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The Four Month Hypothesis: An Overview on the Ecology and Behaviour of Chilobrachyssp Spiders (Araneae: Theraphosidae)

Rakhi Roy[1], Rounak Khare[2], Rudrajit Sarkar[3], Hena Sardar[3], Suparna Mukherjee[4].
[1]Former Scholar, Zoological Survey of India. Assist.HOD, BNHS,
[2] Pursuing M.Sc. in Wildlife Conservation Action,
[3] Pursuing M.Sc. (Zoology), University of Calcutta,
[4] Pursuing M.Sc. (Zoology), Darjeeling Govt. College

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ABSTRACT

A number of reports on a large black spider being sighted which cause rashes and painful blisters due to piercing were being reported to local authorities. This scenario was for four months especially between early summer till monsoon. When the sightings continuously were going on significantly, media reported it as a "Panic about Tarantula in Rural Bengal". Tarantula refers to not to any particular species of spider but refers to a defensive posture representing the galloping of a wild horse from which a group of spiders belonging to different families has derived the name. Cases of so called Tarantula outbreak reported on a continuous basis from 2016 to 2018 from the months of early March to late June, which was sporadic before in occurrence, is actually a spider infestation of the Family: Theraphosidaeunder the Genus *Chilobrachys*in different districts in West Bengal with red laterite soil areas. Extensive studies like habitat location, soil testing, analysis of environmental parameters and identification of proper niche in Block Debra under District Paschim Medinipur of State West Bengal, India has revealed an increase in spider infestation and human-animal conflict in the rural areas as by chance of these spiders are directly coming in close contact with the humans and indiscriminate spider killings are going on. Currently, there is a lack of awareness starting from the local authorities or the proper identification and treatment of the aforesaid problem which needs to be addressed immediately to protect both "The prevention of Cruelty to Animals Act", ecological balance and human interest on social, biological and economical levels. Comparative studies through data collection from Debra Hospital has revealed the number of occurrence of people being admitted for venomous snake bites and tarantula piercing, shows that snake bite is being more fatal to human life, is being treated rather easily by hospitals whereas spider piercing and bristles shooting that causes allergic reaction is causing panic due to lack of awareness resulting in indiscriminate killing of spiders disturbing the ecological balance, biodiversity and disrupting food chain.

The study was conducted to figure out the reason behind the panic, finding out which species of spider is responsible for the panic and the role of the species in the ecosystem. Surveys, micro and macro awareness programme and one to one interaction with the affected people were undertaken to find out the reason behind arachnophobia as observed among these people.

Keywords:- *Spider, Importance of Spiders, Chilobrachys, Theraphosidae, Tarantula, Behavioural study, Arachnophobia, Red Laterite Soil, West Bengal, Infestation, Human-Animal Conflict, Animal Rights, Ecology, Niche, Comparative Studies, Micro and Macro Awareness.*

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I. INTRODUCTION

Spiders, composing the order Araneae, is the largest group among Arachnids and divided under two suborders: Mesothelae (segmented abdomen) and Opisthothelae (includes all other spiders). Later one is further divided into two infraorders: Mygalomorphae (ancient' spiders such as tarantulas, trapdoor and funnel web spiders) and Araneomorphae (modern spiders include the vast majority of spiders) (Coddington, 2005). Araneomorphs have pincer like fangs, most have 6 spinnerets, and one pair of book lungs plus a pair of air tubes (tracheae). Mygalomorphs have reduced spinnerets, dagger like fangs and two pairs of book lungs similar to ancestral ground living spiders(Tikader, 1987). Other external features that distinguish infraorders include the structure of the male palp(Bertani, 2000), presence or absence of an epigynum in the female and internal genital features(Eberhard et al., 1998). Families are distinguished on the basis of plesiomorphic characteristics such as number and spacing of simple eyes, number of tarsal claws, number of spinnerets, and structure of chelicerae, while specialized (apomorphic) characters such as glands, setae, teeth and peculiarities of the genitalia are important for species recognition(Weygoldt, 2009). The current world list of spiders includes 45,776 species under 3974 genera distributed over 114 families(World Spider Catalog, 2016)**.**In India,they are represented by 1686 species belonging to 438 genera of 61 families (Keswani & Hadole, 2014)listed 91 species of Mygalomorphae under 28 genera belonging 8 Families. Present list includes a total of 111 species of Mygalomorphae distributed over 32 genera under 8 families from India(Dhali, Sureshan, & Chandra, 2016).

Tarantulas comprise a group of large and often hairy Arachnida belonging to the Theraphosidae family of spider. The family Theraphosidae is divided into 13 subfamilies containing over 144 genera and around 974 species in them.(World Spider Catalog, 2018). Most species of tarantulas are not dangerous to humans, and some species have become popular in the exotic pet trade in foreign countries, but in the area under our study, a number of local infestations of tarantula spiders were reported from 2016 onwards on regular basis.So, there was need to address this rising“human- animal conflict” and subsequent effects on human health and also on spider population.The study was therefore being conducted in the Block - Debra, of Dist. Paschim Medinipur,under state West Bengal from where outbreaks are being reported continuously.

