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RESEARCH ARTICLE

MACROINVERTEBRATE ASSEMBLAGE PATTERN ON LITTER BAGS IN AN INTERMITTENT POND OF SOUTH INDIA

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ABSTRACT

The present investigation was carried out on leaf litter bags in on intermittent pond .The leaves were studied in on intermittent pond at Pullamuthur village in Thirumangalam Taluk of Madurai District, Tamil Nadu. Investigation also focused on the aquatic insects in artificial leaf litter packs, colonization consisting of two plant species viz, *Ficus bengalensis* and *Thespesia populenea* and their break down. *Chirenomus sp* and *Melanoids sp* was abundant in leaf bags during the experimental period.

INTRODUCTION

The benthic of fauna form a very important source of food for insects and therefore a better understanding of their ecology are essential for evaluation of their role in aquatic productivity. In view of its present investigation was carried out covering ecological aspects like water quality and biodiversity of faunal and its importance in sustainable species composition. They are known to play a very important role in the processing and cycling of nutrients, as they belong to several specialist feeding groups such as filter-feeders, collectors, scrapers, shredders and predators (Dudgeon, 1999). The liming intervention should have encouraged the recovery of the benthic community and leaf decomposition processes were employed to assess indirectly the effectiveness of the neutralization. Two aspects of leaf processes were considered: breakdown rates and leaf colonization by macroinvertebrates. These aspects of the decomposition process are not separate, since invertebrate activity regulates the rate of detritus processing (Petersen and Cummins, 1974; Menendez *et al.,* 2001; Alvarez, 2006). This normally happens in unpolluted aquatic environments, although there is a significant reduction in the rate of breakdown processes in the bottom of lentic waters compared with streams (Webster and Simmonds, 1978; Alvarez, 2006). In fact, decay of vascular plant detritus results from several interactions between physical and chemical nature of specific leaves and the biotic and abiotic features of the environment (Petersen and Cummins, 1974; Reice, 1974; Webster and Benfield, 1986). Macroinvertebrate colonization and breakdown of leaves in an intermittent pond in south India (Dinakaran *et al.,* 2008). The species composition of intermittent pond in varies aquatic insects. The occurrence and abundance of aquatic insects in intermittent pond in ecosystem of species composition. The pond is semi-perennial natural water body used culture of Indian major fishes and aquatic insects. The pond water is also regularly irrigation used. Two species of leaf processes were considered breakdown rates and leaf colonization by macro invertebrate. Hence the knowledge on abundance composition and seasonal variations of aquatic communities help in planning and successful management of water in this way, the processes structuring aquatic insect assemblages in the different substrate type, already described. The extinction of species in South Indian tropical streams (Dinakaran and Anbalagan, 2007 & 2008) using changes in species composition, diversity and functional organization of aquatic insects, many techniques, protocols and indices have been developed recently. The objective of the present study was to study the macro invertebrate assemblage pattern on litter bags in on intermittent pond of south India.

MATERIALS AND METHODS

The Pullamuthur pond is an intermittent pond situated in the village of the Thirumangalam Taluk of Madurai District. It is

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semi-perennial man-made pond which receives rainwater from the surrounding. Geographical location of pond is $9^0$82'72" N latitude and $77^0$92'93" E longitude and the Altitude is 43± 18m.The study was conducted in the remote villages of Thriumangalam Taluk of Madurai District between August, September and October 2011. Physico-chemcial attributes of the pond are given in Table 1. Along the banks of the pond are thick strands of trees and shrubs, whose leaves are the pond's principal source of organic detritus and the dominant riparian tree species are *Ficus bengalensis* and *Thespesia populenea*.

