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Research article

DISTRIBUTION, ECOLOGY AND COLLECTION METHODS INVOLVED IN SAMPLING OF FIVE SPECIES OF GENUS *PHEIDOLE* WESTWOOD (FORMICIDAE: MYRMICINAE) FROM KERALA

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ABSTRACT: Ants in general are a focal taxon in ecology, which is partly based on their ecological and evolutionary success as the most diverse and abundant eusocial animal family (Hölldobler and Wilson, 1990, Wilson and Hölldobler 2005). The genus *Pheidole* Westwood is one of the most specious rich genera that show highest dispersal in terms of ecological dominance. The current investigation was carried out for a period of three years (2010-2013). The present paper comprises the details of general ecology of four species of *Pheidole* namely *P. fergusoni* Forel, *P. noda* Smith, *P. parva decanica* Forel, *P. sharpi sharpi* Forel, *P. spathifera spathifera* Forel and collection methods that help in sampling of Genus *Pheidole* Westwood in Kerala region.
Key words: *Pheidole*, ecology, collection, eusocial.

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INTRODUCTION

Ants are widespread and well known group, possibly the most successful of all the insect groups. They are regarded as the most ecologically and numerically dominant families of organisms in almost every terrestrial habitat throughout the world [1,2]. Ants are common in all habitat from the Arctic Circle to the Equator [3], although they are absent from Iceland, Greenland and Antarctica [4] and some islands lack native ants [5]. The genus *Pheidole* Westwood is one of the world's most diverse ant genera. The hyperdiverse subfamily Myrmicinae, comprising the genus *Pheidole* is unsurpassed for number of species in a single ant genus [6]. *Pheidole* presently comprises of more than 9.5 % of the entire known world ant fauna [7]. They generally occupies a large variety of ecological niches. Majority are seed harvesters and they also predate other invertebrates and attack their family members

MATERIALS AND METHODS

Study area

The study was conducted in Kerala. Geographically Kerala is a tropical region; the total area of Kerala is 38, 863 sq km. Kerala has 14 districts. Latitudinally, Kerala lies in between 88°.17'.30" N and 12°. 47'.40" N and longitudinally in between 74°.27'47" E and 77°.37'.12" E. Covered with land on all the three sides, Kerala is engulfed with the Arabian Sea to the west, the Indian Ocean to its south and Western Ghats to the east. Kerala has a very large area under forest cover but is quite rich in vegetation. Climate of Kerala remains wet most of the time as it is heavily influenced by seasonal rains brought by the monsoons. The maximum temperature throughout the year is around 36.7°C and the minimum is around 19.8°C.

SAMPLING PROCEDURE

Ants were collected between three years (2010-2013) from 14 districts of Kerala (ie;. Allapuzha, Ernakulam, Idukki, Kannur, Kasargod, Kollam, Kottayam, Kozhikode, Mallappuram, Pallakkad, Patthanamtita, Trivandrum, Thrissur and Wyanad). Collections were carried out in whole year. Species were collected by all out search method, brush method, sweep net and by pit fall traps. All the collected samples were brought back to the lab and they were separated them from other invertebrate material. They are then mounted on cards and pinned with Asta insect pins of size 38 mm x 0.53 of 3 (made by Newy Goodman Ltd U K) and then dried.

PRESERVATION AND IDENTIFICATION

Field note books were maintained. Colony characteristics, collection and habitat patterns were recorded. Species were identified under Leica MZ6 Stereo zoom Microscope (Germany made). Genus level identification were carried out using the keys of Bolton [8] and species level identification was done using the keys of Bingham [9], relevant literature and by using the monograph *Pheidoles* in the New world of Wilson [6].

OBSERVATION AND RESULTS

Different collection methods like all out search method, aspirator, sweep net, pit fall trap and food bait were employed. As compared to other methods, food bait helped to obtain the major workers as well as the minor workers in sufficient numbers, which in turn helps in the identification process. And it was found that the most effective and reliable method. Most of the time, the major workers resided inside the nest and came out only when the minor worker had any difficulty in transferring the food to the nest. By providing a relatively big size of food piece as bait, the major workers could be attracted out of the nest and could be collected with the help of aspirator as well as by brush method.

Ants exhibit a diverse array of behaviour, colony structure and genetic systems, the evolution and maintenance of which has intrigued evolutionary biologists [10,11]. Though most of the species of ants *Pheidole* were nocturnal; species like *P. spathifera spathifera* Forel, *P. sharpi sharpi* Forel, were found to be very active during mid day while *P. fergusoni* Forel and *P. noda* Smith was found to be active in the early morning and late night. while *P. parva decanica* Forel was found to be active in the early morning. They were more common in open habitats with weedy vegetation.

Climatic and seasonal changes also affected species diversity and distribution. Rain can destroy the nests of ground dwelling ants [4]. Most of the *Pheidole* species constructed their nest in soil and it was observed that when there was precipitation, the feeding pattern was disturbed as the ants could not come out from their nest for foraging. *Pheidole* used a large range of niches (Table 1). These species of *Pheidole* was found to construct nests in soil. Each species varied in activity patterns and habitat. Ecological diversity of the four species of *Pheidole* was dealt under habitat and microhabitat (Table 2). From the stated table, it could be inferred that two species viz., *P. sharpi sharpi* Forel, *P. spathifera spathifera* Forel were attracted towards sunlight. Nest construction pattern varied from species to species. For *P. sharpi sharpi* Forel, *P. spathifera spathifera* Forel nest had a number of accessory nest openings as a safety mechanism to escape from enemies and as a precautious measure to face any catastrophe to their nest. Their nest entrances were surrounded with a small heap of porous soil, small stones and dry twigs were found near nest entrance as a barrier. All the five species was found to be abundant in those areas where the human interaction was high.

