on an AHB hive.

EUROPEAN WOOL CARDER BEES and HONEY BEES; ORCHARD BEES, ROBOTIC BEES, and HUMANS AS POLLINATORS

As stated previously, the Africanized Honey Bee can mate with the European Honey Bee and reproduce viable progeny. Several individuals have asked me if the European Wool Carder Bee could mate with the European Honey Bee and reproduce... maybe even produce an intermediate bee of some sort. The answer is NO! (It would be like trying to crossbreed chickens with ducks.) The EWC Bees and EH Bees are two separate species, in two widely separated families. Only individuals of the same species, including subspecies or races (of which the African and European Honey Bees are), can mate and successfully reproduce viable offspring. Secondly, the worker honey bees (any race) encountered by the EWC Bees in the field are sterile; although again, as I stated previously, sometimes a sterile worker honey bee will deceitfully deposit an egg in the hive. Only the honey bee queen can lay viable eggs, and the EWC Bees are not going to encounter queen bees in their domains.

The European Wool Carder Bee (as the majority of all other bees) does not make or produce honey or beeswax. The EWC Bee is not a bee that can be bred by humans, transported or moved about, or used as commercial pollinators as is our European Honey Bee.

Even the recently studied and introduced "mason" or "orchard bees," also known as "metallic leafcutter bees," including, Osmia laeta (family: Megachilidae), employed to pollinate apples, pears, and some other fruits, cannot be utilized in mass quantities as the honey bees are. And not to forget, they do not produce honey or beeswax! Note that Osmia spp. are native to North America, and more than 75 species have been described from California [ref: 93].

Before and since the early Egyptians, man has cultivated and "domesticated" the honey bee over several thousand years to provide honey and pollinate his agricultural crops. It will take that long or more to train another species of insect or multiple species of insects to accomplish this tedious mission. As far as employing robotic drone bees or flies in order to pollinate crops on a massive scale, the technology does not exist and is only science fiction at most; and there would be no by-products such as honey or beeswax!

As currently practiced in China, as honey bees there have or are disappearing (being blamed on CCD), 10,000 humans have been employed in a Herculean task, donning bamboo poles, with feathers attached to the tips, individually touching thousands of pear and apple blossoms during the blooming season, in order to accomplish the pollination of these valuable orchard crops normally done by the honey bees. Imagine this technique being employed in the 800,000 acres of almond orchards in California alone each spring! Again, there would be no by-products such as honey or beeswax!
Note: CCD reported in southwestern China... the EWC Bee is there.

THE EUROPEAN WOOL CARDER BEE and ITS AFFECT ON HONEY BEES, and POSSIBLE ROLE IN COLONY COLLAPSE DISORDER (CCD)

I discovered the European Wool Carder Bee here in Sacramento, California, in 2009. Internet computer searches by others (including professionals from the agricultural offices and researchers from the local university), indicated, previous to that time, the EWC Bee had not been found west of Missouri. The EWC Bee has now been collected throughout the United States from Rhode Island to California and in Canada from Nova Scotia to British Columbia (coast to coast) [ref: 2]. My discovery here in California occurred about 3 years after large numbers of honey bees were reported disappearing and "Colony Collapse Disorder" (CCD) was assigned (in 2006) as the ailment of "honey bee hive desertion."

The European Honey Bees are not simply deserting their hives... they are being maimed and killed by a savage, dominant, competitor species of bee, the European Wool Carder Bee, while out foraging for pollen and nectar. They cannot return to their hives... especially without wings, antennae, heads, tarsi (feet), or after being left at their foraging sites bleeding to death after being stabbed by the male European Wool Carder Bee's five stout chitinous spines or weaponry also referred to as "pseudostingers," sometimes called "posterior abdominal teeth." [TMA=pseudostinger(1972); also see ref: 9 =pseudostinger =teeth.]

My observations reveal that the preferred method a male EWC Bee uses to disable a honey bee is to sever or cut off one or more of the four wings a honey bee possesses. Honey bees, as all their other relatives in the order Hymenoptera, including bees, wasps, ants, and sawflies, possess four wings. Honey bees have four separable wings to aid them in folding their wings over their backs when crawling or working inside of the close quarters of the hive. The two fore (front) wings are held or hooked with the two rear wings with microscopic hairs called "hamuli" (similar to a simple strand of velcro), creating two large, more powerful wings, which enhance the bee's flight capabilities. This is necessary to the bee especially when carrying large payloads of pollen, nectar, or water. By cutting off, tearing, or clipping one or more wings, front or rear, the honey bee has no control over its flight ability, just as an airplane with a damaged wing, and cannot return to its hive. The worker honey bee, sometimes after completing her laborious work of collecting pollen or nectar, is left crawling around on the ground, and "rubbing" her damaged or missing wing(s) with her hind legs.

A clipped antenna, another way EWC Bees maim honey bees, too, renders a honey bee helpless, as the honey bee loses its guidance and sensory systems. Other injuries to the honey bee, described above, are all self-explanatory. Although, some honey bees and other leafcutter and long-horned bees are able to continue near normal functions after losing one or more of their tarsi [from observations and dismembered and impaired specimens collected by T.M. Allen].

KNOWN ENEMIES OF HONEY BEES, OLD and NEW

My research shows that the European Honey Bee has been gradually disappearing for several decades. News of honey bees, continuing to be in trouble, gained limited attention in 1998 [ref: 10] when it was reported that honey bee numbers were declining throughout North America for reasons unknown. Honey bees suffer losses from numerous enemies, including predators, parasites, and diseases, just as any other species of animal on Planet Earth.

Insect pests such as the "lesser and greater wax moths," Achroia grisella (Fabricius) and Galleria mellonella (Linnaeus), respectively (family: Pyralidae, order: Lepidoptera), are serious pests and intrusive invaders of honey bee hives. Once inside the hive, the larvae (which feed on wax) of these moths eat and tunnel through the waxy combs; a honey bee comb can be destroyed in just a matter of weeks.

Honey bee populations have also been compromised since the mid-1980's with the accidental introductions of the large external blood sucking "varroa mites," Varroa destructor (=jacobsoni) (ectoparasite), and microscopic internal respiratory "tracheal mites," Acarapis woodi (endoparasite), (both of the order: Acari, class: Arachnida). The "varroa mite" originated in Southeast Asia where it is a parasite of the Eastern Honey Bee, Apis cerana; it is now found on every continent except Australia.

In addition, insect pathogens, as the Israeli acute paralysis virus, are being transmitted by a Microsporidian, Nosema ceranae (family: Nosematidae, order: Microsporida), a protozoan that destroys the lining of the adult bee gut causing gastroenterological issues and death; these protozoa have a high potential for spreading viruses and other microorganisms. It is, of course, related to an old honey bee foe, Nosema apis, which causes serious dysentery (aka: "foul brood") of bees. [ref: 4 & How To Know The Protozoa.]

And another new insect pest, the "small hive beetle," Aethina tumida (family: Nitidulidae, order: Coleoptera), is invading bee hives; they don't feed directly on adult bees, but its presence in the hive contaminates the honey and causes the honey bees to desert the hive. The beetle larvae feed on the bee brood and honey, causing the honey to drip from the cells and ferment, thus causing an odor that drives the adult honey bees out of the nest. Originating from South Africa, the small hive beetles were found in Georgia (U.S.) honey bee colonies in 1998. [ref: 4 & misc. newspaper articles].

Then there are the "Rasberry crazy ants," Paratrenicha sp. near pubens (family: Formicidae, order: Hymenoptera), that have invaded Texas (through the port of Houston, in 2002). Although these fast moving "crazy" ants eat the stinging fire ants (see fire ants, referred to later) they also feed on beneficial insects such as ladybird beetles (aka: ladybugs) and honey bees

-- they simply overwhelm a beehive in massive attacks. These new invasive pests, as the mites, viruses (spread by the protozoa), and hive beetles described previously, have similarly and recently become established in North America [ref: 4 & misc. newspaper articles].

OTHER NATIVE (INDIGENOUS) and COMMON PREDATORS OF HONEY BEES

It should be noted that other indigenous predators such as the praying mantis (family: Mantidae, order: Orthoptera /Dictyoptera) sometimes feed on honey bees; some species, though, have been introduced to North America. But they are not usually mature or large enough to catch and eat honey bees until late summer and autumn; and they only kill to eat... not maim, or destroy, or murder as the European Wool Carder Bee does.

Here in Sacramento, the native "wild" praying mantises' egg cases (ootheca) hatch in summer, the first instar nymphs emerging from very late April through early June; the nymphs, 1/4-inch long, are not capable of catching a honey bee until they reach adult maturity in very late July through late September [TMA]. Praying mantis' egg cases are also sold at garden centers and biological control supply stores. As "insect novelties," they are purchased by many backyard gardeners and other eco-friendly enthusiasts in hopes of introducing an insect predator to control insect pest species in their gardens. Most buyers of this active and entertaining carnivorous hunter are not aware that it catches and eats anything it can overpower... including honey bees! How disappointing to the gardener or environmental enthusiast trying to protect the honey bees. But in all fairness, the praying mantis feeds on so many different kinds of insects, including small to large flies, crickets, wasps, butterflies, and more, that its hunger is generally satisfied with the variety and supply of prey, and only a small portion of its diet consists of honey bees.

