Apis-UK The Electronic Beekeeping Newsletter

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EDITORIAL

Hello again!

In a month when US scientists have discovered how to genetically engineer a microbe that eats industrial waste and excretes crude oil (true), this issue of Apis UK tries to follow suit by bringing to us many new ideas in the field of bee research. We look at how scientists appear to be pinning down the causes of CCD; we find out about how pollution can and does reduce the number of pollinating insects, especially bumble bees; we investigate linguist bees, gambling bees and as is often the case, we take a quick peek at bats and we get some sage advice on 'the rots' which affects both bees and sheep from the well known missionary beekeeper W.C. Cotton.

Bee science and its practical application never fails to amaze me in its subject scope. Do non native invasive plants transported across continents help or hinder native plants in attracting pollinating insects? Is the functional brain asymmetry of humans applicable to bees? Is kin selection is fundamental to the evolution of social insects? And so the list goes on of subjects that are actively being studied by bee scientists –

and all of these plus more are included in this month's issue of Apis.

On a negative note we look at a letter concerning the withdrawal of Gaucho and Poncho from the market following mass deaths of bees in Germany and it yet again serves as a wake up call for all of us in our efforts to educate ignorant politicians that many chemicals kill bees even if the label on the drum says it doesn't. I guess though that if these substances had affected their expenses, they would have been banned years ago!

Our innovative and original recipe comes to us with thanks to Jan Tempelman of The Netherlands and we offer our thanks for sharing this delicious treat with us. Take a look at Jan's site at http://www.xs4all.nl/~jtemp/index.html It has some very interesting articles of interest to beekeepers. Please let me know what you think of Jan's dish after you've tried it. I need feed back on this one. I suppose brown sauce might improve it!

Finally, if you can tell me what this photo shows before you read the article, then you deserve a prize.

I hope you enjoy this issue of Apis UK and the next issue will definitely come out on time – more or less. Keep in touch

David Cramp. Editor.

BEEKEEPING NEWS

JAR SIZES

With effect from April 2009 the prescribed quantities for pre-packaged foods is deregulated so honey may be packed in any type and size of jar.

Trading Standards Officers have been advised not to prosecute anyone caught applying the new rules
from 1 January 2008.

Honey Bee Losses Continue To Rise In U.S.
Colony Collapse Disorder, mites and other stressors continue to take a devastating toll on U.S. honey bee populations, according to apiculture experts in Penn State's College of Agricultural Sciences.

A recent survey by the Apiary Inspectors of America found that losses nationwide topped 36 percent of managed hives between September 2007 and March 2008, compared to a 31 percent loss during the same period a year earlier. Pennsylvania fared better, with losses of about 26 percent, compared to nearly 48 percent the previous year. About 70 percent of the state's losses this year were not related to Colony Collapse Disorder. The state's lower overall bee-mortality rate may be due to greater awareness of bee health issues and beekeepers' diligence in controlling varroa mites, nosema and other threats. Weather conditions also may have been more favourable for winter survival.

The state's comparatively lower losses meant that beekeepers this spring were able to meet the pollination demands of Pennsylvania's $61 million apple industry, which is the fourth largest in the country. Apples are completely dependent on insects for pollination, and 90 percent of that pollination is accomplished by honey bees. However, the cost of pollination has risen dramatically. This year, apple growers paid about $65 per colony, compared with $35 to $45 in the past. A typical apple orchard requires one colony per acre to achieve adequate pollination. Last year, apple growers harvested about 21,500 acres. Later this year, pumpkin growers may pay $95 to $105 per colony, compared to $55 to $65 last year.

CCD. Pinning Down the Causes
Meanwhile, Penn State researchers are making progress in pinning down the cause or causes of Colony Collapse Disorder (CCD), a mysterious ailment that threatens the beekeeping industry and the crops and native plants that rely on honey bees for pollination.

In fall 2007, a team led by Diana Cox-Foster, professor of entomology, reported a strong correlation between CCD and the presence of Israeli

acute paralysis virus, making the pathogen a prime suspect in the disease. Since that time, researchers have introduced IAPV to healthy honey bee colonies in a controlled greenhouse environment in an effort to induce a collapse. Within one week of introducing the virus, they observed dramatic bee mortality, with bees dying outside the colonies across the room in the greenhouse. Bees were found on the floor with paralytic-type movements, and guard bees were observed removing paralytic bees from colonies and flying across the room. The majority of these 'twitcher' bees were found to have IAPV. Within a month, infected colonies had declined to small clusters of bees, many of which had lost their queens. These data indicate that IAPV is a highly pathogenic virus. But they do not yet support a finding of IAPV as the sole cause of Colony Collapse Disorder. Researchers still suspect that additional stresses are needed to trigger CCD. Among the potential triggers being investigated are environmental chemicals. Penn State scientists analyzing pollen, wax, adult bees and brood (larvae) have found the presence of dozens of chemicals, including pesticides used by agricultural producers to protect crops and by beekeepers to control hive pests such as parasitic mites.

"This raises several complicated questions," said Maryann Frazier, senior extension associate in entomology. "Some of these compounds could react with each other to cause toxic effects or could combine with viruses or poor nutrition to weaken immunity and cause colony collapse. We also need to do more research to understand these chemicals' sub-lethal effects on bees." Though the role of chemicals in Colony Collapse Disorder is still unknown, Frazier noted that beekeepers need more options for controlling varroa mites so they can reduce their reliance on chemicals. "With the sheer number of compounds we're finding in hives, it's hard to believe that pesticides aren't contributing to the general decline in bee health," she said.

Article adapted from materials provided by Penn State USA.

