

1947

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Recommended Citation

Becker, Elery R. (1947) "Distribution of the Tropical Rat Flea (*Xenopsylla Cheopis*) in the Interior of the United States," *Proceedings of the Iowa Academy of Science*, 54(1), 297-300.

Available at: <https://scholarworks.uni.edu/pias/vol54/iss1/46>

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Distribution of the Tropical Rat Flea (*Xenopsylla Cheopis*) in the Interior of the United States

ELERY R. BECKER

The addition of *Xenopsylla cheopis*, proved vector of plague and endemic or murine typhus, to the known fauna of Iowa was made by Roudabush and Becker (1) in 1934. It was believed at the time to be the first collection of that flea in the interior of the United States, but there existed several previous records which, strangely enough, had been generally overlooked, principally because the reporters had not pointed out the implications of their findings, and because of their inclusion in official reports rather than in widely circulated journals. As was claimed by Roudabush (2) and as several new records presently to be introduced indicate, the flea is well-established in interior localities. Furthermore, the records prove that the flea had penetrated far inland as early as 1908 and 1910, and recent collections over a widespread area suggest that it will persist here indefinitely.

A summary of localities, reported or presumptive hosts, and authorities for the existence of the records follows:

1908	Memphis, Tenn.		Trembley and Bishopp (3)
1910	Raleigh, N. C.	<i>Sigmodon hispidus</i>	Shaftesbury (4)
1924	Indianapolis, Ind.	<i>Rattus norvegicus</i>	Wallace (5)
1924?	St. Paul, Minn.	<i>Rattus norvegicus</i>	Riley (6); Owen (7)
1931-	Raleigh, N. C.	<i>Mus musculus</i>	
1933	Raleigh, N. C. Greensboro, N. C.	<i>Rattus norvegicus</i>	Shaftesbury (4)
	Plymouth, N. C.	<i>Mus musculus</i>	
1934	Ames, Ia.	<i>Rattus norvegicus</i>	Roudabush and Becker (1)
		<i>Rattus norvegicus</i>	Roudabush (2)
1936	St. Paul, Minn.	Man, cats (barn)	Owen (7); Riley (6)
1938	Urbana, Ill.	(Elevator refuse)	Ewing and Fox (8)
	Youngstown, O.	(An office; biting man)	
1935-	Phoenix, No-	(<i>Rattus rattus</i>	Prince (9)
1941	gales, Ariz.) <i>Rattus alevandricus</i>	
	Denver, Colo.	<i>Rattus norvegicus</i>	
	Lordsburg, N. M.	<i>Rattus alexandricus</i>	
	Albuquerque, N. M.	<i>Rattus norvegicus</i>	
	Salt Lake City, Utah	(<i>Rattus rattus</i>) <i>R. norvegicus</i> <i>R. alexandricus</i>	

1938	Nashville, Tenn.	<i>Rattus norvegicus</i>	Trembley and Bishopp (3)
1939	Youngstown, O. Rochester, N. Y.	Chandelier in church	Roudabush (2)
	Des Moines, Ia.	<i>Rattus norvegicus</i>	
1939	LaFayette, Ind.	<i>Rattus norvegicus</i> (later on laboratory rats, mice and rabbits)	Cable (10)
1940	Manhattan, Kans.	<i>Rattus norvegicus</i>	Grundmann <i>et al</i> (11) Ackert <i>et al</i> (12)
1940	Columbus, O.	<i>Rattus norvegicus</i> (feed box)	Runner (13)
1942	Ann Arbor, Mich.	<i>Rattus norvegicus</i>	Jachowski (14)
1943	Lincoln, Nebr.	<i>Rattus norvegicus</i>	Gates (15)

The writer wishes to record at this time having taken 22 specimens of the flea from a rat killed in the fire station at Red Oak, Iowa, in May, 1941, 1 female taken from a rat in Ames, Iowa, in August, 1946, and 3 females taken from 3 rats shot in Nevada, Iowa, on March 11, 1947. For records of collections at inland points in coastal states other than North Carolina the reader should consult Trembley and Bishopp (3) and Prince (9).

The widespread collections of the tropical rat flea indicate that one may expect to find it almost any place in the Middle West where a persistent hunt is made. Rats caught or shot in dumps, business establishments are much more likely to be found infested than corn crib or field rats, according to our experience. As Roudabush (2) states, the flea actually maintains itself by breeding, and not by annual migrations into the interior.

It is evident from the records that the flea has been established at inland points for a long time. Were one so meticulous as to reject the 1908 Memphis and 1924 Indianapolis records on the basis of inadequate proof of the identity of the flea, and the 1924 St. Paul observation for lack of publication, there would still remain the 1910 Raleigh, N. C., record of specimens determined by no less an authority than N. C. Rothschild, who described the species in 1903 from fleas taken in the valley of the Egyptian Nile.

As the writer read the notes concerning the circumstances under which the fleas were taken, he was impressed with how accessible human beings in the interior of the United States are to the vector of bubonic plague and endemic typhus. Roudabush and Becker found heavy infestations in rats from a dump frequently used for disposing of refuse from Iowa State College. Riley's and Owen's record is most though-provoking, for the employees in a dairy barn were complaining of "being annoyed by excessive numbers of fleas", and the floor, hay, and cats in the barn were infested. Shaftesbury took the flea from house mice. Ewing and Fox note that their specimens were from an office, where they had been biting man, and from

elevator refuse. Roudabush's Rochester, N. Y., specimens were brought to him by workers who found them in a chandelier of the inverted dome type in a church. Trembley and Bishopp state that the specimens submitted by H. E. Meleney from Nashville, Tenn., were taken from a rat captured in a grain store. Runner took them from a feed box in a university building, and from rats caught in the residential district of Columbus, O. Cable reported an almost unbelievably heavy infestation of the rats, mice and rabbits in his animal room, but people were not being seriously annoyed.

It is obvious that the flea is established here in the interior. It still has an abundance of the preferred host, the rat. It has accessibility to man. Sylvatic plague appears to be spreading steadily eastward, with records from Wyoming, Montana, North Dakota, and Oklahoma. If the microorganism is introduced into the Mississippi Valley states, what will happen? Probably nothing more serious than sporadic outbreaks, when one considers the controls available to man; viz., new insecticides, new raticides, rat-proof construction, and new therapeutics. Let us not, however, remain too complacent!

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