

SOME OF THE MORE IMPORTANT TICKS OF THE UNITED STATES.

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INTRODUCTION.

In recent years considerable attention has been attracted to the tick which transmits splenic fever of cattle, known as the North American fever tick. The importance of this tick as the sole transmitter of the disease in nature has become common knowledge, at least in the South. As a matter of fact, this tick is of much greater importance than any other species occurring in the United States. Nevertheless there are other forms which should be considered. One species, for instance, transmits a serious disease of human beings which is spread over an extensive region and causes the loss of a considerable number of human lives each year. As in the case of the cattle disease, the human disease, known as Rocky Mountain spotted fever, is transmitted only through the attack of a tick, and the plan that is being followed in dealing with the cattle disease would apply in the case of the human disease; that is, the eradication of the tick would result in the eradication of the disease.

Although ticks are attracting more attention at the present time as transmitters of diseases than in other ways, they are of considerable importance as parasites of domestic animals. Their presence always results in irritation and the loss of blood. The consequence is that the infested animals frequently fail to make proper returns for the expense incurred in feeding, and in some instances the attack is so severe that death follows. (See Pl. XV, fig. 1.)

The object of the present paper is to point out some of the species of ticks occurring in the United States which are of importance either as transmitters of disease or otherwise. It will be noted that in several cases where diseases are not known to be transmitted at present, future investigation may possibly connect the ticks with certain maladies. It is thus very probable that increased knowledge of ticks will show a degree of importance which is not now realized.

All ticks occur in four stages, namely, egg, larva or seed tick, nymph, and adult. The ticks usually seen are adults, in which stage there are, of course, males and females. The females, however, increase greatly in size on account of the engorgement of blood; the males are consequently inconspicuous and generally overlooked, being

frequently found attached to the skin of the host directly beneath the females. After fertilization the females quickly become distended by the engorgement of a large amount of blood, which is utilized in the formation of eggs. When the body of the female becomes so distended that it will hold no more blood the tick drops to the ground.¹ Deposition of eggs begins in a short time. Depending upon the species, from 300 to as many as 11,265 eggs are deposited by a single female. Death follows after egg laying is completed. (See Pl. XVI, fig. 5.)

The seed ticks emerging from the eggs are provided with but three pairs of legs. The subsequent stages both have four pairs. The seed ticks remain in the immediate vicinity of the place where the eggs were deposited. There is a strong tendency to move upward on a blade of grass or similar support while awaiting a host animal. No food is taken by the seed ticks until they attach to the host.

Ticks have remarkable ability to exist for long periods without food, but as soon as a host comes within reach the seed ticks attach to the skin and immediately begin to extract blood and in a short time become distended. At this point some species drop to the ground for the purpose of molting and others remain upon the host, the general rule being to drop to the ground. To this there are two important exceptions, namely, the cattle fever tick, *Margaropus annulatus* Say, and the tropical horse tick, *Dermacentor nitens* Neumann, which do not drop for molting. In the case of the ticks which drop from the host as engorged larvæ the molt takes place in a short time. The stage reached after the molt is the nymph, in which stage the tick again awaits a host, often for a long time, and attaches, as in the larval stage, at the first opportunity and immediately fills itself with blood. It then detaches and another molt takes place, which marks the beginning of the adult stage. Again an opportunity is awaited to attach to a suitable host. When this occurs the males and females come together, fertilization takes place, and the engorgement of the females follows shortly, with the formation of eggs, thus beginning another cycle.

THE FOWL TICK (*ARGAS MINIATUS* KOCH).

