ECOLOGY AND DIVERSITY OF SUBTERRANEAN TERMITES IN BHADRACHALAM FOREST REGION, ANDHRA PRADESH, INDIA

NAGESWARA RAO, A., CH. SRAVANTHY AND SAMMAIAH CHINTA *

ENVIRONMENTAL BIOLOGICAL LAB
DEPARTMENT OF ZOOLOGY, KAKATIYA UNIVERSITY
WARANGAL- 506009, ANDHRA PRADESH, INDIA

***E-mail: drapkanagesh@gmail.com**

ABSTRACT

Biodiversity study in forest ecosystems is very important to understand species composition of Insects. In order to study the ecology and biodiversity of termites in forest ecosystem an attempt was made from June-2008 to December 2010 in Bhadhrachalam forest region of Khammam district, Andhra Pradesh. During this period, 13 termite species were observed and identified, which are belong to 5 genera of 2 families. All pest species were common and dominant in the study area.

KEY WORDS: Biodiversity, Bhadrachalam forest region, ecology, termites

INTRODUCTION

Termites are soil animals, which are super-abundant in the tropical and subtropical regions. They can also be found widely spread in some areas of temperate and occasionally occur in semi-arid environment (Lee and Wood, 1971; Wood and Sand, 1978; Swift et al., 1979; Josens, 1985; Wilson, 1990). This extraordinary abundance of termites is the result of their highly developed social organization (Noirot, 1989; Wilson, 1990; Nalepa, 1994) and symbiosis with microorganism (Martin, 1987; Wood and Thomas 1989; Breznak and Brune, 1994).Termites play an important role of super-decomposer (Matsumoto and Abe, 1979; Collins, 1981; Collins, 1983) and carbon-nitrogen balancer in the tropical terrestrial ecosystems of which they are a biotic constituent (Higashi *et al.*, 1992), thus forming the basis for a large food web (Lapage, 1981). Termites are also named as ecosystem engineers (Jones *et al.*, 1994; Lawton, 1994), that modify the soil structure by constructing mounds and subterranean nests (Lee and Wood, 1971) providing many species of animals and plants with diverse habitats (Glover *et al.*, 1964).

An attempt, therefore, deals with the ecology and diversity of termites on forest ecosystem was made from June 2008 to December 2010 in Bhadhrachalam forest region in Andhra Pradesh.

MATERIAL AND METHODS

The present investigation was carried out in Bhadrachalam forest region, Khammam district in Andhra Pradesh, India, It lies in between 17°36', and 18°38', North latitudes and 80°21'

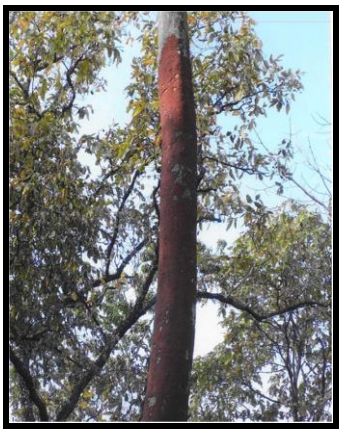
East of Greenwich longitudes. Quantitative survey of the termites in Bhadrachalam forest region was conducted during June 2008 to December 2010. Due to the variability in size and location of the termite colonies, a quadrate method was used to quantify the abundance of subterranean termite colonies in forest areas.

The study of termite diversity and other ecological data were randomly surveyed for termites during three seasons of the year. Intensive observations were made on ground, trees, branches, twigs and dead stumps for presence of termites. Tunnels, foraging trials on ground, trees or under leaves and debris were also searched. Information in relevant to the specimen collected were recorded in writing and also photographed. Specimens were preserved in 80 % alcohol for further studies. Soldiers play an important part in the termite classification and identification of species. More efforts were made to collect soldier caste. All individuals of worker caste were also collected by keeping infested object on big white hard paper sheet. For the identification of termites, the scheme of Roonwall and Chhotani (1989) and Chhotani (1997) was used, which is more acceptable and seems to be more practical and satisfactory in India context (Rathore and Bhattacharya, 2004).