Table 1. Physico-chemical parameters of the pond during experimental period

Parameter	
Air temperature °C	31.8 ± 0.2
Water temperature °C	28.83 ± 0.02
pH	9.04 ± 0.13
Conductivity (μ^s)	8.14 ± 0.1
TDS (mgl^{-1})	5.74 ± 0.25
Salinity (ppm)	3.80 ± 0.002
Transparency (cm)	25.16 ± 1.2
Dissolved oxygen (mgl^{-1})	6.393 ± 0.25
Depth (m)	2.05 ± 0.001
Total surface area of pond (m)	240 ± 3.46

Freshly fallen leaves of two plant species (*F. bengalensis* and *T. populenea*) were collected from the study site. The collected leaves were dried at room temperature for two days and weighed into 15g fresh mass and placed in nylon mesh bags with a mesh size of 10mm (Dinakaran *et al.*, 2008). Twenty-one bags were randomly taken and secured at the bottom of the pond. Three bags were taken from pond after every 2, 4, 8, 16, 32, 48 and 64 days and brought to the laboratory in countable species. Leaves were removed from the litterbags and individually rinsed to remove sediments and invertebrates. The macro invertebrates associated with leaves were gently washed, then sorted according to taxon and functional role (Cummins, 1974) and enumerated.

RESULTS

Overall, 595 specimens representing 6 taxa were collected from leaf litter of two species (*F. bengalensis* and *T. populenea*). *Chironomus sp* were, high percentage in *F. bengalensis* and *Melanoides sp* were high percentage is *T. populenea* than other taxonomic groups *Chironomus sp*, the larvae of *Chironomus sp* were high numbers (n=125) in *F. bengalensis* and Gastropoda (*Melanoidea sp* & *Bithynia sp*, n=90) were high numbers in *T. populenea* (Fig.1). The results reflected that the importance of litter as a source of food and total densities of macro invertebrates of major taxo were greater in leaf litter of *F. bengalensis*. Both taxo were frequently collected throughout the experimental period in leaf litter of both species. *Deptera* were high percentage in *F. bengalensis* and *Gastropoda* were high percentage in *T. populenea* than other taxonomic groups (Fig.2). *Chironomus sp, Melanoides sp, Bithynia sp, Procloen sp, Coenagnion pulla sp* and *Orectochilus sp* were high in *F. bengalensis.* (Fig.2) Colonization of *Chironomus* sp was high (n = 20 – 25) on 4^{th} day and 64^{th} day and scarce in 2^{nd}, 8^{th}, 16^{th}, 32^{nd}, and 48^{th} days. Colonization of *Bithynia* and *Melonoids* sp was high (n = 18 – 22) on 16^{th} and 64^{th} day. Colonization of *procloean* sp, *Orectochilus* sp & *Coenagnion pulla* sp was scarce in 2^{nd}, 4^{th}, 8^{th}, 16^{th}, 32^{nd}, 48^{th} and 64^{th} days in *F. bengalensis.* Colonization of *Chironomus* sp, *Bithynia* sp & *Melanoides* sp, *Procloean* sp, *Orectochilus* sp and *Coenagnion pulla* sp was scarce in *T. populenea*.