The fowl tick is found in many localities in the warmer portions of the earth. Outside of the United States it has been recorded from Russia, Persia, North and South Africa, Australia, Mexico, and Brazil and other localities in South America. Notwithstanding this

¹Among the species here discussed there are two exceptions to the rule that eggs of ticks are deposited on the ground. These are the spinose ear tick, which crawls upon posts or other supports, where oviposition takes place, and the chicken tick, which secretes itself in cracks in the vicinity of the perches and there deposits its eggs.

wide range over the globe, the species is of rather sharply restricted distribution in the United States. It is found very commonly in southern and western Texas, New Mexico, Arizona, and southern California. The range extends westward from a line drawn from Wichita Falls to Goliad, in Texas. This line corresponds almost exactly to the division between the humid and arid divisions of the Lower Austral zone, which is marked by the eastern limit of the area in which less than 30 inches of annual rainfall occur. There are reports of the occurrence of the species outside of the region indicated—for instance, from Florida—and one occurrence is known in Texas outside of the arid region. The numerous observations that have been made in Texas, however, show that the restricted range is distinctly marked. The occurrence of the species elsewhere is probably due to its shipment along with fowls or coops.

In the United States the fowl tick is probably the most serious pest of chickens in the regions where it occurs. In cases that have come to the attention of the writers, the raising of poultry has been abandoned on account of the death of the fowls as the result of the attack of this tick. Even where the infestation never becomes so heavy as to cause death, the irritation of the skin and the draining of blood interferes to such an extent with fattening and egg laying that the poultry industry has become unprofitable.

There is a possibility that this species may transmit a specific disease of fowls in this country. In Brazil, the Sudan, India, South Australia, and Transcaucasia a disease of fowls, known as spirochaetosis, has been demonstrated to be transmitted by this tick. Up to this time no reliable evidence of the occurrence of this disease in the United States has come to hand.

The fowl tick may be identified readily by its appearance. The engorged adult is about one-third of an inch in length, of a bluish or almost blackish color. The conspicuous feature of the structure is the greatly flattened form and the roughened and pitted appearance of the skin. (See Pl. XVI, fig. 3.) The unengorged ticks are smaller, very flat, and have a brownish or yellowish appearance.

The eggs of this tick are deposited in cracks and openings of any kind in the buildings in which fowls are kept. The stage of the tick which hatches from the eggs has but six legs. It is ready to attach itself to fowls soon after hatching, and in from three to eight days it engorges and drops from the host. In about a week's time the larval tick sheds its skin and becomes a nymph, and is then ready to attach again to the host. This attachment is short, probably never occupying more than two hours. The tick drops again from the host, undergoes another molt, and appears in the second nymphal form. As in the preceding stage, the attachment to the fowl is very short. After

dropping again, another transformation takes place and the adult ticks emerge. After engorgement and mating, the deposition of eggs takes place. After each deposition the female attaches to the host and fills with blood, then secretes herself, and in due time deposits another mass of eggs, a process which may be repeated as many as six times. At least three separate engorgements and depositions of eggs seem to be normal.

The fowl tick is practically nocturnal in its habits. During the day and in the presence of artificial light it will secrete itself. Attachment to the host as well as dropping occurs normally during the night. While the later stages of the tick attach themselves for only a short time during the night, as has been stated, the first or larval stage remains attached for several days.

One of the most remarkable facts about the fowl tick is its longevity. The larvæ will live at least five months without food. The adults, in several instances, have been kept alive without nourishment for more than two years. It is also remarkable that the adult ticks are extremely resistant to insecticides. Applications of liquid preparations that will kill most insects seem to have but little effect upon them. These ticks are also very resistant to such poisonous gases as quickly kill most species of insects.

The considerations mentioned in the last paragraph indicate that it is not feasible to attempt to "starve out" the fowl tick by removing the birds from the houses, and that the application of insecticides is attended by many difficulties. It is fortunate, under these circumstances, that an economic and effective method of obtaining relief is available. This consists of providing perches for the fowls of such construction that the ticks are unable to reach them. This can easily be accomplished by suspending the perches from the ceiling by means of wires or iron rods. In this manner complete exemption from injury to the roosting fowls can be obtained. In the case of setting hens the same results may be obtained by providing nesting boxes on legs which are placed in cups or pans filled with crude oil.

THE SPINOSE EAR TICK (*ORNITHODOROS MEGNINI DUGÈS*).