RESEARCH NEWS

Bee Species Outnumber Mammals and Birds Combined

It has recently been reported that there are more bee species than previously thought. In the first global accounting of bee species in over a hundred years, John Ascher, a research scientist in the Division of Invertebrate Zoology at the American Museum of Natural History, compiled online species pages and distribution maps for more than 19,200 described bee species, showcasing the diversity of these essential pollinators.

This new species inventory documents 2,000 more described, valid species than estimated by Charles Michener in the first edition of his definitive The Bees of the World published eight years ago.

Outnumbered? It seems so!

"The bee taxonomic community came together and completed the first global checklist of bee names since 1896," says Ascher. "Most people know of honey bees and a few bumble bees, but we have documented that there are actually more species of bees than of birds and mammals put together." The list of bee names finished by Ascher and colleagues was placed online by John Pickering of the University of Georgia through computer applications that linked all names to Discover Life species pages, a searchable taxonomic classification for all bees, and global maps for all genera and species. The scientists recently reviewed all valid names from the university checklist and from those of experts from all over the world for the World Bee Checklist project led by the Smithsonian Institution's National Museum of Natural History and available online at: (http://www.itis.gov).

The bee checklists were developed as a key component of the Museum's Bee Database Project initiated in 2006 by Ascher and Jerome G. Rozen,

Jr., Curator of bees at the Museum.. A primary goal of the project is to document floral and distributional records for all bees, including now obscure species that may someday become significant new pollinators for our crops. The vast majority of known bee species are solitary, primitively social, or parasitic.

These bees do not make honey or live in hives but are essential pollinators of crops and native plants. Honey is made by nearly 500 species of tropical stingless bees in addition to the well-known honey bee *Apis mellifera*.

The crises facing traditionally managed pollinators like honey bees highlight the need for more information about bee species and their interactions with the plants they pollinate. The US National Academy of Sciences identified improved taxonomic data on bees as a high priority, and the new online bee checklists, maps, and other databases have for the first time made comprehensive data readily accessible.

The checklists compiled by Ascher and colleagues facilitate ongoing data-basing of the Museum's worldwide collections of more than 400,000 bee specimens.

Note: Adapted from materials provided by American Museum of Natural History.

MEMORY. New light on brain lateralisation.

It is generally known that the right and left hemispheres of the brain perform different tasks. Lesions to the left hemisphere typically bring impairments in language production and comprehension, while lesions to the right hemisphere give rise to deficits in the visual-spatial perception, such as the inability to recognize familiar faces.

In the last few years, we have become used to the idea that functional asymmetry between the left and right sides of the nervous system is not unique to humans: fishes, amphibians, birds and mammals have functional and anatomical asymmetries. So, the idea that all vertebrate species, even non-human ones without any linguistic skills, have an asymmetric brain seems to be finally accepted.

Now, this process of extension among species is going on and brain lateralization has been extended beyond the class Vertebrata. Insects, with their nervous system so different from that of vertebrates, are also "lateralized", and this has been demonstrated in a paper written by an international team of scientists and published in PLoS ONE by Lesley J. Rogers of the Centre for Neuroscience and Animal Behaviour, University of New England (Australia), and Giorgio Vallortigara, of the Centre for Mind/Brain Sciences, University of Trento (Italy).

Is Functional Asymmetry common to bees as well?

The scientists looked at memory in bees using a widely tested procedure, known as proboscis extension reflex (PER). When presented with a droplet of sugar solution, the honeybee extends its proboscis to get it. If an odour stimulus, such as lemon scent, is present shortly before the droplet, after very short training, animals learn to extend their proboscis when the odour alone is presented.

The honeybee can learn to discriminate between different odours, extending its proboscis to lemon and not to vanilla, keeping memory of the correct scent for a long period. The odour is perceived by the two antennae that honeybees have on their heads. After the bees had been trained using both antennae, Rogers and Vallortigara tested their recall ability, by coating either the left or right antenna with a harmless latex-based substance and thus rendering one antenna incapable of detecting odour.

The authors observed that, one hour after training, honeybees recognized the correct odour when the right antenna was in use and didn't when using the left antenna. However, 24 hours after training, the pattern reversed: correct responses were significantly higher when the

left antenna was in use. The "lateralization" appears to be linked to memory consolidation. Testing animals using lateral presentation (the odour was presented to the left or right side of the bee) and no coating of the antennae (both antennae in use), the authors found that bees showed better recall of the task when they were tested at one hour after training using the right antenna, an effect that disappeared three hours after training. However, by 6 hours after training, a lateral shift had occurred and the memory could be recalled mainly when the left antenna was in use. The left antenna took over on the long period (after 6 hours and remained so at 24 hours).

It would seem that the right antenna and the associated neural structures form the basis for a short term and relatively temporary memory, and left antenna supports long term learning, taking place from about 3 hours after training on. It is not clear at present whether learning via the right antenna is sufficient to trigger shorter-term encoding on the right side of the brain and longer-term encoding on the left side of the brain. An alternative hypothesis would be that the memory encoding is the same on both sides of the brain but only the right antenna has access for shorter-term recall and only the left antenna has access for longer-term recall.

What could the ecological reason for that be? Perhaps the shift from one antenna to the other allows use of the right antenna to learn about new odours without interference from odour memories in long-term stores. It is known that bees visit different flowers at different times of the day, as nectar becomes available, and this would require the formation of different odour associations during the course of the day, a process that might be aided if recall of earlier odour memories is avoided on the learning side of the brain.

Reference:
Rogers et al. From Antenna to Antenna: Lateral Shift of Olfactory Memory Recall by Honeybees. PLoS ONE, 2008; 3 (6): e2340 DOI:
This article was adapted from materials provided by Public Library of Science in the USA.

