J. Adv. Sci. Edu. Res. **2022: 3: 120-147,** ISSN: 2583-0155 (ONLINE)
https://doi.org/10.56253/JASER.3.1.2022.120-147
Published: 25.12.2023 (http://jaser.rkmvccrahara.org/)

On a collection of arboreal spiders (Araneae: Arachnida) from the campus of Central Institute for Subtropical Horticulture (CISH), Malda, West Bengal, India

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Abstract

23 species, belonging to 20 genera, 7 families, and 1 Order Araneae are collected from Malda Horticulture Institute. The predominant family of the studied area are Araneidae (11), followed by Salticidae (8), Lycosidae (3), Theridiidae, Tetragnathidae (2 each), and Scytodidae, and Cheiracanthiidae (1 each). Genera-wise *Neoscona* with five species is the dominant genus reported from this campus.

Keywords: Diversity, spider, Malda, Horticulture.

1. Introduction

Spiders consist of 51,444 species under 4,339 genera and 135 families (World Spider Catalog, 2023) globally, with the Indian spider fauna represented by 1686 species in 438 genera in 60 families (Keswani *et al*., 2012). Spiders, being terrestrial predators, are a complicated group of species by their wide diversity in foraging activities (Goldsbrough *et al*., 2004). They are ubiquitous groups of predaceous species in the faunal kingdom (Raiz *et al*., 2018). They act

as biological indicators and have extreme sensitivity to natural conditions and anthropogenic disturbances, thereby assessing the health of an ecosystem (Pearce and Venier, 2006). Spiders are female-dominated species, predatory in nature (Bennett, 2001).

Spiders are functionally very important predators and are effective biological control agents in ecosystems thereby regulating the terrestrial arthropod species. They are found in almost all microhabitats and are easily collected. So, it is evident that despite their fundamental roles in ecosystems, conservation strategies have been ignored (Pearce and Venier, 2006; Rajeevan *et al*., 2019).

In West Bengal several works on made on spiders. Soren and Chawdhury (2010) studied the Spider Fauna of Chintamoni Kar Bird Sanctuary. Chowdhury (2015) studied the diversity and nature of damage of mango insect pests at Kaliachak, Malda. Dhali *et al*., (2016) documented the new records of spiders (Arachnida: Araneae) from the Sundarbans Biosphere Reserve, India. Saha *et al*., (2017) published their study on the spider fauna of Barasat and Basirhat. Sen *et al*., (2010) also worked on the spider species of Dooars. Sen *et al*., (2011) described a new species of the genus *Theridion* from the state. Recently, Singh (2023) documented a total of 567 species of spiders described under 245 genera belonging to 39 families are enlisted that have been described and/or recorded from 23 out of 24 districts of West Bengal, India.

2. Materials and Methods

Malda is a city in the Indian state of West Bengal, and is the sixth largest city in West Bengal. The study area of this work, Icar-Cish Regional Research Station/ Krishi Vigyan Kendra, Malda West Bengal (Latitude-24°98'39"N, Longitude-88°14'10" E) and near Malda food park, Mokdumpur, Malda, West Bengal-732101.

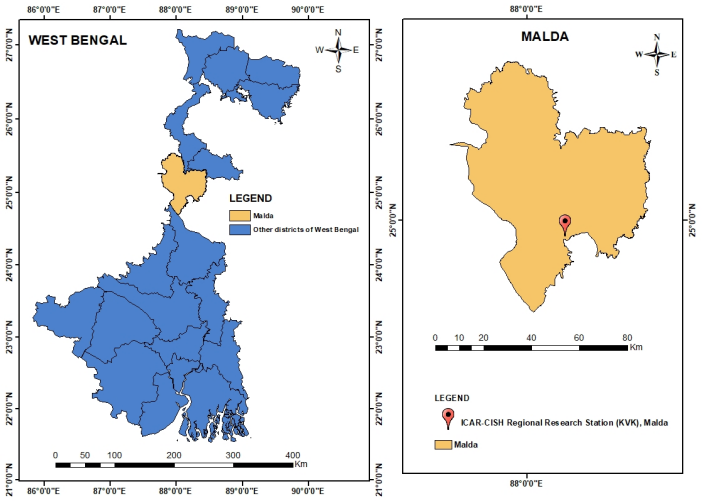

Fig.1. Study area: ICAR- CISH, Regional Research Station/ Krishi Vigyan Kendra, Malda, West Bengal**.**

The specimens were collected either by hand or by beating or by sweeping net from the different areas and preserved temporarily in 70% alcohol. The examples were identified by consulting following literatures and then photographed with the help of Stereo Zoom Binocular Microscopes, model Leica EZ4 HD. Specimens examined are deposited in the Department of Zoology, Ramakrishna Mission Vivekananda Centenary College, Rahara, Kolkata-700118**.**

Identification of the spider samples was done following Tikader (1967, 1970, 1977, 1982, 1987), Majumder & Tikader (1991), Barrion & Litsinger (1995), Saha *et al.,* (1994), Majumder (2005, 2007), Sebastian *et al*., (2005), Metzner (2016), WSC (2023) and others. Other consulted literature is mentioned in the text under different families. The determined status of the taxa is also confirmed by the scientists of Arachnida Section, Zoological Survey of India, Kolkata.

