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INCIDENCE OF EGG PARASITISM IN *ARGIOPEPULCHELLA* THORELL, 1881 (ARANEAE: ARANEIDAE) BY *BAEUS* SP

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ABSTRACT

Scelionid wasps are considered as idiobionts that attacks and consumes spider eggs. This group of parasitic hymenopteran insects parasitize the egg sacs of spiders, thereby playing a significant role in controlling the spider population. Wasps of Baeini tribe, due to their unique morphology have succeeded in parasitizing eggs of a number of spider families. Though a number of reports confirm spiders as the host of Baeus sp. But, identification of host species of this group of wasp still remains lacking. The present paper reports the incidence of egg parasitism in Argiopepulchella Thorell, 1881 by Baeus sp. for the first time from India.

KEYWORDS: *Parasitoid, Egg Sac, Idiobionts, Argiopepulchella, Baeus*

INTRODUCTION

Parasitic wasps are one of the most important predators of spiders. They either feed on the arthropod body externally as osteoporosis or may ingest spider eggs as end parasites (Foelix, 2011). End parasites that are known to consume larval eggs are classified as parasitoids (Cobb andCobb, 2004). Parasitoids that develop in broods of small number or singly by feeding on encased spider eggs mostly belong to two families of Hymenopter- Ichneumonidae and Pteromalidae. Certain wasps of families such as Pompilidae, Sphecidae and Ichneumonidae acts as external spider parasites, whereas few highly specialized Scelionid wasps acts as endoparasitoids by developing inside spider eggs (Fitton*et al.*, 1987). Scelionid wasps are considered to be idiobionts, which infest spider eggs. Their larva consumes host egg contents and after pupating inside it, emerges into adults (Stevens and Austin, 2007). Although there are many record of rearing such endoparasites from spider eggs, but in most records the spider host were not identified or were classified upto the family level. Literatures on 22 species of *Baeus* sp. had there host recorded but only upto the family level (Stevens and Austin, 2007).

Argiopepulchella Thorell, 1881 is an orb weaving spider species that occurs abundantly in Kamrup district of Assam. It builds its web on above ground vegetation and lays eggs in a roughly triangular egg sac attached to irregular web built aside its own regular orb web. This present paper attempts to describe the egg sac structure of the host spider *A.pulchella*and incidence of egg parasitism by *Baeus*sp.

MATERIALS AND METHODS

Study Area

The study was conducted in Kamrup (M) district, which is located at 26°11'0"N latitude and 91°44'0"E longitude. This district occupies an area of 1527.84 km². The study area is a mosaic of hills, reserve forest, wetlands, semi-urban and urban areas. The area has a sub-tropical climate with hot humid summer and cool dry winter. Annual rainfall ranges between 1500-2600 mm, average humidity of 76%, maximum temperature of 37-39˚C and minimum temperature of 6-7 ˚C. Surveys were conducted along belt transects of 10 m breath and 1 km length by visual search from 8:00 am to 12:00 noon and from 1:00pm to 3:00 pm from January 2016 to January 2017.

Collection

For specimen collection, direct capture method (Zschokke and Herberstein, 2005) was employed. Adult spiders were collected and identified with the help of published literature (Tikader, 1982; Jager,2012) (Figure 1). For species confirmation, the specimens were studied under Olympus Magnus stereozoom microscope (MSZ- Bi). Egg sacs were studied both from wild and those obtained from laboratory rearing. Egg parasites obtained were fixed in 80 % ethanol and were deposited to BMGU (Biodiversity Museum Gauhati University, Northeast Region) with Museum Accession No. (BMGU/A-10/ARI- 30)

Laboratory Rearing

Ten female *A. pulchella* individuals were reared and allowed to mate with mature males in spider rearing cages in laboratory. Spider rearing cages measuring 50x15x50 cm (lxbxh) were constructed out of cardboard (modified form of Zschokke & Herberstein, 2005). External light source (5W) was provided to maintain the photo period of 12 hrs day and 12 hrs night. Webs were misted with water at regular intervals. Wild collected egg sacs were maintained in plastic vials in laboratory under room temperature. Egg sacs were dissected using fine forceps and a pair of scissors and egg clusters was examined and measured under stereo zoom microscope Leica EZ4 E.

