INTRODUCTION
Termites (Isoptera) are considered as the most abundant invertebrates and represent up to 95% of soil insect biomass show an elaborated morphology and complex behaviour (Wang, et al., 2009) Termites are the serious pests of agricultural and horticultural crops that mainly destroy the roots and above ground parts and feed on paper, wood and timber (Murthy, et al., 2015). They are classified in about 280 genera, and over 2800 species within 14 subfamilies (Eggleton & Tayasu, 2001). In India about 300 species within seven families have been reported (Kumar & Pardeshi, 2011). Termites are often referred as “ecosystem engineers” (Jouquet et al., 2006, & Ali, et al., 2013) as they play a vital role in recycling of plant materials and wood, modifying and improving the soil condition and composition, and providing food for other animals (Ackerman et al. 2009, & Sugimoto et al., 2000). Termites are also considered as potent catalysts due to their role involved in converting lignocellulose into biofuels (Deivendran, 2013) and contribute to gas exchange, nitrogen fixation, and soil stability and quality (Bignell 2000, & Hemachandra et al., 2010).

Termites are abundant throughout the tropics, subtropics and the temperate regions of the world.

ABSTRACT
The abundance and diversity of subterranean termites was studied in the states of Andhra Pradesh, Kerala, Karnataka and Tamilnadu. Fifteen species of termites belonging to subfamilies Apicotermitinae, Kalotermitidae, Macrotermiteinae and Nasutitermitinae, were recorded. The fungus growing termites (Macrotermiteinae) accounted for 66.66% abundance, across the states. The Apicotermitinae (soil feeders) and Kalotermitidae (dry wood termites) registered 6.62% each and the dry wood termites (Nasutitermitinae) recorded 20.1% abundance. Among the different species of termites, Odontermes obesus, was more predominant (15.62%) than others. The cropping pattern, soil type and topography predisposed the abundance and diversity of termites.

Keywords: Abundance, Cropping pattern, Diversity, Macrotermiteinae.
The subterranean termites which are of economic importance (Wang et al., 2009) to agriculture are mostly found in temperate climates. The population density and biomass determines the extent and dimension of their function in an ecosystem (Evans et al., 2011). The composition in a given region is predisposed by the habitat disturbance and ecological factors (Jones & Eggleton 2000, Pardeshi & Prusty 2010, & Luke et al., 2014). Loss in biodiversity and degradation of natural habitats due to climate change and human interference in natural ecosystem has necessitated the need to have an inventory of species richness in an ecosystem.

The information on species diversity, relative abundance of termites in different agro-ecological regions of South India has not been adequately addressed. It is imperative to understand the species distribution in different regions, so to develop a strategy for their management and conservation in wild habitats to maintain the ecological balance.

MATERIALS AND METHODS

Study area:
Surveys were carried out in the southern states of India, viz., Andhra Pradesh, Karnataka, Kerala and Tamilnadu in different locations. The geographical co-ordinates in the different locations considered for study ranged from 10.52\(^0\) - 17.89\(^0\) N, 74.29 - 83.2\(^0\) E. The study area comprised of different cropping patterns and soil types (Table 1).

Collection and identification of termite samples
Termite specimens (Soldiers and workers) were collected from the various locations listed in Table 1 by adopting the belt transect method (Eggleton et al. 1997, Davies et al., 2003, & Anantharaju et al., 2014). Collections were made at three months intervals from August 2016 to July, 2018. The sampling also included the micro habitat (mounds, leaf litter, stump, tree bark, tree logs, bamboo fencing and vegetation) apart from the crop canopy. Contiguous sections of the transect, measured 10 sq. m each. The collected specimens were taken to the laboratory at the Division of Molecular Entomology, NBAIR-ICAR Bangalore, The labeled specimens were preserved in 75% (v/v) ethyl alcohol.

Taxonomical identification of these specimens was done at the Division of Entomology Indian Agricultural Research Institute, New Delhi, Institute of Wood Science Technology Bangalore, and Centre for Insect taxonomy, University of Agricultural Sciences, Bangalore, by using the keys of Roonwal and Chottani (1989), Chottani (1997) and Kalleshwaraswamy et al. (2013).

