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# BIONOTES

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Cover Photo by Tshulthrim Drukpa of a *Nymphalis antiopa* Butterfly

**TABLE OF CONTENTS**

FIRST REPORT OF COMMON FIVE-RING <i>YPHIMA BALDUS</i> (INSECTA: LEPIDOPTERA: NYMPHALIDAE) FOR PAKISTAN by Muhammad Akram Awan & Saghir Hassan	58
<i>BAORISA HIEROGLYPHICA</i> (INSECTA: LEPIDOPTERA: NOCTUIDAE) IN HIMACHAL PRADESH by Usha Hooda	60
RE-DISCOVERY OF THE PRICKLY ASH ELFIN <i>AHLBERGIA HARADAI</i> (IGARASHI, 1973) (INSECTA: LEPIDOPTERA: LYCAENIDAE) IN NEPAL by Piet van der Poel & Mahendra Singh Limbu	61
<i>CAMPTOLOMA MANGPUA</i> (INSECTA: LEPIDOPTERA: NOLIDAE) IN ARUNACHAL PRADESH, INDIA by Alka Vaidya & Peter Smetacek	63
FIRST REPORT OF <i>DANAUS CHRYSIPPUS</i> FORM <i>DORIPPUS</i> (INSECTA: LEPIDOPTERA: NYMPHALIDAE) FROM ANDHRA PRADESH, INDIA by M Yuvaraj & Peter Smetacek	65
CHELONIOPHAGY BY CHECKERED KEELBACK, <i>XENOCHROPHIS PISCATOR</i> (SCHNEIDER, 1799) ON INDIAN PEACOCK SOFTSHELL TURTLE, <i>NILSONNIA HURUM</i> (GRAY, 1830) by Kritagya Gyawali	67
<i>NYMPHALIS ANTIOPA</i> (INSECTA: LEPIDOPTERA: NYMPHALIDAE) IN THE HIMALAYA by Karma Wangdi, Tshulthrim Drukpa & Piet van der Poel	71
THREE NEW LYCAENID BUTTERFLY RANGE EXTENSIONS FROM CHHATTISGARH, INDIA by Anupam Sisodia, Nileshkumar Kshirsagar (I.A.S.) & Saurabh Singh	73
FIRST REPORT OF THE MOTH <i>XYLOPHYLLA PUNCTIFASCIA</i> (LEECH, 1900) (INSECTA: LEPIDOPTERA: EREBIDAE) FROM INDIA by Alka Vaidya	76
MITES ON SOME MEDICINAL PLANTS OCCURRING IN PURULIA AND BANKURA DISTRICTS OF SOUTH BENGAL WITH TWO NEW REPORTS FROM INDIA ALONG WITH KEYS TO DIFFERENT TAXONOMIC CATEGORIES by Afsana Mondal & Salil K. Gupta	78
CONTRIBUTION TO THE KNOWLEDGE OF BUTTERFLIES IN AND AROUND SUKINDA VALLEY, ODISHA, INDIA by Suraj Kumar Dash, Soubhagya Kumar Sahoo, Arajush Payra & Siba Mohanty	90
THE HAWKMOTHS (LEPIDOPTERA: SPHINGIDAE) OF MUSSOORIE, UTTARAKHAND, INDIA: CONFIRMATION OF FAUNAL DRIFT IN RESPONSE TO CLIMATE CHANGE by Rajashree Bhuyan, Sindhu Ramachandran Clark & Peter Smetacek	99
<i>CHALCOSIOPSIS VARIATA</i> (INSECTA: LEPIDOPTERA: ZYGAENIDAE) IN ARUNACHAL PRADESH, INDIA by Peter Smetacek	103

# MITES ON SOME MEDICINAL PLANTS OCCURRING IN PURULIA AND BANKURA DISTRICTS OF SOUTH BENGAL WITH TWO NEW REPORTS FROM INDIA ALONG WITH KEYS TO DIFFERENT TAXONOMIC CATEGORIES

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Reviewer: Peter Smetacek

## Introduction

The two districts, viz. Purulia and Bankura, come under South Bengal and both are considered as drought prone areas. Purulia is located between 22.60° and 23.50° North latitude, 85.75° and 76.65° East longitude. Bankura district is located in 22.38° and 23.38° North latitude and between 86.36° and 87.46° East longitude. The collection spots in Purulia district were Bundwan, Baghmundi, Jalda-I, Santuri and those in Bankura district were Chhatna, Bishnupur, Simlapal. The total land areas of these two districts are 6259 and 6882 sq. km., respectively. The climatic conditions of the two districts are tropical to sub-tropical. Although both the districts are very dry areas but they are good habitats for many medicinal plants. So far as mites on medicinal plants are concerned, though some works like Gupta *et al.* (2003), Ghosal *et al.* (2003), Lahiri *et al.* (2004), Gupta S.K (2005), Gupta *et al.* (2005), Roy *et al.* (2006), Roy & Saha (2010), Gupta *et al.* (2015), Mondal & Gupta (2016), Gupta *et al.* (2017), have been published, none of those studies intensively covered these two districts. In view of that, the present study was taken up during July 2018 to April 2019 and this paper documents the mite species collected from medicinal plants of those areas, and provides information regarding their collection data, diagnosis, distribution and importance, if any.

A total of 30 species of mites belonging to 19 genera, 9 families, and 4 orders have been

reported, of those, 11 being phytophagous, 17 being predatory and 2 being fungal feeders. It has also included 2 species, viz. *Amblyseius sakalava* Blommers and *Orthotydeus caudatus* (Duges), the records of which were earlier unknown from India. These apart, *Raoeilla pandanae* Mohanasundaram has also been reported for the first time from West Bengal. All the measurements given in the text are in microns. A key to all taxonomic categories has also been provided.

## Materials and Methods

The mites including both phytophagous and predatory groups were collected during July, 2018 to April, 2019 from medicinal plants encountered in Purulia and Bankura districts of South Bengal. The collection was done by directly examining the leaves in the field itself with a 20x pocket lens and the collected specimens were preserved in 70% ethyl alcohol. Initially, mounting was done in lactic acid and were gently heated over an electric bulb (40 watts) and subsequently permanently mounted in Hoyer's medium. For identification, the updated literature was consulted.

