

## PRELIMINARY OBSERVATIONS ON THE ROLE OF THREE SOIL MACROINVERTIBRATES IN THE BREAK DOWN OF THE LEAF LITTER IN A GARDEN NEAR CALCUTTA

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### INTRODUCTION

Soil dwelling macroinvertebrates include earthworms, land snails, Crustacea, millipeds, insects of various orders and many other invertebrates. These invertebrates help in the break down of littered organic matters either in the form of plant materials or animal matters. Directly and indirectly these animals help in the soil formation. Soil formation is a dynamic process wherein both micro and macroinvertebrates take part. Moreover, it includes weathering of parent materials, decomposition and incorporation of organic matter as well as the accretion of new materials. In these stages of soil formation soil dwelling invertebrates also play great role. The role played by earthworms is well established since the days of Darwin; in case of other invertebrates researches are going on.

In the present paper roles of the snail, *Opeas gracile* (Hutton) (Pulmonata : Subulinidae), millipede *Orthomorpha coarctata coarctata* Saussure (Diplopoda : Strongylosomidae), and the earthworm, *Perionyx excavatus* Perrier (Haplotaxida : Megascolecidae) in the process of disappearance of leaf litter in a garden at Dum Dum Park on the eastern fringe of Calcutta opposite Bidhan Nagar (Salt Lake city). have been reported.

### MATERIALS AND METHODS

Observations were made both in field and in the laboratory. For field observations a small garden, at Dum Dum Park was selected. The garden was adjacent to the residence of the second author (TRM). It was a small patch of land used for raising vegetables and ornamental plants. The garden contained following species of plants; *Clitoria ternatea* L., *Limonia crenulata* Roxb., *Hiptage benghalensis* Kurtz., *Nerium indicum* Mill., *Ixora coccinea* L., *Dolichos lablab* L., *Aegle marmelos* Corr., *Michalia champaca* L., *Bougainvillia* sp., *Capsicum* sp. *Citrus* sp., *Vinca rosea* L., *Ipomoea pes-caprae* Sw., *Hibiscus rosa-sinensis* L., *Murraya paniculata* (L) Jack, *Punica granatum* L. *Gardenis jasminoides* Ellis, *Ervatamia coronaria* Stapf., *Jasminum humile* L., *Carissa carandus* L., *Hibiscus mutabilis* L., *Tecoma capensis* Lindl.

Preferences of *Opeas gracile*, *Orthomorpha coarctata* and *Perionyx excavatus* of different ages, for leaves and parts of leaves of different species of the aforesaid plants were directly observed in the experimental field from early morning to midmorning, every day by TRM. Freshly fallen leaves as well as those under different stages of decay were kept in nylon net bags (Ladies'

hair net) and left on the soil surface tying to tree trunk with a long thread to observe the activities and succession of the macroinvertebrates on the leaves.

In the laboratory, experimental animals were kept either alone or with others, in wide mouthed glass jars half-filled with garden soil and moistened with rain and pond water. Fallen leaves were collected, dried in the air, weighed (in some cases) and moistened with pond water and offered to the animals. Activities of different animals in the experimental conditions on different species of plants, either occurring in the garden or collected from elsewhere, were recorded from 10.30 hrs to 19.30 hrs. every day. Numerical data were collected to assess the approximate quantity of biomass added.

### OBSERVATIONS

**A. In the experimental field :** In the field all species of animals, under consideration, were found to feed normally freshly fallen, etiolated or slightly decomposed leaves. Snails of different age groups were found to eat plant materials of their choice. Among millipedes immature ones played key role while in cases of earthworm there was no distinction of activities between old and young ones. They eat all available leaves which appeared to be soft and without choice. Snails and millipedes were found to prefer freshly fallen but etiolated leaves of *Clitoria ternatea*, *Limonia crenulata*, *Nerium indicum*, *Hiptage benghalensis*, *Ixora cocinea*, *Dolichos lablab*, *Capsicum sp.*, and *Citrus sp.* Semi-decomposed leaves of *Hibiscus rosa-sinensis*, *Ipomoea pes-caprae* and *Vinca rosea* were accepted by snails and millipedes. Freshly fallen green leaves of *Aegle marmelos* were often accepted by the animals.

The definite preferences in consumption of different parts of leaves by snails and millipedes were also recorded. It was found that animals prefer only the soft parts of lamina of leaves of *Clitoria ternatea*, *Limonia crenulata*, *Dolichos lab lab* and *Citrus sp.*, were eaten and the veins were left. In cases of *Hibiscus benghalensis*, *Nerium indicum*, *Ixora coccinea*, *Aegle marmelos* whole leaf was consumed leaving only the midrib. All these macro-invertebrates avidly consumed the decomposed leaves of *Hibiscus rosa-sinensis*, *Vinca rosea* and *Ipomea pes-caprae*.

**B. In the laboratory :** In the laboratory condition millipedes were not showing much interest in feeding as seriously it was doing in the field environment. Earthworms and snails showed activities identical to the natural environment. Following table (Table-1) shows the food preferences of the snail in the laboratory.