Other native predators include the carnivorous bee-killer robber flies, especially the "bumble bee robber fly," Mallophora fautrix fautricoides, and the "bee killer," Promachus fitchii, along with other species of robber flies (family: Asilidae, order: Diptera). The bumble bee robber fly sports the same colors as and actually looks like a bumble bee, although it does not commonly prey on bumble bees; mimicking the bumble bee affords the fly protection from predators that might consider it a next meal. Another massive bee killer, the Belzebul bee-eater, Mallophora leschenaulti, is named for the devil, and the word translates as "lord of the flies." Sacken's Bee Hunter, Laphria sackeni, another robber fly and bumble bee mimic, lives in open mountain habitats in coniferous forests where there are flowers; they attack honey bees, wasps, and other flower visitors. Although bees and wasps have stingers, they are unable to defend themselves from robber flies, especially when taken from behind by these swift aerial attackers. Mallophora spp. and Laphria spp. are quite common and regularly prey on honey bees for their

food and sustenance; again, they are not mature until late summer and autumn, and they only kill to feed themselves. The carnivorous larvae of the robber flies live independently on or in vegetation, or in stumps and logs, feeding on worms, beetle grubs, other insect prey, and whatever they find scrumptious.

There are also the "bee-killer wasps" (aka: "beewolves"), Philanthus spp. (family: Sphecidae, order: Hymenoptera), which kill and provision their nests with bees or ants for their larvae to consume during their development. There are more than thirty native species of Philanthus in North America. These bee-killer wasps evolved over hundreds of thousands of years on the North American continent without the presence of honey bees (as the honey bee wasn't introduced until some 400 years ago), so they adapted to preying on the indigenous bees common to the land. They all seem to prefer wild bees, so their predation on honey bees is limited and their effect on honey bee populations is most likely negligible. One species here in North America though, Philanthus bicinctus, the bumblebee-wolf, is a formidable enemy of bumble bees.

But in Europe, the Philanthus species of beewolves there are not popular with the beekeepers as they prey exclusively on honey bees. It is reported that a single female beewolf may catch as many as ten honey bees in a day, taking them back to their nest to feed their brood. With a local population of 3,000 bee-killer wasps, which is not unusual, the beewolves could capture 30,000 honey bees in a day -- the number of adult bees in a single hive! They usually go unnoticed by the beekeepers as they hunt a distance away from the beehives at flowering areas (similar to the European Wool Carder Bee) where the honey bees travel to in order to gather pollen and nectar. But in the winter, with very few flowers in bloom, the beewolves hunt at the beehives, attacking, clutching and flying off with foraging honey bees as they return to the beehive. [See ref: 13 for information included in the above paragraph].

OTHER FORCES (NATURAL and UNNATURAL) AFFECTING HONEY BEES

Honey bees, as other insects, also suffer great losses from adverse yet common weather conditions including rain, wind (especially hurricanes and tornadoes), freezing temperatures, extreme heat, and drought. Natural disasters such as floods and forest fires also quash wild and domestic honey bee hives.

Another, sometimes forgotten, killer of honey bees are the radiators and windshields of cars and trucks. A seasoned beekeeper knows better than to locate his/her beehives near a high-speed roadway. Hundreds if not thousands of honey bees leaving and returning to their hives are smashed upon impact with high-speed vehicles. Over the last 60 plus years, after the construction of smoother paved roads and better and safer designed vehicles, allowing for faster automobiles and larger transport trucks, honey bees, butterflies, and other insects have

not adapted, nor will they, to fly higher over highways and freeways. The worker honey bees flying outside of the hive do not reproduce; so even if they survive their trek over the roadways, their genes are not being passed on to the next generations.

CHEMICAL PESTICIDES AFFECTING HONEY BEES

The honey bee, also, is subjected to and succumbs from the application of chemical pesticides put towards other insect and plant pests "targeted" for control or eradication by man. The direct spraying of a pesticide onto agricultural crops or rangeland, and even small backyard gardens, can have a devastating effect on honey bees and other beneficial organisms. The aerial applied "blanket" insecticides used to wipe out insect pests such as "the Medfly" or mosquitoes (routinely applied here in the Sacramento Valley to halt the mosquito borne disease West Nile Virus), kills untold numbers of honey bees and other beneficial and nontargeted insects, even when sprayed after dusk when honey bees should have returned to their hives [collection data, TMA]. Pesticides cannot directly hit the intended target pest and do not discriminate--they kill or adversely affect every species of living organism they come into contact with! Even the accidental "drift" of pesticides (chemicals landing on nontargeted areas due to strong breezes or wind currents) can kill honey bees.

Chemical pesticides have been blamed for the loss of our honey bees for a long time. Some are now attributing fungicides and seed coating chemicals (especially the neonicotinoids) to the disappearance of honey bees. But that is another issue mired in controversy and fraught with opposing arguments. As the (sole) author of the "Restricted Materials Permit (Computer) Program, Instruction Manual," November 14, 1986, and computer programmer aid and computer software installer for the California State Department of Food and Agriculture, I am fully aware of the delicate balance between the use of chemical pesticides and the protection of our environment and flora and fauna, especially our honey bees [T.M. Allen].

HONEY BEES and THEIR RELATIONSHIP WITH WATER

But another main source of honey bee kills is sometimes overlooked... WATER. Honey bees need water, lots of it; much of it is used to produce their honey. On extremely hot days, more water is collected by the "water carrier bees" and brought back to the hive in order to cool it down. Massive die-offs of honey bees can occur from poisoned or chemically treated water, as sometimes found in over-chlorinated swimming pools or contaminated horse troughs, etc. The "water bees" collect and bring back water in their expandable honey stomachs (where the contents are not digested, also used to transport flower nectar), to expel and "wing-fan" at the entrance, into the hive, to lower

the internal temperature of the hive (similar to a swamp cooler). When the water is contaminated, tainted, or poisoned, it is equivalent to "spraying" a pesticide into the hive. This will not only cause a high number of fatalities of the bees, this can wipe out an entire colony in a day! Remember that bees, as other animals, need a constant supply of fresh water all year round.

"Scout" bees signal to the "water bees" where the water sources are located; so all of the bees from the hive where they receive their instructions go to that water source. Other bees from other hives may or may not repair to the same water sources. This is why beehives located in the same area may or may not be affected from locally contaminated or poisoned water, as they may get their water supply from a different source. Water can be accidentally contaminated from "pesticide drift" (see above), or it can be intentionally poisoned, per se, by someone introducing a chemical into a backyard birdbath, fish pond, or stagnant swimming pool in order to control mosquitoes and/or their larvae. Some people have been known to set out containers of water treated with antifreeze or other poisons to kill pesky or annoying animals such as stray cats or skunks; this practice is forbidden by law, as the sweet tasting poison water kills unintended victims such as birds and honey bees or other animals. A good beekeeper will surely provide his/her bees with a fresh source of clean water. [TMA]

BACK TO THE EUROPEAN WOOL CARDER BEE and ITS RELATION TO "CCD"

The reported arrival on the east coast (in 1963) and population growth and spread and establishment across North America to California (through 2009), of the European Wool Carder Bee, coincides with the reports and steady decreasing populations and the disappearance of our imported European Honey Bees over the last several decades. It is yet another factor directly killing honey bees, affecting the survival of our "cornerstone" beneficial insect. This time it is a threat to our bees outside of the beehives. One just has to "look outside of the box" to find the answer to our disappearing honey bees!

The European Wool Carder Bee is not a predator or a parasite of bees. It is an evolutionary aggressive dominant competitor and may I be so bold as to label it as an "invasive species" and "Butcher Bee!!!" Whether brought to the United States intentionally or unintentionally, the male EWC Bee is simply dominating territory, and food and natural resources, including pollen and nectar, and plant sources for the pubescence or "carded plant material" the female EWC Bee uses to pad or line her nest. He also protects his polyandrous females (those mating freely with many different males) from smaller or weaker males and other perceived trespassers in his domain. Note too, that the male EWC Bees are exceedingly promiscuous. Between drinking nectar for their own sustenance and chasing and killing intruders, they will mate constantly throughout the day with as many female EWC Bees as time allows (sort of like Bonobos). [TMA]

THE EUROPEAN WOOL CARDER BEE - MORE BAD BEHAVIOR

The male EWC Bee delineates his territory and additional satellite biogeographic realms (traversing between locations), and patrols or leks (displaying his prowess and courtship suitability), hovering in midair like a hummingbird, darting towards and attacking any visitor perceived as a threat to his territory and resources. He will also alight and rest on a leaf or twig in the vicinity of his territory surveying and waiting for unsuspecting honey bees, other species of indigenous leafcutter (Megachile spp.) or flower (Agapostemon spp.) or long-horned (Svastra and Melissodes spp.) bees, flower flies (family: Syrphidae), small skipper butterflies (family: Hesperiidae), or other unwary pollen/nectar collectors, from which he launches out off his perch and attacks. Anthophilous incomers to a male EWC Bee's territory are not welcome and are driven off, dismembered, mutilated, butchered, or stabbed by the sharp abdominal stout chitinous spines of the male EWC Bees. The male EWC Bees have even challenged me, hovering inches in front of my eyes (while I was standing upright), and defied me to leave the area.

