NEUROPTERA INTERNATIONAL 7(1-2)- 1992. p.1.5.

MORPHOMETRIC STUDIES ON EGG BURSTERS OF SOME CHRYSOPIDAE

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Abstract

Egg bursters of 4 species of Chrysopids viz. *Chrysoperla carnea* (Stephens), *Mallada boninensis* (Okamoto), *Mallada astur* (Banks) and *Apertochrysa* sp. have been studied and compared using quantitative parameters. The results presented not only confirm earlier observations on the existence of intraspecific variations in the general shape of egg burster but also indicate that significant interspecific differences do exist. However, only a comprehensive study of egg bursters of Chrysopidae would indicate clearly its value in understanding relationships among taxa or its utility, at least as a supplementary character in identification of Chrysopids.

Descriptive Index: *Chrysoperla carnea* (Stephens), *Mallada boninensis* (Okamoto), *Mallada astur* (Banks) and *Apertochrysa* sp.

Contribution n° 60001 of Biological Control Centre, NCIPM, Bangalore- 560 024.

INTRODUCTION

The egg burster is a cuticular structure on the head of the embryo which assists in the emergence of the larva from egg. Normally the embryonic cuticle is shed before the larva emerges out of the egg and hence the egg burster is found within empty egg shells. Embryos of insects belonging to several Orders possess this structure which may consist of a single tooth or a sharp plate with several teeth. It has not been adequately studied for its taxonomic value, although it features as a supplementary key character for separating species of *Eurygaster* (Scutelleridae, Hemiptera) (Puchkova, 1959). Killington (1936) in his monograph of British Neuroptera observes that the form of egg burster differs in different families and to some extent from one genus to another, but its minute details, such as the number and shape of the serrations, are inconstant and subject to individual variations. The egg bursters of some Chrysopidae

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have been figured (Smith, 1922a & b; Toschi, 1965) but not critically studied. A study of the general structures of egg bursters of 6 species of Chrysopids led Krishnaswamy and Yaseen (1972) to conclude that a great deal of variation within each species existed and hence definite determination of the various species based on this character was not possible. However Gepp (1984) concedes that details of the sharp toothed blade of the egg burster might have some taxonomic value. Hence the egg bursters of 4 species of Chrysopids were studied, using 5 quantitative parameters and the results have been presented in this paper.

MATERIAL AND METHODS

Laboratory-hatched empty egg shells were left over-night in acid fuchsin and the egg burster dissected out in a drop of xylol. Permanent mounts of these were prepared for microscopic study. Figures were drawn using camera lucida. The following parameters of the egg bursters were measured, using a sheet of graph paper: the co-ordinate values of the mid-point on the curvature of the blade, on the opposite side of the serrated edge of the egg-burster; the length, width at base and mid-width of the blade. For observing the co-ordinate values, the extremity of the blade was fixed at a definite point on the graph sheet and the Y-axis was fixed through this point and the central point at mid-width. The X-axis was fixed at 4cms below the tip of the egg burster. On the figure of the egg burster the mid point was selected on the curvature and co-ordinate values noted. To check the reliability and to eliminate error due to subjective fixing of this point two sets of observations were made independently for the same figures and on statistical analysis these were found to be at par. Based on a few sample observations, the number of observations required to bring the error level within 10% of the mean was calculated for each species.

RESULTS

Typical examples of egg bursters of each species are figured (Plate 1). In fig.1, the positioning of the egg burster of *C. carnea* on graph sheet has been indicated and the various parameters studied have also been marked. In figs. 2 to 4, the mid point O is marked. The mean values for the parameters studied is presented in Table I. The values for all the parameters of the egg bursters of the four species were analysed with a "t" test and the results presented in Table 2. It clearly indicates that the X co-ordinate value was significantly varying among all the species while the values of Y co-ordinate did not vary significantly between any species. Except between ***M. boninensis*** and ***M. astur***, the values for the length of blade varied significantly. The width at the base of the blade varied between *M. boninensis* and *M. astur*, *M. boninensis* and *Apertochrysa* sp. and between *C. carnea* and *Apertochrysa* sp. and excepting between *M. astur* and *C. carnea*, the mid-width varied between any other 2 species. The values of the l/b varied significantly among all the species except between *M. astur* and *M. boninensis* and the values of l/mid-width varied among all the 4 species studied. To ascertain whether the extent of variability in the values of the various parameters of any species was due to observations on progeny of several females or was characteristic of the species itself, observations made on egg bursters obtained from eggs laid by several females of each species were statistically analysed. The parameters were found homogenous in the egg bursters obtained from different females of same species in all the 4 species studied. The observations not only confirm the existence of intraspecific variations reported earlier but also indicate that significant interspecific difference do exist.

No consistency in the number of serrations on the egg bursters could be found and the height and width of the upper branch from the blade also differed very greatly from specimen to specimen. However ultrastructures of the chorions are known to vary interspecifically (Gepp, 1984). Principi (1964) found that the eggs of *Italochrysa* have their ends strongly tapered, unlike those of other Chrysopids known. The manner in which eggs are laid, if documented, could also serve as a supplementary charcater, of use in taxonomy.

The results now reported indicate that egg bursters have potential utility in systematic studies of Chrysopids, a group wherein only recent investigations to include broader range of characters in systematics analysis are being made. However, a comprehensive study would be required to indicate its value in understanding relationships among taxa and to assess its utility, as a supplementary character in identification of empty field- collected eggs, as also indicated by Neuenschwander (1984).