Non Native Plants Can Help Native Plants

In a new and pioneering study, scientists at the Universidad Autónoma de Barcelona (UAB), [the Autonomous University, Barcelona], the Biological Station, Donana, CSIC [the Spanish National Research Council] and the Instituto Mediterráneo de Estudios

Avanzados (IMEDEA) [Mediterranean Institute for Advanced Studies] have shown that invasive non native plants can assist rather than hinder native plants. Using empirical tests, a pioneering study shows how plant species, such as the prickly pear, invade Mediterranean ecosystems, and can either rob the native plants of pollinating insects, or, surprisingly, can attract them, thus benefiting the whole plant community, such as in the case of balsam. The research contradicts the hypothesis of the "floral market" whereby only the invasive flowers are seen to benefit and the native flowers are no longer visited by pollinating insects. This study would make useful treading for conservationists in New Zealand and Australia who are increasingly turning their attention to the eradication of anything that smacks of 'having been introduced' – unless it is a money making crop. By first studying the impact that introduced plants are having (positive or negative) on the plant population as a whole, then only those having a negative impact need be eradicated.

Biological invasions (species transported by humans outside their region of origin to other regions where these species become established and expand) are one of the major causes of the loss of biodiversity. The plants fight for nutrients, space and light, and for pollinating insects. However, according to this research, the existence of invasive plants in invaded sites can increase visits from insects to the majority of native plants. In this way the "floral market" hypothesis in which only the invasive flowers are seen to benefit and the native flowers are no longer visited by insects is contradicted. Ignasi Bartomeus, a researcher at the UAB, and the main author of the study, points out some important details to SINC: "the invasions do not follow a single pattern: for this reason it is necessary to understand the mechanisms and structure whereby the native species compete".

Carpobrotus Affine. Can this invader help attract pollinators to the native flowers, or will it benefit at their expense?

The two invasive plants under study, Opuntia stricata – a type of prickly pear – and Carpobrotus affine acinaciformis – also called Sally-my-handsome or balsam – have more eye-catching flowers and are richer in pollen that the rest of the native plants and receive many more insect visits that the latter. The study reveals that the invasive plants play a central role in the plant pollination network. This is because during the period of the study, Opuntia stricta received 30.9% of insect visits, compared to 43.4% for Carpobrotus affine acinaciformis.

The scientists discovered that the more resources there are in the plant community, the more pollinators will be attracted towards all of the plants, although it is still not known whether the impact on the seeds of the native plant is positive or not. This is the case for Carpobrotus, which can impact upon the pollination of the native plants.

The researchers observed 23 pollinating insects for Carpobrotus and 17 for Opuntia. Compared to the native plants, the two invasive plants have a different impact. In the first case, there was no insect that was an exclusive pollinator, whereas in the second case, the carpenter bee (Xylocopa violacea) was an exclusive pollinator. The Opuntia flowers monopolise the market, attracting all the pollinating insects in the area to their flowers, whereas the Carpobrotus attracts more pollinating insects to the area, but all the plants are seen to benefit.

The study concludes that Carpobrotus can improve the reproduction of the native plants whereas Opuntia reduces it. Bartomeus confirms to SINC that "the presence of the invasive plants can alter the structure of the plant community, and it is difficult to predict the long-term effects of this."

Reference: Bartomeus I., Vila M., Santamaría L. Contrasting effects of

invasive plants in plant-pollinator networks. Oecologia 155(4): 761-770 ABR 2008.

Gambling Bees

It seems that bees have a similar propensity for risk taking as humans. In some very interesting research reported in the journal Nature, Israeli researchers showed that when making decisions, people and bees are more likely to gamble on risky courses of action - rather than taking a safer option - when the differences between the various possible outcomes are easily distinguishable. When the outcomes are difficult to discern, however, both groups are far more likely to select the safer option - even if the actual probabilities of success have not changed.

The findings by researchers at the Technion-Israel Institute of Technology, Tel Aviv University and the Hebrew University help shed light on why people are inclined to choose certainty when differences between potential outcomes - such as paybacks when gambling or returns on financial investments - are difficult to discern.

The scientists first started with testing 50 college students and asked the subjects to choose between two unmarked computer buttons. Pushing one of the buttons resulted in a payoff of 3 credits with 100% certainty, while pushing the other led to a payoff of 4 credits with an 80% certainty - though participants only learned these payoffs through trial and error as they flashed on screen. The test subjects were required to make 400 such decisions each, and tended to choose the risky strategy when payoffs were represented as simple numbers (i.e. “3 credits” and “4 credits”). The results were similar when the numerals 3 and 4 were replaced with easily distinguishable clouds of 30 and 60 dots. But when the numerals were replaced with clouds of 30 or 40 dots - making it much more difficult to distinguish between the two - subjects veered towards the more certain outcome.

What shall I do?
Red or Black?

Then the researchers subjected honeybees to similar trials, using the bees' sense of smell and 2 µl drops of sugar solution payoffs of varying concentrations. The researchers first tested the bees with payoffs for risky and safe alternatives at 10% and 5% sugar concentrations, respectively. In a second experiment, the payoffs were a less-easy-to-discriminate-between 6.7% and 5%, and in a third experiment, the payoff in both alternatives was 6.7%. Bees were required to make 32 such decisions, and were given a choice between two smells, each presented twice for one-second each, in an alternating sequence. The bees tended towards the risky strategy only when their choice was easily discernable, paralleling their human counterparts.

Application in the work place

According to Professor Ido Erev of the Technion Faculty of Industrial Engineering and Management, some practical implications of this research can be seen in an analysis of the values placed on rule enforcement in the workplace.