The spinose ear tick has been recorded from a number of localities in the southwestern portion of the United States and in Mexico, as well as from Louisiana, California, Nevada, Idaho, Colorado, Nebraska, Kansas, Iowa, and Kentucky. Recent work which has been done toward obtaining accurate information regarding the distribution of ticks in the United States indicates that the occurrence outside of Texas, New Mexico, Arizona, southern California, southern Colorado, southern Utah, and Mexico are more or less accidental. In northern Louisiana a restricted infested region was found in 1907. In this

case there is a rather clear history of the introduction of the species with horses from western Texas.

The spinose ear tick is found only in the ears of animals infested by it. The species may be recognized primarily by this restriction in the place of attachment. The more common hosts are horses, cattle, dogs, cats, and man. Its appearance is unmistakable, the general color being yellowish brown or darker, the legs much paler. The engorged females measure about one-third of an inch in length and are irregularly oval in outline, the body being constricted just behind the middle. The surface of the nymphs is covered with small, sharp, spinelike bristles which aid it in maintaining its place in the ears of the host. (See Pl. XVI, fig. 4.)

In western Texas, New Mexico, and Arizona this species is found in the ears of many of the horses and cattle and not uncommonly causes the death of the animals. The irritation which it causes is increased by the fact that its wounds frequently attract the screw-worm fly, *Chrysomyia macellaria* Fab. If an animal is weakened from any cause and suffers from this combined attack it is likely to succumb.

A number of cases have been recorded in which this species has been taken from the ears of human beings. In such instances very great pain was caused, but as far as known no deaths have occurred.

Although this species is not known to be concerned in the transmission of disease, a closely allied form does transmit a disease of human beings in Africa. The same African species, *Ornithodoros moubata* (Murray), was recently found to be capable of transmitting spirochætosis in fowls.

There are certain peculiar features of the life history of this tick. When the nymphs are fully engorged they drop from the ears of the host and crawl upward on any convenient object. They then secrete themselves, molt, and begin deposition. This species never attaches to an animal in the adult stage.

The spinous ear tick, like the fowl tick, is able to exist for a long time without nourishment. Specimens have been kept alive in glass vials for a year and a half.

THE LONE STAR TICK (*AMBLYOMMA AMERICANUM* L.).

So far as known the lone star tick does not occur outside of North America and South America, but in these continents it has an extended range. It has been recorded from Labrador to Brazil. In the United States it has been taken from Maine to Michigan and from Florida to Texas. It appears to be rare or absent west of the Mississippi River, except in Louisiana and Texas, although it has been taken in Missouri, Arkansas, and Oklahoma. In Texas and Louisiana it is one of the most common ticks.

The lone star tick has been found on cattle, horses, human beings, dogs, goats, hogs, deer, squirrels, wolves, cats, and in the immature stages on certain birds. It appears to have a special predilection for goats. In the vicinity of Kerrville and Llano, Tex., where Angora goats are raised in great numbers, this tick is more common than in any locality known to the writers, far outnumbering all other ticks.

This tick and the Gulf coast tick are probably more frequently found attached to human beings than any species which occurs in the eastern and southern portions of the United States. Its long beak enables it to maintain a firm hold. Cases are on record in which severe results have followed such attachments. In these cases the injury seems to be merely mechanical or due to the ingress of bacteria through the punctures. Two investigators have conducted experiments to determine whether this species is capable of transmitting splenic fever of cattle. They were unsuccessful in both cases.

The lone star tick may be identified by the presence of a bright metallic spot on the shield of the female. This distinct mark gives it the common name by which it is known. Fully engorged females sometimes measure over one-half inch in length. The general shape is oval and the color generally grayish yellow.

On account of its wide range and the number of animals it attacks, including man, this is one of the more important of the ticks. In localities where it becomes numerous the cattle, horses, goats, and sheep suffer severely from its attack. The long mouthparts, which penetrate deeply into the skin, seem to cause more irritation than is caused by the attack of the fever tick, *Margaropus annulatus*. The large amount of blood taken by this species is an additional factor in causing it to be of considerable importance to stock raisers.