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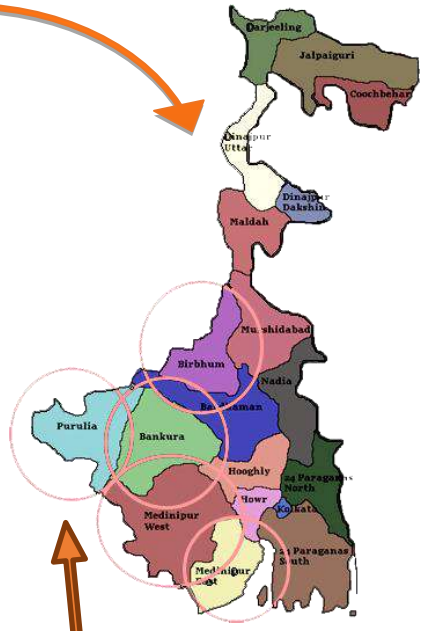
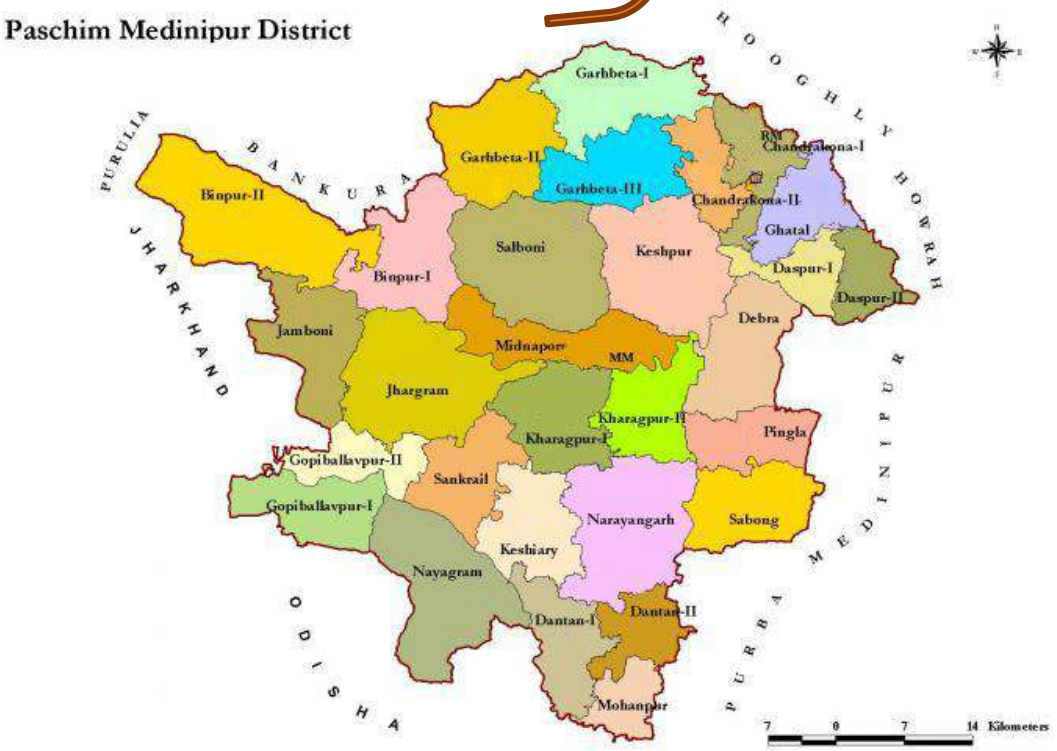
Study Area Map



Occurrence of *Chilobrachys sp* in West Bengal



Study Area Map Paschim Medinipur

A. Nomenclature
On the basis of World Spider Catalogue the following was carefully examined under the microscope.

The important features studied were:
Eye quad, Carapace, Abdomen (Abdominal bristles), Walking legs with bristle, Tarsal claw, Palpal organ, Book lung, Spinnerets.

All aforementioned features match with the Family: Theraphosidae (Karsch, 1892) and it reflects the similarities with the Genus: *Chilobrachys sp.*

B. Systematic position:
Kingdom: Animalia

Sub-Kingdom: Metazoa

Phylum: Arthropoda

Sub-Phylum: Chelicerata

Class: Arachnida

Order: Araneae

Infraorder: Mygalomorphae

Family: Theraphosidae

Genus:*Chilobrachys*(Karsch, 1892)

- *Morphological features*

Important terminologies:
1. Arachnid: An arthropod with four pairs of walking legs, two body sections, chelicerate mouth parts.
2. Eye quad: Eight closely grouped eyes, two large middle surrounded by three eyes on each side.
3. Chelicerae: A pair of oral appendages or jaws modified as fangs on spiders
4. Cephalothorax: Fused head and thorax of an arachnid.
5. Opisthosoma: the abdomen of a spider.
6. Book lungs: Breathing organs, present in the opisthosoma, four in number.
7. Spinnerets: Remain projected from the end of abdomen, having 3 segments in each.
8. Bristles: Specialised urticating and irritating hair on abdomen.

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Plate no. 1 Morphological Features