The results, he said, suggest that:
"Consistent and constant rule enforcement is necessary, since workers are more likely to ignore risks - if they have done so before without punishment; workers are likely to be supportive of enforcement, since they initially plan to obey many of the rules (wearing safety goggles, for instance) they end up violating; and severe penalties that are not always enforced are not likely to be effective, but gentle, consistently enforced rewards and punishments can be. "The similar responses by humans and bees demonstrates that this decision-making process happens very early

in evolution," said Erev. "The results suggest that this is a very basic phenomenon shared by many different animals."

Adapted from materials provided by American Technion Society.

Linguist Bees

This piece of research has astonished me and as usual with bees it makes a mockery of the proposition that bees merely inherit a set of instructions that enable them to carry out their essential roles. It has now been determined that Asian and European honeybees can learn to understand one another's dance languages despite having evolved different forms of communication, an international research team has shown for the first time.The various species of honeybees found worldwide separated about 30 to 50 million years ago, and subsequently developed different dance 'languages'. The content of the messages is the same, but the precise encoding of these languages differs between species.

Now researchers from Australia, China and Germany have discovered that the two most geographically distant bee species—the European honeybee Apis mellifera and the Asian honeybee Apis cerana—can share information and cooperate to exploit new food sources.

All beekeepers know that the members of a honeybee colony routinely exchange information via dance about the location of newly discovered locations, like feeding places, water or new nesting sites. The scouts perform the so-called bee dances inside the nest. The coordinates of distant locations are encoded in the waggle phase of this ballet, with the direction and distance to the food source indicated by the orientation and duration of the dance. This duration differs across honeybee species, even if they fly the same distance in the same environment. It's these differences which we can think of as distinct languages.

The research team is the first to successfully study the behaviour of a colony containing a mixture of two different species of bees. One of the first findings of this novel approach was that Asian and European honeybees, after some time of adjustment in the mixed colony, could share information and work together to gather food. Asian honeybees followed the dances of European forager bees, and deciphered the encoded information correctly.

The dance language of honeybees is among the best studied communication systems in the animal kingdom. Nevertheless, surprises are still possible, as we have shown and this work has potentially major implications for our understanding of animal communication. Next the scientists plan to study exactly to what extent variation is a factor between different bee dance languages."

The research was carried out by an international collaborative team. In addition to the work done at ANU, the research team included Dr Shenglu Chen and Songkun Su from Zhejiang University in China and Dr Jürgen Tautz from Würzburg University in Germany.

USING OZONE TO SANITISE BEE HIVES

Ozone Might Help Make Bee Hives Cleaner and Safer especially in case of build ups of anti varroa chemicals.

Low levels of ozone are already used as disinfectants in residential homes and for many other sanitising uses, such as:

- Disinfect laundry in hospitals, food factories, care homes etc
- Water disinfectant in place of chlorine
- Deodorize air and objects, such as after a fire. This process is extensively used in Fabric Restoration;
- Kill bacteria on food or on contact surfaces;
- Ozone swimming pool and spa sanitation
- Scrub yeast and mold spores from the air in food processing plants;
- Wash fresh fruits and vegetables to kill yeast, mold and bacteria;

Now it is being studied to find out if it might help make hives cleaner and safer for America's beleaguered honey bees. That's according to results from preliminary laboratory tests by Agricultural Research Service (ARS) scientists in the USA.

The researchers tested ozone's effects on two pesticides, coumophos and tau-fluvalinate, both widely used by beekeepers to control varroa mites. As beekeepers, we all know that residues of these chemicals can accumulate in hives, including in the honeycomb and of course, beekeepers typically reuse the honeycomb after the honey has been extracted.

For the experiment, they placed glass vials of the pesticides in a small, tightly sealed chamber, then exposed the chemicals to a flow of ozone gas. Keeping the chamber at 50 percent relative humidity, different temperatures were tested and different ozone and pesticide concentrations.

Applying 500 parts per million of ozone in an approximately 93 degree Fahrenheit chamber for 10 to 15 hours degraded low concentrations of both pesticides, but 20 hours were needed to break down higher concentrations of tau-fluvalinate. They also looked at ozone's ability to zap the greater wax moth, a honeycomb pest, in all of its life stages, from egg to adult. Wax moths attack bee young and damage the honeycomb.

Young wax moth larvae and adults were killed by just a few hours of ozone exposure. However, eggs, the most resistant life stage, had to be exposed to the gas for a few days.

Further tests are needed to find out whether the breakdown products of the degraded pesticides pose a hazard to bees. In related work, the researchers are finding that ozone can destroy microbes that cause major bee diseases such as chalkbrood and American foulbrood, but much higher ozone concentrations and longer fumigation times are needed.

The research was carried out by entomologist Rosalind R. James. She leads the agency's Pollinating Insects Biology, Management and Systematics Research Unit at Logan, Utah.

Article adapted from materials provided by USDA/Agricultural Research Service.

How Drones Find Queens

This article was Adapted from materials provided by University of Illinois at Urbana-Champaign and the findings appear in the Proceedings of the National Academy of Sciences.

Odorant Receptor For Queen Bee Pheromone Identified I well know that the mating ritual of the honey bee is a mysterious affair, occurring on

the wing and usually out of sight and hearing in what are known as Drone Congregation Areas. But I've always wanted to know how drones find the queen in the vastness of the open sky. Now a research team led by the University of Illinois has identified an odorant receptor that allows male drones to find a queen in flight. The receptor, on the male antennae, can detect an available queen up to 60 meters away. This is the first time an odorant receptor has been linked to a specific pheromone in honey bees.

