

Original Research Article

Nesting Animals in the Lumbok Seminung Biodiversity Park, West Lampung, Indonesia

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Abstract: Lumbok Seminung Biodiversity Park is a biodiversity conservation area in Lumbok Seminung District, West Lampung Regency of Lampung Province, Indonesia. The park that was established in 2015 is intended to preserve the biodiversity of flora in the region that has the potential to attract and preserve various types of animals, especially pollinators and seed dispersers. This study conducted to presence of nest-building animals indicating the support function of the park in preserving biodiversity. Study approach used was descriptive intended to contact as many types of nest-building animals as possible that are actually present. Observation made by direct sighting thoroughly, either with or without visual aids, along established trails in the park. There were 41 animal nests found during the monitoring, comprise 33 nests of insect, 6 nests of birds and 2 nests of mammals. Totally there were 10 types of nesting animals identified, consisting of 7 species of insects, 2 species of birds and 1 species of mammal. Some of these nesting animals are known to have ecological roles as pollinators (bees and wasps) and seed dispersers (birds and squirrels). The plants used as nesting sites by animals in the park totally are 14 species. In conclusion, the Lumbok Seminung Biodiversity Park already has support functions for the regional biodiversity.

Keywords: Biodiversity Park, Taman Kehati, Lumbok Seminung, Nesting Animal, Pollinators, Seed Disperser.

1. INTRODUCTION

In Indonesia a biodiversity park (Taman Kehati) is defined as a reserve area for local biological natural resources outside the forest area that has the function of *in-situ* and/or *ex-situ* conservation, especially for plants whose pollination and/or dispersal of seeds must be assisted by animals with the structure and composition of the vegetation able to support the preservation of pollinators and seed disperser animals [1].

One of the biodiversity parks in Indonesia is Lumbok Seminung Biodiversity Park (Taman Kehati Lumbok Seminung). The park was established in 2015 on an area of 15 hectares which was previously (2009) designated as a tourist destination resort. At the beginning of its designation as a biodiversity conservation area, in the park were found 101 plant species consisting of various cultivated plants and woods. In addition to the flora data, the initiator and developer team of the park also reported the types of animals they found namely: mosquitoes, crickets, grasshoppers, bees, butterflies, weaver ants, scorpions, finches, squirrels and monkeys [2].

Given the previous status of the Lumbok Seminung Biodiversity Park as a purely tourist destination resort, there would be changes in management and utilization policies. Changes in the policy system will certainly have an impact on the ecological function of the park.

One indicator of an increase in the ecological function of a park is the increase in the variety of fauna related to the structure and composition of the vegetation in the area. It is known from several studies that the abundance and richness of animal species in a forest area is strongly influenced by the vegetation. The diversity of bird and bat species in agricultural landscapes, for example, is positively correlated with the diversity of tree species [3]. Another indicator

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showing the effectiveness of the faunal biodiversity supports function in a forest area is the existence of nest-building animals [4, 5].

The presence of nest-building animals in a landscape can be used as an indicator of the availability of sufficient resources for these animals. To find out the existing status of faunal biodiversity at the Lumbok Seminung Biodiversity Park after being established for more than 5 years this study was conducted to monitor the existence of nest-building animal species.

2. MATERIALS AND METHODS

2.1 Study Area

The monitored area, the Lumbok Seminung Biodiversity Park, is located in Lumbok Village, Lumbok-Seminung District, West Lampung Regency, of Lampung Province. The park is covered an area of 15 hectares, situated on the shore of lake named Lake Ranau, not far from a mountain called Mount Seminung, at an altitude of 560 to 780 m above sea level. In the park are grown cultivated plants such as avocado (*Persea americana*), kapok (*Ceiba pentandra*), matoa (*Pometia pinnata*), mindi (*Melia azedarach* L.), water apple (*Syzygium aqueum*), mango (*Mangifera indica*), cocoa (*Theobroma cacao*), kedondong (*Spondias pinnata*), coffee (*Coffea canephora*), coconut (*Cocos nucifera*), banana (*Musa* spp), and papaya (*Carica papaya*). There are also many types of wooden trees such as angsana (*Pterocarpus indicus*), mahagoni (*Swietenia mahagoni*), pulai (*Alstonia scholaris*), gandaria (*Bouea gandaria*), jelutung (*Dyera costulata*), merawan (*Hopea mangarawan*), and medang (*Litsea* sp.). Additionally, on the park's land area there are tourist facilities including parking lots, children's playgrounds, lodging and canteens.