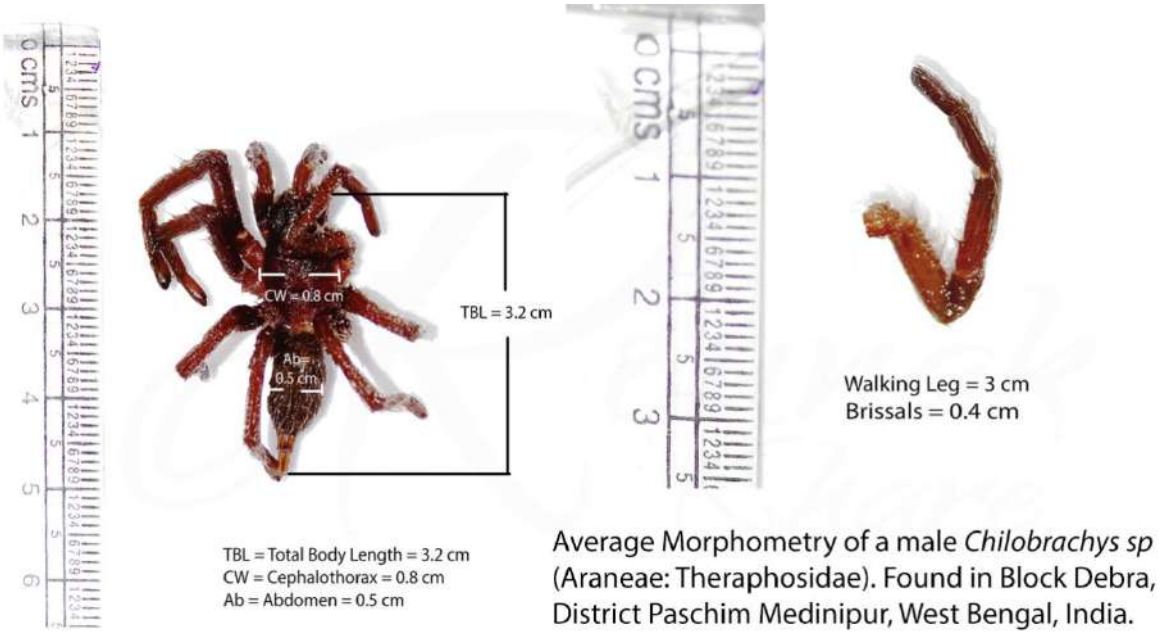

Fig 1:- Morphometry

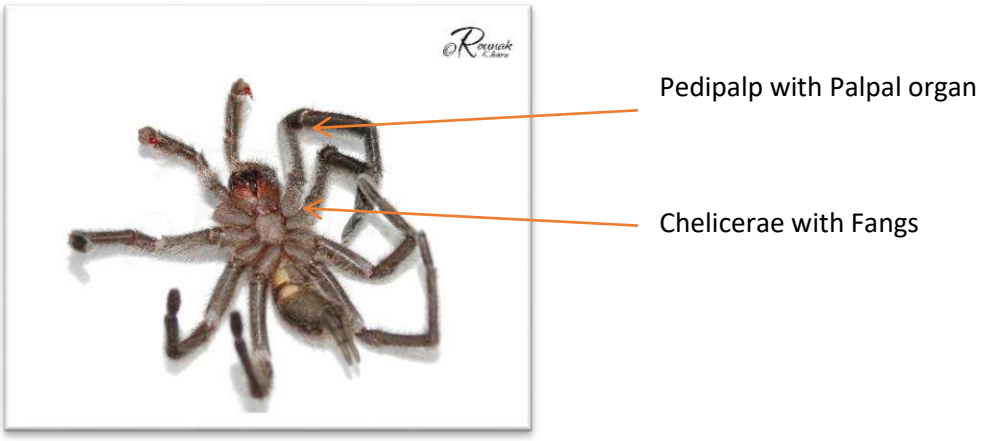

Fig 2:- Ventral View

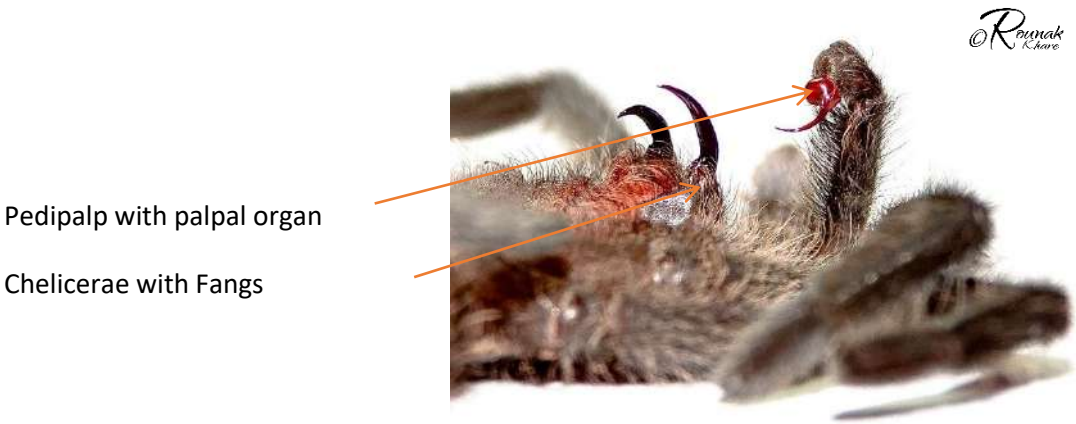

Fig 3:- Showing Chelicerae and pedipalp

Plate no 2 Different Views of *Chilobrachys sp*

Fig 4:- Dorsal View

Fig 5:- Dorsolateral View

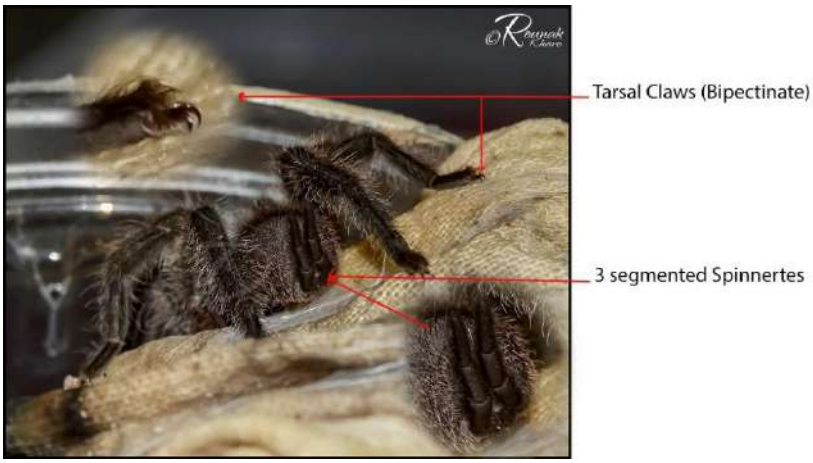

Fig 6:- Showing Tarsal Claws and spinnerets

C. Morphological peculiarities:

- Tarantula can vary in size from the size of a quarter (1 inch.) to the size of an ultimate frisbee (11 inch.). All Tarantula have an exoskeleton which serves structural purposes (determining shape, holding body parts together) and protective purposes (preventing dehydration, injuries and infection). They also have a small endoskeleton which aids in muscle attachment in the body.

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- Tarantula have main body parts and a set of appendages. The two main body parts are called the prosoma (head with fused thorax; cephalothorax) (Fig.4) and opisthosoma (abdomen and spinnerets), which contains their lungs and heart. Most of the appendages are attached with the prosoma (Fig.2).
- The appendages are attached to the prosoma include all eight of the spider's legs, plus the one pair of pedipalps (contain Palpal organs in male only) and one pair of orthognathous chelicerae (Fig.3). The legs contain retractable claws (fig 6) that assist with climbing and adhering to surfaces. The pedipalps are like feelers that assist with moving and eating. The chelicera has one pair of fangs at the end with associated venom glands that vent through the hollow fangs which not only assist in prey capture but also in mastication. The fangs are articulated and fold back towards the chelicerae as a pocket knife blade folds back into its handle.
- The only appendages attached to the opisthosoma are the spinnerets(Fig.6) which are used to spin silk and it is three segmented one.
- The mouth parts are like straws so the food must be liquified which is accomplished by regurgitating digestive juices onto whatever the tarantula try to it.
- Each tarantula has several different types of bristles which gives them a hairy appearance. One type of bristle which is the setae. These are sensory organs allowing them to feel vibration and detect chemicals on the hair and wind direction.
- The second type of bristles are the scopulae which are a dense network of bristles at the end of the tarantula's legs which allows it to stick to surfaces.
- They also have urticating bristles (Fig.5) that they can detach at will at the direction of an enemy for self-defence.
- All the above mentioned anatomical features have been observed in the collected specimen and morphometric analysis have done.

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II. BEHAVIOURAL ASPECTS

A. Nocturnal hunting behaviour:

Arachnologists around the world studying on Theraphosidae spiders have observed that both males and females show a typical nocturnal predatory behaviour(Herberstein, 2011). Traditionally both males and females are ambush predator lurking inside burrows or crevices of tree trunks to capture their prey but during the mating season the males wander out and become a cursorial predator.

B. Habitat preference:

Tarantulas worldwide starting from the Yucatan in Mexico, up to the Nevada valley in Texas USA and in some parts of Sub-Saharan region of Africa and in the Australian outback; prefer a semi-arid, dry, laterite soil area for their foraging, roosting, nesting and mating.

In India also, Tamil Nadu, Kerala, Maharashtra, Orissa, especially in red laterite soil area of West Bengal support the presence of tarantula group of spiders(Dhali et al., 2016). In West Bengal specially in Paschim Medinipur is pre-dominant in which the maximum number of *Chilobrachys sp*burrows have been found. Although traditionally they are land dwellers, they may sometimes occupy the cavities of dead tree trunks and old trees approximately at a height of 1-1.5mt, above the ground.