The Amazing Drone

The "queen substance," or "queen retinue pheromone," was first identified decades ago, but scientists have only recently begun to understand its structure and role in the hive. The pheromone is a primary source of the queen's authority. It is made up of eight components, one of which, 9-oxo-2-decenoic acid (9-ODA), attracts the drones during mating flights. It also draws workers to the queen and retards their reproductive growth.

Principal investigator Hugh Robertson, a professor of entomology, said the research team pursued the receptor for the queen retinue pheromone because it was the "lowest hanging fruit" of the known honey bee odorant receptors. Robertson was among the research group that last year published the entire honey bee genome, a feat that allowed his lab to identify 170 odorant receptors in honey bees.

Robertson and his colleagues knew that male drones probably had little use for most of these receptors. The drones don't forage and so do not need to detect the subtle scents of flowers. Their social role within the

hive is virtually non-existent. They have only one task: to find and mate with a queen. Once they have accomplished this, they die.

Using a functional genomics approach, entomology postdoctoral researcher Kevin Wanner was able to determine which odorant receptors were more dominant in males than females. He found four receptors that were expressed in much higher quantities in males than females.

"These proteins are expressed in the membranes of the olfactory neurons way up in the tips of these little sensilla in the antennae of these males," Robertson said. "A neuron goes all the way from there to the brain. Now the brain gets a signal that says, 'I've smelled this chemical.' If the chemical is 9-ODA, for the drone that means one thing and one thing only: 'There's a queen somewhere!

Determining which of the four primary receptors in males was actually responding to 9-ODA was a formidable challenge. By chance, at a conference on the science of olfaction, Wanner met Charles Luetje, a neuroscientist at the University of Miami who had expertise with precisely this type of problem. Luetje had perfected a technique for expressing mammalian odor-sensing receptors on the outer membranes of frog oocytes (eggs) and testing them to see which compounds activated them. When he heard of Wanner's work in honey bees, Luetje offered to use this technique to test the four primary odor receptors of honey bee drones.

After refining and testing the technique in insects, the researchers exposed each of the drone odorant receptors to 9-ODA. Only one of the four receptors responded. When it bound 9-ODA, the protein receptor's conformation changed, setting off a measurable shift in the membrane potential. None of the four primary male odorant receptors responded to the other components of the queen pheromone. Only the 9-ODA elicited a response in one of the four. Of course, ultimately, there are another 169 receptors to go. Scientists have spent decades exploring the mysteries of insect smell, but the newest tools make such research much more promising. "Like so many biologists, we are wonderfully caught up in the genomic revolution," he said. "We can sequence genomes. We can use functional genomics to narrow it down. We've got these assays, such as the frog oocyte, and other assays. And the genomic revolution has opened up this black box of the molecular biology of insect smell. Finally

now we can peer inside."

(What I want to know though is how do drones find Drone Congregation Areas? When I researched these areas they were full of drones long before any queens arrived at them. The queen finding receptor would not be used in this case and I presume would only be used once a queen entered the area. Also, how do queens find DCAs?). Ed

Flowers' Fragrance Diminished By Air Pollution

A new study shows that air pollution from power plants and automobiles is destroying the fragrance of flowers and thereby inhibiting the ability of pollinating insects to follow scent trails to their source, a new University of Virginia study indicates. This could partially explain why wild populations of some pollinators, particularly bees—which need nectar for food—are declining in several areas of the world, including California and the Netherlands.

Could reduced scent be causing a decline in pollinator numbers?

"The scent molecules produced by flowers in a less polluted environment, such as in the 1800s, could travel for roughly 1,000 to 1,200 meters; but in today's polluted environment downwind of major cites, they may travel only 200 to 300 meters," said Jose D. Fuentes, a professor of environmental sciences at the University of Virginia and a co-author of the study. "This makes it increasingly difficult for pollinators to locate the flowers."

The result, potentially, is a vicious cycle where pollinators struggle to find enough food to sustain their populations, and populations of flowering plants, in turn, do not get pollinated sufficiently to proliferate and diversify. Other studies, as well as the actual experience of farmers, have shown that populations of bees, particularly bumblebees, and butterflies have declined greatly in recent years. Fuentes and his team of U.Va. researchers, including Quinn McFrederick and James Kathilankal, believe that air pollution, especially during the peak period of summer, may be a factor. To investigate this, they created a mathematical model of how the scents of flowers travel with the wind. The scent molecules produced by flowers are very volatile and they quickly bond with pollutants such as ozone, hydroxyl and nitrate radicals, which destroy the aromas they produce. This means that instead of traveling intact for long distances with the wind, the scents are chemically altered and the flowers, in a sense, no longer smell like flowers. This forces pollinators to search farther and longer and possibly to rely more on sight and less on smell.

The scientists calculated scent levels and distances that scents can travel under different conditions, from relatively unpolluted pre-industrial revolution levels, to the conditions now existing in rural areas downwind from large cities.

"It quickly became apparent that air pollution destroys the aroma of flowers, by as much as 90 percent from periods before automobiles and heavy industry," Fuentes said. "And the more air pollution there is in a region, the greater the destruction of the flower scents."

The study appears online in the journal Atmospheric Environment.

Tropical Reforestation Aided By Bats

In a very interesting project which is nothing to with bees but does involve an important pollinator, German scientists are engaging bats to kick-start natural reforestation in the tropics by installing artificial bat roosts in deforested areas. This novel method for tropical restoration is presented in a new study published online in the science journal Conservation Biology this week. Detlev Kelm from the Leibniz Institute for Zoo and Wildlife Research in Berlin (IZW) and Kerstin Wiesner and Otto von Helversen from the University of Erlangen–Nuremberg report that the deployment of artificial bat roosts significantly increases seed

dispersal of a wide range of tropical forest plants into their surroundings, providing a simple and cheap method to speed up natural forest regeneration.

