Urban Bee Keeping is buzzling
Small Insects to turn a noisy city into *Satoyama*

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Abstract—Urban dwellers may not see or ever think about bees in their busy lives. Notably, bees are among the hardest working creatures on the planet and are one of the most important creatures on Earth. Bees engage in pollination which is crucial for food production, human livelihoods, and biodiversity. Despite the critical role bees play for humans and other creatures, bee populations are now facing a variety the threats, including climate change, the prevalence of diseases, pesticides, and industrial agriculture. Traditionally, beekeeping has been practiced on farmlands for a long time. Nevertheless, urban beekeeping has seen significant growth with bees buzzing in big cities such as New York, Paris, and London. This study first analyzes the important roles, current situation, and future prospects of bees, followed by an urban beekeeping case in Tokyo's Ginza, one of Japan's noisiest cities.
Keywords: Bees, Pollination, Food Insecurity, Biodiversity, Intensive Agriculture, Climate Change, Global Warming, Pollution, Ecosystem, Urban Beekeeping

I. INTRODUCTION RODUCTION

The story of honey is older than history itself. An 8,000-year-old cave painting in Spain depicts honey harvesting, indicating that honey has been used for food, medicine, and other applications by cultures all over the world since then [1].
Honey is made by bees, who are among the most vital organisms on our planet. Honey bees visit millions of blossoms in their lifetimes, making pollination of plants possible and collecting nectar to bring back to the hive. These bees make more honey than the requirements of their colony. Consequently, beekeepers can extract the excess and bottle it for sales [2].
Bees also provide high-quality food—honey, royal jelly, and pollen—and other products such as beeswax, propolis (a functional food), and bee venom [3].
The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) states that the western honey bee is the most widely managed pollinator globally, with over 80 million hives producing an estimated 1.6 million tons of honey annually [4].
This study primarily focuses on beekeeping. Beekeeping has traditionally been conducted on farmlands by professional beekeepers. In recent decades, cities around the world have been buzzing with new kinds of activities—urban beekeeping. Urban beekeeping has emerged even in the central part of cities where skyscrapers and concrete jungles were constructed. Bees have found a home and urban residents have embraced the art of beekeeping [5].
The second part of this article discusses urban beekeeping activities in Ginza, located in the heart of Tokyo, Japan.

II. LITERATURE REVIEW

Rutger Remmers and Niki Frantzeskaki conducted a biblio-metrics study to examine the urban characteristics that impact bees. The study found that (a) natural areas are more valuable for bees since biodiversity levels are higher; (b) urban areas generally score higher than agricultural and rural areas; (c) plant biodiversity positively influences bee biodiversity; and (d) the urban environment significantly impacts certain bee traits and the proportion of native bees. Based on their observations, they recommended maintaining natural areas, and connecting natural areas to urban ecosystems, encouraging floral abundance and

diversity, and increasing the size of urban green areas overall [6].

Joan Casanelles-Abella and Marco Moretti first noted that urban beekeeping is flourishing, heightening awareness of the importance of pollinators. They observed an increase in urban beekeeping, raising concerns that its fast growth might exceed existing resources and adversely impact urban biodiversity. They analyzed urban beekeeping data from 14 cities in Switzerland between 2012 and 2018. As a result, they found that the current urban green space (UGS) might still be capable of sustaining the current honeybee population. However, continuous increases in the number of hives, with UGS likely not increasing at an equal pace, pose a challenging scenario for honeybees in the near future [7].

Kyle M. Ruszkowski and John M. Mola argued exotic bees have the potential to shift from a relatively neutral presence in the environment to cause economic, environmental, or ecological harm through synergies between their biology and human activity. Exotic bees often thrive in urban environments where advantageous traits, such as cavity-nesting and high reproductive plasticity, intersect with human activities. Although many exotic species remain benign, others may transition to invasive status, leading to competition with native bees, the spread of diseases, and disruption of biodiversity assessments [8].

J. Lanner et al. recognized that pollination is crucial for biodiversity and food security, with bees having a pivotal role. Conversely, they contended that the growing popularity of urban beekeeping is resulting in increased honeybee densities in cities, raising concerns about competition for pollen and nectar with wild bees due to limited foraging resources in densely urbanized areas. According to their study on apiary densities and indices for species richness, they identified an overlap of high apiary densities and wild bee hotspots. They concluded that spatial planning is necessary to balance urban beekeeping and wild bee conservation [9].