3. Result

Family **Lycosidae** Sundevall, 1833

Genus ***Hippasa*** Simon, 1885

1. *Hippasa holmerae* Thorell, 1895

Genus ***Trochosa*** Koch, 1847

2. *Trochosa ruricoloides* Schenkel, 1963**

Family **Araneidae** Clerck, 1757

Genus *Neoscona* Simon 1864

3. *Neoscona* sp.

Genus ***Eriovixia*** Archer, 1951

4. *Eriovixia laglaizei* (Simon, 1877)

5. *Eriovixia* sp.

Genus ***Gasteracantha*** Sundevall, 1833

6. *Gasteracantha* sp.

Genus ***Larinia*** Simon, 1874

7. *Larinia* sp.

Genus ***Cyrtophora*** Simon, 1864

8. *Cyrtophora* sp.

Family **Salticidae** Blackwall, 1841

Genus ***Myrmarachne*** MacLeay, 1839

9. *Myrmarachne melanocephala* MacLeay, 1839

10. *Myrmarachne* sp.

Genus ***Rhene*** Thorell, 1869

11. *Rhene flavicomans* Simon, 1902

Genus ***Menemerus*** Simon, 1868

12. *Menemerus* sp.

    Genus ***Brettus*** Thorell, 1895

13. *Brettus* sp.

    Genus ***Phintella*** Strand, 1906

14. *Phintella* sp.

    Genus *Carrhotus* Thorell, 1891

15. *Carrhotus* sp.

    Family **Tetragnathidae** Menge, 1866

    Genus ***Guizygiella*** Zhu, Kim & Song, 1997

16. *Guizygiella melanocrania* (Thorell, 1887)

17. *Guizygiella* sp.

    Genus ***Leucauge*** White, 1841

18. *Leucauge decorata* (Blackwall, 1864)

    Genus ***Tetragnatha*** Latreille, 1804

19. *Tetragnatha* sp.

    Family **Theridiidae** Sundevall, 1833

    Genus ***Nesticodes*** Archer, 1950

20. *Nesticodes rufipes* (Lucas, 1846)

    Genus ***Nihonhimea*** Yoshida, 2016

21. *Nihonhimea* sp.

Family **Scytodidae** Blackwall, 1864

Genus *Scytodes* Latreille, 1804

22. *Scytodes* sp.

Family **Cheiracanthiidae** Wagner, 1887

Genus ***Cheiracanthium*** Koch, 1839

23. *Cheiracanthium* sp.

****- New record from the State of West Bengal.**

Systematic Account

Order **Araneae** Clerck, 1757

Family **LYCOSIDAE** Sundevall, 1833

Diagnostic characters: Size: small to large. Colour: brown or grey in colour with various markings on the body. Head: Cephalothorax longer than its width, narrower, elevated in cephalic region, with a longitudinal fovea; eight eyes are arranged in three rows 4:2:2, all eyes are black; posterior median eyes are largest. Legs: moderate length, with notched, decorated with spines; scapulae are present. Abdomen: oval.

Remarks: This family consists of 2304 species globally, of which 126 species are known from India (Siliwal *et al*., 2005). They are free-living ground-dwelling spiders, with females carrying their egg sacs attached to their spinnerets. They also make burrows and some also build silken retreats. They are active hunters with good eyesight (Mondol *et al*., 2020).

Genus ***Hippasa*** Simon, 1885

Diagnostic characters: Posterior pair of spinnerets having two segments with the elongated basal segment. Palps in both sexes are covered with long setae.

They make funnel-shaped webs in low vegetation with or in open spaces at tree bases. They make woven sheet webs with a funnel-shaped retreat which leads into the ground or into dense vegetation. Males are short-lived, while mating occurs for a short time at the start of the rainy season 17 India. (Siliwal *et al.* 2005).

Remarks: 9 species are reported from West Bengal (Singh, 2023).

1. ***Hippasa holmerae*** Thorell, 1895

Material examined: India, West Bengal, Malda, Horticulture campus, 31.i.2023, (2 ♀), coll. S. Das and M. Ghosh.

Distribution: India: Manipur, and West Bengal. Elsewhere: Bangladesh, China, Myanmar, Philippines, Singapore, Taiwan and Uttarakhand.

Genus ***Trochosa*** Koch, 1847

Diagnostic characters: Brown carapace having paired dark longitudinal stripes between the fovea and a posterior row of eyes. Eyes wide as middle row anteriorly. Abdomen dark with few white spots. Legs short, stout, reddish brown. They are found in dark, moist places in under leaf litter or tall grasses. Females make shallow "nest holes" in the upper layers of soil, guarding their eggs until they hatch. Nocturnal in habit, they are sluggish in nature.

Remarks: 1 species is reported in West Bengal (Singh, 2023).

2. ***Trochosa ruricoloides*** Schenkel, 1963

Material examined: India, West Bengal, Malda, Horticulture campus, 31.i.2023, (1 ♂), coll. S. Das and M. Ghosh.

Distribution: India, China, Taiwan, Thailand, Malaysia, Indonesia, Papua New Guinea.

Remarks: This species is newly reported from the state.