C. Food preference:

Theraphosidae spiders are very flexible predators and their prey selection ranges from Orthopterans, Dipterans, Dictyopterans, Hymenopterans, Lepidopterans insect groups, to both cold blooded vertebrates (toads, frogs, small lizards) to warm blooded mammalian, rodents as observed both in wild and captive condition. They are also the cannibals, especially the females and all Theraphosidae spiders are strictly carnivorous and non-scavengers. Their preferred food is frequently found within and around human settlements.(Herberstein, 2011).

D. Mating desire and pattern:

Theraphosidae mating, like other spiders mating behaviour is a strictly ritualise act performed by both partners. A female during the start of the mating season shifts to a new burrow near its foraging areas and in the process, they leave behind a specially designed pheromone laced dragline. The males due to their insatiable urge of mating comes out of their burrow and competes with one another in search of a female dragline. The first male to encounter such a dragline follows the pheromone gradient towards the mating burrow and tabs the ground with its front walking legs in a typical rhythm to announce its presence and intentions to the nesting female. The female in turn may twitch the dragline in a particular frequency, either in acceptance of mating proposal or it can turn into the predatory response from the female. Only a small percentage of males make a successful mating attempts with the female and survive to mate with more than one female, as female spiders are predominantly cannibals(Yánez, Locht, & Macías-Ordóñez, 1999). This explains the migration of males in search of females as percentage of successful mating is very low in the spider world and also as the spider population are on a gradual decline due to various anthropogenic effects. The needs of mating within the species become a greater compulsion that has increased in recent times, thus become wanderer during mating season. Mating has become the sole purpose of the life of a male spider to carry on their gene pool. Also, it is reported that the average life span of males is less than reproductively matured females despite all the risk involved.

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The following figure shows the mating behaviour or ritual and mating posture of *Chilobrachys sp*. (Figure 7)

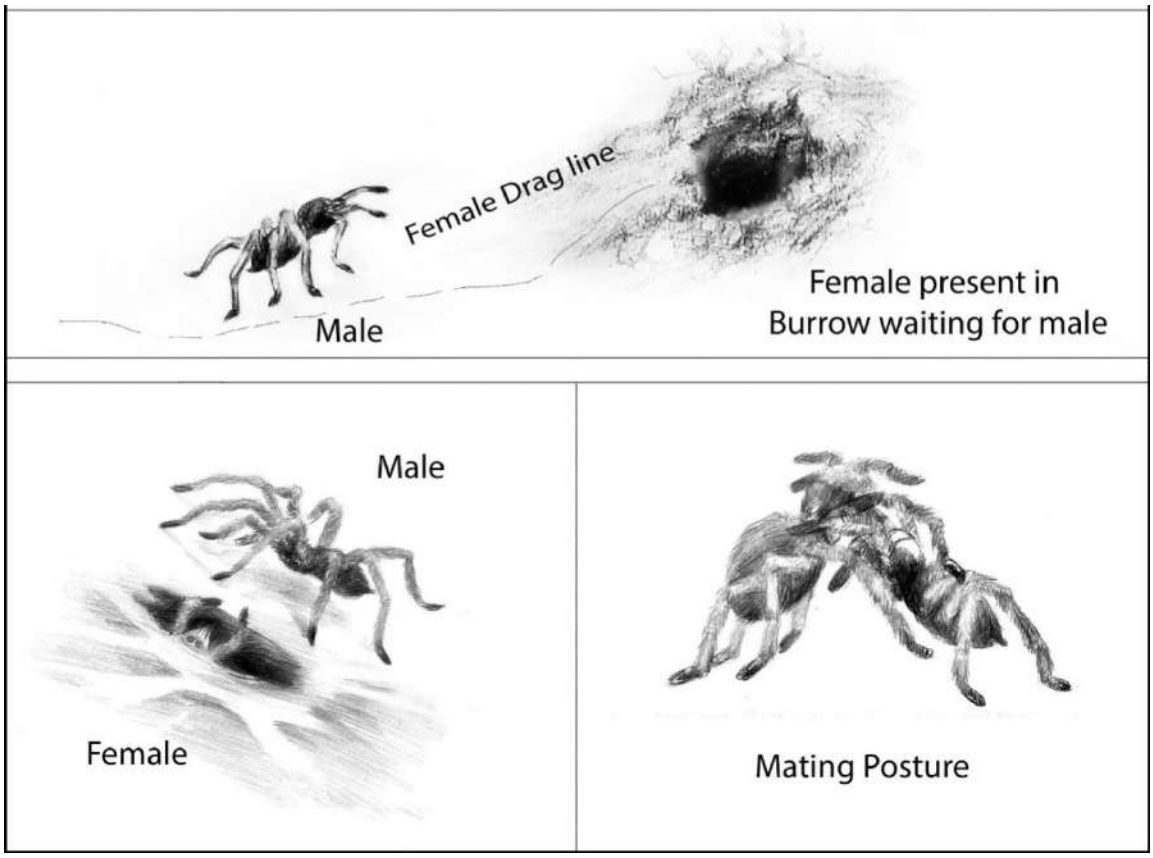


Fig 7:- Illustration showing mating behaviour of Theraphosidae (Chilobrachys sp)

III. METHODOLOGY

A. Material Used for study

For detailed field study followed by identification of specimen under laboratory setup different apparatus and field accessories used are as follows:

Forceps, Petri dish, 70% Ethanol, Measuring scale, Camera, Torch, Rubber Gloves, Pen, Notebook, Container, Soil pH tester Model No.CM-13, Light meter, Humidity meter, Type K Thermometer, Sound level Meter - METRAVI - Model No. ET-2, Microscope – Stereo zoom –Magnus MSZ No. 6A00531, Questioner,

B. Strategies adapted.

After having number of occurrence of outcoming of *Chilobrachys* spider from Paschim Midnapore, we have visited the field (Plate 4), identify the habitat and probable areas where they reside (Plate 6) and also interacted with the local villagers about the sighting of the spider and also have interacted with the affected people in different spots with number of specific questions in questionnaire form (Plate 4).We also visited DebraHospital and interacted with medical officers to know about the affected people and collected data on the patient affected by spider piercing and with symptoms of rashes.We also have taken data regarding venomous snake bite for making comparison between the data of spider piercing and snake bite for consecutive three years from 2016 to 2018

