Issue 25 · July 2026

NO BEES LIFE

EBA MAGAZINE

25 ISSUES OF THE EBA MAGAZINE

32 COUNTRIES

FROM WHICH EBA HAS MEMBERS

(65 beekeeping organizations)

In order of confirmation of the Statute of EBA

430.584 beekeepers

Serbia
Slovenia
North Macedonia
Bulgaria
Greece
Romania
Malta
Germany
Hungary
Ukraine
Montenegro
Lithuania
Bosnia and Hercegovina
Sweden
Croatia
Czech Republic
Poland
United Kingdom
Netherlands
Italy
Ireland
Belgium
Cyprus
Türkiye
Switzerland
Prishtina*
Portugal
Spain
Slovakia
Austria
Albania
Iceland
Estonia

GENERAL SPONSOR

OF THE
EUROPEAN BEEKEEPING ASSOCIATION

SAVA
INSURANCE
GROUP

AMONG GOOD PEOPLE

SAVA
ZAVAROVALNA
SKUPINA

V DRUŽBI DOBRIH LJUDI

SILVER SPONSOR

OF THE
EUROPEAN BEEKEEPING ASSOCIATION

BRONZE SPONSOR

OF THE
EUROPEAN BEEKEEPING ASSOCIATION

We have now published 25 issues of the EBA magazine NO BEES, NO LIFE—marking two full years of dedicated work to keep Europe's beekeepers accurately informed about the many activities of the European Beekeeping Association, while also providing high-quality technical articles from which we have all been able to learn something new.

Over the past two years, EBA has been exceptionally active and has achieved a great deal. Consequently, there has been no shortage of important developments to report in our shared European magazine—the first publication of its kind in the history of European beekeeping. This is an achievement of which we should all be proud.

That said, one challenge remains: we continually need more technical and scientific articles. We are convinced that every EBA member organization could contribute at least one high-quality article every three months by selecting it from its national beekeeping journal or magazine.If translating the article into English is difficult or impractical, don't worry—we will gladly do it using modern AI-assisted translation, which today is capable of producing highly accurate translations while correctly handling specialized beekeeping terminology. Please support this common project by sending us one article—not necessarily every month, but at least once every three months. Together, we can ensure that the technical section of our shared magazine remains of the highest possible quality.

With faith and determination, we will continue confronting the many lobbying interests that are currently trying to obstruct EBA's primary mission: eliminating honey fraud throughout Europe. The road ahead is uncertain, but it is one that we must shape ourselves. Too often it seems that everyone else is working against the interests of honest beekeepers. We cannot expect others to solve our problems for us. It is becoming increasingly clear that this responsibility rests with us—the beekeepers themselves—despite the pressure, exhaustion, and unfair competition we face every day. Yet we must find the strength to persevere and reach our goal.

There is an old saying that every journey begins with a single step. We have already taken far more than that first step. We have built a strong foundation, achieved significant milestones, and demonstrated what united European beekeepers can accomplish. That is why we have every reason to believe in success. Let's keep moving forward!

HONEY FRAUD BECOMES A REPUTATIONAL RISK FOR THE RETAIL SECTOR – NEW EU HONEY DIRECTIVE MARKS A TURNING POINT

GHIC calls on consumers, beekeepers, and food retailers for greater transparency and rigorous quality controls

Willingen/Brussels, June 14, 2026 – With the entry into force of the new EU Honey Directive, a new phase in the fight against honey fraud in Europe begins today. The reform aims to make the origin of honey more transparent, improve traceability, and boost consumer confidence.

This legislative change follows alarming findings from the European "From the Hives" investigation, conducted by the European Anti-Fraud Office (OLAF), the European Commission, and the Joint Research Centre (JRC).

The study revealed that around 46 percent of the imported honey samples examined were suspected of being adulterated. It also showed that conventional testing methods are often insufficient to reliably detect modern forms of adulteration.

"Today is an important day for consumers and beekeepers in Europe. The new Honey Directive sends a clear signal that policymakers and authorities have recognized the problem. Now, action must follow words," explains Bernhard Heuvel, founder and CEO of the Global Honey Integrity Council (GHIC).

What changes specifically for consumers?

With the entry into force of the new EU Honey Directive, consumers will gain significantly greater transparency regarding the origin of their honey for the first time.

Previously, a general statement on many honey jars sufficed:

"Blend of honey from EU and non-EU countries"

or

"Blend of honey from non-EU countries"

This made it virtually impossible for consumers to trace where the honey actually came from.

The new regulation stipulates that countries of origin must be specified much more precisely in the future. Consumers should be able to see which countries the honey comes from and the proportion each country of origin contributes to a blend.

Example:

Previously: "Blend of honey from EU and non-EU countries"

In the future:
Ukraine 45%
China 30%
Argentina 15%
Romania 10%

This makes the origin much more transparent for consumers and significantly limits the scope for obscuring origins.

"The new Honey Directive gives consumers a tool they did not have before: genuine transparency regarding the origin of their honey," explains Heuvel.

Consumers have more influence than they think

The Global Honey Integrity Council (GHIC) calls on consumers across Europe to make active use of this new information.

When buying honey, consumers should pay close attention to origin details and ask themselves:

Which countries does this honey come from? Are the countries of origin clearly stated? Is the supply chain traceable? Does my purchase support transparency and fair market conditions?

Every purchase sends a signal to the market.

Choosing transparent products strengthens honest beekeepers, supports responsible companies, and helps make food fraud less attractive.

Honey fraud is no longer a marginal issue

For years, beekeepers across Europe have complained of immense pressure regarding prices and competition caused by products whose authenticity is increasingly being called into question.

While European beekeepers struggle with rising costs for labor, energy, supplies, and animal health, large quantities of extremely low-priced honey are entering the European market. At the same time, scientific studies and international investigations are increasingly revealing that honey fraud is not an isolated incident but has become a structural problem within the global honey trade.

New analytical techniques—such as DNA sequencing, proteomics, high-resolution mass spectrometry, and modern multi-method approaches—are now providing authorities with capabilities that were unavailable just a few years ago.

Investigations are currently underway in several European countries. National authorities are increasingly exchanging information at the European level.

Simultaneously, there is growing pressure on traders and importers to demonstrably ensure the authenticity of their products.

The retail sector faces a crucial decision

For food retailers, the issue has long since moved beyond mere compliance with legal regulations.

It is a matter of trust.

Consumers rightly expect that a product sold as honey is, in fact, honey.

The new EU Honey Directive increases transparency. At the same time, it places a greater responsibility on supermarket chains, importers, and bottlers to align their quality control measures with the latest scientific and technical standards.

"The greatest damage does not stem from a fine, but from a loss of trust. Those who invest in modern quality control today protect both their brand and their customers," says Heuvel.

The GHIC therefore calls upon the European food retail sector to:

critically review supply chains,

employ modern authenticity analysis methods,

increase transparency for consumers,

consistently investigate suspicious products,

and act swiftly and responsibly in cases of substantiated suspicion.

Beekeepers Organise Globally

The Global Honey Integrity Council (GHIC) was established to address the challenges of the international honey market.

The organization connects beekeepers, scientists, laboratories, journalists, consumer advocates, and policymakers with the aim of strengthening the integrity of the honey market, protecting consumers, and creating a level playing field for honest beekeepers.

The Coming Weeks Could Be Crucial

Over the past few months, Bernhard Heuvel and his partners have organized extensive sampling operations in several European countries, including Germany, Italy, Belgium, and the Netherlands.

Preliminary analyses of numerous products have already raised significant doubts regarding their authenticity.

Sampling procedures witnessed by a notary have been completed. The results of the laboratory analyses are expected in the coming weeks and will subsequently be handed over to the relevant authorities in the affected EU member states.

If the suspicions are confirmed, official investigations and further measures could follow.

The goal is to:

expose honey fraud,

initiate official investigations,

protect consumers,

increase pressure on the trade sector to improve quality controls,

and restore fair market conditions for honest beekeepers.

At the same time, discussions are underway with Members of the European Parliament, European Commission officials, scientists, journalists, and beekeeping associations to launch further measures against honey fraud.

Support Needed

To date, the ongoing investigations, sampling, and discussions with authorities, scientists, media representatives, and policymakers have been largely funded through private means.

The Global Honey Integrity Council is therefore calling on beekeepers, consumers, and supporters to provide financial backing for these ongoing activities.

Every contribution helps to:

conduct further sampling,

secure evidence that stands up in court,

educate consumers,

provide authorities and the media with reliable information,

expand international cooperation,

and restore fair market conditions for honest beekeepers.

If just 130 beekeepers, consumers, and bee enthusiasts contribute 50 euros each, the budget for the next phase of the campaign would already be covered.

You can support this work here:
https://gofund.me/3ce928018


PIONEERING INNOVATIVE METHODS
FOR HONEY AUTHENTICITY IN EUROPE
INNOVATION. SCIENCE. AUTHENTICITY.
ESTONIA
Second innovative accredited DNA method for determining honey authenticity.
Method accredited in April 2026.
SERBIA
First innovative accredited EIM-IRMS method for determining honey authenticity.
Method accredited in April 2023.
The laboratory was robbed by the beekeeping mafia immediately after it started working and all equipment was taken.

About the Global Honey Integrity Council (GHIC)

The Global Honey Integrity Council (GHIC) is an independent international initiative comprising beekeepers, scientists, laboratories, consumer advocates, and industry experts dedicated to transparency, authenticity, and a level playing field in the global honey market.

The GHIC aims to expose honey fraud, protect consumers, and safeguard the livelihoods of honest beekeeping families. To this end, the GHIC supports scientific research, international cooperation, policy initiatives, and the exchange of information among regulatory bodies, research institutions, the media, and market participants.

The initiative promotes modern methods for verifying honey authenticity, advocates for transparent supply chains, and works to strengthen consumer confidence in honey as a natural food product.

In light of growing evidence of systematic adulteration in the international honey trade, the GHIC serves as a platform for factual information, scientific integrity, and practical solutions that benefit consumers, beekeepers, and honest businesses.

Further information:
Global Honey Integrity Council (GHIC)
Contact:
Bernhard Heuvel
CEO & Founder
Global Honey Integrity Council (GHIC)
ceo@honeyintegrity.com
+49 176 4166 1815

About the Founder

Bernhard Heuvel is a professional beekeeper, entrepreneur, and one of Europe's most prominent figures in the fight against honey fraud and the campaign for honey authenticity.

He served as President of the European Professional Beekeepers Association (EPBA) until early 2026. Additionally, he was the Vice President of the German Professional Beekeepers Association (DBIB).

In recent years, Heuvel has launched numerous international initiatives to expose honey adulteration and has played a pivotal role in driving dialogue among beekeepers, scientists, laboratories, the media, regulatory authorities, and policymakers.

*He gained widespread recognition for his involvement in the ZDF *Frontal* documentary "Fake-Honig: Eine süße Illusion" (Fake Honey: A Sweet Illusion), produced in collaboration with professional beekeepers from across Europe. For the documentary's research, Heuvel traveled to locations including China and participated in undercover investigations along international supply chains. These efforts involved conversations with syrup manufacturers, honey traders, and processing plants, documenting how modern honey adulteration is carried out and how adulterated products enter international trade flows. The documentary revealed the scale and sophistication of global honey fraud to an audience of millions for the first time.*

*The ZDF *Frontal* report on honey: https://youtu.be/Gh-N5L-D3C4*

Furthermore, Heuvel has collaborated with journalists, research institutions, Members of the European Parliament, European Commission officials, and national authorities to develop scientifically sound and practical solutions to combat honey fraud. His analyses, research findings, and statements have garnered significant attention across Europe within trade media, political institutions, and the beekeeping community. With the founding of the Global Honey Integrity Council (GHIC), Bernhard Heuvel aims to unite the efforts of beekeepers, scientists, laboratories, consumer advocates, the media, and responsible companies worldwide in order to strengthen transparency, scientific integrity, and fair competition in the honey market.

He is dedicated to protecting consumers, safeguarding the future of beekeeping, and ensuring that honey remains what it ought to be:

an ***unadulterated natural product*****.**

Abstract

Honey fraud has become one of the most significant challenges facing the European honey market. Although the European Union has established a comprehensive legislative framework to ensure the traceability of honey from production to the consumer, effective implementation remains uneven among Member States. Greece is the only EU country that received formal observations from the European Commission following the coordinated From the Hive investigation concerning deficiencies in its honey balance system and the absence of an effective traceability mechanism for imported honey.

This article examines the structural weaknesses of the current Greek traceability system and explains why they create favourable conditions for the fraudulent marketing of imported honey as Greek honey. It argues that the problem does not stem from inadequate legislation, but from the failure to integrate existing digital tools—including the Electronic Beekeepers Register, the Honey Balance Sheet, the CHED-P certificate and the TRACES platform—into a single, operational traceability system covering both domestic production and imports. A comparison with successful systems already operating in several EU Member States demonstrates that effective traceability is both technically feasible and legally supported under existing European legislation.

Introduction

Consumer confidence in honey depends on one fundamental principle: traceability. Every jar of honey placed on the market should be traceable back to its producer and its country of origin. For genuine beekeepers, traceability provides protection against unfair competition; for consumers, it guarantees transparency and authenticity.

Over the past decade, however, honey fraud has become one of the most serious threats to the European honey market. Increasing volumes of inexpensive imported honey and adulterated honey blends have undermined consumer confidence while placing considerable economic pressure on European beekeepers. In response, the European Union has strengthened its legal framework, requiring greater transparency regarding the geographical origin of honey and reinforcing official controls throughout the supply chain.

Despite these legislative advances, implementation differs considerably among Member States. Greece represents a particularly revealing example. While extensive administrative controls are imposed on beekeepers, the traceability of imported honey remains incomplete. This imbalance creates significant opportunities for the fraudulent declaration of imported honey as Greek honey, commonly referred to in Greece as "Greekisation."

The shortcomings of the Greek system became evident during the European Commission's coordinated investigation From the Hive, which examined honey imports and market controls across sixteen Member States. Published in 2023, the Commission's report identified Greece as the only participating country where the authorities' highlighted weaknesses in the honey balance system and the lack of an effective traceability mechanism for imported honey.

The purpose of this article is not merely to identify deficiencies but to demonstrate that Greece already possesses most of the legislative and digital tools required to establish an effective traceability system. What is missing is their integration into a single, coherent digital framework capable of monitoring both domestic production and imported honey throughout the supply chain.

The Electronic Beekeepers Register and the Honey Balance Sheet

European legislation already provides Member States with the essential instruments required to establish an effective honey traceability system. These include the National Electronic Beekeepers Register, the Honey Balance Sheet, commercial documentation, the CHED-P health entry certificate, and the TRACES information system. When these tools operate together, they enable the competent authorities to monitor the movement of honey from the producer—or the point of import—to the final stage of marketing.

Unfortunately, Greece has not fully exploited these possibilities. The resulting administrative gap has become one of the principal factors enabling imported honey to be marketed fraudulently as Greek honey and allowing low-cost adulterated products to circulate within the domestic market.

The Electronic Beekeepers Register is mandatory for all Member States participating in EU beekeeping support programmes under the Common Agricultural Policy (CAP), in accordance with Regulation (EU) 2021/2115 and the relevant CAP Strategic Plans.

Under Ministerial Decision No. 175/118284 (Government Gazette 2712/B/25 April 2023), the Greek National Electronic Beekeepers Register records all professional and amateur beekeepers owning more than five colonies. It contains detailed information on the number of hives, apiary locations, colony movements, and annual production of honey and other bee products. Beekeepers are also required to record the quantities marketed and identify purchasers whenever products are not sold directly to consumers.

Each active beekeeper receives a unique digital identity, which is essential for the legal practice of beekeeping, participation in support programmes, hive movements and official inspections.

The Ministry of Rural Development and Food has also announced the gradual introduction of digital monitoring of commercial transactions involving honey through the myDATA 2.0 platform of the Independent Authority for Public Revenue (AADE). Under this system, producers will upload their invoices electronically, while production declarations will eventually be cross-checked with tax records and CAP support applications. Transitional arrangements are expected to facilitate adaptation to the new digital environment.

In practice, however, the Electronic Beekeepers Register functions primarily as an administrative database rather than as a genuine traceability system. It records producers but does not systematically follow the movement of honey through the commercial chain.

This role should be fulfilled by the Honey Balance Sheet.Although not explicitly required by a

specific EU Regulation, the Honey Balance Sheet derives directly from the traceability principles established by Regulations (EC) No. 178/2002 and No. 931/2011. These regulations embody the fundamental principle of food traceability known as "one step forward, one step back." Every operator placing honey on the market must be able to identify both the source of the product and its subsequent destination.

The importance of the Honey Balance Sheet has increased further following Directive (EU) 2024/1438, which requires honey blends to indicate on their labels both the countries of origin and the proportion contributed by each country. Importers must therefore be able to substantiate these declarations using commercial documentation such as invoices, customs documents and shipping records.

A properly functioning Honey Balance Sheet records the quantities of honey produced, marketed and remaining in storage for each beekeeper. For importers, it records the quantities imported, domestic purchases, blending operations and subsequent sales. Whenever imported honey is blended with domestic honey, the operation should be linked electronically to the CHED-P certificate and recorded within the company's internal traceability system, allowing competent authorities to verify every stage of the process.

Several Member States—including Italy, France, Spain, Germany, Slovenia and Croatia—have successfully integrated their Electronic Beekeepers Registers with digital Honey Balance Sheets to create effective national traceability systems. Traders and packers are required to maintain detailed warehouse records and production logs identifying every blending operation, while digital reconciliation ensures that input and output quantities correspond.

The principle is straightforward. A trader importing ten tones of honey and purchasing two tones from domestic producers cannot legitimately market twelve tones as "domestic honey."

These countries have also adopted additional measures to distinguish domestic honey from imported products. National beekeeping organizations have introduced distinctive jars, official seals or unique labels that enable consumers to identify genuine locally produced honey immediately. These initiatives strengthen consumer confidence while enhancing the market value of authentic national honey (figure 1).

Figure 1.
Distinctive jar and label used for Slovenian domestic honey. The base of the jar bears the official seal of the Slovenian Beekeepers' Federation, which supplies these jars exclusively to registered beekeepers

Why the Current Greek Traceability System Falls Short

The legislative framework required to establish an effective honey traceability system already exists in Greece. The challenge lies not in the absence of legislation but in the way the available instruments are implemented and interconnected.

The Electronic Beekeepers Register was conceived primarily as an administrative tool for recording beekeepers and monitoring eligibility for support measures. Although it contains valuable production-related information, it has not been integrated into a dynamic traceability system capable of following honey throughout the marketing chain.

Furthermore, the information contained in the Register is protected as personal data and is therefore not directly available for real-time verification of commercial transactions. As a result, authorities cannot automatically confirm whether the quantities of honey sold by a trader correspond to purchases made from registered beekeepers with sufficient production capacity.

Other European countries have addressed this challenge without compromising data protection. Italy, France, Spain, Slovenia and several other Member States have developed traceability systems in which the identity of the producer is securely linked to the marketed product through digital platforms. Consumers can often scan a QR code or barcode to obtain information about the producer, the geographical origin of the honey and, in some cases, even the floral source.

Another weakness concerns production declarations. Although Greek beekeepers are required to declare annual production and marketing volumes, the system still depends largely on self-reporting. Some producers under-declare production for taxation purposes, while others report only the minimum production required to qualify for financial support. Stocks remaining in storage are not routinely verified, making it difficult to establish an accurate Honey Balance Sheet for individual producers.