## Results

The systematic account deals with a total of 30 species under 19 genera, 9 families and 4 orders collected from 27 species of medicinal plant. Out of these, 11 species under 9 genera, 3 families were phytophagous, 17 species under 8 genera, 4 families and 2 orders were

predatory and the remaining 2 species under 2 families were fungal feeders. Regarding relative abundance, 8 species of phytophagous mites, viz. *Porcupinychus abutiloni* on *Piper nigrum*, *Oligonychus biharensis* on *Aegle marmelos*, *Tetranychus macfarlanei* on *Rauvolfia serpentina*, *Polyphagotarsonemus latus* on *Mentha arvensis* and *Raoiella pandanae* on *Phoenix dactylifera* were most abundant and important as pests. Among predatory mites, *Amblyseius adhatodae*, *Amblyseius largoensis*, *Agistemus fleschneri* and *Pronematus elongatus* were abundant as predators. Keys to different taxonomic categories have also been given.

**Systematic Account**

**Subclass-Acari**

⊙ **Key to Superorders/ Orders/ Suborders of subclass Acari:**

1. With 1-4 pairs of dorsolateral or ventrolateral stigmata posterior to coxae II, legs II-IV with peripodomeric fissure associated with slit organ, tarsus of legs I with dense dorsal cluster of solenidiform setae subdistally...Superorder-Parasitiformes\*

\* Normally tritosternum present having a distinctive base and 1 or 2 laciniae, palp tarsus with forked seta, stigmata present laterally between 3<sup>rd</sup> and 4<sup>th</sup> coxae... Order-Mesostigmata

- Without visible stigmata posterior to coxae II, coxae of legs integrated with venter of podosoma and often forming coxisterna, coxae of leg II-IV without peripodomeric fissure and slit organ, tarsus of leg II with sparse pairing of dorsal setae.....2
2. Chelicerae rarely chelate, fixed digit often regressed, movable digit hook, knife, needle or stylet-like structure, palpi simple or modified to thumb claw process.....2  
Order- Trombidiformes\*

\* Tracheal system with 1 pair of stigmata between bases of chelicerae or on anterior prodorsum...Suborder-Prostigmata

- Chelicera typically chelate, dentate, stylet-like palp never with thumb claw process, empodium claw-like or sucker-like...Suborder Sarcoptiformes,3

3. Prodorsum without specialized sensory organ, genital aperture exposed or partially covered by paragenital flaps, inversely V, U or Y shaped with 2 pairs of genital papillae...Suborder-Oribatida, Cohort- Astigmata

- Prodorsum usually with a pair of specialized setae arising from sensory pits (bothridia or pseudo-stigmatic organ), genital aperture covered, leg claw with a median claw-like empodium (tridactyle)

or only empodial claw present (monodactyle).....Suborder-Oribatida (excluding Astigmata)

**A. Phytophagous Group**

**Order: Trombidiformes**

**Sub order: Prostigmata**

⊙ **Key to the families of Prostigmata:**

1. Gnathosoma usually circular, palpi minute, lying closely appressed laterally, chelicerae tiny, stylet-like....Family -Tarsonemidae
- Gnathosoma variously shaped, generally conspicuous, chelicerae distinct, palpi well developed.....2
2. With a distinct palpal thumb claw process.....4
- Without a distinct palpal thumb claw process.....3
3. Chelicera with opposed stylet or scissors-like,...FamilyTydeidae/Iolinidae
- Chelicera whip-like and long, genital aperture transverse..... Family-Tenuipalpidae

4. Chelicera not long and whip-like, rather short and stylet-like,  
Genital aperture longitudinal....Family-Stigmaeidae
- Chelicera long, re-curved, whip-like arising from stylophore, genital aperture transverse....Family-Tetranychidae

**Family1: Tetranychidae**

☉ **Key to the genera of Tetranychidae:**

1. Empodium with tenent hairs, female with 3 pairs of anal setae and male with 5 pairs of genito anal setae....  
Subfamily-Bryobiinae  
Humeral setae (C<sub>1</sub>) contiguous with first pair of dorsolateral setae.....Tribe-Hystrichonychini (genera-*Hystrichonychus*, *Porcupinychus*)
- Empodium without tenent pairs, or empodium may be absent, female with 1 or 2 pairs of anal setae, males with 3-4 pairs of genito anal setae.....Subfamily-Tetranychinae.
2. With 2 pairs of para anal setae, ..... genus-*Schizotetranychus*
- With 1 pair of para anal setae..... 3
3. Empodium of Tarsus I without claws.....genus-*Eutetranychus*
- Empodium of Tarsus I ends in claws..... 4
4. Tarsus I with duplex setae distal and approximate, empodial claw with proximo ventral hairs.....genus-*Oligonychus*
- Tarsus I with duplex setae well apart, empodial claw splits into 3 pairs of hairs....genus-*Tetranychus*

**Subfamily: Bryobiinae**

**1. *Hystorichonychus* sp. nr *gracilipes* (Banks)**

*Tetranychus gracilipes* Banks, 1900, *USDA, Tech.Ser.*8:72.

*Hystoriconychus gracilipes*, Pritchard & Baker, 1955, *Pacific Coast. Ent. Soc. Mem. Ser.*2:39.

**Diagnosis:** The dorsal setal characters do not tally with those of *gracilipes* and also difference exists in the chaetotaxy of tibia and tarsus of both leg I and leg II. Further study is being done to ascertain its identity.

**Collection Data:** 1 ♀, West Bengal, Bankura Dist., Shimlapal forest, ex. *Piper nigrum*, 30.ix.2018.

**Distribution:** India (West Bengal).

**Remarks:** Only once encountered, economic importance unknown.

**2. *Porcupinychus abutiloni* Anwarullah**

*Porcupinychus abutiloni* Anwarullah, 1996, *Can.Ent.* 98: 71-75.

