



New record of St. Andrew's Oval Cross Spider *Argiope aemula* (Walckenaer, 1841) (Arachnida: Araneae: Araneidae) from Bijnor, Uttar Pradesh (India), a potential biological controller, with systematic account and other aspects

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(Received 12 May 2023, Revised 21 July 2023, Accepted 30 July 2023)

(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: Present communication deals with the new record of *Argiope aemula*, the St. Andrew's Oval Cross Spider, from Bijnor district of Uttar Pradesh with its systematic account, distribution, habitat, webbing, food & feeding, mating & cannibalism, venom and predation threats. It, as subsisting on various insects including plant insect pests, is considered a potential biological controller, especially in rice crop fields.

Keywords: New record, *Argiope aemula*, Bijnor, Uttar Pradesh.

INTRODUCTION

The spider fauna of Tarai region and eastern part of Uttar Pradesh has been studied by various workers during the past (Hore & Uniyal 2008; Mishra *et al.*, 2012; Kumar *et al.*, 2017; Sharma & Singh 2018a,b; Sharma *et al.*, 2020) but nothing is known from the rest of the area. Recently a good specimen of colourful spider *Argiope aemula* (Walckenaer, 1841), the St. Andrew's Oval Cross Spider, belonging to family Araneidae, was sighted at Pheena on *Cannabis sativa*, the *Bhang* plant in Bijnor district which on study was found to be the new record from the district and north-western Uttar Pradesh as well and hence reported here.

STUDY SITE: PHEENA, DIST. BIJNOR (UTTAR PRADESH)

Physiography: The district of Bijnor lies in north-western part of Uttar Pradesh state, covering an area of 4561² km and at 29° 2' - 29° 58' N Latitude and 78° 0' - 78° 57/59' E Longitude. It is bounded in north and north-east by Uttarakhand state, in south-east by Moradabad dist., in south by Amroha dist. and in west by river Ganga, separating from Muzaffarnagar and Meerut districts. Pheena, the study site, is located at 29° 04' 60" N Lat. and 78° 20' 60" E Long., at 207 m / 680 ft elevation and falls in Noorpur block and Chandpur tehsil, in southern part of the district.

Weather: Day time temperature 33 °C and humidity 40 % (5th May, 2021).

Flora: *Hygrophila auriculata* and *Diclipetra paniculata* (syn. *Peristrophe paniculata*) (Acanthaceae); *Acorus calamus* (Acoraceae); *Trianthema portulacastrum* (Aizoaceae);

Caesalpinia decapetala, *Senna tora* (syn. *Cassia tora*) and *Crinum asiaticum* (Amaryllidaceae); *Catharanthus roseus* (Apocynaceae); *Cannabis sativa* (Cannabaceae); *Carica papaya* (Caricaceae); *Cleome viscosa* (Cleomaceae); *Commelina benghalensis* (Commelineaceae); *Ageratum conyzoides*, *Cichorium intybus*, *Cyanthillium cinerum* (syn. *Vernonia cinerea*), *Helianthus annuus*, *Sonchus oleraceus*, *Sphaeranthus senegalensis* and *Tagetes erecta* (Compositae); *Bryophyllum pinnatum* (Crassulaceae); *Momordica charantia* (Cucurbitaceae); *Cyperus rotundus* (Cyperaceae); *Desmodium gangeticum*, *Macrotyloma uniflorum*, *Melilotus indicus* (syn. *M. indica*), *Mimosa pudica* and *Mucuna pruriens* (Fabaceae); *Swertia chirayita* (Gentianaceae); *Anisomeles indica*, *Leucas cephalotes* (Lamiaceae); *Punica granatum* (Lythraceae); *Hibiscus rosa-sinensis*, *Malva parviflora*, *Malvastrum coromandelianum* and *Sida rhombifolia* (Malvaceae); *Anagallis arvensis* (Primulaceae); *Ranunculus sceleratus* (Ranunculaceae); *Murraya paniculata* (Rutaceae), *Physalis peruviana* (Solanaceae), *Tamarix dioica* (Tamaricaceae) and *Lantana camara* (Verbenaceae) (Chaudhary & Kumar 2015; personal information).

SYSTEMATIC ACCOUNT WITH DISTRIBUTION

Argiope aemula (Walckenaer, 1841)

Synonymy with references on distribution & other aspects:

Epeira aemula Walckenaer, 1841. *Histoire naturelle des Insectes. Apteres*, 2: 118 (male, female).

