

Development of the Leaf-Footed Bug, *Anoplocnemis dallasi* (Hemiptera: Coreidae)

Park, Sang Ock

Department of Biology, Catholic University of Taegu-Hyosung

장수허리노린재(*Anoplocnemis dallasi*)의 발육

朴 商 玉

대구효성가톨릭대학교 자연과학대학 생물학과

ABSTRACT

Anoplocnemis dallasi Kiritchencho is a sap-sucker which feeds on tips of *Amorpha fruticosa* Linne in Korea. *A. dallasi* had one generation a year and overwintered as the young adult stage. Most overwintered survivors emerged in early-mid May to late May. Known host plants were reviewed, and new host records were added. Females mainly laid eggs in linear single chain masses on leaves of *Miscanthus sinensis* var. *purpurascens*. Nymphs (except the non-feeding first instars) fed on young shoots. First instar nymphs clustered on leaves or shoots where they hatched, and, if disturbed, reformed aggregations soon. The second to the fifth instar nymphs migrate to the upper part of the shoot and congregate on a partly expanded leaf. New adults firstly appeared in late August, remained on *A. fruticosa*, host plant, and fed on until mid October. The duration and survivorship curve, in laboratory rearing, of the egg and each nymphal stadium was determined.

Key words: *Anoplocnemis dallasi*, Coreinae, Development, Hemiptera, Host plants, Survivorship curve

INTRODUCTION

Anoplocnemis dallasi Kiritchencho is a plant-juice sucker as a primary consumer and a medium to large sized bug of the sub-family Coreinae, about 22.01 ± 0.88 mm (mean \pm sd) in length (Park and Lee 1971).

Until recently, Lee (1971), Tanaka (1938, 1939) and some entomologists reported studies on the morphological and taxonomical descriptions, and Park and Lee (1971) reported an analytical study on the growth of *A. dallasi* from Korea. However, they did not study the development and bionomics of *A. dallasi*.

This study examines the unknown host plants, seasonal history, habits and duration of

nymphal stadia of *A. dallasi* based on field observations and laboratory rearing.

MATERIALS AND METHODS

Populations of *A. dallasi* were monitored at irregular intervals from April to November 1991 and 1992 in the vicinity of Taegu, South Korea. Each time host plants were examined, and the presence of adults and eggs was noted. Any nymphs observed were collected and transported to the laboratory. And then they were assigned to proper nymphal stadium.

Adult *A. dallasi* collected from the suburbs of Taegu, South Korea from 20 May to 10 September were reared on *A. fruticosa* in a rearing pot in a ventilated laboratory. Bug colonies were maintained in laboratory at 25 ~ 30°C, a photoperiod of \approx 14:10 (L:D) h, and \approx 65% RH. Newly collected overwintered adults were permitted to lay eggs for 3 month and then removed. The eggs were checked for eclosion twice a day at 0900 and 2100 hours. Newly hatched first instars were placed individually on fresh host plant in rearing pot. During nymphal development, the host plant was checked twice a day for exuviae to determine when ecdysis occurred, and to remove dead nymphs. If molting or hatching was anticipated, an additional observation was made in the late evening. Data on duration of nymphal stadia were based mainly on the laboratory rearing of *A. dallasi* nymphs that originated from 9 egg masses deposited in laboratory. Numbers of eggs used in rearing, and of nymphs are listed in Table 1.

Table 1. Percentage survival for the immature stages of *A. dallasi* in laboratory^a

No. of eggs	Instar					Adult
	1	2	3	4	5	
118	76.27	57.62	0.03	0.02	0.01	0.01

^a The percentages are those entering each stage.

RESULTS

A. dallasi has one generation a year and overwinters in the young adult stage. It leads an active life from early May to late September. Accurate overwintering sites were not found. However, overwintered adult *A. dallasi* was collected on 20 May for laboratory rearings. These bugs appeared in early-mid May to late May.

The first egg masses were observed on 31 May in laboratory. Eggs were deposited end-to-end in linear single chain-like masses along the mid rib on the upper surface of a fully hardened dry leaf near the base of *Miscanthus sinensis* var. *purpurascens* around host plants in the field, there being up to 23 in a batch (Fig. 1).