*Porcupinychus abutiloni*, Gupta, 1994, *Mem., Zool. Surv. India* 18(1):16-18.

**Diagnosis:**

**Female:** Body including rostrum 400 long, 200 wide, oval, terminal sensillum of palp longer than broad. Idiosomal setae thick serrate on tubercles. Tarsus I with 1 sensory and 2 tactile setae proximal to duplex setae. Tarsus II with 1 sensory and 2 tactile setae.

**Collection Data:** 5 ♀, West Bengal, Purulia Dist., Bundwan, ex. *Marsilea quadrifolia*, 8.x.2018.

**Distribution:** India (West Bengal, Punjab, Gujarat), Pakistan.

**Remarks:** Moderate infestation occurred on both surfaces of mentioned host causing severe chlorosis.

**Sub-family: Tetranychinae**

**3. *Eutetranychus maximae* Nassar & Ghai**  
*Eutetranychus maximae* Nassar & Ghai, 1981, *Oriental Ins.*15: 333-396.

*Eutetranychus maximae*, Gupta, 1994, *Mem., Zool. Surv. India*, 18(1): 33-34.

**Diagnosis:**

**Female:** Body including rostrum 450 long, 330 wide, propodosomal setae 3 pairs. Hysterosomal setae 10 pairs, set on strong tubercles, propodosoma with longitudinal

striae, hysterosomal striation between 2<sup>nd</sup> and 3<sup>rd</sup> dorsocentral setae in V pattern.

**Collection Data:** 2♀, West Bengal, Bankura Dist., Chhatna, ex. *Murraya koenigii*, 18.x.2018.

**Distribution:** India (West Bengal, Delhi).

**Remarks:** Occurred on upper surface of mentioned host causing no damage worth mentioning.

#### 4. *Schizotetranychus baltazari* Rimando

*Schizotetranychus baltazari* Rimando, 1962, *Tech. Bull. Coll. Agric. Univ.*, 11:52.

*Schizotetranychus baltazari*, Gupta, 1994, *Mem., Zool. Surv. India* 18(1):89-90.

#### **Diagnosis:**

**Female:** Body including rostrum 310 long, 220 wide, Tarsus I with 9 tactile setae proximal to duplex setae. Tibia I with 1 tactile and 7 sensory setae.

**Collection Data:** 3♀, West Bengal, Bankura Dist., Chhatna, ex. *Murraya koenigii*, 18.x.2018.

**Distribution:** India (West Bengal, Assam, Karnataka), Myanmar, Thailand, Taiwan, Hong Kong, Philippines.

**Remarks:** Moderate infestation was seen on the mentioned host on upper leaf surface, producing stippling on leaves.

#### 5. *Oligonychus biharensis* (Hirst)

*Paratetranychus biharensis* Hirst, 1924, *Ann. Mag. nat. Hist, London*, 9(14): 522-527.

*Oligonychus biharensis*, Pritchard & Baker, 1955, *Pacific Coast Ent. Soc. Mem. Ser. 2*: 364-365.

*Oligonychus biharensis*, Gupta, 1994, *Mem., Zool. Surv. India*, 18(1): 100-103.

**Diagnosis:** Body including rostrum 400 long, 300 wide. Palp with terminal serisillum 3 times longer than wide, tibia I with 1 sensory and 9 tactile setae, tarsus I with 1 sensory and 4 tactile setae proximal to duplex setae. Preanal setae shorter than inner and outer sacra.

**Collection Data:** 3♀, West Bengal, Purulia Dist., Santuri, ex. *Aegle marmelos*, 10.ix.2018.

**Distribution:** India (West Bengal, Andaman & Nicobar Is., Bihar, Gujarat, Karnataka, Kerala, Tamil Nadu), Antigua, Brazil, Hawaii, Mauritius, Philippines, Thailand, Taiwan.

**Remarks:** Often encountered on the host on upper surface, causing first yellowing and then browning of leaves, followed by defoliation.

#### 6. *Tetranychus macfarlanei* Baker & Pritchard

*Tetranychus macfarlanei* Baker & Pritchard, 1960, *Hilgardia* 29: 455-574.

*Tetranychus macfarlanei*, Gupta, 1994, *Mem., Zool. Surv. India* 18 (1): 129-131.

#### **Diagnosis:**

**Female:** Body including rostrum 350 long, 330 wide. Terminal sensillum of palp shorter than broad. Tarsus I with 2 sensory and 3 tactile setae proximal to duplex setae. Tarsus II with 1 sensory and 4 tactile setae. Outer and inner sacral setae of same length.

**Collection Data:** Several males and females, West Bengal, Purulia Dist., Santuri, ex. *Rauvolfia serpentina*, 10.ix.2018.

**Remarks:** Infestation during July-October was nil, appeared in second fortnight of March and became abundant in April.

#### **Family2: Tenuipalpidae**

#### ☉ **Key to the genera of Tenuipalpidae:**

1. Dorsosublateral hysterosomal setae absent or not more than 1 pair, genital and ventral plates separate, well defined, the latter being rectangular palp 4-5 segmented...genus-*Brevipalpus*
- Dorsosublateral hysterosomal setae 2-4 pairs, palp two segmented...genus-*Raoiella*

#### **Genus: *Brevipalpus***

#### ☉ **Key to the species of *Brevipalpus*:**

1. Tarsus II with single solenidion.....2
- Tarsus II with 2 solenida.....*phoenicis*
2. Propodosoma with irregular reticulation dorsolaterally, median area smooth..... *obovatus*

- Propodosoma not like above, trochanter IV without seta..... *euphorbiae*

### 7. *Brevipalpus euphorbiae*

#### Mohanasundaram

*Brevipalpus euphorbiae* Mohanasundaram, 1982, *Entomon* 7(4): 427-429.

*Brevipalpus euphorbiae*, Gupta & Mandal, 2015, *Mem., Zool. Surv. India*, 22 (2): 19.

**Diagnosis:** Body 290 long, 175 wide, rostrum extends beyond middle of femur I, palp 4-segmented, 5 pairs of dorsocentral hysterosomal setae being serrate, 1 pair of medioventral propodosomal setae.

