Description.—Seventh tergite lacking a pair of divergent carinae bounding the disk; eighth tergite with the lateral angles produced well beyond the middle of the hind margin, the hind margin between the processes decidedly angulate; disk of eighth tergite widely depressed along median line; side of eighth tergite angulate posteriorally.

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Chagas Disease and Vectors in North Central Texas

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All members of the large hemipterous family Reduviidae are predacious, but only members of the subfamily Triatominae feed exclusively on vertebrate blood. Readio (1927) noted that Mr. J. R. Lembert observed the common Pacific Coast species of *Triatoma* feeding on carrion and excrement. Lutz (1918) reported that *Triatoma sanguisuga* LeConte feeds on insects, including grasshoppers and potato beetles. Apparently neither of the above accounts illustrate normal feeding habits.

Bites of triatomine bugs are relatively painless, although severe systemic reactions result not infrequently in man. These bugs are of medical note since they serve as intermediate hosts for *Trypanosoma cruzi* Chagas, the protozoan causing Chagas' disease or South American trypanosomiasis.

Students of tropical medicine recognize the widespread and serious nature of Chagas' disease. According to Usinger (1944), hundreds of acute cases are on record in Latin America, and active research concerning this disease is now in progress in the United States, Mexico, Argentina, and Brazil. Subclinical cases have been uncovered by xenodiagnosis, and it is suggested that many unrecognized cases exist among the native populations of Latin America.

The bionomics of these insects have been well worked. No less than 24 species of Triatominae have been found infected in nature with *T. cruzi.* Six of these infected species have been found within the United States. Due to the investigations of

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Usinger, Packchanian, Eads, Wood, and others, the taxonomy and ecology of this subfamily are better known than in any of the other subfamilies of Reduviidae.

In my investigations I have found a total of 186 individuals of Triatominae in Dallas, Denton, and Ellis counties. Sixteen of these individuals were *Triatoma gerstaeckeri* (Staal); three, *Triatoma lecticularius* (Staal); and the remainder were *Triatoma sanguisuga* (LeConte). Of the *T. sanguisuga,* 41 were found in human dwellings (four of them caught in the act of biting human victims and, in three of the instances, systemic reactions resulted). Unfortunately, only one of these four insects was fresh enough for thorough examination when brought into the laboratory, and this individual was uninfected with *T. cruzi.*

Biology

Eleven of the 16 specimens of *T. gerstaeckeri* were found on the ground in sparsely wooded areas. Five were found in rodent nests. Mr. Ralph Barr found a *T. lecticularius* on an oak leaf at Elam Springs. The other two individuals were found in rodent nests.

Of the 167 individuals of *T. sanguisuga,* 41 were found in human habitations; 12 were found at night around electric lights; 16 at night under neon lights; two in flight in wooded areas; 20 crawling on the ground in wooded areas; five in sweepings of tree foliage; 15 crawling on the ground in grassland; and 56 were collected from rodent nests.

With the exception of three specimens of *T. sanguisuga* found in a dog kennel, none was found around livestock. Many barns were carefully examined, both by day and by night, but with negative results. These observations are contrary to results I obtained in other parts of the State, especially in East Texas, where I found many specimens of *T. sanguisuga* living about livestock; and in South Texas where I found *T. gerstaeckeri* in barns and stalls.

According to Wood (1941), the preferred host of *Triatoma* is the wood rat *Neotoma.* No wood rats were found in north central Texas. Mr. F. W. Miller, Curator of the Dallas Museum of Natural History, tells me that some ecological upset has caused the wood rats practically to disappear from north central Texas. In the absense of *Neotoma,* I have yet to find another preferred host in this area.

Nearly always when a bug was found in a house the residents assured me that they had never found *Triatoma* before 1945. From this, one might infer that the bugs are slowly moving into houses seeking human hosts in the absence of the wood rats.

Laboratory Observations

Both Usinger (1944) and Chandler (1930) state that defecation characteristically occurs immediately or soon after feeding in the Triatominae. Thus the bugs contaminate the wounds and spread Chagas' disease. *T. cruzi* is transferred to man strictly by the feces. In nature, wild animals may become infected by eating the bugs.

Brumpt (1939) found that *Rhodnius prolixus* Staal and *Mestor megistus* (Burmeister) defecate promptly after feeding, while *Triatoma protracta* (Uhler) defecates more tardily. I have observed that *T. sanguisuga* adults are very tardy in defecating after a meal. In only one instance did I note defecation before the bug left the host, and this particular insect was so engorged that it had difficulty in moving about.

