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Subhasree Mitra

Research Scholar,
Department of Zoology,
Ballygunge Science College,
University of Calcutta,
Kolkata, West Bengal, India

Shelley Acharya

Scientist D,
Zoological Survey of India,
M- Block, New Alipore,
Kolkata, West Bengal, India

Sujay Ghosh

Assistant Professor,
Department of Zoology,
Ballygunge Science College,
University of Calcutta,
Kolkata, West Bengal, India

Faunal account of the predatory mites (Acari: Cunaxidae and Phytoseiidae) from the Agri-horticultural crops of south Bengal with three new records from India

Subhasree Mitra, Shelley Acharya and Sujay Ghosh

Abstract

The paper deals with the study of predatory mites which was undertaken from January, 2015 to March, 2017 to explore the predatory mite fauna from different agri-horticultural crops in 11 southern districts of West Bengal. A total number of 33 species of predatory mites were recorded with their predatory habits, prey preference, impact on prey population and the inhabiting plants among which 10 species under 2 genera are of family Cunaxidae and 23 species under 7 genera are of family Phytoseiidae. Phytoseiids were found more diverse and abundant than family Cunaxidae. One species namely *Amblyseius impressus* of Phytoseiidae and two species of Cunaxidae viz., *Cunaxa evansi* and *Dactyloscirus fuscus* were reported first time from India. The current investigation reports the diversity of predatory mites harbouring various types of agriculturally important crops of South Bengal with their distribution, habitat specificity, prey preference and effective predatory behaviour.

Keywords: Predatory mites, Cunaxidae, Phytoseiidae, Agri-horticultural crops, Biological control, South Bengal

Introduction

Mite-plant interaction is one of the fascinating avenues of acarological research. Mites directly affect humans as pests of different crops, fruit plants, vegetable crops and field crops; as parasites of human beings, veterinary animals, poultry and pets; pests of stored grains and other products; mushrooms and cheese; and as parasites of honeybees. Mite infestations are responsible for economic losses worth billions of dollars in terms of reduced crop yields and lowered quality of produce. Mites are encountered as pests regularly or as sporadic pests under all situations. Fruits and crops are infested by different groups of mites at all growing stages and appear under favourable conditions of climatic conditions. Currently, pests such as insects, mites, bacteria, fungi, viruses, nematodes, and weeds often cause up to 40% reduction in crop yields (SP-IPM 2010). Insect pests are responsible for a major part of these losses due to direct feeding damage and/or vectoring of viral, bacterial, and fungal diseases. Predatory mites are very important and potential group of biological control agent with the ability to suppress the phytophagous mites, thrips, aphids, coccids population of various agricultural crops. Among the predatory group Phytoseiids are the most dominant. Major part of works on Phytoseiidae have been reported by Gupta [43-48] from India, Gupta & Karmakar [50] from India, Tuttle & Muma [80] from Arizona, Chant & McMurthy [11-15] from all over the world, De Moraes & McMurtry [22, 24] from Brazil and Kenya, De Moraes & Mesa [25] from Columbia, De Moraes *et al.* [23, 26-29] Brazil, French, Africa and Brazil, Fiaboe *et al.* [39] from Southeastern Brazil, Denmark *et al.* [35] from Central America, Dhooria [36] from Punjab, Kreiter & Tixier [56] from Brazilian Atlantic Forest, Mallik *et al.* [59] from India, Karmakar & Gupta [54] from West Bengal, Matheus *et al.* [60] from Brazil, Prasad [68] on the genus *Paraphytoseius* from all over world, Chinniah & Mohansundaram [20, 21] from Kerala and Tamil Nadu in India, McMurtry, Moraes & Sourassou [64] on lifestyle and implications for biological control strategies of Phytoseiid mites. A considerable work have been done on Cunaxidae from Greece by Sioni & Papadoulis [74], from Iran by Den Heyer, Ueckermann & Khanjani [30, 31, 32], from Brazil by Castro and Den Heyer [9, 10], from Pakistan by Muhammad & Chaudhri [66]; Bashir & Afzal [3] and Bashir *et al.* [4, 5] from Florida by Muma [67], from Eastern United States by Skvarla & Dowling [76] and a review of Cunaxidae in ZooKeys 2014 by Skvarla, Fisher & Dowling [75, 77]