**Collection Data:** 4♀, West Bengal, Purulia Dist., Jalda-I, ex. *Solanum xanthocarpum*, 28.xi.2018.

**Distribution:** India (West Bengal, Punjab, Tamil Nadu).

**Remarks:** Importance unknown.

### 8. *Brevipalpus obovatus* Donnadieu

*Brevipalpus obovatus* Donnadieu, 1875, *Ann. Soc. Linn. Loyn (n. ser.)*, 22(1876): 29-136.

*Brevipalpus obovatus*, Gupta & Mandal, 2015, *Mem., Zool. Surv. India*, 22 (2): 23-24.

**Diagnosis:** Tarsus II with single sensory rod, no propodosomal reticulation, 6 pairs of dorsolateral hysterosomal setae.

**Collection Data:** 2♀, West Bengal, Purulia Dist., Jalda-I, ex. *Clerodendrum inerme*, 28.xi.2018.

**Distribution:** India (Delhi, Punjab, Tamil Nadu, Haryana and West Bengal). This is one of the widely distributed species throughout the world.

**Remarks:** This mite caused the appearance of brownish spots which later coalesce to form brownish patches.

### 9. *Brevipalpus phoenicis* (Geijskes)

*Brevipalpus phoenicis* Geijskes, 1939, *Arten. Meded. Landb.-Hoogeschool Wageningen*, 42(4): 1-68.

*Brevipalpus phoenicis*, Gupta & Mandal, 2015, *Mem., Zool. Surv. India*, 22(2): 24-25.

**Diagnosis:** Mediolateral area of propodosomal region with polygonal cells. Hysterosoma reticulated throughout its length.

**Collection Data:** 10♀, West Bengal, Bankura Dist., Bishnupur, ex. *Moringa oleifera*, 7.xii.2018.

**Distribution:** India (West Bengal, Arunachal Pradesh, Assam, Bihar, Delhi, Haryana, Himachal Pradesh, Jammu & Kashmir, Karnataka, Maharashtra, Meghalaya, Odisha, Punjab, Sikkim, Tamil Nadu, Tripura). This species is known from different parts of the world and from India this has been recorded from extensive areas. (Gupta & Mandal, 2015).

**Remarks:** This mite causes light brownish patches on leaves.

### 10. *Raoiella pandanae* Mohanasundaram

*Raoiella pandanae* Mohanasundaram, 1989, *Indian J. Acar.* 10(1&2): 31-33.

*Raoiella pandanae*, Gupta & Mandal, 2015, *Mem., Zool. Surv. India* 22(2):42-43.

**Diagnosis:** Body round, propodosoma with 3 pairs of setae, Hysterosoma with 3 pairs of dorso centrals and 5 pairs of dorso lateral, 4 pairs of dorsosublateral setae, genital plate with 2 pairs of setae.

**Collection Data:** 8♀, West Bengal, Bankura Dist., Bishnupur, ex. *Phoenix dactylifera*, 7.xii.2018.

**Distribution:** India (West Bengal, Tamil Nadu).

**Remarks:** This is the first report from West Bengal. It occurred on under surface of leaves producing reddish patches.

### Family 3. Tarsonemidae

#### 11. *Polyphagotarsonemus latus* (Banks)

*Tarsonemus latus* Banks, 1904, *Proc. U. S. Nat. Mus.*, 32(1553): 615.

*Hemitarsonemus latus*, Dutta, 1958, *Indian Farm.*, 8: 10-12.

*Polyphagotarsonemus latus*, Gupta, 2012, p.187.

**Diagnosis:** Body oval, tiny, glossy or whitish. Hysterosoma of female with 1 pair of ventral



setae situated between coxae IV. Terminal claw of leg IV of male reduced to small tubercle.

**Collection data:** 5♀, West Bengal, Purulia Dist., Baghmundi, ex- *Mentha arvensis* on 5.ix.2018.

**Distribution:** India (Cosmopolitan).

**Remarks:** This mite in all stages was found abundantly on lower surface of apical leaves of *Mentha arvensis* causing crinkling of leaves. *Scapulaseius polyanthaeae*, as its predator, was found associated with this tarsonemid mite.

**B. Predatory Group**

**Family 4: Iolinidae**

**12. *Pronematus elongatus* Baker**

*Pronematus elongatus* Baker, 1968, *Ann. Ent. Soc. Amer.* 61: 1093-1094.

*Pronematus elongatus*, Gupta, 2003, *Mem. Zool. Surv. India* 20 (1): 124-125.

**Diagnosis:** Propodosoma with longitudinal striation. Histerosomal plate with transverse striation between D<sub>1</sub>-D<sub>2</sub>. Tarsus I longer than tibia I, Distal setae of tarsus I slightly longer than segment, solenidion on tarsus I short and rounded.

**Collection Data:** 1♀, West Bengal, Bankura Dist., Bishnupur, ex. *Punica granatum*, 25.ix.2018.

**Distribution:** U.S.A, India (Jammu & Kashmir, West Bengal).

**Remarks:** It was found associated with mealybug.

**Family 5: Stigmaeidae**

**Genus: *Agistemus***

© Key to the species of *Agistemus*:

- 1. Propodosomal plate reticulate.....*fleschneri*
- Propodosomal plate not reticulate..... 2
- 2. Ratio of setae ae/ae-ae 1.5 or more..... *industani*
- Ratio of setae ae/ae-ae less than 1.5..... *edulis*

**13. *Agistemus* sp. nr *edulis* Gupta**

**Diagnosis:** Propodosomal plate non-reticulate with 3 pairs of setae and hysterosomal plate with 5 pairs of setae. Measurements of setae ae-40, be-80, ce-60, a-60, b-60, c-65, la-63, ae/ae-ae=1.42, a-b=70

**Collection Data:** 3♀, West Bengal, Bankura Dist., Shimlapal forest, ex. *Melia azadirachta*, 20.ix.2018.

**Distribution:** India (West Bengal, Arunachal Pradesh).

**Remarks:** This species, although close to *Agistemus edulis* but the measurements of dorsal idiosomal setae do not tally with those of *Agistemus edulis*.