C. Field studies

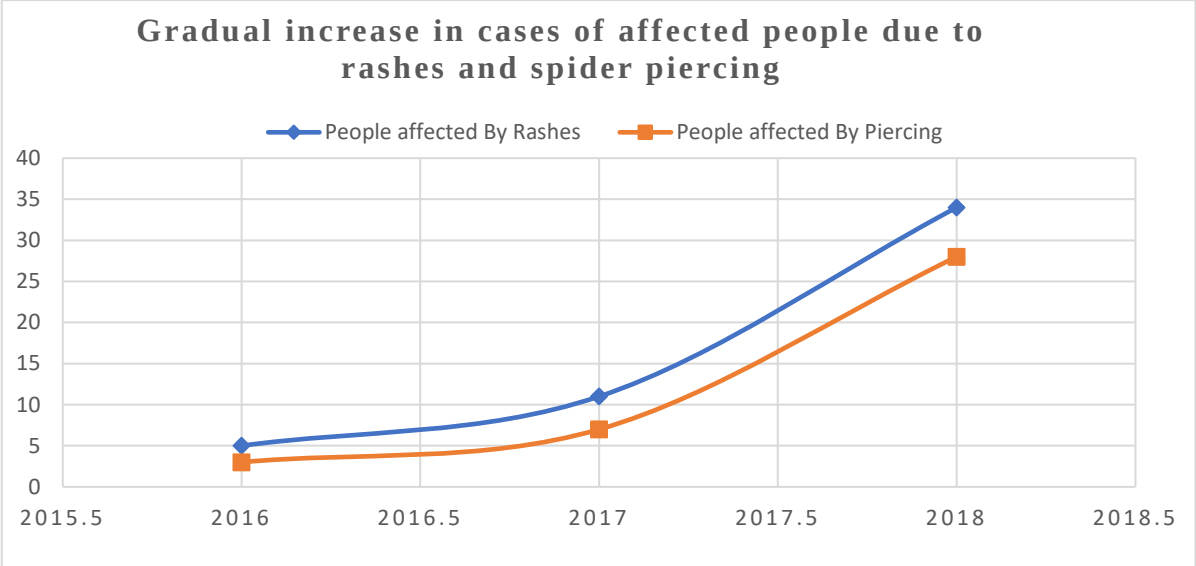
It was found that, the average temperature was 38^{o}C, relative humidity was 59.4%, sound level was low 52dB and high 62.7dB, with average soil pH was 7, average soil temperature was 36^{o}C.

D. Causes and explanation behind spider outbreak.

Spiders, especially the concerned group under study have a very regular and fixed mating season, starting from early summer and continued up to the arrival of monsoon, i.e. March till early July. During the mating season as discussed earlier, traditionally the females occupy burrows and were placed considerably far apart from each other, hence the males are scattered across a large geographical area in search of females. Tarantula sighting were very low and such encounters were very sporadic, but in the present scenario, as human population is increasing and people getting settled in various corners of villages and other developmental activities that are flourishing in the rural areas, the fact that anthropogenic activities like construction of roads, permanent human settlements, etc. are pushing the female Tarantulas into an ever-decreasing radius of mating burrows. The male spiders are also getting pushed to narrower spaces, during the mating seasons, since a large number of males are coming out in search of female for mating. Is initially appearing as a population bloom and increase in spider density, it is a paradox which is highlighting the ever-increasing spider sightings.

E. Conflicts

As mentioned earlier the mating and predatory behaviour of the male spider Chilobrachys and increasing anthropogenic interference in the natural world is the base of the unwanted situation that is currently under study. Spiders being highly adaptive organisms, they are slowly adapting to this change in their surroundings, finding easy food around human settlements some have made their nests or found places in human settlements as their new altered abode. As the development increasing at an exponential rate annually the spiders have no choice but to cross human inhabited spaces to satisfy their basic and biological roles. This might be putting them indirectly in conflict zone in case of encounter by human and maximum people being scared of various insects, spiders, lizards and snakes this big black hairy spider feels like a threat and people try to show them off. Spider as a defence gives a warning pose like a horse’s dance people identify it as a tarantula if further harassed as a first line of defence the spider shoots its abdominal bristles and tries to run towards dark places. These bristles cause rashes and it’s a human tendency not to allow a threat causing animal to be left wandering around so they try to lift the spider and throw them away where the human is likely to get pierced or if a person accidentlly walks on him or disturb him at a close proximity unintentionally.

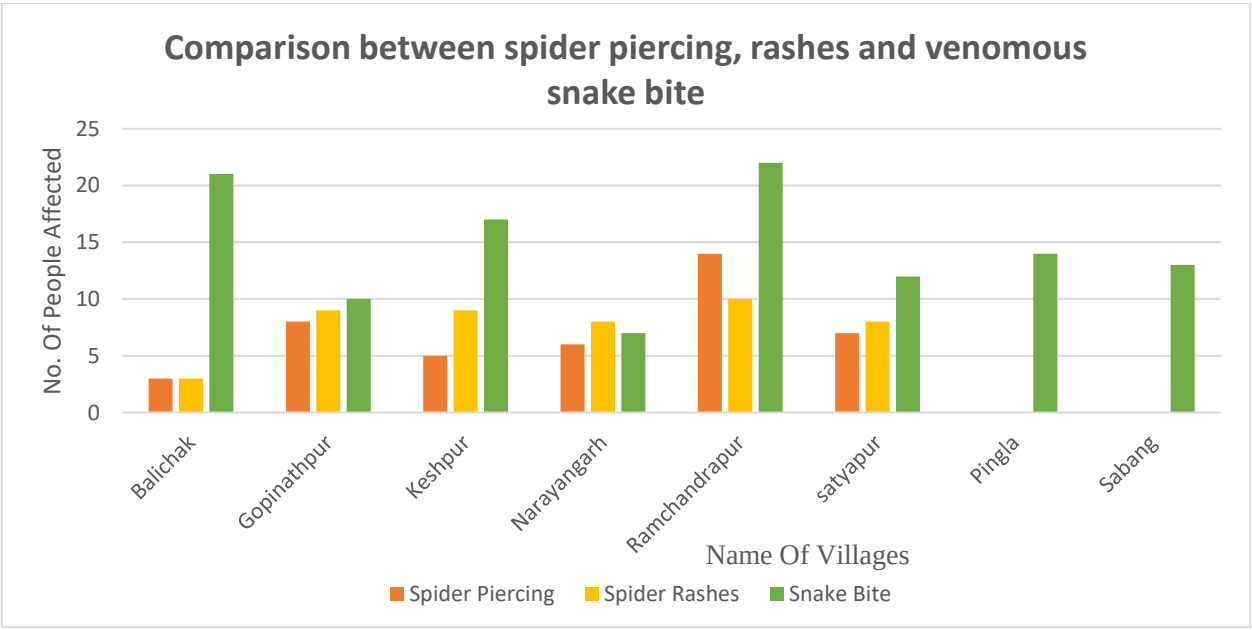


Graph 1. Gradual increase in cases of affected people due to rashes and spider piercing

Reports coming in from 2016 till date is showing an increase trend in the occurrence direct human-spider interaction which indicates a major decline in the local habitats of the spiders and overall ecological degradation and habitat fragmentation. (Graph 1)

F. Analysis:

Data taken on rashes and piercing was of around 253 cases reported in Debra hospitals. With the help of doctors, the symptoms and observations were carefully studied and roughly 100 were estimated as affected by rashes & spider piercing. On the contrary, it has been found that 118 cases of venomous snake bite were reported during the month of April to July for last 3 years which can be more fatal than the spider piercing if the patients are not treated with proper anti venom in time. People being aware and used to see snake around them are quite adapted with the fact that snakes are going to be around them but spiders for them are new and not being aware of the facts about spiders and also non-availability of proper treatment for spider piercing is causing panic among them. (Graph 2).