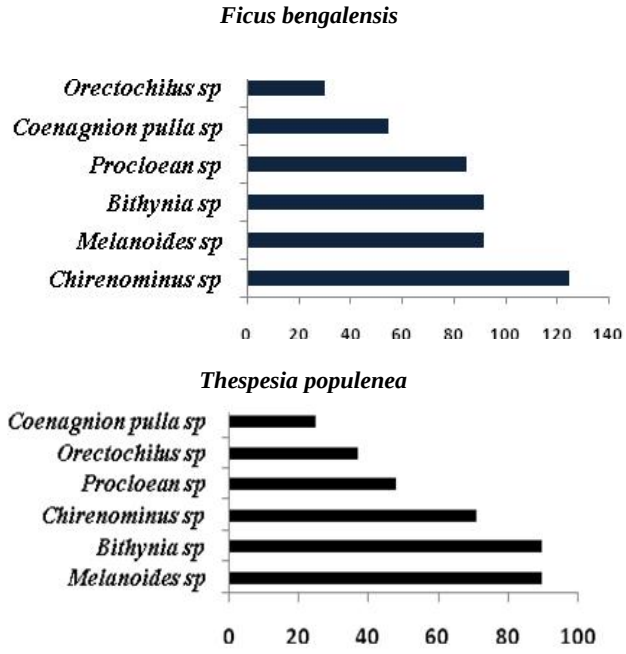

Fig. 1. The six most abundant taxo associated with leaf litter

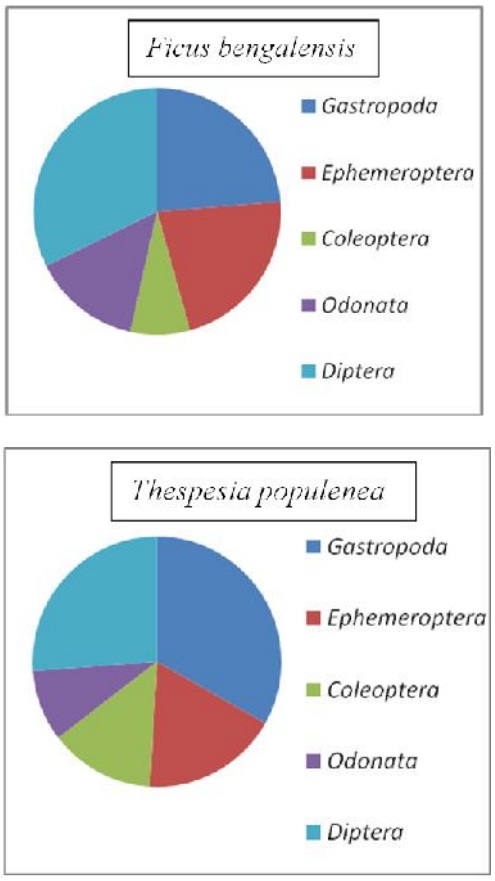

Fig. 2. Percentage of taxonomic groups inhabiting leaf litter

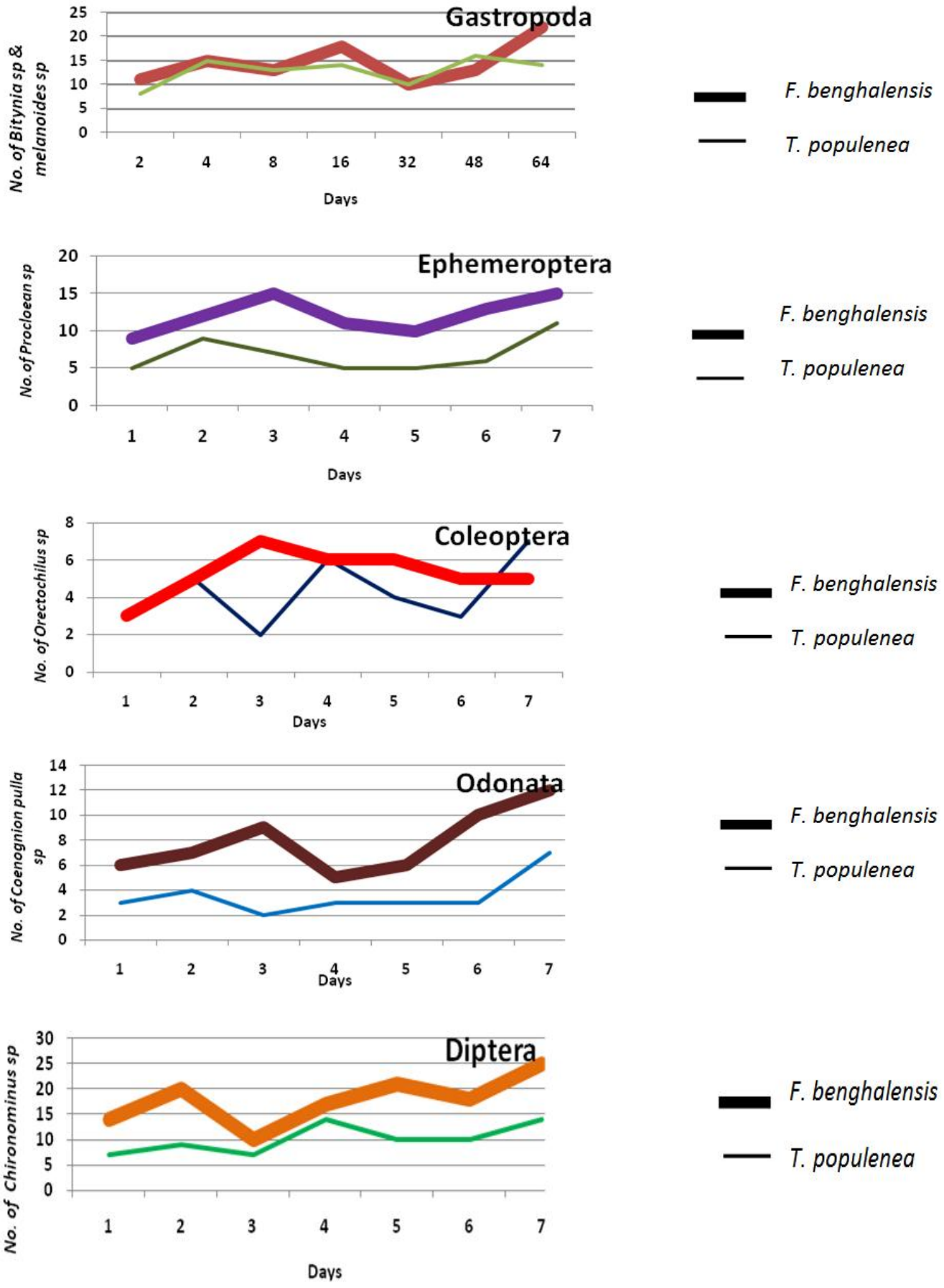

Fig. 3. Abundance of macroinvertebrates in two species of leaf litter during experimental period

DISCUSSION

Marked variation was observed in the species composition and population number in both ponds. Further were was zonal variation in shore bottom and mittle bottom zones observed under present study which agree with the investigation made by Krishnamoorthy (1966).This indicates that *F. bengalensis* from a palatable litter, which served mainly as a food source and thus supported high densities of macro invertebrates. Contrarily lower densities of macro invertebrates associated with litter of *T. populenea* indicated lesser palatability of its leaf and therefore may be useful as a substrate. Similar results have been reported in other studies where the colonization of palatable and non palatable leaves has been compared in streams (Winterboun, 1978; Dobson *et al*., 1992; Dudgeon and Wu1999). This result reflects the fact that leaf litter in a tropical stream May Serve as food or substrate for macro invertebrates (Dudgeon and Wu, 1999). In tropical countries where many leaf types of varying palatability and defensive compounds are present (including a greater proportion of condensed tannins: Stout, 1989), the patch–specific response of faunal densities to changes in the total amounts of the compounds can be expected to be rather weak, and macro invertebrates abundance is unlikely to correlate closely with litter biomass.