RESULTS AND DISCUSSION

Study area
The study area comprised of four South Indian states, viz., Andhra Pradesh, Karnataka, Kerala and Tamilnadu. The states are characterized with varied cropping pattern, soil type and geography (Table 1). The plantation crops (arecanut, coconut, cocoa, coffee, pepper, tea and rubber) predominate in the state of Kerala, while Karnataka has more diversified pattern with maize, millets, pulses arecanut and vegetables. The type of soil in the states varied from red loamy, alluvial soils, sandy loams, red laterite and silty loam. The geographical co-ordinates ranged from 10.52-15.51\(^0\) N, 70.58-83.2\(^0\) E

Species distribution and abundance
The population of termites were collected from different geographical locations in the country from the four states of South India - Andhra Pradesh, Karnataka, Kerala and Tamilnadu. The locations surveyed are indicated in Table 2. The distribution of subterranean termites in the different states indicated occurrence of fifteen species in the locations surveyed. The collected termites belonged to the subfamilies Macrotermiteinae, Nasutitermitinae Apicotermitinae and Kalotermitidae. The Species belonging to sub family Macrotermiteinae, outnumbered the others in abundance. Ten species of Macrotermiteinae, three species of Nasutitermitinae and one each of Apicotermitinae and Kalotermitidae. Among the macrotermiteinae, \textit{Odonotermes obesus} registered 15.62% abundance followed
by *Odontotermes holmgren* (13.24%) and *Odontotermes longignathus* (10.21%) and *O. gurdaspurensis* (10.04%), in the various locations (Table 2), while *Hypotermes makhamensis*, *Hypotermes xenotermis* and *Microtermes obesi* accounted for low occurrence (1.72% each). *Dicuspiditermes Krishna* registered the least abundance (1.31%). The species *Euhamitermes hamatus* and *Neotermes koshunensis* under the subfamilies, *Apicotermitinae* and *Kalotermitidae*, respectively recorded 6.62% each. The *Nasutitermitinaids*, *Nasutitermes exitiosus* and *Nasutitermes octopilis*, registered 11.62 and 6.66% abundance, respectively. (Fig 1).

The taxonomic composition of termites and their abundance revealed occurrence of species diversity with respect to the area and the cropping pattern. Our observations in the present study are corroborative with the earlier reports of diversity of termite species reported by several earlier workers. Earlier, Twenty five species of termites around 22,400 km2 in three states: Tamil Nadu 400 km2, Karnataka 13,000 km2 and Kerala 9,000 km2 were sampled in a study conducted to assess the economic damage caused to forest trees and ecological habitat by termites (Roonwal & Bose, 1978). Twelve termite species were identified in the Western Ghats, South India to understand impact of human disturbance on pristine ecosystem (Basu et al., 1996). A survey by Rao et al. (2012) to investigate diversity of termites and their damage to living trees of forest region of Bhadrachlam forest (1, 44,603 ha) in Andhra Pradesh revealed greater distribution of *Macrotermiteinae*. in the area (*Odontotermes bruneus* (Hagen), *Odontotermes feae* (Wasmann), *Odontotermes guptai* (Roonwal and Bose), *Odontotermes indicus* (Thakur), *Odontotermes obesus* (Rambur), *Odontotermes redemanni* (Wasmann) and *Odontotermes wallonensis* (Wasmann). Similarly, Varma and Swaran (2007), Vidyashree et al. (2018 and 2018a) and Shanbhag and Sundarai (2013) reported their occurrence in the western ghats of Karnataka.

Anantharaju et al. (2014) spotted ten species of termites belonging to eight genera and three families in Northeastern Puducherry. Parween, et al. (2016) found thirteen species of termite in the states of Uttar Pradesh, Rajasthan and Haryana and reported the maximum occurrence of *Odontotermes obesus* (Macrotermiteinae) in these regions.

The percentage distribution of termites across the different states indicated that the fungus growing termites, *Macrotermiteinae*, outnumbered the other groups with 66.66% occurrence followed by the exclusive soil feeders, subfamily *Apicotermitinae* and the dry wood termites, *Kalotermitidae* which accounted for 6.62% each. The wood feeding termites (sub family *Nasutitermitinae*) occurred to the extent of 20.01% across the different states (Table 3 and Fig. 2).

