ColliNest: An Innovation with Integrated Method for the Propagation and Conservation of Subterranean Stingless Bees (Tetragonilla collina)

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Stingless bees (Tetragonula (Tetragonilla) collina) are key pollinators in agriculture and ecosystems. However, they are at risk of extinction due to the rapid urbanization, unsustainable harvesting practices, and global climate changes. In addition, there is currently no effective method for propagating this species of stingless bee due to its unique subterranean mode of habitation. This study aims to survey the behavior and nest structure of stingless bees in local areas, and use the information to guide the development of an innovative artificial nest called “ColliNest”. Of all the designs tested, we found that the PVC cylinder with a height of 20 cm and a diameter of 13 cm was the most effective at inducing bee relocation. Furthermore, complete nest expansion, in which the original nest components were moved to the artificial nest, was observed when ColliNest was placed next to the original nest's pollen or honey pots for 3 weeks. Once populated, the ColliNest was moved to a new area, identified as suitable for stingless based on geographic information technology. Following a 6-week relocation period, the stingless bee exhibited an increased foraging range each week, confirming their survival in the new area, with the propagation success rate of 93%. Additionally, the product yields increased by up to 3.91 folds. Overall, the results show that ColliNest is a novel method for propagating the stingless bee and reducing their risk of extinction, leading to the sustainable development of terrestrial ecosystems worldwide.

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