Not only do European Wool Carder Bees (especially the males) "chase," "bump," and "physically maim" honey bees by cutting off their wings, antennae, tarsi, and heads, they have been observed cutting honey bees in half. I have found a couple of dead honey bees cut in half or with a large portion of their abdomens cut off; but I could not verify if they were actually attacked by a EWC Bee or a predator. A hobbyist beekeeper in Gold River (northeast Sacramento) I have consulted with, actually observed male EWC Bees enter her backyard, where she keeps her box hives, and aggressively chase and attack some of her honey bees. She has found honey bees "cut in half" in her yard near the beehives.

THE JAPANESE HORNET IN COMPARISON TO THE EUROPEAN WOOL CARDER BEE

The EWC Bee is not a predator like the Japanese Hornet, Vespa mandarina (family: Vespidae, order: Hymenoptera), in Japan. Japanese Hornets are carnivores. First, a "scout" hornet (adult wasp) locates a honey bee hive, marks the hive with location pheromones, then returns to its own nest site and alerts its nest members of its meaty find. The scout hornet then returns to the honey bee hive with a small army of hornets to raid the hive. The hornets are about 4-times larger than the honey bees and easily kill the adult guard and worker honey bees by cutting them into pieces with their powerful mandibles. A couple of hornets may be killed during the assault by swarming stinging honey bees, but the attack is so overwhelming that the honey bees succumb. As they are carnivorous, after killing the honey bees and honey bee brood (larvae), the hornets chew the carcasses up for their own sustenance. They then return to their nest with small meat balls made up from adult and larval honey bees to feed their own immature larvae. An invasion of just 30 Japanese Hornets can destroy an entire colony of 30,000 honey bees in one attack [ref: 31]. The battleground at the bee hive site, now littered with

thousands of dead honey bees, remains a source of available nourishment and protein for the Japanese Hornets and their larvae for days. Note that the honey bee has only recently been introduced to Japan, about 100 years ago, and the honey bee has met up with a new challenger, Japan's own native Japanese Hornet!

THE EUROPEAN WOOL CARDER BEE, A DIRECT THREAT TO HONEY BEES

The EWC Bee usually maims and kills honey bees in its established territories, nearby or far away, maybe miles away, from the honey bees' hive. Research has proven that honey bees can fly and forage up to 8 miles from their hive and return safely. With EWC Bees maiming and killing honey bees far from their hives, this could explain why high numbers of otherwise healthy adult worker honey bees leave the hive and do not return.

But, too, the behavior of EWC Bees entering the honey bee hive location (previously mentioned) should be taken into consideration when it comes to yet another threat and evolutionary challenger to our honey bees. The behavior of a species can and will vary among individuals (even insects) of the same species depending on conditions, genetic differences, and even individual personalities. Mentioned earlier, the EWC Bee may adapt to killing honey bees near the beehives as reported by the beekeeper in Gold River, California; and also as the beewolf, Philanthus, in Europe is reported to do.

THE EUROPEAN WOOL CARDER BEE, INFIGHTING AMONG ITS OWN SPECIES, LIVING IN HARMONY, & OBSERVATIONS OF COORDINATED "PACK ATTACKS"

The male EWC Bee can also be protective in its designated territory, lekking, or patrolling and guarding it and his females from opponent or challenging male EWC Bees. I have witnessed, and captured a pair of male EWC Bees dueling, fighting in midair, clasped together, tumbling to the ground, and rolling around on the ground in vicious physical combat. Additionally, I have collected a male EWC Bee that possesses a wing that has been "clipped" by a rival male EWC Bee.

Yet, the male EWC Bees may live and act together in harmony in the same territory; I have witnessed up to 6 males in the same flower bed along with a half dozen females. Although the males appear to have a "pecking order," constantly reminding others who is the most dominant by "bumping" one another, the males also act as a team of protectors and aggressors when attacking a larger adversary. I observed a male EWC Bee "bump" and "chase" an adult female Valley Carpenter Bee, Xylocopa varipuncta (family: Anthophoridae =Xylocopidae), 4-times larger than itself, from my flower bed study area. Upon subsequent observation, I witnessed a male EWC Bee attack a female Valley Carpenter Bee, and within seconds, 2 additional male EWC Bees, appearing from nowhere, joined in the attack. All 3 males ganged up together in the attack, tackled and drove the Carpenter Bee to the ground; the 3

males grappled with and tried to harm or destroy the larger bee. The Carpenter Bee, on the ground, wriggled free and flew away, maybe physically injured. The male EWC Bees were successful, though, causing the Carpenter Bee to flee. This pack mentality and coordinated behavior is seen in nature mainly among predatory mammals including lions, Cape or African wild dogs, spotted hyenas, Australian dingoes, wolves and coyotes, killer whales, and "domesticated" pit bull dogs; but these predators, except for pit bulls, form hunting packs and kill for food (pit bulls kill for dominance or want).

THE FEMALE EUROPEAN WOOL CARDER BEES' BEHAVIOR and THE PHYSIOLOGICAL DIFFERENCES BETWEEN MALE & FEMALE EWC BEES

Although the male EWC Bees are the main aggressors, a female EWC Bee, too, will challenge other species of insects in its vicinity. Female European Wool Carder Bees will also "chase" and "bump" honey bees. Besides honey bees, I also observed a female EWC Bee "bump" a male Long-horned Bee (aka: Digger Bee), Melissodes sp. (family: Anthophoridae, order: Hymenoptera); it was about the same size as the female EWC Bee. [TMA]

Dissection shows that the female EWC Bee possesses a single stinger about one-quarter the size of a female worker honey bee's stinger. It appears to be underdeveloped or vestigial and of little use for the purpose of defense or aggression. I have had no success in prodding or inciting a female EWC Bee to sting me. [TMA]

The female EWC Bee's scissor-like "cutting" mandibles, though, armed with 5 teeth on each opposing jaw, can be used as formidable weapons. Note: although the male EWC Bees possess much larger mandibles than the females', each opposing jaw possesses only 3 large teeth (better for clipping wings off of bees?). The females' mandibles, each with 5 teeth, may make it more efficient for the female bee to "card" the fibrous material from plant and tree leaves and stems which is used to line her brood nest. [TMA]

THE EUROPEAN WOOL CARDER BEE'S BAD BEEHAVIOR and BEHAVIORAL COMPARISONS WITH OTHER INSECTS

I have been studying the "bad beehavior" of the European Wool Carder Bee now for four years. Discounting parasitic and predatory lifestyles of carnivorous insects, except for the dominant behavior of some species of butterflies, dragonflies, carpenter bees, beewolves (wasps), and a few other insects exhibiting sexual prowess or territorial behavior, where dominant insects "chase," "bump," "butt," or attempt to "frighten" unwanted visitors (usually of their own species) from their territories, the outright savage murderous and "butchery behavior" of the male EWC Bee for territorial rights appears to be unprecedented in the insect world.

Listed below are some examples of territorial behavior of some other insects:

Some adult butterflies (order: Lepidoptera), usually the males, including Mourning Cloaks, Nymphalis antiopa, Red Admirals, Vanessa atlanta, Anglewings and Commas, Polygonia spp., various species of Skipper butterflies (family Hesperiidae), some Swallowtails, Papilio spp., the California Sister, Adelpha bredowii californica, and several other butterfly species, exhibit territorial "lekking," "patrolling," and "perching" behavior, including an aggressive behavior for location dominance termed "hilltopping," allowing males to spot females. Locations chosen usually consist of prime mate-location sites (where the males wait for females to fly by) or nectar or sap sources for themselves; some even choose sites that offer warmth or are in prime sunny spots in open areas or along streams or trails. They will "chase" and "bump" others of their own species, but too will guard these sites against, birds, humans, and large animals. But butterflies do not and cannot inflict physical harm against other butterflies, other insects, or animals.

Stronger or more agile-flying adult male dragonflies (order: Odonata), will delimit territories, usually prime egg-laying sites (for a potential female mate), near or over water ponds or along small creeks or streams. This is where the female dragonfly, many times physically escorted by the male, will oviposit her eggs. Dragonflies and damselflies exhibit incomplete metamorphosis; their aquatic predaceous free-living nymphs progress through their underwater growth stages (sometimes lasting up to three years) until they reach the adult stage. They eventually emerge from their underwater habitat, taking to the air as carnivorous winged adults. Male dragonflies will confront other male dragonflies entering their domains, by "bumping" or "chasing" the challenger from the area. Weaker male dragonflies are sometimes driven so far away from egg-laying habitats that they do not get a chance to mate or reproduce. Again, their dominant behavior is usually directed towards those of their own species.

Male Carpenter Bees, Xylocopa varipuncta, will sometimes hover near their nesting holes or plants with pollen sources and even engage in territorial jousting or combat, but only with other members of their own species.

Male beewolves, Philanthus bicinctus, exhibit similar territorial behavior, usually towards males (and sometimes females) of their own species, but have also been observed pursuing passing butterflies and even birds [ref: 13, p. 119].

Social ants (family: Formicidae) also exhibit territoriality and will kill intruders near their colonies.