The Importance of Bats

Tropical forests are of global ecological importance. They are a key contributor to the global carbon balance and are host to a major part of the world's biodiversity. Between 2000 and 2005, worldwide net losses of tropical forest cover averaged 0.18 % annually and regionally even exceeded 1.5 % annually in some Latin American countries. Forest is usually replaced by agriculture. Often soils become rapidly infertile and land is abandoned. Because deforested areas rarely offer much food or protection for seed dispersers such as birds or small mammals, natural forest regeneration is hampered by a lack of natural seed inputs. The alternative, replanting tropical forests, is too expensive and rarely a feasible option, and, in general, knowledge on how best to rapidly restore natural vegetation is lacking.

The scientists believe that bats could help in reforestation. They are able to cover large distances during their nightly foraging flights and are willing to enter deforested areas. Many bats eat fruits or nectar, and thus are key species for seed dispersal and flower pollination. Kelm and colleagues showed that the principal barrier to reforestation - the lack of seed inputs - could be overcome by the deployment of artificial day roosts for bats in deforested areas. These roosts were designed to approximate characteristics of large, hollow tree trunks, the main type of natural bat roost. Within a few days to weeks the first bats will move in. So far they have found ten bat species using the roosts, and several of these are common and important seed dispersers. They measured the effect of the roosts on seed dispersal and found seeds of more than 60 plant species being transported by the bats. Of these plants, most were

pioneer species, which represent the initial stages of natural forest succession. This cost and labour efficient method can thus support and speed up natural forest regeneration. Artificial roosts are simply built boxes, which require little maintenance and can be used by bats for many years. They hope that this cheap and easy to use method will be applied in many parts of the tropics in the near future, and that bats will be "employed" as efficient agents of reforestation. They may provide an effective contribution to the amelioration of deforestation and climate change.

Reference: Detlev H. Kelm, Kerstin R. Wiesner, Otto Von Helversen. Effects of Artificial Roosts for Frugivorous Bats on Seed Dispersal in a Neotropical Forest Pasture Mosaic. Conservation Biology. Published article online: 25-Apr-2008.

Adapted from materials provided by Forschungsverbund Berlin e.V..

Altruism in Social Insects is a Family Affair

Amongst other insects, honey bees are known for the fact that only the queen bee in the colony will mate and reproduce and they will be assisted in this function by their non reproductive offspring, the workers. In other words the interest of the colony is put first by the workers. The debate about why insects evolved to put the interests of the colony over the individual has now been reignited by new research from the University of Leeds, showing that they do so to increase the chances that their genes will be passed on.

The concept of kin selection

A team led by Dr Bill Hughes of the University's Faculty of Biological Sciences studied 'kin selection'. This theory postulates that an animal may pass on its genes by helping relatives to reproduce, because they share common genes, rather than by reproducing itself.

The concept of was developed in 1964 by the evolutionary biologist Bill Hamilton and was first proposed by Charles Darwin to explain, for example, why sterile workers evolved in social insect groups and why a honeybee would sacrifice its life to defend the colony. Charles Darwin recognized that such altruistic behaviour in highly social insect groups was at odds with his theory of natural selection, and Hamilton's theory of kin selection showed that this behaviour can evolve because it still fulfils

the drive to pass on genes - but through relatives instead.
As such, high relatedness between insects has generally been seen as essential for the evolution of highly social behaviour and until recently, kin selection was widely accepted by the scientific community.

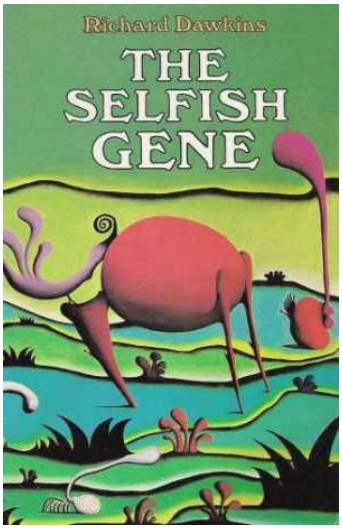
Kin Selection Theory Challenged
But this model was challenged in 2005 by the eminent academic E.O. Wilson, the founder of socio-biology, who pointed out that relatedness is rather low in some of today's social insects. He suggested that highly social behaviour evolves solely because individuals do better when they cooperate than when they live a solitary life - a controversial theory which not only conflicted with 45 years of scientific research, but which also sparked a highly charged debate between Wilson and Richard Dawkins, author of 'The Selfish Gene'.

Testing the Theories
Dr Hughes and colleagues at the Universities of Sydney and Sussex tested the two alternative theories by examining the level of relatedness between females in colonies of bees, wasps and ants, determined by DNA fingerprinting techniques, and using statistical methods to look at levels of monogamy in the ancestral social insects when they evolved up to 100 million years ago. If females were monogamous, mating with one male, this would mean the members of the colony are highly related, and so Hamilton's theory would be correct. If they were polygamous, with the female mating with many males, relatedness would be lower and so Wilson may be right after all.

The Result
The research, published in the journal, Science, found that in every group studied ancestral females were found to be monogamous, providing the first evidence that kin selection is fundamental to the evolution of social insects.
This means that Dr Hughes and his team have produced the first conclusive evidence that kin selection explains the evolution of social insects and that Wilson's hypothesis is most probably wrong. By challenging something that we have based all our understanding on for 45 years, Wilson has forced us all to examine the theory again and assess the logic of the arguments. In a recent media interview, he issued a challenge to the scientific community to prove his theory wrong and whilst many felt it was, there hasn't been any hard evidence until now.

