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Biology of Green Lacewing *Chrysopa* (=*Chrysoperla*) *scelestes* Banks (Neuroptera : Chrysopidae) an Important Perdator in Gujarat

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ABSTRACT

The species of *Chrysopa*=*Chrysoperla*) *scelestes* Banks was recorded for the first time in Gujarat State. Life history of *Chrysopa* (=*Chrysoperla*) *scelestes* Banks was studied for the first time in Gujarat in detail under the laboratory conditions at Junagadh during 1981-82. The egg period was on average 2.96 days. There were three distinct larval instars when the predatory larvae were reared on the eggs of *Corcyra cephalonica* Stainton and duration of each instar was on average 2.26, 2.14 and 2.30 days, respectively. Mean larval duration was recorded as 6.77 days. The average length and breadth of I, II and III larval instars was recorded as 2.450, 4.880 and 7.136 mm; 0.551, 1.020 and 2.363 mm, respectively. The average head width of I, II and III larval instars was 0.346, 0.558 and 0.819 mm, respectively. The pupal stage was passed in cocoon and the average pupal period was found to be 6.13 days. Average pre-oviposition, oviposition and post-oviposition periods observed were 3.52, 10.94 and 10.15 days, respectively. Male and female *Chrysopa* adults survived for 15.20 and 23.42 days, respectively. The entire life-span (from egg to the death of adult) was completed within 17 to 73 days.

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INTRODUCTION

Green lacewing, *Chrysopa scelestes* Banks is one of the important and well known *Chrysopa* species commonly associated with cotton insect pests in India (Nagarkatti, 1981). It is also one of the most important and valuable predators of economic crop pests like *Heliothis armigera* Hubner, *Spodoptera litura* Fabricius, different species of aphids and other sucking pest-complex. According to Kharizanov and Babrikova (1978) chrysopids were important predators of crop pests and their larvae were known to feed over 80 species of insects and 10 of tetranychid mites. Excepting for few preliminary studies on the bionomics of this species *Bemisia tabaci* made by Rahman (1940) and Nasir (1947), not much information on its bionomics is available. Krishnamoorthy and Nagarkatti (personnal communication) have recently attempted to mass rear this predator by using the eggs of rice moth *Corcyra cephalonica* Stainton as larval diet at Bangalore. Although the population of *C. scelestes* was

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widely distributed in Saurashtra (Gujarat) in important agricultural crops viz., cotton, groundnut, greengram and sugarcane, etc., but its detailed information on bionomics was not available. Hence a a detailed study was undertaken on bionomics of this beneficial insect under laboratory condition at Junagadh during 1981-82, the results of which are presented in this paper.

MATERIALS AND METHODS

Initial laboratory culture of green lace wing was made by collecting the large number of adults from the unsprayed field of cotton grown at the Cotton Breeding Farm, Junagadh. They were further kept separately in different 3-4 groups in plastic jars (16 cm X 20 cm) and provided with cotton wool swabs soaked in 5 per cent honey solution as food. The top of plastic jar was covered with brown paper to facilitate egg laying. Freshly laid eggs were kept individually in separate glass vials (2.5 cm X 15 cm). Daily observations on hatching of eggs were recorded to find out the incubation period. Newly hatched larvae were provided with freshly laid eggs of rice moth, *Corcyra cephalonica* Stainton upto the cocooning. Larval size and head-width were measured for each instar. The larval instars were determined by measuring the head-width with the help of occular and stage micrometers and also confirmed by the presence of the exuviae of the head-capsules casted off by the larvae.

RESULTS AND DISCUSSION

1. Oviposition and Fecundity :

The average pre-oviposition, oviposition and post-oviposition periods of a mated female were 3.52, 10.94 and 10.15 days, respectively (Table 1). The oviposition potential of mated female was ranged from 6 to 264 eggs with an average of 91.55 eggs.

