

A preliminary investigation on the ecology of the weaver ant (*Oecophylla smaragdina* Fabricius) in the southern belt of Indian sub-continent, Karnataka

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Abstract

Weaver ants are forceful hunters that can be utilized to control teak bugs. This preliminary study was led to decide the biological capability of weaver ants. A termite-eating yellow ant was seen in Karnataka, India. The impact of weaver ants has been seen on teak termite assault and teak deciduousness. This study was led to assess whether weaver ants, which are abundant in mango plantations, are equipped for controlling red-striped thrips and bugs, acting as a biocontrol agent. This study utilized a blended technique to notice the natural way of behaving of weaver ants. Additionally, the present study observed the food preference of weaver ants and their food hunting time. The study aims in prevailing the ecological importance of weaver ants, along with the understanding of its behaviour across India.

Key words : Weaver ant, Hymenoptera, Formicidae, Karnataka, Ecology.

Ants are currently a tremendous natural achievement. Presently, they might rise to the biomass of humankind. In certain rainforests, the commitment of ants to biomass is faltering. Weaver ants (sort *Oecophylla*) are social bugs of the family Formicidae. Silk weaver ants (*Oecophylla* spp.) have been displayed to lessen both harm and thickness

of numerous arthropod species and increment crop yields around the world. The reason for this paper is to evaluate the financial perceptions of weaver ants and subsequently survey possible future tensions on this asset. The current study is meant to distinguish factors that influence the natural parts of weaver ants. In this specific circumstance, the

investigation talks about weaver ant conduct, weaver ant populaces, and the significance of weaver ants in the climate. This study chose Kotturu, Karnataka, India to notice the way of behaving, insight, and biological significance of nearby weaver ants.

Weaver ants are profoundly friendly bugs of the ant family. Silk weaver ants are arboreal (they are committed tree tenants) and are known for their novel nest structure propensity, wherein laborer ants assemble nests by winding around together leaves with larval silk. Ant settlements can be incredibly huge, comprising more than 100 nests spread over many trees and containing the greater part of 1,000,000 specialist ants. In the same way as other different types of ants, weaver ants feed on little bugs and supplement their eating routine with starch-rich honeydew discharged by little bugs. Weaver ants have unmistakable two-layered size dissemination, with practically no cross-over between the measures of the optional and principal specialist ants³. The principal laborer termites are around 8-10 mm (0.31-0.39 in) long and the assistant specialists are about a portion of the length of the primary specialist termites. The principal laborers find, safeguard, keep up with, and grow the settlement, while the youthful specialists will quite often remain in the nest where they care for the posterity and “handle” scale bugs in or close to the nest.

Colony ontogeny of Weaver ants :

Weaver ant settlements are shaped by at least one mated female (sovereign ants). The sovereign termites lay their most memorable eggs on leaves and safeguard and support the hatchlings until they mature into

grown-up working drones. The working drones then form the nest and assist with supporting the new multitude that the sovereign produces¹⁷. As the quantity of laborer ants' increments, more nests are constructed and the efficiency and development of the ant settlement increment significantly. Laborer termites perform undertakings important for the endurance of the state, including searching, building nests, and safeguarding the province. The trading of data and the change of specialist conduct that happens during laborer worker associations are worked with using substance and profound correspondence signals⁸. These signs are mostly utilized for rummaging and province guard. Effective foragers make pheromone pathways that assist with enrolling different specialists in new food sources.

Nest-building behavior of Weaver ants :

Weaver ants are known for their momentous helpful way of behaving, making the absolute most complex nests. They nest in trees, on the leaves of vegetables, or barriers or dykes in the fields (Figure 1 and 2). They utilize new passes on to fabricate the most perplexing of ant nests¹². The leaves give very much disguised security from hunters and the components.

In order to make flawless nests, chains of laborer ants' structure along the edge and consolidate the edges by shortening the chains of one ant. When the leaf edges are set up, the ant will hold one of its hatchlings in its lower jaw and delicately press the hatchling to deliver silk to stick the leaf edges together⁵. Hatchlings have exceptional organs to deliver more sturdy silk, yet grown-ups don't.

Working behavior of Weaver ants :

Silk-winding around ants is utilized as food by a few nearby networks and is particularly preferred by customary healers for their restorative purposes. Furthermore, their eggs are likewise a delicacy (preparing) that is cherished by many individuals (Figure 3). Laborer ants fabricate nests by winding around leaves along with the silk of the hatchlings⁹. Ant provinces can be kept up with in having plants (particularly mango trees) on the off chance that they are shielded from hunters and if substrate and water are given, as the ants need them to deliver acidic corrosive.