Correspondence

Subhasree Mitra

Research Scholar,
Department of Zoology,
Ballygunge Science College,
University of Calcutta,
Kolkata, West Bengal, India

from all over the world. In the current investigation a general survey on Phytoseiid (Acari: Phytoseiidae Berlese, 1913) [6] and Cunaxid (Acari: Cunaxidae Thor, 1902) [79] mites harbouring various types of agri-horticulturally important crops has been conducted in different districts of South Bengal during the period from January, 2015 to March, 2017 to explore the habitat specificity, predatory behaviour, occupied vegetation types with special emphasis to potentially important species.

Materials and Methods

Study area

The survey was conducted in 11 southern districts of West Bengal and samples were collected from North and South 24 Parganas, Howrah, Kolkata and Nadia districts under presidency division of Bengal; Bankura, Burdwan, Birbhum, East Midnapur, West Midnapur and Hoogly under Burdwan division of West Bengal.

Habitat

The samples were collected from different vegetation of South Bengal viz. forest vegetation of Jaipur forest, coastal plain of Digha dune, Kanthi dune, Rarh region of Burdwan, Birbhum, Bankura, Gangetic delta region of Nadia, Hoogly, Kolkata, South and North 24 Parganas. Some parts of western plateau and high lands of South Bengal were also covered for sample study.

Hosts

Mite samples were taken from medicinal plants, flower yielding plants, fruit crops, vegetables, oil yielding crops, aromatic plants, spice yielding crops, economic crops and some grass and weeds.

Collection procedure

The mites were collected seasonally during summer, pre-monsoon, post-monsoon and in winter during the period from January, 2015 to March, 2017. Mite samples were examined under hand lens with magnification of 20X and picked with the help of fine brush [size "0"] moistened with 70% alcohol.

Laboratory method

The infested leaves were brought to the laboratory within a zipper bag and then examined under stereoscopic research microscope [Motic SMZ-168 Stereo Zoom Microscope]. Mites were mounted in Hoyer's medium and examined under compound light microscope [Motic DM-B1 Digital Microscope]. The identification was done following the latest keys of Gupta [47, 48]. Identified collections are deposited in the National Zoological Collection (NZC) of Zoological Survey of India, Kolkata.

Results

The study reports a total number of 33 species of predatory mites with their predatory habits, feeding status, prey preference, impact on prey population and the inhabiting plants (Table 1, 2) of which 10 species under 2 genera belong to the family Cunaxidae and 23 species under 7 genera are from the family Phytoseiidae. One species from Phytoseiidae *Amblyseius impressus* (Denmark & Muma, 1973) [34] and two species from Family Cunaxidae *Cunaxa evansi* (Smiley, 1992) [78] and *Dactyloscirus fuscus* (Chaudhri, 1977) [18] were reported first time from India. The distribution data of each studied species are also incorporated.

Table 1: List of Collected Cunaxid (Family: Cunaxidae, Thor 1902) Mites from Agri-Horticultural Crops of South Bengal during January 2015 to March 2017.