Family **ARANEIDAE** Clerck, 1757

Diagnostic characters: Cephalothorax normally flat and varied, with an oblique depression separating the cephalic and thoracic regions with a conspicuous or non-existent fovea. Chelicerae with bosses and furrows with strong, dissimilar teeth. 8 homogeneous eyes grouped in two rows, laterals and medians widely spaced, medians creating a quadrant, either square or trapezium, laterals generally near and frequently projecting on angular tubercles. Legs long and robust, with the tarsus and metatarsus never being longer than the patella and tibia combined, and a tarsal claw. The abdomen variable has unique patterns on the dorsum, humps, and sigil (muscular apodeme). Usually, with scopes, epigynum is complicated. Male palpal procambium with a sclerotized hook and prominent median apophysis (Dhali *et al*. 2017).

Remarks: This family consists of 3108 species and 186 genera worldwide. The size of the abdomen differs sometimes such as tubercles, and spine-like structures. They have six spinnerets. Sexual dimorphism is present in this family. For this reason, male spider size is smaller than female spider species. Male spider species in this family consist of clasping spines and several spurs are present in their leg for this reason cephalothorax and abdomen sizes differ. Males are not found rigorously compare to female spider species (Tikader, 1987).

Genus ***Neoscona*** Simon 1864

Diagnostic characters: Thoracic fovea longitudinal, cephalothorax longer than wide. In males, coxa I ventrally with a hook and dorsal tubercle, femur II with groove, and tibia II prolateral with macrosetae. Oval, sub-oval, triangular, or sub-triangular abdomen original scapes are tongue-like, never wrinkled, rigid, totally united to the base, and have one or two pairs of lateral lobes, as well as original apertures beneath the scape. Male palpal femur with tubercle at the base, patella with two long and powerful setae, and broad cymbium (Dhali *et al.* 2017). Spider species is commonly known as orb-webbing spider which belongs to this family (Majumder, 2007).

Remarks: 13 species are reported from West Bengal (Singh, 2023)

3. *Neoscona* sp.

Material examined: India, West Bengal, Malda, Horticulture campus, 31.i.2023, (4 ♀), coll. S. Das and M. Ghosh.

Distribution: India, Pakistan, Bangladesh.

Genus ***Eriovixia*** Archer, 1951

Diagnostic characters: Colour varies from dark black to white. Females have an abdomen with a sub-triangular varying degree of extension at the posterior end. Males are smaller in size, spiny.

Males and females stay resting on one side of the leaves. (Siliwal *et al*., 2005).

Remarks: 4 species are reported from West Bengal.

4. *Eriovixia laglaizei* (Simon, 1877)

Material examined: India, West Bengal, Malda, Horticulture campus, 31.i.2023, (2 ♀), coll. S. Das and M. Ghosh.

Distribution: India, Pakistan, Bangladesh, China, Philippines, New Guinea.

5. *Eriovixia* sp.

Material examined: India, West Bengal, Malda, Horticulture campus, 31.i.2023, (1 ♀), coll. S. Das and M. Ghosh.

Distribution: Southeast Asia.

Genus ***Gasteracantha*** Sundevall, 1833

Diagnostic characters: According to Majumder, (2007) Cephalothorax of this genus's spider is longer than wide. The anterior margin of this genus's spider is blunt and the cephalic region is

depressed and the thoracic region is gradually slopping down to the end of the posterior end. On the posterior portion, the ocular quad is wider than long. Strong chelicerae are present. The shape of the abdomen is octagonal and it overlaps with the cephalothorax. The outer side of the species is white blackish, and brown in colour and pairs of sigilla are present.

The presence of a spine in their body, for this reason, this spider's name is a spiny orb-web spider. Economic importance is present in the case of this genus's spider species they act as a controlling agent of insect pests in the cop field such as rice fields (Majumder, 2007).

Remarks: 5 species are reported from West Bengal. (Singh, 2023)

6. *Gasteracantha* sp.

Material examined: India, West Bengal, Malda, Horticulture campus, 31.i.2023, (1 ♀), coll. S. Das and M. Ghosh.

Distribution: Worldwide distribution is present in the case of the *Gasteracantha* species. It finds in the topical and the subtropical region. Some of the species of this genus are shown in America and Africa also.

Genus ***Larinia*** Simon, 1874

Diagnostic characters: According to Majumder, 2007 Cephalothorax is sometimes half longer than wide. On the front side of this genus's spider species is narrower in nature. The presence of labium is sometimes long and wide in nature. Legs are very prominent and slender in nature. Presence of four teeth in marginal region.

Remarks: 5 species are reported from West Bengal. (Singh, 2023).

7. *Larinia* sp.

Material examined: India, West Bengal, Malda, Horticulture campus, 31.i.2023, (1 ♂), coll. S. Das and M. Ghosh.

Distribution: This species is shown in the tropical and subtropical countries in the world. Australia, New Guinea, Maldives, Thailand, and Indonesia.

Genus ***Cyrtophora*** Simon, 1864

Diagnostic characters: The colour of the cephalothorax is pale in nature. Sometimes it acts yellowish in nature with a blackish spot. Chelicerae of this spider species are moderately strong in nature. The anterior median eye (AME) is also large apart from the Posterior eye. The median eye is encircled with the help of the black ring. The nature of the abdomen of this spider species is elongated and two pair of small black conical tubercles are present.

This spider species is commonly known as a dome-shaped orb-web spider. They live in a colony. The network of this spider species is mostly predominating nature. (W.S.C., 2023).

Remarks: 7 species are reported from West Bengal. (Singh, 2023).

8. *Cyrtophora* sp.