The landscapes located in sub-tropical and low humid temperate region (N 30°, 12.57 - 12.97 N and 75.72 - 77.85 E) with a broad altitude range (2322 - 2479 msl) facilitated the diversity of termites in different habitats. The correlation between altitude and diversity of woodfeeding termites in South East Asia was stated by Inoue et al (2006) that Subfamily *Macrotermiteinae* showed increasing abundance with the increasing altitude. On the contrary, the abundance of Subfamily *Nasutitermitinae* decreased with the increasing altitude.

The significance of changes in altitude and low temperatures on the abundance and diversity of species richness must be correlated, probably, the low temperatures at high altitudes might limit the development of termites. The soil content decreases as the altitude gets higher, poor soil nutrient, high CaCO₃ and pH, do not offer a favorable habitat for many species of termites which depend on soil substrate, as source of nutrient for community development (Pratiknyo & Setyowati 2020).

The natural vegetation and the cropping pattern might have contributed to greater diversity of termite fauna in the region. Most termite assemblages having a more diverse range of food resources with the varying cropping pattern (e.g., wood, soil, and
leaf litter) and soil type for nesting strategies (mound, arboreal nests, and nests of wood) as reported by Dawes (2010). Soil parameters, vegetation and microclimate strongly modify the termite communities as opined by Basu et al. (1996). Land use patterns had an observable impact on the termite species composition and abundance Previous studies by Blanchart and Julka (1997) and Ferry (1992) suggested that increased anthropogenic activity in the region adversely affected the soil macrofauna and diversity, while Menon and Bawa (1997) opined conversion of forest land in to cultivation land with coffee and areca plantations.

Assessment of species diversity and abundance, would provide information on planning strategies for the conservation of their natural enemies, habitat management, and formulate pest management strategies.

### Table 1: Characteristics of the study area

| State           | Location                  | Geographical Co-ordinates | Cropping pattern                                                                 | Soil type                                      |
|-----------------|---------------------------|---------------------------|---------------------------------------------------------------------------------|------------------------------------------------|
| Andhra Pradesh  | Anakapalle                | 17.38 N., 83.2 E          | Pigeon pea, Sugarcane, Groundnut, millets                                       | Red laterite, Sandy loam                      |
|                 | Samarlakota               | 17.5 N., 82.2 E           | Millets, Sugarcane, Pulses, cotton                                             | Alluvial, Sandy loam                          |
|                 | Tirupathi                 | 13.65 N., 79.42 E         | Groundnut, millets, pulses                                                      | Red sandy loam                                |
| Kerala          | Kannur                    | 11.8 N., 75.12 E          | Arecanut, Coconut, Paddy, Pepper, Tapioca                                        | Red laterite, Sandy loam                      |
|                 | Thrissur                  | 10.52 N., 76.2 E          | Arecanut, Banana, Coconut Paddy, Vegetables                                     | Alluvial, Red laterite, Sandy loam            |
|                 | Sultan Betheri Wayanad    | 11.67 N., 76.28 E         | Arecanut, Coconut, Coffee, Cardamom, Rubber, Pepper and Vegetables              | Alluvial soil, Red laterite soil, Silty loam   |
| Karnataka       | Malanad region            | 12.57 -13.52 N., 75.72 -75.22 E | Millets, maize, pulses. Arecanut, cocoa, sugarcane, coffee, cardamom and spices | Red laterite, Red Sandy, Silty clay           |
|                 | Bangalore, Mysore         | 12.97 N., 77.57 E         | Rice, Small millets, Maize, Groundnut, sorghum, Sugarcane, castor and vegetables | Red laterite and red loamy                    |
|                 | Chintamani                | 13.40 N., 78.05 E         | Rice, Small millets, Maize, Groundnut, sorghum, pulses, sunflower, fruit crops and vegetables | Red loamy, Red sandy                          |
|                 | Belgaum                   | 15.51 N., 74.29 E         | Jowra, Maze, Paddy, Wheat, Bajra, Pulses, groundnut, sunflower, sugarcane, cotton, tobacco | Deep black soil, Red loamy, Laterite          |
| Tamilnadu       | Gudalur                   | 11.59 N., 76.50 E         | Coffee, Tea, Paddy, Vegetables, Spices                                          | Lateritic soil, Red sandy soil, Red loam, black soil, Alluvial and Colluvial soil... |
|                 | Coimbatore                | 11.16 N., 76.58 E         | Banana, Coconut, cotton, Oilseeds, Pulses, Millets, Vegetables, Sugarcane       | Red calcareous Soil, Red loam, black soil, Alluvial and Colluvial soil... |
|                 | Ooty                      | 11.41 N., 70.58 E         | Potato, Cabbage, Carrot, Cauliflower, pears, plums and strawberries Vegetables, Coconut | Lateritic soil, Red sandy soil, Red loam, black soil, Alluvial and Colluvial soil... |
|                 | Theni                     | 15.51 N., 77.79 E         | Banana, Chilte, Sugarcane, Paddy, Oilseeds, Vegetables, millets                | Red spot, Black soil, Brown soil              |
|                 | Valparai                  | 15.51 N., 74.29 E         | Coffee, Tea, Cardamom, Coconut, pulses, vegetables, millets                    | Red Sandy, Sandy Loam, Clay Loam             |
Table 2: Relative abundance of Termites in various locations in Southern states