All of the above examples of insect behavior and territoriality are of comparative interest, for mating opportunities and resources, but none are near the violent killing behavior eventuated by the European Wool Carder Bee. [TNA]

OBSERVATION and COLLECTION DATA OF THE EUROPEAN WOOL CARDER BEE

Here in Sacramento, CA, after overwintering, the first adult EWC Bees have appeared in the spring as early as April 20. [Note: these times may vary in other localities depending on weather and temperature conditions.]

Emergence or first appearance of EWC Bees, by T.M. Allen:

Year 2009 = May 23, One female EWC Bee.
Year 2010 = Jun 07, One female EWC Bee.
Year 2011 = May 23, One female EWC Bee.
Year 2012 = May 14, One female EWC Bee.
Year 2013 = Apr 20, Two male EWC Bees (jousting at flowering Lavender bush)
One female EWC Bee (also on Lavender).

Last sightings of EWC Bees at end of year, by T.M. Allen:

Year 2009 = Aug 23, One female EWC Bee on sunflowers.
Year 2010 = Sep 29, Although EWC Bees not seen, I found a honey bee with a "clipped" wing, and 3 additional dead honey bees/ground.
Year 2011 = Sep 28, One female EWC Bee (a small male?).
Year 2012 = Sep 27, Male EWC Bee chasing and bumping honey bees, and fiery & checkered skipper butterflies.
Year 2013 = Sep 17, Female EWC Bee on lavender flowers; observations still in progress.
Oct 16, I found 4 dead honey bees on ground.

Mature adult EWC Bees begin to appear in late April and immediately begin lekking, jousting, and maiming and killing honey bees... for the protection of territory and resources. They continue this behavior through the end of September and into October [see data above]. Of the hundreds of dead honey bees I have collected and performed visual autopsies on, I concluded many were attacked and fatally maimed by EWC Bees. Over the four year period from 2010 to 2013, honey bees definitively maimed or killed by EWC Bees were found between April 9 and November 5.

Although I may not have personally seen the EWC Bee through October and early November (something was clipping wings off of or maiming honey bees), this data closely matches my visual field observations of the spring appearances and autumn disappearances of the EWC Bees from April 20 (2013) through September 28 (2011); recurring over the 4-year time period.

Note of Interest: Another leafcutting bee relative, the "Giant Resin Bee," Megachile sculpturalis, originally from Asia, was first reported in North Carolina, U.S., in 1994; it now ranges in Minnesota and Ontario south to Alabama and Georgia. The females have been found building their nests in the abandoned tunnels of the eastern carpenter bees, the nests with up to 10 brood cells. The adults of this bee emerge in late spring and summer. [see: Nat'l Wildlife Fed Field Guide to Insects & Spiders,p.365.] This bee's emergence behavior is similar to that of the EWC Bee.

THE EWC BEES' DIRECT AFFECT ON HONEY BEE DISAPPEARANCE

by Terrance N. Allen

Over the last four years, I have observed the EWC Bees attack, dismember, or stab to death, honey bees from April through September, and found maimed and dying honey bees from April through November. I observed a single male EWC Bee attack and maim four honey bees in a matter of five minutes, leaving them crawling on the ground and unable to fly. I personally witnessed a male EWC Bee attack, but not disable, two honey bees in a matter of seconds. I have collected, mounted, and cataloged dozens of dead, dismembered, and "stabbed" honey bees along with other species of bees attacked and killed by the EWC Bee. Mathematically calculating the optimum ability of aggressive attacks, from a male EWC Bee maiming or killing four honey bees every five minutes, one could extrapolate an optimum of a total of 48 honey bees being permanently disabled per hour; that would compute to 480 honey bees per a 10 hour daylight day, 3,360 per week, 13,440 per month, ... or a total of 80,640 permanently maimed or dead honey bees in a 6-month "single EWC Bee" active year. Theoretically, one male EWC Bee alone could be responsible for the complete collapse of two beehives, each containing 40,000 honey bees, per year! Additionally, if 6 male EWC Bees are patrolling and territorially defending a flower bed, which I have observed, multiply the number of honey bee deaths by six. This, of course, would be the optimum kill number... but realistically, it would be unreasonable to believe this is actually happening.

But... from a more realistic frame of reference... after surveying the flower beds in my suburban neighborhood, I found that every flower bed with flowering blooms had one or more EWC Bees (an equal number of male and female bees) attending the flowers. There are approximately 10,000 homes in my locale of approximately 6 square miles. If only half of the homes have a flower bed or garden, and every flower bed harbors one male EWC Bee, that means there are at least 5,000 male EWC Bees in my community every day. This is not out of the ordinary, as simple simulated insect population models and theoretical calculations estimate that for every individual of an insect species found, there may be 5,000 more members of that species in a locality; or in favorable ecological areas, there may average several thousand individuals of that species per square mile [ref: 12]. If there are 5,000 male EWC Bees in my community and each male EWC Bee maims or kills just one honey bee each day (an underestimate), it means that 5,000 honey bees are being butchered or killed each day. If each male EWC Bee kills 2 honey bees a day (more realistic), 10,000 honey bees are killed each day, or 70,000 honey bees are being killed "or disappearing" each week! This is the number of honey bees occupying two honey bee hives! If each male EWC Bee kills 5 to 20 honey bees a day for a period of six months, the actual numbers of honey bees killed could be astronomical. If it were not for the interrelationship between man and the honey bee, without the protection and mass-breeding assistance from man, left on its own, the honey bee could be on the endangered species list due to the actions of the EWC Bee!

Just imagine the number of honey bee losses from a combination of Beewolf (previously described) and European Wool Carder Bee populations in the same localities in European habitats, both taking their tolls on the honey bee populations! For over 12 years, the disappearance of honey bees or "CCD" continues to occur in European countries even after banning the use of suspected insecticides blamed for killing honey bees.

The majority of worker honey bees from a single hive are instructed and guided to pollen, nectar, and water sources by "scout" bees. So the worker honey bees from the same hive are visiting the site or sites communicated to them by their scouts. If the pollen and nectar sites are guarded and patrolled by EWC Bees, hundreds of honey bees from the same hive could be maimed or killed each day. But if just a fraction of the kill rate from the EWC Bees' butchering behavior is occurring, as previously stated, the honey bees from that hive would still have to sustain above average or acceptable losses. These losses, gradually reducing the population of honey bees in the hive from spring through the beginning of winter, would account for the depleted numbers of honey bees in the hive come winter, or the condition termed "winter disappearance."

As it is, the winter season is a critical time for the honey bee colony. As the cooler temperatures arrive in early October, the collection of pollen and nectar and other outdoor activities of the worker bees decreases, as fewer flowers are in bloom. Fewer eggs are being produced by the queen bee, and hive workers labor to feed the developing larvae with the honey reserves prepared during the previous spring, summer, and autumn seasons. And although the worker bees may live a bit longer in the hive during this season, with fewer adult honey bees remaining, due to the previous seasons' slaughter by the EWC Bees, it may be more difficult to maintain the vigor of the hive. Adult worker honey bees may be leaving the beehive a little sooner, before the warmer spring temperatures arrive, looking for resources. Without the reserve backup of more adult workers to take their places, it may appear that the honey bees are "vacating" the hive. Without enough adult honey bees to feed the developing larvae through the winter, many of the young brood die and the housekeeping chores and internal workings of the hive collapses.

As the previously described scenario of European Wool Carder Bees slaughtering honey bees is occurring in every other flower bed in my community, and knowingly throughout the greater Sacramento area (and I am sure the rest of the country), the overaggressive actions of the EWC Bee is by far enough to destroy a honey bee hive population by the coming of the winter season, if not sooner. Note that worker honey bees from other hives located in the same area may or may not be visiting the same sites being guarded or patrolled by the EWC Bees; this is why beehives located in the same area may or may not be affected or suffer losses.

MORE ON WHY HONEY BEES DISAPPEAR

Generally speaking, the last two weeks (of the six-week life span) of the adult worker honey bee is spent laboring or foraging "in the field" outside of the hive. The "field work" (collecting pollen, nectar, or water) of the honey bee is a dangerous mission fraught with many new natural, unnatural and enviromal hazards; the field workers face and are subjected to many new and unforeseen perils:

- A certain number of worker honey bees are not expected to return to the beehive each day, due to other insect (described later) or bird (flycatchers, kingbirds, summer tanagers, and even hummingbirds) predation.

- Some honey bees get caught in unseen spider webs and get devoured by the carnivorous spiders that weave them. Some honey bees escape the poison filled fangs of the spider, and escape, but may be tangled in silken threads. The silk, as strong as steel, can tie the wings or tarsi of a healthy bee, prohibiting the bee to adequately function or return to the hive; it will die from exposure away from the beehive.

- Some don't return when the sun unexpectedly disappears behind the clouds or from sudden overcast conditions (especially before nightfall). Bees not only use and memorize local landmarks, they use the sun's position as their main point of reference, noting the sun's movement in the sky; the ultraviolet light from the sun is also needed for direction and guidance.

- Other bees get caught off guard and are delayed or stranded and even "grounded" from fast moving or heavy rain storms.

- Still others just get lost or return to the wrong hive where sometimes they are not welcome. Bees recognize each other by their individual colony's odor, and a disoriented bee trying to enter a strange colony may be killed by the resident worker bees.

