



progenies

December 2021

INTRODUCTION

Blockchain has long been associated with cryptocurrency as it was originally created as the ultra-transparent ledger system for Bitcoin to operate on, but the technology's transparency and security has seen growing adoption in a many other areas.

Pollinators are caretakers of our everyday surroundings, and their decline is one of the most talked environmental issue. Most of the crops depend on pollinators, so declines in both managed and wild pollinators with associated loss of pollination services, raise concerns about food security.

How to make a direct path between, in the last decade emerged, blockchain applications and the worrying decrease of the pollinator's population, well known for a several decades?

Compared to honeybees, wild native bees and pollinators in general are not well studied, and their condition has received relatively little public attention. As there are limited historical data available to quantify pollinators declines, so the large-scale evidence on trends among wild pollinators are lacking, the blockchain technology can be set as an enabler to start learning about our pollinators. The enabler in the sense of tracking and storing data about pollinators, their stressors, and interactions with the environment they live in.

However, it is not that simple like it might sound, though. There are several hundred thousand species of pollinators, so monitoring and tracking all of them is not possible. Some species-specific habitats can be more easily monitored, and some even created with embedded monitoring technology. From there we believe the learning journey about pollinators with a help of underlying blockchain shall start.

MONITORING NESTING RESOURCES

The loss of that habitat has a huge impact on whether pollinators can survive and reproduce in our modern world. Essentially, the loss of pollinator's habitats is a direct consequence of the replacing natural, biodiverse habitats with cities or monocultures of crops, or in other words of the high-level urbanisation and agriculture intensification.

When considering the use of technology in monitoring pollinators, we have witnessed that many honeybees' hive IoT monitoring systems have been adopted by some beekeepers. We'll not elaborate here whether all these systems, based just on the collecting sensor's data, brought enough proactivity to the beekeepers. In our opinion they did not, so more automatized beekeeping processes are needed for honeybees' protection, along with the AI driven data correlation and analytics, and finally with underlying blockchain for storing all the captured data.

Blockchain transparency and data traceability should be applied first on the honeybee's hive, simply because it is easiest to start with. Namely, honeybee's hives usually have just one entrance which could be embedded with the bee counter functionality for early detection and notification. All in-hive sensor's data as well as external environmental data could be correlated with in/out flights data. The main use case is tracking relationships and interactions between honeybees and environment they live in. At the end, this will enable tracing of the intensity of all events and stressors that impact pollinator's health and productivity during the entire bee's lifecycle.

Another example where the monitoring technology and blockchain could be implemented is so called bee hotels for wild native bees that can nest above the ground. They have become increasingly popular consumer item, promoted as the way to augment the natural environment for native bees. However, some key considerations of their effectiveness are usually missing. The most important factor for these replicating nesting places is design along with how easy they can be managed and maintained. If design is too big, and if it doesn't allow disassembling for adequate cleaning, bee nesting boxes could be even detrimental for the bees, and other insects which found there a shelter or resting place. Properly designed, regularly maintained, and monitored bee hotels could provide to researchers the new insights and knowledge about wild native bees and relations with environment they live in. Artificial intelligence-based analytics and blockchain for storing and tracing captured data can be essential for this purpose.

The biggest challenge is capturing and storing consistent data about wild pollinators coming from monitoring their floral resources. This practise mainly relates to pollinator's conservation planning and protection efforts, done mainly by researchers and to some less extent by nature enthusiasts. We'll bring here some facts and limitations, assessed in a several researching studies about wild bee's restoration and conservation.



MONITORING FLORAL RESOURCES

The context of bee restoration so far has been predominantly agricultural, likely because significant governmental funding exists for pollinator restoration on agricultural lands. Pollinator responses to land management are rarely evaluated in non-agricultural settings, and there is only a couple of studies related to bee restoration outside of agricultural context.

Problem with monitoring in agricultural settings is that bees are generally sampled just at flowers growing in this specific field. Researchers often don't have data on the alternative floral resources available in larger landscapes, so the forager densities result in the specific agricultural field might be difficult to interpret. Another issue is the lack of studies assessing how different bee species are affected by land use change. This could help conservation planners to prioritize the needs of the most sensitive species.



As said, pollinator restoration and conservation planning are a huge and complex topic which goes beyond the scope of this article. As a summary, to achieve a better pollinator's restoration and conservation outcomes land managers and farmers should incorporate pollinators foraging and nesting needs as design considerations in any of their planning.

CONCLUSION

There is a great need for monitoring of pollinators to provide information about long term population trends. To design effective restorations, it would be useful to know what factor(s) most often limit their population size, so that these factor(s) could be restored. As is the case for insects in general, wild bees are underrepresented in conservation planning and protection efforts. The resources bees require to complete their life cycle can be roughly divided into those related to nesting, and those relating to foraging to flowers. Several studies have suggested that either floral or nest site availability can limit bee reproduction or population size.

On the other hand, there is a blockchain technology which could enable traceability, sharing and storing all the data, captured by consistent pollinator's monitoring. We suggest monitoring the nesting sites, like beehives and bee hotels, to be considered as the starting point of using blockchain in tackling a worrying pollinator's decline.