| Sl. No | Subfamily         | Species                  | Relative Abundance (%) | State (Location)                                                                 |
|--------|------------------|--------------------------|------------------------|---------------------------------------------------------------------------------|
| 1      | Macrotermitinae  | Odontotermes obesus      | 15.62                  | Tamilnadu (Coimbatore, Gudalur, Ooty, Valparai, Theni, Dindigul)                |
|        |                  | O. gurdaspurensis        | 10.04                  | Karnataka (Bangalore, Bagalkot, Chikkaballapur, Chintamani, Hubli, Mysore)     |
|        |                  | Odontotermes longignathus| 10.21                  | Karnataka (Bangalore, Belgaum, Chikamagalur, Udupi, Mangalore)                 |
|        |                  | Odontotermes – wallonensis| 8.31                  | Karnataka (Thirthahalli, Chikmagalur, Bagalkot, Belgaum)                       |
|        |                  | Odontotermes Holmgren   | 13.24                  | Karnataka (Belgaum, Mudhigere, Sirsi)                                         |
|        |                  | Microtermes mycophagus   | 2.78                   | Karnataka (Bangalore Sringeri, Shivamoga, Thirthahalli, Sirsi)                 |
|        |                  | Hypotermes makhamensis   | 1.72                   | Karnataka (Mysore, Mandy, Gudalur)                                            |
|        |                  | Dicuspiditermes Krishna  | 1.31                   | Karnataka (Mudhigere, Sringeri, Sirsi)                                        |
|        |                  | Microtermes obesi        | 1.72                   | Karnataka (Udupi, Mangalore, Bagalkot)                                         |
|        |                  | Hypotermes xenotermitis  | 1.72                   | Tamilnadu (Uddanpatti, Dindigul, Ooty)                                         |
| 2      | Nasutitermitinae | Nasutitermes sp.         | 1.72                   | Karnataka (Sirsi, Sringeri Shivamoga)                                         |
|        |                  | Nasutitermes octopilis   | 6.66                   | Tamilnadu (Ooty, Theni, Dindigul)                                             |
|        |                  | Nasutitermes exitiosus   | 11.62                  |                                                                                  |
| 3      | Apicotermitinae  | Euhamitermes hamatus     | 6.62                   | Karnataka (Bangalore, Chikkaballapur, Daddaballapur)                           |
| 4      | Kalotermitidae   | Neotermes koshunensis    | 6.62                   | Tamilnadu (Dindigul, Theni, Ottanchatram)                                     |

Table 3: Percentage of Termites in South Indian states

| S. No. | Subfamily       | Abundance (%) |
|--------|-----------------|---------------|
| 1      | Macrotermitinae | 66.66         |
| 2      | Nasutitermitinae| 20.10         |
| 3      | Apicotermitinae | 6.62          |
| 4      | Kalotermitidae  | 6.62          |
Fig. 1: Percentage occurrence of more prevalent Termites of subfamily Macrotermiteinae in the states of South India.

Fig 2. Percentage abundance of major termite sub families across the states.
CONCLUSION

The study on diversity and abundance of subterranean termites in the states of Andhra Pradesh, Kerala, Karnataka and Tamilnadu revealed that species of sub family Macrotermitinae, the fungus growing termites, occurred in greater abundance than others. The soil type, cropping pattern and topography influenced the diversity.