RESULTS

Host Egg Characteristics

A total of 20 egg sacs were studied, ten collected from wild and ten from laboratory rearing. Eggs of *A. pulchella*are laid in clusters. Each egg sac is a roughly triangular shaped elongated sac, made of silk (Figure 2). Each egg sac has a basal and a cover plate encasing a mass of concentrically arranged eggs (Figure 3) covered by flocculent silk. Mean length of the egg sac was (±SE) 2.95±0.18 cm and mean width 1.57 ±0.10 cm. Mean area of the egg sac was found as 2.32±0.22 cm^2. Eggs are spherical and creamy orange in color at initial stage, which turns to opaque white on further maturation (Figure 4). Mean diameter of eggs ranged from 0.67– 0.75 mm. Egg sacs collected from wild had a mean cluster size of 1194.67±160.28 eggs/sac whereas laboratory reared egg sacs had a clutch size of 134.84±60.3 eggs/sac.

Frequency of Infestation

From the wild collections, only in one egg sac, egg parasites were found. A total of 3.07% of spider eggs were parasitized. From the collected infected egg sac a total of 35 *Argiope* juveniles emerged a day after the egg sac was collected and after two days, 1,164 juveniles emerged. Total clutch size of the infected *Argiope* egg sac was 1,237 eggs. *Argiope* eggs were found to be parasitized by idiobiontscelionid wasp. Parasitized eggs appeared to have two distinct black

eye spots (Figure 5). A total of 34 female and 4 male idiobionts emerged from the egg sac. Sex ratio was found to be 2:17 (male: female). Emergence of scelionid wasp took place within 20- 30 days after the emergence of first batch of *Argiope* juveniles. The parasitoid was identified as *Baeus* sp. of Baeni tribe and family Scelionidae. Identification of the scelionid wasp was on basis of the following characters as per Fitton 1987.

Description of the Parasitoid

Based on ♀♂ (BMGU/A-10/ARI- 30) from Assam, India, collected on 18/12/2016 (co-ordinates 26˚08' 37.32" N, 91˚38' 14.49" E).4♂ (Figure 6); body black in colour, appendages yellowish brown, antenna with 11 free antennomeres, last segment not swollen into clava, length of antennal scape (0.131±0.0007mm),2nd tergite of the gaster is largest, macropterous with 2 pairs of fully developed wings, wings with marginal setae. 10♀ (Figure 7); wings completely absent, body squat, oval and highly fusiform, smooth and polished, gaster appearing to be fused to thorax, metanotum absent, metasomatic horn absent, antenna with 7 antennomeres with last segment expanded into a large disctinctclava. Body measurements (in millimimeters) are enlisted in Table 1.

DISCUSSIONS

This is a new record of egg parasitism in *A.pulchella* from India. Previously in 1978, *Sarcophagabanksi* (Diptera) and *Tachinobiarepanda* (Hymenoptera) were reported to infest *A.pulchella* eggs (Prakash and Pandian, 1978). Spider egg sacs are considered as a physical barrier that isolates the eggs from external environmental stresses (Austin 1985) and as result of adaptive response to biotic factors which may increase mortality, structural diversity in egg sacs might have resulted across different spider families (Austin, 1985). *Baeus* wasps are morphologically specialized and are well adapted to burrow through the thick- walled egg sacs of araneids, linyphiids and theridiids (Austin, 1985). The scelionid tribe Baeni comprises about 200 described species world-wide of which only around 25 species belong to genus *Baeus*(Margaría*et al.*, 2006) and only 1 species *Baeusprimitus* (Rajmohana, 2014) has been recorded from India till date. *Baeus* wasps have been recorded to parasitize eggs of spiders of different families such as Agelenidae, Araneidae, Dysderidae, Linyphiidae, Lycosidae and Theridiidae (Stevens and Austin, 2007). Among araneids egg sacs of *Argiopeaethera*, *Celaenia* sp., *Crytophoramoluccensis* and *Araneus* sp. has been recorded to be infected by *Baeus* wasp (Austin, 1985;Lubin, 1974). Austin in 1985 stated that some scelionid species may not be capable of parasitizing more than 35% of the eggs in the egg sac as their ovipositor cannot reach further than upper two layers of eggs, therefore in some host – parasitoid interaction, the shape and the volume of the egg mass may play a major role. Spider egg sacs and silk retreats play a critical role in preventing desiccation of eggs and with the synchronous development of eggs within a single egg sac, *Baeus* sp. like *Echthrodesis* sp. (van Noort, 2014) can complete its life cycle in a protected environment.

Members of Baeini tribe are known only to be endoparasites of spider eggs and this group of insect is considered to be the most significant group that controls spider population (Austin, 1985).Further studies on host specific interactions are required as parasitoids play one of the major roles in shaping spider population.