- Some honey bees simply die outside of the hive from disease, internal or external parasites, or old age.

Untold numbers of worker honey bees perish from natural phenomena or unfortunate situations once outside of the protective hive. This is why so many thousands of honey bees are produced in the first place... to maintain and perpetuate the species or genetic line of their family in the hive. (TNA)

THE APPEARANCE OF DEAD HONEY BEES IN CONJUNCTION WITH EWC BEES

The arrival of the EWC Bee to my flower bed study area in 2009 now explains why I had been finding so many dead honey bees on my property and in and around my neighborhood for the past several years. The EWC Bee most likely arrived before 2009. I had not, nor did anyone else, notice, capture, or report the new species of bee in California before that. (After distributing my first report, others proclaimed they found the EWC Bee earlier.)

After 4 years of picking up hundreds of crawling, dying, or dead honey bees off the ground, and bringing them into my personal laboratory for simple, visual autopsies, I found dozens of honey bees with their wings clipped or cut off, accounting for the majority of honey bee deaths attributed to the EWC Bee. Fewer had their antennae clipped off. Some had their tarsi clipped off, and fewer yet had visible abdominal stab wounds with blood seeping out. Still fewer had missing heads. And a couple of reliable people reported to me that they found honey bees cut in half.

Many honey bees, though, showed no direct signs of trauma, and their deaths remain unexplainable. I kept living or crawling and freshly dead (where rigormortis had not set in) honey bees in separate containers for further observations to see if internal parasites may be the cause of death of these individual specimens; no parasites emerged or were found (see below: report of the parasitic phorid fly, Apocephalus borealis).

But I did find the "varroa mite" on two of the honey bees collected. One honey bee was found on the ground, walking in circles, under my back porch light after sunset. The other honey bee was dead on the ground at my front driveway flower bed. [TNA]

OTHER SUSPECTS OF COLONY COLLAPSE DISORDER (CCD), FIRE ANTS, and RESPONSES FROM THE ACADEMIA

Another insect has recently been reported and is suspected of having a detrimental "zombie bee" effect on the honey bee "CCD disappearance." It is the scuttle fly, Apocephalus borealis, (family: Phoridae, order: Diptera), discovered and identified by researchers at San Francisco State University, particularly, Professor John Hafernik, Ph.D. I have left several telephone messages for Dr. Hafernik, and sent faxes and letters to the University regarding his and others' research regarding disappearing honey bees, honey bees crawling on the ground, or honey bees attracted to and settling at porch lights at night (an unusual behavior for bees), in response to Dr. Hafernik's television news broadcast request, aired July 26, 2012, along with other questionnaires. I have not received a single response. I believe that although this parasitic fly is yet another "straw on the camel's back" in relation to the honey bees' multiple stressors, I believe that the European Wool Carder Bee plays a much greater role in the honey bees' disappearance.

About those Fire Ants

Since 1995, scientists have been releasing parasitic flies called "zombie" flies, in particular, Pseudacteon curvatus, from Brazil, and also Pseudacteon tricuspis (family: Phoridae, order: Diptera), into the Texas environment as biological control agents in order to slow the spread of the invasive species of "the imported fire ant," Solenopsis invicta (family: Formicidae, order: Hymenoptera). The female "zombie" fly lays its egg on or into the ant (usually from behind, on the back of the abdomen). The fly maggot hatches and burrows into the ant's body, and begins sucking the vital fluids and blood from their ant host. It squirms internally to the head of its host, grows in "the brain" (head capsule), and decapitates and kills the ant.

The "zombie" flies wouldn't necessarily eradicate the fire ants. They would, like other biological control agents, become self-sustaining; they would reduce the population of the target ant, but maintain a balanced or host population in order to continue their own existence. These flies attack but have limited effects on "the imported fire ant." Unfortunately, they also attack other native ants and other Hymenopterans. Is it possible that other "zombie" or scuttle flies, of the family Phoridae, like Apocephalus borealis (reported above) have found honey bees to be acceptable hosts for their young? Absolutely. The consequences and outcomes of introducing or releasing a new species into a foreign environment are not always predictable. (TMA, Entomologist on the Bio-Control Unit, CDFA, 1977-1981.)

Additional Responses from the Academia

Dr. Eric Mussen, lead honey bee researcher at UCD, who was at first astonished with my discoveries of the European Wool Carder Bee, later stated and wrote in a news article that the EWC Bee may only be as detrimental to honey bees as praying mantids, phorid flies, and spiders. THIS IS NOT TRUE! Another researcher, Celeste Ets-Hokin, degrading my discoveries and supporting the UCD researchers' stance, wrote on the Internet that "the European Honey Bee is not essential to North American ecosystems!"... WHAT? In conjunction to these outrageous claims, on January 18, 2011, I received, from Ramona Saunders, Deputy Agricultural Commissioner, Sacramento County, written confirmation that Dr. Steven L. Heydon, UCD, agreed with my identification of the European Wool Carder Bee, but that the bee was already "known from this region and is fairly common here in Davis." This was quite confusing, unsettling, and contrary as to what I was originally told by the top researchers at UCD and the other governmental agencies, that there were no reports of the EWC Bee species having been found or recorded in California. Note that these same researchers also claim that they have never seen a EWC Bee attack a honey bee, and suggest that if it does, the number of honey bees killed would be negligible... this is a short-sighted absurd response.

SUGGESTIONS TO COMMERCIAL AGRICULTURAL GROWERS

It has been recently suggested that commercial growers of multi-acre "monocrops" such as almonds, stone and pome fruits, and other multi-acre crops, begin integrating landscape forage or native and wild flowers, including mustards, clovers, and leguminous vetch, on the outskirts or borders or amongst the large orchards in order to attract native pollinators to the "monocrop" environs. This would invite native bees, wasps, flower flies, beetles, and butterflies and other insects to the area whereupon they may take up some of the pollinating tasks that are currently left up to the honey bees alone. By increasing the number of native pollinators attending the crops needing pollination, it has been additionally observed that it may actually boost the activity and productivity rates, along with the added nutrition, of the honey bees. A little bit of competition appears to be good for bee business.

This is a splendid idea but may give the commercial grower a false sense of security. Man is always searching for the utopian environment or balance of nature, which is admirable. But planting magnet botanicals near commercial fields or orchards, attracts unwanted pest animals and other pest insects, and pest plants (or weeds) which the grower must now deal with.

And now that the European Wool Carder Bee is here, the outplantings would lure this "butcher bee" to these areas where it would set up territories and attack and kill honey bees brought in to pollinate and produce honey.

I must, though, interpose and clarify: if the crop needing honey bee pollinating services blossoms before the end of April, which is the case for many early crops such as cherries, California's almond trees, and our thornless boysenberries, the grower or beekeeper need not worry over the EWC Bee. The EWC Bee does not appear from its overwintering stage, at least from my observations in Northern California, until late April. Almonds which are, on average, in full bloom in mid February, with the last pollination period concluding at the end of the first week of March, and our thornless boysenberries, which bloom the third week of March through mid April, would be safe from pollinating honey bees being slaughtered by the EWC Bee. Other warmer agricultural zones or regions, with early blooming crops, though, may experience the invasion of EWC Bees earlier in the spring; the EWC Bee may also remain longer through the autumn and early winter seasons in warmer regions. [TMA]

BIOLOGICAL INVASIONS & MORE ON THE EUROPEAN WOOL CARDER BEE

The impacts of biological invasions, evolutionary over time or prematurely introduced, in the same regions at the same time, can be devastating, especially to the weaker species. Two separate or more species competing for the same territory or resources may lead to the weaker one or ones being displaced or

eventually becoming extinct. As was the case of our own species, Homo sapiens, where we, the Modern Human, along with Cro-Magnon Man and Neanderthal Man, cohabitated or shared territories during the same time period, 400-thousand to 100-thousand years ago... Modern Man and Cro-Magnon Man (referred to as early cave man), effective hunters, stronger and smarter, two, more dominant species, may have indirectly caused the extinction of Neanderthal Man and even co-existing species of animals such as woolly mammoths, woolly rhinoceroses, giant deer, cave bears, and saber-toothed cats. Modern man, our current species with many races, alone survived. Previous to that, Neanderthal Man could have dominated and "extinguished" Homo erectus (the upright protohuman hominid ancestors with elementary speech ability)... and so on, continuing back in time, annihilating species, all the way back to our earliest Australophithecine ancestors... [T.M. Allen].

The appearance of the European Wool Carder Bee in my flower bed study area in Sacramento is commensurable to the number of dead European Honey Bees found during the last several years. The EWC Bees depredate the pollinators of flowering plants. It would be fatuous to agree with the academic researchers who claim the EWC Bee would have little impact or the same repercussion on honey bee populations as that of the praying mantis. Commandeering flowering habitats where honey bees attend, almost invisible, going unnoticed by the casual observer, as they are basically the same size as honey bees, EWC Bees are decimating honey bee populations. Note that many male EWC Bees are larger than the worker honey bees, and the "buzz" created from their beating wings has a lower sound pitch than the honey bee and female EWC Bee; this is another way one may discern if EWC Bees inhabit an area, along with observing their "hovering" behavior above flowering plants. The aggressive and butchering behavior of the EWC Bee against passive pollinators will only be witnessed by the most patient and observant individuals. In combination with other natural phenomena, predators and parasites, diseases, and unintentional or thoughtless manmade causes, the EWC Bee is definitely contributing to the disappearance of our most important pollinators. The EWC Bee just may be responsible for maiming and killing more honey bees than all of the other previously described native and introduced predators and parasites combined!