Douglas B. Sponsler and Eve Z. Bratman draw upon urban ecological theory to construct a conceptual model of urban beekeeping that differentiates beekeeping "in," "of," and "for" the city. According to their model, beekeeping "in" the city refers to the mere importation of the traditionally rural practice of beekeeping into urban spaces for the personal motives of the individual beekeeper, whereas beekeeping "of" the city denotes a practice that is consciously tailored to the urban context, often accompanied by the professionalization of beekeepers and the formation of local expert communities. Beekeeping "for" the city describes a shift in the mindset in which beekeeping is oriented towards civic purposes and beyond the boundaries of the beekeeping community per se. Using this framework, Sponsler and Bratman identify and discuss specific socio-ecological assets and liabilities of urban beekeeping and their relevance to beekeeping in, of, and for the city [10].

III. Importance of the Role of Bees in the Environment

There are more than 20,000 distinct bee species worldwide, with more than 4,000 species found in the U.S. alone. Bees exist in all types of climates around the world from forests in Europe to deserts in South Africa, and even in the Arctic Circle [11].

A. Why are bees crucial to the environment?

Bees play crucial roles as pollinators, facilitating the reproduction of many plants, including food crops and wild flora. Plants, in turn, benefit our environment and allow humans and animals to survive. Plants store carbon dioxide from our atmosphere, release oxygen, and purify water to boost soil fertility and prevent soil erosion [12].

B. How do bees help the environment?

Pollination

Pollination plays a significant role in the agriculture sector and serves as a basic pillar for crop production. Plants depend on vectors to move pollen, which can include water, wind, and animal pollinators such as bees. Cultivated plants are typically pollinated by animals. Animal-based pollination contributes to 30% of global food production, with bee-pollinated crops contributing to approximately one-third of the total human dietary supply [13].

The United Nations' Food and Agriculture Organization report titled, "Why Bees Matter," states that 75% of the global crops yielding fruit or seeds for human consumption depend on pollinators such as bees. Moreover, pollinators affect 35% of the world's agricultural land and support the production of 87 leading crop varieties [14].

Improving soil health

More than 90% of the world's bee species nest within the soil in more arid regions of the world. Solitary bee species nest in large communal aggregations. These gatherings may include hundreds or even thousands of individual bees whose nests may extend several

feet into the soil, facilitating aeration and enabling water sequestration. Bees play a significant role in ensuring these soils remain healthy [15].

Biodiversity

Bees not only produce honey but also act as hardworking pollinators, facilitating the reproduction of numerous plant species, many of which serve as essential sources of food for both humans and wildlife. Without bees and their efficient pollination methods, the world would suffer a devastating loss of plant diversity, ultimately disrupting the delicate balance of our ecosystems [16].

IV. Role of Bees

Bees contribute to the global food supply by pollinating a wide range of crops. Bees significantly enhance the quality and quantity of crops, hence improving global economic dietary outcomes. In addition to pollination, bees take important roles in other capacities [17].

Economic impact of bees:

Beekeeping significantly contributes to economic growth on both local and global scales. By harnessing the natural abilities of bees, a multitude of economic opportunities arise, bolstering agricultural sectors, creating employment, and fostering sustainable development.

Pollination services: Bees play a crucial role in the reproduction of several fruit, vegetable, and flower crops. This pollination process enhances crop yield and quality, thus strengthening agricultural economies and fostering innovation in farming practices.

Honey production: Honey is a valuable commodity. The production, processing, and trade of honey create employment opportunities and generate revenue for both beekeepers and related industries. Additionally, honey and its derivatives find applications in various sectors, such as food, medicine, and cosmetics.

Wax and propolis: Bees produce beeswax and propolis. Beeswax is used in an extensive range of products, including candles, cosmetics, and pharmaceuticals, providing economic avenues for different industries. Alternatively, propolis contributes to the pharmaceutical and health sectors.

Beekeeping equipment and services: The growth of the beekeeping industry has fostered the development of a wide array of equipment, ranging from hives and frames to protective gear for beekeepers. Additionally, the demand for educational programs, hive maintenance services, and pollination contracts generates employment opportunities and stimulates economic growth within associated sectors [18].

V. Challenges of Beekeeping

Bees and other pollinators including butterflies, bats, and hummingbirds are increasingly under threat from human activities. The global decline of bee populations in recent decades can be attributed to: (1) habitat loss, (2) intensive farming practices, (3) changes in weather patterns (4) excessive use of agrochemicals, and (5) air pollution [19].