The picture above shows these ants getting food excessively enormous for them to carry all alone and cooperating to move it back to the nest. As well as being a fascinating illustration of participation, such a way of behaving could likewise act as motivation for the plan of straightforward multitudes of robots that perform complex errands¹⁵.

Food preference of Weaver ants :

One of the most striking contrasts between ant species is the hour of the day when foragers are effectively scavenging for food. Searching exercises of ants are partitioned into two kinds as day-to-day rummaging and occasional scavenging¹⁰. Day-to-day taking care example is the ant's everyday daily practice for 24 hours, for example, the ants rummaging outside the nest and taking food back to their nest, while the occasional scrounging design reflects reactions to occasional changes like winter and summer. Different biotic and abiotic

variables can impact the everyday and occasional taking care of ants. Organic factors like normal adversaries, rivalry among ants, and accessible assets influence the everyday and occasional exercises of numerous ant species. On account of abiotic variables, temperature, and relative moistness have been involved as the primary elements affecting the taking care of propensities for some ant species. Everyday scavenging movement of weaver ants was adversely corresponded with temperature and decidedly associated with relative mugginess¹⁴. Accordingly, ants scavenge more around evening time because of lower temperatures and higher relative moistness. By concentrating on day-to-day taking care of propensities, ants can be delegated dynamic during the day (daytime), around evening time (nighttime), or dynamic at sunset and daybreak.

Uses of Weaver ants :

Weaver ants are among the best and most proficient hunters of arthropods on lasting tropical harvests; their presence likewise goes about as an obstacle to herbivorous bugs, particularly female tephritid organic product flies, as they produce signal transmitters (Figure 4). Ants have been utilized to treat various illnesses, including asthma, malignant growth, joint pain, and other bacterial contaminations in the two cases of customary and present-day medication². Weaver ants have generally been utilized for natural control in citrus plantations in China and Southeast Asia since somewhere around 400 Promotion. *Oecophylla* ants are the main recorded natural control specialists and have some control over more than 50 types of vermin over 12 tropical yields. A nest of weaver ants is brought into

the plantation, and the ants are urged to colonize every one of the trees by setting bamboo strips between the trees as “ant spans”¹². This technique is currently being resuscitated as a less expensive method for developing products of the soil bugs that have created protection from synthetic pesticides.

The present investigations were made at the locality of Karnataka province for the observations of weaver ant, its nest building behaviour and ecological significance. The mixed method was employed to generate the data on weaver ants. In Karnataka, various regions in the area with different ethnic societies were visited and their customary information on weaver ants was recorded. The primary and secondary survey was carried out as part of mixed method. In the primary research the field observations and survey were conducted were as, the further data was generated from the published articles and variant online resources as secondary research. The behaviour of weaver ants in the Kotturu region of Karnataka was studied. The current review researches the restricted way of Weaver ant behaviour and the significance of the Karnataka environment, both essential and optional. This study has found the ecological benefit of weaver ants at various types of nearby weaver ants as well as their scientific classification, propensities, and conduct.

To survey the food inclinations and scrounging action of *O. smaragdina*, three food sources with various wholesome substances chosen for this analysis. Food attractants are: Fish addresses a more protein-rich food yet has a combination of proteins and lipids (5:1), powdered milk (Settle Items Sdn. Bhd.) addresses a food rich in carbs yet



Figure 1: Nets of Weaver ants
(Source: Research Gate, 2022)



Figure 2: Nets building behavior of weaver ants
(Source: ScienceDirect, 2021)



Figure 3: Working behavior of weaver ants
(Source: ScienceDirect, 2022)



Figure 4: Use of weaver ants in the management of fruit flies in South Asia and Africa
(Source: Jena, and Sahu, 2020)