"The spread of A. manicatum (the European Wool Carder Bee) may be detrimental to native bees because the males of the species aggressively defend their territories and even kill intruders" [direct quote from ref: 2].

The EWC Bees may be responsible for the depletion and extinction of many of our native bees. I have evidence (by observation and collected specimens) that they are maiming other native bees including other species of leafcutter bees, long-horned bees, and carpenter bees. If they are bold enough to attack large carpenter bees, 4-times larger than themselves, the EWC Bees may be attacking bumble bees (which they have been reported to do) causing their mysterious disappearance too! [TMA]

WILL THE EUROPEAN HONEY BEES SURVIVE?

On the Earth's terrestrial battleground, the European Honey Bee vs. the European Wool Carder Bee, can or will the European Wool Carder Bee challenge and drive the European Honey Bee to extinction? Probably... over time. Invasive species (animal or plant) can harm native species (or in this case, a pre-established species, the European Honey Bee) by commandeering food, resources, or habitat, or all. It is possible that extinctions of a species can occur from another more dominant invasive species. But the honey bee has a predominate advantage... a partner to help in its battle for survival, the human animal. Man has a tendency to choose certain or favorite species on the planet to breed and protect, and sometimes he succeeds. Man has established a mutually beneficial alliance with the Honey Bee and he (or the majority) will go to great lengths to protect it. [T.M. Allen].

CAN WE ERADICATE THE EUROPEAN WOOL CARDER BEES?

When I first discovered and identified the EWC Bee, through library research and computer Internet information, I gathered the bee was fairly new to North America. From the information I read, I guessed the bee had entered the United States in 2005 or 2006, but maybe it had appeared in New York as early as 1963. I also estimated that its arrival to California occurred in 2009 (from my original find) or maybe shortly earlier (I know I didn't capture the very first specimen when it arrived in Sacramento).

In my original report of finding and identifying the EWC Bee, I referred to two families of parasitic and predatory wasps which should be researched and may be utilized for possible control measures against the new invasive bee. I did this in preparation for or if asked for advice on this matter; as the EWC Bee could be found responsible for the disappearing honey bees [ref: The European Wool Carder Bee, T.M. Allen, Sept. 20, 2010, revision: 10/19/10]. As my research progressed, I confirmed that the EWC Bee had been found in the U.S. in 1963 and that it had, as of 2011, become widespread from New York to California. The EWC Bee has now become ubiquitous across the North American Continent, in the U.S. and Canada.

The European Wool Carder Bee is now permanently established and entrenched as is the introduced European Honey Bee, and there are no known measures which can be taken against it to control or eradicate it without harming the honey bees or other native or indigenous bees. The two original families of wasps I referenced (parasitic Leucospid wasps and predatory Chrysidid wasps) are established natives which parasitize and prey on the larvae of solitary bees. They are permanent residents in my backyard vegetable and flower gardens, and are seen frequently, sometimes even entering the nesting tunnels of the local leafcutter bees. After 5 years of observation, it is now obvious that they are not having any affect on the population of the EWC

Bee. Our indigenous parasitic and predatory wasps may not have yet recognized the EWC Bee as a new potential or viable host for their progeny; or they haven't identified the EWC Bees' nesting tunnels, with a plug or tuft of plant fibers protruding from the exit holes. Sometimes it takes hundreds or thousands of years for the evolutionary process of predator-prey or parasite-host relationships to unify, take form, and balance.

Another predator that I considered may have been a contender and possible biological control agent for the EWC Bee was one that again is already present and well established in California; an enemy and predator with a predilection for honey bees... the "bumble bee robber fly," Mallophora fautrix fautricoides (family: Asilidae). It looks like a bumble bee, and although larger than a EWC Bee, robust and with stealth attack abilities, it appears that this "bee killer" robber fly has no interest in the EWC Bee as a direct food source. I have witnessed the "bumble bee robber fly" and EWC Bees at the same flower bed at the same time, and no interaction between the two species occurred. It may be possible that the EWC Bee, with its thickset exoskeletal body armor (heavier than a honey bee), fortified with the five posterior abdominal pseudostingers or stout chitinous spines (of the male) or simple stinger (of the female), and the three-toothed (in the male) or five-toothed (in the female) loricated scissor-like cutting mandibles, the EWC Bee may be an invincible quarry. The EWC Bee just may be invulnerable and able to sustain the attacks of all species of "bee killer" robber flies, as well as other predators including praying mantises and bee eating birds. Or, maybe the EWC Bee simply counters with an offensive attack when challenged by a predator.

CONCLUSION: THE EUROPEAN WOOL CARDER BEE IS NORTH AMERICA'S NEW UBIQUITOUS RESIDENT BEE

The answer to identifying the reason(s) as to why our honey bees are disappearing or to the cause of "Colony Collapse Disorder" (CCD) is not a simple one. And finding a cure or solution can be even more perplexing.

It appears now that the European Wool Carder Bee is here in North America to stay. The EWC Bee arrived to New York State, intentionally or unintentionally, from the actions of humans. Upon its arrival, it readily adapted and established itself in its new environment, as did the European Honey Bee some 400 years ago. As it came to North America with no natural enemies, including parasites or predators to keep its populations in check, and it appears with no competitors to challenge it (such as the Japanese Hornet which seek out and attack the introduced honey bees in Japan), it has been met with no resistance. It also appears that, except for the reports of a few observant individuals, the EWC Bee, as "a wolf in sheep's clothing," has infiltrated flowering habitats across the land, both wild and human cultivated, and has been slaughtering our honey bees for the last 50 years! [TMA]

Dominant or invasive species do not immediately take over territory, displace, or extinguish species. Our Earth is a violent arena. The species of animals in the animal kingdom, and plants in the plant kingdom too, both complexly interrelated, are in selfish and brutal competitions, ever changing and endlessly evolving, for the survival of their own species. Our introduced honey bees and other native and indigenous bees, along with other insect pollinators, and man, must adapt or evolve, and learn ways to accept and live with the European Wool Carder Bee, along with other challengers, in this interconnected web of life. [TMA]

I would be remiss and delinquent as an educated professional entomologist if I did not publicly report my findings. The European Wool Carder Bee must be considered a direct threat to our honey bees and other indigenous bees in North America.

Terrance M. Allen 

Terrance M. Allen, S.C.E. (State Certified Entomologist)

Retired Entomologist, Arachnologist, Practicing Paleoentomologist and Factotum Naturalist
-State of California, Certified & Qualified Commercial Applicator
-Inventor of the Insect Collecting Allen Aspirator (BioQuip Pro),
-Fruit Fly (Medfly) Fruit Collection/Detection Stacking Bucket,
-and Intense-Biased Survey Medfly Detection Program, and more.
-Collector & identifier of other new species of insects and spiders in California and the Western Hemisphere.
-Collector & identifier of insects, arachnids, other arthropods, and botanicals in amber and copal from around the world.

* "Butcher Bee" appellation coined by this author September 2013.

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Acknowledgements and thanks go to the following individuals for their input into my research (listed in alphabetical order):

Laurence (Larry) A. Allen, B.C.E. (Board Certified Entomologist)
Retired Entomologist
Van Waters & Rogers, Chemical Company, a Division of Univar
Sacramento County Department of Agriculture, California
San Joaquin County Department of Agriculture, California

Morgan Fischer
Electrical Engineer
Beekeeper

Linda Ricardo Henderson
Retired Administrative Assistant, State of California
Aided in computer searches for beekeepers and other contacts.

Rebecca (Becki) McCabe
Commercial Almond Grower
Community Volunteer

Donald (Don) C. Perkins
Retired Biologist
CDF Forester for 30 years,
California Department of Forestry and Fire Protection
California Licensed Forester, License No. 266
California Pest Control Advisor, License No. 75113
Thank you for supporting my research and delivering to me the current publications and news articles regarding honey bees.

Contact:
Terrance (Terry) M. Allen
7734 River Village Drive
Sacramento, CA 95831-4128
U.S.A.
Telephone Number: 916/393-2943

THE EUROPEAN WOOL CARDER BEE, aka: "Cotton Bee," "Shaver Bee"
Scientific name: Anthidium manicatum
Family: Megachilidae, Order: Hymenoptera

A new species of bee not seen before,
captured and identified by Terrance M. Allen.
Identification verified by Sacramento County Department of Agriculture via University of California Davis: October 12, 2010.

The European Wool Carder Bees' behavior and possible environmental impact as a new accidental introduction into the U.S. (possibly transported in wood pallets in 2005? or 2006?, or maybe as early as 1963? to New York) and California (2009?).

Data compiled by: Terrance M. Allen Telephone: 916/393-2943
7734 River Village Drive
Sacramento, CA 95831

May 23, 2009
Caught one female Wool Carder Bee (new and unknown species).
Location: front yard / driveway flowerbed, at above address.
On Bird of Paradise Tree, Poinciana (Caesalpinia) gilliesii and flowering Dwarf Boxleaf Euonymus, Euonymus japonica.
Additional variety of flowers include: Zinnia, Salvia, Sweet Alyssum, Snapdragon, Canna Lily, Freesia, Gerbera Daisy, +.
First thought: this is another indigenous pollinating bee.