An even greater weakness concerns imported honey

Despite repeated announcements by the Ministry of Rural Development and Food regarding the introduction of an Electronic Honey Balance Sheet, no fully operational digital system has yet been implemented. Consequently, the CHED-P certificate—which accompanies every consignment of honey entering the European Union through the TRACES platform—remains largely disconnected from subsequent commercial transactions within Greece. This creates a significant gap in traceability.

Once imported honey enters commercial storage facilities, there is no comprehensive digital mechanism linking import documents, warehouse records, blending operations and final sales. Although individual operators are legally required to maintain internal traceability records, the absence of a centralized electronic reconciliation system makes official verification considerably more difficult.

The practical consequences are obvious. Without a functioning Honey Balance Sheet, imported honey can be blended with relatively small quantities of domestic honey and marketed under labels that emphasize Greek identity. Whether such products comply with labelling legislation ultimately depends on their composition and presentation, but the absence of effective digital traceability greatly reduces the ability of enforcement authorities to detect potential irregularities.

The imbalance in regulatory oversight is therefore striking. Beekeepers are subject to detailed administrative controls, while traceability further along the supply chain remains comparatively weak. A truly effective control system should apply the same level of transparency and accountability to every stage of the supply chain—from producer to importer, processor, packer and retailer.

Pressure on Beekeepers and the Way Forward

Greek beekeepers operate under an increasingly demanding regulatory framework. Digital registration, hive identification, annual declarations, movement notifications and administrative inspections are now routine requirements. Failure to comply may result in financial penalties or exclusion from support programmes.

Such controls are entirely justified when they contribute to a comprehensive traceability system that protects both producers and consumers.

However, when the information collected remains confined to administrative databases rather than being incorporated into an operational traceability network, its effectiveness is inevitably limited.

At the same time, the market continues to receive substantial quantities of imported honey and honey blends. Without systematic reconciliation of import data, purchase invoices, warehouse records and sales documentation in real time, opportunities for origin fraud remain.

This regulatory imbalance has important economic consequences.

Genuine Greek honey, produced under significantly higher production costs, is forced to compete with lower-priced imported products that may subsequently acquire an apparent Greek identity through blending or misleading marketing practices. The resulting downward pressure on producer prices threatens the long-term sustainability of professional beekeeping in Greece.

The issue extends beyond producer income. Consumers also suffer when they cannot be confident that the declared origin of honey accurately reflects its true provenance. Trust, once lost, is difficult to restore.

For this reason, discussion should move beyond stricter controls on beekeepers alone. Future policy should focus on establishing a fully integrated national traceability system that connects:

- the Electronic Beekeepers Register;
- the Electronic Honey Balance Sheet;
- CHED-P import certificates within the TRACES platform;
- digital invoicing through myDATA;
- warehouse and blending records maintained by traders and packers; and
- official laboratory controls supported by National Reference Laboratories operating in accordance with Regulation (EU) 2017/625.

Such a system would enable real-time reconciliation of production, imports and commercial transactions while respecting personal data protection requirements. More importantly, it would substantially strengthen the capacity of the competent authorities to detect origin fraud and other forms of honey adulteration.

Beekeeping organizations could also contribute by advocating the establishment of National Reference Laboratories for honey and by supporting the development of harmonized analytical methods through the European Union Reference Laboratory (EURL). Reliable laboratory analysis, combined with effective digital traceability, would provide a far stronger defense against honey fraud than either approach alone.

Conclusion

The challenge facing Greece is not a lack of legislation but a lack of integration.

The European Union has already provided the legal framework and the digital tools required to establish an effective honey traceability system. What remains is to connect these tools into a single operational network capable of monitoring honey from the hive—or the point of import—to the consumer.

Until that objective is achieved, opportunities for origin fraud will remain, honest beekeepers will continue to face unfair competition, and consumers will remain vulnerable to misleading claims regarding the origin of the honey they purchase.

A fully operational Honey Balance Sheet integrated with modern digital traceability technologies would not merely strengthen official controls. It would enhance consumer confidence, protect the reputation of genuine Greek honey and contribute to the long-term sustainability of one of Greece's most important agricultural sectors.

Andreas Thrasyvoulou

Professor of emeritus at the
Aristotle University
Thessaloniki, Greece

UNIQUE OPPORTUNITY FOR THE BLIND AND VISUALLY IMPAIRED IN SLOVENIA: EXPLORING HONEY SENSORY ANALYSIS TRAINING

On Wednesday, 10 June 2026, the Beekeeping Centre of the Slovenian Beekeeper's Association at Brdo pri Lukovici hosted an open day presenting training opportunities for blind and visually impaired honey tasters. The event was organised at the initiative of Slovenian Beekeeper's Association President Boštjan Noč and marked a continuation of the long-standing cooperation between the Slovenian Beekeeper's Association and the Association of Societies of the Blind and Visually Impaired of Slovenia.

Eleven blind and visually impaired individuals attended, accompanied by several companions. The programme opened with a theoretical session covering the main types of Slovenian honey, their characteristics, and the work of professional evaluation panels. Particular attention was given to the role of sensory assessment in quality assurance. Boris Potočnik, food safety specialist adviser at the Slovenian Beekeeper's Association, presented the honey evaluation process in a clear and accessible way.

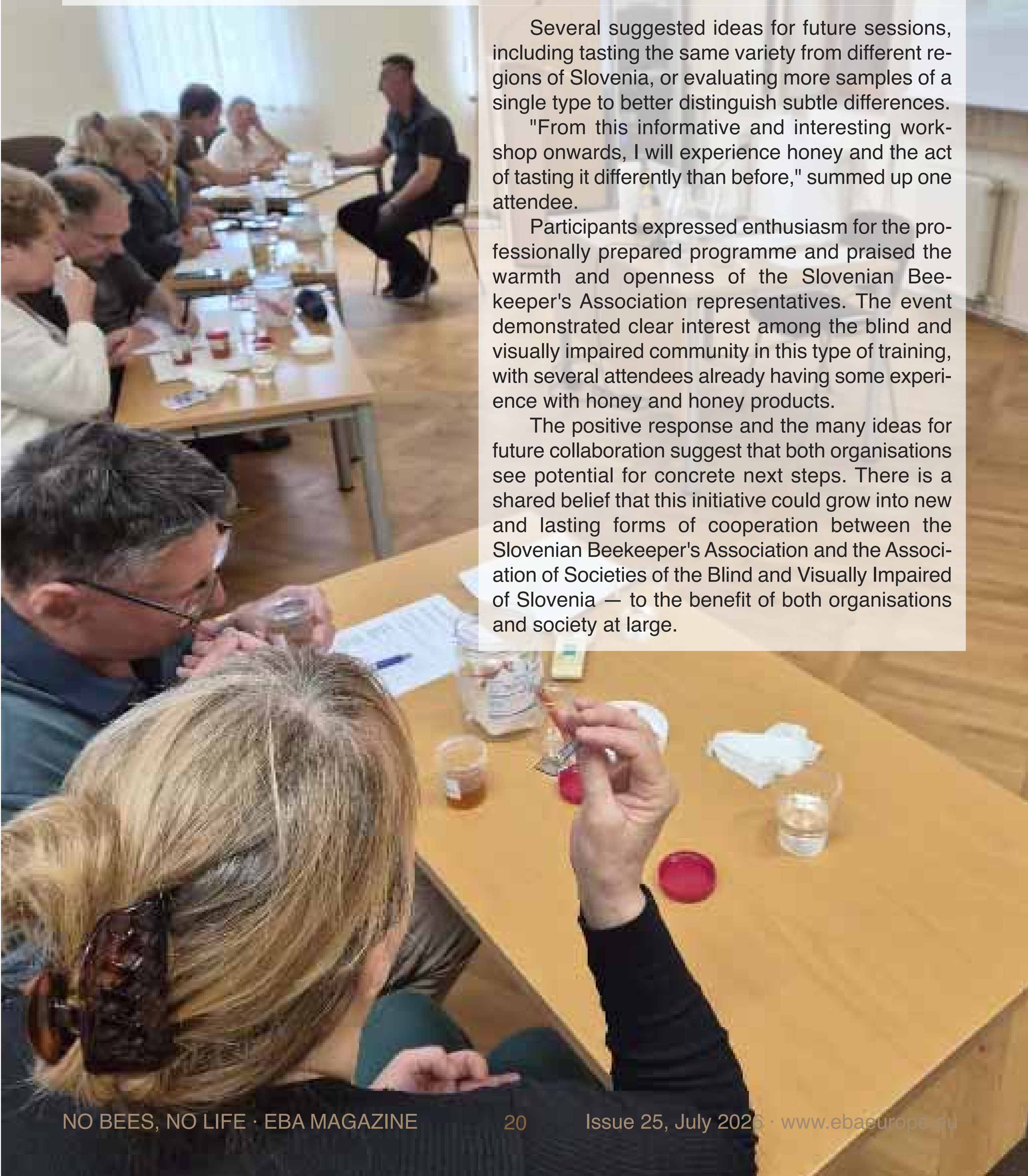
"I learned about many things I had not paid much attention to before — I had not imagined how many factors you need to consider as a honey taster," said one participant.

Participants then had the opportunity to taste and identify seven varieties of honey: acacia, linden, silver fir, forest, blossom, chestnut, and the less common buckwheat. The experience proved both fascinating and humbling. Participants quickly discovered that identifying honey varieties is no simple task — it demands extensive knowledge, practice, and finely tuned attention to flavour and aroma. Although most encountered sensory evaluation for the first time, many were surprisingly successful at identifying individual samples.

One participant, who had kept bees as a child, reflected: "When I tasted so many honey samples, I realised I know nothing about honey. I had always taken it for granted — spread on bread or stirred into tea. Perhaps from now on I will pay more attention when tasting."

Another noted the particular significance of the experience for people with visual impairments: "I became even more focused on taste, smell and texture, rather than visual appearance. It showed beautifully that such an activity can be accessible and enjoyable for everyone, while encouraging inclusion and cooperation among participants with different abilities."

One participant remarked that, despite not being able to see, she instinctively closed her eyes during tasting — finding it easier that way to focus on her inner senses.



Several suggested ideas for future sessions, including tasting the same variety from different regions of Slovenia, or evaluating more samples of a single type to better distinguish subtle differences.

"From this informative and interesting workshop onwards, I will experience honey and the act of tasting it differently than before," summed up one attendee.

Participants expressed enthusiasm for the professionally prepared programme and praised the warmth and openness of the Slovenian Beekeeper's Association representatives. The event demonstrated clear interest among the blind and visually impaired community in this type of training, with several attendees already having some experience with honey and honey products.

The positive response and the many ideas for future collaboration suggest that both organisations see potential for concrete next steps. There is a shared belief that this initiative could grow into new and lasting forms of cooperation between the Slovenian Beekeeper's Association and the Association of Societies of the Blind and Visually Impaired of Slovenia — to the benefit of both organisations and society at large.

HYPOTHESIS PAPER

SCIENCE SPEAKS, NATURE REMINDS

The invention of the movable frame was one of the greatest technological breakthroughs in the history of beekeeping. Conceived to simplify colony management, it was rapidly accepted worldwide and ultimately revolutionized modern apiculture.

The movable frame offered obvious practical advantages. It enabled easy manipulation of the brood nest, facilitated colony inspections, and greatly simplified the production and commercial exchange of honey bee colonies.

Yet every intervention in a natural system has consequences. Nature operates according to highly integrated biological principles.

Whenever one element of that system is altered, a chain of interconnected events inevitably follows. What initially appears to be a technological improvement may, over time, reveal biological consequences that were impossible to foresee. History repeatedly demonstrates that short-term benefits do not always translate into long-term advantages.

The principle of causality reminds us that every action has its consequence.

In Eastern philosophy this relationship is described as karma; in biology it is reflected in the complex interactions through which ecosystems maintain their equilibrium.

One striking example is the relationship between the ectoparasitic mite Varroa destructor and its original host, the Eastern honey bee, Apis cerana.

Over evolutionary time, parasite and host developed a biological balance that allowed both species to coexist without threatening one another's survival.

Nature rarely favors destruction. Rather, it tends toward equilibrium.

The global spread of Varroa illustrates what may happen when evolutionary relationships that developed over thousands—or perhaps millions—of years are suddenly disrupted by human activities.

The Origin of the Problem

For thousands of years, the Western honey bee, Apis mellifera, evolved entirely free from Varroa destructor. During that period it developed sufficient biological resilience to maintain healthy populations and survive the ecological challenges imposed by its natural environment. That equilibrium changed dramatically once Varroa shifted to a new host.

The mite became an efficient parasite of Apis mellifera, feeding on the bee's fat body and hemolymph while simultaneously transmitting numerous viruses, bacteria, and fungal pathogens. The result is a substantial reduction in the lifespan of individual bees, deterioration of colony health, and, ultimately, colony collapse.

Today, the Western honey bee survives largely because of continuous human intervention. More than fifty viruses have been identified in honey bees (Beaurepaire & Piot, 2020).

Most persist within colonies as covert infections until additional stressors disturb colony homeostasis. Among all known stress factors, Varroa destructor remains by far the most significant.

Even after successful acaricide treatment substantially reduces mite populations, viruses continue to spread through oral and fecal transmission.

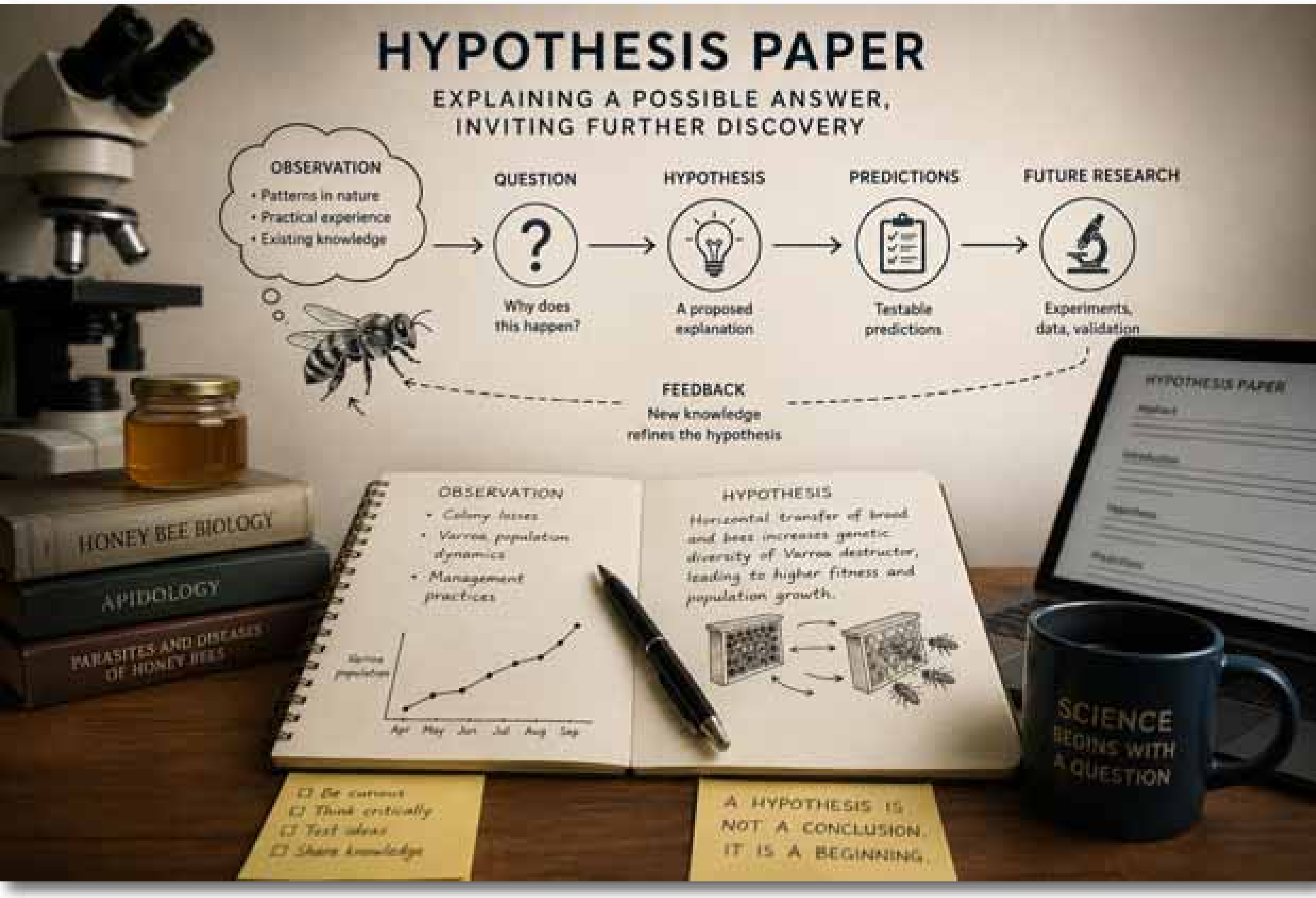
Viral particles are exchanged during trophallaxis and while nurse bees feed developing larvae, allowing infections to persist despite temporary suppression of the parasite.

Following the introduction of Varroa into Europe and the Americas, between 95% and 100% of feral honey bee colonies disappeared from natural habitats (Commonwealth of Australia, 2011).

Until recently, Australia represented the only continent free of Varroa destructor. That situation has now changed.

The mite has become established in Australia and is gradually expanding throughout the continent, with the notable exceptions of Kangaroo Island and Tasmania.

Only a limited number of isolated regions worldwide remain free of Varroa, including Malawi in eastern Africa, Greenland, Samoa, Ouessant Island off the western coast of France, Robben Island in South Africa, the Canadian regions of Newfoundland and Labrador, parts of northern Norway and Sweden, the Hawaiian Islands of Maui, Kauai and Molokai, and the Azores (Portugal) (Lopes & Low, 2024; Anderson; Downey, 2015).



From a biological perspective, the critical mistake was not the mite itself, but the disruption of the natural geographic separation between honey bee species.

The pursuit of greater honey production gradually displaced bee races and species far beyond their native ranges.

During the eighteenth and nineteenth centuries, the rapidly expanding international trade in colonies and queens accelerated this process.

Asian beekeepers sought more productive honey bees, while European beekeepers increasingly exchanged colonies across vast geographical distances.

For countless generations, powerful natural barriers had maintained the separation between Apis mellifera and Apis cerana.

Vast oceans, severe Arctic climates, extensive mountain systems, and enormous deserts prevented contact between the two species. These barriers were not merely geographical—they preserved evolutionary isolation.

For centuries they remained intact. Only modern transportation and the globalization of beekeeping ultimately removed those barriers. Economic interests, together with the accelerating exchange of biological resources, succeeded where nature had imposed limits.

The worldwide movement of colonies, queens, and genetic material increased dramatically. The introduction of movable-frame hives further facilitated this process, while advances in transportation enabled the rapid transfer of honey bees between continents and into regions where they had never naturally existed. Among the events that most profoundly influenced the global spread of Varroa was the relocation of Apis mellifera from European Russia to the Russian Far East, where Apis cerana had long occupied its native forest habitats around Ussuriysk.

Figure 1.

Those ancient natural barriers were eventually overcome by technology. One of the most significant developments was the completion of the Trans-Siberian Railway in 1916, which established a direct transportation route between Moscow and Vladivostok.

For the first time, the Western honey bee (Apis mellifera) and the Eastern honey bee (Apis cerana) could be brought together easily and on a large scale.

According to Professor V. V. Alpatov, Russian settlers who migrated to the Far East brought Apis mellifera colonies with them, keeping them in hollow log hives.

Later, immigrants from Ukraine also settled in the region and introduced additional European honey bee colonies.

As the number of managed colonies increased, many beekeepers maintained both Apis mellifera and Apis cerana within the same apiaries. Under such conditions, robbing and drifting between colonies became increasingly common.