This species is as susceptible as other species to oils and to the arsenical dip. To a certain extent it can be controlled by the same means which are used in controlling the fever species on cattle; at least this is the case in so far as dipping and greasing are concerned. The plans of relieving cattle of the fever tick and of freeing pastures by the starvation plan applied to the fever species are not equally effective against this one. The reason is that, unlike the fever species, it drops to the ground twice for the purpose of molting.

THE GULF COAST TICK (*AMBLYOMMA MACULATUM* KOCH).

The Gulf coast tick occurs in the United States in a restricted region along the Gulf coast, especially in Louisiana and Texas. It has been recorded from Tennessee, Virginia, and California on single occasions. The occurrence of the species in these States is probably due to its having been carried on some of its hosts from the region in which it occurs commonly. The range of the species extends through Mexico and far into South America.



FIG. 1.—COW DYING FROM GROSS INFESTATION BY THE NORTH AMERICAN FEVER TICK. (ORIGINAL.)

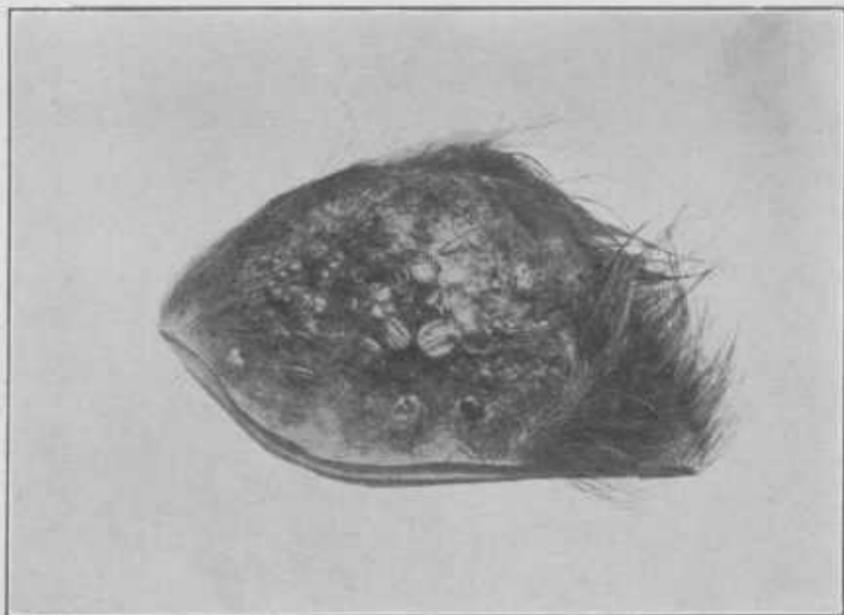
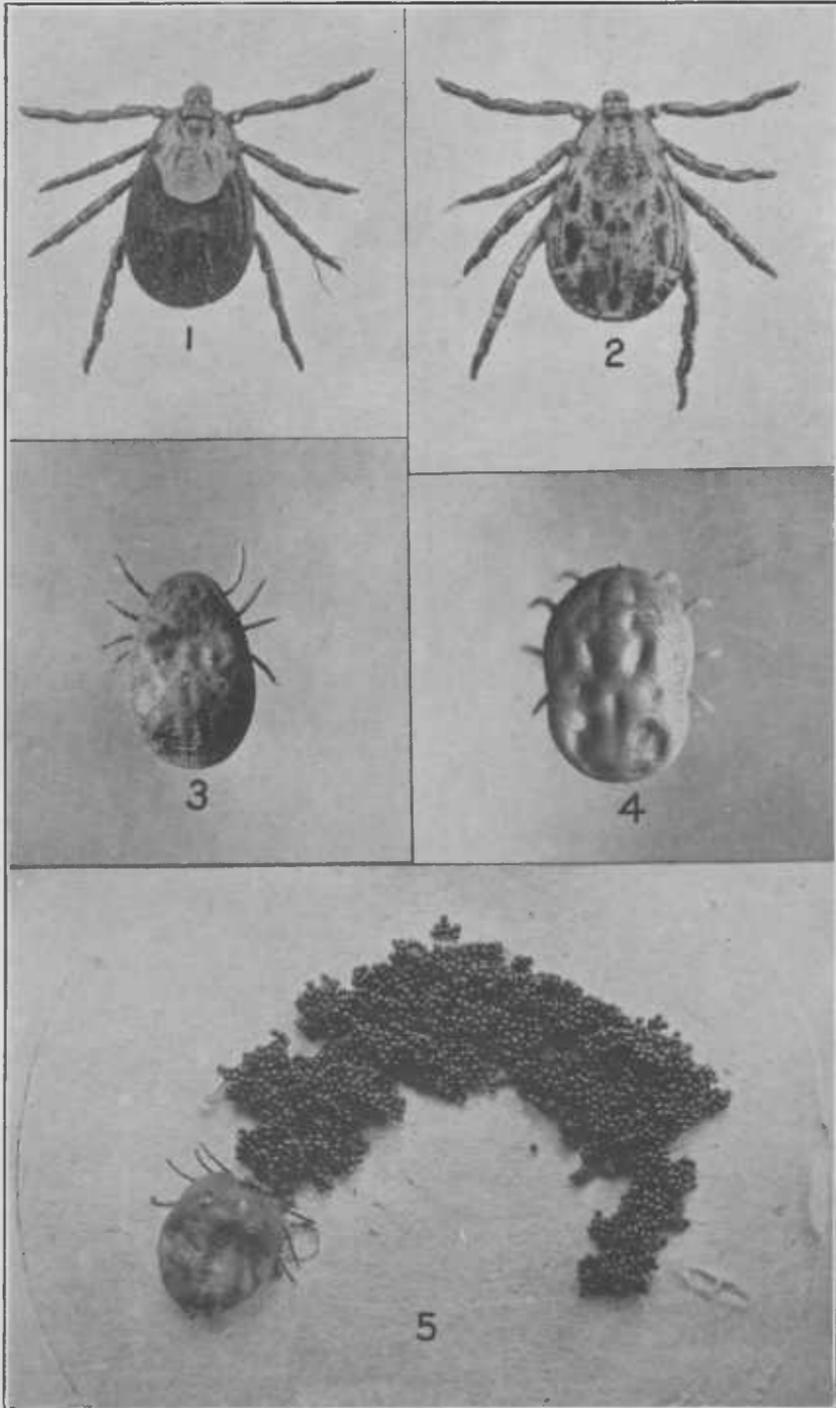


