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STUDY OF BIOLOGICAL CONSTRAINTS IN APIS FLOREA AT KALABURAGI REGION, KARNATAKA

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ABSTRACT

The Apis florea, often known as the dwarf honeybee, is the subject of this research, which focuses on the biological restrictions that may be found in the Kalaburagi region of Karnataka. There are a number of biological variables that restrict the population dynamics and productivity of the Apis florea plant, notwithstanding the ecological relevance of the plant in terms of pollination and honey production. The research finds important restrictions, such as the deterioration of habitat, the incidence of illness, competition with other bee species, and environmental stresses such as swings in temperature and the availability of resources. In order to evaluate the health of Apis florea colonies and their behavior, both field surveys and laboratory laboratory analyses were carried out. A considerable decrease in colony strength and foraging efficiency has been observed, which can be linked to environmental changes and disease burdens, as shown by the findings. The findings of this study highlight the critical need for conservation techniques and sustainable management practices in order to improve the resilience of Apis florea populations in the Kalaburagi region. This

Keywords: Biological, Apis Florea, Kalaburagi

1. INTRODUCTION

A significant contribution to the process of pollination and the preservation of biodiversity is made by the honeybee species *Apis florea*, which is more frequently referred to as the dwarf honeybee. *Apis florea* is a species that is noted for its durability and adaptation to a wide variety of settings. It is mostly found in tropical and subtropical climates. In India, this species makes a substantial contribution to the agricultural production as well as the ecosystem services that are necessary for the development of sustainable sustainable practices. On the other hand, new findings made in the Kalaburagi region of Karnataka have given rise to worries over the diminishing populations of *Apis florea* colonies as well as their general health. When it comes to honeybee populations, biological restrictions are among the most important elements that determine their ability to survive and produce. These restrictions may include a wide range of biotic and abiotic stresses, including as the destruction of habitat, the presence of diseases and pests, the presence of competition from other pollinators, and changes in climate. In order to design effective conservation and management methods that can promote the sustainability of *Apis florea* in the face of fast environmental changes, it is vital to have a solid understanding of these restrictions. By analyzing the health, behavior, and environmental interactions of this species, the purpose of this study is to investigate the biological restrictions that are influencing *Apis florea* in the Kalaburagi region. We are going to uncover the major reasons that are contributing to the observed drop in colony strength and foraging efficiency by conducting field surveys and laboratory studies. It is anticipated that the outcomes

of this research will give useful insights into the issues that *Apis florea* is now encountered with, as well as to guide methods for the conservation and management of the species. It has been shown that a mix of anthropogenic influences and natural disturbances are responsible for the fall in pollinator populations, which includes the diminution of A*pis florea.* An increase in the use of pesticides, urbanization, and agricultural intensification have all contributed to the fragmentation and degradation of habitats, which has resulted in a decrease in the availability of nesting sites and resources for foraging. Furthermore, the ever-increasing frequency of diseases and parasites presents a severe danger to the health of honeybees. Notably, the Varroa destructor mite, which is often associated with other honeybee species, has been detected in colonies of *Apis florea*, which further exacerbates the vulnerability of these honeybees. Environmental variables such as climate change are contributing to the transformation of the ecological landscape, in addition to the biological restrictions that are already there. Temperature extremes and unpredictable weather patterns have an effect on flowering times and the availability of resources, both of which are highly important for the success of honeybee colonies in their foraging endeavors. In order to evaluate the overall health and viability of *Apis florea* in the region, it is essential to have a solid understanding of how these stressors interact with the biological characteristics of the plant.

2. RESEARCH METHODOLOGY

Within the Kalaburagi district, which is located in the northern hemisphere, the research region was chosen because it is situated between 17.3297 degrees North and 76.8343 degrees East. A agricultural field consisting of sunflowers (Helianthus annuus) and onions (Allium cepa) was chosen as the location for the research sites.It was determined that the research sites were identified by mapping A, B, C, and D in both of the fields, and the total area was approximately 700 square feet. In the morning, between the hours of seven and eight o'clock, in the afternoon, between one and two o'clock, and in the evening, between four and five o'clock, the observation was carried out. Over the course of two months, each plot was subjected to two observations, during which the pollinators were observed for fifteen minutes throughout each season. These observations were carried out in order to keep track of the species of aphids and non-aphids that visited the blooms at various times throughout the day.