2.2 Observation Methods

The monitoring was performed from October-November 2021, on sunny days between 07:00 -16:00. Study approach used was descriptive intended to contact as many types of nest-building animals as possible that are actually present at the surveyed area [6]. Observation method in this study follows Khan (2018) by direct sighting thoroughly along established trails in the park [7]. To facilitate the identification of the nests and the types of animal living in and/or built them, visual aids such as binoculars and cameras are used in the observation. For small nesting animals, such as insects, specimens are captured and then preserved. To determine the taxonomic categories of the specimens any relevant identification keys were used such as Borror *et al.*, (1981) for insects, MacKinnon and Phillips (1993) for birds, and Payne *et al.*, (1985) for mammals [8-10].

2.3 Data Presentation

The traits recorded in this survey is the type of nesting animal, the type of nesting-site plants, the number of nests, and the height of the nest from the ground. The data are presented descriptively.

3. RESULTS AND DISCUSSION

Overall there were 41 animal nests found during the monitoring, comprise 33 nests of insect, 6 nests of birds and 2 nests of mammals. There were a total of 10 types of nesting animals identified, consisting of 7 species of insects, 2 species of birds and 1 species of mammal. The plants used as nesting sites by animals in the Lumbok Seminung Biodiversity Park totally are 14 species, namely: mango (*Mangifera indica*), bamboo (*Bambusa* sp), angsana (*Pterocarpus indicus*), avocado (*Persea americana*), kapok (*Ceiba pentandra*), matoa (*Pometia pinnata*), catalpa (*Catalpa bignonioides*), common beech (*Fagus sylvatica*), cocoa (*Theobroma cacao*), Pinto peanut (*Arachis pintoii*), coffee (*Coffea canephora*), and saninten (*Castanopsis argentea*).

In details the type nest-site plants, number of nests, and height of nests from the ground that were recorded in the survey are presented in Table 1.

Table 1: Nest-building animals found in the Lumbok Seminung Biodiversity Park

Group	Species	Common name	Nesting plants	Number of Nest *)	Height **)
Insect	<i>Oecophylla smaragdina</i>	weaver ant	mango (<i>Mangifera indica</i>)	1	10 m
		flower ant	bamboo (<i>Bambusa</i> sp)	4	8-10 m
	angsana (<i>Pterocarpus indicus</i>)		1	11 m	
	avocado (<i>Persea americana</i>)		4	5-7 m	
	kapok (<i>Ceiba pentandra</i>)		2	6-8 m	
	matoa (<i>Pometia pinnata</i>)		2	9-12 m	
	mahagoni (<i>Swietenia mahagoni</i>)	2	10-12 m		
mangga (<i>Mangifera indica</i>)	2	8-12 m			