Leaves and other coarse particulate detritus are used as feed by macroinvertebrates (Cummins *et al*., 1989). In south India organic detritus enters the pond all through the year but a substantial proportion of the annual input from riparian trees at circumference pond occurs during April and May 2011. Deciduous leaves are clearly a major food inputs to Semi-perennial is an intermittent ponds. The rate at which these leaves decompose and enter the food web depends on a number of factors and processes viz., resistance to physical abrasion (by flow, sand and silt particles), chemical composition and susceptibility to chemical leaching, pond temperature following microbial activity and the feeding activity of aquatic macro invertebrates. The present investigation shows considerable variability among species in the rate at which leaves leach and decompose once they have fallen into Semi-perennial is an intermittent pond. For example, *F. bengalensis* leaves lost about 30%of their mass after being submerged for 64 days in pond water, whereas *T. populenea* leaves only lost about 20% during the same period. Leaf weight loss during this experiment was probably due to microbial activity because leaves kept in sterile pond water for control purpose only lost about 4-9% of their mass during the same period. In the present study, *Chironomus* sp greatly reduced the decomposition time of *F. bengalensis* leaves by scraping at the end of the second week. In contrast, the larvae had little or no measurable effect on the rate of decomposition of *T. populenea* leaves because they were not readily ingested. Vass *et al*. (1977) recognized red *chironomus* as pollution indicator in Dal Lake. Das (1978) recorded high population of *chironomus* larvae in Nainital Lake even in polluted region and suggested that these larvae larvae may be considered as pollution indicator High population of *chironomus* larvae observed throughout from the different zones of the ponds under present study supports the findings of Vass *et al*. (1977), Das (1978) and Shyam and Vass (1988).