3. RESULT AND DISCUSSION

For the sunflower field, observations were carried out in the months of September (after the monsoon season), October (during the winter season), and November (during the winter season). On the other hand, the observations of the onion field were carried out during the months of January (during the winter season), February (during the pre-summer season), and March (during the summer season).

In the sunflower field, the bees were seen searching for nectar and pollen beginning about 7:45 in the morning, as indicated by the observations made in plots A, B, C, and D. A significant number of Tetragonula irridipennis were discovered at each of the sunflower's florets respectively. Around six species of non-Apis were recorded in addition to the species of Apis florea and Apis dorsata. When compared to the evening hours, the honeybees were found to be more active in the morning hours, while their activity was found to be lower in the afternoon hours. The Tetragonula irridipennis and the Apis dorsata were the most successful pollinators that were seen in each and every plot. In comparison, the number of pollinators was found to be much higher during the months of October and November in 2019, but it was significantly lower during the month of September in 2019, due to the intense rains. The research plots A, B, C, and D revealed that the highest concentration of pollinators was found in the D plot.

It was decided to conduct the research on an oilseed field, namely a sunflower field, in the Kalaburagi district. The sunflower field was located on a parcel of land that was two acres in size. Within that area, a 700 square foot area was chosen, and plots A, B, C, and D were designated. Each plot had an area of around 175 square feet. During the months of September, October, and November, the observations were recorded, and twice a month, the pollinators were recorded in order to evaluate the sunflower field's capacity for pollination. During the morning, afternoon, and evening hours, the observation was carried out by observing the bees in each plot for about fifteen minutes. Within each plot, the *Apis florea* bees were watched for five minutes, the *Apis dorsata* bees were observed for five minutes, and other bees that were not of the Apis genus were seen for five minutes. Tetragonulla irridepennis and *Apis dorsata* were the two species that generated the majority of the pollinators. In comparison to the months of September and November, the number of pollinators that were active during the month of October was much higher.

Field of onions: Beginning at 7:45 in the morning, the bees were observed moving across plots A, B, C, and D in search of nectar and pollen. This was the case according to the observations. Tetragonula irridipennis and *Apis florea* were discovered in considerable numbers at each of the florets of the onion flower. Apis florea and *Apis dorsata*, in addition to about three to four species of non-Apis, were documented. Comparatively, the activity level of the honeybees was found to be highest during the afternoon hours, while it was shown to be lowest during the early hours. The Tetragonula irridipennis and the Apis florea were the most common pollinators that were seen in each of the plots. The number of pollinators was discovered to be much higher during the month of February 2023, compared to the amount that was observed during the month of January 2023. The research plots A, B, C, and D revealed that the highest concentration of pollinators was found in the D plot.

Onion fields were chosen as the location for the research project in the Kalaburagi area. The size of the onion field was around 700 square feet, and the plots A, B, C, and D were marked. The area of each plot was approximately 175 square feet. The observations were taken throughout the months of January, February, and March, and twice a month, the pollinators were recorded in order to evaluate the onion field's capacity for pollination. During the morning, afternoon, and evening hours, the observation was carried out by observing the bees in each plot for about fifteen minutes. Within each plot, the Apis florea bees were watched for five minutes, the Apis dorsata bees were observed for five minutes, and other bees that were not of the Apis genus were seen for five minutes. It was Tetragonulla irridepennis and *Apis florea* that were responsible for the majority of the pollination. During the month of February, there was a significant increase in the number of pollinators that were active.

Table No. 1: Pollinators of both the apis and non-apis species were found in PLOT – A in the sunflower field.

Months	Morning			Afternoon			Evening		
	Apis florea	*Apis dorsata*	Non-*Apis*	*Apis florea*	*Apis dorsata*	Non-*Apis*	*Apis florea*	*Apis dorsata*	Non-*Apis*
September	0	3	22	1	2	20	1	5	21
October	1	1	38	7	6	25	6	10	24
November	5	8	26	2	7	27	2	9	34
Mean	2	4	28.66	3.33	5	24	3	8	26.33
Variance	7	13	69.33	10.33	7	13	7	7	46.33
S.D±	2.64	3.60	8.32	3.21	2.64	3.60	2.64	2.64	6.80