Group	Species	Common name	Nesting plants	Number of Nest *)	Height **)
			catalpa (<i>Catalpa bignonioides</i>)	1	12 m
			common beech (<i>Fagus sylvatica</i>)	1	15 m
			cocoa (<i>Theobroma cacao</i>)	2	5 m
	<i>Dolichoderus</i> sp	semut hitam	mango (<i>Mangifera indica</i>)	2	8-10 m
	<i>Vespa affinis</i>	lesser banded hornet	matoa (<i>Pometia pinnata</i>)	1	12 m
			Pinto peanut (<i>Arachis pintoï</i>)	2	1-2 m
	<i>Polistes gallicus</i>	paper wasp	coffee (<i>Coffea canephora</i>)	2	3-5 m
	<i>Apis dorsata</i>	giant honey bee	saninten (<i>Castanopsis argentea</i>)	1	13 m
<i>Nasutitermes</i> sp	arboreal termite	matoa (<i>Pometia pinnata</i>)	2	5-10 m	
		mango (<i>Mangifera indica</i>)	1	8 m	
Birds	<i>Lonchura punctulata</i>	spotted munia	mango (<i>Mangifera indica</i>)	3	5-10 m
			lead tree (<i>Leucaena leucocephala</i>)	1	5 m
			Javanese pepper (<i>Piper retrofractum</i>)	1	2 m
	<i>Prinia atrogularis</i>	plain prinia	Javanese pepper (<i>Piper retrofractum</i>)	1	2 m
Mammals	<i>Callosciurus notatus</i>	plantain squirrel	bamboo (<i>Bambusa</i> sp)	2	4-6 m
*) The number indicates the sum of nests found on the related plant species, not the number of nests on a single plant					

The expected benefit of establishing a biodiversity park is to attract and preserve the diversity of animals that support pollination and plant dispersal. However, based on the data in Table 1, only 5 out of 10 species of nesting animals in Lumbok Seminung Biodiversity Park that are known to have an ecological role as pollinators and/or seed dispersers.

The nesting pollinators found are insects, namely lesser banded hornet (*Vespa affinis*), paper wasp (*Polistes gallicu*), and giant honey bee (*Apis dorsata*). The three insects build nests on plants whose flowers are commonly visited by pollinating insects, namely matoa (*Pometia pinnata*, Sapindaceae), pinto peanut (*Arachis pintoï*, Leguminosae), coffee (*Coffea canephora*, Rubiaceae), and saninten (*Castanopsis argentea*, Fagaceae). These three plant families are known as groups of plants whose pollination is supported by insects, especially bees and wasps [11].

These facts indicate that the selection of nesting sites by the insect is most likely related to the strategy of the animals to ensure there are sufficient resources nearby their nest [12, 13]. With regard to honey bees, in particular of *Apis* spp and *Trigona* spp, their existence and abundance are closely related to the richness of flowering plant species in the area concerned, such as rambutan, coconut, mango, coffee, and kapok that grow a lot in the studied park [14].

Furthermore, there were two types of nesting birds found in the monitored park area, namely spotted munia (*Lonchura punctulata*) and plain prinia (*Prinia atrogularis*). Of the two bird species, only the spotted munia has the potential to spread seeds, while the plain prinia is a bird of prey. Even though the spotted munia is a grain feeder, in the Lumbok Seminung Biodiversity Park this bird does not build nests on grain-producing plants, but on a fruit plant of mango (*Mangifera indica*) and a berry-producing plant named Javanese pepper (*Piper retrofractum*). Coincidentally, the insectivorous bird—the plain prinia, was also found nesting on the Javanese pepper.

Although the two bird species do not nest on their food-producing trees, the trees used are in areas where various types of wild grain-producing plants are still very diverse and abundant. Thus, like insects, birds also choose nesting sites according to their need for sufficient resources for nest building materials and diet for their offspring [15-17]. Another park area in Indonesia with a similar diversity of flora to the Lumbok Seminung Biodiversity Park, Gedebage of Bandung in West Java, has proven effective in inviting and conserving a wide variety of bird species [18].

Plantain squirrel (*Callosciurus notatus*) is the only nesting mammals identified in the studied area. There were two squirrel nests found and both were built in bamboo trees, instead of fruit trees of their usual source of food. The tendency of squirrels to choose bamboo as a nesting site is clearly unrelated to their food source, but most likely due to bamboo canopy structure provides safety against predators [19]. The nest building strategy based on safety against predators is applied by all nesting animals, both invertebrates and vertebrates including mammals, such as lemurs [20].