2. Description and duration of various life stages (Table 2)

Egg : Freshly laid eggs are green in colour, oval in shape with micropylar apparatus and placed at the tip of elongated hair like foot-stalks (Fig. 1). The

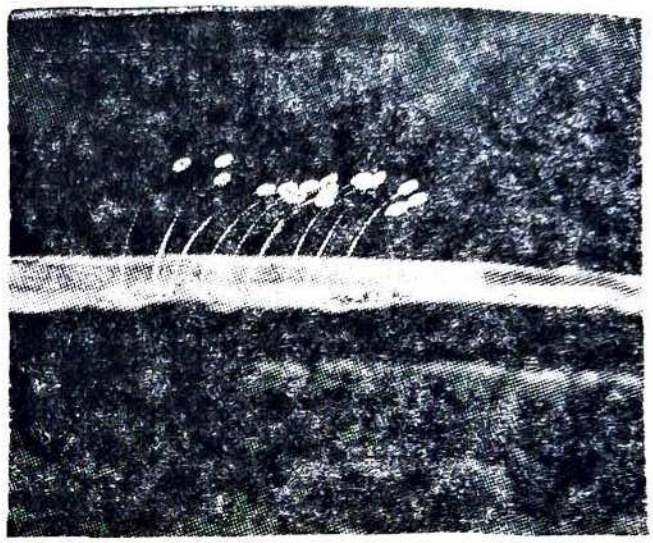


Fig. 1: Chrysopa eggs alongwith elongated hair like foot-stalk.

average length and breadh of eggs were 0.826 and 0.361 mm, respectively. The length of foot-stalk varied from 2.91 to 6.09 mm with an average of 3.86 mm. According to Nasir (1947), the average length of foot-stalk was 2.60 mm. The average incubation period of egg was 2.96 days and the hatching percentage was recorded as 93.02 per cent at an average 27.06° temperature and 86.82 per cent relative humidity. Rahman (1940) reported the egg period to be 2 to 5 days.

Larva : The larvae passed through three distinct larval instars when reared on the eggs of *Corcyra cephalonica*. The

TABLE 1

Pre-oviposition, oviposition and post-oviposition periods of *C. scelestes*.

Period of study	*Temperature in °C*			*Relative humidity %*	*Female observed No.*	*Pre-oviposition period (days)*			*Oviposition period (days)*			*Post-oviposition period (days)*		
	Min.	*Mix.*	*Av.*			*Min.*	*Max.*	*Av.*	*Min.*	*Max.*	*Av.*	*Min.*	*Max.*	*Av.*
Sep. 21 to Oct. 30, 1981	28.0	32.5	30.37	86.85	15	2	6	3.40	4	21	9.87	3	22	8.53
Dec. 5, 1981 to Feb. 11, 1982	20.0	26.6	23.87	81.12	18	2	8	3.61	2	31	11.83	2	36	11.50
Overall	20.0	32.5	27.20	84.06	33	2	8	3.52	2	31	10.94	2	36	10.15

