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Comaprative Morphometrics of Three Aphidophagous Syrphids Occurring in Navsari Region

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ABSTRACT

The experiment was carried out to differentiate the three species of syrphids viz. Ischiodon scutellaris (Fabricius), Episyrphus balteatus (De Geer) and Paragus serratus (Fabricius) in Navsari condition for easy identification for the further research purpose. The major difference between species lies in body colour and shape, eyes pattern and abdominal colouration pattern.

Key words: *Syrphid fly, I. scutellaris, E. balteatus, P. serratus, Morphometrics*

INTRODUCTION

The Syrphidae is an important group of resources and natural enemy insects, which not only could be used for controlling aphids and pollination, but also as important experimental materials for bionics[14]. They have great economic importance due to friendly behavior to mankind and play an important role in pollination of flowering plants. In addition the immature of numerous species are predators of destructive aphids and other pests.

Keeping in mind the importance of syrphid fly in pollination and as efficient predator of aphid, it is very important to know their diversity with some of the scientific evidence. A detailed understanding of survey and morphometric specification ultimately helps in proper identification of this important group of insect. In India, the earlier studies on morphology and biology of syrphids were by Bhatia[2]; Lal and Gupta[6]; Roy and Basu[11]; Gilbert[4]. These studies are however, not complete and are fragmentary. Other studies by the Indian workers are limited to the new records of syrphids as predators of different species of aphids[10,1,5,13].

In spite of prosperous biodiversity of this important insect species, very scanty information is available on species morphomertrics. Practically no work has been done on its morphometrics in Navsari region and whatever information is available, it is scanty and of a general nature.

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To fill this lacunae the investigation was undertaken to study the comparative morphometrics of three syrphid species *viz., Ischiodon scutellaris* (Fabricius), *Episyrphus balteatus* (De Geer) and *Paragus serratus* (Fabricius) particularly in Navsari condition.

MATERIAL AND METHODS

To study the morphometrics of different syrphids, larvae of syrphids collected from different cropping ecosystem of NAU farm and surrounding field was reared in the P. G. Research Laboratory of Department of Agricultural Entomology, NMCA, NAU, Navsari. The adults obtained were killed and preserved in 70 per cent alcohol. The collected specimens were assigned with location, crop, collector and date of collection to avoid the assimilation of species.

The collected samples of different species were carefully observed for studying their morphometrics. Morphometrics characters were observed carefully with the help of trinocular stereomicroscope (Make: Olympus – SZ 16) fitted with Brand Catcam-130 camera software power scopephoto (version 3.1). The data was analyzed statistically by approxing mean and standard deviation of each character will be workout. The following morphological characters were studied:

Body length : Distance between the anterior most points of front to the tip of abdomen.
Body breadth : Distance measured in the middle of body where it is maximum.
Head length : Distance between anterior most points to the posterior most point of head.
Head breadth : Distance measured in the middle of head where it is maximum.
Antennal length : Distance between the bases of scape to the end of the flagellum.
Antennal breadth : Distance measured in the middle of antennae where it is maximum.
Thorax length : Distance between the anterior to the posterior end of the thorax.
Thorax breadth : Distance measured in the middle of thorax where it is maximum.
Fore wing length : Distance measured between the articulatory point of fore wing and its apical tip.
Fore wing breadth : Distance measured in the middle of forewing where it is maximum.
Haltare length : Distance measured between the articulatory point of haltare and its anterior tip
Fore leg length : Distance measured between the anterior tip articulation point and posterior tip of the fore leg.
Middle leg length : Distance measured between the anterior tip articulation point and posterior tip of the fore leg
Hind leg length: : Distance measured between the anterior tip articulation point and posterior tip of the hind leg.
Abdomen length : Distance measured between anterior most points to the posterior most point of abdomen.
Abdomen breadth : Distance measured in the middle of Abdomen where it is maximum.
Colour and shape of body : Colour, shape and number of the spots and shape Or pattern of the spots.

RESULTS AND DISCUSSION

The data on the comparative morphometrics of syrphid species collected from different cropping system were presented in Table-1 and Fig.-1 and discussed here under.

Body length and breadth

The studies on body length and breadth of different species of syrphids revealed that the body length and breadth varied among different species. The maximum mean body length was recorded in *E. balteatus* (6.87 ± 0.18 mm) followed by *I. scutellaris* (6.81 ± 0.33 mm). The minimum body length was observed in *P. serratus* (5.84 ± 0.21 mm). Whereas mean body breadth was maximum in *I. scutellaris* (1.57 ± 0.16 mm) followed by *E. balteatus* (1.28 ± 0.16 mm) and the minimum in *P. serratus* (1.09 ± 0.06 mm).

Head length and breadth

The mean head length was recorded maximum in *E. balteatus* (2.02 ± 0.14 mm) followed by *P. serratus* (1.61 ± 0.45 mm) and the

minimum length recorded in *I. scutellaris* (1.38 ± 0.06 mm) while the head breadth was maximum in *E. balteatus* (3.46 ± 0.26 mm) followed by *I. scutellaris* (2.82 ± 0.16 mm). The minimum head breadth recorded in *P. serratus* (2.15 ± 0.58 mm).