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REFERENCES

Ackerman, I. L., Constantino, R., Glauch, J. R. H. G., Lehmann, J., Riha, S. J., & Fernandes, E. C. M. (2009). Termite (Insect: Isoptera) species composition in a primary rain forest and agroforestry in Central Amazonia. *Biotropica*. 41, 226–233.

Ali, M., Sial, N., Ashraf, S., & Hasanat, A. (2013). A survey of subterranean termite (Isoptera) fauna and its population diversity in district Bahawalpur. *Stard. Sci. Res. Essays. 1*, 289–293.

Anantharaju, T., Kaur, G., & Lakshmi, G. (2014). Sampling and identification of termites in Northeastern Puducherry. *J. Ent. Zool, Studies*. 2, 225-230.

Basu, P., Blanchart, E., & Lepage, M. (1996). Termites (Isoptera) community in the Western Ghats, South India: Influence of anthropogenic disturbance of natural vegetation. *Eur. J. Soil Biol*. 32,113–121.

Bignell, D. E. (2000). Termites in ecosystems, Pp. 363–387. In Bignell, A.T., Higashi, D. E., & Kluwer, M. (eds.), Termites-Evolution, Sociality, Symbioses, Ecology. Kluwer Academic Publishers, Dordrecht, The Netherlands.

Blanchart, E., & Julka, J. M. (1997). Influence of forest disturbance on earthworm (Oligochaeta) communities in the Western Ghats (South India). *Soil Biol. Biochem*. 29, 303–306.

Chottani, O. B. (1997). The Fauna of India and the Adjacent Countries: Isoptera (Termites) II. Zoological Survey of India, Calcutta.

Davies, R. G., Hernandez, L. M., Eggleton, P., Didham, R. K., Fagan, L. L., & Winchester, N. N. (2003). Environmental and spatial influences upon species composition of a termite assemblage across neotropical forest islands. *J. Trop. Ecol*, 9, 509-524.

Dawes, T. Z. (2010). Impacts of habitat disturbance on termites and soil water storage in the tropical Australian Savanna. *Pedobiologia*. 53, 241–246.

Deivendran, T. (2013). Genetic Diversity in the soldiers of the Subterranean Termite Macrotermes convolutionarius (Konig, 1779) Termitidae, Isoptera. *Int. J. Adv Lif Sci*. 6, 318-324.

Eggleton, P., Homathevi, R., Jeeva, D., Jones, D. T., Davies, R. G., & Maruati, M. (1997). The species richness and composition of termites (Isoptera) in primary and regenerating lowland dipterocarp forest in Sabah, east Malaysia. *Ecotropica*. 3, 119–128.

Eggleton, P., & Tayasu, I. (2001). Feeding groups, lifetypes and the global ecology of termites. *Ecol Res*.16, 941–960

Evans, T. A., Dawes, T. Z., Ward, P. R., & Lo, N. (2011). Ants and termites increase crop yield in a dry climate. *Nat. Commun*. 2, 262.

Ferry, B. (1992). Distribution of the important litter decomposing termites (Isoptera) in the Western Ghat forest of Karnataka (India). *Pedobiologia*. 36, 193–211.
Hemachandra, J., Edirisinghe, P., Karunaratne, W. A. I. P., & Gunatileke, C. V. S. (2010). Distinctiveness of termite assemblages in two Fragmented Forest types in Hantane hills in the Kandy district of Sri Lanka. *Ceylon J. Sci. (Biological Sciences)*. 39(1), 11-19.

Inoue, T., Takematsu, Y., Yamada, A., Hongoh, Y., Johijima, T., Moriya, S., Somnuwat, Y., Vonkaluang, C., Obkuma, M., & Kudo, T. (2006). Diversity and abundance of termites along an altitudinal gradient in Khao Kitchagoot National Park, Thailand. *J. Tropic. Ecol.* 22, 609-612.

Jones, D. T., & Eggleton, P. (2000). Sampling termite assemblages in tropical forests: Testing a rapid biodiversity assessment protocol. *J. Appl. Ecol.* 37, 191–203.