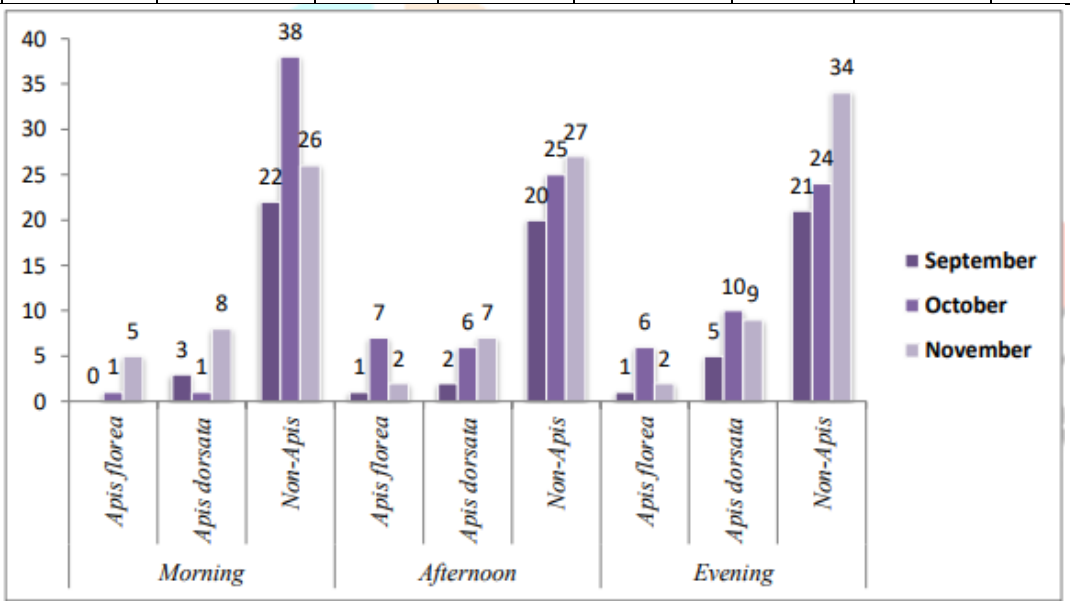

Fig No. 1: A graph illustrating the pollinators—both apis and non-apis—that were present in PLOT-A in the sunflower field

Table No. 2: Pollinators of both apis and non-apis species were seen in PLOT-B in the sunflower field.

Months	**Morning**			**Afternoon**			**Evening**		
	Apis florea	***Apis dorsata***	**Non-*Apis***	***Apis florea***	***Apis dorsata***	**Non-*Apis***	***Apis florea***	***Apis dorsata***	**Non-*Apis***
September	**2**	**4**	**18**	**4**	**6**	**18**	**1**	**5**	**18**
October	**3**	**7**	**31**	**7**	**6**	**20**	**5**	**5**	**26**
November	**7**	**10**	**20**	**5**	**9**	**27**	**5**	**9**	**33**

Mean	**4**	**7**	**23**	**5.33**	**7**	**21.66**	**3.66**	**6.33**	**25.66**
Variance	**7**	**9**	**49**	**2.33**	**3**	**22.33**	**5.33**	**5.33**	**56.33**
S.D±	**2.64**	**3**	**7**	**1.53**	**1.73**	**4.72**	**2.30**	**2.30**	**7.50**