Some beekeepers even strengthened colonies of Apis mellifera by transferring brood originating from Apis cerana (De Jong et al., 1982b).

Reports soon began to describe exceptionally high honey yields from the Vladivostok region, which was considered one of the richest nectar-producing areas in the Russian Far East.

These reports attracted numerous beekeepers from European Russia, who became convinced that the local bees possessed extraordinary productive potential.

The commercial trade that followed involved not only queens but also complete colonies moving in both directions between European Russia and the Far East. It is widely believed that this exchange provided the principal route through which Varroa destructor began its expansion from Russia toward Europe and, eventually, throughout much of the world via Ukraine and Bulgaria.

Unfortunately, the Apis cerana populations involved carried what later became recognized as the most destructive lineage of Varroa destructor—the Korean haplotype, which ultimately devastated millions of managed honey bee colonies worldwide.

The difference in honey production between the two host species is considerable. Colonies of Apis cerana generally produce only several kilograms of honey annually, commonly between 5 and 10 kg, and only exceptionally around 20 kg (Somerville, 2010).

By comparison, Apis mellifera is capable of producing five to ten times more honey under fa-

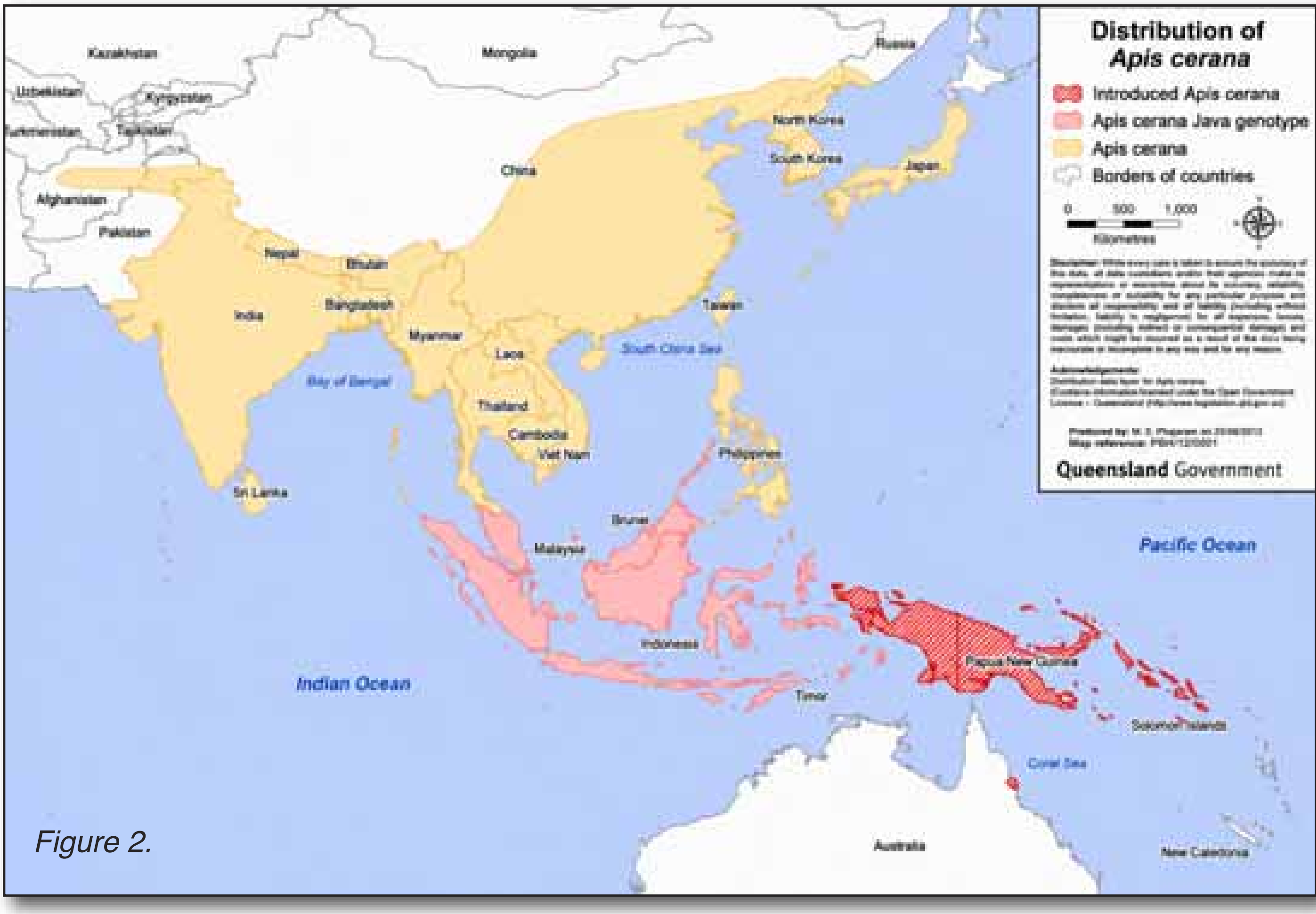


Figure 2.

vorable conditions. Until Varroa reached Europe, relatively little scientific attention was devoted to the mite, and many aspects of its biology remained poorly understood.

Nevertheless, one conclusion could already have been anticipated. Whenever long-established biological relationships are disturbed, unforeseen consequences should be expected rather than dismissed. The behavioral differences between Apis cerana and Apis mellifera appear almost perfectly matched to explain why Varroa remains relatively harmless to its original host while becoming devastating to the Western honey bee.

Workers of Apis cerana display remarkably efficient hygienic behavior. They actively groom themselves and nestmates, frequently removing or damaging attached mites.

Although Apis mellifera also possesses hygienic behavior, its efficiency is generally lower than that observed in Apis cerana.

Geographic distribution of Apis cerana- Worker brood in Apis cerana is largely unsuitable for successful Varroa reproduction. When a mite enters a worker brood cell and lays an egg, worker bees respond almost immediately.

They remove both the mite and the infested brood, frequently consuming the affected larva before the parasite can complete its reproductive cycle (Peng et al., 1987; Boecking & Ritter, 1994).

This highly specialized defense mechanism has become known as Varroa Sensitive Hygiene (VSH) (Spivak, 1996; Ibrahim & Spivak, 2006; Harris, 2007).

In Apis cerana, mite reproduction is largely restricted to drone brood. Furthermore, colonies naturally produce between six and ten swarms each year.

Swarming substantially reduces the resident mite population, which rarely exceeds approximately 800 mites per colony (Rath, 1999). Another important characteristic is the limited production of drone brood.

On average, Apis cerana colonies rear drone brood for only about 59.5 days per year, producing approximately 30 drones per day, while the maximum number of sealed drone brood cells seldom exceeds 800 (Rath, 1991).

Perhaps even more remarkable is another defense strategy. When drone brood becomes heavily infested, Apis cerana workers effectively entomb the affected brood by reinforcing the wax cappings. As a consequence, neither the developing drones nor the reproducing mites are able to emerge, thereby interrupting the parasite's reproductive cycle (Rath, 1999). For this reason, Varroa is incapable of destroying natural populations of Apis cerana.

The situation is fundamentally different in Apis mellifera. Without treatment, feral colonies of the Western honey bee generally collapse within only three to four years following infestation (De Jong et al., 1982a).

Only a small number of naturally surviving populations have been documented to persist for a decade or longer without acaricide treatment (De Jong & Soares, 1997; Fries et al., 2006; Le Conte et al., 2007; Rinderer et al., 2001; Seeley, 2007). Today, beekeepers maintain approximately 310 million managed honey bee colonies worldwide (Dietemann et al., 2009; Pirk et al., 2014), investing enormous effort in compensating for the biological consequences of this host shift while, in many cases, simultaneously introducing acaricide residues into bee products intended for human consumption.

According to Tanabe and Tamaki (1986), the initial host shift of Varroa onto Apis mellifera may have occurred in Japan, where the Western honey bee had already been introduced by 1877 (Sakai & Okada, 1973).

The mite itself was formally described by Suzuki in 1909 (Crane, 1999), although it was not photographed on Apis cerana until 1957. Long before the invention of the modern movable-frame hive, beekeepers had already attempted to make combs removable.

The earliest known example dates back to seventeenth-century Greece, where woven wicker hives were equipped with several wooden top bars supporting natural comb construction.

These combs, however, were not interchangeable. Each comb occupied a unique position within the colony and, after inspection, had to be returned to exactly the same location. They could neither be rearranged nor transferred between colonies.

This approach, almost certainly inspired by careful observation of naturally occurring colonies, attracted little attention outside Greece. The subsequent hive designs developed by Prokopovich (1814), Dzierzon (1845), Langstroth (1851), and Berlepsch (1852) followed a different direction and ultimately became the foundation of modern beekeeping.

Another technological milestone soon followed. Honey was no longer obtained by crushing the comb but by centrifugal extraction.

Only recently, however, has scientific evidence begun to demonstrate that honey obtained by crushing comb retains certain characteristics that may be partially altered during centrifugal extraction because the fine

streams of honey are exposed to atmospheric oxygen, promoting oxidation.

In an attempt to minimize this effect, the editor of the journal NO BEES NO LIFE designed a centrifugal extractor in which honey is not projected through the air during extraction. To date, however, no manufacturer has undertaken its commercial production.

This naturally raises an intriguing question. If the history of beekeeping technology had evolved along a different path—one that had not been centered on the movable frame—might another technological solution have become standard?

Perhaps a machine designed specifically for crushing comb could have replaced the honey extractor.

Perhaps investment costs would have been lower.

Perhaps beekeepers would have adopted different colony management practices.

Perhaps many of the problems confronting modern apiculture today would never have emerged.

And perhaps, when all long-term consequences are considered, overall profitability would ultimately have been even greater.

These questions cannot be answered with certainty.

They nevertheless deserve consideration. The beekeeping community should therefore reflect on whether continual movement and rearrangement of brood comb within the nest truly represented the most appropriate technological direction.

Did this innovation eventually impose hidden biological costs upon global apiculture?

Did scientific progress, together with the globalization of beekeeping, unintentionally open doors whose consequences continue to affect beekeeping today?

Or might a different, more conservative path have preserved more of the biological mechanisms that evolved naturally over countless generations?

Comb Cell Size

The introduction of movable frames inevitably required another technological innovation—the manufacture of embossed wax foundation. Like many innovations, wax foundation was rap-

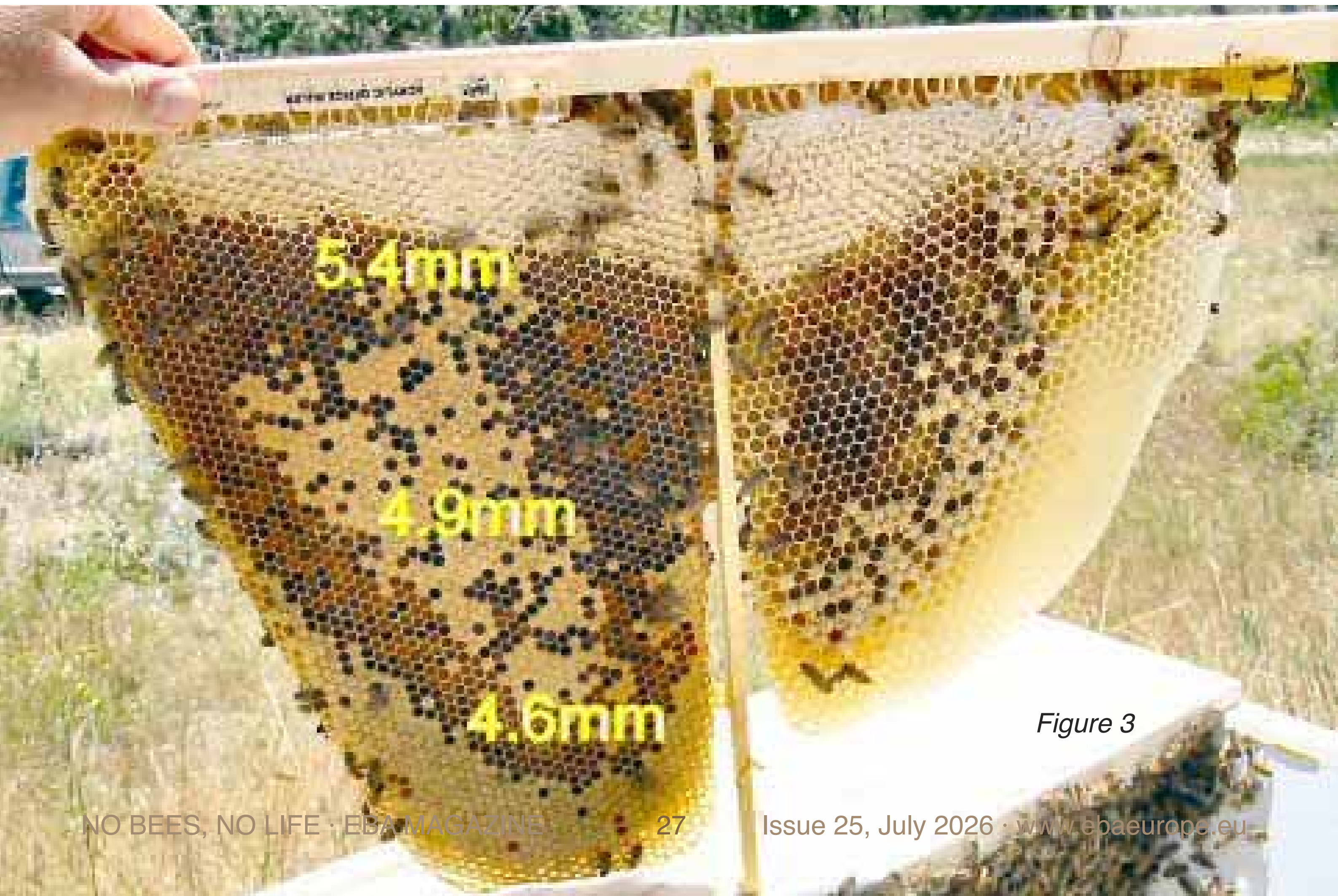


Figure 3

idly adopted before its long-term biological consequences had been thoroughly evaluated.

Beekeepers were attracted by persuasive arguments. Larger cells would supposedly produce larger bees. Larger bees would supposedly collect more nectar. Greater honey yields, reduced swarming, and easier honey extraction were expected to follow. Experiments conducted in 1941 and again between 1957 and 1963 appeared to support the conclusion that larger worker cells were preferable.

That conclusion fundamentally transformed the global wax foundation industry. Remarkably, this worldwide change was based on experiments involving only five or six colonies, yet it was rapidly adopted throughout the beekeeping world almost without question.

Commercial wax foundation soon standardized worker-cell diameters between 5.21 and 5.40 mm.

Natural comb tells a different story. Wild honey bee colonies do not construct comb consisting exclusively of cells measuring 5.2 or 5.4 mm. Around the same period, T. W. Cowan reported natural worker-cell diameters ranging from 4.72 to 5.35 mm. According to A. I. Root, the natural range is even broader—from 4.6 to 5.9 mm.

An equally important observation is that natural comb architecture varies according to climatic conditions. In colder regions, where average monthly temperatures are lower, worker-cell diameters generally occupy a broader range.

Where average temperatures vary between –17°C and approximately 26°C, most naturally constructed cells measure between 5.0 and 5.2 mm.

By contrast, in tropical and subtropical climates with average temperatures exceeding 26.6°C, the predominant worker-cell diameter ranges between 4.5 and 4.7 mm.

Independent measurements performed by Ivan Brndušić (Bor, Serbia) support these observations. At elevations between 200 and 500 meters, natural worker-cell diameters ranged from 4.6 to 5.2 mm.Between 500 and 1,000 meters, the corresponding range increased to 4.8–5.3 mm.

Thus, naturally constructed comb consists predominantly of smaller cells. The important question therefore is not whether 4.9-mm cells exist. They clearly do. Rather, should artificial wax foundation consist exclusively of 4.9-mm cells? Would such uniformity itself represent another departure from natural biological diversity, considering that these cells account for only about 70–80% of naturally constructed worker comb rather than its entirety?

From a biological perspective, narrower brood cells may reduce the probability that multiple foundress mites enter the same brood cell simultaneously. Consequently, opportunities for genetic recombination between unrelated Varroa lineages arriving from neighboring colonies or apiaries may also decrease.

On the other hand, the naturally occurring variation in cell size among different climatic regions may itself represent an adaptive biological strategy that should not be ignored.

Modern hive construction has altered several characteristics of the natural brood nest—from defense mechanisms to the physical integrity and continuity of the comb structure.

It is entirely possible that additional biological consequences remain undiscovered. Indeed, some may never be fully understood.

The essential question therefore remains: Were all of these modifications truly necessary? Or have some of them unintentionally created new biological problems that became apparent only decades later?

Horizontal Transfer of Frames

The commercialization of beekeeping created an additional opportunity for economic profit: the sale of colonies on movable frames. From a practical standpoint, this represented a major technological advance.

From a biological perspective, however, it introduced an entirely new phenomenon that had never existed in nature.

Wild honey bees do not transport comb from one colony to another.

By enabling brood comb to be transferred between colonies, humans unintentionally assisted numerous pathogens and parasites in colonizing environments they might otherwise never have reached. At the same time, this practice contributed to the gradual formation of a globally interconnected beekeeping system in which the

natural geographic isolation of honey bee populations became increasingly irrelevant.

The consequences were not limited to honey bees alone. Genetic mixing also affected their parasites, viruses, bacteria, and other associated microorganisms.

Approximately 60–70 hours after brood capping, the foundress Varroa female leaves the site where she deposited her feces and moves toward the anterior region of the brood cell to lay her first egg. This egg is deposited almost invariably in one of the three corners formed by the hexagonal geometry of the cell.

The first egg develops into a male. Approximately 24 hours later, the female lays her second egg, which develops into a female.

Because male development requires approximately 6.5 days, whereas female development requires about 5.5 days, both individuals reach sexual maturity at nearly the same time.

This synchronization ensures successful mating before the emerging adult bee leaves the brood cell. The developmental sequence is as follows:

Male* Egg: approximately 30 hours* Protonymph: approximately 52 hours* Deutonymph: approximately 72 hours* AdultTotal developmental time: approximately 6.5 days.

Female* Egg: approximately 24 hours* Protonymph: approximately 30 hours* Deutonymph: approximately 75–80 hours* AdultTotal developmental time: approximately 5.5 days.

The first egg is haploid, containing seven chromosomes, and produces a male. The second egg is diploid, containing fourteen chromosomes, and produces a female. When only one foundress mite reproduces within a brood cell, mating occurs between brother and sister. This represents inbreeding.

Across most animal species, inbreeding is generally associated with reduced biological fitness.

Its effects are particularly pronounced in complex organisms, where increased homozygosity may reduce survival, impair development, or diminish reproductive performance.

Honey bees provide a familiar example. When queens are instrumentally inseminated with semen from closely related drones, beekeepers frequently observe scattered brood, reflecting the failure of many fertilized eggs to develop normally.

Under natural mating conditions, such close inbreeding rarely occurs because queens mate with numerous unrelated drones at drone congregation areas. Although repeated inbreeding may occasionally increase the adaptive value of certain individual traits, the overall biological performance of the population generally remains unchanged or declines. An additional phenomenon becomes important as brood production decreases.

When fewer brood cells are available while the adult bee population remains high, the ratio of nurse bees to larvae increases. Consequently, individual larvae receive visits from a larger number of worker bees.

Each additional visit slightly increases the probability that another foundress mite originating from a different colony may enter the same brood cell.