The research was carried out by Dr Hughes, Professor Ben Oldroyd of the University of Sydney, Associate Professor Madeleine Beekman of the University of Sydney and Professor Francis Ratnieks of the University of Sussex.

Reference: William O. H. Hughes, Benjamin P. Oldroyd, Madeleine Beekman, and Francis L. W. Ratnieks. Ancestral Monogamy Shows Kin Selection Is Key to the Evolution of Eusociality. Science, 2008; 320 (5880): 1213 DOI: 10.1126/science.1156108 Adapted from materials provided by University of Leeds



Further reading
The Selfish gene by Richard Dawkins shown with the original cover painted by Desmond Morris. The book was republished as a 30 anniversary edition in 2006 and is available on Amazon

ARTICLES

Chad offers more advice for our readers, telling us about the general state of things in the matter of his beekeeping and he also comes up with a brilliant new idea!

Nothing in Particular

I'll tell you what made me mad today. There I was, standing on the ridge of a roof, clinging to a chimney stack, wondering about life insurance whilst trying to shake wasp powder down the chimney in the hope that I might kill-off the bees that were preventing the builders from restoring the roof. I wondered, who it was that had put Apistan strips down the chimney last autumn, to keep the bees healthy? I wondered who had given them their sugar feed? And why it was that despite my treating and feeding my own bees I still managed to lose 15 colonies. The bees that had swarmed into the chimney and had had no one to tend to them managed perfectly well to get through the winter. Blooming maddening. What a waste.

On the other hand, things are generally going well, I am, for the first time ever, ahead of the game, my hives and equipment are all sorted out, all the frames made, all the apiaries healthy and hive parts serviceable. It feels good; let me tell you, especially after the previous three years which produced more frustration than honey. All my hives are just next to, or in, oilseed rape fields and this evening I drove to a couple of vantage points and made a note of just how many farms were growing the oilseed rape in the area, it's great to see so many yellow squares. I am going to do a bit of localized migratory beekeeping this year, I have got my field-bean apiaries lined up for the June gap so as soon as the rape finishes flowering I'll be moving the hives there. Bee farming is rather fun when you're not behind with things. The only big job I've left to do is to secure my extractor somehow. When it was bolted down into six inches of concrete it hardly vibrated on full spin but now it's in the Portakabin I will have to come up with some new way of securing it, a wobbly extractor destroys frames and combs.

I've come up with a brilliant idea. I have always been a great fan of Michael Crichton's Jurassic Park. I was studying A-level geology when the book first came out and loved all the references to Paleontology (spell that

when you're off your head on mead.) The book, for those that haven't read it, is all about extracting dinosaurs' DNA from blood sucking insects that have been trapped and preserved in amber. It's not the sort of

science you can do in the kitchen but the theory is fascinating. Everyone knows about amber, the jewellery is very popular and I'm very excited to tell you that I have developed my own Amber Honey. What

I do is this; I take a 1 oz jar. I half fill it with warmed clear honey; I put a dead bee in the jar and then fill the jar with more honey. Then screw the lid on and you're done; it looks fantastic. I know what you're thinking, how do I stop the bee from floating to the top of the jar, well it's simple. You can glue a single piece of lead shot to the underside of the thorax (so that it cannot be seen) and this compensates for the buoyancy of the dead bee. I know what you're thinking, where do you get lead shot? Well, most game keepers will sell you shotgun cartridges which you can either cut into using a sharp knife or, as I prefer, the old, tried-and-tested vice, hammer and pillow technique. If you use a really clear honey the finished product looks terrific, a perfect gift for children. And here's the good bit, I'm selling these jars at £2.50 each. That's right, £2.50 each. I know what you're thinking; there are over forty thousand bees in a summer colony. Oh yes. And now you're realising why I'm taking next year off to go on holiday. My amber honey has been flying off the Farmers' Market stalls; just wait until Christmas.
Chad.

(Paleontology was one of my main subjects at Uni. Ed.).

RECIPE OF THE MONTH

FRIED DRONE PUPAE
This exciting and unusual recipe comes to us from Jan Tempelman in Holland. I expect it is used somewhere in the world and no doubt would be a great protein provider. I haven't actually tried this recipe yet and am actively looking for a reviewer.

Method (in Jan's words).
1. First uncap the closed cells. I use an old saw blade.


2. Then push out the pupae

3. Now take a pan, fry some onions, and add the pupae and fry for about 5 min.


4. It tastes great. (Why not, we eat snails, frog-legs, prawns, shrimps and oysters etc).

After that enjoy your dinner with some buttered toast or a continental hard bread and of course a pint of Waggle Dance beer or a smooth glass of mead. (Make that several). (Ed).

(These great pictures made with my new Casio QV-11 (and what a pleasure that is.)

HISTORICAL NOTE

In this extract, The Reverend William Charles Cotton gives us an idea of the thinking of progressive beekeepers in the early 1800s when coming up to winter time.

"In damp places many Bees die of the rot. Even in dry places a good deal of water settles on the top of the hives inside, made by the breath of the bees. When you put your bees in their winter quarters, take the bung out of the hole in the top, and put a tin on the board on which the cap stood in summer. It is an upright ring, standing on a flat plate of tin, or zinc, with a hole through the middle. Over this, turn a glass top-turvey. The hot air comes up through the hole, turns into steam, and runs down the glass, outside the upright ring.
(……..Damp air gives them the rot as it does sheep)."

The Reverend WC Cotton. There is no doubt that William Cotton was a talented man whose achievements were limited by his mental ill-health. Numerous references have been made to Cotton's erratic behaviour, in particular his over-spending, and his periods of depression. There can be little doubt that he suffered from what is now known as bipolar disorder. He did achieve much, particularly during his years as a missionary in New Zealand, and in the field of apiculture.