TABLE 2

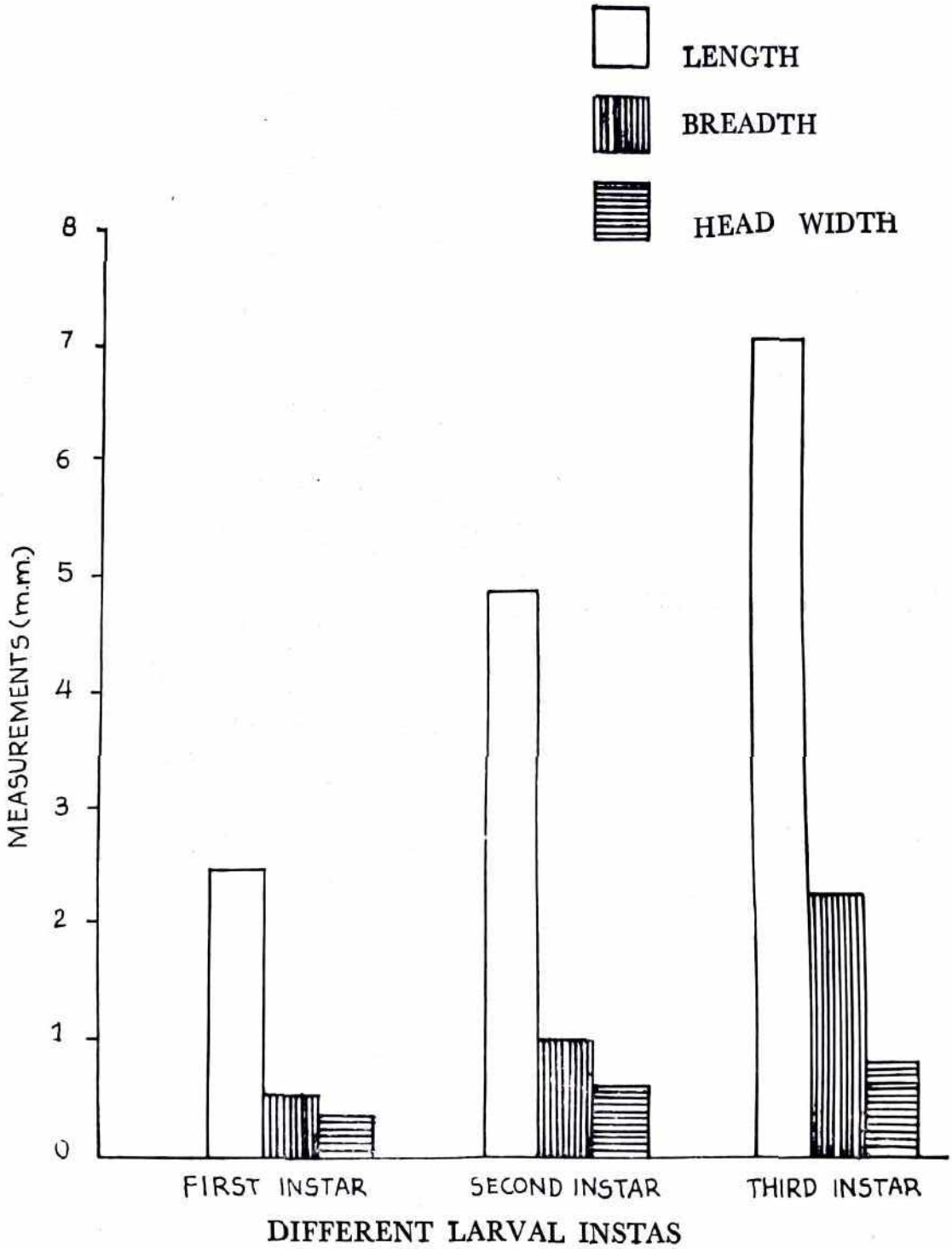
Measurements and duration of different stages of *C. scelestes*.

Stage of the insect	*Average temperature °C*	*Average relative humidity*	*Number of observations*	*Measurements in mm*			*Number of observations*	*Duration in days*	
				Length	*Breadth*	*Head width*		*Range*	*Mean*
Egg	27.06	86.82	50	0.826	0.391		774	2-6	2.96
Foot-stalk			80	3.864					
Larval instars	26.80	83.19							
I			40	2.450	0.551	0.346	137	1-4	2.26
II			40	4.880	1.020	0.558	133	2-4	2.14
III			40	7.136	2.244	0.819	131	2-4	2.30
Entire larval stage	26.80	83.19					131	5-9	6.77
Pupa	27.44	83.29	40	3.400	2.581		125	5-9	6.13
Adult									
Male	26.41	82.67	26	7.2	22.6*		35	3-43	15.20
Female	26.41	89.07	30	8.0	24.9		36	4-56	23.43
Entire life-stage	26.41	83.05					71	17-73	35.44

*With wings expanse.

length, breadth and head width of all the three larval instars were also measured and depicted in Graph 1.