However, in laboratory rearing, eggs are laid in a continuous single and occasionally double chains along the mid rib of leaf, stem and steel wire surface (Fig. 1). *A. dallasi* fe-

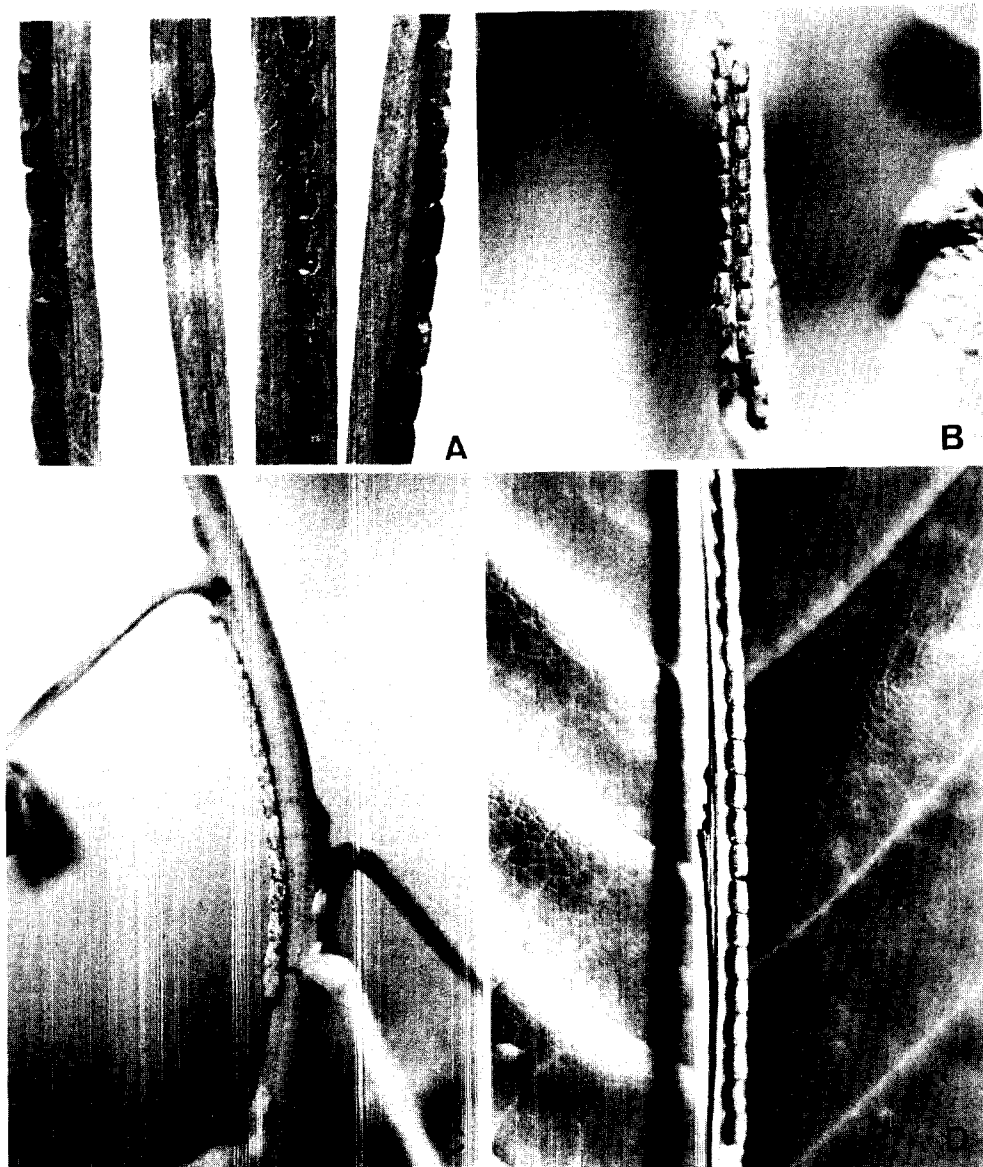


Fig. 1. *A. dallasi* egg chains. A: on upper hardened leaf surfaces of *M. sinensis* var. *purpurascens* in natural state, B: on *A. fruticosa* shoot (double chains), C: on *A. fruticosa* shoot (single chain), D: on mid rib on the upper surface of *A. fruticosa*.