Material examined: India, West Bengal, Malda, Horticulture campus, 31.i.2023, (**1** ♂), coll. S. Das and M. Ghosh.

Distribution: India, Australia, China, East Africa, Malaysia, Pakistan, Philippines, and Taiwan.

Family **SALTICIDAE** Blackwall, 1841

Diagnostic characters: According to Barrion, and Litsinger, (1994) variable abdominals, generally with appealing colour patterns and decorations. Spiders of small to medium size. Some of them are lengthy and ant-like. Eyes are organised in three rows, covering the entire cephalic area, anterior row with four eyes on a vertical face. Chelicerae are tough, and the teeth on the

borders vary in size and shape. Presence of variable sternum. Legs are normally long and thick, with two tarsal claws and a claw tuft. The anatomy of the first set of legs varies between species. Epigynum complex and highly variable. Tibial apophysis and male palp complex are present.

Remarks: According to the world spider catalogue 2023, this family consist of 671 genera. They are commonly known as jumping spiders in nature. This jumping spider is present on plants, and walls of buildings. This spider species moves fast from one position to another position.

Genus ***Myrmarachne*** MacLeay, 1839

Diagnostic characters: The colour of the cephalothorax in this spider species is reddish in nature. The shape of the cephalothorax is longer than apart from wide. Transverse constriction is present in the cephalic and thoracic regions. Recurved anterior rows of eyes are present in the case of these genus' spider species. Their posterior row of eyes is straight in condition. Chelicerae resemblance to the cephalothorax. 4 and 5 large teeth are present in the case of this genus's spider species. Long maxillae and labium are present. Legs' shape is mostly thin and long in nature. Pedicel is the narrow stock-like projection present between the hind end of the cephalothorax and abdomen. It acts as a connection bridge between the cephalothorax and the abdomen. The size of the pedicel in this genus's spider species is long in nature and shown very prominent (Majumder, 2007). The common name of the genus's spider species is ant-mimicking spider. This genus's spider species act as an ant for escaping their predator. In that situation when their predator comes in front of these spider species then they raised their first two front legs. These two legs act as an ant's antenna and they easily escape their predator.

Remarks: 11 species are reported from West Bengal. (Singh, 2023).

9. *Myrmarachne melanocephala* MacLeay, 1839

Material examined: India, West Bengal, Malda, Horticulture campus, 31.i.2023, (1 ♂), coll. S. Das and M. Ghosh.

Distribution: India, Indonesia, Pakistan.

10. *Myrmarachne* sp.

Material examined: India, West Bengal, Malda, Horticulture campus, 31.i.2023, (1 ♂), coll. S. Das and M. Ghosh.

Distribution: India, South Africa, Thailand, USA,

Genus ***Rhene*** Thorell, 1869

Diagnostic characters: This genus is the most important spider genus in the world. This genus of spider species is typically small to medium size in nature. The range of size is millimeter and 1 centimeter in body length. They have shorter in length. The colour pattern of this genus of spider species is usually blackish in nature but sometimes it shows brown colouration which consists of grey stripes. Eyes are present in front of the head and are often more prominent compared to the other eyes. The first pair of legs are typically longer and thicker apart from the other legs. For this reason, the jumping ability is present in the case of this spider species. The behaviour of the spider species is a very important part of this research as the species of their genus's leg is very long then the presence of jumping behaviour is present in the case of this spider species. Hunting behaviour is present in the case of this spider species. The vision and the jumping capacity are present in the case of this genus of spider species. Rhene spider genus consists of a group of spider species and this spider species is commonly known as the jumping spider species.

Remarks: 7 species are reported from West Bengal. (Singh, 2023).

11. ***Rhene flavicomans*** Simon, 1902

Material examined: India, West Bengal, Malda, Horticulture campus, 31.i.2023, (1 ♀), coll. S. Das and M. Ghosh.

Distribution: India, Bhutan, Sri Lanka.

Genus ***Menemerus*** Simon, 1868

Diagnostic characters: Menemerus spiders are typically small and medium size in nature. Adult body length is 5-12 millimeters along with male and female. The body shape is the robust body shape and it characterizes with the cephalothorax. The Cephalothorax of this spider genus is

fused to the head and thorax. The abdomen of this spider genus is oval in nature. Some additional marking colour is present in the case of this genus of spider species. The colour of their genus spider species is usually grey and brown in nature. Excellent vision is present in the case of this spider species-genus. Four pair of eyes are present these are arranged in front of the cephalothorax. Two large Anterior Median Eye (AME) and two smaller Anterior Lateral Eye ALE eyes are presently situated behind them. Legs of this genus of spider species are well developed. For this reason, they easily jumped from one place to another place. The hind leg of this spider species-genus is very long and distinguished in nature.

Remarks: 5 species are reported from West Bengal. (Singh, 2023).

12. *Menemerus* sp.

Material examined: India, West Bengal, Malda, Horticulture campus, 01.ii.2023, (1 ♀), coll. S. Das and M. Ghosh.

Distribution: India, Australia, China, Japan, Saudi Arabia, South Africa, and UAE.