FIG. 2.—EAR OF CALF WITH CLUSTER OF GULF COAST TICKS. (ORIGINAL.)



SOME TICKS OF THE UNITED STATES.

[1.—Rocky Mountain spotted fever tick (*Dermacentor venustus*): Unengorged female. 2.—Same, male. 3.—Fowl tick (*Argas miniatus*): Partially engorged female. 4.—Spinose ear tick (*Ornithodoros megnini*): Engorged nymph. 5.—North American fever tick (*Margaropus annulatus*): Female depositing eggs. All enlarged. (Original.)]

The Gulf coast tick is found more commonly on the dog than on any other host, although in its range in this country it is frequently found upon cattle, as well as upon human beings. It is probably more inclined to attack human beings than any species found in the United States, except possibly the Rocky Mountain spotted-fever tick.

In size and general appearance this tick resembles the lone star tick, but lacks the metallic spot which very readily distinguishes the female of the lone star tick from all other species. The light marking of the shield forms an irregular lyre-like pattern.

In attacks upon various hosts it has been noted that this species is inclined to form clusters consisting of a half dozen or more individuals. The long mouthparts give it a firm hold upon the host, naturally causing considerable irritation. The clustering thus leads to an amount of local irritation which frequently affects the host severely. (See Pl. XV, fig. 2.) Up to the present time this species has not been found to transmit any disease.