Graph 2. Comparison between spider piercing, rashes and venomous snake bite

From the data analysis and as represented in above graph, it exhibits that snake bites are a more serious threat both in terms of occurrence and fatal to human. But for spider piercings there has been no recorded fatalities both globally and locally and the

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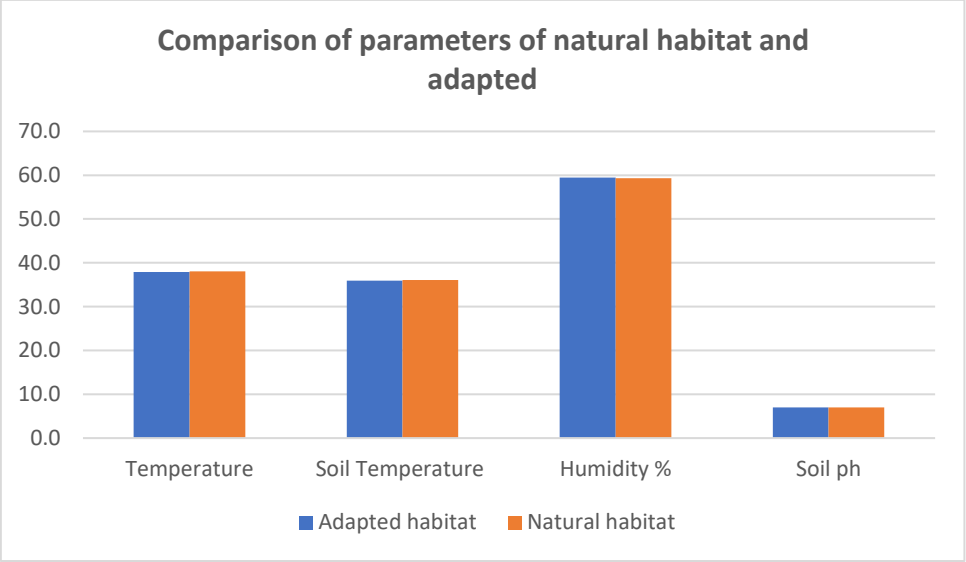
number of occurrences is very less as compared to snake bites and such incidents of spider outbreak occur only for a few months whereas snake bites are continuous throughout the year. Still extreme panic for spiders is found but no such panic or fear has been observed for snakes as per our survey.

The survey of affected people and the data collected on environmental parameters of the natural habitat and the places where the spider had pierced the people (Table 1), it has been found that the parameters were fairly same, with a very small difference in humidity and temperature. The surroundings were covered in natural leaf litter, piles of firewood, hey stags outside house and inside human premises were moderately clean with personal items like cloths, bedding, shoes, utensils, firewood etc. were kept in a heap all around (Figure 19). These conditions provide a hospitable niche to the spiders. (Graph 3.)

Table 1. Comparison of parameters of ideal habitat and adapted abode

	Temperature ^{0}c	Soil Temperature ^{0}c	Humidity %	Soil pH
Adapted habitat	37.9	35.9	59.5	7.0
Natural habitat	38.1	36.1	59.3	7.0
Average	38.0	36.0	59.4	7.0



Graph 3. Comparison of parameters of ideal habitat and adapted.

G. Interaction and awareness programs:

The study was conducted to find out the exact reason behind the panic caused by the spider (Plate 4). Several surveys, micro and macro awareness programme and one to one interaction with the affected people were undertaken to address the arachnophobia as observed among these people. (Plate 5 and 6).

Plate 4 News and media reports creating panic.

TOI SHARE

CITY

Tarantula scare at Debra village in Bengal

Krishnendu Bandyopadhyay | TNN | May 25, 2016, 18:41 IST

block of Bengal's Paschim Midnapore district after eight people were hospitalised due to spider-bites. All the victims were discharged after preliminary treatment. Though there was a strong rumour that it was bite of venomous Tarantula spider, the chief medical officer, health (CMOH), Paschim Midnapore Girsh Chandra Bera, however, denied that it was not a tarantula bite that caused such a wide spread terror.

The Statesman
Saturday, 23 June, 2018

Home / India /

West Bengal: Tarantula scare again, man admitted to Murshidabad hospital

Hairy, 'poisonous' spiders spotted in four places of Burdwan and Hooghly districts too. Experts dismiss fears that tarantula bites can be fatal

SNS Web | Murshidabad, Burdwan, Hooghly | June 3, 2018 4:39 pm

MIRRORNOWNEWS.COM

Fear of large, hairy tarantulas spreads across West Bengal, zoologists say panic unfounded

Updated Jun 01, 2018 / 21:25 IST / Mirror Now Digital

Sightings and reports of spider bites have emerged as many as 30 times in the past few weeks with people in certain districts describing the spiders as hairy and large. Such speculation has triggered panic in several districts such as Purulia, Birbhum, Burdwan, Howrah, East Midnapore, Murshidabad, and North Dinajpur.

YouTube

West Medinipur: Again Tarantula Spider panic at Sabang

ABP ANANDA · 19,566 views

Business Standard

Home › Latest News

Panic after eight Bengal villagers suffer tarantula bites

By IANS | Kolkata | Last Updated at May 25 2016 13:43 IST

Panic gripped villagers in Debra block of West Bengal's West Midnapore district after eight people had to be hospitalised due to tarantula bites and were suffering from severe allergic reactions, officials said on Wednesday.

hindustantimes

HOME › INDIA NEWS

Parts of Bengal in grip of Tarantula scare, experts say panic baseless

People in parts of West Bengal are killing spiders over fear that they were bit by tarantulas.

Dozens of people across several districts of West Bengal have reported suspected tarantula bites. (Shutterstock/ Creative Image)

YouTube

Tarantula are coming to Kolkata with flowers?

ABP ANANDA · 20,615 views

dailyhunt

Sunday, 03 Jun, 1.28 pm

Kolkata24x7

Bengal Shudders In Fear Of Tarantulas

Kolkata: Parts of West Bengal are in the grips of tarantula scares after dozens of people reported getting bitten. Panic has spread across villages in several districts over suspected tarantula bites.

