Seasonal Distribution in Alfalfa of the Convergent Lady Beetle, *Hippodamia convergens* Güer.

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The convergent lady beetle, *Hippodamia convergens* Güer., is one of the most important predators of aphids, having been recorded as feeding on 26 species (Palmer, 1914). It is one of the principal natural controls for the greenbug, *Toxoptera graminum* Rond., as reported by Fenton (1942) and Fenton and Fisher (1940). There is considerable information available on its bionomics which has been brought together by Balduf (1935). Fenton and Dahms (1951) noted that temperature had a very important effect on the number of greenbugs eaten by *H. convergens* and that the adults ate more than the larvae. This is in agreement with work done by one of the writer's students who conducted feeding tests with the spotted alfalfa aphid, *Therioaphis maculata* Buckton. Observations made in Payne County by Fisher (1939) showed that larvae, pupae and adults were present in wheat fields infested with greenbugs, from March 31 to May 8. In a three-year study by Fenton (1942), the convergent lady beetle was observed to reduce greenbug population during two of these years, although not enough to control it.

The recent appearance of the spotted alfalfa aphid in Oklahoma alfalfa fields increases the importance of obtaining all the information possible on biological control of this insect. Since the convergent lady beetle is one of the chief biotic agents of control of this pest, it is of vital interest to learn everything possible about the biology and ecology of the lady beetle under Oklahoma conditions.

This paper reports information on the occurrence of the lady beetle in alfalfa in Payne County for a three-year period, 1954 to 1956 inclusive. The data were obtained by using a sweep net having a 13-inch diameter opening and a 19-inch handle. Very few small *H. convergens* larvae or pupae were collected, the latter being more or less firmly attached to the plants. It was also noted that early in the season while the plants were small, the beetles tended to run about over the surface of the ground and it is believed that at this time a smaller proportion was caught is the net than later when there was more plant growth. Despite the experimental error inherent in collecting insects with a sweep net to estimate populations, it is believed that the data are of value in comparing dates of collection and are quite accurate for comparison of years.

The data are shown in tables I to III. In 1954, collections were made on 30 dates from February 26 to December 15. There were three species of aphids present, namely, the pea aphid, *Macrosiphum pisi* Kalt., and the spotted alfalfa aphid, *Therioaphis maculata* Buckton, on alfalfa and the rusty plum aphid, *Hysteroneura setariae* (Thomas) on shepherd's purse, a weed growing profusely in the young alfalfa. The first and last named were most abundant during the early part of the season from March 26 to April 24. A small infestation of the pea aphid developed in early June. The spotted alfalfa aphid appeared in the collections made October 6. The convergent lady beetle was most abundant in the collections made April 16 and 24. Very few showed up in the collections made in June and none thereafter until a larva was picked up December 15. The absence of the lady beetle from the collections made after July 12 coincided with a severe drouth and the dry alfalfa stubble interspersed with sparse, stunted new growth which did not support an aphid infestation.

In 1955 (Table II) the spotted alfalfa aphid was by far more numer-

Table I. Comparative Populations of *Hippodamia convergens* Gûer. and Aphids in Alfalfa Fields, Payne County, Oklahoma 1954.

Date	Number of insects per 100 sweeps				Temp.** °F.	Wind m.p.h.
	H. convergens Adults	*H. convergens* Larvae	*Macrosiphum pisi*	Other aphid species		
Feb. 26	1	0	3		61	4.5
Mar. 8	0	0	5		75	7
Mar. 12	0	0	11		62	10
Mar. 22	0	1	65	51*	65	6
Mar. 26	0	1	220	Not counted	54	4
Apr. 9	8	65	2,325	9,300*	88	10
Apr. 16	7	31	23,836	41,104*	65	9
Apr. 24	906	238	8,296	Not counted	54	5
Apr. 28	60	51	41	Not counted	—	—
May 5	17	1	5		68.5	Calm
May 14	52	0	15		78	Calm
May 22	10	0	10		82	Calm
May 28	7	0	35		69	7
June 4	6	1	340		77	Calm
June 9	1	13	241		81	4
June 14	7	3	6		84	3.5
June 21	5	10	52		85	2.5
June 29	2	0	0		81.5	Calm
July 12	0	0	0		89	Calm
July 26	0	0	0		90	5
Aug. 2	0	0	0		98	5
Aug. 10	0	0	0		87	Calm
Aug. 18	0	0	0		88	10
Aug. 28	0	0	0		93	4
Sept. 15	0	0	0		97	1
Sept. 27	0	0	0		91	10
Oct. 6	0	0	0	32+	86	5
Oct. 18	2	0	0	155+	85	2
Nov. 8	0	0	0	310+	75	2
Dec. 15	0	1	1	1,955+	54	7

* *Hysteroneura setariae* (Thos.)

** Temperature taken as shade-air reading at 5-foot level

\+ *Therioaphis maculata* (Buck.)

Table II. Comparative Populations of *Hippodamia convergens* Güer. and Aphids in Two Alfalfa Fields, Payne County, Oklahoma 1955.