In response to the excessive use of agrochemicals, world leaders convened at the United Nations Biodiversity Conference (COP 15) from Dec 7–19, 2022 in Montreal, Canada, where they established the post-2020 biodiversity policy mandating a reduction of pesticides by at least two-thirds by 2030 [20].

On World Bee Day, May 20, 2024, the United Nations declared the need for governments, organizations, civil society, and concerned citizens to protect pollinators and their habitats [21].

VI. Benefits of Urban Beekeeping

Urban beekeeping has several benefits.

1. Impact on biodiversity:

The introduction of beekeeping in urban spaces plays a pivotal role in increasing local biodiversity. Bees facilitate the reproduction of various plants, hence fostering a diverse urban flora.

2. Economic advantages of beekeeping in the city:

Honey harvested from city bees often has higher market prices owing to its distinct taste of mixed flavors derived from diverse urban flora.

3. Urban beekeeping connect between humans and nature:

In the cacophony of city life, the connection between people and nature often gets lost. Urban beekeeping serves as a bridge, rekindling this bond. Beehives serve as a reminder to urban people of the intricate web of life that exists even in metropolitan settings.

4. Promote sustainable urban infrastructure:

Urban beekeeping aligns seamlessly with sustainable building initiatives commercial buildings can elevate their Leadership in Energy and Environmental Design (LEED) scores by integrating beehives, paving the way for other sustainability certifications.

5. Engaging communities with nature-centric act

Urban beekeeping is not just about bees, but about people as well. By adopting beekeeping, hotels and restaurants can enhance their brand image showcasing their commitment to sustainability [22].

VII. Challenges of Urban Beekeeping

Urban beekeeping brings many benefits; however, it is not without its challenges.

1. Hive placement and neighborly concerns: Identifying the right spot for a beehive in a city can be tricky. Beekeepers have to consider sunlight, wind patterns, and accessibility.
2 Regulations: Navigating the regulatory landscape of urban beekeeping can be a complex endeavor. While the practice is gaining popularity, it is crucial to understand that every city or municipality might have its own unique set of beekeeping rules.
3. Common regulatory themes: Despite the variability, certain common themes emerge in urban beekeeping regulations. For instance, many cities require hives to be placed far from property lines or public spaces to minimize potential conflict with neighbors [21].

VIII. Ginza Bee Project

A. History: Start of beekeeping in Ginza

Ginza District, located in the heart of Tokyo, is known for its long-established department stores and luxury brand flagship stores, making it a popular shopping area for tourists [23].

However, since the last decade, Ginza has been attracting pollinators such as honey bees, environmentalists, Sustainable Development Goal (SDG) advocates, birds and insects, and community members. Their focus has been bees and urban beekeeping practices. Approximately, 50,000 bees inhabit beehives installed on the rooftop of a tower building in the heart of Ginza [24].

This bee project started by chance. Atsuo Tanaka, a manager of the conference hall of a high scraper in the central part of Ginza, invited a professional beekeeper Seita Fujiwara to speak about his bee keeping job at a community meeting in 2005. Interested in Fujiwara's job, Tanaka asked Fujiwara to start keeping bees in the Ginza area. However, Fujiwara rejected Tanaka's request and then told Tanaka, "Why don't you start beekeeping on the roof of the building you work at?" Tanaka initially rejected Fujiwara's proposal. However, in 2006, Tanaka established three beehives on the Ginza Pulp and Paper Hall Building, launching the Ginza Bee Project [25].

In his capacity as a conference hall manager, Tanaka was organizing community development programs, inviting residents and Ginza workers, including restaurant chefs, bartenders, club hostesses, traditional shop owners, department store salespersons, and others. Utilizing his community networks, Tanaka established a volunteer team to maintain the rooftop garden beehives. These volunteers visit Tanaka's office building weekly to take care of the bees from spring through winter.

In the next year (2007), Tanaka set up a non-profit organization (NPO) called "NPO Ginza Bee Project," abbreviated as Gin-Pachi (Bees are referred to as Hachi in Japanese) [26].

B. Development of the Ginza Bee Honey Project

In its first year (2006), the Ginza Bee Project produced merely 150 kgs of honey. However as the volunteers' bee-handling skills improved and the number of bees increased, the honey production amount rapidly increased. In 2024, the NPO Ginza Bee Project collected 2.7 tons of honey from their bees, constituting approximately 0.1% of the total production of all Japanese bee farmers [27].

The Ginza area is replete with restaurants, shops, bars, and department stores. The NPO Ginza Bee Project, led by Mr. Tanaka, started developing bee brand products using Ginza Bee's honey:

-Famous sweet shops in Ginza such as Kameya-Mannendo, Seigetsudo, Henri Charpentier, and Maison Kayer developed new sweets using Ginza Honey.

