

# Origin and Spread of Important Insect Pests of Animals

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A GOOD MANY AGES AGO, insects originated the idea of thumbing a ride from one part of the country or one part of the world to another. Any conveyance suits them—an animal, a bale of hay, a ship, automobile, or airplane, or just the winds that scud over land and sea. Here is a small part of the story of the world's craftiest and most dangerous stowaways.

AS FAR BACK as the days of Pliny in the first century, and probably long before, horses, cows, sheep, goats, dogs, and chickens were known to be infested with fleas, bots, and lice. Until the white man arrived in America not one of these animals had been present on this continent for a long time, with the possible exception of the dog. It is natural to assume therefore that all of the specific parasites that take so large an annual toll of our domestic animals were brought to the Western Hemisphere along with their hosts.

In the geological past, long before even the most remote historical periods, the American Continent was well supplied with ungulates, or hoofed animals. A great many species of wild horses were well established over much of the country, and elephants and camels were then indigenous. The hoofed animals disappeared during the early Quaternary geological period, estimated at a million years ago. The stony records of paleontology disclose a remarkable and interesting coincidence. In the Oligocene period some 40 million

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years ago, great shale beds were laid down in the vicinity of Florissant, Colo. These beds are particularly rich in insect fossils and have been very well explored. Among the fossilized insects is none other than a tsetse fly (fig. 1), closely related to the fly that has practically prohibited the establishment of domestic animals in extensive areas of Africa. It is not impossible that this fly was the cause of the absolute extinction of the North American hoofed animals that might have carried the pests and parasites now found on

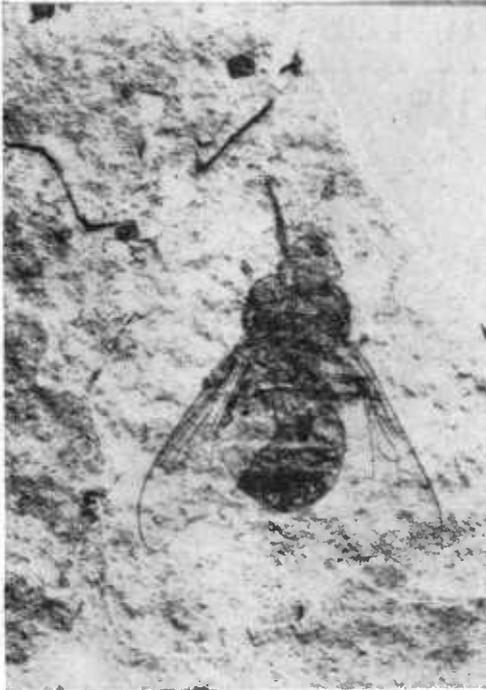


FIGURE 1.—A fossil tsetse fly.

domestic animals throughout the world. Because of the long lapse of time, however, between the early Quaternary period and the discovery of North America, none of the lice, fleas, ticks, bots, and mites that now infest our domestic animals could have been on this continent when the early settlers arrived. Some of our domestic-animal pests do attack wild animals, but in most instances this is probably an adaptation of the pests to a different host. In a few instances, also, the natural enemies of wild animals have turned their attention to our domestic livestock.

In the early days many of the pests of plants were prevented from reaching this continent by the long period of overseas travel required and the lack of suitable food and habitat in transit. The pests of domestic animals, on the other hand, found a ship's hold full of their natural host animals an excellent place in which to live and reproduce; in fact, ships' holds often became unbearably infested with vermin. Early breeders in North America were constantly seeking new sources of breeding stock. Not satisfied with the domestic cattle of Europe, they went farther and brought in the humped cattle (or zebu) from southeastern Asia, the Arabian horse, the peculiar varieties of poultry developed in India and China, the remarkable fur-bearing sheep of southwestern Asia, the Siamese cat, and the Pekingese dog. And all these introduced animals brought with them their peculiar pests and parasites.

## DAMAGE DONE BY VARIOUS INSECT PESTS

The insect pests of livestock are extremely important from an economic standpoint. It has been estimated that the damage to livestock amounts to \$168,900,000 annually, and this does not include the loss occasioned by mosquitoes, horseflies, scab mites, and a large number of less important pests, or damage to animal products such as woolen goods and leather.

It may be illuminating to review the damage done by some of the pests already introduced into the country.

The northern cattle grub, *Hypoderma bovis*, first recorded here in 1910, is probably of European origin. It and a native species cause severe damage to hides and losses in beef and milk production amounting to over \$65,000,000 annually.

Another insect, the nose botfly (*Gasterophilus haemorrhoidalis*), has been a serious pest of horses since it was first reported in this country. The early history of the occurrence of this insect in the United States seems to be somewhat clouded, but the earliest reports show that it was present in western North Dakota in 1883, in Montana in 1890, in Wyoming and Minnesota in 1910, in Nebraska in 1911, in Iowa in 1912, and in other States more recently. Just why this pest of horses did not become prominent years before these dates is difficult to tell. It seems almost certain that it was brought into this country at an early date with shipments of horses from Europe. The habits of the insect indicate that its dissemination is largely brought about by the movement of horses from place to place. The long time which the larvae spend within the host and the rather extended period during which they normally live away from the animal add to the danger of spread whenever horses are shipped or driven from infested to uninfested areas. Its failure to become established earlier may have been due to conditions surrounding the imported animals after arrival here, such as adverse climate. It is possible that climate may have a marked influence on the perpetuation of the species in any region and that it will not thrive in the more humid area east of the present area of great abundance, in North and South Dakota. Certainly it has become established in the United States only comparatively recently.