The present investigations are inconclusive but suggest that understanding the relationship between macro invertebrate and litter in tropical semi-perennial is an intermittent pond. Although pond ecosystem in south India have been subjected by humans to a vast array of perturbations (altered physical, chemical and biological characteristics), the most severe perturbation may have been the extensive removal of riparian trees from the boundaries of ponds and lakes. This litter input studies are needed for understanding the role of detritus in the food webs of semi-perennial is an intermittent pond ecosystem.

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REFERENCES

Alvarez, J.A. and E. Becares, 2006. Seasonal decomposition of *Typha latifolia* in the freshwater surface constructed *wetland. Ecol. Eng.*, 1038, 1-7

Cummins, K.W, 1974. Structure and function of stream ecosystems. *Biosci.*, 24, 631-641

Cummins, K.W., M.A. Wilzbach, D.M. Gates, J.B. Perry and W.B. Taliaferro,1989. Shredders and riparian vegetation. *Biosci.*, 39, 24-30

Das, S.M. 1978 High pollution in lake Nainital U.P. as evidenced by biological indicator. *Sci. and Cult*.44:236-237

Dinakaran. S and S. Anbalagan, 2008. Macro Invertebrate colonization and break down of leaves in an astatic pond in South India. *J. Enviorn. Biol.*, 29(2), 249-252

Dobson, M., A.G. Hildrew, A. Ibbotson and J. Garthwaite, 1992. Enhancing litter retention in streams: Do altered hydraulics and habitat area confound field experiments? *Freshwater Biol.*, 28, 71-79

Dudgeon, D, 1999. Tropical Asian Streams: Zoobenthos, Ecology and Conservation. Hong Kong University Press, Hong Kong

Dudgeon, D. and K.K.Y. Wu, 1999. Leaf litter in tropical stream: Food or substrate for macro invertebrates? *Arch. Hydrobiol.*, 146, 65-82

Krishnamoorthy, K.N. 1966. Preliminary studies on the bottom macrofauna of the Tungabhadra reservoir.*Proc. Ind.Acad.Sci*.B.63:96-103

Menendez, M., M. Martnez, O. Hernandez and F. Comin, 2001. Comparison of leaf decomposition in two Mediterranean rivers: A large eutrophic river and an oligotrophic stream (S. Catalonia, N.E. Spain). *Int. Rev. Hydrobiol.*, 86, 475-486

Petersen, R.C. and K.W. Cummins, 1974. Leaf processing in a Woodland stream. *Freshwater Biol.*, 4, 343-368

Reice, S.R,1974 Environmental patchiness and the breakdown of leaf litter in a woodland stream. *Ecol.*, 5, 1271-1281

Shyam, S. and K.K. Vass, 1988. Seasonal dynamics of benthos in some Kashmir lake. *Proc Nat.Acad. Sci India*.58(B):193-203

Stout, R.J, 1989. Effects of condensed tannins on leaf processing in mid-latitude and tropical streams: A theoretical approach. *Can. J. Fish. Aquat. Sci.*, 46, 1097-1106

Vass, K. K., S. Sunder and R. K. Langer, 1977. Pollution indicators of Dal lake Kashmir. *Proc.Ind.Sci.Congr*.Part-111,183

Webster, J.R. and E.F. Benfield, 1986. Vascular plant breakdown in freshwater ecosystems. *Ann. Rev. Ecol. Syst.*, 17, 567-594.

Webster, J.R. and G.M. Simmonds, 1978. Leaf breakdown and invertebrate colonization on a reservoir bottom. *Verh. Int. Ver. Limnol*., 20 1587-1596

Winterboun, M.J. 1978. an elevation of the mesh bag method for studying leaf colonization by stream invertebrates. *Verh. Int. Ver. Limnol*., 20 1557-1561

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