

Aphidophagous Predator diversity in Kalimpong District, India

Manashi Debnath

District Entomologist, Chief Medical Officer of Health, Purba Medinipur, West Bengal, India

***Author's E-mail:** manashi005@gmail.com

Abstract

Kalimpong, part of Eastern Himalaya have a diverse flora and aphid fauna. Aphidophagous predators are important natural enemies of aphids in these areas. Coccinellids, Syrphids and europterans are the important predators. These are abundant at altitude between 1400-2100 meters.

Keywords: Association, distribution, eastern Himalaya, predators.

Introduction

In a suitable conditions aphids are rapidly rise above the economic threshold levels. However, biotic agents mainly predators exercise a check on their rate of multiplication. Thus extensive survey of aphids along with their food plants in different seasons and their natural enemies are essential to understand their inter-relationships for the effective control of aphid species (Debnath and Chakrabarti, 2020). Natural controlling agents, including climatic conditions and several biological agents, directly and indirectly exert an important influence on the potential size of aphid populations (Ghosh and Raychaudhuri, 1977).

Kalimpong has five distinct seasons: spring, summer, autumn, winter and the monsoons. The annual temperature is 18^oC (64^oF). Summers are mild, with an average maximum temperature of 25.5^oC (77.9^oF) in August. Summers are followed by the monsoon rains

which lash the town between June and September. The monsoons are severe, often causing landslides which sequester the town from the rest of India. Winter lasts from December to February, with the minimum temperature being around 8^oC (46^oF).

Aphidophagous predators are the most important natural enemies of aphids in Eastern Himalaya. Important predators mainly Coccinellid, Syrphids, Neoptera are associated with aphids. These predators play an important role in the aphids association

Systematics of aphid and aphidological studies have been attempted and significant exploration in India were made since 1960 (Raychaudhuri and Chatterjee, 1980; Ghosh and Raychaudhuri, 1977, 1980 & 1982; Chakrabarti et al., 2012, Agarwala and Das, 2012). Here, information on the efficacy, diversity, host association, seasonal incidences as well as altitudinal variation of

the aphidophagous predator diversity is present and discussed.

Materials and Method

This account is mainly based on the reviews made on the studies on aphidophagous predator from Kalimpong district, Eastern Himalaya.

Result and Discussion

A total no of 33 aphidiphagous aphids were recorded from Kalimpong district. Among of them 23 species from Aphidinae, 4 species from Drepanosiphinae, 1 species from

Grennididae, 2 species from Hormaphidinae and 3 from Lachninae. It is about 21.02% in total aphidophagous predator found in Kalimpong. So, Kalimpong, Part of eastern Himalaya shows a great abundance of aphid predator diversity. The most diverse and greatest numbers of species of predators are associated with species of Aphidinae. Coccinellid diversity is highest number from this area. Figure. 1 shows the association of predator and aphid prey at different altitude. The predators are associated with the maximum number of species of aphid in the vegetational zone of 1400-2100 meter ranges.