Date	Number of insects per 100 sweeps								Temp.* °F.	Wind m.p.h.
	Hippodamia convergens				*Macrosiphum pisi*		*Therioaphis maculata*			
	Field #1		Field #2							
	Adults	Larvae	Adults	Larvae	Field #1	Field #2	Field #1	Field #2		
Mar. 29	3	5	9	2	0	0	156	2407	68-70	5-12
Apr. 7	2	3	10	1	0	0	4418	6599	69-78	3-4.5
Apr. 14	—	—	3	13	—	0	—	6108	66	5
Apr. 19	—	—	4	4	—	17	—	1943	72	5
Apr. 20	31	156	—	—	0	—	13272	—	73	4
May 3	—	—	4.4	45	—	13	—	15787	79	3
May 10	—	—	153	16	—	17	—	85	83.5	Calm
May 17	—	—	39	1	—	4	—	36	95	5
May 24	—	—	26	1	—	14	—	5	79	Calm
May 31	—	—	12	2	—	19	—	9	84	4
June 15	7	8	—	—	60	—	295	—	90	7
June 27	29	2			558	—	858	—	83	5
June 28	—	—	17	1	—	126	—	308	88.5	2
July 6	—	—	21	31	—	56	—	1937	87	Calm
July 8	—	—	13	7	—	18	—	682	88	Calm
July 13	143	60	—	—	0	—	2229	—	91	4.5
July 15	15	39	—	—	—	0	—	642	92	Calm
July 27	105	10	—	—	0	—	683	—	86	Calm
Aug. 24	32	1	—	—	0	—	379	—	84	5
Sept. 7	12	0	—	—	0	—	215	—	77	5
Sept. 21	2	0	—	—	0	—	473	—	95	4.5
Oct. 10	2	2	—	—	0	—	94	—	75.5	5

*Temperature taken at ground level in shade of plants.

Table III.—Comparative Populations of *Hippodamia convergens* Güer. and Aphids in Alfalfa Fields, Payne County, Oklahoma, 1956.

Dates	Number Per 100 Sweeps				Temp. °F.**	Wind m.p.h.
	H. convergens Adults	Larvae	Macrosiphum pisi	Therioaphis maculata		
Apr. 5	6	28	12	35,558	70	2
Apr. 12	18	40	2	61,886	76	5
Apr. 19	92	56	0	26,978	82	Calm
Apr. 26	939	336	0	11,857	96	8
May 3	714	15	0	299	96	3
May 8	203.5	1	Not counted	Not counted	86.5	2½
May 15	36.5	0	0	10.5	73	8
May 17	11	0	0	22	93	Calm
May 22	11	58.7	0.5	14	89	4
May 30	1	0	4	22.5	88	3
June 6	7	8.5	12	88.5	79.5	2½
June 12	37.5	6.6	100.7	5,207	94	1½
June 19	7	3.5	0	33.5	101	Calm
June 27	3	2	0.5	27	92.5	?
July 3	0	0	0	105.5	90	5
July 10	2.5	0	0	73.5	81	Calm
July 17	0	0	0	149	92	Calm
July 24	6	0	0	172	86	Calm
July 31	1	0	0	26	101	2
Aug. 2	2*	0	—	—	100	4½
Aug. 17	0	0	0	0	95	23
Aug. 24	0	0	0	40	96	3
Aug. 31	10	0	0	35	85	9

* In irrigated alfalfa—not comparable.

** Temperature taken at ground level in shade of plants.

ous than the pea aphid in the two fields under observation. As a result of more plant growth and accompanying aphid infestation throughout the season, the convergent lady beetle was present in the 22 collections made from March 29 to October 10. The occurrence of larvae of the beetle in most of these collections indicated the degree of breeding throughout the season.

In 1956 there were 23 collections made from April 5 to August 31 (Table III). Great numbers of the spotted alfalfa aphid were collected April 5 through April 26. From then on they were always present, but in much smaller numbers. The pea aphid, on the other hand, was far less abundant. The beetle was also more numerous than during the other two years and its larvae were collected up to and including the collection made June 19.

Discussion and Summary

The convergent lady beetle, *Hippodamia convergens* Güer., was found present in the alfalfa fields throughout the growing season when conditions were favorable, *e.g.,* plenty of plant growth supporting aphid populations. The numbers collected varied greatly between dates and years. These differences were due in part to the comparative sizes of the aphid populations which in turn were greatly influenced by plant conditions, weather and the pressure of predation caused chiefly by the beetle itself. The pattern each year was for the over-wintered beetles to migrate into the alfalfa fields, mate and lay eggs. Due to low temperature which favored the aphids, the overwintered beetles and their larvae were unable at first to check the tremendous aphid population increase. However, with warmer weather and the emergence of great numbers of first generation beetles, populations of the aphids were quickly brought under control. Following this, the beetle population declined, owing to migration out of the field. When and if there was a later aphid population increase, migration of beetles into the field soon stabilized the situation.

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