Two of his better known works on beekeeping were:My Bee Book 1842, and A Manual for New Zealand Beekeepers 1848

POEM OF THE MONTH

Another poem by that supreme 19th Century, American poet, Emily Dickenson.

THE BEE
By Emily Dickenson

Like trains of cars on tracks of plush
I hear the level bee:
A jar across the flowers goes,
Their velvet masonry
Withstands until the sweet assault
Their chivalry consumes,
While he, victorious, tilts away
To vanquish other blooms.
His feet are shod with gauze,
His helmet is of gold;
His breast, a single onyx
With chrysoprase, inlaid.
His labor is a chant,
His idleness a tune;
Oh, for a bee's experience
Of clovers and of noon!

LETTERS

David,
Re CCD and the comments in the recent newsletter. I wholeheartedly support the comment about CSL being in denial over this.

I have suffered losses of this type over the past three seasons - no identifiable reason just empty hives. This last winter I lost another three colonies and that wiped me out.

Whatever the cause, this problem is with us now and we must lobby for immediate research as to the cause and possible control.

Excellent newsletter, keep up the good work

Peter Barker

Press Release, May 21, 2008
Coalition against BAYER Dangers (Germany)

Mass death of bees in Germany: Pesticide approvals suspended

"Bayer has to take Gaucho and Poncho from the market worldwide"

The German Office for Consumer Protection and Food Safety (BVL) has ordered the immediate suspension of the approval for eight seed treatment products due to the mass death of bees in Germany's Baden-Wuerttemberg state. The uspended products are: Antarc (ingredient: imidacloprid; produced by Bayer), Chinook (imidacloprid; Bayer), Cruiser (thiamethoxam; Syngenta),
Elado (clothianidin; Bayer), Faibel (imidacloprid; Bayer), Mesurol (methiocarb; Bayer) and Poncho (clothianidin; Bayer). According to the German Research Centre for Cultivated Plants 29 out of 30 dead bees it had examined had been killed by contact with clothianidin. Also wild bees and other insects are suffering from a significant loss of population.

"We have been pointing on the risks of neonicotinoids such as imidacloprid and clothianidin for almost ten years now. With an annual turn-over of nearly 800 million Euro (1.25 billion US dollar) imidacloprid and clothianidin are among Bayer´s most important products. This is the reason why Bayer, despite serious environmental damage, is fighting against any application prohibitions", says Philipp Mimkes, speaker of the Coalition against BAYER-dangers. The Coalition demands that Bayer withdraw allneonicotinoids from the market worldwide.

Bayer is the worldmarket leader for pesticides. With sales of 556 million Euro in 2007, imidacloprid is Bayer´s best selling pesticide product. In Germany imidacloprid is used under the brand names Gaucho, Antarc and Chinook, primarily during the cultivation of rape, sugar-beet and corn.

"It's a real bee emergency", said Manfred Hederer, president of the German Professional Beekeeper's Association. "Fifty to 60 percent of the bees have died on average, and some beekeepers have lost all their hives." Beekeepers and agricultural officials in Italy, France and Holland all noticed similar phenomena in their fields when planting began a few weeks ago.

In France most applications of imidacloprid were already banned in 1999. In 2003 the Comité Scientifique et Technique, convened by the French government, declared that the treatment of seeds with imidacloprid produces a significant risk for bees. Only a few months ago Bayer´s application for clothianidin was rejected by French authorities.

Clothianidin is a non-selective poison. According to the U.S. Environmental Protection Agency's fact sheet 'clothianidin is highly toxic to honey bees.' Seeds are treated with clothianidin in advance or sprayed with it while in the field, and the insecticide can also be blown onto other crops. The chemical is often sprayed on corn fields during the spring planting to create a protective film on cornfields.

For further information see also:

* Press Release of the Research Centre for Cultivated Plants (German):
www.jki.bund.de/cln_044/nn_813794/DE/pressestelle/Presseinfos/2008/1605__BienensterbenClothianidin.html__nnn=true

* Protection of Bees: Open Letter to EU Commissioner of Health
http://www.cbgnetwork.de/1736.html

* Bee-keepers and environmental groups demand prohibition of pesticide "Gaucho"
http://www.cbgnetwork.de/306.html

* French Institutes Finds Imidaproclid Turning Up in Wide Range of Crops
2003 report from the "Comité Scientifique et Technique de l'Etude Multifactorielle des Troubles des Abeilles"
http://agriculture.gouv.fr/IMG/pdf/rapportfin.pdf

Coalition against BAYER Dangers

DATES FOR YOUR DIARY

Saturday 12th July Thorne's Open Day, **WRAGBY** 9am – 4pm
Monday 21st July **NEWARK** Region, Bromley Arms, **FISKERTON** 8pm
Monday 18th August **NEWARK** Region, Lord Nelson, **WINTHORPE** 8pm

Bees for Development Safari Dates
TURKEY
2-14 August 2008
Last chance to join this excellent Safari - reply by return
TANZANIA
13-27 November 2008
This Safari will be organised in co-operation with our local partners, Njiro Wildlife Research Centre based in Arusha, East Tanzania
TRINIDAD & TOBAGO
2-12 February 2009
Organised in co-operation with our partner of 14 years, Gladstone Solomon. Contact us for further information, we will be happy to help.
PLEASE BOOK EARLY!
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http://www.beesfordevelopment.org/info/activities/safaris/index.shtml
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Bees for Development Trust Charity No 1078803

QUOTE OF THE MONTH

Which well known beekeeper uttered these words?

"It comes to mind that, if as a young man I was typical of my generation, I cannot have changed very much, as much of this book is about sex."