The life history of the Gulf-coast tick is very similar to that of the lone-star species, which has been described. The only control measures that can be suggested are the use of oils or grease applied locally or the dipping in any of several well-known "tickicides."

THE ROCKY MOUNTAIN SPOTTED-FEVER TICK (*DERMACENTOR VENUSTUS* BANKS).

The Rocky Mountain spotted-fever tick is restricted in range to the western portion of the United States. Recent work by the Bureau of Entomology has shown that it occurs from Wyoming to Washington State, and from New Mexico to California. It is thus essentially a species of the Rocky Mountain region. It is not to be found, however, equally numerous in all portions of that section. The greatest abundance seems to be in Montana, Idaho, and Wyoming. South of Colorado and Utah it is very uncommon. The relative abundance of this species in different States is probably indicated by the number of lots of specimens which were received at the Dallas laboratory during the season of 1910, 85 lots having been received from Montana, 84 from Idaho, 72 from Wyoming, 51 from Washington, 29 from Colorado, 25 each from Oregon and Nevada, and 9 from California. The range of the species also extends into Canada and possibly Alaska, but its occurrence outside of the North American Continent is unknown.

This tick, in certain ways, is not especially restricted as regards hosts. The immature stages are to be found on a large number of rodents, but the adult stage occurs only very exceptionally on these animals. Adults have been taken commonly from only horses, cattle, deer, and mountain goats, in addition to man.

The existence of a number of closely allied species renders it impracticable to give a description of this form which would enable the general observer to identify it. (See Pl. XVI, figs. 1, 2.)

Although of some little importance in the adult stage as a parasite of domestic animals, the injury to man by transmission of Rocky Mountain spotted fever overshadows the importance of this species in all other respects. It is one of the two ticks which are known to transmit diseases of human beings. The other case is an African tick, *Ornithodoros moubata*, which transmits African relapsing fever. The history of the various steps in the demonstration of the connection between this tick and spotted fever is of great interest. The disease itself was not recognized as a distinct malady until a comparatively few years ago. In 1902 Doctors Wilson and Chowning first placed on record the hypothesis that the disease was transmitted through the agency of a tick. In 1906 Dr. H. T. Ricketts undertook the study of the question. As a result of most carefully planned and praiseworthy investigation under many difficulties, Doctor Ricketts demonstrated that this species transmits the disease in nature. The control and eradication of spotted fever has therefore become essentially a matter of the control of the tick, exactly as the control of yellow fever or malaria depends upon the eradication of certain species of mosquitoes.

The importance of this tick may best be considered in connection with the disease which it transmits. Although spotted fever occurs throughout the Rocky Mountain region, the death rate is high in but one locality. Ordinarily the death rate ranges in the neighborhood of 5 per cent. In the Bitterroot Valley, in Montana, however, there exists a type of the disease in which the death rate is much higher; it averaged 70 per cent in 114 cases which were collated in 1902 by Doctors Wilson, Chowning, and Ashburn. It is estimated conservatively that since 1885 at least 400 cases of spotted fever have occurred in the Bitterroot Valley, the percentage of deaths showing that during this period the fever has caused the loss of 280 human lives. The deaths, outside of the Bitterroot Valley, due to the less virulent form of the disease, probably increase the total mortality during the last twenty years to 1,000. It will thus be seen that the tick is of considerable importance in a large portion of the United States.

In addition to the direct loss of lives, a great indirect injury has been done by interfering with the development of large areas of land. Moreover, there is a possibility that this tick may become of even much greater importance. As far as can be seen there is no reason why the virulent form of the disease occurring in the Bitterroot Valley could not be transported to other regions. If a person or animal harboring the organism of the disease should move from

the Bitterroot Valley to some other State where the fever tick occurs, opportunity would be given for the introduction of the virulent strain. This consideration emphasizes the great practical importance of attempting the eradication of the tick in the Bitterroot Valley.