It all started in the West Midnapur district about three weeks back when villagers from Danton, Debra, and Keshiary went to local hospitals complaining of spider bites.

There have been no fatalities so far, and experts said residents might be over-estimating a natural phenomenon. They reported pain, swelling, blackening of areas around the bite wounds, and even respiratory problems.

Garia woman in hospital after 'tarantula' bite

MONOTOSH CHAKRABORTY, TNN | KOLKATA

UPDATED 26 MAY, 2018 07:16 AM IST

KOLKATA: A 24-year-old homemaker from Garia's Boral locality had to be hospitalized on Thursday after a suspected tarantula bit her when she was offering puja at the ground floor of her house. The incident took place on Thursday.

The Statesman
Saturday, 23 June, 2018

Home / Cities /

West Bengal: Tarantula scare in Debra

After a pregnant woman was bitten by a venomous spider, forest department officials have started an investigation to identify the insect and find out where did it come from.

Statesman News Service | Midnapore | May 23, 2018 2:04 pm

Plate 5 Field visits and study.

Field visits and awareness program conducted during study.

Fig 8:- Post piercing observation by doctor

Fig 9:- Revisit the place after two years

Fig 10:- Searching for spiders guided by villagers

Fig 11:- One to one interactions with affected people

Fig 12:- One to one interactions with affected people

Fig 13:- Meeting with medical officers in Debra Hospital

Fig 14:- Identification work

Plate 6 Awareness programs

Fig 15:- Mass Awareness programme in the presence of honourable minister of West Bengal organised by Debra Panchayat Samiti,JillaParishad, Paschim Medinipur

Crowd of around 500+ people which included teachers, students, villagers from neighbouring villages, medial officers, nurses, health workers, etc.

Fig 16:- Awareness programme by Dr. Rakhi Roy(Arachnologist) and the Members of Wings and web

Interactions with affected people and other villagers regarding importance of spiders and preventions from spider infestation.

Fig 17:- Macro Awareness programme during field work and surveys

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Plate 7 Habitat study

Ideal habitat place for *Chilobrachys sp*, red laterite soil areawith shade, proper humidity prevails.

Fig 18:- Natural niche of Chilobrachys sp.

Inside house, hips of cloths provide a temporary refuge to the wandering male, *Chilobrachys sp.*

Fig 19:- Temporary refuge of *Chilobrachys* in human settlements

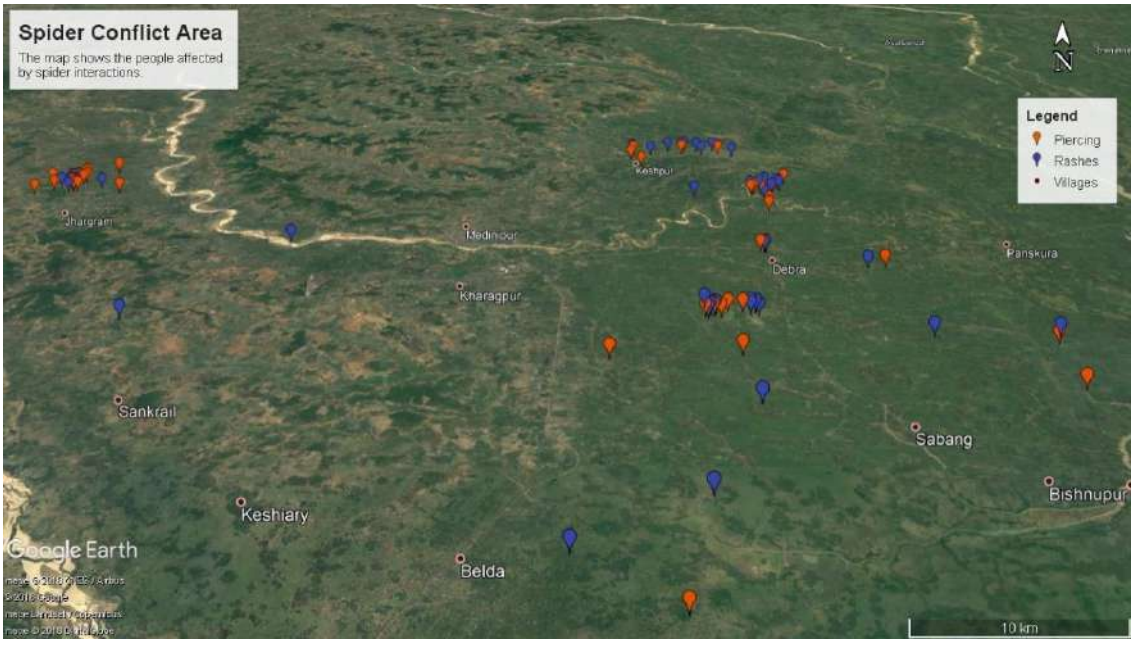

Fig 20:- Map showing spider conflict area

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IV. DISCUSSION

A. Ecological Aspects:

Conservation of nature and natural resources specially in the current millennia has become an utmost important function for naturalists. Without a proper balanced ecosystem along with its physical and biological components it's a great headache for the present generation and a curse for the upcoming ones. In the areas of red laterite soil regions under study, it has been observed that *Chilobrachys*spider play a major role in the regulation of various insect pests in their own micro habitats forming a very important food chain which in the long run is useful for people who depend on agriculture as their livelihoods. The villages of Paschim Medinipur district are dependent on paddy and potato cultivation where locust infestation in crop plants is the major problem for agriculturist. All locally available *Chilobrachys*has been reported to prey on these locusts not only regulating the insect population but also protect the interest of the farmers. It is a proved fact that spiders can act as a major controller of various groups of insects maintaining ecological balance and maintains both natural and human habitats which raises a major question to bid about conservation of spiders as they act a biological indicator of a healthy ecosystem.

B. Socio-economic Aspects:

Conservation has two sites, one is upholding the ecological interest from a biological viewpoint and secondly evaluating the cost benefit ratio of the adjustments made to anthropogenic activities in the light of socio-economic scenario. To conserve natural resources, we cannot forget that human development activities are as important as conservation of any animal or plant group to uplift the lives of millions of people both government level and public level development, that are undergoing at a rapid pace in the rural regions of Bengal under study. It has shown remarkable increase in economic and social status in a major section of people residing there in terms of better education, health, living and employment facilities but all being said about human development, there should be a plan behind the chaos and unplanned human activities house both nature and human life, no matter, how fast or how large the developmental programmes are, it should not be forgotten that without a sustainable ecosystem with a healthy habitat for all of these plant and animal residence, nothing makes sense or can be viable. People should be made aware about the importance of spiders and local involvement needs to be deployed on a regular basis to discuss first unit and act to protect both human and animal interest.