ACKNOWLEDGEMENTS

The author is grateful to Ms. S.K. Rajeswari, for preparing the slides of egg bursters and also for making a set of observations for checking the reliability of the parameters measured. She is grateful to Dr S.J. Brooks, Natural History Museum, U.K., for his help with the identifications of the Chrysopid species and also for commenting on an earlier draft of this paper. Thanks are due to the Head, Biological Control Centre, for providing the facilities for conducting these studies.

Manuscript accepted: August 1992.

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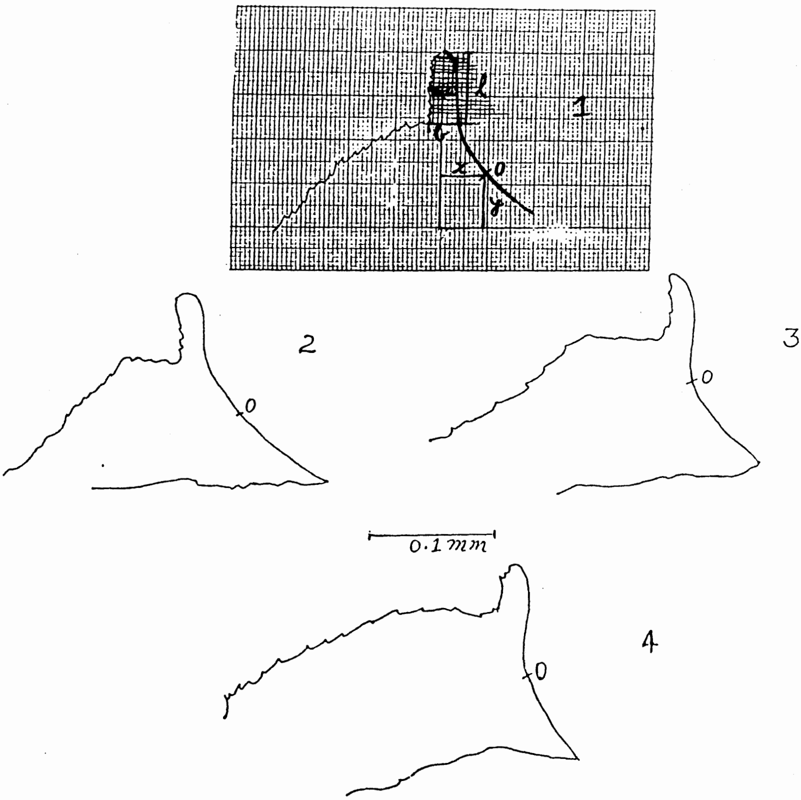

Figs. 1 to 4. Egg bursters of *Chrysoperla carnea* (Stephens), *Mallada boninensis* (Okamoto), *Mallada astur* (Banks) and *Apertochrysa* sp.

O- mid point on the curvature.

Table 1. Parameters of egg bursters in 4 species of Chrysopidae

Species	N	Coordinate value of mid point of curvature		Length of blade	Width of blade		l/b	l/mw
		X	Y	l	base b	mid-width mw		
Chrysoperla carnea	104	0.70 ± 0.23	1.42 ± 0.41	1.90 ± 0.25	0.90 ±0.23	0.56 ± 0.09	2.20 ± 0.48	3.45 ± 0.61
Mallada boninensis	94	0.61 ± 0.61	1.42 ± 0.35	1.60 ± 0.20	0.89 ± 0.18	0.61 ± 0.12	1.84 ± 0.36	2.69 ± 0.57
Mallada astur	70	0.28 ± 0.22	1.46 ± 0.35	1.65 ± 0.18	0.97 ± 0.24	0.57 ± 0.09	1.78 ± 0.39	2.97 ± 0.44
Apertochrysa sp.	52	0.47 ± 0.29	1.35 ± 0.39	1.51 ± 0.22	0.99 ± 0.18	0.69 ± 0.12	1.56 ± 0.34	2.24 ± 0.50

Table 2. t-values for comparison of egg-burster parameters of 4 species of Chyrsopidae

Species compared	df	Coordinate value of mid point of curvature		Length of blade	Width of blade		l/b	l/mw
		X	Y	l/	base b	mid-width mw		
C. carnea and *M. boninensis*	195	2.55**	0.00	9.22**	0.34	3.64**	5.84**	9.06
C. carnea and *M. astur*	171	11.96**	0.60	7.01**	1.78	0.49	6.06**	5.69
C. carnea and *Apertochrysa* sp.	153	5.30**	1.04	9.58**	2.38**	8.06**	8.51**	12.44
M. boninensis and *M. astur*	162	8.98**	0.66	1.81	2.27**	2.75**	1.05	3.40
M. boninensis and *Apertochrysa* sp.	144	3.10**	1.12	2.45**	3.11**	4.04**	4.56**	4.79
M. astur and *Apertochrysa* sp.	120	4.22**	1.60	3.96**	0.59	6.76**	3.22**	8.51

** Highly significant (P > 0.01)

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Reference Citation:
Narasimham, A. U. 1992 [1992.??.??]. Morphometric studies on egg bursters of some Chrysopidae. Neuroptera International 7:1-6.

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