and first abdominal segments. There are 12 sclerotized bands, or dorso-pleural plates, extending almost entirely around the body, as is usual with this type of larva. Setae are found in the following places. One pair dorsally on the first thoracic segment near the posterior border and one pair ventrally also posteriorly; one pair dorsolaterally on the anterior edge of the second thoracic segment and one pair dorsally on the posterior edge; one pair dorsally on the third thoracic segment and one pair ventrally, both near the posterior border; one pair ventrolaterally on each of the second and third abdominal segments near the posterior border; a pair of long caudal cerci apparently attached to the fleshy portion of the ninth abdominal segment, since no circular base can be discerned on the sclerotized part of this segment, whereas in the other cases the circular bases are quite distinct. The second thoracic segment is the longest medially, the thoracic plates terminating ventrally in a simple manner, the first to fourth abdominal segments each have a distinct tooth on each side posteriorly in a ventro-lateral position, and the inner angle of the posterior edge of the segments is somewhat pointed; the fifth abdominal segment bears two large teeth at its posterior-ventral margin; the sixth, somewhat wider than the preceding segments, is drawn out posteriorly in a long tooth that is obtuse before the apex but has a sharp-pointed apex; the seventh and eighth are slightly drawn out to a point posteriorly, otherwise simple; the ninth seems to be a simple plate without teeth.

NOTES ON THE SEASONAL HISTORY OF THE RABBIT TICK, HAEMAPHYSALIS LEPORIS-PALUSTRIS, IN OKLAHOMA.[1]

By Gaines W. Eddy.[2]

ECONOMIC IMPORTANCE.

Although the rabbit tick has been known for over seventy years, its importance in the dissemination and transmission of diseases has only recently come to light. It was shown to transmit spotted fever by Parker (1923) and was incriminated as a carrier of tularaemia by Parker, Spencer and Francis (1924). This tick is also a proved vector of tularaemia in British Columbia, according to Moilliet (1936), and was shown to carry that disease in Alaska by Philip and Parker (1938).

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[1] A contribution from the Oklahoma Agricultural and Mechanical College Department of Entomology, Stillwater.

[2] Now with the U. S. Department of Agriculture, Bureau of Entomology and Plant Quarantine.

The rabbit tick likely plays an important role in the maintenance of both tularaemia and spotted fever in nature. It also meets in common with the American dog tick, *Dermacentor variabilis*, on cottontail rabbits. The importance of rabbits as hosts for the American dog tick will be brought out in a subsequent paper.

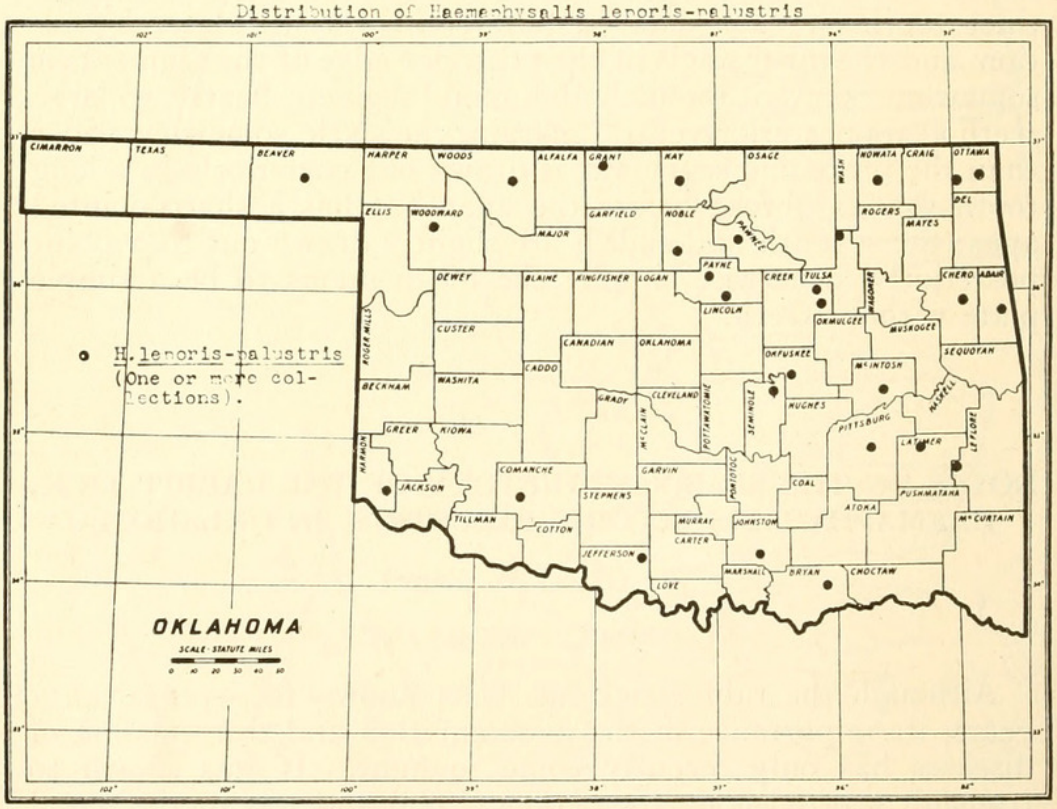
DISTRIBUTION.

The rabbit tick is known to occur in southern Alaska, Canada, throughout the United States and in Central and South America.