Regarding nest height, the data obtained in this monitoring confirm most of the results of studies in other countries. In all groups of tree-nesting animals, both invertebrates and vertebrates, nest height is affected by the surrounding conditions. In insects, the height of the nest can reach 25 meters or more, depending on the height of the tree canopy or roof of the nesting building and the surrounding green open space [21, 22]. In birds and mammals, habitat structure and the surrounding landscape have also been known to influence nest height [23-25].

4. CONCLUSION

There are 10 species of nesting animals found in the Lumbok Seminung Biodiversity Park, consisting of three groups namely insects (7 species), birds (2 species), and mammals (1 species). Some of these nesting animals are known to have ecological roles as pollinators (bees and wasps) and seed dispersers (birds and squirrels). The plants chosen as nesting sites by these animals varied comprise 14 species of flowering plants. Thus it can be concluded that the Lumbok Seminung Biodiversity Park already has support functions for the regional biodiversity.

Compliance with Ethical Standards

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REFERENCES

1. Regulation of the State Minister for the Environment of Indonesia No. 03 of 2012 concerning Biodiversity Park. (Permen-LH Nomor 03 Tahun 2012 Tentang Taman Keanekaragaman Hayati) <http://kehati.jogjaprovo.go.id/po-content/uploads/PERMENLH-3-2012.pdf>
2. Lambar, D. L. H. (2020) . Profile Document of Kehati Park, Lumbok Seminung, West Lampung (Dokumen Profil Taman Kehati, Lumbok Seminung,Lampung Barat). <https://dlh.lampungbaratkab.go.id/detailpost/dokumen-profil-taman-kehati-lumbok-seminung-lampung-barat> [Accessed, February 15, 2023]
3. Harvey, C. A., Medina, A., Sánchez, D. M., Vílchez, S., Hernández, B., Saenz, J. C., ... & Sinclair, F. L. (2006). Patterns of animal diversity in different forms of tree cover in agricultural landscapes. *Ecological applications*, 16(5), 1986-1999.
4. Wenzel, J.W. (2020). Nest Structure: Social Wasps. In: Starr, C. (eds) Encyclopedia of Social Insects. Springer, Cham. https://doi.org/10.1007/978-3-319-90306-4_146-1
5. Mainwaring, M. C., Hartley, I. R., Lambrechts, M. M., & Deeming, D. C. (2014). The design and function of birds' nests. *Ecology and Evolution*, 4(20), 3909-3928. doi: 10.1002/ece3.1054.
6. Nageleisen, L. M., & Bouget, C. (2009). *Forest insect studies: methods and techniques, key considerations for standardisation. An overview of the reflections of the Entomological Forest Inventories working group (Inv. Ent. For.)* (pp. 144-p). ONF. <https://hal.science/hal-00539124/document>
7. Khan, W. A. (2018). *Wildlife Survey Techniques: A Field Guide for Wildlife Ecologists, Biologists and Managers*. Pakistan Wildlife Foundation (March, 2018)
8. Borror, D. J., Long, D. M., & Triplehorn, C. A. (1981). *An Introduction to the Study of Insects*. Fifth Edition, Saunders College Publishing, USA. 928 p.
9. MacKinnon, J. R., & Phillipps, K. (1993). *A field guide to the birds of Borneo, Sumatra, Java, and Bali: the Greater Sunda Islands*. (No Title).
10. Payne, J., Francis, C. M., & Phillipps, K. (1985). *A Field Guide to the Mammals of Borneo*. *PencetakWeng Fart Sdn. Bhd.*, Kuala Lum.
11. Momose, K., Yumoto, T., Nagamitsu, T., Kato, M., Nagamasu, H., Sakai, S., ... & Inoue, T. (1998). Pollination biology in a lowland dipterocarp forest in Sarawak, Malaysia. I. Characteristics of the plant-pollinator community in a lowland dipterocarp forest. *American journal of botany*, 85(10), 1477-1501.
12. Invernizzi, E., & Ruxton, G. D. (2019). Deconstructing collective building in social insects: implications for ecological adaptation and evolution. *Insectes Sociaux*, 66, 507-518. <https://doi.org/10.1007/s00040-019-00719-7>.
13. Dar, S. A., Wani, S. H., Javeed, K., Ahmad, M. O., Mir, S. H., Yaqoob, M., ... & Farook, U. B. (2020). Nesting behaviour and nesting substrates of insect pollinators of Indian Himalayas. *J. Entomol. Zool. Stud.*, 8(6), 583-591.
14. Batoro, J., Lastriyanto, A., Junus, M., Jaya, F., Lamerkabel, Y. E., Masyithoh, D., & Ustadi. (2022). Plant families potentially visited by the honey bees (*Apis* spp. and *Trigona* spp.) at Universitas Brawijaya campus area and Sawojajar residential area of Malang City, East Java, Indonesia, *International Journal of Agriculture and Forestry*, 12(2), 37-44. doi: 10.5923/j.ijaf.20221202.01.
15. Ranibai, M. (2022). Diversity of nests and nest-building in birds. *International Journal of Creative Research Thoughts (IJCRT)*, 10(2). <https://ijcrt.org/papers/IJCRT2202140.pdf>