The major workers were mainly concerned with the colony defense and assisting the members during colony emigration. The minor workers took care of young ones and engaged in foraging activities. The colony emigration was the common nature of *Pheidole* species.

Table 1 : District wise distribution and diversity of species of genus *Pheidole* Westwood

S.NO	NAME OF SPECIES	ALLAPUZHA	ERNAKULAM	IDUKKI	KANNUR	KASARGOD	KOLLAM	KOTTAYAM	KOZHIKODE	MALLAPPURA	PALLKKAD	PATTHANAMTII	TRIVANDRUM	THRISSUR	WYANAD
1	*P. fergusoni* Forel	-	*	-	-	-	-	-	-	-	-	-	-	-	-
2	*P. noda* Smith	-	*	-	-	-	*	-	-	*	-	-	*	*	-
3	*P. sharpi sharpi* Forel	-	*	-	*	*	*	-	*	*	*	*	*	*	*
4	*P. spathifera spathifera* Forel	-	*	-	*	-	*	*	*	*	*	-	*	*	*
5	*P. parva decanica* Forel	-	-	-	-	-	*	-	*	*	-	-	*	*	-

*** indicates the presence of species, '–' indicates the absence of species.**

When any disturbance occurs in the vicinity of colony, the major workers moved into the nest and shift the colony by carrying the younger ones to the new place. Colony emigrations were inherent part of the foraging ecology [12]. *P. spathifera spathifera* Forel, *P. sharpi sharpi* Forel) showed colony defensive behaviour as they safe guard their colony from other ant invaders especially from *Anoplolepis gracilipes* (Smith) and exhibited territorial behaviour, as they did not allow other species of ants to come near to their nest. In case of *P. fergusoni* Forel and *P. noda* Smith territorial behaviour is not much noticed.

Table: 2 Ecological Diversity of the Species of *Pheidole* Westwood in Kerala

S.No	Name of Species	Habitat						Microhabitat			
		AE	**SL**	**FT**	**LA**	**GL**	**MA**	**AM**	**BT**	**CR**	**LL**
1	*P. fergusoni* Forel									*	
2	*P. noda* Smith					*	*		*	*	
3	*P. sharpi sharpi* Forel	*		*	*						
4	*P. spathifera spathifera* Forel	*	*		*				*	*	
5	*P. parva decanica* Forel									*	*

*** Indicates the presence of the species in that habitat / microhabitat.**
AE= Agreoecosystem , **SL**= Scrub locality, **FT**= Forest, **LA**= Light attracted, , **GL**= Grassland, **MA**= Marshy area, **AM**= Animal matter, **BT**= Bark of tree, **CR**= Cervices, **LL**= Leaf litter

CONCLUSION

In terms of species diversity and ecological dominance, it is indeed one of the most successful genera in ants. These soil dwellers were important ecological engineers, hence more studies to be conducted on their biology so as to bring out their role in the ecosystem. As the entire state was covered, this study thought to be a good source for future studies. Since the present study covered entire state of Kerala, this report would be a good source for future studies as so much scattered information in respect of this species was brought together in this investigation.

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REFERENCES

[1] Stork, N.E. 1987. Guild structure of arthropods from Bornean rainforest trees. Ecological Entomology, 12: 69-80.
[2] Stork, N.E. 1991. The composition of the arthropod fauna of Bornean lowland rain forest trees. Journal of Tropical Ecolog. 7: 161-180.
[3] Brian, M.V. 1978. Production Ecology of Ants and Termites. IBP 13, Cambridge, UK: Cambridge University Press.
[4] Hölldobler, B. & Wilson, E. O. 1990. The ants, Springer-Verlag, Berlin Heidelberg. 1-732.
[5] Wilson, E.O. and Taylor, R.W. 1967. The ants of Polynesia (Hymenoptera: Formicidea). Pacific Ins. Mon. 14: 109.
[6] Wilson, E. O. 2003. *Pheidole* in the New World: A dominant, hyperdiverse ant genus. Cambridge, Mass.: Harvard University Press, [ix] + 794 pp.: 794pp.
[7] Bolton, B.; Alpert, G.D.; Ward, P.S.; Naskrecki, P. 2006. Bolton's Catalogue of Ants of the World (CD). Harvard University Press, Cambridge, MA, USA.
[8] Bolton, B. 1994. Identification guide to the ant genera of the world. Cambridge, Mass.: Harvard University Press, 222 pp.
[9] Bingham, C. T. 1903. The fauna of British India, including Ceylon and Burma. Hymenoptera, Vol. II. Ants and Cuckoo-wasps. London: Taylor and Francis, 506 pp.
[10] Bourke, A. F. G.; Franks N. R. 1995. Social Evolution in Ants. Princeton University Press, Princeton, New Jersey, 529 pp.
[11] Crozier R.H.; Pamilo, P. 1996. Evolution of social insect colonies: sex allocation and kin selection. Oxford University Press, Oxford.
[12] Wilson, E. O. 1971. The Insect Societies. Harvard Univ. Press.

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