Antennal length and breadth

The antennal length and breadth was maximum in *E. balteatus* (1.04 ± 0.01 and 0.27 ± 0.03 mm, respectively) which was followed by *I. scutellaris* (0.99 ± 0.02 and 0.24 ± 0.04 mm, respectively) and the minimum antennal length and breadth recorded in *P. serratus* (0.73 ± 0.02 and 0.20 ± 0.02 mm, respectively).

Thorax length and breadth

The maximum mean length of thorax was recorded in *E. balteatus* (2.49 ± 0.12 mm) which was followed by *I. scutellaris* (2.27 ± 0.31 mm) and the minimum recored in *P. serratus* (1.76 ± 0.17 mm). Similarly, the breadth recorded maximum in *E. balteatus* (1.96 ± 0.08 mm) followed by *I. scutellaris* (1.74 ± 0.21 mm). The minimum breadth was observed in *P. serratus* (1.52 ± 0.14 mm).

Forewing length and breadth

The maximum forewing length was recorded in *E. balteatus* (9.32 ± 0.49 and 2.57 ± 0.21 mm, respectively) which was followed by *I. scutellaris* (8.63 ± 1.01 and 2.37 ± 0.36 mm, respectively) and the minimum forewing length was observed in *P. serratus* (5.82 ± 0.69 and 2.00 ± 0.26 mm, respectively).

Haltere length

The maximum haltere length observed in *E. balteatus* (0.63 ± 0.03 mm) which was followed by *I. scutellaris* (0.57 ± 0.02 mm) and the minimum haltere length was in *P. serratus* (0.50 ± 0.03 mm).

Fore leg, mid leg and hind leg length

The maximum fore leg and mid leg length was recorded in *E. balteatus* (4.56 ± 0.21 and 4.07 ± 0.03 mm, respectively) which was followed by *I. scutellaris* (4.07 ± 0.12 and 4.03 ± 0.02 mm, respectively) and the minimum fore leg length observed in *P. serratus* (3.68 ± 0.22 and 3.62 ± 0.15 mm). Whereas, the maximum hind leg length was observed in *I. scutellaris* (5.46 ± 0.31 mm) which was followed by *E. balteatus* (5.42 ± 0.40 mm) and the minimum hind leg length was in *P. serratus* (4.57 ± 0.32 mm).

Abdomen length and breadth

The maximum abdomen length and breadth recorded in *E. balteatus* (3.99 ± 0.09 and 1.75 ± 0.04 mm, respectively) which was followed by *I. scutellaris* (3.54 ± 0.19 and 1.43 ± 0.04 mm, respectively) and the minimum forewing length observed in *P. serratus* (2.94 ± 0.13 and 1.22 ± 0.04 mm, respectively).

Colour and Shape

I. scutellaris and *E. balteatus* were long slender flies whereas *P. serratus* was small sized fly. *I. scutellaris* was orange yellow to black coloured. Face was bright orange yellow with microscopic pubescence whereas *E. balteatus* was black-orange and yellow colour patterns. Face was orange with orange hairs and Body of *P. serratus* was punctate with yellowish brown and whitish pubescence. Antennae of all three species were aristate type with brownish orange to black bare arista in *I. scutellaris*, dull yellow in *E. balteatus* and dark brown to black in *P. serratus*.

Eyes were glabrous and brown coloured in *I. scutellaris* and *E. balteatus* and in *P. serratus* eyes were hairy and hairs were arranged in three longitudinal stripes forming a pattern of light and dark areas. In male eyes were holoptic *i. e.*, both eyes were contiguous while in female there was a wide space between two eyes in all the three species. Thorax was shining black with side margins bright yellow in colour, scutellum was yellowish with the centre often brownish in colour and wings were transparent with third longitudinal vein upcurved apically and ending well before wing apex in *I. scutellaris*. The thorax was black with two narrow lateral grayish stripes, scutellum was translucent yellow with the slightly darker base in *E. balteatus*. Thorax was shining blue-black with a pair of grayish median strip on anterior part, scutellum was black with yellow margin in *P. serratus*. Abdomen was flat or slightly convex dorsally.

Abdomen was shining black in colour with a large yellow band on each side of its

segment in *I. scutellaris* whereas in *E. balteatus,* abdomen was completely yellow with a black median spot on first segment united to a black stripe on hind margine. Third and fourth segments are with narrow sub basal and broad apical black bands. A moderately wide black band is present before the hind border on second and third segments and in *P. serratus,* abdomen was yellow with brown markings. Abdominal tip in ventral view were symmetrical in female and asymmetrical in male fly in all three species.