Genus ***Brettus*** Thorell, 1895

Diagnostic characters: The body size of this genus of spider species is very essential part of this research. This genus of spider species' body size is very small and medium in size. The length of their body can change from a few millimeters to around 1 centimeter. The shape of this spider species-genus is mostly flattened in nature. Brown, black and grey colouration is present in the case of this genus of spider species. Sometimes this spider species shows metallic hues. Sharp vision is a present case of this genus of spider species. Forward-facing eyes are present in the case of this spider species. This eye arrangement provides them with good depth perception and allows them to accurately judge distances when hunting or navigating their environment. This genus of spider species hunted their accuracy is much stronger. This genus has specialized leg adaptations and their legs are covered by bristle and spines. Active behavior is present in the case of this spider species They hunted their prey very fast. This genus of spider species es mostly found in various regions these are forests, grasslands, and shrublands. Some species are mostly found at the ground level (ground-dwelling spider) and tree (tree-dwelling).

Remarks: 5 species are reported from West Bengal. (Singh, 2023).

13. *Brettus* sp.

Material examined: India, West Bengal, Malda, Horticulture campus, 01.ii.2023, (1♀), coll. S. Das and M. Ghosh.

Distribution: India, Japan, Sri Lanka, Nepal, Myanmar, and Madagascar.

Genus ***Phintella*** Strand, 1906

Diagnostic characters: Small and medium spider size is present in the case of this spider species. They are usually 2 centimeters in body length. Cephalothorax (prosoma) is large and the size of the abdomen (opisthosoma) is smaller in nature. Acute stereoscopic vision is present in the case of this spider genus species. This stereoscopic vision is provided by AME which is also known as anterior median eye. This eye is present at the top of the cephalothorax. Some various colour is present in the case of this spider genus's species such as grey, white, yellow, and green. This spider genus belongs to family Salticidae family. The jumping ability is present in the case of this spider species. The other important behavior is present in the case of this spider species such as the ant-mimicking behavior is also present in case of this spider gene's species. In the case of this genus spider species have unique hunting behavior and their accuracy is very remarkable. They often exhibit courtship rituals involving intricate displays, including movement and vibration, to attract mates. (W.S.C., 2023).

Remarks: 5 species are reported from West Bengal. (Singh, 2023).

14. *Phintella* sp.

Material examined: India, West Bengal, Malda, Horticulture campus, 01.ii.2023, (1♀), coll. S. Das and M. Ghosh.

Distribution: India, China, Russia, Vietnam, East Africa, South Korea, Japan.

Genus ***Carrhotus*** Thorell, 1891

Diagnostic characters: This is the most important spider genus all over the world. The eye is very sharp in the case of these spider genera species. Cephalothorax is moderately long in nature and their legs are robust and clothed in nature. The abdomen is long and rigid.

Remarks: 3 species are reported from West Bengal. (Singh, 2023).

15. *Carrhotus* sp.

Material examined: India, West Bengal, Malda, Horticulture campus, 01.ii.2023, (1 juvenile ♀), coll. S. Das and M. Ghosh.

Distribution: India, China, Libya, Nepal, Philippines, Vietnam and Indonesia.

Family **TETRAGNATHIDAE** Menge, 1866

Diagnostic characters: Sternum longer than wide. Cephalothorax length greater than width. Long maxillae and labium. Brown or grey in colour, with dull or lustrous silvery patterns. Chelicerae vary in size and shape, with a row of big teeth and powerful projecting spurs, but no boss. Legs long and slender, with or without spines, and the presence of tarsal claw. Eight eyes in two rows, lateral eyes contiguous or apart. Variable, elongated and cylindrical or round to oval abdomen. Spinnerets are comparable in size. Simple or complicated epigynum with an unsclerotized genital plate. Male palp without apophysis in the middle. Tetragnathidae species have orb-weaving behavior. Through the help of this behavior, they capture their prey. They also trapped the flying insect easily with the help of this wave. Near waterbodies this this wave is most abundant.

Remarks: 3 species are reported from West Bengal. (Singh, 2023).

Genus ***Guizygiella*** Zhu, Kim & Song, 1997

Diagnostic characters: Cephalothorax longer mostly long apart from wide narrowing in front. Ocular quadrate is present and this is slightly longer apart from wide. Their eyes are recurved in

nature. AME is also known as the anterior median eye larger apart from PME is known as the posterior median eye. Chelicerae is averagely strong in the case of this genus's spider. Legs are averagely strong and long in nature. The shape of their abdomen is oval in nature. There is a distinctive folium on the dorsum that has black and white splotches (Majumder, 2007). Long legs are present in the case of this spider species. This spider species is shown in various parts of the country all over the world such as Myanmar Pakistan, Laos, India, China, and Vietnam.

Remarks: 3 species are reported from West Bengal. (Singh, 2023).

16. *Guizygiella melanocrania* (Thorell, 1887)

Material examined: India, West Bengal, Malda, Horticulture campus, 01.ii.2023, (1 ♀), coll. S. Das and M. Ghosh.

Distribution: India, China, Laos.

17. *Guizygiella* sp.

Material examined: India, West Bengal, Malda, Horticulture campus, 01.ii.2023, (1 ♀), coll. S. Das and M. Ghosh.

Distribution: India, China, Laos, and Vietnam.