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APPENDICES

Table 1: Morphometry of Male and Female Baeus Wasp

Parameters	*Baeus* sp. ♂	*Baeus* sp. ♀
Head length	0.248±0.004	0.364±0.004
Thorax length	0.448±0.003	0.22±0.003
Abdomen length	0.311±0.004	0.51±0.012
Forewing length	0.97±0.02	Absent
Hindwing length	0.726±0.002	Absent

Figure 1: Argiope Pulchella (Host of Baeus Sp)

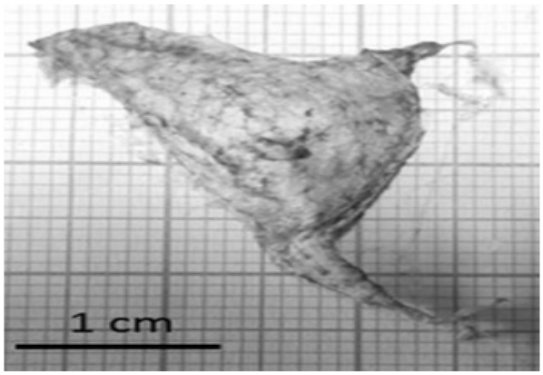

Figure 2: A Pulchella Egg Sac

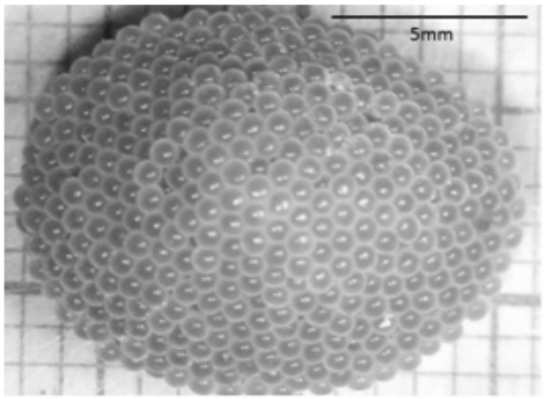

Figure 3: Egg Cluster of A Pulchella

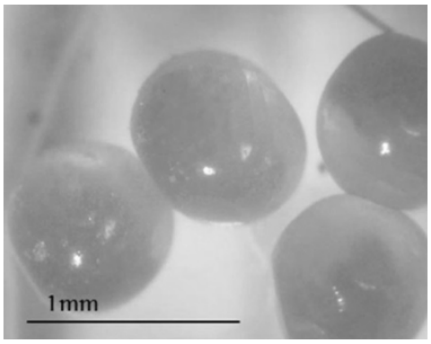

Figure 4: Normal A Pulchella Eggs Before Parasite Infestation

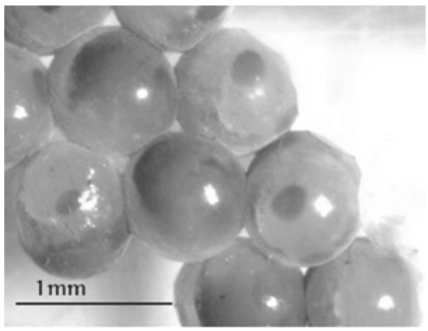

Figure 5: Parasitized A Pulchella Eggs with Developing Baeus Sp. With Distinct Eye Spots

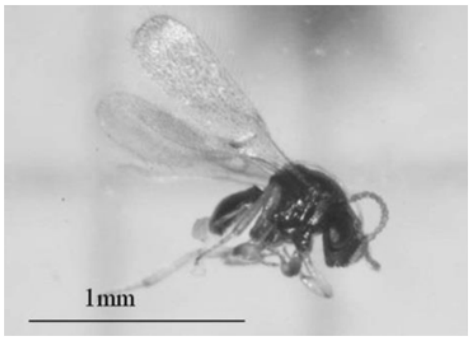

Figure 6: Emerged Male Baeus Sp

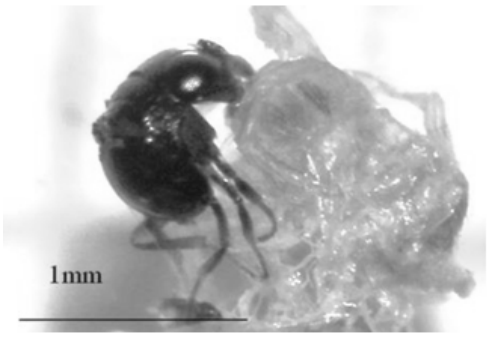

Figure 7: Emerged Female Baeus Sp