Gilbert[4], recorded the mean breadth of head of *E. balteatus* as 3.06 mm and the mean length and breadth of forewing of *E. balteatus* as 9.80 and 2.88 mm, respectively which partially confirms the present investigation. Makhmoor and Verma [7], reported that the body length of adult *E. balteatus* ranged from 8.10 to 12.90 mm. The similar description about the body colour and shape is reported by Mitra *et al*.[8]. According to Gelot *et al.*[3], the body length of *Xanthogramma scutellare* Matsumura ranged from 6.89 to 9.90 mm. The average length of male and female adults of *X. scutellare* ranged from 8.43±0.57 to 8.79±0.72 mm and 7.92±0.85 to 8.3±0.74 mm, respectively while, average breadth of male and female adults ranged from 14.50±1.76 to 14.95±1.66 mm and 14.42±1.76 to 14.64±1.25 mm, respectively. According to Sajida *et al.*[12], *E. balteatus* adults emerged were bright colored, normally orange-yellow abdomen with black strips on body and with average body length of 15.2mm. These specific banding patterns of abdomen were one of their identification marks Mitra *et al*.[9]. The remaining findings of the present investigation cannot be compared as there is no information available pertaining to this aspect. And the variations in the results might be due to different agro climatic conditions and food availability.

Table 1: Comparative morphometrics of predacious syrphids

Sr. No.	Body Character	*E. balteatus*	*I. scutellaris*	*P. serratus*
1	**Body length (mm)**	6.87±0.18	6.81±0.33	5.84±0.21
2	**Body breadth (mm)**	1.28±0.16	1.57±0.16	1.09±0.06
3	**Head length (mm)**	2.02±0.14	1.38±0.06	1.61±0.45
4	**Head breadth (mm)**	3.46±0.26	2.82±0.16	2.15±0.58
5	**Antennal length (mm)**	1.04±0.01	0.99±0.02	0.73±0.02
6	**Antennal breadth (mm)**	0.27±0.03	0.24±0.04	0.20±0.02
7	**Thorax length (mm)**	2.49±0.12	2.27±0.31	1.76±0.17
8	**Thorax breadth (mm)**	1.96±0.08	1.74±0.21	1.52±0.14
9	**Forewing length (mm)**	9.32±0.49	8.63±1.01	5.82±0.69
10	**Forewing breadth (mm)**	2.57±0.21	2.37±0.36	2.00±0.26
11	**Haltere length (mm)**	0.63±0.03	0.57±0.02	0.50±0.03
12	**Foreleg length (mm)**	4.56±0.21	4.07±0.12	3.68±0.22
13	**Middle leg length (mm)**	4.07±0.03	4.03±0.02	3.62±0.15
14	**Hind leg length (mm)**	5.42±0.40	5.46±0.31	4.57±0.32
15	**Abdomen length (mm)**	3.99±0.09	3.54±0.19	2.94±0.13
16	**Abdomen breadth (mm)**	1.75±0.04	1.43±0.04	1.22±0.04

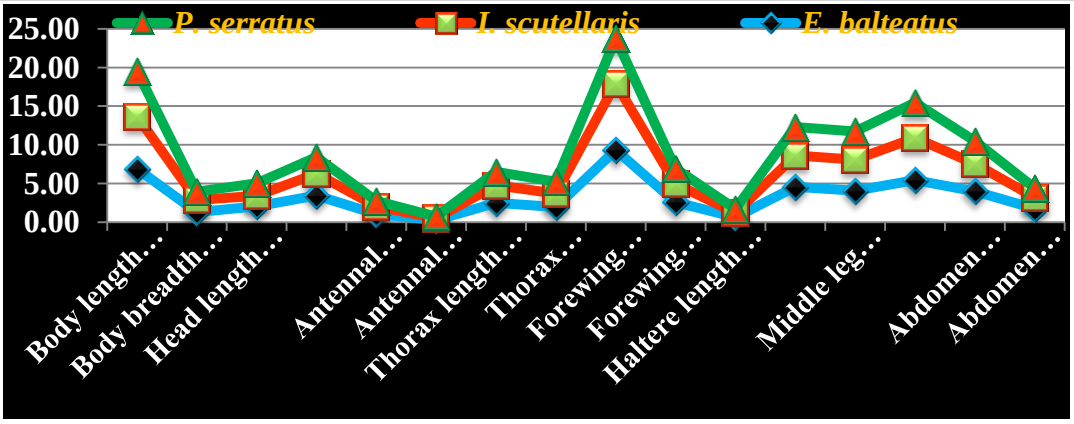

Fig. 1: Comaprative morphometrics of *I. scutellaris*, *P. serratus* and *E. balteatus*

CONCLUSION

In the present investigation, the different species of syrphid flies fron Navsari region were differentiated on the basis of their morphological character. However, the morphological character of the syrphids does not affect the predation of the species on aphids. In fact, several studies with both morphological and ecological data have concluded that there is no relationship between ecology, predatory potential and morphology and the observed morphological pattern are only for the sake of identification of the species in the locality.

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