16. Gokula, V. (2001). Nesting Ecology of the Spotted Munia *Lonchura punctulata* in Mudumalai Wildlife Sanctuary (Southern India). *Acta Ornithologica*, 36(1), 1-5.
17. Arigela, R. K., Siddabathula, N., Prasad, K., & Singh, R. K. (2020). Preferent wild grasses of Scaly-breasted Munia (*Lonchura punctulata*) in Andhra Pradesh, Tamil Nadu and Telangana. *NeBIO* 11(1), 13-17.
18. Yuliawati, A., Pramadi, R. A., Zuldin, M., Yusuf, D. K., Jamaludin, A. N., & Patoni, U. (2021, March). Recommended plants for green open space to enrich bird diversity in Gedebage region Bandung West Java. In *IOP Conference Series: Materials Science and Engineering* (Vol. 1098, No. 5, p. 052002). IOP Publishing.
19. Thapamagar, T., Youlatos, D., Bhusal, D. R., & Bhandari, S. (2021). Habitat and nest use by hoary-bellied squirrels (*Callosciurus pygerythrus*): preliminary observations in central Nepal. *Tropical Ecology*, 62, 139-143. <https://doi.org/10.1007/s42965-020-00116-3>
20. Baden, A. L. (2019). A description of nesting behaviors, including factors impacting nest site selection, in black-and-white ruffed lemurs (*Varecia variegata*). *Ecology and Evolution*, 9(3), 1010-1028. <https://doi.org/10.1002/ece3.4735>.
21. Sangma, J. S. A., & Prasad, S. B. (2021). Population and Nesting Behaviour of Weaver Ants, *Oecophylla smaragdina* from Meghalaya, India. *Sociobiology*, 68(4), e7204-e7204. DOI: 10.13102/sociobiology.v68i4.7204.
22. MacIvor, J. S. (2015). Building height matters: nesting activity of bees and wasps on vegetated roofs, *Israel Journal of Ecology & Evolution*, DOI: 10.1080/15659801.2015.1052635.
23. Jean-Pierre, L., Savard, J., & Bruce, F. (1981). Influence of habitat structure on the nesting height of birds in urban areas. *Canadian Journal of Zoology*, 59(6), 924-932.
24. Vogrin, M. (2000). Nest height and nesting losses of rural and urban Blackbirds *Turdus merula*. *Ornis Svecica*, 10, 149–154.
25. Kobayashi, S., Placksanoi, J., Taksin, A., Waengsothorn, S., Aryuthaka, C., Panha, S., & Izawa, M. (2020). Activity pattern and resource use of two *Callosciurus* species in different habitats in northeastern Thailand. *Raffles Bulletin of Zoology*, 68. DOI: 10.26107/RBZ-2020-0080.