**14. *Agistemus fleschneri* Summers**

*Agistemus fleschneri* Summers 1960, *Proc. Ent. Soc. Wash.*, 62: 237-240.

*Agistemus fleschneri*, Gonzalez-Rodriguez 1965, *Univ. Calif. Pub. Ent.*, 41: 30-31.

*Agistemus fleschneri*, Gupta, 2003, *Mem., Zool. Surv. India* 20 (1): 101-102.

**Diagnosis:** Propodosoma with polygonal cells, 3 pairs of setae on propodosoma measuring ae-40, be-69, ce-65, a-50, la-50, b-45, lm-50, c-52, li-55, e-30, le-10.

**Collection Data:** 2♀, West Bengal, Bankura Dist., Chhatna, ex. *Carculigo orchioides*, 3.ix.2018.

**Distribution:** India (Arunachal Pradesh, Assam, Manipur, Meghalaya, Sikkim, Tripura, Delhi, West Bengal, Haryana, Punjab, Andaman & Nicobar Is.), U.S.A, Chile, Mexico.

**Remarks:** Although this is known to be a good predator of spider mites but such behavior was not observed in the present study.

**15. *Agistemus industani* Gonzalez - Rodriguez**

*Agistemus industani* Gonzalez-Rodriguez, 1965, *Univ. Calif. Pub. Ent.*, 41: 40.

*Agistemus industani*, Gupta, 2003, *Mem., Zool. Surv. India* 20(1): 104-105.

**Diagnosis:** Propodosomal shield smooth. Measurements of setae ae-56, be-80, ce-65, a-55, b-70, lm-70.

**Collection Data:** 2♀, West Bengal, Purulia Dist., Bundwan, ex. *Emblica officinalis*, 15.ix.2018.

**Distribution:** India (West Bengal, Arunachal Pradesh, Mizoram, Nagaland, Uttar Pradesh, Punjab, Tamil Nadu, Karnataka).

**Remarks:** Importance of this species is unknown.

**Family 6: Tydeidae**

**16. *Orthotydeus caudatus* (Duges).**

*Orthotydeus caudatus*, Zhang et al. 2001, MAF Science Policy, Project FMA 171, July 2001: 25.

**Diagnosis:** Idiosoma 300 long, propodosoma with 4 pairs of setae including sensory setae. Idiosoma with 11 pairs of setae, of which 4 pairs on dorsocentral series, 3 pairs of posterior opisthosomal setae (h<sub>1</sub>, h<sub>2</sub> and ps<sub>1</sub>) and remaining on dorsocentral series. Femur II with 2 setae, Femur III with 1 seta.

**Collection Data:** 1♀, West Bengal, Purulia Dist., Jalda-I, ex. *Clerodendrum inerme*, 22.viii.2018.

**Distribution:** Ireland, Canada (Manitona), Egypt, Ukraine, Sweden, New Zealand, India (West Bengal).

**Remarks:** This species was so far not known from India.

**Order: Mesostigmata**

**Family 7: Phytoseiidae**

**☉ Key to the tribes and genera of sub family Amblyseiinae:**

1. Sternal shield with posterior projection, some forward migration of preanal setae JV2 and ZV2, preanal setae in male arranged in tangential row rather than in triangular pattern.....Tribe-Euseiini, genus-*Euseius*,  
-Sternal shield without posterior projection, no forward

migration of JV2 and ZV2, preanal setae in male arranged in triangular pattern not in tangential row.....2

- 1. Setae S<sub>4</sub> absent...tribe-Kampimodromini, genus-*Paraphytoseius*
- Setae S<sub>4</sub> present.....3.

- 2. Ratio of setae s<sub>4</sub>: Z<sub>1</sub><3.0:1.0Tribe-Typhlodromipsini
- Ratio s<sub>4</sub>: Z<sub>1</sub>> 3.1:1.0...Tribe-Amblyseiini, genus-*Amblyseius*
- 3. Dorsal shield with waist at level of R<sub>1</sub> seta.....Genus-*Typhlodromips*
- Dorsal shield without prominent waist at the level of R<sub>1</sub> seta..... Genus-*Scapulaseius*

**Genus: *Amblyseius* (after Denmark & Muma, 1989)**

**☉ Key to the species of *Amblyseius*:**

- 1. Cervix long slender, tubular or fundibular.... *largoensis* group, 2
- Cervix sacular or sacular with various modifications...punctatus group.....*kulini*.
- 2. Spermathica with tubular cervix..... 3
- Spermathica with fundibular cervix
- 3. Z<sub>5</sub> 275 micron long..... *sakalava*.
- Z<sub>5</sub> about 200 micron long..... *largoensis*.
- Z<sub>5</sub> about 250 micron long..... *herbicolus*.
- Z<sub>5</sub> about 100 micron long..... *adhatodae*.
- S<sub>4</sub> less than 100 micron long..... *herbicoloides*.

**17. *Amblyseius kulini* Gupta**

*Amblyseius kulini* Gupta, 1978, *Indian J. Acar.* 2 (2): 62-65.

*Amblyseius kulini*, Gupta, 2003, *Mem.Zool.Surv. India* 20(1): 22.

**Diagnosis:**

**Female:** Dorsal shield 300 long, 230 wide. j<sub>1</sub>, j<sub>3</sub>, s<sub>4</sub>, Z<sub>4</sub>, Z<sub>5</sub> measure 28, 44, 82, 85 and 200 respectively Macrosetae on leg IV, genu-70, tibia-60, basitarsus-60.

**Collection Data:** 2♀, West Bengal: Purulia Dist., Bundwan, ex *Paederia foetida*, 6.vii.2018.

**Distribution:** India, West Bengal (Purulia, Bankura), Assam, Meghalaya.

**Remarks:** The host forms a new habitat record for the species.

**18. *Amblyseius largoensis* (Muma)**

*Amblyseiopsis largoensis* Muma, *Ann. Ent. Soc. Amer.*, 48:266.

*Amblyseius largoensis*, Wei-nan, 1984, *Acarology* VI, 1: 222.