August 15, 2009
Caught one female Wool Carder Bee (same as above).
August 23, 2009
Caught one female Wool Carder Bee (same as above).

June 7, 2010 (one year after original find)
Caught one female Wool Carder Bee (same as above).
Note: the Wool Carder Bee has overwintered.

Searched for more bees for 3 months, found none.

September 2, 2010
Observed female Wool Carder Bee
on Bird of Paradise Tree (see above).
Followed bee to neighbor's at 7738 River Village Drive,
Caught one male and one female Wool Carder Bee(s)
on Blue Flowering Rosemary, Rosmarinus officinalis.
* Was able at this time to make a positive i.d. of this bee, as I was able to identify the species by having the male.

September 4, 2010
Caught two males and two females, Wool Carder Bees,
on Blue Rosemary

September 7, 2010
Observed aggressive behavior of a male Wool Carder Bee towards a European Honey Bee, Apis mellifera, Family: Apidae. Male Wool Carder Bee attacked, wrapped its body around, and drove off the Honey Bee. This is not good.

I periodically watched the activity of the bees and flies (mainly Hover Flies, Family: Syrphidae, Order: Diptera) on the Blue Flowering Rosemary. I observed the aggressive behavior and what appeared to be "territory" battles of the male Wool Carder Bees against the other bees including Honey Bees, common Leaf-cutter Bees and Flower Bees, and flies. There was no apparent aggressive behavior towards other Wool Carder Bees, male or female.

September 20, 2010

I took some time to spend watching the Wool Carder Bees on the Flowering Rosemary plants. Nearby, on the ground, I observed a Mediterranean Paper Wasp, Polistes furcata, Family: Vespidae, Order: Hymenoptera, (a recent accidental introduction), wandering around as if wounded and missing a wing or two. It was searching for a place to hide. I did not think to capture it.

I then observed some very aggressive behavior of a male Wool Carder Bee towards the Honey Bees gathering pollen from the Rosemary flowers. A male Wool Carder Bee attacked a female Honey Bee; he engaged her, wrapped himself around her, and wrestled her to the ground. After rolling about on and in the substrate (soil and decorative tree bark) for several seconds, the male released her and flew away. But the female Honey Bee was on its back not moving. The female Honey Bee started to move and upright herself but did not fly. It took several minutes for the female Honey Bee to recuperate. She slowly crawled up a stem of the Rosemary and sat breathing deeply. I gently placed her in a collection vial. I immediately observed that she was missing some wings -- the male Wool Carder Bee had disabled her by clipping off two of her wings! She was unable to fly or return to her hive! She was left to bleed to death and die. I told myself this is not good at all! This just may be the answer or at least an important factor as to our current Honey Bee population decline, referred to as Colony Colapse Disorder, aka: CCD.

I talked to 3 different scientists including my brother Larry A. Allen, B.C.E., and Don Perkins. Two of the 3 (including Larry and Don) suggested I contact the local Sacramento County Department of Agriculture or the Agricultural Commissioner, Frank Carl. I called and spoke extensively with Ramona Saunders with the Ag Commissioner's Office. She gave a message to Adrian Ramos, an Inspector/Biologist with their office. He is to call me, come out, gather some specimens, and interview me, maybe tomorrow, September 21. I went out and captured one male and one female Wool Carder Bee(s) to give to him.

I surveyed the immediate area around the flowering Rosemary. Besides the female Honey Bee with the wings clipped off (I had preserved her in the freezer), I found an immobile "dying" Honey Bee on the nearby sidewalk and a completely dead and dry Honey Bee on the porch near the flowering Rosemary. I collected another, a healthy "working" Honey Bee on the Rosemary for comparison. The last 3 bees will be given to the inspector along with the male and female Wool Carder Bees caught today.

I also observed a "Bee Killer" Robber Fly, Mallophora fautrix, Family: Asilidae, Order: Diptera, attack, capture, and eat a Honey Bee. This is normal behavior as a natural balance has been established between this predatory fly and Honey Bees.

In general, Wool Carder Bees are related to the leaf-cutter bees in the Family: Megachilidae. They possess scissor-like "cutting" mandibles and collect fluffy plant material or animal hairs as nest-lining materials. The European Wool Carder Bee is a "solitary" bee and builds its nest in cavities in wood or masonry, lining it with a cottonlike fluff "carded" from the leaves and stems of hairy plants. They feed their larvae pollen, but do not produce honey. Body length of the female is 0.4 inches (or 10 mm), the male is larger at 0.6 inches (or 15 mm); they are similar in size to Honey Bees.

The female Wool Carder Bee collects and carries pollen on a brush of hairs (scopa) on the underside of her abdomen, rather than on the hind legs as in most other bees. The male Wool Carder Bee possesses stout spines or chitinous projections at the tip and sides of his abdomen, similar to the male "dagger" wasps of the Family: Scoliidae, Order: Hymenoptera. The male uses his stout spines for defense / offense and to chase other males and other intruders away from his "territory."

Both the male and female Wool Carder Bees can enroll their abdomens into a sphere, curling up into a ball, (like a Pillbug /Crustacean, a Cuckoo Wasp /Family: Chrysididae, Order: Hymenoptera, or an armadillo /mammal) to protect their under belly, or in the case of the male to ensnare and hold and wrestle unwanted guests in his "territory." Both can "hover" in mid air similar to hover flies or hummingbirds; this behavior is not readily seen in the European Honey Bee. The female Wool Carder Bee "buzzes" or "humms" similar to the European Honey Bee, whereas the male Wool Carder Bee has a slightly lower or deeper "buzz" as compared to the Honey Bee.

I have been finding dead European Honey Bees in my back and front yards for the last several years. The number of dead bees I have seen throughout my neighborhood appeared unusually high, but I could not determine the death of the Honey Bees. My thoughts now are that while female European Honey Bees are foraging for nectar and pollen, the male European Wool Carder Bees have been attacking the female European Honey Bees, driving them away from prime nectar and pollen collection sites, or worse killing them. The male Wool Carder Bees are very aggressive and dominate the flowering areas by constantly patrolling, hovering, and attacking intruders in their territories.

If not directly killing, maiming, or dismembering the Honey Bees, including "clipping off" their wings, antennae, heads, or legs (examples include bees of which were found crawling or dead), it could be that the male Wool Carder Bees may be injuring the Honey Bees in other ways. The male Wool Carder Bee has no sting (as it has no ovipositor / modified stinger), but it does

possess 3 stout spines at the tip of its abdomen and a pair or a single stout spine on opposite sides of the second to the last segment of its abdomen. In its attack of unwanted visitors to its territory, the male bee rolls its victim up under his abdomen; this could result in puncture wounds or other physical damage from the stout spines to the body or abdomen of his victim. This could result in eventual death to the unwanted visitors.

Or it could be that the unknowing female Honey Bee simply collecting nectar and pollen becomes disoriented upon being attacked by the male Wool Carder Bee. The Honey Bee is a simple-minded organism acting on simple innate or hardwire behavior and just following the flight instructions of where to collect nectar and pollen given to her from "scout bees" back at the hive. After being attacked, the female Honey Bee may lose her orientation and forget the way back to the hive. Or it may be that the female Honey Bee, after being attacked is "demoralized," (not meaning to give her anthropormorphic characteristics, but to acknowledge that she has been thrown off track). Imagine the consequences if the "scout bees" are attacked and dismembered.

Whichever case scenarios presented above, this could explain why the Honey Bees are disappearing. They leave their hives to forage for nectar and pollen, but they do not return home. Without the workers returning to the hives, the population of the hive dwindles, the larvae starve, and the hive collapses, leading to the collapse of the colony, or Colony Collapse Disorder.

Regarding Colony Collapse Disorder, it is possible the Honey Bees succumb to viral, fungal, or bacterial diseases, they are being poisoned by chemicals or "pesticide drift," their hives are invaded by parasites or predators, they are interrupted by radio or electronic wavelengths, or maybe there has been too much "inbreeding" in the domestication of the Honey Bee creating weak or underperforming bees. Although these are all attributable factors to the health and well being of the hive, we know that the worker Honey Bees are leaving their hives but not returning. I demonstrate here that the worker Honey Bees are being attacked outside of the hive by a newly observed perpetrator and are not able, for several reasons, to return home to their hive. The perpetrator responsible is an accidentally introduced aggressive, pollen collecting competitor, the European Wool Carder Bee.

Note: Possible natural parasitic wasps (or maybe their European equivalents) that may be looked into to control the European Wool Carder Bee may be Leucospid wasps of the Family: Leucospidae, or Cuckoo Wasps of the Family: Chrysididae, both of the Order: Hymenoptera; their larvae develop as parasites and predators, respectively, of the larvae of solitary bees and other wasps.