If two genetically distinct foundress mites reproduce within one cell, their offspring are no longer the product of brother-sister mating alone. Instead, genetic recombination occurs between unrelated lineages.

The Nectar Dearth Period—The Critical Phase

This process becomes particularly important during periods of nectar shortage. Throughout July, August, and September, deteriorating forage conditions substantially increase robbing and drifting among colonies.

These forms of horizontal bee transmission provide Varroa with opportunities to encounter genetically unrelated mites. Such encounters effectively introduce new genetic material into mite populations.

The resulting offspring may exhibit greater vigor, improved reproductive performance, and enhanced adaptive fitness.

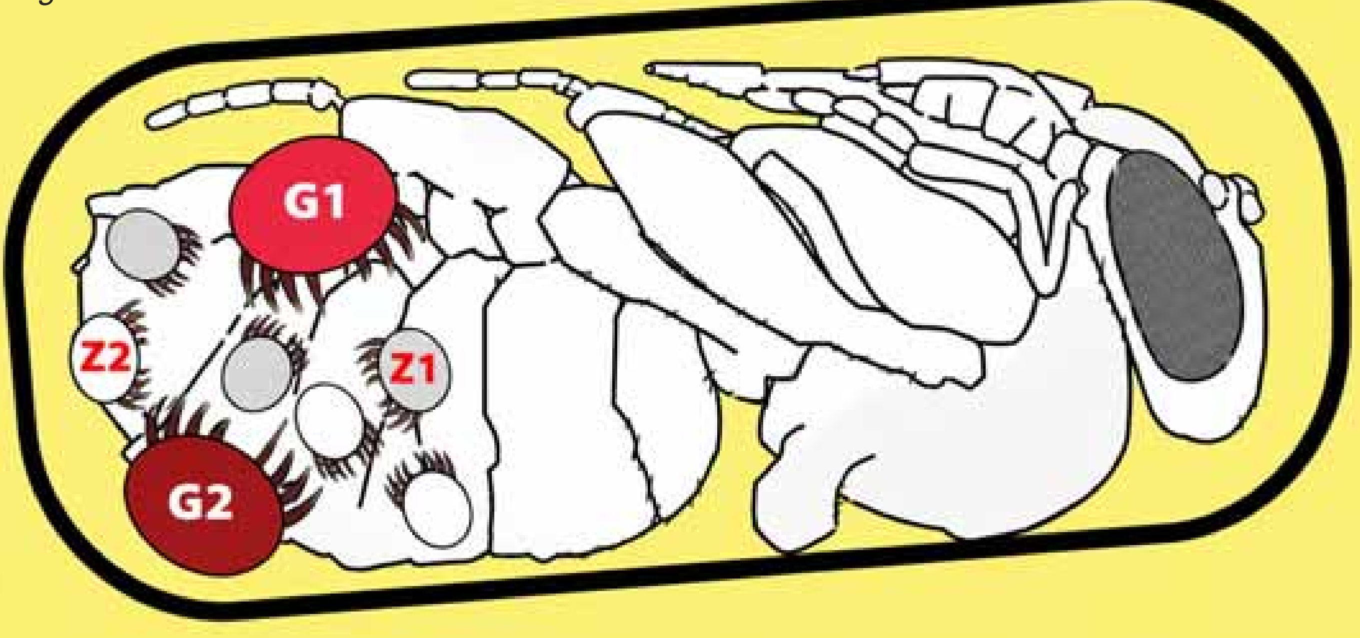
A single genetically advantageous mating event may therefore generate descendants capable of producing more offspring even when reproducing alone within subsequent brood cells.

From this perspective, even one successful outcrossing event may function as a biological “time bomb,” initiating the rapid population increase typically observed during late summer. Whether this actually occurs depends upon many interacting factors, including random events and the genetic characteristics of both the host colony and the parasite population.

These interactions may explain why neighboring colonies often harbor dramatically different numbers of Varroa mites despite experiencing similar environmental conditions.

One principle nevertheless deserves particular attention. Because the resident mite population within a colony normally represents a single hereditary lineage, introducing even one geneti-

Figure 4



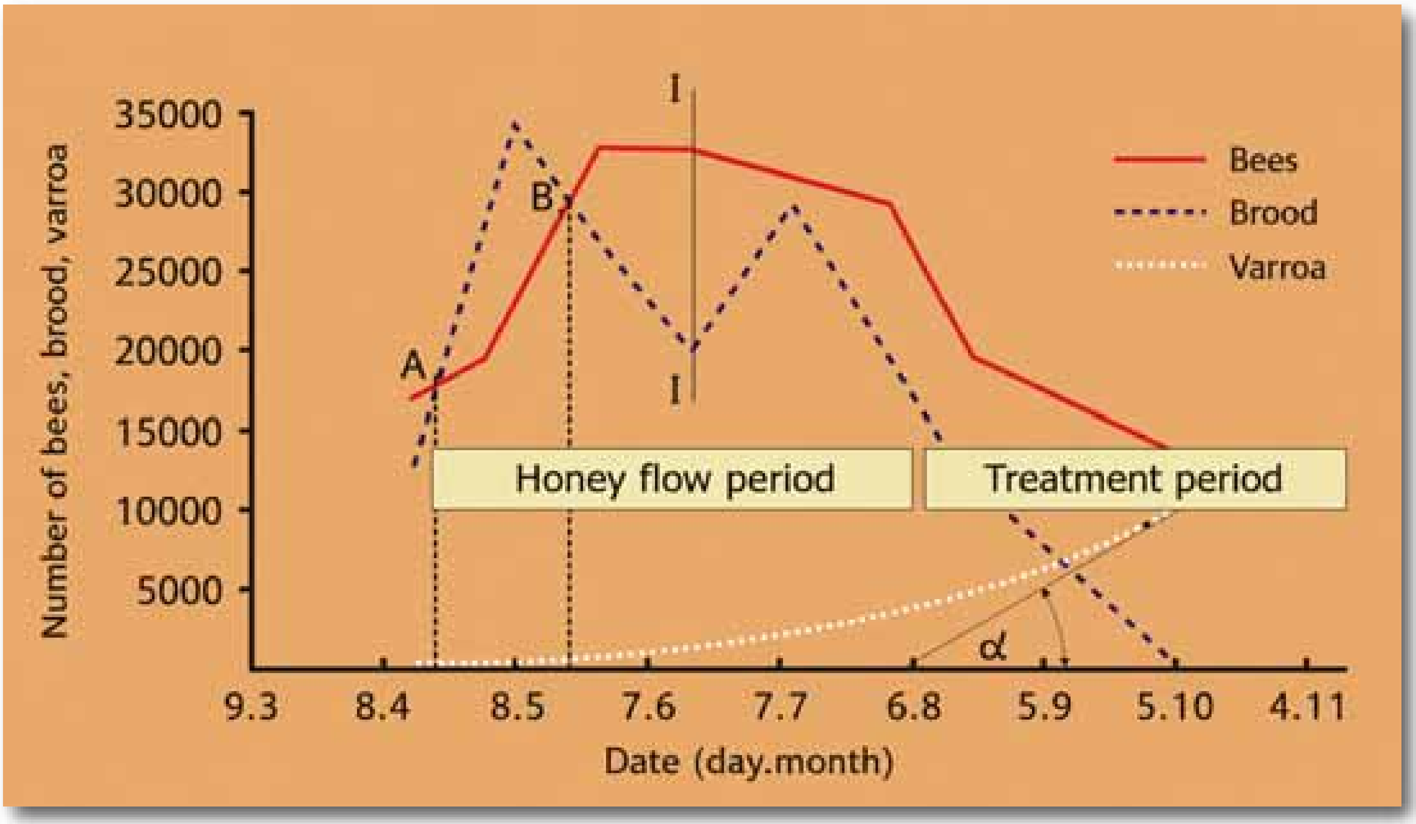


Figure 5.

cally distinct mite from another colony may substantially increase the probability that future generations will possess greater adaptive fitness. If this hypothesis is correct, every horizontal transfer of brood frames between colonies—whether performed for colony equalization, strengthening weak colonies, creating nuclei, or merging colonies—unintentionally assists the parasite by increasing opportunities for genetic recombination. This conclusion applies irrespective of whether the introduced mite lineage is considered highly virulent or relatively benign.

In Figure 5 (Liebefeld Institute, Switzerland), the population growth curve of Varroa changes dramatically beginning at Point V, precisely when the adult bee population begins to exceed the amount of brood.

Between Points A and B, population growth remains comparatively stable because brood is abundant relative to the adult bee population. Consequently, fewer nurse bees attend each larva.

The critical period occurs at Intersection I–I, where the ratio of adult bees to brood reaches its maximum, regardless of the distribution of mites between adult bees and brood.

Figure 5A complementary observation is presented in Figure 6 (University of Évora, Portugal). Here, the proportion of mites residing on adult bees increases sharply during August relative to those reproducing within brood.

This is precisely the period during which genetically recombined mite lineages could begin to dominate colony populations. If the proposed hypothesis is correct, it also suggests an important practical implication. The most effective period for Varroa control may coincide with the interval during which opportunities for such genetic recombination are greatest—approximately from the second half of May until early July.

Naturally, these periods vary according to climate, geography, and the honey bee subspecies involved.

An interesting observation supporting this discussion appeared in the June 1996 issue of the Serbian beekeeping journal Pčelar (Beekeeper). The article described a traditional wicker skep (trmka) that survived eight consecutive years without any treatment against Varroa. It also reported a colony inhabiting a natural tree cavity that remained alive for nine years, despite being located only about 500 meters from several

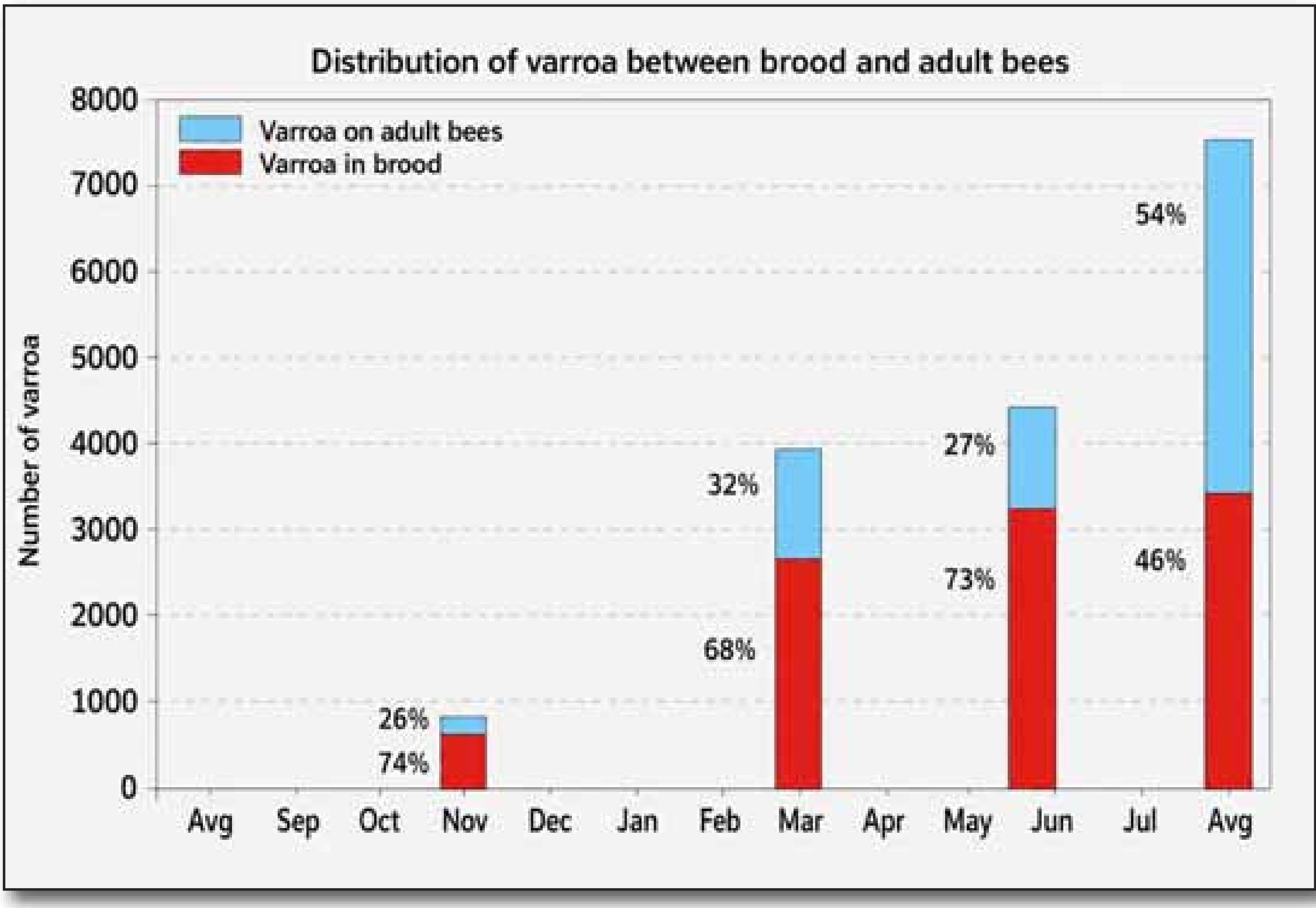


Figure 6.

managed apiaries that had already collapsed as a result of Varroa infestation. Such observations cannot by themselves prove a biological mechanism.

They do, however, raise questions that deserve careful scientific consideration.

Under natural conditions, foreign Varroa mites can enter a colony primarily through the horizontal transfer of adult bees during robbing or drifting. Natural ecosystems do not permit horizontal transfer of brood comb. Furthermore, because colony density in undisturbed habitats is very low, opportunities for robbing and drifting occur far less frequently than in managed apiaries.

Perhaps these observations are merely coincidental. Yet it is noteworthy that the worldwide expansion of the movable-frame hive, the disruption of long-established natural colony organization, and the global spread of Varroa destructor all occurred within roughly the same historical period.

Whether this represents coincidence or causation remains an important scientific question.

Thomas D. Seeley proposed that the feral honey bee population inhabiting the Arnot Forest in the United States survives without chemical treatment because these bees have evolved resistance to Varroa.

He also suggested another intriguing possibility: according to the evolutionary theory of host–parasite relationships, natural selection may favor parasite strains that become less harmful to their hosts, since killing the host ultimately reduces the parasite's own chances of survival. To investigate these ideas, Seeley established experimental bait hives throughout the Arnot Forest.

The hives were installed high in tree canopies and provided with entrance dimensions closely matching those commonly found in naturally occupied tree cavities—approximately 7.5 cm wide and 1.8 cm high. Each hive was designed to allow accurate monitoring of naturally fallen mites.

One of Seeley's observations is particularly noteworthy:"Although every colony became infested with Varroa, none experienced the characteristic late-summer population explosion. "This observation may have important biological implications. If Varroa populations are to remain below levels that threaten colony survival, preventing both horizontal transmission of brood comb and horizontal transmission of adult bees may prove to be equally important. In other words, colonies may remain healthier when exposed only to their own resident Varroa population rather than continually acquiring genetically different mites from neighboring colonies.

The contrast between natural ecosystems and modern apiculture is striking. In nature, honey bee colonies occur at very low densities. Modern apiaries, by contrast, frequently concentrate dozens or even hundreds of colonies in a single location, often situated close to neighboring apiaries.

Such conditions inevitably promote robbing, drifting, and every form of horizontal transmission. The movable frame undoubtedly transformed beekeeping and brought enormous practical advantages.

Nevertheless, it may also have produced biological consequences that became apparent only decades later.

Perhaps it is time to examine this innovation from a broader perspective—not only through the lens of convenience and productivity, but also through its long-term ecological effects.

Nature never anticipated that bees would routinely "fly with comb. "That possibility became reality only through human intervention. Our capacity to innovate has unquestionably improved beekeeping in many ways. At the same time, every technological advance carries responsibilities, including the obligation to recognize and understand its unintended biological consequences. The widespread adoption of movable-frame hives gradually introduced numerous management practices that have no equivalent in natural honey bee populations. These include inducing swarming outside the natural reproductive season, repeatedly strengthening colonies with brood from unrelated colonies, equalizing colony strength, merging colonies, exchanging food combs, and reusing brood combs for many years.

Most of these practices are now deeply embedded in modern beekeeping. This article does not argue that they should necessarily be abandoned.

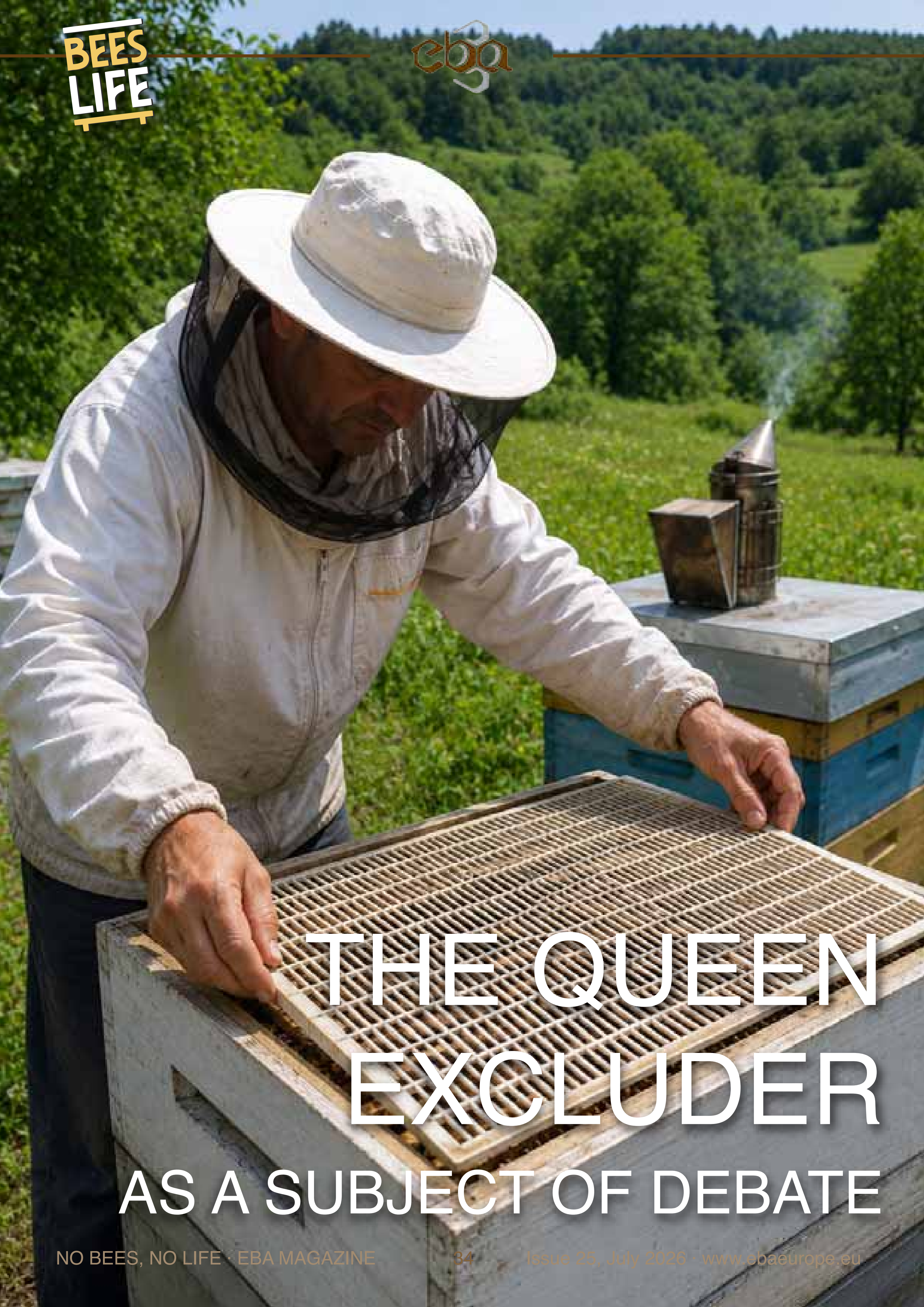
Rather, it invites beekeepers to reconsider them from a different perspective.