The newly hatched larva (Fig. 2) was tiny, alligator shaped, having pale to reddish colour. The larva was somewhat translucent with faint markings in each segment (Fig. 2). It measured on an average 2.450 mm in length and 0.551 mm in breadth. The average head width was recorded as 0.346 mm. According to Nasir (1947), the first instar larva of *C.*



scelestes when reared on pupae of *B. tabaci* measured on average of 2.29 mm in length, 0.47 mm in breadth and 0.340 mm in head-width. The second and third instar larvae were more or less similar to each other, except in size. The third instar larva (Fig. 3) was larger and stouter in body and appeared to be light yellowish to brownish in colour. Head was yellowish, with two prominent black lines. Mandible, palpi and antennae were translucent and red at tip. Eyes were dark brown to blackish. Thoracic segments were light brown with faint markings and black dots. Abdominal segments are with reddish black lines.

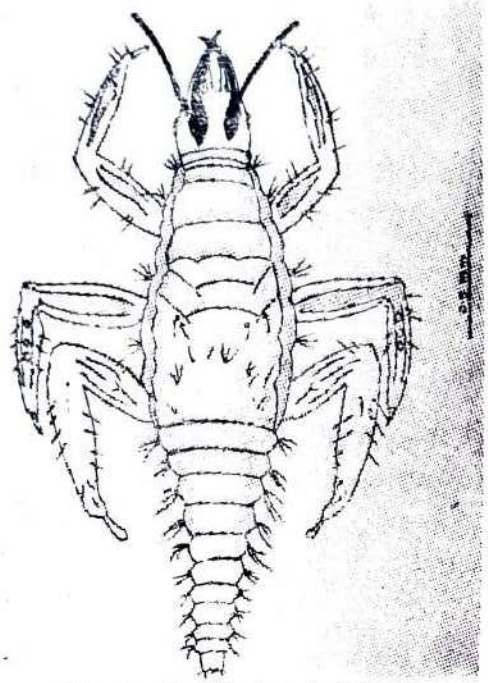


Fig. 2: Newly hatched larva.

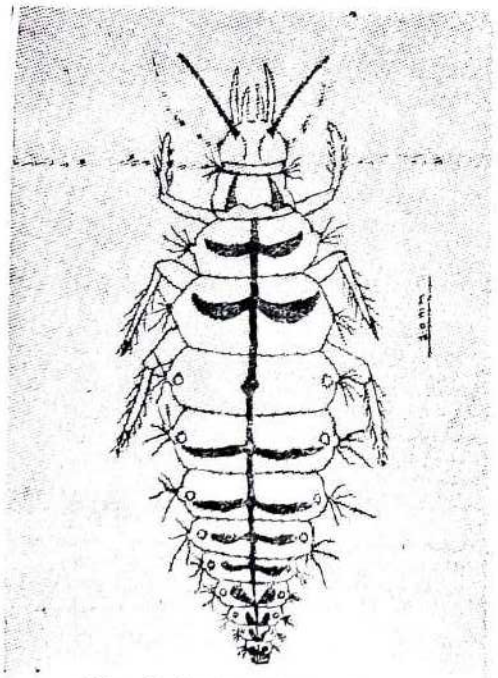


Fig. 3: Third instar larva.

The average length, breadth and head-width of second instar larvae were 4.880 mm, 1.020 mm and 0.558 mm, respectively, while the corresponding figures for the third instar larvae were 7.136 mm, 2.244 mm and 0.819 mm. The various measurements of larvae were more or less in accordance with the work reported by Nasir (1947). Slight variations in measurements may be attributed due to change in prey material used for larval diet.

Average duration of I, II and III larval instars were 2.26, 2.14 and 2.30 days, respectively. Krishnamoorthy and Nagarkatti (Personnal communication) also reported three larval instars with 3.0 to 3.5, 2.0 to 3.0 and 3.0 to 4.5 days of larval duration, respectively.

Pupa : Pupa of *C. scelestes* (Fig. 4) is spherical, purdy white covered with silken thread and become green in colour before adult emergence. The average pupal length and breadth were 3.400 mm and 2.581 mm, respectively which suggest that the pupal size was very small as compared to its adult. The average pupal duration recorded was 6.13 days.

