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STUDIES ON HABIT AND HABITAT, EXTERNAL MORPHOLOGY, FEEDING CAPACITY AND PREY PREFERENCE OF ZEBRA JUMPER *Plexippus petersi* (KARSCH)

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ABSTRACT

Laboratory studies were carried out to investigate habit and habitat, external morphology, preying capacity and prey preference of zebra jumper *Plexippus petersi* collected from different places of U.P. India. The spider was found to inhabit bushes, walls of houses and crop fields. Jumping spiders are generally recognised by their eye pattern. They typically have eight eyes arranged in two or three rows. These spiders do not weave web. These prey on small and medium sized insects by direct jumping. These feed on live prey as these do not see dead prey. In general, zebra jumpers attack prey of the same size or smaller than they are.

KEYWORDS: *Plexippus petersi*, Habit And Habitat, Morphology, Preying Capacity, Prey Preference, Bio-Control Agent.

The jumping spider family (Salticidae) contains more than 500 described genera and about 5,000 described species, making it the largest family of spiders with about 13% of all species. Jumping spiders have good vision and use it for hunting and navigating. They are capable of jumping from place to place, secured by a silk tether. Both their book lungs and tracheal system are well developed, as they depend on both systems (bimodal breathing). Jumping spiders live in a variety of habitats. Tropical forests harbor the most species, but they are also found in temperate forests, scrublands, deserts, intertidal zones and even mountains. *Euphrys omnisuperstes* is a species reported to have been collected at the highest elevation, on the slopes of Mount Everest.

Jumping spiders are generally recognized by their eye pattern. All jumping spiders have four pairs of eyes with very large anterior median eyes.

Jumping spiders are generally diurnal active hunters. Their well developed internal hydraulic system extends their limbs by altering the pressure of body fluid (haemolymph) within them. This enables the spiders to jump without having large muscular legs like a grasshopper. Most jumping spiders can jump several times the length of their body. When a jumping spider is moving from place to place, and especially just before it jumps, it tethers a filament of silk (or *dragline*) to whatever it is standing on. Should it fall for one reason or another, it climbs back up the silk tether.

Jumping spiders are active hunters, which means that they do not rely on a web to catch their prey. Instead, these spiders stalk their prey. They use their superior eyesight to distinguish and track their intended meals, often for several inches. Then they pounce, giving the insect little to no time to react before succumbing to the spider's venom.

Spiders are of major importance in ecosystems and are recognized as effective natural control agents in agro-ecology. They are classified into 106 families with about 40,000 species, but the actual number of species is expected to be many times higher. These are carnivorous arthropods and are found all over the world in almost every kind of habitat. They mainly prey on insects, although they may also feed on various other kinds of prey. The population densities and species abundance of spider communities in agricultural fields can be as high as in natural ecosystems (Tanaka, 1989).

Vijayalakshmi and Ahimaz (1993) have given a descriptive account of spiders. Gajbe (2004) has provided a detailed account of spiders of Jabalpur, Madhya Pradesh, Rao *et al*. (2005) have described arachnid fauna of Nallamalai region, Eastern Ghats Andhra Pradesh (India) and Majumder (2004, 2005 and 2007) has given a detailed account of taxonomic studies of some spiders from Mangrove and Semi-Mangrove areas of Sunderban, studies on some spiders from Eastern Coastal region of India and various aspects of spiders of Sunderbans, West Bengal (India) respectively. Mishra *et al.* (2012[a] and 2012[b]) have reported *Neoscona nautica* and *Neoscona crucifera* and *N. adianta* from Azamgarh district and Yadav *et al* (2012[a] and 2012[b]) have reported *Leucauge decorata* from Azamgah and *Hippasa holmerae* from Azamgarh and Mau districts of U.P., India. Recently Chaubey and Mishra (2016, 2017[a] and 2017[b]) have reported *Cyrtophora cicatrosa* (Stolockza), *Cyrtophora citricola* (Simon) and Eucta chamberlini (Simon) from U.P. India. They have described habit and habitat, morphology, feeding capacity and prey preference of these spider species and also suggested for use of

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spiders as bio-control agents in controlling insect pests of crop fields.

From the review of literature, it appears that role of spiders as bio-control agents in agriculture, poultry as well as in controlling house-hold insects is being studied in various parts of the world, but unfortunately, no proper investigation, regarding role of these efficient bio-control agents in India is scanty.

In the present investigation, therefore, it has been to find out habit and habitat, external morphology, preying capacity and prey preference of zebra jumper *Plexippus petersi* collected from various places of U.P. (India).

MATERIALS AND METHODS

Collection of Spiders

Individuals of *Plexippus petersi* were collected from walls, crop fields, orchards, ornamental and wild plants.

Mehods of Collection

Following techniques were used for collection of spiders:

Jarring

The foliage spider fauna was collected by jerking the plants on a cloth sheet, from which the specimens were transferred alive in to plastic containers having pores in their corks for aeration and brought to the laboratory for studies.

Direct Hand Picking

Collection of most web building spiders was made by direct hand picking with the help of test tubes.

Inverted Umbrella

In this method an inverted umbrella was placed below flowering shoots and bushes and when the tree or branch was thoroughly shaken, spiders along with insects fallen to the inverted umbrella. After removing leaves, spiders were transferred into collecting tubes.

Preservation

Before the spiders were permanently preserved they were arranged properly. For this, collected specimens were transferred into petridish containing Isopropyl alcohol. It was kept covered undisturbed for about 2 or 3 hours in order to allow the relaxation of body muscles. The body parts like legs, abdomen, and palps were then arranged in a life like manner with the help of forceps and brush. Spiders were then kept in alcohol in a closed pair of petridish overnight before transferring to tubes for permanent preservation. The glass vial containing preserved specimens were stoppered by a rubber cork to prevent evaporation of alcohol. Alternatively, glass vials were plugged by cotton and group of these tubes were then placed in large bottle containing alcohol. This was the method used for preserving most specimens. Each collecting tube enclosed a label indicating the collection data. Collection data includes the name of the collector, place of collection, date of collection and habitat of collection.