Perhaps the most important question is not whether these practices are convenient. The more important question is whether they are biologically justified. Have some of our long-established management traditions become accepted simply because they have been repeated from one generation to the next?

Or should we once again look more carefully toward the biological system that has guided honey bees successfully for millions of years?

Nature remains our oldest—and perhaps our wisest—teacher.

Milan Jovanović
37A/16 Radoja Krstića St, 37240 Trstenik
Republic of Serbia
+381 37 713 335, +381 629611513
3/114 May Street, Adelaide, South Australia
+61 451 549 929 (viber)
www.apiarium.rs
apiaryum@outlook.com

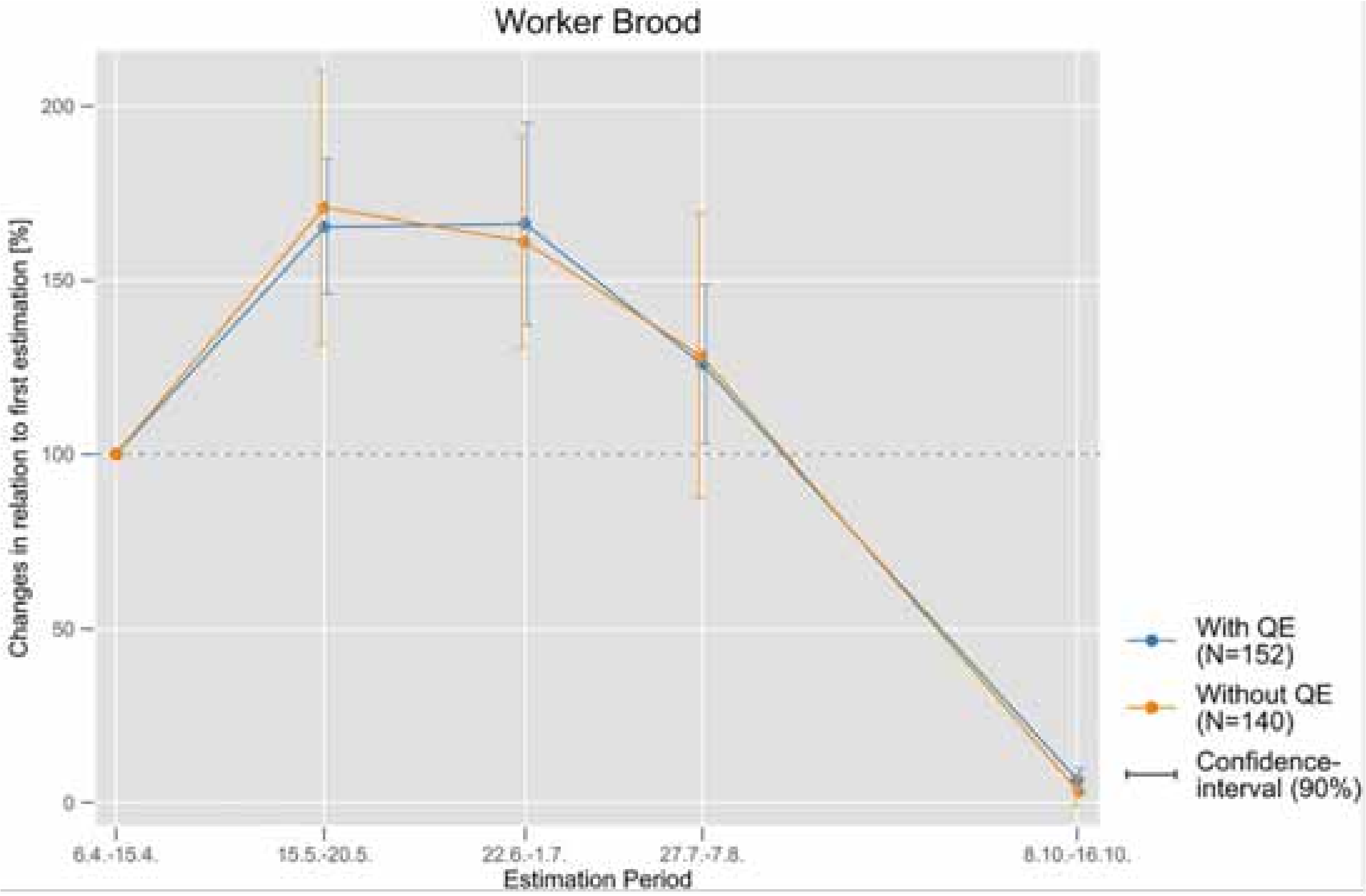


THE QUEEN EXCLUDER AS A SUBJECT OF DEBATE

For many years, beekeepers have engaged in endless debates over whether the queen excluder has a positive or negative effect on honey yield. Although numerous studies have addressed this issue, their findings have not always been widely accepted by beekeepers. As early as 1944, Farrar established guidelines for the use of the queen excluder that are still respected today. He concluded that the queen excluder is indispensable for achieving maximum honey production in commercial beekeeping. Subsequent scientific studies have likewise demonstrated that, in European honey bee races kept under temperate continental climatic conditions, the queen excluder does not reduce honey yield.Overall, the queen excluder has either a neutral or a slightly positive effect on honey production while providing brood-free honey supers and improving honey hygiene. These findings have also been confirmed in Austria for the Carniolan honey bee by the Austrian Carnica Association. Austrian beekeeper Marian Aschenbrenner places the queen excluder nine days before the onset of the first major nectar flow and reports no adverse effects on colony strength or total honey yield. In general, under Austrian beekeeping conditions, the queen excluder is considered standard practice for the production of varietal honey, easier colony management, and improved swarm control. In Slovenia, it is widely used as an integral component of the traditional AŽ hive, where the queen excluder is a standard structural element.

Recent Studies on the Queen Excluder

Today, we also have more recent research addressing this issue. In 2024, Jana Bundschuh and co-authors published an important study in the journal Apidologie. They monitored 64 Carniolan honey bee colonies distributed across eight apiaries during the 2020 beekeeping season under biodynamic management. Half of the colonies were equipped with a queen excluder, while the other half served as controls without one. The results revealed no statistically significant differences between the two groups in terms of the number of adult bees, brood area, pollen stores, or honey stores. In colonies without a queen excluder, brood occasionally appeared in the honey supers; however, this had no measurable effect on the overall colony performance. Interestingly, a close examination of the published graphs clearly shows that the differences were practically negligible (the accompanying graph illustrates the apparent “differences” in worker brood area). The authors concluded that the queen excluder neither impairs colony development nor reduces honey yield under European beekeeping conditions. This outcome is likely attributable, at least in part, to the biological characteristics of the Carniolan honey bee, which naturally tends to restrict the queen’s egg-laying activity during strong nectar flows. An Ethiopian study published in 2023 reached a somewhat different conclusion. Conducted by Desta Abi Gemedi and published in the Journal of Biological and Environmental Statistics, the research followed 24 colonies fitted with queen excluders and a control group of six colonies across different agroecological zones. Queen excluders were installed at different weeks during the honey flow seasons of 2020, 2021, and 2022. Colonies equipped with queen excluders exhibited a statistically significant increase in both honey-filled comb area and total honey yield. The greatest benefit was achieved when the queen excluder was installed two to three weeks after the onset of the honey flow season. Without a queen excluder, colonies continued intensive brood rearing even during the peak nectar flow, thereby reducing the amount of nectar converted into surplus honey. Importantly, the queen excluder had no negative effect on colony population size. Since the experiment was conducted under tropical conditions, where queens continue laying



eggs intensively throughout the nectar flow, the queen excluder substantially increased honey production. An earlier African study published in 2013 by Nuru Adgaba Al-Ghamdi of King Saud University, conducted on tropical honey bee colonies in Ethiopia, reached similar conclusions. The experiment included two groups of six colonies each. In the treatment group, queen excluders were installed three weeks before the beginning of the nectar flow. The colonies were monitored throughout four major honey flows over two consecutive years. Before the queen excluders were installed, there was no difference in brood area between the two groups. During the nectar flow, however, colonies without queen excluders continued intensive brood rearing until the peak of the flow, whereas colonies with queen excluders had a statistically significantly smaller

brood area. Honey yield in the queen excluder group was 25% higher. The authors concluded that under tropical conditions, where colonies continue intensive brood rearing even during the peak of strong nectar flows, particularly when honey flows are relatively short, the queen excluder increases honey yield by redirecting colony resources from brood production toward nectar collection and honey storage, without adversely affecting the long-term strength of the colony. A German study further demonstrated that the principal advantages of the queen excluder are brood-free and pollen-free honey supers, easier honey extraction, and improved honey hygiene. As for recommendations under our own beekeeping conditions with the Carniolan honey bee, the queen excluder should be installed shortly before the main nectar flow, preferably one to two weeks in advance. Its effect will naturally depend on colony strength as well as the type and duration of the nectar flow. While the queen excluder is unlikely to reduce honey yield, neither should it be expected to increase it dramatically.

Nevertheless, it provides the practical benefits described above. In addition, the queen excluder facilitates the standardization of beekeeping techniques, which significantly reduces production costs—an objective that is always of great importance in commercial beekeeping.

The Effect of the Queen Excluder on Royal Jelly Production

A Turkish study published in 2005 investigated the use of the queen excluder for restricting the brood nest during royal jelly production under climatic conditions similar to those of our region. Interestingly, under these conditions the Carniolan honey bee produced 14.46% more royal jelly than the other bee races tested, while also demonstrating excellent adaptation to seasonal changes.Similar research has also been carried out by Chinese scientists. In 2019, Fu-Liang Hu (Institute of Apicultural Research, Chinese Academy of Agricultural Sciences), together with colleagues from China, Slovakia, and France, published a study in the prestigious Journal of Apicultural Research as part of the COLOSS BEEBOOK series. In their protocol for royal jelly production, the queen was confined with a queen excluder to a brood nest consisting of 4–6 combs.

The introduction of the queen excluder increased annual royal jelly production from approximately 200–300 g per colony—as achieved by older queenless methods—to 5,000–12,000 g per colony. The older queenless methods weakened colonies, reduced the number of nurse bees, and decreased the overall productivity of both royal jelly and honey. The introduction of the queen excluder, which allowed the queen to remain present in the colony, dramatically increased royal jelly production. This improvement was, of course, also supported by the selective breeding of honey bees for enhanced royal jelly secretion and by the use of plastic queen cell cups. Within the queen-confined brood nest of 4–6 combs, the colony contains not only brood but also sufficient pollen reserves. In the queenless upper section, where royal jelly is produced, there are at least five combs, including one or two pollen combs together with several brood combs. Frames containing grafted larvae are then introduced into this section.Larvae 12–18 hours old are grafted into plastic queen cell cups. The grafting frames are placed in the queenless compartment between brood combs and combs containing both brood and pollen. After 68–72 hours (approximately three days), the larvae are removed and the royal jelly is harvested. Colonies managed in this manner are capable of producing royal jelly throughout the entire beekeeping season. Today, this technique has become the standard method of royal jelly production in China.

MD Rodoljub Živadinović

Epidemiology specialist, apitherapist

President of the Serbian Federation of Beekeeping Organization’s

apikult@gmail.com

EASY SUPPRESSION OF SWARMING IN ITS EARLY STAGE

No information on this subject can be found in the available beekeeping literature. The following practice was brought from Germany by Jovica Petrović of Jarebice near Loznica (Serbia), who learned it while working for a well-known commercial beekeeper managing a large number of colonies. Whenever this beekeeper encountered a colony that had only open queen cells, he immediately removed and discarded the drone comb frame (a frame containing drone brood), regardless of the developmental stage of the brood. Interestingly, he did not search for drone brood on the remaining frames, because under his management system almost all drone brood was concentrated on the dedicated drone comb frame. Beekeepers who do not use a dedicated drone comb frame containing drone brood should instead remove all drone brood from the entire colony, whether open or capped. This eliminates the need to destroy queen cells and avoids the considerable time required for that procedure, which usually only delays swarming rather than preventing it. Removing drone brood in this manner suppresses the swarming impulse in approximately 95% of colonies, an exceptionally high success rate. The swarming tendency ceases, while the beekeeper spends very little time carrying out the intervention. Consequently, this otherwise demanding task can be completed very quickly, even in large commercial apiaries. We hypothesize that drone brood is a major source of drone pheromones. When all drone brood is suddenly removed, the pheromone level drops dramatically. This may serve as a signal that the colony is experiencing an abnormal condition, prompting the bees to abandon the swarming process. As a result, the beekeeper saves considerable labor, time, and ultimately money, since time is an especially valuable resource in large-scale beekeeping operations. Goran Tomić of Kosjerić (Serbia) has developed his own method for suppressing swarming in colonies that have just been relocated to a forthcoming nectar flow, that is, to a new apiary site. The method is effective only under these circumstances and works even when the colony already contains sealed queen cells, provided that queen emergence has not yet become imminent. All honey supers, together with the bees occupying them, are transferred to other colonies, while the colony exhibiting swarming behavior is left with a single empty honey super. Under these conditions, the swarming impulse ceases. Another method has proven effective in a relatively high percentage of colonies housed in AŽ hives. It consists of reversing the orientation of the brood frames bearing queen cells (or, more conveniently, reversing all brood frames to avoid searching for individual queen cells), so that the top bar becomes the bottom bar and vice versa. In most cases, this procedure interrupts the swarming impulse. When one of Serbia's leading beekeepers, Zoran Kovačević of Grocka, needs to remove from his beekeeping pavilion (container apiary) a colony that has entered the swarming state despite all preventive measures, he replaces it with another colony. However, he observed that the replacement colony subsequently developed a swarming tendency much more readily. He concluded that this was triggered by the returning forager bees from the original colony, which entered the newly introduced colony at the same location. Since making this observation, he has carried out such colony replacements exclusively at night, and the problem has disappeared. We sincerely thank Jovica Petrović, Goran Tomić, and Zoran Kovačević for generously sharing these valuable practical observations with the beekeepers of Serbia. Their experience may prove highly beneficial to beekeepers facing similar challenges.

MD Rodoljub Živadinović

Epidemiology specialist, apitherapist

President of the Serbian Federation of Beekeeping Organization's

apikult@gmail.com

TEMPORAL INCREASE OF VARROA MITES IN TRAP FRAMES USED FOR DRONE BROOD REMOVAL DURING THE HONEY BEE SEASON

ABSTRACT

Varroa mites are highly attracted to drone brood of honey bees (Apis mellifera), as it increases their chance of successful reproduction. Therefore, drone brood removal with trap frames is common practice among beekeepers in Europe and part of sustainable varroa control. However, it is considered labour- intensive, and there are doubts about the effectiveness of this measure. At present, it is mostly unknown how many mites a drone frame can carry at different times of the season, and how many mites can be removed on average if this measure is performed frequently. Therefore, we sampled a total of 262 drone frames with varying proportion of capped cells (5– 100%) from 18 different apiaries. Mites were washed out from brood collected from mid-April to mid- July based on a standard method to obtain comparable results. We found that a drone frame carried a median of 71.5 mites, and with the removal of four trap frames, about 286 mites can be removed per colony and season. In addition, mite counts were significantly higher in June and July than in April and May (Tukey-HSD, $P < 0.05$). The number of mites and the proportion of capped cells, however, were not correlated ($R^2 < 0.01$, $P < 0.05$). Our results suggest that drone brood removal is effective in reducing Varroa destructor numbers in colonies, supporting the findings of previous studies on the efficacy of this measure. Although mite counts varied, we believe that increasing sample size over different seasons and locations could elucidate infestation patterns in drone brood and ultimately improve drone brood removal as an integrated pest management tool for a wider audience of beekeepers.

More than 70% of Varroa destructor mites are found in capped cells of bee brood when brood is present in Apis mellifera colonies (Frey & Rosenkranz, 2014). Drone brood is 6– 11 times more likely to be infested with mites than worker brood for probably several reasons (Beetsma et al., 1999; Fuchs, 1990); (i) drone evelopment takes 2 days longer, giving mites more time to reproduce (Boot et al., 1995); (ii) drone brood is two to three times more likely to be frequented by nurse bees that may carry phoretic mites (Calderone & Kuenen, 2003); (iii) the pre- capping period during which drone brood is attractive to mites is two to three times longer than for worker brood (Boot et al., 1992); and (iiii) longer and increased production of kairomones by drone larvae, which make them attractive to mites (Trouiller et al., 1992).

Considering all the reasons above makes drone brood removal (DBR) an effective tool for controlling varroa mites when integrated as a pest management measure (Evans et al., 2016; Whitehead, 2017). Good results can be achieved when 4 to 5 fully capped trap frames are removed per season (Charrière et al., 2003). It is worth noting that DBR is mainly used by small- scale beekeepers in Europe and is considered labour-intensive or not effective enough as a single treatment elsewhere (Evans et al., 2016; Whitehead, 2017). There is also a risk of rapid varroa spread if trap frames are not harvested in time (Jack & Ellis, 2021).

When done properly, the effectiveness of DBR is demonstrated by the fact that the number of mites during colony development in spring and early summer was significantly lower than in untreated colonies (Wantuch & Tarpy, 2009). Final infestation rates of colonies after late summer treatments were also substantially lower than in colonies where DBR was not performed (Calderone, 2005; Charrière et al., 2003). However, to date, there are few data on how many mites a single drone frame can actually carry. Furthermore, it is unknown whether there is a difference in infestation levels over time and to what extent the proportion of capping (i.e. the number of capped drone cells in relation to all drone cells) may influence DBR success. The latter could play a role in practice, since beekeepers may simply have removed the trap frame too early if they do not find the method sufficiently effective. There is also general doubt among beekeepers if this method removes mites at all (Whitehead, 2017).

The aim of this study was, therefore, to determine the number of mites in individual drone frames over the course of a bee season. In addition, we assessed whether there was a correlation between the number of mites and the proportion of capped cells.

2 MATERIALS AND METHODS

2.1 Experimental field sites and colonies

The field sites with apiaries (n = 18) were all located in the state of Baden- Württemberg in southern Germany. Apiaries were sampled unevenly due to logistical reasons (1– 3 times). Some drone frames were collected only once, others multiple times from these locations. The total number of honey bee colonies (A. m. carnica) sampled was n = 63. These colonies belonged to the stock of the Apicultural State Institute and were kept according to good beekeeping practice. This included varroa treatment with 85% formic acid twice in the previous season (August and September) and winter treatment with 3.5% oxalic acid in November/December, the last treatment before drone frames were sampled. Colonies were housed in Hohenheim standard hives with 10 Zander frames per box. A hive consisted of two boxes for brood and up to two boxes for honey, separated by the use of a queen excluder. One empty frame without foundation was placed next to the brood nest, either as frame no. 2 or 9 in the upper brood box. Bees and brood showed no clinical signs of disease upon inspection throughout the sampling period.