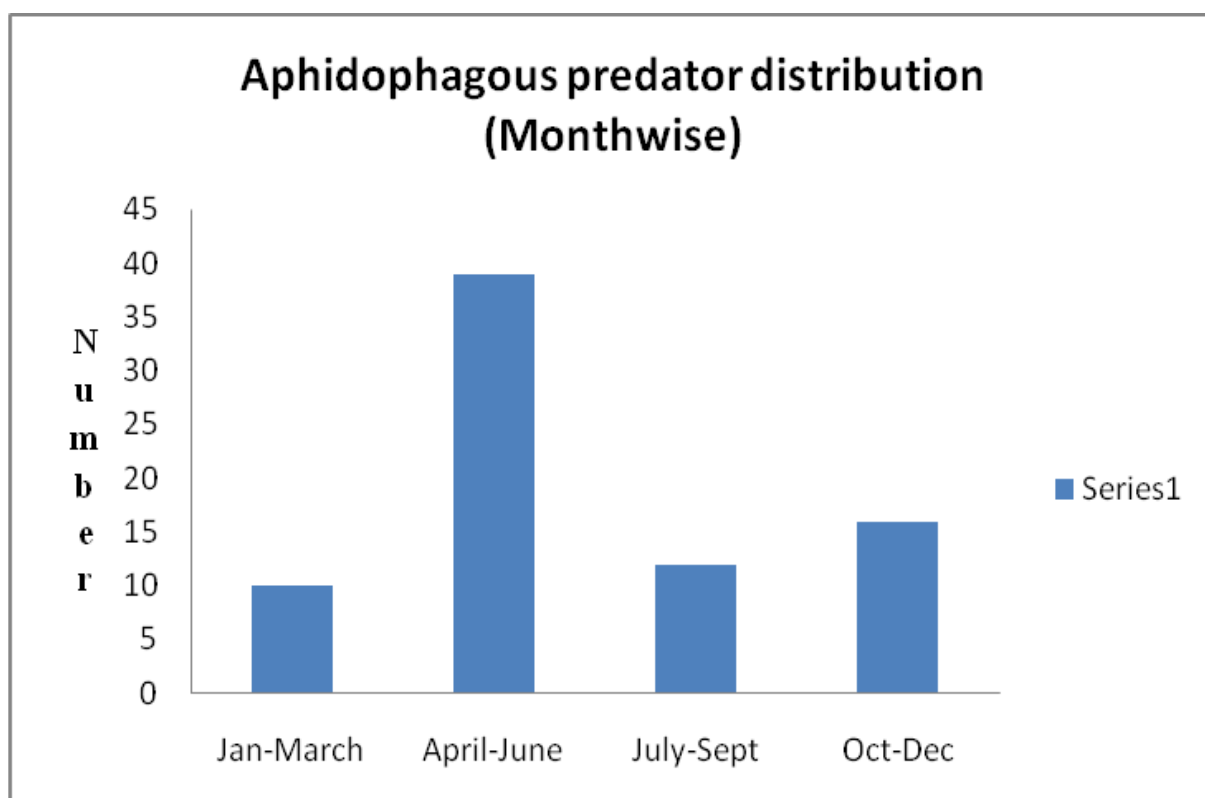


Figure 1. Month wise distribution of Predators.

In conclusion, Aphids begin an obligatory group of polyphagous insects, floral abundance & diverse ecological conditions in the hilly terrains may be regarded as important contributing factors in the origin of

aphid fauna. It may be said that the aphids are a group of most defenseless yet destructive insects showing a high degree of polymorphism.

Table 1. Distribution of Aphidophagous predators, aphid species and their host Plant in Kalimpong District, India.