Species Name	Habitat (Inhabiting Plants)	Locality of collection records in South Bengal	Distribution	Feeding status	Remarks
<i>Cunaxa setirostris</i> Herman	<i>Artocarpus lankoocha</i> , <i>Ocimum tenuiflorum</i> , <i>Tagetes patula</i> .	Raidighi Laksmikantapu, Chandannagar.	India- Arunachal Pradesh, Meghalaya, Sikkim, Tripura, West Bengal, Himachal Pradesh, Punjab, Andaman & Nicobar Isls., Lakshadwip, Uttar Pradesh. Elsewhere- Cosmopolitan.	1	Very common and effective predator of spider mites
<i>Cunaxa capreolus</i> Berlese	<i>Justicia adhatoda</i> , <i>Psidium guajava</i> .	Narendrapur, Sreerampore	India-Meghalaya, Manipur, Arunachal Pradesh, West Bengal. Elsewhere- Cosmopolitan	3	Rare occurrence
<i>Cunaxa myabunderensis</i> Gupta & Ghosh	<i>Saraca asoca</i> <i>Aegle marmelos</i>	Asansol, Halisahar, Kamarpokur	India- West Bengal, Andaman & Nicobar Isls.	3	Rare occurrence
<i>Cunaxa evansi</i> Smiley	<i>Barleria cristata</i> , <i>Nyctanthes arbor-tristis</i>	Sonarpur, Rajpur	India-New report from India. Elsewhere- Mexico.	3	Rare occurrence and new report from India
<i>Dactyloscirus bengalensis</i> Gupta	<i>Aegle marmelos</i> , <i>Dahlia spp.</i> <i>Nyctanthes arbor-tristis</i>	Siuri, Satragachi, Narendrapur	India- West Bengal. Elsewhere- Bangladesh	3	Rare occurrence
<i>Dactyloscirus fuscus</i> Chaudhri	<i>Ficus hispida</i>	Rajpur (Chowhati area)	India- New report from India. Elsewhere- Pakistan.	3	Rare occurrence and new report from India
<i>Dactyloscirus machairodus</i> Oudemans	<i>Ixora coccinea</i> , <i>Cocos nicifera</i> , <i>Phoenix dactylifera</i> .	Debipur, Kulpi road, Narendrapur	India- Meghalaya, Manipur, West Bengal. Elsewhere- Indonesia.	3	Rare occurrence
<i>Cunaxa bambusae</i> Gupta & Ghosh	<i>Bambusa vulgaris</i>	Digha, Kanthi, Contai	India-Andaman & Nicobar Isls, Digha, Orissa, Tripura.	3	Rare occurrence
<i>Cunaxa anacardae</i> Gupta	<i>Mangifera indica</i> , <i>Litchi chinensis</i>	Tamluk, Mourigram, Krishnamohan, Daspur.	India- West Bengal, Tripura, Elsewhere- Bangladesh.	2	Not very common but effective predator
<i>Cunaxa mangiferae</i> Gupta	<i>Mangifera indica</i> <i>Syzygium jambolanum</i>	South Barasat, Narendrapur, Shibpur	India- West Bengal, Tripura. Elsewhere- Bangladesh	1	Very common and good predator of spider mites

Table 2: List of Collected Phytoseiid (Family: Phytoseiidae, Berlese 1913) Mites from Agri-Horticultural Crops of South Bengal during January 2015 to March 2017.