2.2 Data collection

Whole drone frames (n = 262) were collected from mid- April (18 Apr) to mid- July (15 Jul) of the 2011 season. We applied a brood washing method similar to that of Dietemann et al. (2013), chapter 3.1.4.2.2.In brief, the entire brood was uncapped with a sharp knife, and the comb parts were rinsed through a first sieve (5 mm mesh) with a hand shower until all the cell contents were removed. Subsequently, empty comb parts were washed again, and cell caps that were removed and washed separately, as mites can hide under them. All mites were then collected in a second sieve (0.5 mm mesh) and dried on tissue paper. They were counted with the help of a counting grid and a hand counter. Prior to washing, the area of capped cells of each drone frame was measured in 10 × 10 cm squares, which were then converted to percentage using the Liebefeld method (Imdorf et al., 1987). One Zander frame fits exactly 8.1 dm2 or eight Liebefeld units per side and thus a total of 8 × 230 (1840) drone cells (Aumeier, 2017; Imdorf & Gerig, 1999).

2.3 Statistical analysis

We fitted a negative- binomial mixed model (estimated using ML and nlminb optimizer) to predict mites with month and location (formula: mites ~ month + location). The model included the proportion of the frame with capped cells as a random effect (formula: ~1Icapped_perc). The model's explanatory power related to the fixed effects alone (marginal R2) was 0.65. To compare groups pairwise, estimated marginal means were calculated and adjusted by the Tukey- HSD method for multiple comparisons for the response variable month (= adjusted means). In addition, linear regression was performed to identify whether the number of mites per frame, and the

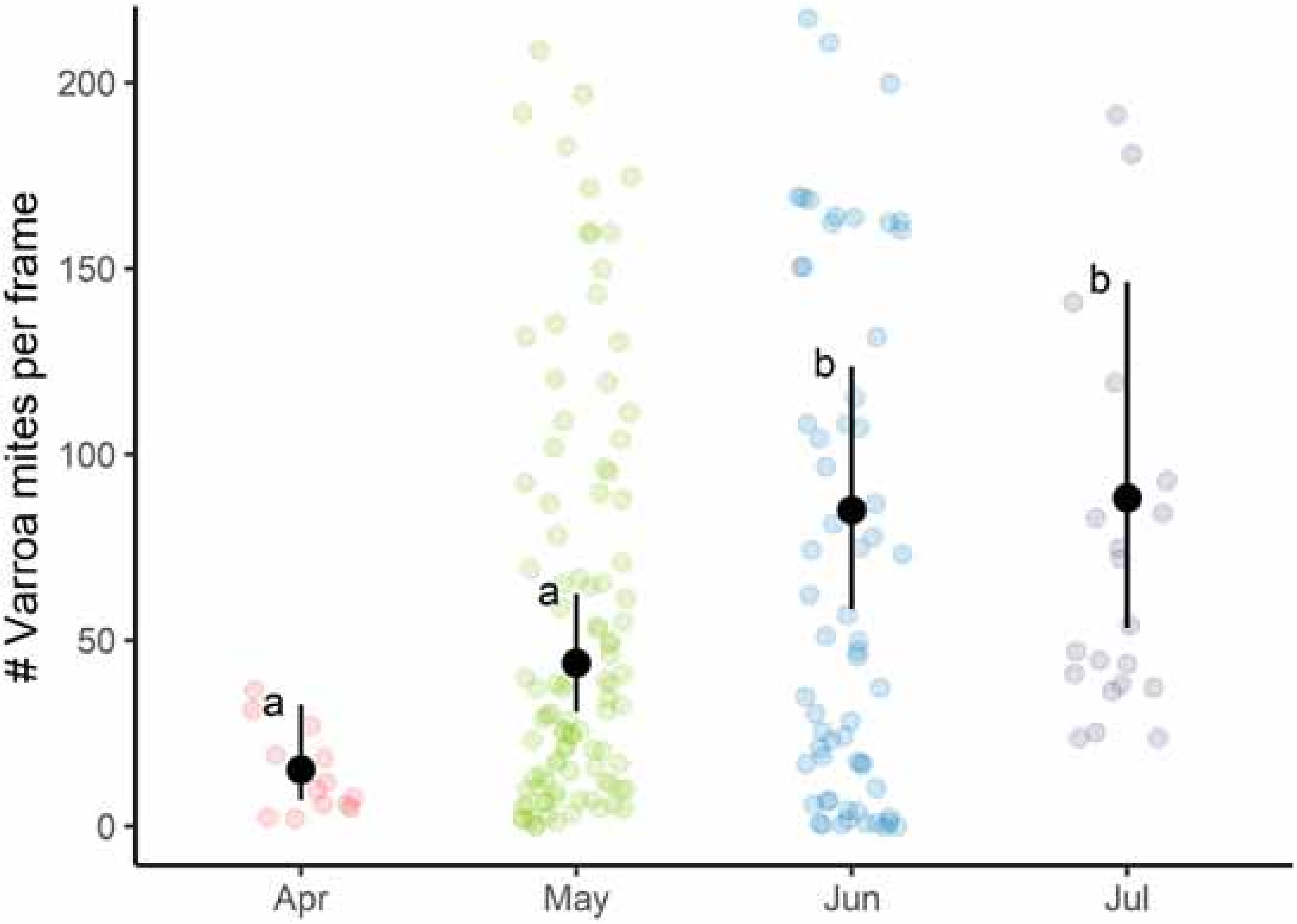


FIGURE 1

Number of varroa mites per drone frame. Black dots and error bars indicate the adjusted means (±CL) of mites per drone frame. Means that follow a common letter are not significantly different (Tukey- HSD, P>0.05). Note that all values above 200 mites are not shown in this graph but are available in Figure S2 proportion of capped cells were correlated (formula: mites ~ capped_perc).

All analyses were performed in R v.4.1.2 (R Core Team, 2021). A significance level of α = 0.05 was used for all tests, respectively.

3 RESULTS

3.1 Varroa mite count

The model's intercept was at 3.94 (95% CI [3.07, 4.81], P < 0.001). To illustrate the effect size, the estimated marginal means (± CL) are shown in Figure 1. The number of mites per drone frame increased each month, as indicated by the higher mean values. The increases from April to June, April to July, May to Jun and May to July were significant (Figure 1, Tukey- HSD, P < 0.05). Across all samples, a single frame carried a median of 71.5 mites (Mean = 208.49, SD = 344.21, Skewness = 3.31, Figure S2).

The number of mites per frame across all 18 apiaries was significantly different (Tukey- HSD, P < 0.05), as was the number of drone frames removed (Figure S1). Overall, there were only six samples with 0 mites (2.3%) and 40 samples with <10 mites (15.3%) (Figure S2).

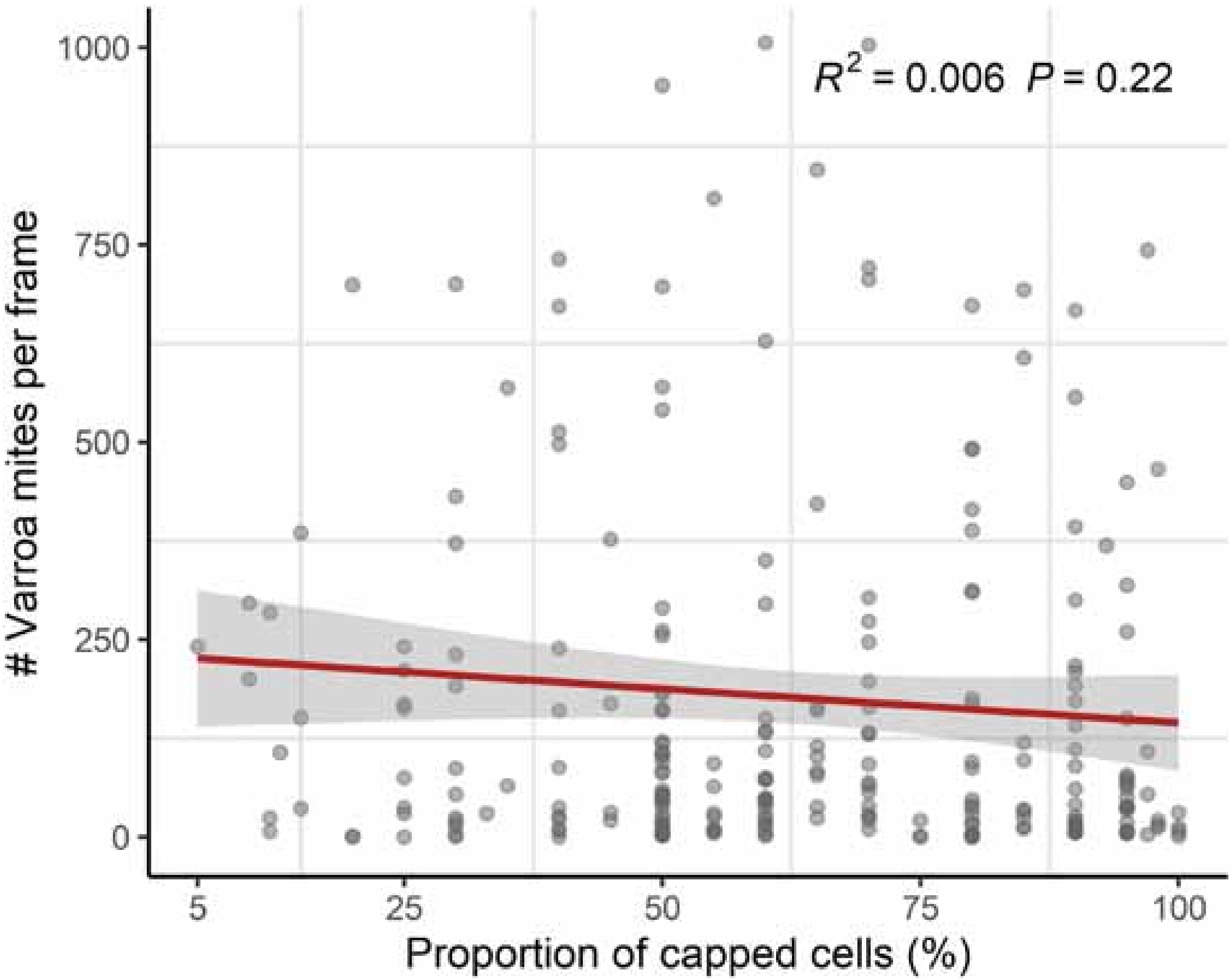


FIGURE 2

Scatterplot of capped cell proportion (x- axis) versus varroa mite number per frame (y- axis) including 250 valid data points. Linear regression for mite count and proportion of capped cells was not significant (P = 0.22)

Note that all data points above 200 are shown in Figure S2 only.

3.2 Proportion of capped cells

For linear regression, 12 data points were excluded from the analysisbecause their capping status was not recorded. Therefore, only n = 250 data points were analysed. With R2 < 0.01, no correlation was found between the number of mites and the proportion of capped cells (Figure 2). On average, the proportion of capped cells was 63% across all samples, with the majority above 50% (n = 210 samples or 84%, Figure S3).

4 DISCUSSION

It is known that drone brood attracts varroa mites on average eight times more than worker brood and is, therefore, an effective means of controlling this pest when removed (Charrière et al., 2003).

Due to limited data, it is currently unclear how many mites are removed by a single frame and at what status drone cells were cut. Understanding how a temporal progression can alter drone brood infestation could provide insight into the effectiveness of this measure and further improve it. In this study, therefore, we evaluated drone frames taken from 18 apiaries over an entire season to determine mite counts and infestation patterns that have not been reported anywhere before.

We found a significant increase in mites over time, consistent with mite development in the entire colony (Wantuch & Tarpy, 2009). Less than 3% of our samples contained no mites at all and only ~15% contained <10 mites, demonstrating the effectiveness of this method. Assuming that DBR was performed four times per season and colony, an average of 834 mites could be removed (mean). This agrees with the results of Charrière et al. (2003), who removed 788 mites under similar conditions. It is important to note that our data are left- skewed, which requires a cautious interpretation of mean values. A more reasonable interpretation, in this case, is provided by the median of 71.5 mites per drone frame (von Hippel, 2005).

Removing four trap frames during the season, therefore, yields a more realistic estimate of 286 mites removed (median).

Furthermore, the proportion of capped cells of the drone frame did not affect the mite count. When the frames were evaluated, an average of 63% of the cells were capped. This indicates that all open cells containing larvae were in an appropriate condition to be infested (i.e. <60 h before capping) (Calderone & Kuenen, 2003; Frey et al., 2013). In practical terms, this means that DBR does not require fully capped frames to be effective. Thus, frames could be removed earlier to minimize removal intervals and maximize removal frequency to extract more mites. Likewise, Licek et al. (2004) suggest overwintering colonies with drawn trap frames to promote drone rearing in the early season and extend the removal period. Some beekeeping magazines also recommend using two trap frames and collecting them in alternating order to maximize mite extraction (Bienen & Natur, 2022).

Since we have only presented a small data set on this subject, a better insight into the infestation pattern of drone brood and ultimately an increase in the effectiveness of DBR could be the result if studied in more detail. This is why we encourage data collection from different countries to enable future region- specific recommendations for DBR as an integrated pest management measure in beekeeping.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available in the'Open Science Framework' under DOI: https://doi.org/10.17605/OSF.IO/ZJS4X (Odemer et al., 2022).

Funding information

R. Odemer was supported by funds of the Federal Ministry of Food and Agriculture (BMEL) based on a decision of the Parliament of the Federal Republic of Germany via the Federal Office for Agriculture and Food (BLE) under the innovation support programme.

Furthermore, this work was supported by funds of the German Government's Special Purpose Fund held at Landwirtschaftliche Rentenbank.

This is an open access article under the terms of the Creative Commons Attribution-NonCommercial License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited and is not used for commercial purposes.

© 2022 The Authors. Journal of Applied Entomology published by Wiley-VCH GmbH.

J Appl Entomol. 2022;00:1–5. wileyonlinelibrary.com/journal/jen

Richard Odemer
Julius Kühn- Institut (JKI) – Federal Research Centre for Cultivated Plants, Institute for Bee Protection, Braunschweig, Germany
richard.odemer@julius-kuehn.de

Franziska Odemer
Institute for Apiculture, Lower Saxony State Office for Consumer Protection and Food Safety, Celle, Germany

Gerhard Liebig
Doris de Craigher
Apicultural State Institute, University of Hohenheim, Stuttgart, Germany

REFERENCES

Aumeier P (2017) Sie dürfen nicht alles glauben, was Sie denken!, Die neue Bienenzucht (DNB) 02/2017: 48- 51.

Beetsma, J., Boot, W. J., & Calis, J. (1999). Invasion behaviour of Varroa jacobsoni Oud.: from bees into brood cells. Apidologie, 30, 125– 140.

https://doi.org/10.1051/apido :19990204

Bienen & Natur (2022) Drohnenrahmen: Varroa bekämpfen und Wachs ernten (English title: Drone Frame: Fighting Varroa and Harvesting Beeswax), dlv Deutscher Landwirtschaftsverlag. https://bit.ly/3L2D3XC. Accessed May 11, 2022.

Boot, W. J., Calis, J. N. M., & Beetsma, J. (1992). Differential periods ofVarroa mite invasion into worker and drone cells of honey bees. Experimental & Applied Acarology, 16, 295– 301. https://doi.org/10.1007/BF012 18571

Boot, W. J., Schoenmaker, J., Calis, J. N. M., & Beetsma, J. (1995). Invasion of Varroa jacobsoni into drone brood cells of the honey bee, Apis mellifera. Apidologie, 26, 109– 118. https://doi.org/10.1051/apido:19950204

Calderone, N. W., & Kuenen, L. P. S. (2003). Differential tending of worker and drone larvae of the honey bee, Apis mellifera, during the 60 hours prior to cell capping. Apidologie, 34, 543– 552. https://doi.org/10.1051/apido :2003054

Calderone, N. W. (2005). Evaluation of drone brood removal for management of Varroa destructor (Acari: Varroidae) in Colonies of Apis mellifera (Hymenoptera: Apidae) in the Northeastern United States. Journal of Economic Entomology, 98(3), 645– 650. https://doi.
org/10.1603/0022- 0493- 98.3.645

Charrière, J.- D., Imdorf, A., Bachofen, B., & Tschan, A. (2003). The removal of capped drone brood: an effective means of reducing the infestation of varroa in honey bee colonies. Bee World, 84, 117– 124. https://doi.org/10.1080/00057 72X.2003.11099587

Dietemann, V., Nazzi, F., Martin, S. J., Anderson, D. L., Locke, B., Delaplane, K. S., Wauquiez, Q., Tannahill, C., Frey, E., Ziegelmann, B., Rosenkranz, P., & Ellis, J. D. (2013). Standard methods for varroa research. Journal of Apicultural Research, 52, 1– 54. https://doi.org/10.3896/IBRA.1.52.1.09

Evans, J., Müller, A., Jensen, A. B., Dahle, B., Flore, R., Eilenberg, J., & Frøst, M. B. (2016). A descriptive sensory analysis of honeybee drone brood from Denmark and Norway. Journal of Insects as Food and Feed, 2, 277– 283. https://doi.org/10.3920/JIFF2 016.0014

Frey, E., Odemer, R., Blum, T., & Rosenkranz, P. (2013). Activation and interruption of the reproduction of Varroa destructor is triggered by host signals (Apis mellifera). Journal of Invertebrate Pathology, 113, 56– 62. https://doi.org/10.1016/j.jip.2013.01.007

Frey, E., & Rosenkranz, P. (2014). Autumn invasion rates of Varroa destructor (Mesostigmata: Varroidae) into honey bee (Hymenoptera: Apidae) colonies and the resulting increase in mite populations. J Econ Entomol, 107, 508– 515. https://doi.org/10.1603/EC13381

Fuchs, S. (1990). Preference for drone brood cells by Varroa jacobsoni Oud in colonies of Apis mellifera carnica. Apidologie, 21, 193– 199. https://doi.org/10.1051/apido :19900304

Imdorf, A., Buehlmann, G., Gerig, L., et al. (1987). Überprüfung der Schätzmethode zur Ermittlung der Brutfläche und der Anzahl Arbeiterinnen in Freifliegenden Bienenvölkern. Apidologie, 18, 137– 146. https://doi.org/10.1051/apido :19870204

Imdorf, A., & Gerig, L. (1999). Lehrgang zur Erfassung der Volksstärke. Schweizerisches Zentrum für Bienenforschung.

Jack, C. J., & Ellis, J. D. (2021). Integrated pest management control of Varroa destructor (Acari: Varroidae), the Most Damaging Pest of (Apis mellifera L. (Hymenoptera: Apidae)) Colonies. Journal of Insect Science, 21(5). https://doi.org/10.1093/jises a/ieab058

Licek, E., Moosbeckhofer, R., & Pechhacker, H. (2004). Varroa destructor, a parasitic mite of the honeybee (Apis mellifera)— a survey of biology and control strategies. Wiener Tierärztliche Monatsschrift, 91, 311– 316.

Odemer R., Odemer F., Liebig G., de Craigher D. (2022) Data: Temporal Increase of Varroa Mites in Trap Frames Used for Drone Brood Removal during the Honey Bee Season. OSF. March 22. https://doi.org/10.17605/ OSF.IO/ZJS4X

R Core Team. (2021). R: A language and environment for statistical computing. R Foundation for Statistical Computing. https://www.R- project.org/

Trouiller, J., Arnold, G., Chappe, B., le Conte, Y., & Masson, C. (1992). Semiochemical basis of infestation of honey bee brood by Varroa jacobsoni. Journal of Chemical Ecology, 18, 2041– 2053. https://doi.org/10.1007/BF009 81926

von Hippel, P. T. (2005). Mean, median, and skew: correcting a textbook rule. Journal of Statistics Education, 13, 3. https://doi.org/10.1080/10691 898.2005.11910556

Wantuch, H. A., & Tarpy, D. R. (2009). Removal of drone brood from Apis mellifera (Hymenoptera: Apidae) colonies to control Varroa destructor (Acari: Varroidae) and retain adult drones. J Econ Entomol, 102, 2033– 2040. https://doi.org/10.1603/029.102.0603

Whitehead HR (2017) Varroa mite management among small- scale beekeepers: Characterizing factors that affect IPM adoption, and exploring drone brood removal as an IPM tool. Master Thesis. The Ohio State University.