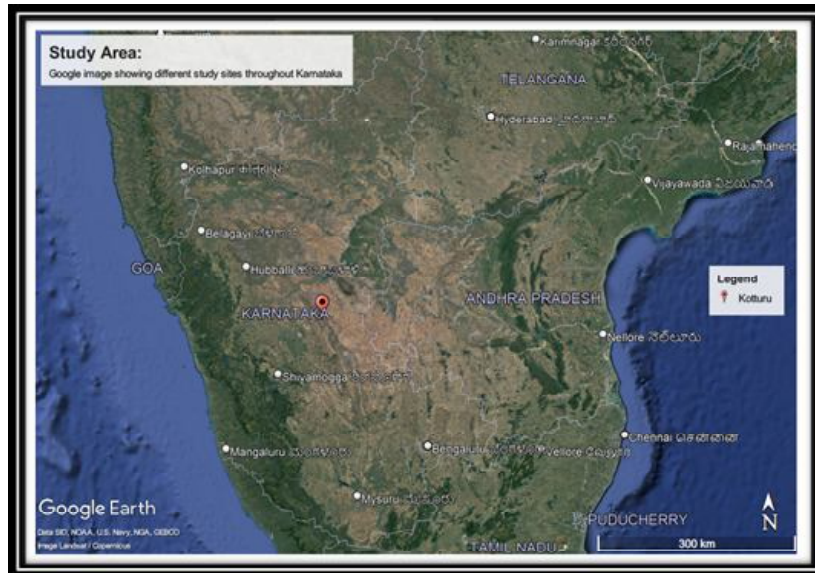


Figure 5: Google Map of Karnataka, India

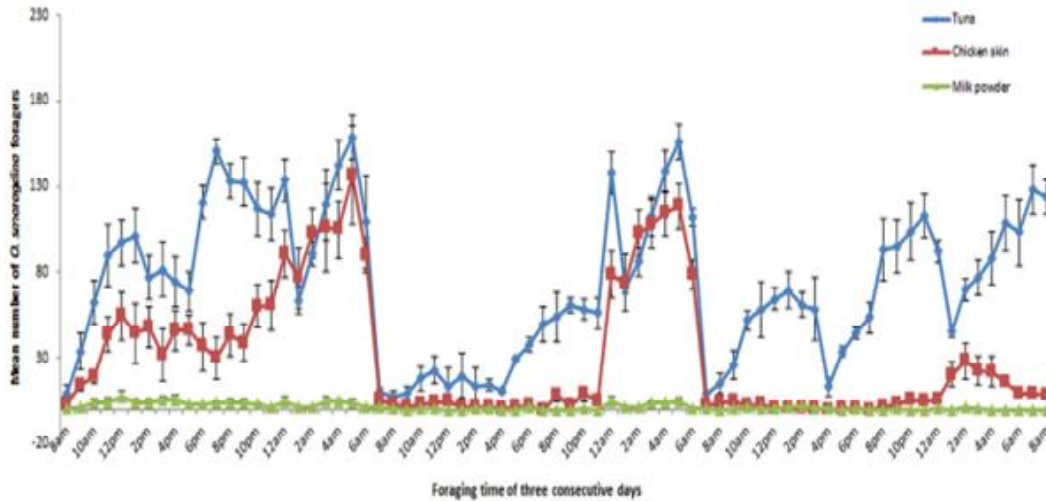


Figure 6: Mean number of *O. smaragdina* foraging on tuna, chicken skin, and milk for three consecutive days (Source: Pimid *et al.* 2019)

containing lipids and proteins (proportion 2:1), and chicken skin (Natural Keesong Chicken), a lipid-protein food (proportion 2:1) with higher lipid content. Fish skin and chicken are arranged new while milk is utilized in powder structure.

A. Observation of Weaver ant in a local place (Kotturu, Karnataka) :

Weaver ants are exceptionally regional and laborer ants effectively protect their domain against interlopers. Since they feed on bugs that harm plants, weaver ants are here and there utilized by native ranchers, particularly in Kotturu, Karnataka, as a characteristic natural control specialist against horticultural vermin. Even though weaver ants are not venomous, they can cause excruciating nibbles and frequently splash formic corrosive straightforwardly onto the injury, causing

extraordinary uneasiness. Weaver ants of the ant family *Oecophylla* (subfamily Formicinae) incorporate two firmly related living species: *O. longinoda* and *O. smaragdina*. They were briefly relegated to their very own clan, the Oecophyllini⁸. The family Oecophylla is somewhat old, and 15 fossil species have been found from Eocene to Miocene silt¹². The other three genera of material ants, *Polyrhachis*, *Camponotus*, and *Dendromyrmex*, additionally utilize larval silk to fabricate nests, however, their nest design and engineering are less complex than that of *Oecophylla*.

Ants can shield numerous earthbound plants from bug bothers; nonetheless, perceptions on the biology of these ants were made in the Karnataka locale where they are deficient. General natural perceptions establish that ants can safeguard their host plants in less positive mangrove environments. In G Leaf's

view, the herbivores and ant populace *O. smaragdina* was estimated on *Rhizophora mucronata* at two destinations⁵. The outcomes showed a negative relationship between ant and herbivore thickness. In the two destinations, the typical level of leaf region harmed in the plants without ants was multiple times higher than in the trees without ants. Weaver ant nests are curved in shape and change in size, from a little leaf collapsed and joined to each other to huge nests comprised of many leaves the greater part a meter long.