Species Name	Habitat (Inhabiting Plants)	Locality of collection records in South Bengal	Distribution	Feeding status	Remarks
<i>Amblyseius largoensis</i> (Muma)	<i>Bauhinia acuminata</i> , <i>Colocasia antiquorum</i> , <i>Impatiens balsamina</i> , <i>Malvaviscus arboreus</i> , <i>Alagium lamarckii</i> , <i>Michelia champaca</i> , <i>Gelonium multiflorum</i> , <i>Mangifera indica</i> , <i>Hibiscus rosa-sinensis</i> , <i>Citrus</i> spp., <i>Aegle marmelos</i> , <i>Musa sapientum</i> , <i>Clitoria ternatea</i> , <i>Solanum melongena</i> , <i>Artocarpus heterophyllus</i> .	Canning, Gosaba, Kulpi road, Taldi, Joynagar-Majilpur, Jagaddol, Tamluk, Baruipur, Barasat, Narendrepur, Sonarpur, Dunlop, Budge-Budge, Hind Motor, Kharagpur, Alipore, SaltLake, Jhargram.	West Bengal, Manipur, Tripura, Arunachal Pradesh, Assam, Orissa, Sikkim, Andhra Pradesh, Tamil Nadu, Pondicherry, Kerala, Uttar Pradesh, Punjab, Himachal Pradesh, Jammu & Kashmir, Gujarat, Andaman & Nicobar Isls, Lakshadwip Isis, Mizoram, Bihar, Meghalaya, Karnataka. Elsewhere- Japan, Honduras, Puerto Rico, Brazil, Costa Rica, New Zealand, Mexico, Jamaica, Trinidad, South Africa, Kenya, U.S.A., Israel, Western & Northen Iran, Hong Kong, Philippines, Taiwan, Thailand, China, Papua New Guinea, New California.	1	Very common and good predator on eggs of <i>Panonychus citri</i> , <i>Eutetranychus orientalis</i> , <i>Tetranychus neocaledonicus</i> . This species is very potential bio-controlling agent against phytophagous group.
<i>Amblyseius herbicolus</i> (Chant)	<i>Tamarindus indica</i> , <i>Weed</i> , <i>Cynodon dactylon</i> , <i>Artocarpus heterophyllus</i> , <i>Vigna unguiculata</i> .	Diamond harbour, Gobordanga, Howrah, Canning, Arambagh.	India- Tripura, West Bengal, Mizoram, Sikkim, Tamil Nadu. Elsewhere- USA, Burma Philippines, Thailand, Taiwan, China, Papua New Guinea, Australia, Japan, Madagascar, South Africa, Mexico, Brazil, West Indies, Portugal.	1	Good predator of eggs and nymphs of <i>Eotetranychus syzygii</i> and <i>Tetranychus ludeni</i> .
<i>Amblyseius orientalis</i> Ehara	<i>Camellia sinensis</i> , <i>Rosa</i> spp., <i>Citrus</i> spp.	Bardhaman Agricultural farm, Kalayni Agricultural farm, Newtown (Rajarhat).	India- Assam, Meghalaya, North Bengal. Elsewhere- Japan.	3	Rare occurrence.
<i>Amblyseius aerialis</i> Muma	<i>Carica papaya</i> , <i>Boerhavia diffusa</i>	Halisahar, Madhyamgram	India- Karnataka, Bihar, Chennai, West Bengal, Arunachal Pradesh, Bihar, Karnataka. Elsewhere- USA, Galapagos IsIs., Mexico, Honduras, Jamaica, Brazil, Algeria.	2	Potential predator of <i>Eutetranychus orientalis</i> , <i>Panonychus citri</i> on papaya. Effects on eggs of <i>Brevipalpus karachiensis</i> .
<i>Amblyseius kulini</i> Gupta	<i>Murraya koenigii</i>	Egra, Ramnagar	India- Assam, West Bengal, Meghalaya. Elsewhere- Burma, Bangladesh.	2	Effects on nymphs of <i>Schizotetranychus baltazari</i> .
<i>Amblyseius adhatodae</i> Muma	<i>Justicia adhatoda</i>	Amtala, Haridebpur.	India- Bombay, Delhi, West Bengal. Elsewhere- Pakistan.	1	Good predator of spider mites.
<i>Amblyseius cucurbitae</i> Rather	<i>Cucurbita maxima</i> , <i>Cucumis sativus</i> .	Hogla, Raidighi, Taratala, Namkhana.	India- Jammu and Kashmir, Meghalaya, Darjeeling, Sikkim.	1	They are common predator for spider mite population.
<i>Amblyseius paraaerialis</i> Muma	<i>Citrus</i> spp., <i>Carica papaya</i> , <i>Justicia adhatoda</i> , <i>Saraca asoca</i>	Majherhat, Narendrapur, Hotor.	India- Arunachal Pradesh, Assam, Meghalaya, Sikkim, Kerala. Elsewhere- Thailand.	1	Good predator on eggs of <i>Brevipalpus phoenicis</i> .
<i>Amblyseius impressus</i> Denmark & Muma	<i>Bambusa vulgaris</i>	Sonarpur (Shimultala)	India- New report from India. Elsewhere- Brazil.	3	Rare occurrence and new report from India.
<i>Amblyseius neorykei</i> Gupta	Cactus, Orchid, <i>Punica granatum</i> .	Bolepur, Raichak, Kalayni Agricultural Farm	India- West Bengal, Arunachal Pradesh, Sikkim. Elsewhere- Burma, Bangladesh.	3	Rare occurrence
<i>Euseius alstoniae</i> Gupta	<i>Syzygium jambolanum</i>	Arambogh, Kamarpukur	India- Arunachal Pradesh, Meghalaya, Tripura, West Bengal, Orissa, Bihar, Tamil Nadu, Karnataka,	1	Effects on eggs and nymphs of <i>Brevipalpus</i> sp.