-Matsuya Department Store, a symbolic department store of the Ginza District, started selling these Ginza Honey sweets.

-MIKUNI GINZA, a renowned restaurant in Ginza, produced a new menu using Ginza Honey.

-Bar 5517, a famous bar in Ginza, developed a new cocktail based on Ginza Honey.

-Beeswax was used for making a beeswax candle for a Christmas Event which was held at the Ginza Church [28].

C. Expansion of the Bee Project

While the NPO Ginza Bee Project, was successfully launched, Atsuo Tanaka, the project leader, launched many other related projects.

Bee Garden: The Ginza Bee Project launched the "Ginza Green Project" in 2007, aimed at creating flower and vegetable gardens on building rooftops in

the Ginza area to increase the number of green space sources of nectar for bees.
The objectives of the "Ginza Green Project" were not only the production of more honey, but also reducing the adverse effects of the "urban heat island effect," whereby concrete and roads retain heat from the sun and increase local temperatures. Since the Ginza Green Project was launched, approximately 1,000 square meter of bee gardens have been established in the Ginza area.
Another objective of the Ginza Green Project is to advocate for "Grow Local, Eat Local" ethics. The Ginza Bee Project collects nectar from local sources and the rooftop garden. Shops and stores in the Ginza area prepare food and sweets using that honey. The collaborative efforts between bees and people via the Ginza Bee Project foster interpersonal relationships among people who may have otherwise been strangers.
Free Market: The Ginza Bee Project led by Tanaka started organizing the "Free Market" in the heart of Ginza, inviting farmers from around Tokyo. Tokyoists purchase fresh vegetables and other agricultural products at the Free Market, while local farmers are given networking opportunities at this market.
Demae jyugyo (dispatch a lecturer to a nearby school to deliver a lecture): The Ginza Bee Project led by Tanaka started dispatching Ginza Bee Project members as lecturers (facilitators) to elementary schools around Ginza to educate students about honey bees and environmental issues. In the past, schoolchildren in central Tokyo had few opportunities to see or interact with honey bees. Currently, schoolchildren are accustomed to seeing bees and may even touch honey bees. In 2024, the Ginza Bee Project educated 1,000 students about honeybees and environmental issues.

D. Successful factors of the Ginza Bee Project

The Ginza Bee Project's success may be attributed to several factors.
[Factor 1] Within a 3-kilometer radius of the Ginza Bee Project location, there are large parks including Hibiya Park, Hamarikyu Park, and Imperial Palace [29].
[Factor 2] Street Trees in the Ginza District: A variety of trees are planted along the Ginza streets. The street-side trees switch from cherry blossom, pine, maple to willows between spring to fall [30].
[Factor 3] No agricultural chemicals: Given that the Ginza district ranks among Japan's top shopping districts, no agricultural chemicals are used in this area. Thanks to the noisy shopping stores, restaurants, and bars of the Ginza District, bees can remain in a healthy condition without agricultural chemicals [31].

IX. Conclusion

People have been keeping bees for a long time, even since the Egyptian period. Throughout history, bees have provided many benefits to humans, including honey, bee wax, royal jelly, bee pollen, and propolis, in addition to their role in pollination. Notably, bees are major pollinators, with one-third of the world's food production depending on bees.
Despite their crucial role, bees are under threat from human activities such as intensive farming practices, changes in weather patterns, excessive use of agrochemicals, and air pollution.
Recently, cities have become increasingly committed to SDGs, resulting in initiatives aimed at enhancing environmental justice and biodiversity. Beekeeping is seen by many as a conservation effort.
This study examined a beekeeping practice in the Ginza area of Tokyo. Ginza is one of the nosiest districts in Tokyo. The Ginza Bee Project, an NPO, began beekeeping on the rooftop of a high-rise building in the heart of Tokyo in 2006.
The project was successful. The number of bees rose while the honey produced by beehives on the rooftop of the building increased. The volunteer team, in cooperation with Ginza shops, restaurants, and bars, started producing new products using "Ginza Honey." As a next step, the Ginza Bee Project started constructing Bee Gardens on the rooftops of other buildings, dispatching volunteers to nearby schools to educate children about bees and their habitats, and organizing a "Free Market" in central Ginza. Due to the significant success of the Ginza Bee Project, urban beekeeping practices have been spread across Japan. The Ginza Bee Project reports that over 100 urban beekeeping groups are in Japan today.

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