Genus ***Leucauge*** White, 1841

Diagnostic characters: Abdomen that is broad in the front and narrows in the back, with or without a shoulder hump and a caudal tubercle, and a silvery dorsum. Thoracic furrow deep, not overlapping cephalothorax. The black ring around the eyes has continuous laterals. Chelicerae are nearly as long as they are wide, with four teeth on each border. Femora IV with a double fringe of hairs, tibia IV without a brush of hairs. The morphological character of male spider species is completely different from female spider species. This spider genus is orb-web in nature and their netting pattern and well established. Decoration of their netting pattern is very

good in nature and their netting structure I completely different from other spider species. They are commonly known as decorator spiders.

Remarks: 3 species are reported from West Bengal. (Singh, 2023).

18. *Leucauge decorata* (Blackwall, 1864)

Material examined: India, West Bengal, Malda, Horticulture campus, 01.ii.2023, (1♀), coll. S. Das and M. Ghosh.

Distribution: India, Australia, Africa, South East Asia,

Genus *Tetragnatha* Latreille, 1804

Diagnostic characters: The body is long and thin. Cephalothorax is large at the base and narrows anteriorly, having a straight apex. Black rings around the eyes, and the lateral eyes are never continuous. Chelicerae are long, and thin, and occasionally form a pointed tail beyond spinnerets. Females tend to be larger and have longer bodies and legs than males. Males, on the other hand, have more elongated jaws used during mating. These spider species play a crucial role in nature they maintain ecological balance in the rice field and other ecosystems. They also act as pest control agents.

Remarks: 13 species are reported from West Bengal. (Singh, 2023).

19. *Tetragnatha* sp.

Material examined: India, West Bengal, Malda, Horticulture campus, 01.ii.2023, (1 ♂), coll. S. Das and M. Ghosh.

Distribution: India, Argentina, Brazil, China, Chile, Greenland, and Venezuela.

Family **THERIDIIDAE** Sundevall, 1833

Diagnostic characters: They are spiders that are little to medium in size. Cephalothorax form varies from flat to high, with variations to the cephalic area. There 8 eyes in total, grouped in two rows, more or less parallel, with the AME dark and the rest pale. Clypeus is quite tall. Chelicerae are usually tiny and vertical, with or without teeth. Legs rather long, tarsal claw 3, tarsi IV with a characteristic comb, consisting of a row of strong, curved, serrated bristles, serration may be decreased or missing in some species, each tibia with two rows of trichobothria, female palp with a claw. The abdomen is oval or spherical and elongates past the spinnerets. Single or double pairs of spermatheca in their epigynum complex. Simple male palp, with or without.

Remarks: The Theridiidae spider family, is commonly known as cobweb spiders or comb-footed spiders. Their web is well organized in nature. The irregular type of web is present in the case of this spider genus's species. This spider family consist of about 124 genera (W.S.C., 2023).

Genus ***Nesticodes*** Archer, 1950

Diagnostic characters: This spider genus is the most important spider genera in the world. Its body size is very important and essential regarding this point. This spider's size is almost around 10 millimeters, sometimes it differs depending upon the species. Cephalothorax is small in nature and the abdomen is large in the case of this spider species. The colouration of this spider genus is mostly grey, black, and brown in nature. Irregular web type is present in the case of this spider genera. *Nesticodes* spiders play an important role in ecosystems as predators, controlling populations of insects and other arthropods. Their web-building behavior also helps maintain balance within the arthropod community and provides a food source for other organisms. *Nesticodes* spiders are typically associated with human-made structures, including houses, sheds, and other buildings. They are often found in dark and undisturbed areas where their webs can be easily established.

Remarks: 2 species are reported from West Bengal. (Singh, 2023).

20. ***Nesticodes rufipes*** (Lucas, 1846)

Material examined: India, West Bengal, Malda, Horticulture campus, 01.ii.2023, (1♀), coll. S. Das and M. Ghosh.

Distribution: India, China, Europe, Indonesia, North Africa, Macaronesia, and South America.

Genus ***Nihonhimea*** Yoshida, 2016

Diagnostic characters: These spider genera are the most important spider genera all over the world. Their leg is mostly prominent in nature. Comb-like setae are present in the case of this spider species. The cephalothorax is almost small and the size of the abdomen is round shaped in nature. They are grey in nature and black sport is also present in the abdomen of this spider species. In many species within the *Nihonhimea* genera, there is a noticeable sexual dimorphism. Females tend to be larger and have more robust bodies compared to males. Males often display distinctive colouration or specialized structures to attract females during mating.

Remarks: 1 species are reported from West Bengal. (Singh, 2023).

21. *Nihonhimea* sp.

Material examined: India, West Bengal, Malda, Horticulture campus, 01.ii.2023, (1♂), coll. S. Das and M. Ghosh.

Distribution: India, China, Japan, Korea, Laos, and Taiwan.

Family **SCYTODIDAE** Blackwall, 1864

Diagnostic characters: Their body size is medium and small in nature. Six eyes are present in the case of this spider species. Six eyes are arranged in three pairs. Anterior Median Eye that is also known as AME is the most prominent and distinct in nature. The venom gland is most important and prominent in nature and their venom gland is also important. This venom acts an important role in cases of this spider family. Venom is used for their self-defense. This spider family contract irregular type of web.

Remarks: This spider family is commonly known as spitting spider. They capture their prey through the use of venom. Venom is generally harmful to all humans. This family consist of 4 genera (W.S.C.,2023).