			Gujarat, Haryana, Punjab, Uttar Pradesh, Madhya Pradesh, Jammu & Kashmir Rajasthan.		
<i>Euseius coccocius</i> Ghai & Menon	<i>Terminalia arjuna</i> , <i>Saraca asoca</i> , <i>Gossypium arboreum</i>	Madhyamgram, Jhargram, Taki	India- Karnataka, Pondicherry, Tamil Nadu, Kerala, Andhra Pradesh, Punjab, West Bengal, Lakshadwip, Tripura. Elsewhere- Cosmopolitan.	2	Rare occurrence
<i>Euseius ovalis</i> (Evans)	Tamarind, <i>Impatiens balsamina</i> , <i>Terminalia arjuna</i> , <i>Capricum annum</i> ,	Krishnanagar, Chinsurah, Bandel, Candannagar.	India- Arunachal Pradesh, Assam, Sikkim, Mizoram, Meghalaya, Tripura, West Bengal, Manipur, Bihar, Andhra Pradesh, Karnataka, Tamil Nadu, Pondicherry, Kerala, Maharashtra, Gujarat, Punjab, Andaman & Nicobar Isls., Lakshadwip Isls. Elsewhere- Philippines, Taiwan, Hawaii, Mauritius, Mexico, Malayasia, Hong Kong, Japan, Indonesia, New Zealand, Australia.	3	Good predator of eggs and nymphs of <i>Tetranychus urticae</i> .
<i>Indoseiulus ricini</i> (Ghai & Menon)	<i>Solanum melongena</i> , <i>Dolichos spp.</i>	Nabadwip, Haldia	India- Tamil Nadu, Gujarat, Uttar Pradesh, Himachal Pradesh, Bihar, Arunachal Pradesh, West Bengal, Sikkim, Tripura, Punjab.	3	Voracious feeder and good predator of <i>Tetranychus urticae</i> .
<i>Neoseiulus indicus</i> (Narayanan & Kaur)	<i>Justicia adhatoda</i> <i>Polyalthia longifolia</i>	Alipur, Behala,	India- Delhi, West Bengal, Punjab, Uttar Pradesh. Elsewhere- Bangladesh.	2	Rare occurrence
<i>Neoseiulus longispinosus</i> (Evans)	<i>Carica papaya</i> , <i>Averrhoa carambola</i>	Chakdah, Raichak	India- West Bengal, Orissa, Bihar, Arunachal Pradesh, Sikkim, Tamil Nadu, Karnataka, Pondicherry, Uttar Pradesh, Andaman & Nicobar IsIs, Lakshadwip IsIs. Elsewhere- Philippines, Taiwan, Indonesia, Japan, Pakistan, New Guinea, Australia, Malayasia, Hong Kong, Hawaii, New Zealand, Jamaica.	1	It is very potential predator and feeds voraciously. It attacks all the developmental stages of <i>Tetranychus urticae</i> .
<i>Paraphytoseius bhadrakaliensis</i> Gupta	<i>Triumfetta shombaidea</i> , <i>Artocarpus heterophyllus</i>	Lilua, Kharagpur, Jhargram.	India- West Bengal, Tamil Nadu, Karnataka, Andhra Pradesh, Tripura, Punjab, Andaman IsIs., Jammu and Kashmir, Bihar. Elsewhere- Bangladesh.	2	Very good predator of juvenile stages of tetranychid mites but not very common.
<i>Paraphytoseius multidentatus</i> Swirski & Shechter	<i>Jasminum nudiflorum</i> , <i>Bambusa vulgaris</i>	Taki, Ramnagar	India- Tripura, Arunachal Pradesh, Mizoram, Assam, Sikkim, Meghalaya, West Bengal, Bihar, Maharashtra, Punjab, Tamil Nadu, Karnataka, Uttar Pradesh, Andhra Pradesh, Andaman & Nicobar IsIs. Elsewhere- Hong Kong, Thailand, Philippines, Nigeria, Madagascar, Malayasia, China.	1	Good predator
<i>Paraphytoseius orientalis</i> (Narayanan, Kaur & Ghai)	<i>Cinnamomum zylanicum</i> , <i>Colocasia antiquorum</i> , <i>Cynodon dactylon</i> , <i>Momordica cochinchinensis</i> , <i>Bauhinia acuminata</i> , <i>Solanum melongena</i> .	Taki, Basirhat, Habra, Naihati, Taratala, Dunkuni, Sreerampore, Jaipur Forest.	India- Uttar Pradesh, West Bengal, Punjab. Elsewhere- Brazil, Burundi, China, Colombia, Costa Rica, Democratic Republic of Congo, Guadeloupe, Hong Kong, Japan, Kenya Madagascar, Malaysia,	1	Very common on eggs of tetranychids and tenuipalps.