RESULTS AND DISCUSSION

Termites play an important role in the ecosystem and some species certainly improve the fertility of soil (Pearce, 1997). At the same time, some species cause extensive damage to woodworks in buildings and agricultural crops in many other countries of the world (Sen- Sarma *et al*., 1975, Akhtar, 1983, Akhtar and Shahid, 1988, Akhtar and Shahid, 1990). Termite fauna of the world is estimated to be around 2,761 species, distributed over 11 families and 283 genera (Miles), Indian termite fauna shares a very small portion of the global fauna, i.e., 240 species (9% species), 37 genera (13%) of generic strength and 7 families (64%) of the total families. During the present study, 13 species of 5 genera belonging to 2 families were recorded and the results were tabulated in Table 1. In this study the termite species were collected from different trees, mounds, the fallen tree pieces of logs, dead tree stumps, twigs of more than two cm in diameter (woody debris) on the forest floor in the Bhadrachalam forest area.

Terminalia tomentosa

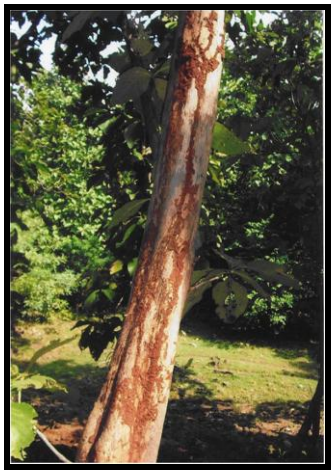


Terminalia alta

Anogeissus latifolia

Foraging earthen sheet of *Odontotermes obesus*

Xyliaxylocarpia



Tectona grandis

Foraging earthen sheet of *Odontotermes guptai*

Foraging earthen sheet of *Odontotermes brunneus* on *Miliusa tomentosa*

Damage of *Coptotermes hemi* on *Cleistanthus collinus*

The identified termite species were belonging two different families of Termitidae and Rhinotermitidae. The family Termitidae represents with 11 speceis viz., *Odontotermes boveni* (Thakur), *Odontotermes brunneus* (Hagen), *Odontotermes feae* (Wasmann), *Odontotermes guptai* (Roonwal and Bose), *Odontotermes indicus* (Thakur), *Odontotermes obesus* (Rambar), *Odontotermes redemanni* (Wasmann), *Odontotermes wallonensis* (Wasmann), *Macrotermes convulsionaries* (Konig), *Microceretermes beesoni* (snyder) and *Microtermes obesi* (Wasmann).

The family Rhinotermitidae was consist two different species of *Coptotermes hemi* (Wasmann), *and Heterotermes indicola* (Wasmann) in their distribution.

The study on termite biodiversity has been done by number of workers. Termite fauna in Pakistan is fairly well known and 50 species of termites have been recorded so far (Akhtar,

1974). Detailed studies about the abundance of different species of termites in different habitats have not been carried out. Akhtar and Sarwar (1997) reported four species of termites, i.e. *Odontotermes boveni*, *O. guptai*, *Macrotermes convulsionaries* and *M. obesi, population* in wheat crop, from Bahawalpur division. Noirot, 1990, Wilson, 1990, Nalepa, 1994 and Glover *et al.,* 1964 were also recorded similar results in their study

CONCLUSION

Thirteen (13) termite species were observed and identified, which are belong to 5 genera of 2 families. All pest species were common and dominant in the study area.

REFERENCES

Akhtar, M. S. (1983) "Wood destroying termites (Isoptera) of Pakistan: Key to the most important species, their distribution and pattern of attack", *Material U. Organismen*, **18**: 277-291.

Akhtar, M. S. and Shahid, A. S. (1988) "Studies on the population density of *Odontotermes lokanadi*, Chatterjee and Thakur in the New Campus area, Lahore", *Pakistan J. Zool.*, **20**(2), 177-189.

Akhtar, M. S. and Shahid, A. S. (1990) "Termite (Isoptera) population and damage in Sugarcane fields at Manga Mandi, Lahore, Pakistan" *Proc. Pakistan Congr. Zool*., 10, 43-53.

Breznak, J. A. and Brune, A. (1994).Role of micro organisms in the digestion of lignocelluloses by termites. Annual Review of Entomology 39, 453-487.

Chhotani, O. B (1997).. Fauna of India – Isoptera (Termites) Vol. 2 Academic Press., Zoological survey of India London, New York, pp: 800

Collins, N. M, (1981). The role of termites in the decomposition of wood and leaf litter in the southern Guibea Savanna of Nigeria.Oecologia 51, 339-389.

Collins, N. M. (1983). The utilization of nitrogen resources by termites (Isoptera). in : Sutton, S.L., Whitmore, T.C. and Chadwick, A.C. (eds.) *Tropical Rain Forest : Ecology and Management*. Blackwell, Oxford. Pp. 381-412.