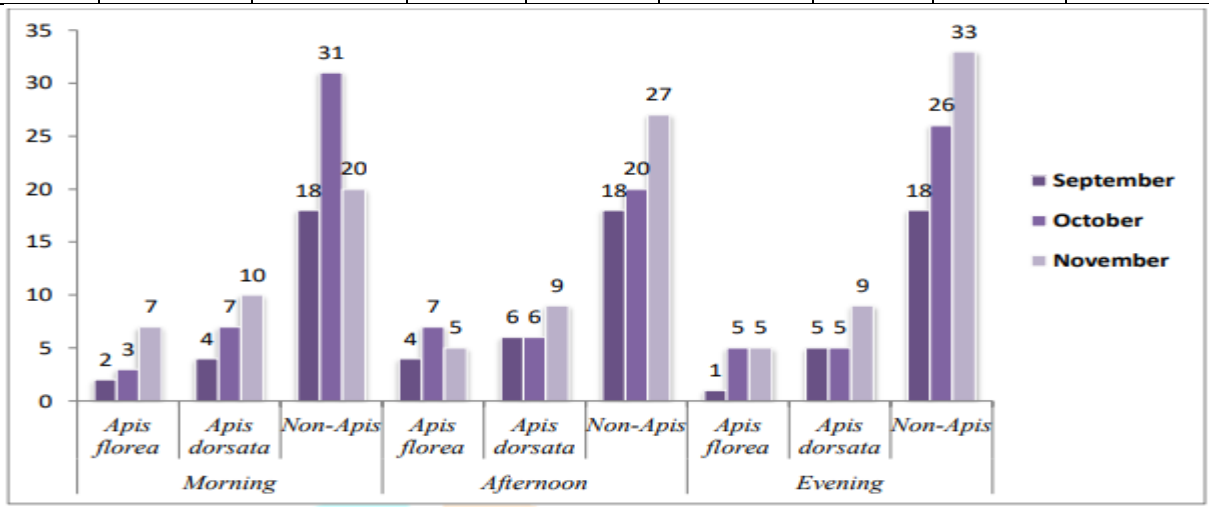

Fig No. 2: Graph illustrating the pollinators who are not apis and those that are apis in PLOT-B in the sunflower field

Table No. 3: Both apis and non-apis pollinators were found in the sunflower field according to the PLOT-C.

Months	**Morning**			**Afternoon**			**Evening**		
	Apis florea	***Apis dorsata***	**Non-*Apis***	***Apis florea***	***Apis dorsata***	**Non-*Apis***	***Apis florea***	***Apis dorsata***	**Non-*Apis***
September	**1**	**3**	**16**	**3**	**7**	**18**	**1**	**5**	**20**
October	**1**	**6**	**28**	**7**	**5**	**17**	**6**	**5**	**27**
November	**3**	**9**	**25**	**6**	**7**	**22**	**3**	**8**	**29**
Mean	**1.66**	**6**	**23**	**5.33**	**6.33**	**19**	**3.33**	**6**	**25.33**
Variance	**1.33**	**9**	**39**	**4.33**	**1.33**	**7**	**6.33**	**3**	**22.33**
S.D±	**1.15**	**3**	**6.24**	**2.08**	**1.15**	**2.64**	**2.51**	**1.73**	**4.72**

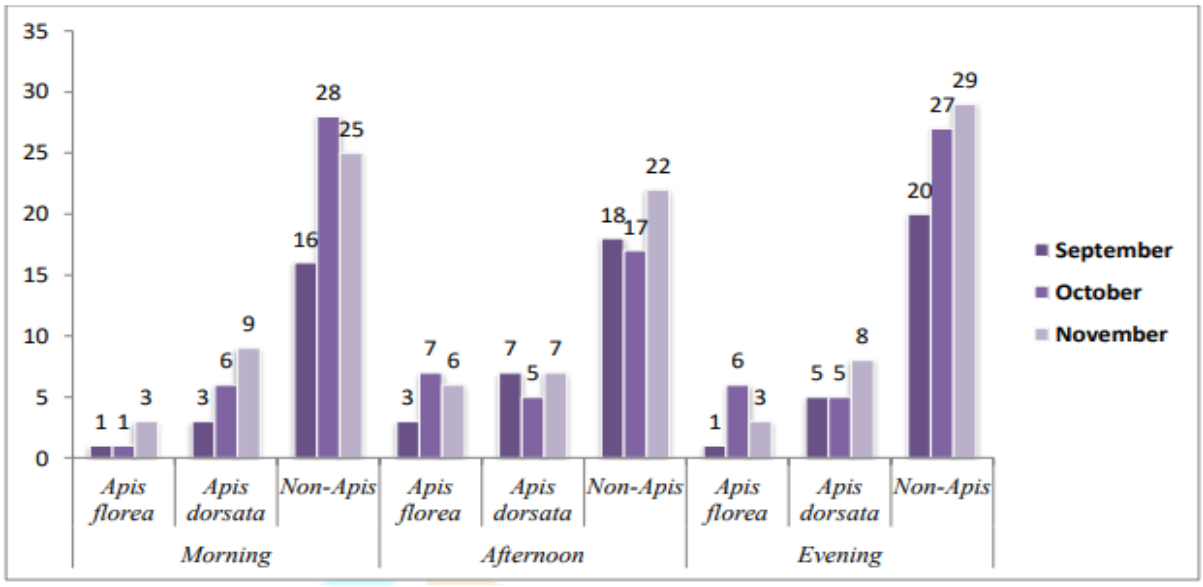

Fig No. 3: A graph illustrating the pollinators who are not apis and those that are apis in the sunflower field PLOT-C

Table No. 4: The sunflower field was seen to have both apis and non-apis pollinators documented in PLOT-D.