Epeira striata Doleschall, 1857. *Natuurkundig Tijdschrift voor Nederlandsch-Indie*, 13: 415

(female); Doleschall, 1859. *Acta Societatis Scientiarum Indica-Neerlandica*, 5: 30, pl. 9, fig. 2 (female).
Argiope magnifera Koch, 1871. *Arachn. Austral.*, 1 (1): 27.
Argiope aemula, Thorell, 1877. *Annali del Museo Civico di Storia Naturale di Genova*, 10: 364 (male); Thorell, 1887. *ibid.*, 25: 164 (male); Pocock, 1900. *Fauna of British India, Arachnida*: 223; Shimojana, 1967. *Biological Magazine Okinawa* 4: 18, fig.11 (female); Tikader, 1970. *Records of the Zoological Survey of India*, 64 (1-4): 29, fig.17b (female); Chrysanthus, 1971. *Zoologische Verhandelingen*, 113: 9, figs. 1-3 (female); Yin, 1978. *Journal of Hunan Teachers College* (nat. Sci. Ed.) 1978 (10): 4, figs. 9A-C (female); Song (ed.), 1980. [*Farm Spiders*]: 100, figs. 46a-c (female); Tikader, 1982. *The Fauna of India. Spiders: Araneae*, 2 (1): 119, figs. 223-226 (female); Levi, 1983. *Bulletin of the Museum of Comparative Zoology*, 150: 273, figs. 9-10, 29-35 (male, female, subadult); Hue, 1984. *The Chinese spiders collected from the fields and the forests*: 101, figs. 97.1-3 (female); Yaginuma, 1986. *Spiders of Japan in color* (new ed.): 114, fig. 59.6 (male); Chikuni, 1989. *Pictorial encyclopedia of spiders in Japan*: 78, fig. 46 (male, female); Feng, 1990. *Spiders of China in colour*: 62, figs. 37.1-4 (female); Biswas & Biswas, 1992. *Fauna of West Bengal. State Fauna Series*, 3 (Part-3): 453; Barrion & Litsinger, 1995. *CAB International*, Wallingford, UK: 575, figs. 256a-d, 357a-f (male, female); Sasaki & Iwahashi, 1995. *Animal Behaviour*, 49 (4): 1119–1121; Yin *et al.*, 1997. *Fauna Sinica: Arachnida: Araneae: Araneidae*: 69, figs. 3a-g (male, female); Song *et al.*, 1999. *The spiders of China*: 260, figs. 150R-S, 151A, 152L, 153F (male, female); Biswas & Biswas, 2003. *Fauna of Sikkim, Part-2, State Fauna Series*, 9: 86; Majumder, 2004. *Memoirs of the Zoological Survey of India*, 20 (2): 1, 6; Gajbe, 2005. *ibid.*, 105 (Part 1-2): 50; Majumder, 2005. *ibid.*, 20 (3): 1, 8; Majumder, 2007. *Pictorial Handbook on Spiders of Sundaebans, West Bengal*, 1-137; Sebastian *et al.*, 2005. *The Journal of Arachnology*, 33: 254; Cheng & Tso, 2007. *Behavioral Ecology*, 18 (6): 1085–1091; Gajbe, 2007. *Fauna of Madhya Pradesh (including Chhattisgarh), State Fauna Series*, 15(1): 512, figs. 269-272 (female); Majumdar, 2007. *Pictorial Handbook on spiders of Sundarbans, West Bengal*: 138 pp; Tanikawa, 2007. *An identification guide to the Japanese spiders of the families Araneidae, Nephilidae and Tetragnathidae*: 45, figs. 24-25, 439-440 (male, female); Abrenica-Adamat *et al.*, 2009. *Egyptian Academic Journal of Biological Sciences, B. Zoology*, 1(1), 65-71; Mathew *et al.*, 2009. Updated checklist of Indian Spiders: 439. In: Sebastian, P. A. & Peter, K. V. (Eds.), *Spiders of India*; Tanikawa, 2009. *The spiders of Japan with keys to the families and genera and illustrations of the species*: 425, figs. 28-29 (male, female); Roy *et al.*, 2009. *Ins. Env.*, 15 (3): 116-117; Roy *et al.*, 2010. *Bionotes*, 12 (4): 113-114; Sebastian *et al.*, 2009. Suborder Araneomorphae: 129-130, pl. 17. In: Sebastian, P. A. & Peter, K. V. (Eds.). *Spiders of India*; Biswas & Biswas, 2010. *Fauna of Uttarakhand, State Fauna Series*, 18 (Part-3): 244, 251-252; Zhu & Zhang, 2011. *Spider Fauna of Henan*: 206, 144 A-E (male, female); Yin *et al.*, 2012. *Fauna Hunan*: 566, figs. 270a-g (male, female); Jager, 2012. *Beitrage zur Araneologie*, 7: 281, figs. 3-7(male); Majumder & Talukdar, 2013. *Records of the Zoological Survey of India, Occ. Pap. No. 340*: 7, 21; Gupta *et al.*, 2015. *Common spiders from select protected areas of upper Assam*: 189 pp; Sen *et al.*, 2015. *World Scientific News*, 20: 111, figs. 642-646, pl. 21 (male); Ade & Dixit, 2016. *International Journal of Scientific Research*, 5 (12): 729, 1a-f (female); Dhamorikar, 2016. *A Field Guide to Insects & Spiders of Kanha National Park*: 188, 189, fig. 46d; Dhamorikar, A., 2016. *A field guide to insects & spiders of Kanha Tiger Reserve*: 188, 230, fig. 46d (female); Palem *et al.*, 2016. *South Asian Journal of Life Sciences*, 4 (2): 55, fig. 2; Chaubey, 2017. *Indian Journal of Science Research*, 15 (1): 30-40; Roy *et al.*, 2017. *World Scientific News*, 67(1): 8, figs. 18-22, 169 (female); Caleb & Kumar, 2018. *Arachnida: Araneae*: 181. In: *Faunal diversity of Indian Himalaya*.
Argiope aemula nigripes Thorell, 1877. *Annali del Museo Civico di Storia Naturale di Genova*, 10: 364 (female).
Argiope trivittata Karsch, 1892. *Berliner Entomologische Zeitschrift*, 36 (2): 280, pl. 10, fig. 6 (female).
Metargiope ornatus lineatus Marapao, 1965. *Junior Philippine Scientist*, 2: 46, pl. 2, figs. 1-4 (female).
Argiope orniata lineata Brignoli, 1983. *A catalogue of the Araneae described between 1940 and 1981*: 242.
Sighting and Photograph: 1 example (female, on *Cannabis sativa* plant); Pheena, District Bijnor, Uttar Pradesh; 5.v.2021; by second author.
Diagnostic Features:
Cephalothorax longer than wide, narrowing in front, greyish-brown, covered with thick whitish-grey hairs /pubescence and irregular dark markings, cephalic region slightly elevated than thoracic region. Sternum heart-shaped, narrowing at distal end, covered with pubescence and hairs, with median yellowish-white markings, sides black; labium longer than wide, yellowish; labium longer than broad, yellowish; maxillae roughly pentagonal, yellowish and blackish-brown proximally, provided with prominent scopulae; chelicerae short, weak, reddish-brown, provided with rudimentary boss; palps yellowish.
Eyes eight, pearly white, arranged in form of trapezium, both anterior and median eyes subequal in size, posterior median eyes encircled with black, lateral eyes contiguous / close, anterior ones smaller than posterior ones and both situated on a prominent tubercle, anterior row of eyes procurved