Adult : Before adult emergence the green lace wing cuts a round hole in pupal case and it remained covered with a piece of cocoon lid, through which it comes out. The adult green lacewing (Fig. 5) was green in colour with a yellow dorsal median streak, having transparent

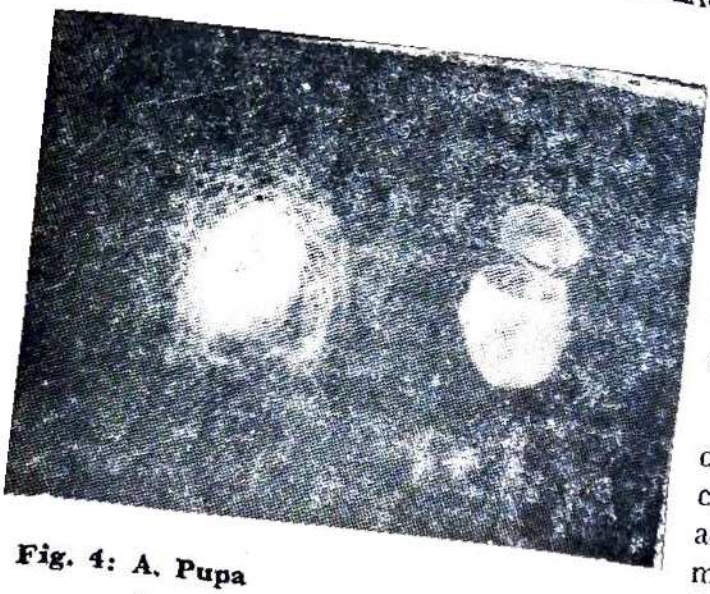


Fig. 4: A. Pupa
B. Pupa showing lid like cover.

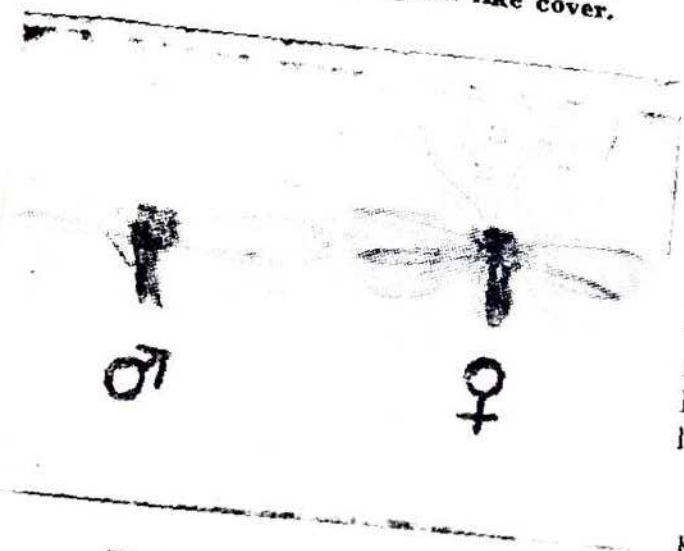


Fig. 5: Green lacewing adults

and abundantly veined wings. The antennae were delicate, filiform and longer than the body. Adults were negatively heliotropic and remain concealed in dark and humid place and becomes active just before sunset. The average length and breadth (with wings expanse) of male measured as 7.2 and 22.6 mm, respectively, while corresponding measurements or female were 8.0 mm and 24.9 mm.

The longevity of male and female es ranged from 3 to 43 and 4 to 56 days with an average of 15.20 and 23.42 days, respectively.

The entire life span (from egg laying to the death of adult) of *C. scelestes* completed within 17 to 73 days with an average of 35.44 days at an average temperature of 26.41° C and 83.05 per cent relative humidity.

Sex-ratio : The sex-ratio was worked out from laboratory reared as well as field collected adults separately. Out of 252 adults reared in laboratory, 121 were males and 131 females giving a male to female sex-ratio of 1: 1.08. Male to female sex-ratio from field collected 448 adults was worked out to be 1 : 1.89. Thus, it can be concluded that females of *C. scelestes* Banks out numbered their male counterpart.

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