Jouquet, P., Dauber, J., Lagerlo, J., Lavelle, & Lepage, M. (2006). Soil invertebrates as ecosystem engineers: Intended and accidental effects on soil and feedback loops. *J Apsoil* 32, 153-164.

Kalleshwaraswamy, C. M., Nagaraju, D. K., & Viraktamath, C. A. (2013). Illustrated identification key to common termite (Isoptera) genera of south India. *Biosystematica*. 7, 11–21.

Kumar, D., & Pardeshi, M. (2011). Biodiversity of Termites in Agro-ecosystem and relation between their Niche Breadth and Pest Status. *J. of Ento.* 8, 250-258.

Luke, S. H., Fayle, T. M., Eggleton, P., Turner, E. C., & Davies, R. G. (2014). Functional structure of ant and termite assemblages in old growth forest, logged forest and oil palm plantation in Malaysian Borneo. *Biodivers. Conserv.* 23, 2817–2832.

Menon, S., & Bawa, K. S. (1997). Applications of Geographic Information Systems (GIS), remote sensing, and a landscape ecology approach to biodiversity conservation in the Western Ghats. *Curr Sci.* 73,134–145.

Murthy, K. S., Rajeshwari, R., Ramya, R., Venkatesan, T., Jalali, S. K., & Vergehese, A. (2015). Genetic diversity among Indian termites based on mitochondrial 12S rRNA gene. *Euro J Zool Res*. 4, 1-6.

Pardeshi, M., & Prusty, B. A. K. (2010). Termites as ecosystem engineers and potentials for soil restoration. *Curr. Sci.* 99, 11–11.

Pratiknyo, H., & Setyowati, E. A. (2020). Short Communication: The diversity of termites along the altitudinal gradient in a Karst Area of Southern Gombong, Central Java, Indonesia. *Biodiversitas*. 21, 1730-1734.

Parween, T., Bhandari, P., & Raza, S. K. (2016). Survey and identification of termite in some selected parts of India. *Res. J. Life Sci. Bioinform. Pharma, Chem Sci.* 2(4), 122-134.

Rao, N., Sravanthy, A. C., & Chinta, S. (2012). Ecology and Diversity of Subterranean Termites in Bhadrachalam Forest Region, Andhra Pradesh, India. *AGRES–An Int. e-J*. 1(3), 244-250.

Roonwal, M. L., & Chhotani, O. B. (1989). Fauna of India-Isoptera (Termites). I. Zoological Survey of India Publication, Calcutta, 672 pp.

Roonwal, M. L., & Bose, G. (1978). Vegetational distribution of termites of Rajasthan (India) and their economic importance. *Proc. Ind., Nat. Sci. Academy (B)*, 44(5), 320-329.

Shanbhag, R. R., & Sundararaj, R. (2013). Assemblages and species diversity of wood destroying termites in different land use systems in Western Ghat, India. *J. Forest Res.* 24, 361–364.

Sugimoto, A., Bignell, D. E., & Macdonald, J. A. (2000). Global impact of termites on the carbon cycle and atmospheric trace gases, Pp. 409–435. In Bignell, A. T., Higashi, D. E., & Kluwer, M. (eds.), Termites: Evolution, Sociality, Symbioses, Ecology. Kluwer.
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Academic Publishers, Dordrecht, The Netherlands.

Varma, R. V., & Swaran, P. R. (2007). Diversity of termites in a young eucalypt plantation in the tropical forests of Kerala, India. *Int. J. Trop. Insect Sci.* 27, 95–101.

Vidyashree, A. S., Kalleshwaraswamy, C. M., & basappa, S. (2018). Termites (Isoptera) fauna in Western Ghats, India. *Agric International.* 5(1), 20-23.

Vidyashree, A. S., Kalleshwaraswamy, C. M., Mahadeva Swamy, H. M., Asokan, R., & Adarsha, S. K. (2018a). Morphological, molecular identification and phylogenetic analysis of termites from Western Ghats of Karnataka, India. *J. Asia-Pacific Ento.* 21(1), 140-149.

Wang, C., Zhou, X., Shujuan, L. I., Schwinghammer, M., Scharf, M. E., Buczkowski, G., & Bennett, G. W. (2009). Survey and Identification of Termites (Isoptera: Rhinotermitidae) in Indiana. *Ann. Entomol. So. Am.* 102(6), 1029-1036.