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THE LIFE HISTORY OF *COSMOPEPLA BIMACULATA*
(THOMAS) (HETEROPTERA : PENTATOMIDAE) IN ALBERTA

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Quaestiones entomologicae
4 : 35-38 1968

The habits and food plant of Cosmopepla bimaculata (Thomas) are recorded. A study of the duration of the nymphal instars was made both under fluctuating and constant laboratory conditions. The external genitalia of the fifth nymphal instar are described.

Cosmopepla bimaculata (Thomas) is a small black and orange pentatomid commonly found on hedge nettle *Stachys palustris* L. in Alberta. It is not considered a serious pest of crops in this province. The species is widespread throughout North America and Mexico.

Habits and Food

The adults were observed feeding on *Stachys* in Edmonton towards the end of June and were freely copulating by the first week in July. Eggs were observed on 13 July and by 22 July first instar nymphs were abundant. The life cycle was completed by early August, but mating continued right through July and first instar nymphs were observed in August. It appears that this insect overwinters in the adult stage, but it is probable that a few overwinter as fourth or fifth instar nymphs.

Cosmopepla was observed and bred on *Stachys palustris* for this series of observations. Blatchley (1926) records many host plants for this species. The insect in all stages feeds on the seed of *Stachys* both unripe seed on the plant and mature seed on the ground. Very little sapsucking occurs and the adults and nymphs can be kept on seed and water alone.

Copulation

Copulation is the same as described for other pentatomids (Poisson 1951). The pair of bugs remain attached on the average one day (S. D. 0.37 days; n = 18).

Egg Laying

The first batch of eggs was laid on the undersurface of a leaf approximately twelve hours after copulation, second and third batches were laid almost immediately afterwards, but occasionally the female would hold her eggs for 24 hours or more between each laying. This is reflected in the wide variation in incubation time for the eggs.

Each female lays from 1-3 batches of eggs (mean 1.9, n = 8) containing 11.5 ± 1.0 eggs (n = 47).

Development and Life History

Eight egg masses were reared through to the adult stage in a laboratory where the temperature was recorded. The average of the maximum and minimum temperatures for the period of development was 23.5 C.

Another series of eight egg masses was transferred on hatching to a growth chamber and reared at a constant temperature and light regime (23 C, day length 14 hours). The intensity of illumination was 2400 foot candles at 30 cm from the light bank. The duration of each instar was recorded when 50% of individuals in each hatch had moulted to the next instar. The two sets of results are given in table 1. Although the mean development times were less for the first three instars at fluctuating temperatures, and for the last two at a constant temperature, the differences in the results are not significant at the 5% level.

Eggs

The eggs (fig. 1) are oval, 0.75 mm long (± 0.04 ; $n = 30$) and 0.60 mm in diameter (± 0.04 ; $n = 30$) and when laid are pale green. The upper margin of the egg bears 15-23 chorionic processes (mean 18.9 ± 2.0 ; $n = 100$) at regular intervals in a circle (fig. 4).

Incubation Period and Hatching

The eggs take from 3-6 days to hatch after laying (mean 4.7 ± 1.0 day; $n = 23$). The shorter incubation period was due in all cases to the fact that these females retained the fertilized eggs for a longer period before laying them. The vertex of the embryonic head bears an elongate triangular sclerotized egg burster (figs. 3 and 4).

Postembryonic Development

The nymphal instars have been figured and described by DeCoursey and Esselbaugh (1962). The colour of first instar nymphs on hatching is pale yellow-green, the eyes are bright red. This instar is gregarious, clustering around the eggs after hatching. At 23 C the duration of each instar was: 1st 3.2 days, 2nd 4.7 days, 3rd 4.2 days, 4th 2.9 days and the 5th 6.4 days (table 1).

The external female genitalia can readily be distinguished in the 5th instar. Abdominal sternum VIII has a median longitudinal suture (fig. 6) and, apically, two small sclerites, the first gonapophyses (fig. 5, 1 Gp.), one on either side of the suture forming a V.

Abdominal sternum IX has, basally and medianly, a pair of small triangular sclerites; these are probably rudiments of the second gonapophyses (fig. 5, 2 Gp.).

Parasites

Some egg masses collected in the field were found to be parasitised by a small wasp *Telenomus* sp. (Scelionidae).