B. Foraging of O. smaragdina on different food sources :

The dietary inclinations of *O. smaragdina* showed genuinely significant contrasts between the three food sources (Kruskal-Wallis, $\chi^2(2) = 129.84$, $p < 0.05$). Dunn's pairwise test with Bonferroni's revision showed a significant contrast between fish, chicken skin, and milk ($p < 0.05$). In such a manner, fish was liked by *O. smaragdina* ($69.51 \pm 3.15\%$) over chicken skin ($28.94 \pm 2.15\%$) and milk ($1.55 \pm 0.15\%$). *O. Smaragdina's* dietary inclinations changed all through the review. Various direct relapse examinations showed that the taking care of action of *O. smaragdina* was impacted by both temperature and relative stickiness¹⁰. The measure of *O. Scrounging* marauding ants was adversely associated with temperature ($F_{1,71} = 21.36$, $r^2 = -0.626$, $p < 0.05$), however, they were decidedly connected with relative dampness ($F_{1,71} = 27.49$, $r^2 = 0.452$, $p < 0.05$). Temperature varies all through 72 hours, the most noteworthy typical temperature recorded at $32.03 \pm 0.86^\circ\text{C}$, basically at 1 pm. Moreover, when temperatures surpass 30°C , the normal

number of rummaging ants drops to around 150 weaver ants.

This study uncovered that the mind-boggling combination of weaver ants affects agro-biological systems. At the point when these hunters feed on herbivorous bugs, bio-control is improved and possibly expanded crop yields. Also, on plants with ants, there are fewer herbivores on the leaves close to the ant nest than on different leaves of the tree. Most misfortunes were because by leaf bugs (62%) and crabs (25%), and the two herbivores were significantly diminished for ants².

This study concluded that weaver ants have been displayed to successfully lessen harm and irritation populaces of numerous arthropod species and increment crop yields around the world. Extraordinary settling conduct of weaver ants, in which laborer ants assemble nests by winding around together leaves utilizing the silk of the hatchlings. A significant negative relationship was found between the mean level of leaf harm and the thickness of ants on the tree. Additionally, the everyday eating routine of *O. smaragdina* was significantly impacted by temperature and relative stickiness.

References :

1. Abdar, M.R. (2020). *Research Journal of Agricultural Sciences*, 11(6): pp. 1413-1415.
2. Exélis, M.P., R. Ramli, R.W. Ibrahim, and A.H. Idris, (2022). *Sustainability*, 15(1): 780.
3. Falahudin, I. and S. Septriani, (2023). *Jurnal Biota*, 9(2): 107-117.
4. Gayathri, G. and J. Roopavathy, (2019).

- International Journal of Advanced Research in Medical & Pharmaceutical Sciences (IJARMPS)*, 4(5):
5. Ghosh, P. and A.L. Cronin, (2021). *Ethology*, 127(5): 395-403.
 6. John, S.J., (2020). *Peckhamia*, 219(1): pp.1-9.
 7. Lee, C.C., H.W. Hsu, C.Y. Lin, N. Gustafson, K. Matsuura, C.Y. Lee, and C.C.S. Yang, (2022). *Viruses*, 14(10): p. 2161.
 8. Mahima, K.V., P.P. Anand, S. Seenaa, K. Shameema, E.M. Manogem, and Y.S. Vardhanan, (2021). *Sociobiology*, 68(2): pp.e5941-e5941.
 9. Patel, D. and N. Bhatt, (2020). *Advances in Zoology and Botany*, 8(4): 351-357.
 10. Pimid, M., A.H. Ahmad, K.T. Krishnan, and J. Scian (2019). *Tropical Life Sciences Research*, 30(2): pp.167-179.
 11. Sail, P., M.R. Borkar, I. Shaikh and A. Pal, (2021). *Journal of Threatened Taxa*, 13(2): 17630-17638.
 12. Sangma, J.S.A. and S.B. Prasad, (2021). *Sociobiology*, 68(4): e7204-e7204.
 13. Seifert, B., (2022). *Osmia*, 10: 35-44.
 14. Selvam, K. and T. Nalini, (2021). *International Journal of Entomology Research*, 6(4): p.2021.
 15. Uy, F.M.K., J.D. Adcock, S.F. Jeffries, and E. Pepere, (2019). *Insectes Sociaux*, 66: 185-192.