Predator	Predator family	Aphid species	Host	Host Family
Aphidinae				
<i>Allograpta javana</i> (Weidmann)	Syrphidae	<i>Macrosiphum (S.) rosaeiformis</i> Das	<i>Rosa</i> sp.	Rosaceae
<i>Allograpta javana</i> (Weidmann)	Syrphidae	<i>Macrosiphum rosae</i> (L.)	<i>Rosa</i> sp.	Rosaceae
<i>Aphelinus</i> sp.	Aphelinidae	<i>Macrosiphum (S.) rosaeiformis</i> Das	<i>Rosa</i> sp.	Rosaceae
<i>Araneus</i> sp.	Araneidae	<i>Macrosiphum (S.) rosaeiformis</i> Das	<i>Rosa</i> sp.	Rosaceae
<i>Araneus</i> sp.	Araneidae	<i>Macrosiphum rosae</i> (L.)	<i>Rosa</i> sp.	Rosaceae
<i>Ballia</i> sp.	Coccinellidae	<i>Myzus persicae</i> (Sulzer)	<i>Gynura angutosa</i>	Asteraceae
<i>Ballia</i> sp.	Coccinellidae	<i>Rhopalosiphum maidis</i> (Fitch)	<i>Zea mays</i>	Poaceae
<i>Betasyrphus serarius</i> Weid	Syrphidae	<i>Aphis craccivora</i> Koch	<i>Dolichos lablab</i>	Fabaceae
<i>Betasyrphus serarius</i> Weid	Syrphidae	<i>Aphis gossypii</i> Glover	<i>Capsicum frutescens</i>	Solanaceae
<i>Betasyrphus serarius</i> Weid	Syrphidae	<i>Aulacorthum magnoliae</i> (Essing and Kuwana)	<i>Sechium edule</i>	Cucurbitaceae
<i>Betasyrphus serarius</i> Weid	Syrphidae	<i>Macrosiphum (S.) rosaeiformis</i> Das	<i>Rosa</i> sp.	Rosaceae
<i>Betasyrphus serarius</i> Weid	Syrphidae	<i>Macrosiphum rosae</i> (L.)	<i>Rosa</i> sp.	Rosaceae
<i>Chilochorus rubidus</i> Hope	Coccinellidae	<i>Macrosiphum (S.) rosaeiformis</i> Das	<i>Rosa</i> sp.	Rosaceae
<i>Chilochorus rubidus</i> Hope	Coccinellidae	<i>Macrosiphum rosae</i> (L.)	<i>Rosa</i> sp.	Rosaceae
<i>Coccenillida septumpunctata</i> (L.)	Coccinellidae	<i>Aphis citricola</i> v.d.G	<i>Capsicum frutescens</i>	Solanaceae
<i>Coccenillida septumpunctata</i> (L.)	Coccinellidae	<i>Aphis craccivora</i> Koch	<i>Vicia faba</i>	Fabeaceae
<i>Coccenillida septumpunctata</i> (L.)	Coccinellidae	<i>Aphis gossypii</i> Glover	<i>Ageratum conyzoides</i>	Asteraceae
<i>Coccenillida septumpunctata</i> (L.)	Coccinellidae	<i>Aphis gossypii</i> Glover	<i>Bidens pilosa</i>	Compositae
<i>Coccenillida septumpunctata</i> (L.)	Coccinellidae	<i>Brachycaudus helichrysi</i> (Kaltb)	<i>Artemesia</i> sp.	Asteraceae
<i>Coccinella septempunctata</i> (L.)	Coccinellidae	<i>Pentalonia nigronervosa</i> Coquerel	<i>Musa</i> sp.	Musaceae

<i>Coccinella septumpunctata</i> (L.)	Coccinellidae	<i>Aphis craccivora</i> Koch	<i>Dolichos lablab</i>	Fabaceae
<i>Coccinella septumpunctata</i> (L.)	Coccinellidae	<i>Aphis gossypii</i> Glover	<i>Capsicum frutescens</i>	Solanaceae
<i>Coccinella septumpunctata</i> (L.)	Coccinellidae	<i>Brachycaudus helichrysi</i> (Kaltb)	<i>Prunus persica</i>	Rosaceae
<i>Coccinella septumpunctata</i> (L.)	Coccinellidae	<i>Macrosiphum (S.) rosaeiformis</i> Das	<i>Rosa</i> sp.	Rosaceae
<i>Coccinella septumpunctata</i> (L.)	Coccinellidae	<i>Macrosiphum rosae</i> (L.)	<i>Rosa</i> sp.	Rosaceae
<i>Coccinella septumpunctata</i> (L.)	Coccinellidae	<i>Myzus persicae</i> (Sulzer)	<i>Solanum niagram</i>	Solanaceae
<i>Coccinella septumpunctata</i> (L.)	Coccinellidae	<i>Toxoptera</i> (B.D.Fonscolombe)	<i>aurantii</i> <i>Schima wallichii</i>	Theaceae
<i>Coccinella septumpunctata</i> (L.)	Coccinellidae	<i>Acrythosiphon pisum</i> (Harris)	<i>Pisum sativum</i>	Leguminosae
<i>Coccinella septumpunctata</i> (L.)	Coccinellidae	<i>Macrosiphum rosae</i> (L.)	<i>Rosa cania</i>	Rosaceae
<i>Coccinella septumpunctata</i> (L.)	Coccinellidae	<i>Macrosiphum rosae</i> (L.)	<i>Rosa</i> sp.	Rosaceae
<i>Coleophora bisellata</i> Mulsant	Coccinellidae	<i>Rhopalosiphum maidis</i> (Fitch)	<i>Zea mays</i>	Poaceae
<i>Coleophora bisellata</i> Mulsant	Coccinellidae	<i>Aphis craccivora</i> Koch	<i>Vicia faba</i>	Fabeaceae
<i>Coleoptora inaequalis</i> (F.)	Coccinellidae	<i>Macrosiphum</i> sp.	<i>Artemisia vulgaris</i>	Asteraceae
<i>Coleophora sexareata</i> Mulsant	Coccinellidae	<i>Macrosiphum (S.) rosaeiformis</i> Das	<i>Rosa</i> sp.	Rosaceae
<i>Coleophora sexareata</i> Mulsant	Coccinellidae	<i>Macrosiphum (S.) rosaeiformis</i> Das	<i>Rosa cania</i>	Rosaceae
<i>Coleophora sexareata</i> Mulsant	Coccinellidae	<i>Macrosiphum alni</i>	<i>Alnus nepalensis</i>	Betulaceae
<i>Coleophora sexareata</i> Mulsant	Coccinellidae	<i>Macrosiphum rosae</i> (L.)	<i>Rosa cania</i>	Rosaceae
<i>Coleophora sexareata</i> Mulsant	Coccinellidae	<i>Macrosiphum rosae</i> (L.)	<i>Rosa</i> sp.	Rosaceae