*Amblyseius largoensis*, Gupta, 2003, *Mem., Zool. Surv. India* 20 (1): 22-23.

**Diagnosis:** Dorsal shield 375 long, 270 wide, setae  $j_1$ ,  $j_3$ ,  $s_4$ ,  $Z_5$ ,  $Z_4$  measure 36, 50, 105, 270, 100 respectively. Macrosetae on leg IV: genu-100, tibia-65, basitarsus-50.

**Collection Data:** 2♀, West Bengal: Purulia Dist., Bundwan, ex. *Paederia foetida*, 6.vii.2018; 2♀, Bagmundi, ex. *Gloriosa superba*, 7.vii.2018, 4♀, 1♂, Bankura Dist, Simlapal forest, ex. *Clerodendrum inerme*, 30.vii.2018, 1♀, Bankura, Simlapal forest, ex. *Datura metel*, 30.vii.2018, 3♀, 1♂, Bankura, Bishnupur, ex. *Thespesia lampus*, 4.viii.2018.

**Distribution:** Australia, Southeastern U.S., Mexico, Guatemala, Jamaica, Bahamas, Puerto Rico, South Africa, Thailand, India (West Bengal, Manipur, Tripura, Nagaland, Arunachal Pradesh, Punjab, Odisha, Sikkim, Andhra Pradesh Assam, Himachal Pradesh, Tamil Nadu, Puduchery, Kerala, Uttar Pradesh, Jammu & Kashmir, Gujarat, Andaman & Nicobar Is., Lakshadwip Is., Mizoram, Bihar, Meghalaya, Karnataka)

**Remarks:** Abundantly available on most of the mentioned plants. It was found feeding on juvenile stages of *Brevipalpus obovatus* on *Clerodendrum inerme*.

**19. *Amblyseius sakalava* Blommers**

*Amblyseius sakalava* Blommers, 1976: *By dragen Tot de Dierkunde* 46(1): 96.

*Amblyseius sakalava*, Denmark & Muma, 1989, *Occ. Pap. Fla. St. Coll. Of Argl.* 4: 56-57.

**Diagnosis:** Dorsal shield 375 long, 250 wide  $j_1$ ,  $j_3$ ,  $s_4$ ,  $Z_4$ ,  $Z_5$  measure 40, 57, 104, 282 and 110 respectively, Macrosetae on leg IV: genu-127, tibia-96, basitarsus-68.

**Collection data:** 2♀, West Bengal, Purulia Dist., Bundwan, ex. *Carica papaya*, 6.vii.2018.

**Distribution:** Madagascar (Malagasy Republic). New report from India.

**Remarks:** New record from India.

**20. *Amblyseius adhatodae* Muma**

*Amblyseius adhatodae* Muma, 1967, *Fla. Ent.*, 50: 268-270.

*Amblyseius adhatodae*, Gupta, 2003, *Mem., Zool. Surv. India* 20(1): 15.

**Diagnosis:** Dorsal shield 380 long, 270 wide  $j_1$ ,  $j_3$ ,  $s_4$ ,  $Z_5$ ,  $Z_4$  measure 45, 58, 130, 300 and 150, respectively. Macrosetae on leg IV: genu-100, tibia-70, basitarsus-90.

**Collection data:** 1♀ 1♂, West Bengal, Bankura Dist., Simlapal forest, ex. *Marsilea quadrifolia*, 30.vii.2018

**Distribution:** India (Maharashtra, West Bengal), Pakistan.

**Remarks:** Importance unknown.

**21. *Amblyseius herbcicolus* (Chant)**

*Typhlodromus (Amblyseius) herbcicolus* Chant, 1959, *Can Ent.*, 91: 84-85.

*Amblyseius herbcicolus*, Lo, 1986, *Pl. Prot. Bull. Taiwan*, 28: 31-39.

**Diagnosis:** Dorsal shield 360 long, 260 wide,  $j_1$ ,  $j_3$ ,  $s_4$ ,  $Z_5$ ,  $Z_4$  measures 25, 35, 110, 210, 120 respectively. Macrosetae on leg IV: genu-130, tibia-80, basitarsus-70.

**Collection data:** 2♀, West Bengal, Purulia Dist. Jalda-I, ex-*Tectona grandis*, 7.viii.2018.

**Distribution:** Portugal, Pakistan, South America, North America, West Indies, Africa, Australia, Turkey, Egypt, Japan and China, India (West Bengal, Tripura, Mizoram, Sikkim, Tamil Nadu).

**Remarks:** Found associated with *Oligonychus biharensis*, but feeding was not observed.

**22. *Amblyseius herbcicoloides* McMurtry & Moraes**

*Amblyseius herbcicoloides* McMurtry and Moraes, 1984, *Internal. J. Acarol.* 10(1):27-37.

*Amblyseius herbicoloides*, Denmark & Muma, 1989, *Occ. Pap. Fla. St. Coll. of Agri.*, 4: 57-58.

**Diagnosis:** Dorsal shield 340 long, 230 wide, j<sub>1</sub>, j<sub>3</sub>, s<sub>4</sub>, Z<sub>5</sub>, Z<sub>4</sub> measure 35,42,70,300,65 respectively. Macrosetae on leg IV: genu-139, tibia-110, basitarsus-45.

**Collection data:** 2♀, West Bengal, Purulia Dist., Jalda-I, ex. *Calotropis procera*, 7.viii.2018.

**Distribution:** Fiji, India (West Bengal, Karnataka).

**Remarks:** Importance not known.

**Genus:** *Euseius*

⊙ **Key to the species of *Euseius*:**

1. Setae S<sub>2</sub>-S<sub>5</sub> equal..... *ovalis*.
- S<sub>2</sub> - S<sub>5</sub> unequal, S<sub>4</sub>, S<sub>5</sub> equal and longer than S<sub>2</sub>..... *sacchari*.

**23. *Euseius ovalis* (Evans)**

*Typhlodromus ovalis* Evans, 1953, *Ann. Mag. Nat. Hist.*, 6: 458-461.