As has been indicated, this tick occurs in the immature stages on a large number of small mammals and in the adult stage only on man or a few of the larger animals. It is found in numbers in the adult stage only during a limited season. It is first noticed on domestic animals in very early spring. The season normally begins about the 1st of March and extends until about the 1st of June, after which the tick is not noticed until the following season. This seasonal abundance of ticks corresponds to the period to which cases of spotted fever are restricted.

Like the majority of ticks, the Rocky Mountain spotted fever species engorges and drops from the host for both molts. It is thus radically different in habits from the species which transmits splenic fever of cattle and its control is correspondingly more difficult.

Recent investigations in Montana by the Bureau of Entomology, in cooperation with the Montana Agricultural College, have indicated certain apparently feasible means for reducing the numbers of this species, or the possibility of eradicating it altogether. The matter will be dealt with fully in a contemplated publication.

THE PACIFIC COAST TICK (*DERMACENTOR OCCIDENTALIS NEUMANN*).

So far as now known the Pacific coast tick is limited in its distribution to western and central California and western Oregon. It is probably also to be found in Lower California and northwestern Mexico. It is the most common tick in the Pacific coast region, where it is usually called the wood tick. Cattle, deer, horses, dogs, and man are the more common hosts of the adults. The immature stages undoubtedly attach to various small mammals. On account of the fact that this tick occurs throughout practically the entire season in certain regions, it is of some importance as a pest of live stock. It is said to be most numerous during the rainy season, and at that time is frequently the source of much annoyance to man.

This species resembles quite closely the Rocky Mountain spotted fever tick, but by the trained eye is readily distinguished from that species. It is much the same in color as the fever-transmitting species, but the white markings are interrupted by numerous red points, which give it a characteristic appearance. The engorged females are somewhat smaller than other members of this group of ticks, seldom attaining a length of more than one-third of an inch.

As has been stated, this species frequently attacks man, but no disease is known to be carried by it. Until recently this tick has been confused with the tick *Dermacentor venustus* Banks, which transmits Rocky Mountain spotted fever. The name *Dermacentor occidentalis* erroneously appears in medical literature in connection with that disease.

On account of the fact that this species drops from the host twice during its development in order to molt, it is doubtful if any method other than the use of "tickicides" can be successfully used in keeping it under control.

THE AMERICAN DOG OR WOOD TICK (*DERMACENTOR VARIABILIS* SAY).

The American dog tick is the most common species occurring east of the Mississippi River. Its range extends from Labrador to Florida; although it occurs in Texas, it is uncommon there. Throughout the central and Rocky Mountain regions it appears to be rare. Recently, however, an area of considerable size in California and Oregon in which this species occurs commonly has come to attention. It is surmised that the species was introduced there by artificial means.

The immature stages of this tick are found upon various small mammals. The dog appears to be the most important host for the adult stage, although in this stage the tick occurs upon various wild animals as well as cattle and man. Although it has a strong tendency to attach in the ears of the host it does not attach far down in the ears, as does the spinose ear tick.

This tick, when engorged, is of a bluish color. When fully engorged the female usually measures nearly one-half inch in length. The shield is reddish brown, marked with white. The marking is more or less variable, but generally maintains a pattern which enables the species to be recognized.

Although of widespread occurrence in the United States, this species is of comparatively little importance. The dog is the only host which ever suffers any serious consequences. The species is rather well known on account of its attaching to human beings, but so far as the records show no special consequences have ever followed its attack. The removal of the ticks from any host is an easy matter.

THE RABBIT TICK (*HEMAPHYYSALIS LEPORIS-PALUSTRIS* PACKARD).

The rabbit tick is one of our most widely distributed species, being very commonly found on rabbits throughout the United States and Mexico. It has also been reported from South America. In the extreme southwestern portion of the United States and portions of California, however, the common tick found on rabbits is another species.

This rabbit tick has been recorded from horses in one instance. With this one exception the rabbit is the only mammal upon which the adults of the species have been found. The larvæ and nymphs are found very commonly upon ground-inhabiting birds, such as quails and larks.