In Oklahoma, it probably occurs in every county but has been collected in only twenty-five of the seventy-seven counties as indicated on the accompanying map.

The tick is more prevalent in the wooded eastern half of the State. Numerous animals have been examined in the western part of the State but only a few specimens have been collected.

Distribution of Haemaphysalis leporis-palustris



HOSTS.

Rabbits and hares are the principal hosts for this tick. Birds, however, play an important role as hosts for the immature forms. Peters (1936) lists forty-six species of birds that have been attacked by the rabbit tick. In only a few instances have the adult stages been known to attack birds.

Some of the more uncommon hosts, as listed by various

authors, are the horse, dasyure, cat, pine squirrel and man. According to Hearle (1938), chipmunks and ground hogs are commonly attacked in British Columbia.

In Oklahoma, the writer has collected larvae from the thirteen-striped ground squirrel (*Citellus tridecemlineatus bodius*); nymphs from the striped skunk (*Mephitis mesomelas varians*); nymphs from the fox squirrel (*Sciurus niger rufiventer*); larvae from the woodrat (*Neotoma floridana attwateri*); and larvae from the house cat. Many specimens have been taken from birds, including the eastern crow and domestic chicken. Field mice appear to be of little importance as hosts. At the time of this paper, a large number of mice (mostly *Peromyscus* spp.) have been examined in Iowa, but no rabbit ticks have been found. Rabbits and birds collected in the same locality have yielded many specimens.

SEASONAL HISTORY.

The rabbits killed, in obtaining information on the seasonal history, were taken in Payne county. Periodical collections were made from January 1, 1939, to January 1, 1940. Each month at least five and no more than thirty-two rabbits were collected, totalling 197. An attempt was made to examine a few animals each week, though in a number of instances this was impossible. For instance, more rabbits should have been examined during February and March than were in this case. Some of the animals taken in January were live-trapped. All the rest were shot, bagged in the field and taken to the laboratory for examination. Usually the animals were allowed to remain in the bags for a few hours before removal of the ticks, since a large per cent will detach after the animals become cold. However, females have been found attached after twenty-four hour periods.

The rabbit population on all areas where collecting was done, varied from one-tenth to five per acre.

It has been known for some time that the rabbit tick is active during the warmer seasons of the year. Hooker, Bishopp and Wood (1912) state that the three active stages of the tick may be collected during all seasons of the year. According to Cooley (1932), it is not a winter feeding species in Montana, probably hibernating between active seasons. He also states that no records of adults have been taken in March, which would appear necessary unless the larvae hibernate over winter. Green, Bell and Evans (1938) report the rabbit tick emerges from hibernation in Minnesota during the first part of April. The latter author (1940) states that the tick may be found during midwinter, but this is an unusual occurrence. Hixon

(1940) says all stages may be collected during the winter months in Florida, but there is a marked decrease in numbers.

In Oklahoma, both the larvae and nymphs were active during all months of the year. No males were collected in December and no females were taken in November or December.

The larvae showed a great increase in June, July and August, with the peak in July. They were fairly steady in September, October and November but showed a marked decrease in December. Even though the temperature went below freezing in January, both flat and replete specimens were taken. In fact, about sixty per cent of the larvae were replete. The larvae, as with the other stages, showed an increase in March. The sudden increase in June was no doubt due, in part, to the first ovipositing females.

No engorged nymphs were collected until the first part of March. They showed a steady increase until their peak in June. A fairly large number was present until December, at which time there was a marked decrease.

Thirty-one rabbits were examined during January and February and seven females were removed. All the specimens were flat. It was not until March 17 that an engorging female was found. They appeared in much greater numbers during June but decreased in a similar manner following that month. This increase was probably was due in part to molting nymphs. Few specimens were taken in October and none were removed from the thirty-six rabbits examined in November and December.

The seasonal fluctuations of the males were similar to those of the females. The males appeared in greater numbers in April, May and June but became gradually fewer in numbers through November. No specimens were collected from sixteen animals examined in December.

The above data indicate the immature stages of the rabbit tick are active during all months of the year, the females in all except the last two months, and the males in all except December. There was no direct correlation between the temperature and humidity and the number of ticks present. Temperature, however, appeared to be an important factor. The immature stages are more active during the colder months than are the adults.

This tick is almost inactive during the winter months in the more northern States, such as Minnesota or Montana, but apparently becomes more active as one goes farther south.

A Summary of a Year's Collection of the Rabbit Tick, *Haemaphysalis Leporis-Palustris*, from the Cotton Tail Rabbit, *Sylvilagus Floridanus alacer*, from January 1, 1939, to January 1, 1940.

Date	No. of animals examined	Average no. of ticks per rabbit each month. Males	Females	Nymphs	Larvae	Total
January	26	.15	.23	2.11	2.15	4.64
February	5	.40	.20	2.20	.40	3.20
March	6	4.66	1.66	4.33	8.16	18.83
April	32	12.03	5.87	6.81	.68	25.40
May	13	11.23	3.30	8.92	.53	24.00
June	19	25.72	18.84	22.05	48.94	115.56
July	17	6.88	5.41	21.35	78.70	112.34
August	11	5.90	3.81	8.27	27.45	45.43
September	15	6.66	3.33	15.33	10.86	36.18
October	17	1.47	.64	10.41	10.76	23.28
November	20	.40	.0	10.00	10.30	20.70
December	16	.0	.0	.62	2.18	2.80

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