ACKNOWLEDGEMENTS

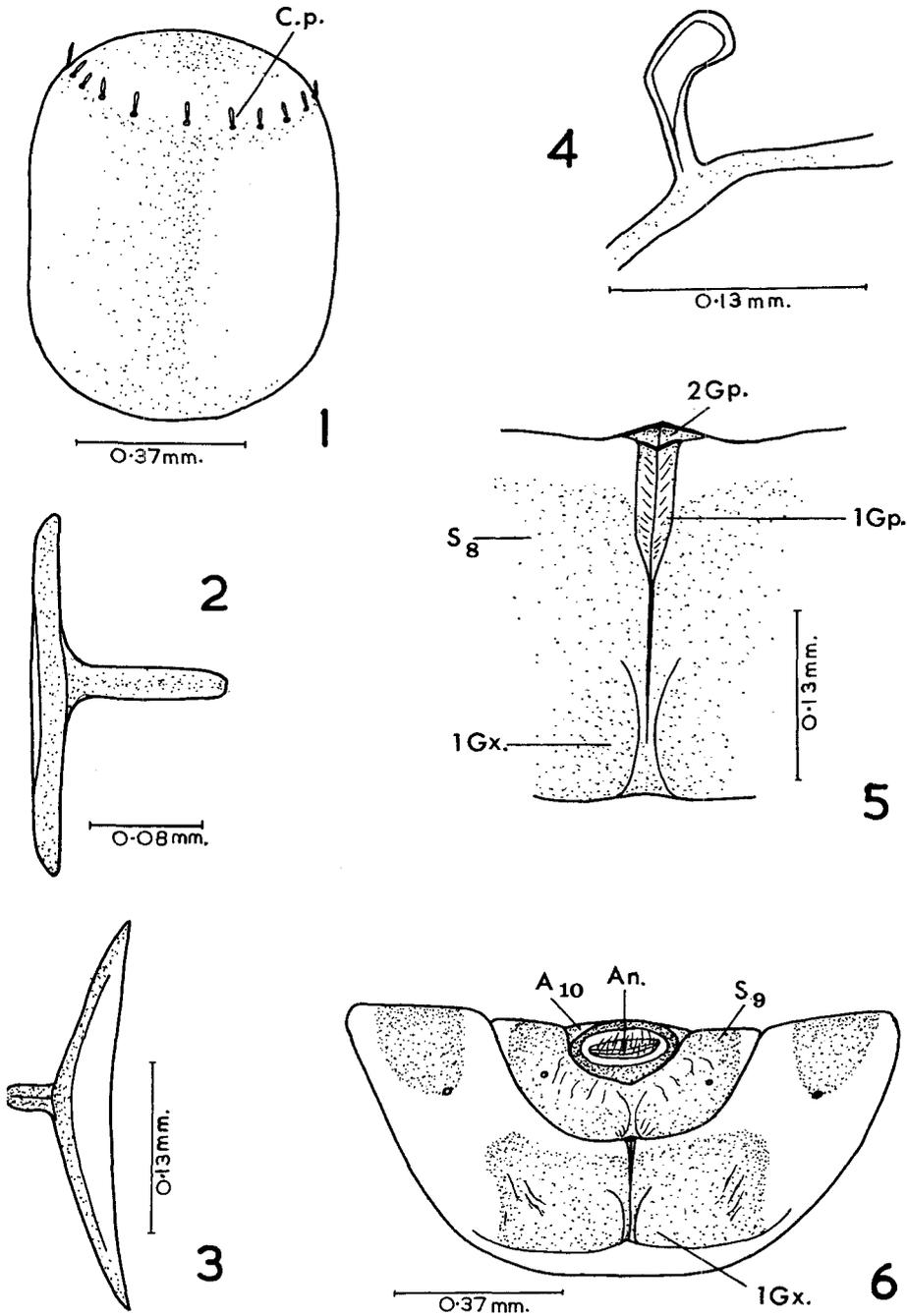
I should like to thank Dr. O. Peck of the Entomology Research Institute, Ottawa, for identifying the hymenopterous parasite of the eggs, and Dr. Brian Hocking and Dr. W.G. Evans, Entomology Department, University of Alberta, for reading and editing this manuscript.

TABLE 1. Developmental periods for all instars of *Cosmopepla bimaculata* at constant and fluctuating temperatures.

At 23 C and 14 hours daylight -						
Instar	I	II	III	IV	V	Total I - V
Range (days)	2 - 4	3 - 7	2 - 6	2 - 4	6 - 8	19 - 24
Mean (days)	3.2 ± 0.7 (8)	4.7 ± 1.2 (8)	4.2 ± 1.3 (8)	2.9 ± 0.8 (8)	6.4 ± 0.7 (8)	21.4 ± 1.5 (8)
At fluctuating temperatures (mean over 27 days, 23.5 C) -						
Range (days)	2 - 3	4 - 5	2 - 5	3 - 5	6 - 12	20 - 27
Mean (days)	2.5 ± 0.5 (8)	4.2 ± 0.5 (8)	3.7 ± 1.3 (8)	3.7 ± 1.0 (8)	8.4 ± 2.0 (8)	22.6 ± 2.2 (8)

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Cosmopepla bimaculata. Fig. 1. Egg. Fig. 2. Egg burster, lateral view. Fig. 3. Egg burster, dorsal view. Fig. 4. Longitudinal section through chorionic process. Fig. 5. Instar V; external female genitalia. Fig. 6. Instar V; abdominal sterna 8-10. A₁₀, abdominal segment 10; An., anus; C. p., chorionic process; 1 Gp., first gonopophysis; 2 Gp., second gonopophysis; 1 Gx., first gonocoxa; S₈, abdominal sternum 8; S₉, abdominal sternum 9.