male may also lay eggs one by one separately on lid gauze. Lee (1971) reported a colour photograph of eggs, without any descriptions in the text, collected by the present author in pictorial record of an encyclopedia. Herein, the present author reports again as the black and white picture and authenticates the plant oviposited in a hardened leaves of *M. sinensis* var. *purpurascens*, as egg laying host (Fig. 1A).

In laboratory rearing, the rate of oviposition was determined, a egg clutch size of 13.1 ± 0.5 (mean \pm SE) in 9 clutches. And the female can produce at least 83 eggs in 5 batches during her life and they lay eggs one time a day. Numbers of eggs deposited a time varies from 5 to 23. Eggs did not hatch in the order of oviposition.

The eggs were more or less rectangular. Nymphs first appeared on 20 June. They hatched 13 to 21 days later, and first instar nymphs clustered near their egg shells without feeding for ca. 5 days, and then moulted to the second instar (Fig. 2). When disturbed, they dispersed, and then reagggregated a little later.

Second instar nymphs appeared as early as 26 June in laboratory. The second to the fifth instar nymphs migrate to the upper part of the host shoots and congregate on a partly expanded leaf.

A. fruticosa is well known as host plant of *A. dallasi* (Lee 1971), and *Amphicarphaea edgeworthii* var. *japonica* and *Glycine max* were also observed as its hosts for the first time. Of these three host plants, *A. dallasi* strongly preferred *A. fruticosa*. But *A. dallasi* did not lay eggs on these three host plants in the field. Most nymphs (except the non-feeding first instar) fed on young shoots of the above hosts (Fig. 3). Lee (1971) reported *Lespedeza tomentosa* as a host for *A. dallasi*, but, it was not observed in this study.

Initially, most nymphs died after their first molt. Only two adults from 118 eggs were obtained by laboratory rearing. The rates of egg hatch and adult emergence were 76 and 0.01%, respectively (Table 1). The survivorship curve of *A. dallasi* was concave. The regression equation describing the relationship between survivals and developmental stages was given in Fig. 4.

The duration in days from egg to adult of *A. dallasi* was total 93.44 days (Table 2). Significant differences were detected in the developmental times between instars ($P < 0.05$).

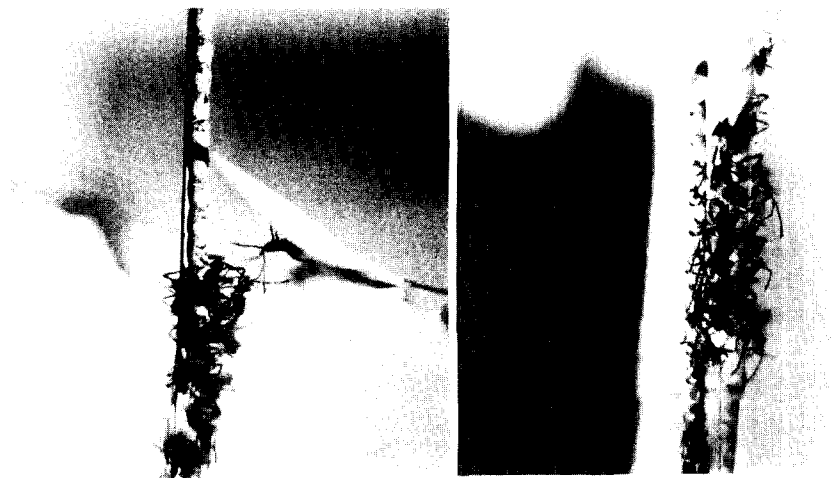


Fig. 2. Nymphal aggregation of *A. dallasi*.