Each of 30 individuals of adult *T. sanguisuga* was checked on two occasions while feeding. The average interval between the end of feeding and the beginning of defecation was 48 minutes; the minimum time 20 minutes; and the maximum time 82 minutes. This gives the bug ample time to leave its host before defecating, and may explain why Chagas' disease is unknown in the United States. Unfortunately, no other species of *Triatoma* were available for similar checking.

Several workers have noted triatomine bugs sucking body juices from other members of the same species without evident harm to the attacked insect. Other workers have never observed this. Among my *T. sanguisuga* this occurence was common among bugs that were starving. I found that young nymphs of the first and second instars could be fed successfully upon engorged adults without apparent harm to the adults. The nymphs attacked the engorged adults between the distended sclerites. This was a successful way to feed young nymphs that were too small to be handled easily while feeding on laboratory animals.

Most of the bugs fed readily on laboratory animals, and when starved nearly all of them would feed even when held

with forceps. Wood (1942) found that some species (especially *T. protracta*) bite very hesitantly, whereas *Triatoma uhleri* (Neiva) is prompt in biting.

Usinger (1944) pointed out that coprophagy may be a means of cross infection of *T. cruzi, and* Brumpt (1939) cited the only known case. In my own experience, I was never able to induce a bug to feed on the feces of another.

Rearing

Specimens were reared in small glass jars with coarse cardboard placed in the bottoms to absorb fecal matter. They were kept in a constantly warm basement. Here the year-around average temperature was 27° C.

The bugs were fed on six white rats, six rabbits, and a guinea pig at ten-day intervals. The laboratory animals were placed in battery jars when feeding occured. Darkness was not necessary for feeding. The nymphs of the first two instars were fed on freshly engorged adult bugs.

Natural Infection

Four individuals of *T. sanguisuga,* all from Dallas county, were found infected with *T. cruzi* under natural conditions. Two were found in houses along Turtle Creek Drive, Dallas, the third in a dog kennel in the same neighborhood, and the fourth on the bank of Turtle Creek about a half-mile north of Fitzhugh Ave. It is interesting to note that all of these bugs were found in Highland Park near Turtle Creek; because Highland Park is a clean area and one of the best residential sections of Dallas. Turtle Creek flows the year around. It has wooded banks and is well cleared of underbrush.

Experimental Infection

A culture of *T. cruzi* was procured from Dr. Cox of the Texas State Public Health Department at Austin. Dr. Cox sent me four *T. gerstaeckeri* nymphs, all infected, which were ground up in a physiological salt solution and injected into the peritoneal cavities of three rabbits and three white rats. Trypanosomes were found in the peripheral blood of all six animals within 20 days.

Ten uninfected *T. sanguisuga* adults were then allowed to feed on the infected animals, and in each case became infected.

Systemic Reactions Among Laboratory Animals

While the rats and rabbits suffered no apparent effects

from the bites of the bugs, a guinea pig used showed ill effects after each bite, becoming listless, with a loss of appetite.

I then let five adult bugs feed upon the guinea pig simultaneously. Eleven hours later the animal died after a characteristic listlessness. I had never allowed an infected bug to feed upon the guinea pig, and autopsy showed it to be uninfected with *T. cruzi.*

I followed this same proceedure with four rabbits and three white rats, but the animals suffered no apparent harm. Later I allowed as many as fifteen adult bugs to feed upon the rabbits, individually, but still with no effect.

Identification of *Trypanosoma cruzi*

Microscopic examination for the crithidia and metacyclic trypanosoma forms was followed by Packchanian's method (1939). I found that Wright's stain proved to be a rapid method for superficial examination of fecal matter. The livers, hearts, spleens, and nerve tissues of laboratory animals were sectioned, stained, and examined for leishmania bodies, but with negative results.

SUMMARY

In the Dallas-Denton-Ellis counties area of north-central Texas 186 individuals of Triatominae were found. Sixteen were *Triatoma gerstaeckeri,* three *Triatoma lecticularius,* and the remainder *Triatoma sanguisuga.* Forty-one individuals of *T. sanguisuga* were found in dwellings.

Examination of the habits of 30 adult *T. sanguisuga* showed that the interval between feeding and the commencement of defecation was 48 minutes.

Four individuals of *T. sanguisuga* were found naturally infected with *Trypamosoma cruzi.* All four were from the vicinity of Turtle Creek in Highland Park, near Dallas.

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