Glover, P. E., Trump, E. C. and Wateridge, L. E. D. (1964). Termitaria and vegetation patterns of the loita plains of Kenya. Ecology 52: 367-377.

Higashi, M., Abe, T. and Burns, T. P. (1992). Carbon-Nitrogen balance and Termite ecology proceedings of The royal Society of London. Biological science 249, 303-308.

Jones, C. G., Lawton, J. H. and Shachak, M. (1994). Organisms as ecosystem engineers. Oikos 69, 373-386.

Josens, G. (1985). The soil fauna of Tropical Savanna III. 'The Termites' in: Bourliere, F. (ed.) Ecosystems of the World. Vol.13. Elsevies, Amsterdam. pp. 505-524.

Lapage, M. G. (1981). L'impact des populations recoltantes de *Macrotermes Michael seni* (sjostett) Isoptera *Macrotermetenae* Insects Sociaux 28, 247-262.

Lawton, J. H. (1994). What do species do in ecosystem? Oikos 71, 367-374.

Lee, K. E. and Wood, T. G. (1971). Termites and soils, Academic Press, New York.

Martin, M. M. (1987). Invertebrate Microbial Interactions, Ingested Fungal Enzymes in Arthopod Biology. Cornell University Press, Itaca.

Matsumoto, T. and Abe, T. (1979). Theroleof termites in an equatorial rain forest ecosystem of west Malaysia II leaf litter consumption on the forest floor. Oecologia 38, 261-274.

Nalepa, C. A. (1994). Nourishment and the origin of termite sociality. In "nourishment and evolution in insect societies" in: Hunt, J.H. and Nalepa, C.A. (eds.) *Nourishment and Evolution in Insect Societies*. Westview Press Boulder, Co. pp. 57-104.

Noirot, C. (1989). Social structure in Termite societies. Ethology Ecology and Evolution 1, 1-17.

Pearce, M. J (1997). Termites, Biology and Pest Management. CAB International, Willing Ford UK, pp: 172.

Rathore, N. S. and. Bhattacharya, A. K (2004). Termite (Insect-Isoptera) fauna of Gujarat and Rajastan, Present state of Knowledge, Occasional Paper No.223. pp: 94.

Roonwall, M. L and Chhotani, O. B. (1989). Fauna of India (Isoptera) ZSI, I: 672-673.

Sen-Sarma, P. K., Thakur, M. L., Misra, S. C. and Gupta, B. K. (1975) "Studies on wood destroying termites in relation to natural termites resistance of timber" *Final Technical Report, PL-480 Project No. A7-FS-58, Grant No.FC-IN-377*, pp. 1-87.

Swift, M. J., Heal, O. W. and Anderson, J. M. (1979) Decomposition in Terrestial Ecosystem. Blackwell Scientific, Oxford.

Wilson, E. O. (1990) Success and dominance in ecosystems: the case of the social insects, Ecology Institute. Oldendorf Luhe, Germany.

Wood, T.G. and Sand, W.A. (1978). The Role of Termites in ecosystem, in: Brain, M.V. (ed.) *Production Ecology of Ants and Termite.* Cambridge University Press, Cambridge. Pp. 245-292.

Wood, T.G. and Thomas, R. J. (1989). The mutualistic association between Macrotermiteneae and Termitomyces. In. insect fungus interactions in: (Wilding, N., Collins, N.M., Hammond, P.M. and Webber, eds) pp. 69-92 Academic press. London.

Table 1: Diversity of termite species recorded in the Bhadrachalam forest region

Family	Sub Family	Name of the Species
Termitidae	Macrotermitinae	*Odontotermes boveni (*Thakur)
		*Odontotermes brunneus (*Hagen)
		Odontotermes feae (Wasmann)
		Odontotermes guptai (Roonwal and Bose)
		*Odontotermes indicus (*Thakur*)*
		Odontotermes obesus (Rambur)
		*Odontotermes redemanni(*Wasmann)
		Odontotermes wallonensis (Wasmann*)*
		Macrotermes convulsionaries (Konig) *Microtermes obesi(* Holmgren)
	Termitinae	*Microcerotermes beesoni (*Snyder)
Rhinotermitidae	Coptotermitinae	*Coptotermes hemi* (Wasmann)
	Heterotermitinae	*Heterotermes indicola (*Wasmann)

[MS received July 3, 2012] ***[MS accepted August 8, 2012]***