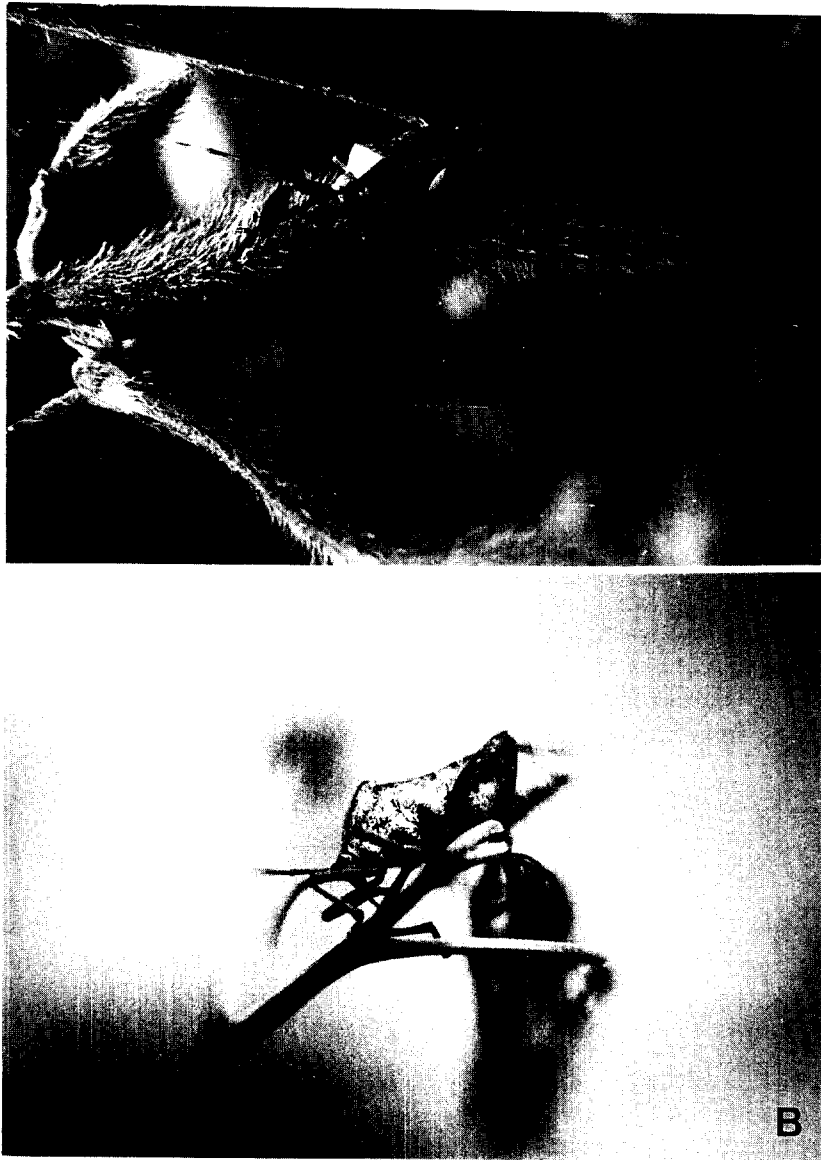


Fig. 3. Pitting by *A. dallasi*. A: the fifth instar nymph on soybean pod, B: adult on young shoot of *A. fruticosa*.

DISCUSSION

The adults of *A. dallasi* can be found feeding near the young shoots (whose soft tissues

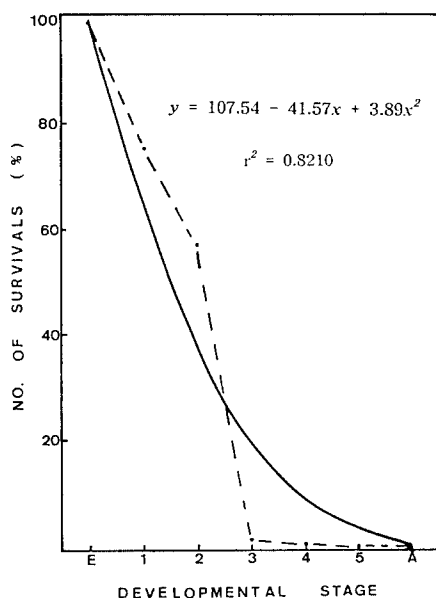


Fig. 4. Survivorship curve of *A. dallasi* for immature stages. Regression curve is as follows: $y = 107.54 - 41.57x + 3.89x^2$ ($r^2 = 0.8210$).
 — : Expected data,
 - - - : Original data.

dallasi produced less eggs and clutches than in *L. fulvicornis*.