Mulsant				
<i>Coleophora sexareata</i>				
Mulsant	Coccinellidae	<i>Macrosiphum (S.) rosaeiformis</i> Das	<i>Alnus nepalensis</i>	Betulaceae
<i>Coleophora sexareata</i>				
Mulsant	Coccinellidae	<i>Rhopalosiphum maidis</i> (Fitch)	<i>Zea mays</i>	Poaceae
<i>Coleophora</i> sp.	Coccinellidae	<i>Aphis gossypii</i> Glover	<i>Galinsuga parviflora</i>	Asteraceae
<i>Coleophora</i> sp.	Coccinellidae	<i>Macrosiphum rosae</i> (L.)	<i>Rosa</i> sp.	Rosaceae
<i>Cryptogonus quadriguttatus</i> (Weid)	Coccinellidae	<i>Macrosiphum (S.) rosaeiformis</i> Das	<i>Rosa</i> sp.	Rosaceae
<i>Cryptogonus quadriguttatus</i> (Weid)	Coccinellidae	<i>Macrosiphum rosae</i> (L.)	<i>Rosa</i> sp.	Rosaceae
<i>Cryptogonus quadriguttatus</i> (Weid)	Coccinellidae	<i>Melanaphis sacchari</i> (Zehntner)	<i>Zea mays</i>	Poaceae
<i>Cryptogonus quadriguttatus</i> (Weid.)	Coccinellidae	<i>Rhopalosiphum maidis</i> (Fitch)	<i>Zea mays</i>	Poaceae
<i>Cyclosa insulana</i> (Costa)	Coccinellidae	<i>Aphis craccivora</i> Koch	<i>Vicia faba</i>	Fabeaceae
<i>Gallerucida bicolor</i> (Hope)	Chrysomelidae	<i>Macrosiphum rosae</i> (L.)	<i>Rosa</i> sp.	Rosaceae
<i>Leucauge celebesiana</i> (Walckenaer)	Araneidae	<i>Aphis craccivora</i> Koch	<i>Vicia faba</i>	Fabeaceae
<i>Leucauge celebesiana</i> (Walckenaer)	Araneidae	<i>Aphis gossypii</i> Glover	<i>Galinsuga parviflora</i>	Asteraceae
<i>Monolepta signata</i> (Olive)	Coccinellidae	<i>Macrosiphum rosae</i> (L.)	<i>Rosa</i> sp.	Rosaceae
<i>Neoscona nautica</i> (Koch)	Araneidae	<i>Macrosiphum (S.) rosaeiformis</i> Das	<i>Rosa</i> sp.	Rosaceae
<i>Neoscona nautica</i> (Koch)	Araneidae	<i>Macrosiphum rosae</i> (L.)	<i>Rosa</i> sp.	Rosaceae
<i>Oenopia kirbyi</i>			<i>Argemone mexicana</i>	
Mulsant	Coccinellidae	<i>Aphis solanella</i>		Papaveraceae
<i>Oenopia kirbyi</i>	Coccinellidae	<i>Macrosiphum (S.) rosaeiformis</i> Das	<i>Rosa</i> sp.	Rosaceae
Mulsant	Coccinellidae	<i>Macrosiphum rosae</i> (L.)	<i>Rosa</i> sp.	Rosaceae
<i>Oenopia luteopustalata</i>				
Mulsant	Coccinellidae	<i>Macrosiphum (S.) rosaeiformis</i> Das	<i>Rosa</i> sp.	Rosaceae
<i>Oenopia luteopustalata</i>				
Mulsant	Coccinellidae	<i>Macrosiphum (S.) rosaeiformis</i> Das	<i>Rosa cania</i>	Rosaceae
<i>Oenopia</i>	Coccinellidae	<i>Macrosiphum rosae</i> (L.)	<i>Rosa</i> sp.	Rosaceae