How to cite this article: Odemer, R., Odemer, F., Liebig, G., & de Craigher, D. (2022). Temporal increase of Varroa mites in trap frames used for drone brood removal during the honey bee season. Journal of Applied Entomology, 00, 1–5. https://doi.org/10.1111/jen.13046

EUROPE RECOGNIZES THE VALUE OF WILD HONEY BEES

When we speak about honey bees, we most often think of hives and beekeepers who care for them. However, honey bees existed long before beekeeping. For a long time, the wild life of honey bees remained largely in the background of public attention. Today, however, this is beginning to change. The International Union for Conservation of Nature (IUCN) has declared wild honey bees (Apis mellifera) an Endangered species at the level of the European Union, giving formal recognition to their importance for nature conservation. This is the first time that this species, which we all know but rarely see in the wild, has been recognized as part of our natural heritage requiring special protection. This decision represents a historic moment — not only for biologists, but also for the beekeeping community, as it emphasizes that the conservation of the species cannot be achieved without the cooperation of all those who live and work with it.

Wild populations of the honey bee — life outside the hive

Wild honey bees belong to the same species as managed honey bees, but their life cycle and ecological role differ in several respects. They do not depend on human intervention:

• they find cavities in which to build their nests on their own (Figure 1),

• they overwinter without supplementary feeding,

• they cope with diseases and parasites without human assistance.

Figure 1.
A wild honey bee colony (Apis mellifera) in a natural tree cavity — an example of life outside the hive

It is precisely this natural "filter" that enables local populations to retain traits that ensure their long-term survival and adaptability under changing environmental conditions. Their genetic diversity and local adaptation represent a valuable resource for the future of the entire species. These populations live hidden from human view, in cavities of old trees, in the walls of buildings, or in natural crevices, forming independent colonies that follow natural rhythms. Such living conditions allow natural selection to act without human intervention, which is essential for the emergence and persistence of resilient genetic lineages.

How the endangered status was assigned

The IUCN assesses the threat status of species according to standardized and strictly defined criteria that are applied globally. The results of these assessments are published within the so-called Red List of Threatened Species (IUCN Red List, Figure 2), which represents an international reference framework for biodiversity conservation. The classification is based on objective indicators — such as population size, decline trends, distribution, and the intensity of threatening factors. These criteria allow assessments to be carried out in the same way for all species worldwide, resulting in comparable and reliable threat categories.

Figure 2.
Logo of the IUCN Red List of Threatened Species — the international system for assessing the conservation status of species. This list represents the global standard for monitoring biodiversity and identifying species at risk. © IUCN

The risk categories range from Least Concern, through Near Threatened, Vulnerable, and Endangered, to Critically Endangered, Extinct in the Wild, and Extinct (Figure 3). The category Data Deficient (DD) indicates that there is not enough information to assess the status of a species. The Endangered status assigned to wild honey bees represents a serious level of threat and implies that there is a high risk of population disappearance in the near future if conservation measures are not taken.

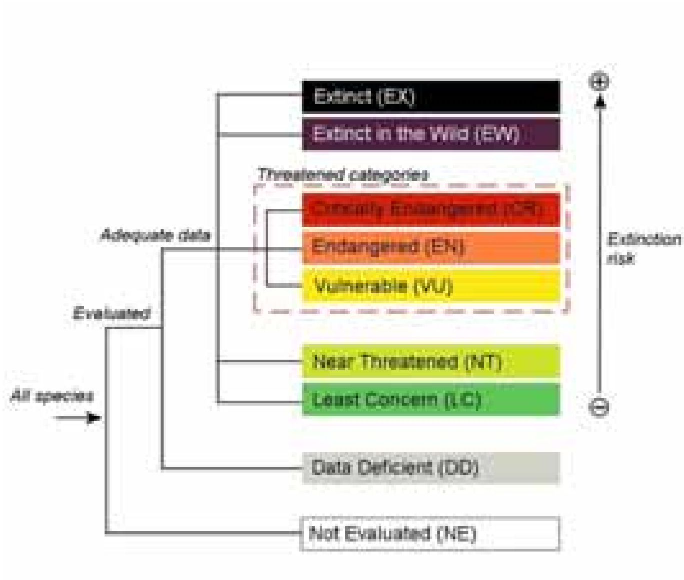


Figure 3.
Graphic representation of the official IUCN Red List threat categories. The range of risk categories extends from LC – Least Concern to EX – Extinct and shows the degree of threat to species, from stable populations to complete disappearance. This classification represents the global standard for assessing the conservation status of species. The category DD – Data Deficient indicates that there is not enough information to assess the status of the species. © International Union for Conservation of Nature — https://www.iucn.org

In the 2014 European Red List of Bees, wild honey bees were classified as Data Deficient (DD) — meaning that there was not enough data to assess the state of their populations. For this reason, in 2022 the IUCN initiated a process of reassessing their status and invited experts from the organization “Honey Bee Watch” to conduct a new assessment.

Honey Bee Watch is an international organization composed of researchers, experts, and beekeepers from different countries, dedicated to the study of wild honey bees. Its goal is to unite research efforts, harmonize methodologies, and build a shared knowledge base. Experts from Honey Bee Watch were involved in collecting, analysing and evaluating the data in accordance with IUCN criteria. Existing data were consolidated and supplemented with new field research and literature reviews, and during the three-year process they were analyzed according to strictly defined standards.

In this way, for the first time, a comprehensive and scientifically grounded picture of the state of wild honey bees in Europe was created, making it possible for this species to receive its official Red List status.

Main threat factors

The results of the assessment show that wild honey bee populations are affected by the same threats as managed honey bees — such as pesticides, climate change, and habitat loss — but they are also exposed to additional pressures arising from certain beekeeping practices.

The most significant threats are:

• Pesticides — long-term exposure to pesticides, especially in agricultural landscapes, negatively affects bee health.

• Climate change — disrupts the synchrony between the needs of bees and the availability of food, shifts and alters plant flowering periods, while increasingly frequent droughts and harsher winters make survival even more difficult.

• Habitat loss — through the destruction of natural habitats, wild bees have fewer and fewer suitable places for nesting and foraging: the number of old trees with cavities suitable for nesting is decreasing, as are areas with diverse nectar- and pollen- rich plants that provide food throughout the season.

• Diseases and parasites — non-native pathogens, introduced from other parts of the world, represent a serious pressure.

• Certain beekeeping practices — frequent long-distance movement of colonies and uncontrolled trade in queens can lead to the mixing of genetic lineages and the loss of local adaptations.

Why this topic is important for beekeepers as well

This IUCN decision does not imply bans or restrictions for beekeepers. Rather, it indicates that, alongside beekeeping, there is also a wild segment of the population that has an important ecological role and value. Wild honey bees are important guardians of genetic diversity within the species Apis mellifera, and it is precisely this diversity of locally adapted populations that allows natural selection to shape more resilient colonies capable of surviving without human assistance — which is essential for the future and sustainability of beekeeping. For this reason, the goal is not to “save” these bees by bringing them under human control, but to allow them to continue living freely, under the conditions in which natural selection can continue to operate.

In the coming years, recommendations and strategies are expected that will help include wild honey bee populations in nature conservation plans — for example, through the protection of their habitats and more careful planning of the number of managed hives in areas where wild populations exist. These are not restrictive measures, but rather a way to ensure a balance between beekeeping and nature conservation.

Addressing sensitive issues thoughtfully

It is known that some beekeeping practices, if not carried out carefully, can have unintended consequences for wild honey bee populations. For example:

• Migratory beekeeping, in which hives are moved over long distances in search of forage, enables the spread of pathogens and brings into contact populations that would otherwise never meet. In this way, the possibility of interbreeding arises, leading to the mixing of genetic lineages and the gradual erosion of local adaptations that have formed over a long evolutionary process.

• Uncontrolled exchange of queens from different regions further intensifies this process. By introducing queens from genetically distant populations into local colonies, specific local genetic characteristics are gradually lost — characteristics that have been shaped by natural selection over a long period of time. These locally shaped characteristics allow bees to adapt to the conditions of their environment. If they are lost, the overall genetic diversity of the species is reduced, as is the resilience of populations to future changes.

It is important to emphasize that this is not about pointing a finger at beekeepers, but about recognizing that beekeeping and nature conservation are deeply connected, and that it is possible to establish a sustainable balance between these two interests — but only if we think about it in time. Beekeepers themselves, as people who know honey bees best and have rich practical experience, can play a key role in finding solutions that will simultaneously support successful beekeeping and the conservation of wild populations. Mutual cooperation between beekeepers, scientists, and decision-makers can become a strong foundation for the future of both agriculture and biodiversity.

How you can get involved

For many years, beekeepers have often been the first to notice wild colonies in their surroundings — in forests, on their properties, in yards, attics, tree cavities, or walls. These observations can be valuable for science.

If you come across a wild colony, you can send the information to Honey Bee Watch:

https://app.honeybeewatch.com/
honeybeewatch.info@gmail.com

Each such observation represents a valuable source of data that helps us better understand the ways in which wild honey bees survive.

Conclusion

Wild honey bees are not like stray dogs and cats that need to be “rescued” fed, and treated. They are not abandoned — they are independent — and that is precisely where their value lies. They should be allowed to remain wild. Only if they live freely can natural selection do its work: shaping colonies that are locally adapted, resilient, and stable without human intervention. In the long term such populations may provide answers to the most important questions — how will bees survive under conditions of climate change, new diseases, and increasingly unstable ecosystems, and what role nature and humans each play in that process. Their conservation does not exclude beekeeping; rather, it can complement and strengthen it. Beekeepers, as guardians and allies of honey bees, have an important role in this process.

The way we work together today — as beekeepers, scientists, and citizens — will determine whether wild bees will remain part of our nature tomorrow.

Assistant Professor Dr Jovana Bila Dubaić
University of Belgrade, Faculty of Biology

EU APPROVES FIRST FEED ADDITIVE FOR HONEYBEES

EU Member States delivered a positive opinion on the first ever feed additive authorisation for insects, based on a scientific assessment carried out by EFSA and a proposal from the Commission.

The feed additive will be allowed for use in honeybees to improve the winter survival rate of bee colonies. The additive will only be fed to honeybees between two honey production seasons. Beekeepers can mix it in sugar syrup or candy bread, to ensure that colonies have sufficient resources during winter. The additive is made of molybdenum and, following the adoption of the authorisation by the Commission, could be placed on the EU market before the end of the year.

That's vote will make a positive contribution to the EU Biodiversity Strategy for 2030 and the EU Pollinators Initiative, which aim to reverse the decline in wild pollinators by 2030.

Strip's d.o.o., Kandrše 7, 1252 Vače, Slovenia T: +386 3 56 70 770 I E: info@beeconn.net I W: www.beeconn.net

THE STONY ROAD TO A DIVERSE PRODUCT RANGE IN THE BEEKEEPING SHOP

The weather is the classic risk factor in beekeeping, just as it is in agriculture. That's common knowledge. Counterfeit products and cheap imports—such as those resulting from the Mercosur Agreement—further exacerbate the situation, even though domestic demand for honey is actually far from being met. The past few years have been sobering for many beekeeping operations. The considerable amount of work involved, with inadequate financial compensation, has caused the love for bees to wane. Honey, honey, honey—everything revolves around this undoubtedly very important product. But what about the other products?

Let's start with honey, though. There are still some blind spots. I'd like to describe three of them here.

True to the saying, "The bait must appeal to the fish, not the angler," some beekeepers have now begun making blends of honey with other fruits or exotic spices. Many of these blends are classic, but many are also new and innovative—

and naturally require a delicate touch and a lot of marketing.

However, the topic of honey blends has not yet been fully explored. If you mix not only fruits but also other bee products such as royal jelly, pollen, or perga—or even freeze-dried drone milk (Apilarnil)—into the honey, you end up with products that are very expensive but of high quality. These products don't sell themselves. Beekeepers and their salespeople need to do their homework and really dig into why each product is good for customers. You can't just pull the right sales pitches out of thin air. Patience is also required. Experience shows, however, that it pays off and that customers keep coming back. And despite inflation and economic difficulties, interest in high-quality natural products has grown.

One widely underrated product is oxymel. It's hardly known outside of Austria and South Germany, and even there, beekeepers rarely offer it. Oxymel is a mixture of honey, vinegar, and various flavour-enhancing ingredients such as flowers, berries, or other additives. It's therefore a healthy soft drink. For parents it is THE alternative to soda. Anyone who walks through supermarkets with their eyes open will see the masses of power drinks, energy cocktails, or electrolyte mixes, which are often already chilled and waiting at the checkout. They are bought and consumed in large quantities and are outrageously expensive for their rather third-rate ingredients. Oxymel has enormous potential here—not only for health-conscious customers but also because of the variety of flavours that can be achieved with honeys and other natural ingredients. Added to this is the health benefit: it effectively supports gut flora. HACCP and record-keeping requirements are actually nothing new for such (semi)-professional beekeepers.

Let's now turn our attention to beeswax and propolis. Traditionally, beekeepers have always used these to make creams, balms, or soaps. Today, these products can legally be sold as cosmetics within the EU legal framework. That can be daunting—different laws, different regulations. Is it really so complicated that a (semi-)professional beekeeping operation can't meet the requirements?

As with beekeeping itself, the prerequisite is a certain amount of enthusiasm and passion—and, of course, a healthy dose of frustration tolerance. Naturally, developing cosmetic products takes time and dedication. However, many have already reached the point where they're producing successful formulations for family and friends. This is because they've inherited successful recipes from older beekeepers or have always enjoyed mixing and experimenting themselves.

Those who aren't quite there yet can still find good basic recipes in both older and newer Hobbythek publications and on a number of online forums. Of course, you shouldn't rush into things and should take the time to gain experience. Some recipes turn out completely wrong. Those who succeed learn from these mistakes. By getting feedback from friends and relatives on your creations, you gain experience and also build up reliable sources for raw materials and fragrances. The world offers many raw materials, yet beeswax, propolis, and honey remain central components of your own cosmetics line. This allows us to meet customer demand for sustainable, regional products.

The next step toward launching your own product involves testing its stability. This is followed by a safety assessment made by an expert, which is then followed by a legally compliant cosmetic declaration. This process is completed with registration in the EU's CPNP database. From that point on, you are permitted and able to legally market your cosmetics—that is, sell them publicly, whether over the counter or, of course, online. There are specialists who offer services to handle these steps. This investment is therefore your ticket into a new product world and an expanded product offering.

The leap into the cosmetics industry is therefore not as risky as is commonly believed. Many of the familiar, documented processes for honey harvesting can also be easily adapted for cosmetics production. Beekeeping produces food. An HACCP plan is standard, and beekeepers must comply with extensive documentation and record-keeping requirements. Thus, the next steps toward cosmetics production aren't that big of a leap after all.

And those who want to test the market first can turn to established products available in stores. This product line can then be expanded, modified, or replaced with your own products step by step.

Yes, honey is important and remains the mainstay for most. But we see that we in beekeeping aren't limited to it; rather:

1. we can be creative with honey
2. gradually bring other bee products into the consumer's focus
3. gain a foothold in the cosmetics market

To do this, of course, we must develop a passion for and expertise in all bee products. This means we have to invest money and time and, above all, engage in intensive continuing education.

Diversification is a stony road, but it promises success to the brave.

Dr. Thomas Gloger is a member of the EBA Scientific Committee on Apitherapy. He works for the Api-Zentrum Ruhr (www.api-zentrum-ruhr.de), a company specializing in bee products. His primary focus is on knowledge transfer (the use of bee products in apitherapy, the therapeutic use of bee venom, and honey massage). Dr. Gloger is the author of the books "The Power of the Bee - The Book of Apitherapy" and "70 Tips from Apitherapy" (available only in German). In addition, the chemist conducts safety assessments for both the company's own products and for beekeeping operations and other clients. Dr. Gloger is a board member of Wellcert e.V. www.wellcert.de—the Association for Natural Substances and Sustainability. Wellcert supports small cosmetics manufacturers and has its own label to highlight local and organic products.

The Step-by-Step Path to Cosmetics

- HACCP
- Food Production (Honey)
- Cosmetics Development
- Formulations and Products
- GMP (Good Manufacturing Practice)
- Products: Organic, Natural, Regional, Sustainable
- Stability Testing
- Safety Assessment
- Legally Compliant Cosmetic Declaration
- CPNP Registration
- Legally Compliant Marketing

With a little imagination, household appliances can be used for small-scale production.

Bee products are suitable not only for honey blends but also for cosmetics

RADIO PRANK

At a large fair for professional beekeepers, a customer came up to me and was already snorting.

"Do you know Elvis Eifel?" he asked me. Elvis Eifel is a radio moderator who call random people to rank them.

I didn't know what he wanted. What does radio fun—where people are confronted by surprise calls with invented and crazy problems—have to do with our stand?

My visitor insisted: "Do you know Elvis Eifel?"

"Of course." I had to admit it, although I haven't listened to classical radio stations as regularly as I used to for a long time.

But now I got to hear the whole story. My visitor, who runs a beekeeping business, got a call. The caller was asking for the delivery of one hundred bees - no queen. Normally the beekeeper sells small colonies of at least five to ten thousand bees and only in the spring. But for heaven's sake, why only one hundred bees, and why without a queen?

The caller persisted and reported that he would keep the bees in the living room. My fair visitor thought that the next moment the caller would pretend to be Elvis Eifel. But the story got even crazier for him. He bravely remained on the phone. The prospect being rewarded with a decent cup of the local radio station may have kept him on the phone. The caller claimed he was in a wheelchair and suffering from ALS (amyotrophic lateral sclerosis). His mother would treat him with the bees and afterwards, he would get better and better. He would need the bees for that. My poor beekeeper was completely dismayed but stayed on the phone still hoping the radio station would break up the fun. But this did not happen. His worldview had just disintegrated. He did not send one hundred bees.

After the call, he started to research. At our stand, he saw my book on apitherapy, which explains bee sting therapy; precisely the treatment for various diseases referred to by the caller. His research had already shown that bee venom can indeed be used therapeutically. Now he was very pleased that he did not got just diffuse internet reports, but had it confirmed by me personally and could even read the procedure in more detail in my book. Although I was not Elvis Eifel either, my visitor was now almost as happy as if I had handed him the ultimate radio station coffee cup.

It's good when you can take a joke. And sometimes it's not fun at all and you just never stop learning.

Dr. Thomas Gloger

ΕΚΠΑΙΔΕΥΣΗ στην ΟΡΓΑΝΟΛΗΠΤΙΚΗ ΑΝΑΛΥΣΗ ΜΕΛΙΟΥ

HONEY SENSORY ANALYSIS EDUCATION

2nd Honey Sensory Analysis Education in Greece
Level 1, 2026 in Athens

We are delighted to invite you to participate in the 2nd **Honey Sensory Analysis Education Level 1**, which will take place in **Athens**.

This 2nd training event follows the highly successful 1st Honey Sensory Analysis Education - Level 1, which was held in **Thessaloniki** and brought together professionals from across Greece and abroad. The strong response and great interest from professionals encourage us to continue spreading specialized knowledge in honey sensory analysis, aiming to further support the development and promotion of Greek honey.