*Amblyseius (Euseius) ovalis*, Gupta, 1986, *Fauna of India: Phytoseiidae*, p. 92-94.

*Euseius ovalis* Gupta, 2003, *Mem., Zool. Surv. India* 20 (1): 42-43

**Diagnosis:** Dorsal shield 330 long, 240 wide measurements of setae j<sub>1</sub> 30, Z<sub>5</sub> 45. Other setae small or very small, macrosetae on leg IV: genu-35, tibia-25, basitarsus-45.

**Collection Data:** 4♀, West Bengal, Bankura Dist., Chhatna, ex. *Woodfordia fruticosa*, 14.viii.2019.

**Distribution:** India (Arunachal Pradesh, Assam, Sikkim, Mizoram, Meghalaya, Tripura, West Bengal, Manipur, Bihar, Andhra Pradesh, Karnataka, Tamil Nadu, Puduchery, Kerala, Maharashtra, Gujarat, Punjab, Andaman & Nicobar Isls., Lakshadwip Isls.), Philippines, Taiwan, Hawaii, Mauritius, Mexico, Malayasia, Hong kong, Japan, Indonesia, New Zealand, Australia.

**Remarks:** Though it is known to be a good predator but such behavior was not observed during present study.

**24. *Euseius sacchari* (Ghai & Menon)**

*Amblyseius sacchari* Gai & Menon, 1967, *Oriental Ins.*, 1: 75-76.

*Amblyseius (Euseius) sacchari* Gupta, 2003, *Mem., Zool. Surv. India* 20 (1): 45-46.

**Diagnosis:** Dorsal shield 320 long, 240 wide, measurements of setae j<sub>1</sub> 30, j<sub>3</sub> 10, s<sub>4</sub> 15, Z<sub>5</sub>, 43, Z<sub>4</sub>, 11. Macrosetae on leg IV: genu-30, tibia-33, basitarsus-50.

**Collection Data:** 2♀, West Bengal, Bankura, Dist. Chhatna, ex. *Croton persiflora*, 14.viii.2018, 1♀, Purulia Dist., Santuri, ex. *Asparagus racemosus*, 22.viii.2018.

**Distribution:** India (Arunachal Pradesh, West Bengal, Bihar, Tamil Nadu, Gujarat, Punjab, Himachal Pradesh, Karnataka).

**Remarks:** Importance not known.

**Genus:** *Paraphytoseius*

⊙ **Key to the species of *Paraphytoseius*:**

1. Macrosetae of leg IV spatulate..... *bhadrakaliensis*.
- Macrosetae on leg IV non-spatulate, more or less rod like..... *orientalis*.

**25. *Paraphytoseius orientalis* (Narayanan, Kaur & Ghai).**

*Typhlodromips (Amblyseius) orientalis* Narayanan, Kaur & Ghai. 1960, *Proc. Nat. Inst. Sci.* 26B: 394.

*Amblyseius (Paraphytoseius) multidentatus*, Gupta, 2003, *Mem., Zool. Surv. India*, 20 (1): 59-60.

**Diagnosis:** Dorsal shield 290 long, 160 wide, measurements of setae j<sub>1</sub> 35, j<sub>3</sub> 80, s<sub>4</sub> 111, Z<sub>5</sub> 100, Z<sub>4</sub> 80 all being thick and serrate. Macrosetae on leg IV: genu-28, tibia-30, basitarsus-30.

**Collection Data:** 3♀, 1♂, West Bengal, Bankura Dist., Bishnupur, ex. *Clerodendrum inerme*, 22.viii.2018, 2♀, Bankura Dist., Chhatna, ex. *Terminalia arjuna*, 14.viii.2019.

**Distribution:** India (West Bengal, Bankura Dist., Bishnupur, ex. *Clerodendrum inerme*, 22.viii.2018, 2♀, Bankura Dist., *Terminalia arjuna*, 14.viii.2019.

**Remarks:** Moderate occurrence in association with *Brevipalpus* mite on *Terminalia arjuna*.

**26. Paraphytoseius bhadrakaliensis (Gupta)**

*Amblyseius bhadrakaliensis* Gupta, 1970, *Bull. Ent. Soc. India*. 10: 127-128.

*Amblyseius bhadrakaliensis*, Prasad, 1974, *Indira Acar. Pub. House, Ludhiana*: 161.

*Paraphytoseius bhadrakaliensis*, Chant & McMurtry, 2007, *Indira. Pub. House, Michigan, U.S.A*: 53.

**Diagnosis:** Dorsal shield 270 long, 138 wide, measurements of setae  $j_1$  22,  $j_4$ - $j_6$  and  $J_5$  6 to 8 long,  $j_3$  50 long,  $Z_5$  80 long,  $Z_4$  70 long,  $r_3$  23 long,  $s_4$  73 long. The other setae on dorsal shield measure 7-10 long. Macrosetae on leg IV: genu-30, tibia-34, basitarsus-45.

**Collection Data:** 2♀, 1M, West Bengal, Purulia Dist., Santuri, ex. *Terminalia chebula*, 31.viii.2018.

**Distribution:** India (Cosmopolitan).

**Remarks:** This mite was found in association with *Brevipalpus* mite.

**27. Scapulaseius polyantheae (Gupta)**

*Amblyseius polyantheae* Gupta, 1975, *Internat. J. Acarol.* 1(2): 42-43.

*Amblyseius (Typhlodromips) polyantheae*, Gupta, 2003, *Mem., Zool. Surv. India* 20 (1): 79.

**Diagnosis:** Dorsal shield 310 long, 240 wide. Measurements of setae  $j_1$  20,  $j_3$  15,  $s_4$  30,  $Z_5$  60,  $Z_4$  30, other setae measure between 8-10 long. Macrosetae on leg IV: genu-27, tibia - 33, basitarsus-30.

**Collection Data:** 2♀, West Bengal, Purulia Dist., Baghmundi, ex. *Mentha arvensis*, 5.ix.2018.

**Distribution:** India (West Bengal, Tripura, Mizoram)

**Remarks:** Found associated with *Polyphagotarsonemus latus*, on which it was found feeding on eggs.

**28. Typhlodromips syzygii (Gupta)**

*Amblyseius syzygii* Gupta, 1975, *Internat. J. Acarol.*, 1(2): 44-45.