Genus ***Scytodes*** Latreille, 1804

Diagnostic characters: *Scytodes* genus have a compact, elongated body shape, with a distinct head and cephalothorax. The abdomen is relatively small compared to the cephalothorax. The eyes are usually clustered together at the front of the cephalothorax in a triangular or semi-circular pattern. The colour of this spider genus is very dark, reddish-brown and pale yellow in nature. One of the most distinctive characteristics of the Scytodes genus is their ability to spit venomous silk. They have a specialized pair of venom glands located in their chelicerae (mouthparts) that produce sticky, venom-laden silk. When threatened, they can eject this silk from their chelicerae, aiming it at their prey or potential predators. These spider species are found in various regions of the world and subtropical regions around the world. They are commonly encountered in areas where vegetation and the present such as shrublands and tropical gardens.

Remarks: 1 species are reported from West Bengal. (Singh, 2023).

22. ***Scytodes*** sp.

Material examined: India, West Bengal, Malda, Horticulture campus, 01.ii.2023, (1 ♀), coll. S. Das and M. Ghosh.

Distribution: India, Algeria, Brazil, China, Ethiopia, Israel, and Mexico.

Family **CHEIRACANTHIIDAE** Wagner, 1887

Diagnostic characters: Cheiracanthidae family spider is also known as the sac spider. They are generally medium size and small size in nature. Eight eyes are present. The eyes are arranged in two rows. Two rows are present such as the anterior eye and posterior eye. The anterior row consists of four eyes and the posterior eye consists of other four eyes.

This spider has a pale-yellow color and grey color and light brown in nature, which helps them blend with its surroundings. Some species may exhibit darker markings or patterns on their body and legs. The most prominent characteristics are present in the case of this spider genera. They construct small, silken sacs or retreats, typically in sheltered areas like under bark, leaves, or within crevices. The spider rests inside this sac during the day and uses it for moulting egg deposition, and protection.

Remarks: The common name of this family of spider species is Sac Spider. Sac spiders are nocturnal hunters. They actively search for prey at night. They can also leave silken draglines as they move through their environment. They can be found in a variety of habitats, including forests, grasslands, gardens, and human dwellings. This family consist of about 14 genera (W.S.C.,2023).

Genus ***Cheiracanthium*** Koch, 1839

Diagnostic characters: *Cheiracanthium* spiders often exhibit pale yellow to light brown coloration. Camouflaging property is present in the case of this spider genera. Dark mark is present on their body and legs also. The shape of the chelicerae is also important in the case of this spider genera. The shape of the chelicerae is elongated and curved in nature; it gives a distinctive appearance. Chelicerae and appendages are located in front of the mouth. Spider inject venom through the use of this chelicerae. This species hunted their prey at night. Some species of *Cheiracanthium* spiders possess venom that can be cytotoxic, causing tissue damage. While bites from *Cheiracanthium* spiders can be painful and result in localized redness and swelling, they are generally not considered medically significant or dangerous to humans.

Remarks: 10 species are reported from West Bengal. (Singh, 2023).

23. ***Cheiracanthium*** sp.

Material examined: India, West Bengal, Malda, Horticulture campus, 01.ii.2023, (**1**♀), coll. S. Das and M. Ghosh.

Distribution: India, Africa, Denmark, France, Madagascar, Yemen and Zimbabwe.

4. Discussion

The study reported 23 species, belonging to 20 genera, 7 families, i.e. Lycosidae, Araneidae, Salticidae, Tetragnathidae, Theridiidae, Scytodidae, Cheiracanthiidae under one Order Araneae collected from Malda Horticulture Institute. The predominant family of the studied area is Araneidae (8), followed by Salticidae (7), Lycosidae, Theridiidae, Tetragnathidae (2 each), and Scytodidae, and Cheiracanthiidae (1 each). Among the genus, *Eriovixia, Guizygiella*, *Myrmarachne* (2 each), followed by *Hippasa*, *Trochosa*, *Neoscona, Gasteracantha*, *Larinia*, *Cyrtophora*, *Rhene*, *Menemerus*, *Brettus*, *Phintella*, *Carrhotus, Leucauge*, *Tetragnatha*, *Nesticodes*, *Nihonhimea*, *Scytodes*, *Cheiracanthium* (1 each).

The study includes one newly recorded species in West Bengal that is *Trochosa ruricoloides* Schenkel, 1963.

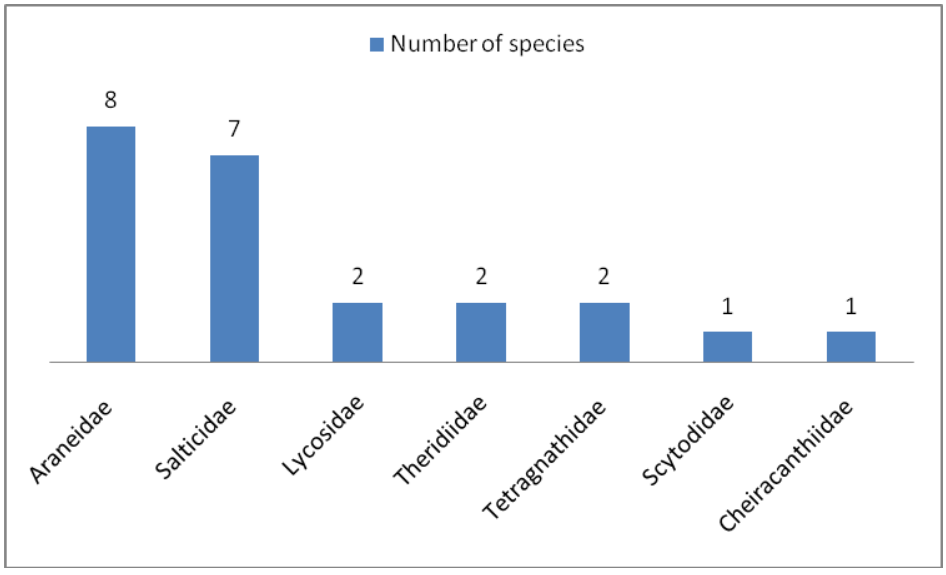

Fig. 2. Family-wise distribution of species.