<i>luteopustalata</i> Mulsant <i>Oenopia</i> <i>luteopustulata</i> Mulsant and <i>O.nr.</i> <i>Luteopustulata</i> Mulsant	Coccinellidae	<i>Macrosiphum (S.) rosaeiformis</i> Das	<i>Rosa</i> sp.	Rosaceae
<i>Oenopia</i> <i>luteopustulata</i> Mulsant and <i>O.nr.</i> <i>Luteopustulata</i> Mulsant	Coccinellidae	<i>Macrosiphum rosae</i> (L.)	<i>Rosa</i> sp.	Rosaceae
<i>Oenopia sauzeti</i> Mulsant	Coccinellidae	<i>Macrosiphonella pseudoartemisiae</i> Shinji	<i>Chrysanthemum coronarium</i>	Asteraceae
<i>Oenopia</i> <i>tutopusteulata</i> Mulsant	Coccinellidae	<i>Rhopalosiphum maidis</i> (Fitch)	<i>Zea mays</i>	Poaceae
<i>Rhene</i> <i>khandalaensis</i> Tikader	Salticidae	<i>Macrosiphum rosae</i> (L.)	<i>Rosa</i> sp.	Rosaceae
<i>Sphaerophoria</i> <i>scripta</i> (L.)	Syrphidae	<i>Lipaphis erysimi</i> (Kaltenbach)	<i>Brassica nigra</i>	Brassicaceae
<i>Sphaerophoria</i> <i>scripta</i> (L.)	Syrphidae	<i>Macrosiphum (S.) rosaeiformis</i> Das	<i>Rosa</i> sp.	Rosaceae
<i>Sphaerophoria</i> <i>scripta</i> (L.)	Syrphidae	<i>Macrosiphum rosae</i> (L.)	<i>Rosa</i> sp.	Rosaceae
<i>Syrphus</i> <i>balteatus</i> De Geer	Syrphidae	<i>Melanaphis sacchari</i> (Zehntner)	<i>Zea mays</i>	Poaceae
<i>Syrphus serarius</i> Wied	Syrphidae	<i>Macrosiphum rosae</i> (L.)	<i>Rosa cania</i>	Rosaceae
<i>Syrphus</i> <i>sp.serarius</i>	Syrphidae	<i>Aphis craccivora</i> Koch	<i>I.balsamina</i>	Rosaceae
<i>Syrphus</i> <i>sp.serarius</i>	Syrphidae	<i>Aphis craccivora</i> Koch	<i>S.arvensis</i>	Asteraceae
<i>Syrphus</i> <i>sp.serarius</i>	Syrphidae	<i>Aphis craccivora</i> Koch	<i>Artemesia vulgaris</i>	Asteraceae
<i>Thomisus</i> sp.	Thomisidae	<i>Macrosiphum rosae</i> (L.)	<i>Rosa</i> sp.	Rosaceae
<i>Uloborus</i> sp.	Araneidae	<i>Aphis gossypii</i> Glover	<i>Tagetes patula</i>	Rosaceae
		Greenidinae		
<i>Bilia</i> sp.	Anthocoridae	<i>Greenidea (T.) formosanum heeri</i> Raychaudhuri et al	<i>Psidium guajava</i>	Myrataceae
		Drepanosiphinae		
<i>Aiolacaria</i> <i>dodicaspilota</i> (Hope)	Coccinellidae	<i>Taoia indica</i> Ghosh & Raychudhuri	<i>Alnus</i> sp.	Betulaceae