Months	**Morning**			**Afternoon**			**Evening**		
	Apis florea	***Apis dorsata***	**Non-*Apis***	***Apis florea***	***Apis dorsata***	**Non-*Apis***	***Apis florea***	***Apis dorsata***	**Non-*Apis***
September	**1**	**6**	**17**	**3**	**6**	**17**	**1**	**6**	**19**
October	**1**	**6**	**28**	**5**	**6**	**20**	**7**	**10**	**30**
November	**5**	**7**	**25**	**3**	**7**	**36**	**5**	**8**	**29**

Mean	**2.33**	**6.33**	**23.33**	**6.33**	**3.66**	**24.33**	**4.33**	**8**	**26**
Variance	**5.33**	**0.33**	**32.33**	**0.33**	**1.33**	**104.3**	**9.33**	**4**	**37**
S.D±	**2.30**	**0.57**	**5.68**	**0.57**	**1.15**	**10.21**	**3.05**	**2**	**6.08**

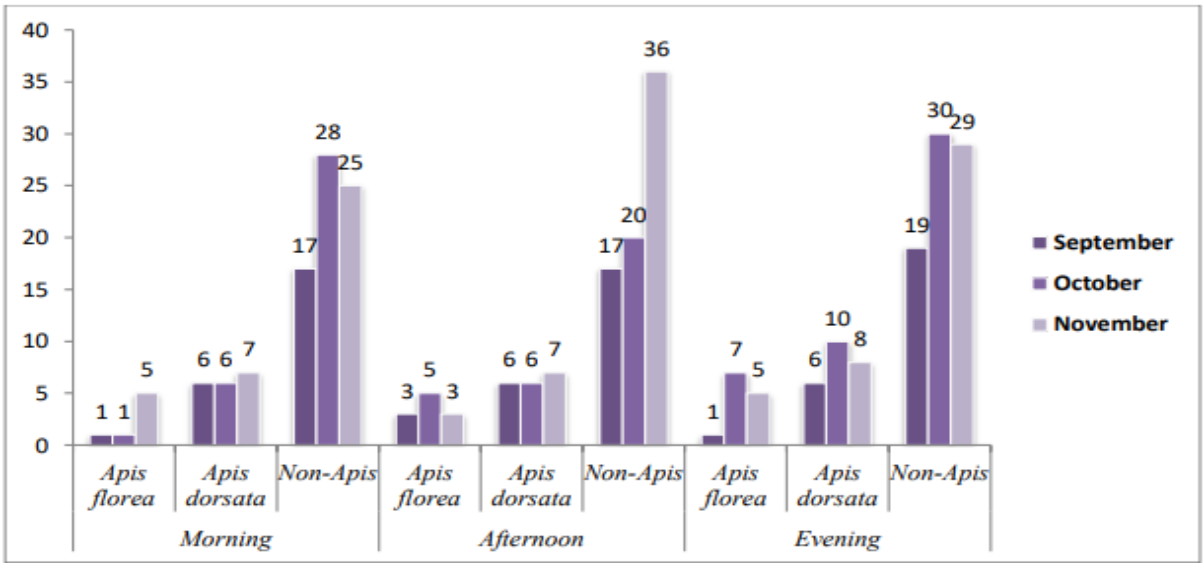

Fig No. 4: Graph illustrating the pollinators who are not apis and those that are apis in the sunflower field in PLOT-D

Table No. 5: Pollinators were detected in PLOT-A in the onion field, including apis and non-apis species.