*Amblyseius (Typhlodromips) syzygii*, Gupta, 2003, *Mem., Zool. Surv. India* 20(1): 82-83.

**Diagnosis:** Dorsal shield 300 long, 200 wide, Measurements of setae  $j_1$  20,  $j_3$  20,  $s_4$  20,  $Z_5$  70 (serrate),  $Z_4$  35. Macrosetae on leg IV, genu-45, tibia-30, basitarsus-50.

**Collection Data:** 4♀, West Bengal, Purulia Dist., Baghmundi, ex. *Ocimum tenuiflorum*, 5.ix.2018.

**Distribution:** India (West Bengal, Odisha, Tripura, Meghalaya, Bihar, Sikkim, Mizoram, Uttar Pradesh), Thailand.

**Remarks:** Found associated with *Polyphagotarsonemus latus*, feeding on its eggs.

**Family 8: Glycyphagidae**

**29. Glycyphagus domesticus (De Geer)**

*Acarus domesticus* De Geer, 1778, *Mem. Hist. Ins.* 7: 106-109.

*Glycyphagus domesticus*, Hughes, 1970, *Min. agri. Fish food, Lond. Tech. Bull.*, 9: 140-143.

*Glycyphagus domesticus*, Kort *et al.*, 1997, *Clinical and Experimental Allergy*, 27(3): 921.

**Diagnosis:**

**Male:** Idiosoma round, cuticle dull, covered with minute papillae, crista metopica extends from base of chelicera up to level of ve seta, idiosomal setae pectinate, radiate from body surface, supracoxal seta forked and branched, legs long with tapering segments, terminate in pre tarsus and small claw.

**Collection Data:** 5♀, West Bengal, Purulia Dist., Baghmundi, ex. *Mangifera indica*, 24.xii.2018.

**Distribution:** India, Japan, Australia, Canada, Europe.

**Remarks:** This is commonly a fungal feeding mite and its occurrence here is an accidental matter.

**Family 9: Oribatulidae**

**30. Scheloribates sp.**

**Collection Data:** 5♀, West Bengal, Bankura Dist., Bundwan, ex. *Phoenix dactylifera*, 20.i.2019.

**Distribution:** India (West Bengal).

**Remarks:** This is normally associated with soil/litter and hence its occurrence here appears to be accidental.

#### Discussion

Out of the mites collected, the most abundant and injurious species were *Porcupinychus abutiloni* on *Marsilea quadrifolia*, *Oligonychus biharensis* on *Aegle marmelos*, *Tetranychus macfarlanei* on *Rauvolfia serpentina* and *Raoiella pandanae* on *Phoenix dactylifera*. Among predatory species, *Amblyseius largoensis*, *Amblyseius adhatodae*, *Agistemus fleschneri*, *Pronematus elongatus* were abundant and important predators.

Among the moderately abundant phytophagous species mention may be made of *Schizotetranychus baltazari* on *Murraya koenigii*, *Brevipalpus phoenicis* on *Moringa oleifera*, while among the predatory group the moderately abundant species were *Amblyseius kulini* on *Paederia foetida*, *Amblyseius herbicolus* on *Tectona grandis*, *Euseius ovalis* on *Woodfordia fruticosa* and *Paraphytoseius orientalis* both on *Clerodendrum inerme* and *Terminalia arjuna*.

Among the least abundant species were *Hystorichonychus* sp. nr *gracilipes* on *Piper nigrum*, *Eutetranychus maximae* on *Murraya koenigii*, *Brevipalpus euphorbiae* on *Solanum xanthocarpum* and *Brevipalpus obovatus* on *Clerodendrum inerme* under phytophagous group and *Amblyseius sakalava* on *Carica papaya*, *Euseius sacchari* on *Asparagus racemosus*, *Agistemus* sp. nr *edulis* on *Melia azadirach*, *Agistemus industani* on *Emblica officinalis* and *Orthotydeus caudatus* on *Clerodendrum inerme* under predatory group. Both the fungal feeding species were least abundant.

Among the 27 species of medicinal plants examined in present study, *Clerodendrum inerme*, which had the maximum number(4) of mite species followed by *Phoenix dactylifera*, *Paederia foetida*, *Marsilea quadrifolia*, *Murraya koenigii* and *Mentha*

*arvensis* each inhibited 2 mite species each while the remaining 21 species harboured 1 species each. Among the predatory mites, Phytoseiidae was most dominant occurred on plant 12 species and that was followed by Stigmaeidae representing 3 species. The families Iolinidae and Tydeidae harboured 1 species each.

#### Conclusion

The present paper reports the occurrence of a total of 30 species under 9 families, 19 genera and 4 orders from 27 species of medicinal plants collected from Purulia and Bankura districts of West Bengal. This includes 11 species belonging to phytophagous group, 17 species under predatory group and 2 species under fungal feeding group. Out of these, *Porcupinychus abutiloni* on *Marsilea quadrifolia*, *Oligonychus biharensis* on *Aegle marmelos*, *Tetranychus macfarlanei* on *Rauvolfia serpentina* and *Raoiella pandanae* on *Phoenix dactylifera* were most abundant and injurious phytophagous species. Among predatory species, *Amblyseius largoensis*, *Amblyseius adhatodae*, *Agistemus fleschneri*, *Pronematus elongatus* were abundant and important predators. *Clerodendrum inerme* harboured the maximum number of 4 species. *Marsilea quadrifolia*, *Murraya koenigii*, *Phoenix dactylifera*, *Mentha arvensis* and *Paederia foetida* had 2 species each while the remaining species harboured 1 species each. In addition, it also reports 2 species, i.e. *Orthotydeus caudatus* and *Amblyseius sakalava*, the occurrence of which were earlier unknown from India. Further, *Raoiella pandanae* on palm was earlier not reported from West Bengal. The collection data, distribution, importance, if any, and keys to the different taxonomic categories have also been given.

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