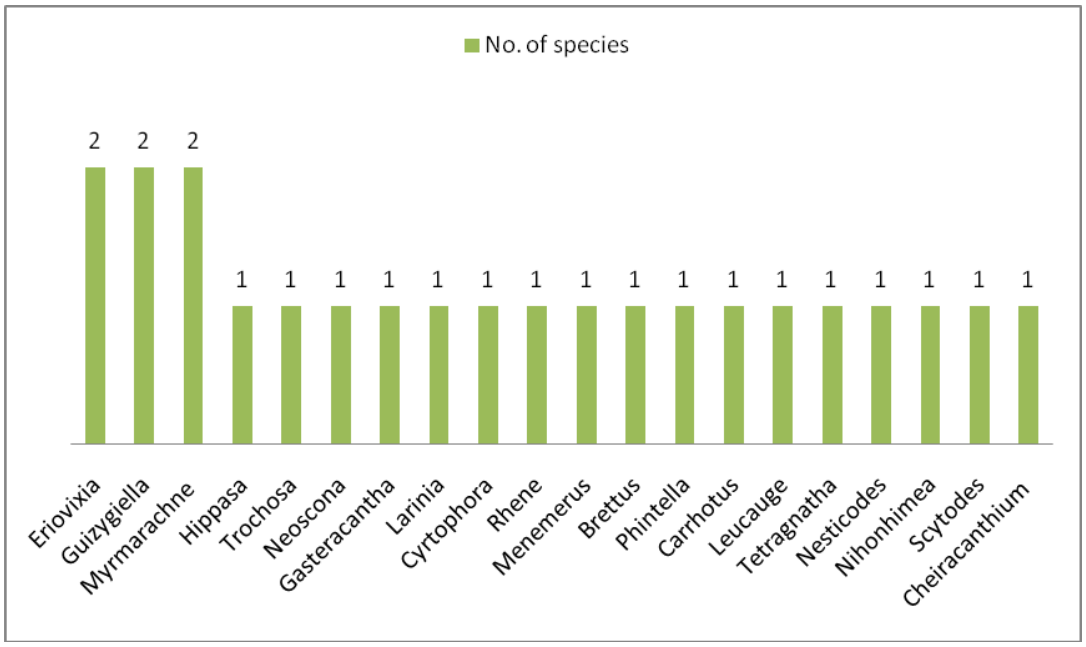

Fig. 3. Genus-wise distribution of species.

Analysis of guild structure indicates that Orb-web builders are the most dominant (40%), followed by Stalkers (30%), Ground runners (15%), Cob-web builders (10%), and Foliage hunters (5%).

The diversity of spiders in the CISH campus indicates a rich faunal composition. This can be attributed to the eco-friendly management of the botanical counterpart, which involves maintaining an unexplored forest on the campus. Additionally, minimal pesticides are used for controlling insect pests, and predator fauna like spiders are encouraged to live without disturbance.

A preliminary checklist on the spiders of the Central Institute for Subtropical Horticulture (CISH), Malda, West Bengal is provided here. Though this is the first documentation of the spiders from the area and throws light into the great diversity of the spider fauna occurring on the campus. Eco-friendly management of the campus is a significant step toward saving biodiversity.

5. Acknowledgements

The authors are thankful to Swami Kamalasthananda Maharaj, Principal, RKMVC College; Swami Vedanuragananda Maharaj, Vice-Principal Controller of Examinations, RKMVC College and Dr. Pradyot Kumar Medda, Head of the Department, Department of Zoology, RKMVC College to give me the opportunity to accomplish the dissertation report.

The authors are truly grateful to Dr. Bulganin Mitra, Emeritus Professor, Department of Zoology, RKMVC College, for his kind support and guidance whenever I needed.

The authors also thank to Dr. Arunava Mukherjee, Coordinator, Post Graduate course in Zoology, Department of Zoology, RKMVC College, for his critical guidance to complete my dissertation project.

The authors are also truly thankful to all the teachers and staffs of the Department, Department of Zoology, RKMVC College for their support.

The authors are grateful to Dr. Dipak Nayak, Scientist & In-charge, ICAR CISH Regional Research Station, Malda for giving us the opportunity to work in ICAR-Central Institute for Subtropical Horticulture, Malda.

I am really grateful to Dr. Souvik Sen, Scientist-D, and Officer in Charge (ZSI), Arachnida Section, and Dr. Dhruba Chandra Dhali, Assistant Professor, Department of Zoology, Shyampur Siddheswari Mahavidyalaya for helping in identification of species.

The authors are thankful to my friends for their active support and assistance to complete this dissertation project.

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