The engorged ticks are dark blue-gray to almost black in color. They frequently measure one-third of an inch in length when fully engorged. No white markings appear on the shields of either the male or female. In all stages the mouthparts are extended on each side so as to form prominent angles. This character can usually be seen by the naked eye and is a reliable means of distinguishing the species from others found on rabbits.

These ticks usually attach about the rabbits' ears, or on other portions of the head. The engorged larvæ and nymphs drop from the host in order to molt.

On account of the fact that this tick is seldom found on other hosts than the rabbit, it is of little economic importance. In some cases it becomes so numerous upon rabbits and weakens them to such an extent that they are easily captured by any animal that preys upon them. The Bureau of Entomology has a record of 1,033 ticks of this species having been taken from two rabbits in western Montana.

An allied species, *Hæmaphysalis chordeilis* Packard, has recently been reported as causing the death of young turkeys in Vermont. Another related species transmits a disease of the dog, known as malignant jaundice, in certain parts of South Africa.

THE NORTH AMERICAN FEVER TICK (*MARGAROPUS ANNULATUS* SAY).

The well-known transmitter of splenetic or Texas fever of cattle, *Margaropus annulatus* Say, in importance far exceeds any of the other ticks found in this country. It has received attention in various departmental publications and will consequently be given but brief notice in this paper. It is found throughout the Southern States. The original northern limit of its range in the eastern part of the country corresponded rather closely to Mason and Dixon's line. The work of eradication which has been undertaken recently has reduced the infested area considerably. Closely allied forms occur in other parts of the world, where they transmit diseases of cattle which are very similar, if not identical, with the splenetic fever which occurs in this country.

This tick causes a direct loss of at least \$40,000,000 a year in the United States; indirectly the damage is much greater. Although primarily a factor connected with cattle raising, the importance of this species extends far beyond that industry. It practically inhibits the proper utilization of live stock and thus prevents a rational system of agriculture. In this manner the whole structure of the

South is affected and its development held back. A better system of agriculture and rapid development are sure to follow the eradication of the tick.

There are two peculiar features of the life history of this tick: It is practically restricted to cattle as a host, and it does not fall to the ground for the purpose of molting. These two peculiarities render the control of the fever tick a comparatively simple matter. Its failure to exist on other hosts renders it practical to free areas of infestation in a comparatively short time by the simple device of keeping the cattle out. Likewise the dipping or greasing of cattle is a certain and economical method. Both of these means are being practiced by the Bureau of Animal Industry of the Department of Agriculture, which has undertaken extensive work which will ultimately relieve the South of a most important obstacle to development.

THE BROWN DOG TICK (*RHIPICEPHALUS SANGUINEUS* LATREILLE).

In the United States the brown dog tick occurs numerous only in southern Texas, although there are records from a few other places. Outside of the United States it has a wide range. It occurs commonly in Mexico; Central America, the West Indies, India, the Mediterranean regions, South Africa, and elsewhere. In tropical and subtropical regions throughout the world it appears to be the most common tick of the dog, but sometimes occurs on other hosts, the horse having been recorded. Essentially, however, at least in the United States, it is a parasite of the dog.

The brown dog tick may be known by the reddish-brown color. This is not relieved by lighter colored markings, as is the case with other species of ticks found infesting dogs in this country. Unlike the common dog tick in the eastern portion of the United States, this species is found on any part of the host.

The allies of the brown dog tick which occur in South Africa are among the most important disease-bearing ticks that are known. On account of its close relation to the pathogenic forms, our species is of considerable interest. At present, as a mere parasite of the dog, it is of some importance in southwestern Texas.

In India the brown dog tick has been found to be a transmitter of a protozoan disease of the dog. Up to this time there is no authentic evidence of the occurrence of this disease in the United States. If once introduced, however, there appears to be no reason why it should not spread in the region in which this tick is commonly found. A number of related species which do not occur in North America are concerned in the transmission of several important diseases of live stock in other parts of the world.

Control of this species can be obtained by the systematic use of oils or grease.