as looks from front, posterior row strongly procurved as looks from above. Abdomen broadly oval, longer than wide, slightly truncated, dirty red edged anteriorly and overlapping anteriorly on the cephalothorax, covered with hair, dorsum creamy-white with two greyish-brown transverse stripes, edged with dirty red and with irregular white patches and two black spots, anterior stripe narrower, posterior 1/3rd part with reticulate pattern (in the form of network) in greyish-brown and two black dots on anterior edge, ventrum blackish-brown with a pair of bright yellow branched parallel longitudinal lines with lateral elongations and four yellow oval spots between the two lines, a reddish patch at proximal end.

Legs long, strong, armed with hairs and sharp spines, tarsal segment with claw, greyish with black cross bands, femora with yellow patches on ventral side, 3rd pair shorter than other three pairs, remain doubled up and spread in X-shape, when in web.

Sexual Dimorphism: Females large and brightly coloured; males much smaller and dull coloured.

Size: 23 mm Pocock (1900); female 20 mm (Tikader, 1970); 19.4 mm (Tikader, 1982); male 5-8, female 25-30 mm (Sebastian *et al.*, 2009; Gupta *et al.*, 2015); male 6-8, female 25-28 mm (India biodiversity).



Fig. 1. *Agriope aemula*, the St. Andrew's Oval Cross Spider.

DISTRIBUTION

Bijnor District: Pheena (present new record).

Rest of Uttar Pradesh: Uttar Pradesh (Gorakhpur, Kushinagar, Maharajganj and Siddharthnagar districts).