<i>Coccinella septumpunctata</i> L.	Coccinellidae	<i>Taoia indica</i> Ghosh & Raychudhuri	<i>Alnus nepalensis</i>	Betulaceae
<i>Coelophora sexareata</i> Mulsant	Coccinellidae	<i>Taoia indica</i> Ghosh & Raychudhuri	<i>Alnus nepalensis</i>	Betulaceae
<i>Linyphia</i> sp.	Linyphiidae	<i>Taoia indica</i> Ghosh & Raychudhuri	<i>Alnus nepalensis</i>	Betulaceae
Hormaphidinae				
<i>Calliphora paltoni</i> Aub.	Calliphoridae	<i>Paraoregma alexandari</i> (Takahashi)	<i>Bambusa</i> sp.	Poaceae
<i>Synonycha grandis</i> (Thunb.)	Coccinellidae	<i>Paraoregma alexandari</i> (Takahashi)	<i>Bambusa</i> sp.	Poaceae
Lachninae				
<i>Marpissa</i> sp.	Salticidae	<i>Cinara tujafilina</i> (Del Guercio)	<i>Cupressus</i> sp.	Cupressaceae
<i>Theridion</i> sp.	Theridiidae	<i>Cinara tujafilina</i> (Del Guercio)	<i>Cupressus</i> sp.	Cupressaceae
<i>Uloborus</i> sp.	Araneidae	<i>Cinara tujafilina</i> (Del Guercio)	<i>Cupressus</i> sp.	Cupressaceae

References

- Agarwala, B. K., Das, S. and Bhowmik, A. K. (1987). Natural food range and feeding habits of aphidophagous insects in Northeast India. *Journal of Aphidology*. 1 (1/2): 10-22.
- Blackman, R. L and Eastop, V. F. (2008). Aphids on the world's Herbaceous plants and shrubs. Willey Publications. Natural History Meseum.
- Chakrabarti, S., Sarkar, S. and Debnath, M. (2012). Diversity and Biosystematics of aphidophagous predators of eastern Himalaya and Northeast India. In: Biodiversitat und Naturlausstattung im Himalaya III, Hartman, M & Weipert, J. Ed., Verein der Freunde & forderer des Naturkundemuseums Erfurt e, IV. Pp. 129-149.
- Ghosh, A. K. and Raychaudhuri, D. N. (1982). Ecology of natural enemy complex of Aphidoidea (Homoptera) in some areas of eastern India. Proceedings of the symposium on ecology of animal population. *Zoological Survey of India*. 3: 55-69.
- Ghosh, M. R and Raychaudhuri, D. N. (1977). Statigraphic distribution of aphid occurring in Darjeeling district of West Bengal and Sikkim. *Indian Journal of Entomology*. 39: 262-270.
- Debnath, M and Chakrabarti, M. (2020). Diversity, bioecology and biosystematics of Aphids (Hemiptera: Aphididae) in Darjeeling Himalaya. *Int. J. Exp. Res. Rev.* 21: 10-18.
- Raychaudhuri, D. N. and Chatterjee, M. (1980). Subfamily-Aphidinae, P. 47-278. In taxonomy of the aphids on north-East India and Bhutan. Ed. Raychaudhuri, D. N. *Zool. Soc. Calcutta*. Pp. 1-521.