			Martinique, New Caledonia, Nigeria, Pakistan, Philippines, Reunion Island, Rwanda, Taiwan and Venezuela.		
<i>Paraphytoseius scleroticus</i> Gupta & Ray	<i>Rauvolfia tetraphylla</i>	Duttapukur	India- Uttar Pradesh, West Bengal, Tripura. Elsewhere- Asiatic countries.	3	Rare occurrence
<i>Phytoseius kapuri</i> Gupta	<i>Setaria paniculifera</i>	Haldia	India- Arunachal Pradesh, Assam, Meghalaya, Tripura, West Bengal, Bihar, Orissa, Tamil Nadu, Pondicherry, Kerala, Gujarat, Rajasthan, Punjab, Uttar Pradesh, Madhya Pradesh, Andaman & Nicobar Isls., Jammu & Kashmir. Elsewhere- Cosmopolitan.	3	Good predator of <i>Tetranychus neocaledonicus</i> and <i>Tetranychus cinnabarinus</i>
<i>Typhlodromips suknaensis</i> Gupta	<i>Theobroma cacao</i> , <i>Cynodon dactylon</i>	Narendrapur, Jaipur forest	India- Arunachal Pradesh, Assam, Sikkim, Mizoram, Tripura, West Bengal, Orissa, Meghalaya, Uttar Pradesh, Andaman & Nicobar Isls, Kerala.	2	Rare occurrence
<i>Typhlodromips syzygii</i> (Gupta)	<i>Citrus maxima</i> .	Narendrapur	India - West Bengal, Orissa, Tripura, Meghalaya, Bihar, Sikkim, Mizoram, Uttar Pradesh. Elsewhere- Thailand.	2	Not very common.

[Note: According to their feeding habit, 1- Very active feeder and mostly voracious feeder, 2- Moderate feeder some are occasionally feeds, 3- Less feeding tendency and rare occurrence].

Discussion

In the present investigation, an initial survey of predatory mites inhabiting various group of agri-horticultural crops from different districts of West Bengal, particularly South Bengal was undertaken. This particular area of Bengal was chosen for its unique and enriched physical features which supports the diverse vegetation with enormous species diversity.

From our study it has been observed that family Phytoseiidae is the most dominant group affecting more than 50 agri-horticultural crops of different vegetation. Genus *Amblyseius* belonging to the subfamily Amblyseiinae represented by 10 species is the most abundant genus among the predatory mites. *Amblyseius largoensis* Muma, *A. herbicolus* (Chant), *A. aeralis* Muma, *Neoseiulus longispinosus* (Evans), are most frequent and dominant predatory species among Phytoseiidae family. McMurthy, Moraes and Sourassou^[64] proposed a new categorization of mite predators viz. Type I as specialized mite predators of *Tetranychus* species, Type II as selective predators of tetranychid mites and Type III as generalised predators is a huge and diverse group of general feeders. In our study we found that *Indoseiulus ricini* (Ghai & Menon) is voracious feeder and good predator on spider mites. *Paraphytoseius bhadrakaliensis* Gupta, *Phytoseius kapuri* Gupta, *Euseius ovalis* (Evans), *Amblyseius adhatodae* Muma, *Amblyseius cucurbitae* Rather are very potential predator of all developmental stages of spider mites specially on tetranychidae family. De Moraes, Barbosa and Castro^[29] studied the Phytoseiids from natural ecosystem in the state of Sao Paulo, Brazil and reported 40 phytoseiid species. Here we reported 23 species from southern part of a state only which undoubtedly specifies the rich biodiversity of the state as well as the country. The recent work of Lofego, Castro & Feres^[58] reported 22 species of phytoseiidae from rubber tree crops in the state of Bahia, Brazil. If we compare our result in respect