**Table 1.** Food preferences of *Opeas gracils* (Hutton)

Name of plants	Edible			Non-edible
	Fallen	Plucked	Stale or decomposed	
1. <i>Clitoria ternatea</i> L.	+	— —	+	—
2. <i>Limonia crenulata</i> Roxb.	+	— —	+	—
3. <i>Hiptage benghalensis</i> Kurz.	+	— —	+	—

Name of plants	Edible			Non-edible
	Fallen	Plucked	Stale or decomposed	
4. <i>Nerium indicum</i> Mill.	+	— —	+	—
	(Softening preferred)			
5. <i>Ixora coccinea</i> L.	+ (-do-)	— —	+	—
6. <i>Dolichos lablab</i> L.	+	— —	+	—
7. <i>Cassia sophera</i> L.	+	— —	+	—
8. <i>Aegle marmelos</i> Corr.	(Not observed)	+	+	—
9. <i>Michalia champaca</i> L.	+ (Only fleshy part of the petiole)	—	— (Lamina)	—
10. <i>Bougainvillaea</i> sp.	+	(Not observed)	+	—
11. <i>Capsicum</i> sp.	+	—	+	—
12. <i>Citrus</i> sp.	+	—	+	—
13. <i>Vinca rosea</i> L.	—	—	+	—
14. <i>Ipomoea pes-caprae</i> Sw.	—	—	+	—
15. <i>Hibiscus rosa-sinensis</i> L.	—	—	+	—
16. <i>Croton sparsiflorus</i> Morung	—	—	+	—
17. <i>Mangifera indica</i> L.	—	—	+	—
18. <i>Calotropis gigantea</i> (L) R. Br.	—	—	+	—
19. <i>Bauhinia</i> sp.	—	—	+	—
20. <i>Aralia</i> sp.	—	—	+	—
21. <i>Murraya paniculata</i> (L) Jack	—	—	—	+
22. <i>Eranthemum platiferum</i> Nees	—	—	—	+
23. <i>Ficus benjamina</i> L.	—	—	—	+
24. <i>Punica granatum</i> L.	—	—	—	+
25. <i>Gardenia jasminoides</i> Ellis	—	—	—	+
26. <i>Jasminum humile</i> L.	—	—	—	+
27. <i>Carissa carandus</i> L.	—	—	—	+
28. <i>Hibiscus inutabilis</i> L.	(Not observed)	—	(Not observed)	?
29. <i>Tecoma capensis</i> Lindl.	(Not observed)	—	(Not observed)	?
30. <i>Ervatamia coronaria</i> Stapf.	—	—	(Not observed)	?

+ : i) Consumed in cases of edible plants; ii) Not consumed in cases of nonedibles

— : i) Rejected in case of edible plants; ii) Accepted in case of nonedibles

? : Not clearly known.

Following observations were also recorded in the laboratory during the period from August to November, 1975, in additions to the above mentioned observations.

1. A mixture of dry fallen leaves of *Clitorea ternatea*, *Lemonia crenulata*, *Bougainvillia*, and *Nerium indicum* weighing 5 gms 480 mgm were given to two adult earthworms and two adult millipedes. They consumed the whole mass during the period from August 29, 1975 to September 28, 1975.

2. 2 gm 10 mgm of dry fallen leaves of *Dolichos lablab* were given to one adult earthworm. It consumed the whole in 20 days from October 5, 1975, to October 25, 1975.

3. One piece of dry fallen leaf *Dolichos lablab* was offered to two four days starving millipedes. They consumed the whole leaf in one day, from October 10, 1975 to October 11, 1975.

4. 1 gm 134 mgm of dry fallen leaves of *Ixora coccinea* were given to five snails, one earthworm and one millipedes. They took more than one month for consumption, from October 16, 1975 to November 20, 1975.

### DISCUSSION

From the above observations it is clear that snails and earthworms of all age groups play significant role in the disappearance of leaf litter. In case of millipedes the immatures play leading role. Pattern of feeding of snails and millipedes are identical.

Mitra and Biswas (1974) already showed that sometimes *Opeas gracile* help in the disappearance of animal matters. Mitra et. al. (1976) already conjectured the importance of *Opeas gracile* in the improvement of soil quality. Frömring (1960) reported that snails, *Trichia villosa*, help in the enrichment of soil with nutrients. Puh (1941) reported that earthworms help in enriching the organic materials, cation-exchange capacity, available phosphorus, potash, etc. Buckman and Brady (1969) reported that snails, slugs, millipedes, showbugs etc. initiate decomposition process. They believe that millipedes often do much work with the digestion of organic matters and forming casts, they influence the structure of the horizon. This view may be applied in the cases of animals under consideration.

### SUMMARY

The paper reports the role of the land snail, *Opeas gracile* (Hutton), milliped, *Orthomorpha coarctata coarctata* Saussure and the earthworm, *Perionyx excavatus* Perrier in the disappearance of leaf litter.

### ACKNOWLEDGEMENTS

Authors are thankful to Dr. J. R. B. Alfred, Director, Dr. G. K. Srivastava, Addl. Director of Zoological Survey of India, for facilities and encouragements in the preparation of the paper. Authors are also thankful to Dr. A. K. Sanyal, Dy. Director, of the same department for critical comments on the paper. Authors apologize for any mistake which inadvertently have escaped their notices and for which they themselves are responsible.

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