Months	Morning			Afternoon			Evening		
	Apis florea	*Apis dorsata*	Non-*Apis*	*Apis florea*	*Apis dorsata*	Non-*Apis*	*Apis florea*	*Apis dorsata*	Non-*Apis*
January	**9**	**0**	**8**	**45**	**0**	**58**	**51**	**0**	**42**
February	**7**	**0**	**6**	**42**	**0**	**48**	**40**	**0**	**32**
March	**13**	**0**	**14**	**62**	**0**	**95**	**32**	**0**	**43**
Mean	**9.66**	**0**	**9.33**	**49.66**	**0**	**67**	**41**	**0**	**39**
Variance	**9.33**	**0**	**17.33**	**116.33**	**0**	**613**	**91**	**0**	**37**
S.D±	**3.05**	**0**	**4.16**	**10.78**	**0**	**24.75**	**9.53**	**0**	**6.08**

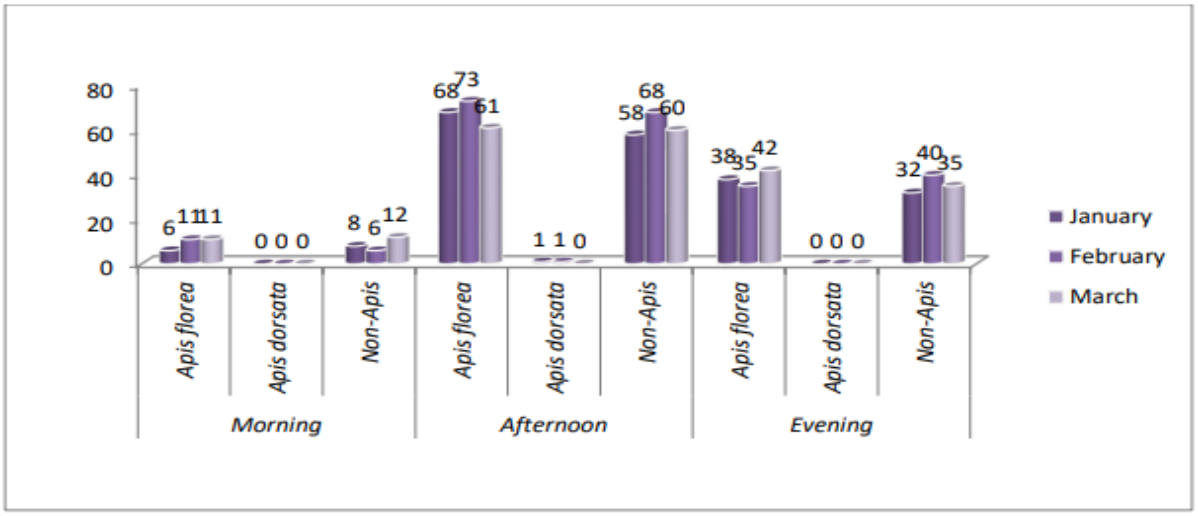

Fig No. 5: In the onion field, the graph displays pollinators that are not apis and those that are apis.

4. CONCLUSION

Several crucial variables that influence the health and productivity of this vital pollinator species have been brought to light as a result of the research of biological restrictions that impact *Apis florea* in the Kalaburagi district of Karnataka. The loss of habitat, the frequency of illness, and environmental stresses have been identified as key issues that are confronting *Apis florea* colonies. These challenges were found through thorough field surveys and laboratory examinations. The findings indicate that these limits not only reduce the strength of the colony and the efficiency with

which it forages, but they also pose a threat to the ecological balance, which is dependent on successfully pollinating the plants. The findings highlight the critical need for focused conservation initiatives to be implemented immediately in order to alleviate these restrictions. In order to maintain healthy populations of *Apis florea*, it is imperative that strategies be centered on the restoration and development of habitats. This will ensure that sufficient resources for foraging are accessible. Furthermore, in order to protect the health of honeybee colonies, it is necessary to keep a close eye on and manage the impact of illnesses and pests. It is possible to make additional contributions to the preservation of this species by educating local populations about the ecological significance of *Apis florea* and by advocating agricultural methods that are environmentally responsible. In conclusion, it is essential to address the biological restrictions that are affecting *Apis florea,* not only for the species itself but also for the larger ecosystem and agricultural systems that are dependent on pollinators. At the end of the day, this study will contribute to the preservation of biodiversity and food security in Karnataka and beyond by serving as a basis for future research and conservation actions that will be directed at guaranteeing the survival of *Apis florea* in the Kalaburagi region.

CONFLICT OF INTERESTS

None.

ACKNOWLEDGMENTS

None.

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