Photography

Live photographs of all important spiders were taken with the help of Web Cam of 12 mega pixel attached to computer. For taking alive photographs, the spiders were anesthetized with mild doses of chloroform in specimen tubes. Generally, major diagnostic features such as dorsal view, ventral view, ocular area and side view were taken for the study. Natural photographs of spiders were taken while they were feeding on insects.

Identification

It was done on the basis of morphometric characters of various body parts. The help was mainly taken from the keys and catalogues provided by Biswas and Biswas (2003), Nentwig *et al.* (2003) and Plantik (2004), information and photographs available on internet and other relevant literature.

Study of Prey Choice

To study the prey choice of the collected spiders, adult house flies, rice moth, mosquitoes and their larvae and small insects were supplied to spiders which were kept under rearing chambers.

Each rearing chamber (9.5 cm height, 6.0 cm length and width) was consisted of transparent plastic containers. The lid of each container was provided with small holes for aeration. Since, spiders are highly cannibalistic, individual spiders were kept in separate chambers.

To study prey choice, spiders were kept starved for 24 h, then each spider was supplied with larvae and adults of moths, house flies and mosquitoes along with small insects collected from houses and surroundings (five individuals of each kind of prey in each rearing chamber). After 12h number of fed and live prey individuals were counted to find out preference of their prey. Attempts were also made to take live photographs while spiders were preying.

Study of Preying Potential

For this purpose spiders were kept starved for 24h and then each spider was supplied with various kinds of insect pests like adult moths, house flies and mosquitoes (ten individuals of each type) separately in their individual rearing chambers. After 12h, dead, fed and live prey were counted.

Statistical Analyses

Each experiment was repeated ten times and student's t-test was applied for comparison between two sample means.

RESULTS

Classification

Phylum: Arthropoda, Class: Arachnida, Order:Araneae, Family: Salticidae, Genus: *Plexippus*, Species: *petersi*

Habit and Habitat

Zebra jumper individuals live in a variety of habitats. These were collected from walls of houses, bushes and crop fields.

Diagnostic Characters

Sexual dimorphism is present. Males (Fig. 01) are smaller than females. Females have larger abdomen in comparison to that of male. Male (Fig. 01) and female (Fig. 04) individuals vary markedly in their body colour pattern also.

DISCUSSION

Plexippus petersi (Zebra jumper) live in a variety of habitats. Tropical forests harbor the most species, but they are also found in temperate forests, scrub lands, deserts, the inter-tidal zone (in Malaysia), even mountains (Wanless,1975).

Jumping spiders have very good vision centered in their anterior median eyes (AME). Their eyes are able to create a focused image on the retina, which has up to four layers of receptor cells in it (Harland and Jackson, 2000). It seems that all salticids, regardless of whether they have two, three or four kinds of color receptors, are highly sensitive to UV light (Peaslee & Wilson, 1989). Some species (for example, *Cosmophasis umbratica*) are highly dimorphic in the UV spectrum, suggesting a role in sexual signaling (Lim and Li, 2005).

When it is darkest, you are looking into its retina and the spider is looking straight at you as clear from Fig. 02 and Fig. 04.

Jumping spiders capture their prey by jumping on it from several inches away, and they may jump from twig to twig or leaf to leaf. They can jump many times their body length. They can carry out complex maneuvers such as detours around obstacles in order to reach their prey. Their eye sight is much better than the other spiders and most, if not all, insects. Most other spiders will only eat prey that they have captured live (Fig. 03) because they are unable to see dead prey.

Zebra jumping spiders do not weave webs, but stalk and ambush prey instead. In general, zebra jumping spiders attack prey of the same size or smaller than they are (Fig. 03). However, they may also attack larger, competing spiders. During present investigation it was found to prey on house flies and moths (Fig. 03). Thus it can also be considered as an efficient bio-control agent for control of insect pests in houses and crop fields.

Figure 1: Dorsal view

Figure 2: Frontal view

Figure 3: male feeding on adult moth pest

Figure 4: Female in dorso-frontal view.

Table 1: Feeding potential/ prey preference of *Plexippus petersi*.

Type/Number of prey consumed/24h / Spider (Mean ± S.D.)						
S.No.	**Lepidoptera**	**Diptera**	**Homoptera**	**Orthoptera**	**Coleoptera**	**Total**
1.	15	19	5	7	1	46
2.	13	15	5	6	0	40
3.	14	17	6	5	0	42
4.	14	14	5	4	0	38
5.	11	18	8	6	1	43
6.	12	20	7	3	1	43
7.	13	16	6	4	1	40
8.	14	14	5	3	1	37
9.	10	13	6	4	0	33
10.	13	15	7	5	1	41
Mean±S.D.	12.90±1.52	16.10±2.33[a]	06.00±1.05[a]	04.70±1.34[b]	0.60±0.51[a]	40.30±3.65[a]

Significance level [a]0.001, [b]0.01, [c]0.05, [d]0.10 and * not significant when compared with adjacent means.

ECONOMIC IMPORTANCE

Acts as an efficient controlling agent for various kinds of insect pest in the crop fields (Fig. 03 and Table -01). Thus, it can be used as a bio-control agent in paddy crop fields like other spider species as suggested by Song and Lee (1994); Kim and Kim (1995) and Im and Kim (1999).

REMARK

This spider species is being reported here for the first time from Uttar Pradesh (India).

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