Wheeler and Miller (1990) also reported laying manner of double chains on three occasions in *L. fulvicornis*. *A. dallasi* also laid eggs end-to-end in double chain.

Schaefer and Mitchell (1983) tabulated for coreoid families and feeding preferences. Chatterjee (1936), Golding (1927), Singh *et al.* (1978) and Villiers (1952) reported leguminous plant as hosts for *Anoplocnemis* spp. In this study, two leguminous plants served as hosts for *A. dallasi*.

Wheeler and Miller (1990) reported that *L. fulvicornis* was difficult to rear in the laboratory, regardless of whether nymphs were maintained separately or in groups, and that

are suitable for food) of host plants (Fig. 3), and remain in this situation for a week or more, before copulation occurs. It took about four hours and more at least in mating, but in all cases studied, the pair were no longer present on the shoot the day after mating had been observed. No more than one pair have been found on a shoot tip, though sometimes two of one sex and one of the other were present.

Hoffman (1975) reported the collection of an overwintering adult *Leptoglossus fulvicornis* from an emergence trap placed in a deciduous woodland habitat in South Carolina, U.S.A. However, overwintering sites of *A. dallasi* was not found in this study.

Wheeler and Miller (1990) reported a mean egg clutch size of 20.3 ± 2.0 (Mean \pm SE; $n=21$), and Mitchell and Mitchell (1983) reported average of 29.6 eggs in 44 clutches in *L. fulvicornis*. However, *A.*

Table 2. Mean development time in days of the immature stages of *A. dallasi*^a

	Egg	Instar					Total
		1	2	3	4	5	
Mean	18.21A	4.63	20.53B	10.27	20.47AB	19.33AB	93.44
SD ^b	2.09	0.54	3.94	2.23	0.45	0.01	9.26

Means in a row followed by the same capital letters are not significantly different ($P=0.05$, t-test).

^a immature stages : $F=518.83$, F (df=5, 163)=4.42, $P<0.001$.

^b Standard deviation

only two adults were obtained by rearing nymphs individually. In *A. dallasi*, only two adults from 118 eggs were obtained by rearing nymphs individually.

ACKNOWLEDGEMENTS

This research was supported by a grant from the Catholic University of Taegu-Hyosung. I thank Dr. Woen Kim, Professor of the Department of Biology, College of Natural Sciences, Kyungpook National University, for identifying host plant species. Thanks are also due to Miss Do, Seon Hee, Assistant of the Laboratory of Ecology, Catholic University of Taegu-Hyosung for assistance.

적 요

장수허리노린재 (*Anoplocnemis dallasi*)는 한국에서 주로 족제비싸리 (*Amorpha fruticosa*)의 신초의 즙액을 흡입하는 1차소비자의 생태적 지위를 가진 곤충이다. 장수허리노린재는 년 1세대를 경과하며, 성충으로서 월동하고, 월동한 성충은 5월 초·중순에서 5월 말까지 출현한다. 지금까지 알려진 기주식물을 재검토하고, 새로운 기주식물을 추가 기록하였다. 암컷은 주로 억새 (*Miscanthus sinensis* var. *purpurascens*)의 마른 잎에 일직선상으로 연결하여 산란한다. 즙액을 섭취하지 않는 1령을 제외한 모든 유충은 신초를 가해한다. 1령유충은 산란된 잎의 난각 주위에서 집합하여 지내며, 교란시 흩어졌다가 곧 재 집결한다. 새로운 성충은 8월 말에 처음으로 나타나며, 10월 중순까지 섭식한다. 실험실 사육을 근거로 한 알과 각 유충의 발육기간과 생존곡선이 제시되었다.

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(Received 19 October, 1996)