of entire state also proves a greater diversity of phytoseiids in the agri horticultural crops studied only from southern part of the state West Bengal. One species *Amblyseius impressus* (Denmark & Muma, 1973)^[34] is reported first from India on Bamboo (*Bambusa vulgaris*) from Sonarpur of South 24 Parganas.

Amblyseius paraaerialis Muma, *Euseius alstoniae* Gupta, *Paraphytoseius orientalis* (Narayanan, Kaur & Ghai) are very common and efficient predator of Tenuipalpid mites specially on *Brevipalpus* spp. *Typhlodromips suknaensis* Gupta, *Typhlodromips syzygii* (Gupta), *Paraphytoseius scleroticus* (Gupta & Ray), *Amblyseius neorykei* Gupta, *Amblyseius orientalis* Ehara, are reported as rare and occasional feeder. *Amblyseius orientalis* Ehara, is very unusual species and basically inhabiting on aromatic types of crop like lemon, rose, tea etc. The coastal salty region specially around Dune area is represented by a single species *Amblyseius kulini* Gupta.

Similarly another studied family Cunaxidae represents two species *Cunaxa evansi* (Smiley, 1992)^[78] on *Barleria cristata* and *Nyctanthes arbour* and *Dactyloscirus fuscus* (Chaudhri, 1977)^[18] on *Ficus hispida* from Rajpur-Sonarpur Municipality area of district South 24 Parganas which are first time reported from India. A nationwide survey by Sionti and Papadoulis^[74] in Greece revealed 14 species of cunaxid mites which is certainly a less number in comparison with our studied species in a part of the state Bengal. Blanca, Recamier and Gabriela^[7] studied the stage distribution of cunaxids in soil and litter in Mexico. Meija *et al.*^[65] studied the cunaxidae diversity and population dynamics in garlic crop field which shows the agricultural practices applied to the garlic crop had an impact on cunaxid abundance. Very little recent work has been done in respect of its biological control and effect of pesticides on the population of mites in India. The cunaxids in our study comprises 10 species from 20 types of agri horticultural plants in studied location of which *Cunaxa setirostris* Hermann, *Cunaxa anacardae* Gupta, *Cunaxa mangiferae* Gupta, are very effective and good predator of spider mites among Cunaxid mites. We reported *Cunaxa anacardae* Gupta and *C. mangiferae* Gupta from fruit crops

viz., *Mangifera indica*, *Litchi cinensis*, *Syzygium jambolanum* etc. *Cunaxa bambusae* Gupta & Ghai was reported from Digha dune and Kanthi dune of coastal plains of south bengal. *Cunaxa myabunderensis* Gupta & Ghosh, *C. capreolus* Berlese, *Dactyloscirus machairodus* Oudemans, *D.bengalensis* Gupta are rarely occurring species with less abundance.

The present study reports an enriched predatory mite fauna of two families Cunaxidae and Phytoseiidae occurring in agri-horticultural crops of South Bengal. These two groups have been reported as a potential natural enemies of phytophagous mites under both natural and environmentally managed condition. The predatory species found in this survey should be conserved for natural suppression of agricultural pests not only of phytophagous mites but also thrips, aphids, coccids, some insects pests also. Minimizing the commercial use of chemical pesticide may conserve the effective population of these beneficial mites. The present study is exhaustive and constitutes the most comprehensive list of predatory mites in south bengal, including a complete bibliography of research on the subject. The publication of this work should help to stimulate further studies on this important group of acari in India.

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