Rest of India: Andaman & Nicobar Islands, Andhra Pradesh, Assam (Kaziranga National Park), Chhattisgarh (Bastar), Gujarat, Kerala (Ernakulam, Idukki and Thiruvananthapuram/Trivandrum districts), Madhya Pradesh (Jabalpur; Kanha National Park/Kanha Tiger Reserve), Maharashtra (Pune; Shivaji College Campus, Akola), Meghalaya (Byrnihat Tea Estate; Nongkhylem Wildlife Sanctuary), Rajasthan, Sikkim, Tamil Nadu (Nilgiris), Uttarakhand (Almora-Ranikhet, Dehra

Dun- Rishikesh, Haridwar, Pauri Garhwal-Srinagar and Rajaji Tiger Reserve), West Bengal (Mahananda Wildlife Sanctuary, Darjeeling district; Mahananda Wildlife Sanctuary, Darjeeling dist.; North & South 24 Pargana dists.- Sundarban; Tea Estates in Dooars) and Western and Central Himalaya.

Elsewhere: Australia, China, Indonesia, Japan, S. Korea (Chinju; Koesan, Chungcheongbuk-do; Namhae), Malaysia, Myanmar, New Hebrides, New Guinea, Philippines, Singapore, South and South-east Asia, Sri Lanka, Taiwan, Thailand, Vanuatu and Western Pacific Region.

OTHER ASPECTS

Habitat: Gardens and woodland in sunny locations with flowers, orchards, bushes, shrubs, ornamental and wild plants, paddy crop plants, other vegetation and around human settlements. Takes rest under leaves during the day.

Webbing: Spins web of high adhesiveness with cruciate (X-marked across the hub) stabilimentum/web decoration in bushy vegetation at around 1-2 m above the ground level, more elaborate in young than in adult. Smaller adults make discoid webs deep inside the vegetation rather than out in the open as they require extra protection due to their size (Cheng & Tso 2007). Generally, the smallest sized web is around 2 m². On disturbance, it vibrates the web and moves behind the web. Abrenica-Adamat *et al.* (2009) studied the influence of prey on size, capture area and web height.

Food and Feeding: Beetles (Coleoptera), flies (Diptera), bugs, (Hemiptera), wasps and ants (Hymenoptera), rice moths (Lepidoptera) and crickets and grass hoppers (Orthoptera) whichever come near the web. Chaubey (2017) studied its prey choice by keeping under rearing chambers.

Mating and Cannibalism: Male is eaten by female mostly after second insertion of their palpal bulbs, borne on last segment of pedipalps or dies at its own, being exhausted (Newman & Elgar, 1991; Sasaki & Iwahashi 1995; Foellmer & Fairbairn 2003).

Cocoon is attached to the lower surface of leaves around (Sebastian *et al.*, 2009).

Venom: Venomous. The venom contains polyamine toxins which are sometimes used against prey if they are still alive. It is not a serious threat to humans as when gets bitten some swelling may develop which may not require medical aid (Foellmer & Fairbairn 2003).

Predation Threats: Dirt dauber, mud dauber, mud wasps or potter wasps (Hymenoptera) mostly attack medium-sized female spiders in cruciate web decorations (Cheng & Tso 2007).

POTENTIAL BIOLOGICAL COTROLLER

Spiders are generally of great help in controlling paddy field pests and other plant pests through their webs.

Argiope spp. usually prefer rice bugs or gundhi bugs (Hemiptera), rice leaf feeders (*Cnaphalocrocis medinalis*- Lepidoptera), grass hopper nymphs and crickets (Orthoptera) etc. and hence help in saving the host plants from these pests (Mitra & Melvin 2019).

Chaubey (2017) while dealing on various aspects of *Argiope aemula*, considered it as an efficient bio-control agent for insect pests in paddy crop fields, like other species as suggested by Song & Lee (1994), Kim (1995a, b), Kim & Kim (1995) and Im & Kim (1999).

Husain & Hasan (2020) found another spider *Nephila pilipes*, the Giant Golden Orb Weaver, helpful in controlling the plants pests, particularly moths, beetle etc.

Acknowledgements. The author (AH) is thankful to Dr. S. S. Talmale, Scientist-C, Western Regional Centre, Zoological Survey of India, Rawet Road, Pune (Maharashtra) for some literature. Thanks are also due to Mr. Prakash Joshi, Sangli (Maharashtra) for help in identification.

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How to cite this article: Akhlaq Husain and Sushain Babu (2023). New record of St. Andrew's Oval Cross Spider *Argiope aemula* (Walckenaer, 1841) (Arachnida: Araneae: Araneidae) from Bijnor, Uttar Pradesh (India), a potential biological controller, with systematic account and other aspects. *International Journal on Emerging Technologies*, 14(2): 01-05.