You can find **more information** about the 1st Education - Level 1 here:
https://chefstories.gr/1st-honey-sensory-analysis-education-in-greece/
Video: https://www.youtube.com/watch?v=uM0AcbNy7mM
Article by a graduate in the Gastronomos magazine: https://shorturl.at/ebL4n

The three-level educational scheme in honey sensory analysis has its roots in Bologna, Italy, where it was developed by **Bee Sources**.

Having trained hundreds of professionals internationally, Bee Sources collaborates with **Chef Stories**, and together they implement in Greece the first two levels of the Italian three-level educational program.

Location: Athens. The exact venue will be announced soon.

Dates & time: 18 - 22 November 2026, 09:00 - 17:00.

Description: Education – Level 1

This is an **intensive five-day training program** focused on developing skills in honey sensory analysis.

Participants will have the opportunity to:
- Train in honey sensory analysis techniques and in the recognition of aromas and flavors
- Become familiar with important varieties of Italian and Greek honey, their botanical origins, and their classifications
- Understand conditions such as crystallization, natural properties, and defects of honey
- Learn about European and Greek legislation regarding honey categories, quality, labeling, and marketing
- Learn how to describe and evaluate honey quality using methodological tools of sensory analysis
- Discover ways to use honey in cooking and pastry-making
- Explore current developments in research and laboratory methods for honey analysis

Note: The training activity will be conducted in English. If you require interpretation in Greek, please indicate this in your expression of interest.

ΕΚΠΑΙΔΕΥΣΗ στην ΟΡΓΑΝΟΛΗΠΤΙΚΗ ΑΝΑΛΥΣΗ ΜΕΛΙΟΥ

HONEY SENSORY ANALYSIS EDUCATION

Objective of the Honey Sensory Analysis Education

The objective of the Honey Sensory Analysis Education is to create a core group of trained sensory honey analysts who will be able to recognize, describe, evaluate, and communicate the origin, characteristics, and quality of honey in a unified and systematic way.

In the long term, the aim is for these trained honey sensory analysts, through their specialized knowledge, to contribute to the enhancement of the professional value chain and to the promotion of Greek honey as a high-quality product at both national and international levels.

The 2nd **Honey Sensory Analysis Education Level 1** is addressed to:

- Beekeepers
- Honey producers and processors
- Honey trade networks and distributors
- Food & Beverage managers
- Nutritionists, dietitians, chefs, and pastry chefs
- Professionals from the agri-food and tourism sectors
- Retail store professionals
- Educators and researchers in relevant fields
- Journalists, food bloggers, and agri-food communication professionals

Next Education Levels: Level 2 & Level 3

Participants who successfully complete **Level 1** will have the opportunity to continue their training with **Level 2 Advanced**, which will take place in **Thessaloniki from 19–21 February 2027**, or in any other city where it may be organized by Bee Sources.

Subsequently, successful graduates will have the opportunity to take part in the **Level 3 Exams** in Bologna, Italy. Successful completion leads to inclusion in the **Italian National Register of Experts in the Sensory Analysis of Honey.**

ΕΚΠΑΙΔΕΥΣΗ στην ΟΡΓΑΝΟΛΗΠΤΙΚΗ ΑΝΑΛΥΣΗ ΜΕΛΙΟΥ

HONEY SENSORY ANALYSIS EDUCATION

Organization & Organizers

The Honey Sensory Analysis Education in Greece, Level 1 & Level 2, is organized by Chef Stories, a company providing consulting services as well as the design, organization, and implementation of specialized, high-quality gastronomy events.

Chef Stories is today a strategic partner of numerous businesses, organizations, and institutions in the sectors of food and beverages, retail, tourism, exhibitions, conferences, and development services, contributing its experience and expertise to the design and implementation of diverse projects that highlight and promote local gastronomy and Greek agri-food products.

Members of the Chef Stories team, Sylvia Koumedaki, Chef Stories Co-founder & Gastronomy Events Specialist, and Nana Zygoura, Business Development & Marketing Consultant and Trainer, have successfully completed the Honey Sensory Analysis Courses (Levels 1 & 2) in Italy Drawing from their personal experience, they have adapted the training content to the specific context and needs of the Greek honey market.

For this 2nd Honey Sensory Analysis Education Level 1, Chef Stories is collaborating with Bee Sources, an internationally recognized consulting and training company in the beekeeping sector Since 2005, Bee Sources has specialized in the development and dissemination of honey sensory analysis techniques.

Bee Sources systematically trains professionals who form part of the Italian National Register of Experts in the Sensory Analysis of Honey (https://www.albomiele.it/), a body of experienced analysts established in 1988 and officially recognized by the Italian Ministry of Agriculture since 1999.

Participation Fee - Level 1

The participation fee for the 2nd Honey Sensory Analysis Education – Level 1 is €900, payable in two installments.
Deposit: 500 €, until 25/08/2026
Final Payment: 400 €, until 20/09/2026.

Bank Account Details:
Piraeus Bank
IBAN: GR33 0171 5590 0065 5916 4159 697Account Number· 655916 4159 697
Account Holder· CHEF STORIES L.P.SWIFT/BIC: PIRBGRAA

The participation fee includes:
Training materials and notes, honey samples for tasting and analysis, a parallel activity, welcome lunch

Not included:
Transportation to and from **Athens** and accommodation.

ΕΚΠΑΙΔΕΥΣΗ στην ΟΡΓΑΝΟΛΗΠΤΙΚΗ ΑΝΑΛΥΣΗ ΜΕΛΙΟΥ

HONEY SENSORY ANALYSIS EDUCATION

Participation Process & Expression of Interest Form

In order to ensure the smooth conduct of the training program, the number of participants is **strictly limited**.

To secure your place:

1. Complete the expression of interest form at the following link:
https://forms.gle/3cxicDHsn8H3cTYLA

2. After submitting the deposit, please send the payment receipt to the email:
events@chefstories.gr

3. You will then receive the detailed program, additional instructions, and the payment receipt.

Participation registrations are managed by **Tania Georgiadou**
T. +30 2310471628
M. +30 6942980958

The Honey Sensory Analysis Education is an investment in personal and professional development and a step forward in promoting Greek honey as a product of high quality.

We look forward to welcoming you!

Kind Regards,

Sylvia – Ioanna Koumedaki & Nana Zygoura

ΕΚΠΑΙΔΕΥΣΗ στην ΟΡΓΑΝΟΛΗΠΤΙΚΗ ΑΝΑΛΥΣΗ ΜΕΛΙΟΥ

HONEY SENSORY ANALYSIS EDUCATION

INSTRUCTOR's CVs

Gian Luigi Marcazzan

Gian Luigi Marcazzan is a researcher and technical manager for honey quality control by chemical and sensory analysis at the Council for Agricultural Research and Economics (CREA) in Bologna, Italy for 26 years. He is the leader of the Honey Sensory group within the International Honey Commission, the leading organization to develop methods for honey quality evaluation. He is the President of the Italian Register of Experts in the Sensory Analysis of Honey with more than 25 years of experience as a teacher and professional honey taster From 2008, Gian Luigi works as a panel leader for the international honey competition BioMiel. Gian Luigi studies the composition of royal jelly and propolis to open up the knowledge on the composition in order to characterize and control the quality He is also a beekeeper and breeds bees for the production of swarms and honey.

Raffaele Dall'Olio

Raffaele Dall'Olio is a beekeeper and animal biologist with a master's degree in honeybee pathogens diagnostic, skilled in artificial insemination of honeybee queens. He has more than 10 years of experience in honeybee research and teaching focusing on genetic conservation of honeybee breeds, detection of pathogens and viruses, improving the quality of beekeeping products. He's a member of the international research networks COLOSS (on Colony Losses) and RNSBB (about Sustainable Bee Breeding). Raffaele has commercial experience with 150 hives in Tuscany, Italy and queen-rearing experience and manuka honey in New Zealand. As an internationally sought out speaker including Apimondia and the European Conference of Apidology, Raffaele has more than 10 years' experience as a teacher and professional honey taster and as a panel leader for the Italian National Register of Professional Honey Taster and member of official Panel Test at CRA-API lab since 2005 and in several Honey Contests. In 2015, he found "AsSenso", sensory analyses as an R&D tool for businesses. Raffaele also has written for national beekeeping magazines in Italy such as L'apicoltoreitaliano, Lapis and APOidea.

Mary Nikolaou

Mary Nikolaou was born and raised in Athens. After completing her studies as an Agronomist Technologist, she trained for a year at the Institute of Agricultural Sciences and Aristotle University of Thessaloniki in beekeeping and professional apiculture, establishing her first hives. Since 2012, she has been a beekeeper and honey producer, fully committed to quality and knowledge. Driven by her interest in understanding honey, she pursued further specialization in honey sensory analysis in Italy for two years. In 2023, she passed the exam at CREA, the Italian Ministry of Agriculture research center, earning the title of Expert in Honey Sensory Analysis, held by only 300 people worldwide. She is the first Greek member of the Italian National Register of Experts in Honey Sensory Analysis. Mary views honey as not merely food, but as a carrier of knowledge, experience, and culture. She is also a certified olive oil taster and collaborates with the Olive Oil Sensory Analysis Lab at the University of Peloponnese. In this first Greek training, she will teach Greek honey varieties alongside Italian experts, presenting the rich botanical and sensory profile of local honeys.

ΕΚΠΑΙΔΕΥΣΗ στην ΟΡΓΑΝΟΛΗΠΤΙΚΗ ΑΝΑΛΥΣΗ ΜΕΛΙΟΥ

HONEY SENSORY ANALYSIS EDUCATION

Nana Zygoura

Nana Zygoura is a Business Development and Marketing Consultant & Trainer. With studies in Marketing, Communication and Culture, she has had a long professional career as a director in Marketing and Communication, Client Service and New Business departments. Today she is an independent professional and supports companies, organizations and institutions in the design and implementation of development programs for agri-food, local, innovative and youth entrepreneurship. She also collaborates with Chef Stories company and together they design, organize and implement comprehensive programs and individual specialized events to highlight and promote Greek and local gastronomy. She is a certified adult trainer, a trained honey taste analyst in Italy, a graduate of the Butchers' School and has completed Level 3 of the Wine Studies of the international organization WSET. More about Nana Zygoura, on: www.zygoura.gr

chef stories
GASTRONOMY
STRATEGY & EVENT EXPERTS

BEESOURCES

crea
Consiglio per la ricerca in agricoltura

ALBO NAZIONALE DEGLI ESPERTI IN ANALISI SENSORIALE DEL MIELE
SOMMELIER DEL MIELE

We are looking for new EUROPEAN CHAMPIONS in honey – a prestigious title for the next two years!

OBALNO ČEBELARSKO DRUŠTVO KOPER

Sample submission

- **3 jars of honey (450 g each)**, properly labelled for sale.
- Register via the online form using the QR code.
- Attach the printed confirmation and proof of payment to the sample.
- Participation fee: **€70** per sample.
- Samples can be sent by post or delivered in person to:

Čebelarska zveza Slovenije, Brdo pri Lukovici 8, 1225 Lukovica, Slovenija.

Online submission form with instructions for sample submission

Evaluation process

The honey will be evaluated by a panel of international honey experts.

- Evaluation is carried out in liquid form (crystallized honey will be properly liquefied beforehand).

A minimum of 7 samples per category is required

- If fewer samples are submitted, the commission will classify them based on electrical conductivity into: honeydew or multifloral.

Submit your samples by: 14.9.2026

All samples will be tested for **basic quality parameters** (≤ 18.6% moisture content, HMF ≤ 15 mg/kg).
The top three honeys in each category will undergo additional analysis for **authenticity** and **safety**.

AWARD CEREMONY IN KOPER, SLOVENIA
5 DECEMBER 2026

European Honey Contest
Koper - Slovenia

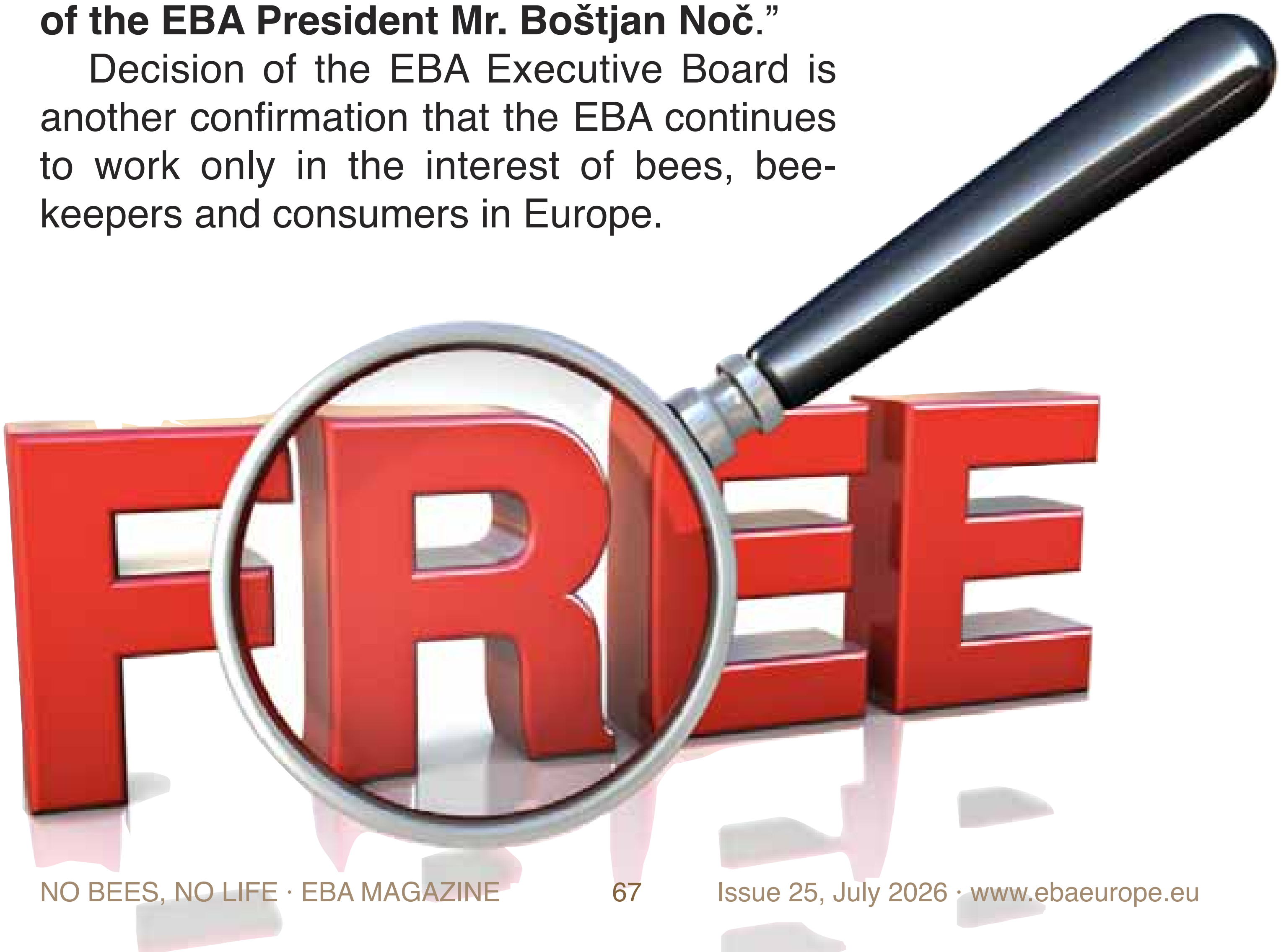
www.honey-contest.eu

Only authentic honeys with exceptional sensory characteristics typical of their variety will be awarded the top three distinctions and earn the right to promote this prestigious title.

TO THE EBA WITHOUT MEMBERSHIP FEE

At the meeting of the EBA Executive Board, on the proposal of the EBA President Mr. Boštjan Noč, an important decision was made regarding membership in the EBA in the upcoming period: "**Membership in the EBA is free for the duration of the mandate of the EBA President Mr. Boštjan Noč**."

Decision of the EBA Executive Board is another confirmation that the EBA continues to work only in the interest of bees, bee-keepers and consumers in Europe.



SPONSORSHIP REQUEST

AND METHOD OF ADVERTISING IN THE MAGAZINE

On behalf of the European Beekeeping Association (EBA),I am writing to seek your support in the form of sponsorship to help ensure the smooth and effective operation of our Association.

The EBA is dedicated to promoting and supporting beekeeping across Europe. The Association was founded out of necessity, as bees and beekeepers are essential for our ecosystem and society. Without beekeepers there are no bees, and whithout bees there is no pollination, leading to a lack of food on planet Earth.

EBA works for bees, beekeepers and consumers.

Our mission is to:

1. Fight against counterfeit honey that flooded the European market;
2. Introduction of incentives per beehive as agro-ecological programme;
3. Fight against the improper use of chemicals that are harmful to bees;

In return for your generous support, we offer various sponsorship benefits. We believe that this partnership would be mutually beneficial and would significantly contribute to the advancement of the european beekeeping sector.

ADVERTISING IN THE MAGAZINE:

1. Through sponsorship packages;
2. It is possible to pay for an ad only for 1/4 page (100 euros), for a larger area by agreement. The entire page cannot be obtained, it belongs only to the General Sponsor.

IT CONTINUES

EBA
sponsorship packages

GOLD sponsor - 5.000 euros:
Advertisement on the EBA website
Presentation at all EBA events, logo on all EBA correspondence
12 advertisements in the EBA monthly e-magazine in A4 page size

SILVER sponsor - 3.000 euros:
Advertisement on the EBA website
Presentation at all EBA events, logo on all EBA correspondence
12 advertisements in the EBA monthly e-magazine in half A4 page size

BRONZE sponsor - 2.000 euros:
Advertisement on the EBA website
12 advertisements in the EBA monthly e-magazine in the size of 1/4 A4 page

EBA SUPPORTER - 1.000 euros:
Advertisement on the EBA website
12 advertisements in the EBA monthly e-magazine in the size of 1/8 A4 page

These are basic packages, but we are open to different forms of cooperation, which we agree on individually. We would be delighted to discuss this opportunity further and explore how we can align our goals with your organization's values.

Thank you for considering our request. We look forward to the possibility of working together.

Yours sincerely,

Boštjan Noč
President of the European Beekeeping Association


BEES
LIFE
CONTENT

EBA informative and professional monthly magazine "**NO BEES, NO LIFE**"

July 2026.
Issued since July 2024.
Publisher: **European Beekeeping Association** (EBA)
Head office: Brdo pri Lukovici 8, 1225 Lukovica, Slovenija
eba@ebaeurope.eu
www.ebaeurope.eu

Downloading and printing texts from "NO BEES, NO LIFE" in other magazines and electronic media is allowed and free of charge, but it is mandatory to indicate the source of the text immediately below the title. Magazine sharing is preferred.

The contents of the texts and advertisements are the responsibility of the autors.

The responsibility for the correctness of the English language in the magazine lies with the authors of the texts.

The editor reserves the right to publish a larger advertisement than the size specified by the sponsorship package, if it improves the design of the magazine.

Advertising in the magazine: 1. Through sponsorship packages; 2. It is possible to pay for an ad only for 1/4 page (100 euros), for a larger area by agreement. The entire page cannot be obtained, it belongs only to the General Sponsor.

The total number of pages in the magazine is not fixed.

There are no fees for published texts and photos.

Editor in chief of the electronic edition of the magazine:
MD Rodoljub Živadinović, Epidemiology Specialist, Apitherapist
apikult@gmail.com, +381 60 444 01 01 (Viber, WhatsApp, Telegram, Signal, WeChat, Daze)