C. Legal and Ethical Aspects:

From the IUCN Red List (2008) it has been observed that *Chilobrachys*has been given the status of least concern (LC) species. However, no matter how large the population size of a particular animal species may be, it is unethical and impractical to kill them at will or due to personal phobia. Every animal like human beings have right to live and people should be made aware of that. It is us who have encroached their territory and hence indiscriminate killing and cruel acts to the spiders by physical, various chemicals, and other means should be discouraged and brought under ethical and legal issues.

D. Prediction of Future Outbreaks:

Study reports coming in from the year 2016 has shown a particular pattern in the increase in spider occurrence (Graph 1). The simultaneous exponential rise in encroachment in natural spaces and spider behaviour regarding mating and predation, it can be concluded that the outbreak may reoccur in the recent future and the biological clock of the genus under study indicates that such situation may not be just a possibility but reality in the upcoming days.

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V. CONCLUSIONS

As per our discussion about the roles of *Chilobrachys sp*. in controlling insects population at a check and thus maintaining the ecological balance of their local habitats, this genus of spiders can be beneficial to human interests regarding protection of crop plants from various insect pests and thus there arises a need for conserving these spiders. The first step of conservation is to make people aware about the ecological role of spiders specially in study area*Chilobrachys sp*, to make them understand that indiscriminate killing of spiders should not be done. From the aforesaid observations on Tarantula it can be inferred that due to their nocturnal predation and summer time mating behaviour of males, in search of females are putting them in direct contact with the ever-increasing human population. In rural areas, as it is very common for people to sleep on ground, collect firewood. The close proximity to potential spider habitats, human settlement provides temporary refuge to the wandering males at night. When people in their daily activity in any time of the day are using all this spider occupied spaces, human-spider interactions are taking place.So, to avoid direct interaction with spiders, various homemade remedies like soaking tobacco leaves in water and sprinkling the water around household and various life style changes like cleaning of household on a regular basis, brushing of clothes before use etc. to safeguard both human and spider lives maintaining both the environment and wellbeing of the villagers. As it is a four months phenomenon, there is a need to dispel arachnophobia among people.

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REFERENCES

[1]. Bertani, R. (2000). MALE PALPAL BULBS AND HOMOLOGOUS FEATURES IN THERAPHOSINAE (ARANEAE, THERAPHOSIDAE). The Journal of Arachnology, 28, 29–42.
[2]. Breene, R.G., Cokendolpher, D.A. and Reger, J. C. (1996). Tarantulas of Texas their medical importance, and world-wide bibliography to the theraphosidae (araneae). American Tarantula Society, (No. C/595.44 T3), 1–76.
[3]. Coddington, J. A., & Levi, H. W. (2003). Systematics and Evolution of Spiders (Araneae).
[4]. Coddington, J. A. (2005). Tree from Spiders of North America, 20.
[5]. Carlin, A. S., Hoffman, H. G., & Weghorst, S. (1997). Virtual reality and tactile augmentation in the treatment of spider phobia: a case report. Behaviour Research and Therapy, 35(2), 153–158.
[6]. Dhali, D. C., Sureshan, P. M., & Chandra, K. (2016). Diversity and Distribution of Indian Primitive Spiders (Araneae: Opisthothelae: Mygalomorphae) in Different State Including an Annotated Checklist. WSN, 37, 88–100.
[7]. Eberhard, W. G., Huber, B. A., S., R. L. R., Briceño, R. D., Salas, I., & Rodriguez, V. (1998). ONE SIZE FITS ALL? RELATIONSHIPS BETWEEN THE SIZE AND DEGREE OF VARIATION IN GENITALIA AND OTHER BODY PARTS IN TWENTY SPECIES OF INSECTS AND SPIDERS. Evolution, 52(2), 415–431.
[8]. Herberstein, M. E. (2011). Spider Behavior: Flexibility and Versatility. thuir.thu.edu.tw.
[9]. IvánMendoza-Marroquín, J. (2014). Psalmopoeus victory, the first arboreal theraphosid spider described for Mexico (Araneae: Theraphosidae: Avicullariinae). Revista Mexicana de Biodiversidad, 85(3), 728–735.
[10]. Karsch. (1892). NMBE - World Spider Catalog.
[11]. Keswani, S., & Hadole, P. (2014). CHECKLIST OF SPIDERS (ARACHNIDA : ARANEAE) FROM INDIA-2012 CHECKLIST OF SPIDERS (ARACHNIDA : ARANEAE) FROM INDIA-2012, (June).
[12]. Klärner, D., & Barth, F. G. (1982). Vibratory signals and prey capture in orb-weaving spiders (Zygiella x-notata, Nephila clavipes; Araneidae). Journal of Comparative Physiology, 148(4), 445–455.
[13]. Lawania, K. K., & Mathur, P. (2015). Study On The Pattern And Architecture Of Spider's Web With Special Reference To Seasonal Abundance In Eastern Region Of Rajasthan, India. IOSR Journal of Environmental Science Ver. I, 9(11), 2319–2399.
[14]. Marie Elisabeth Herberstein. (n.d.). Spider Behaviour: Flexibility and Versatility - Google Books. Retrieved June 18, 2018.
[15]. Mobbs, D., Yu, R., Rowe, J. B., Eich, H., FeldmanHall, O., & Dalgleish, T. (2010). Neural activity associated with monitoring the oscillating threat value of a tarantula. Proceedings of the National Academy of Sciences of the United States of America, 107(47), 20582–20586.
[16]. Pekár, S. (2004). Predatory Behavior Of Two European Ant-Eating Spiders (Araneae, Zodariidae). The Journal of Arachnology, 32, 31–41.
[17]. Sannaningaiah, D., Subbaiah, G. K., & Kempaiah, K. (2014). Pharmacology of spider venom toxins. Toxin Reviews, 33(4), 206–220.
[18]. Santana, R. C., Perez, D., Dobson, J., Panagides, N., Raven, R. J., Nouwens, A., … Fry, B. G. (2017). Venom profiling of a population of the theraphosid spider Phlogius crassipes reveals continuous ontogenetic changes from juveniles through adulthood. Toxins, 9(4).
[19]. Tikader, B. (1987). Handbook, Indian Spiders.
[20]. Weygoldt, P. (2009). Evolutionary morphology of whip spiders: towards a phylogenetic system (Chelicerata: Arachnida: Amblypygi)*. Journal of Zoological Systematics and Evolutionary Research, 34(4), 185–202.
[21]. World Spider Catalog. (2017). World Spider Catalog. Natural History Museum Bern.
[22]. World Spider Catalog. (2018).World Spider Catalog. Natural History Museum Bern.
[23]. Yánez, M., Locht, A., & Macías-Ordóñez, R. (1999). Courtship and mating behavior of Brachypelma klaasi (Araneae, Theraphosidae). Journal of Arachnology, 27(Baerg 1928), 165-170.