Terrance M. Allen, Sacramento, California
Retired Entomologist, Arachnologist, Practicing Paleoentomologist & Factotum Naturalist. The "Galileo" of Entomology.
September 20, 2010, revised 09/27/10, 10/03/10, 10/11/10, 10/19/10
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EDITORIAL

KABC-TV regularly presents editorials on topics of public interest which are delivered by Vice President and General Manager, Thomas K. Van Amburg. Your comments on these editorials are appreciated and the station welcomes requests for broadcast time from responsible representatives of contrasting views.

Gene Webster
Editorial Director

EDITORIAL #E71-81

"THE MESSENGER AND THE MEDFLIES"

No one likes bad news. At one time messengers who brought it were killed. Today we're more sophisticated. We simply hide them away somewhere in the hope it will all be forgotten.

That happened to Terrance Allen. He's the state entomologist,...the bug specialist,...who, in July of 1980 warned Sacramento of the Medfly menace. Then it was thought to be limited to a 9-square-mile area in Santa Clara County.

For a brief time, state teams began stripping fruit from trees and chemically treating the ground around them. Then orders came to stop that process. For several months, according to Allen, the Medflies were left to breed. In September, limited tree stripping and ground spraying began again. When Allen protested that wasn't enough, he was labeled an "alarmist". When he told the media of his concerns, he was transferred to a research library in Sacramento. That was last January.

The state has now spent more than $50 million on a vast spraying program that may be much too late. No one cares to estimate the total cost to California's $14-billion-a-year agricultural industry. Prices in local markets will reflect that soon enough.

Terrance Allen may be forgotten, but his message will be remembered -- especially by the Governor.

I'm Tom Van Amburg.

The above editorial was telecast on August 27, 28 and 29, 1981.

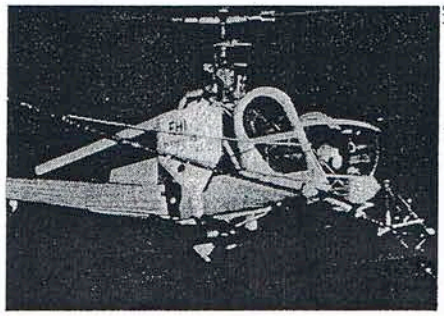
Trying to Thwart the Fruit Fly

Fearing a farm disaster, California begins aerial spraying

In Northern California the biological clock was ticking away. As helicopters began spraying the insecticide Malathion on infested areas just south of San Francisco, they were racing against the marvelous reproductive capacities of the tiny Mediterranean fruit fly: a mature female can produce 1,000 eggs over its two-month life span. Last week alone, the targeted area expanded from 120 to 140 to 180 sq. mi. and fears mounted that the fly was about to break out of the Bay Area and move into the lush farm lands of the San Joaquin Valley. The long-range worry: a federal quarantine, which would cripple the state's $14 billion farm industry and send produce prices soaring all over the U.S. Five states—Texas, Alabama, Florida, Mississippi and South Carolina—have already announced bans on most California fruit, unless it has been fumigated.

Despite the urgency, the spraying effort literally had trouble getting off the ground. State officials had to compete with farmers to get their hands on enough aircraft to do the job. When they finally did get helicopters, repeated mechanical failures led some Californians to joke that the choppers were leftovers from the ill-fated hostage rescue mission in Iran. Pilots and ground crews were unaccustomed to the spraying procedures and slow to adapt to the use of the viscous pesticide solution, which tended to clog pumping equipment. It was not until the end of the week that more than two helicopters were aloft at the same time. Observed a U.S. Department of Agriculture official: "I think Murphy's Law has taken over, because everything that could go wrong has."

The state was already waging an extensive land war. Seven hundred members of the California Conservation Corps helped strip fruit from the trees in infested backyards. More than 500 National Guardsmen carted the fruit away, burying an estimated 750 tons in Santa Clara landfill dumps. Roadblocks had been set up at three points and produce was confiscated from 12,661 of the 286,240 cars and trucks checked. But aerial support was vital, and many Californians, especially farmers, were angry that spraying did not start sooner. At first Governor Jerry Brown had resisted, evidently concerned that he would alienate his strong environmentalist constituency. He changed his mind when U.S. Agriculture Secretary John Block began planning a quarantine. Complained California Senator S.I. Hayakawa: "Brown should have done this eight months ago. Now we are in a position of playing catch-up." Then, with customary chutzpah, the Governor requested that President Reagan declare the three infested counties—San Mateo, Santa Clara and Alameda—a disaster area. That way the Federal Government could share the financial burdens inflicted by the Medfly.



UPI

A Malathion-loaded chopper leaves San Jose

After a period of apocalyptic rhetoric, Californians generally took the spraying in stride. Residents of the infested areas were bombarded with information on the safety of the chemical, which according to state toxicologists is only one twenty-fifth as toxic as the pesticide used in flea collars. Brown's fears notwithstanding, state officials said it was safer to spray from the air than the ground. Reason: the Malathion is mixed with molasses, sugar and yeast and falls in coffee-grain-size droplets that cannot be easily inhaled. B.T. Collins, 40, director of the California Conservation Corps, gave the most dramatic demonstration of its safety: he drank a glassful of Malathion diluted with water to the concentration used in the spray.

Few sought refuge at four Red Cross shelters set up outside the sprayed area; one facility was closed down when not a soul showed up. For the most part, Californians simply followed the precautions recommended by state officials. They closed their windows, brought children's playthings inside and covered their cars with sheets or tarpaulins to prevent chemical damage to the paint. They also showed a sense of humor. The Medfly Project Headquarters in Los Gatos dubbed itself "Home of Old Blue Eyes," and a market blossomed for FLY WARS T shirts and MEDFLY SWAT TEAM buttons.

The spraying was all but imperceptible, a fact that frustrated would-be demonstrators. Two protesters keeping a vigil in Palo Alto heard a helicopter overhead but could find no trace of Malathion. "I don't see how it will work," admitted Patrick Long, 29, who held a black umbrella over his head for symbolic effect. "I don't see how the flies can find it."

There will be havoc, however, if the Malathion does not find the flies. The 200 farm products that the flies infest account for about $4 billion each year. Expensive fumigation and cold-storage treatment could save some crops, but there is no way to salvage dates, figs, olives or almonds. California need only look across the Pacific for an example of the fly's destructive power. Hawaii has been infested since 1910. The only fruit it exports in large quantities is the thick-skinned pineapple, which is immune to the bug. Says Dr. Leroy Williamson, a DOA scientist in Honolulu: "Prior to the fruit flies, we had an abundance of fruit. Now we compete with these insects for our food."

A few Californians thought the battle was already lost. Said Terrance Allen, an entomologist who worked in the state's Medfly eradication program last year: "The infestation is so large that we just don't have the manpower and resources to stop it." But Medfly Project Director Jerry Scribner was more sanguine. He noted that the helicopters had become more efficient by week's end, raising hopes that spraying can be completed on schedule. (The original plan called for six applications spread out over a minimum of six weeks.) If this happens, Scribner and his technical advisers feel there is a 98% chance of wiping out the bedeviling bug. *—By Claudia Wallis. Reported by Eileen Shields and Dick Thompson/San Francisco*

Medfly entrenched in California, study finds

LOS ANGELES (MCT) – Feared and despised by California's $43.5 billion agricultural industry, the Mediterranean fruit fly is seen as a potentially devastating foreign invader who routinely hitchhikes across the border in smuggled fruit.

But a new study argues that the infamous Medfly has established permanent residence in the Golden State – even after decades of diligent spraying, trapping and biological attacks by state officials, who say they have eradicated the pest.

"The invasion is complete, and it's irreversible," said study co-author James Carey, an entomologist at the University of California, Davis. "It's like a slow-moving cancer."

The study, published in the British science journal Proceedings of the Royal Society B, incorporated research conducted at the University of Thessaly in Greece as well as data collected on 5,500 adult tropical fruit flies captured in California from 1950 to 2012.

Based on the geographic pattern and frequency of fruit fly outbreaks, researchers concluded that the Medfly and at least four related species gained a foothold in California more than 20 years ago and have increased their range as they adapted to the environment. Among the Medfly cousins that have taken root are crop-damaging Mexican and Oriental fruit flies, the authors reported.

"Despite the 250-plus emergency eradication projects that have been directed against these pests by state and federal agencies, a minimum of five and as many as nine or more ... species are established and widespread," they wrote.

Carey and colleagues said their findings suggested that state and federal officials needed to re-strategize their long-running war against fruit flies.

Among other things, they said, the California Department of Food and Agriculture should increase its trapping and monitoring of fruit flies throughout the state and should formulate long-term plans for dealing with an entrenched and growing fruit fly population, rather than one made up of occasional visitors.

"The bad news is that they're here," Carey said. "The good news is they're still at low levels."

Uncontrolled growth of tropical fruit flies, which lay their eggs in hundreds of varieties of fruits and vegetables, could carry significant economic consequences for the state. Local consumers would be dismayed to find maggots in their fruits and vegetables. Foreign and domestic trading partners might embargo California produce to prevent the flies from invading their agricultural fields and backyard gardens.

A top state official, responding to the new report, contended that California's fruit fly-control programs were effective and environmentally friendly.

"We'll give this paper to our science advisory panel and have them read it and evaluate it and give us their recommendations," said Robert Leavitt, director of plant health and pest prevention services at the Department of Food and Agriculture. "Quite frankly, I don't think it's going to change anything on the ground."