Another familiar pest is the sheep botfly (*Oestrus ovis*), the injurious effects of which are well known to most ranchers. Although comparatively new in the United States, it has been known in Europe for centuries. In ancient Greece, the Delphic oracle recommended its use as a cure for epilepsy.

Horn flies are a well-known pest of cattle throughout the length and breadth of the United States. The constant annoyance caused by these flies results in decreased weight and lessened milk production, and the loss from this source has been estimated at \$10,000,000 annually. The horn fly was first recorded in this country near Camden, N. J., in 1887. It is interesting to note that almost immediately preceding the appearance of this insect in New Jersey—in fact, the year before it was first observed—there was an extensive importation of Holstein cattle from Holland into that State. By the

summer of 1889, the horn fly was recorded in Virginia, and it had established itself in Ohio by 1891. By 1892 it had spread northward into Canada and southwestward to eastern Texas. By 1895 it had covered practically all of the United States and Canada east of the Rocky Mountains, and 2 years later it was found in California and Oregon. Ten years from the time of its introduction, this pest had spread throughout North America and even to Hawaii.

In addition to the insects that attack our domestic animals, there is another group so closely associated with livestock that they are practically dependent on them for existence. In fact these insects rarely reproduce in noxious numbers in any substance other than the excreta of domestic animals. The most notorious is the housefly. The danger of contamination of dairy products by houseflies is now recognized in the milk laws of most States, which prohibit the sale of such products from premises where precautionary measures are not taken against the presence and breeding of houseflies. Compliance with these regulations involves huge expenditures of money and labor, but when the bacterial count in milk or cream is too high there is complete financial loss because the permit to sell is revoked.

## LIVESTOCK PESTS NOT YET INTRODUCED INTO THE UNITED STATES

Though many livestock pests are quite cosmopolitan, many of the important ones known in other parts of the world have apparently not reached our shores. Among these might be mentioned the Gollubatz fly (*Simulium columbaizense*), which is known to have caused the death of many thousands of wild and domesticated animals in Rumania in 1923. A botfly (*Hypoderma crossi*) seriously infests goats and occasionally attacks cattle in India. In the Union of Soviet Socialist Republics there is a fly (*Wohlfahrtia magnifica*) the larva of which injures the hoofs of animals. In the Philippines a foot maggot (*Booponus intonsus*) produces myiasis, a disease due to the presence of larvae; and in the Soviet Union a horse bot (*Rhinoestrus purpureus*), not known to occur in this country, causes considerable injury to horses. In parts of Africa, India, and the Philippines there is a screwworm (*Chrysomya bezziana*) which, if introduced into this country, would greatly complicate our own screwworm problem, and already extensive damage is done to livestock here by these pests. The well-known primary blowflies (*Calliphora stygia* and *C. augur*) of Australia, which breed in the soiled wool of sheep, might invade America if the right combination of circumstances was present. And last, but probably most serious of all, is the dreaded tsetse fly of Africa, which carries African sleeping sickness.

## HOW INSECT PESTS SPREAD

The spread of insect pests of animals is definite and continuous. It is carried on in many different ways. For example, the tremendous swarms of adult buffalo gnats concentrating in the lower Mississippi Valley late in the spring, which have caused enormous

losses of livestock, are hatched from eggs laid many hundreds of miles to the north and carried to the Mississippi lowlands on the crests of annual freshets.

It has been known that insect pests are carried great distances by the wind, but until collections were made by means of airplanes, the numbers and species that may be found at great heights were not fully comprehended. For example, a flea has been found 200 feet above the ground, mites and spiders at 1,000 feet and more, and flies and bees at an altitude of 14,000 feet—nearly 3 miles.

One of the most remarkable cases of insect spread by wind currents is that of a springtail, a primitive wingless species, collected at an altitude of 3,000 feet. Although this insect was found over southern Louisiana, the species is known only in Cuba. Many of our most serious insect pests of animals are strong fliers in their own right and do not need the aid of wind currents for a change of scenery—witness the screwworm, which overwinters in southern Texas and flies northward on its own power approximately 35 miles a week, and the deer fly, which is one of our swiftest flying insects, although it does not travel far.

There are many other ways in which insect pests of animals may spread. It is not difficult to understand how easily ticks may be carried long distances in bales of hay or imported from outside the United States in guano; and the larvae and pupae of pests such as horn-flies, stableflies, and bots are commonly included in shipments of manure.

The common practice of shipping animals of all kinds long distances to agricultural fairs for exhibition and racing purposes gives their parasites easy and direct entry into new localities. The parasites of poultry are provided a safe and swift journey from their birthplace in eastern America when their hosts are sent to the west coast of the United States or Canada to take part in important egg-laying contests.

The movement of livestock to new ranges and new feed lots, and even to market, provides easy transportation for these insect pests from one section of the country to another and even across national boundaries. Modern passenger and express-carrying airplanes provide them with still another mode of travel.

## PREVENTIVE MEASURES

Some of the measures that might aid in preventing the introduction of species or retarding those already established include quarantine and rigidly enforced inspection of both animals and their products, improved ranch management, and introduction of parasites and predators that prey only upon the injurious insects. In extreme instances it might become necessary to control certain parasites by temporary removal of their wild host.

It is generally known that many insect pests are controlled or their numbers greatly reduced by the introduction of their natural predators and parasites. The introduction of parasites of the eggs of horseflies into parts of Texas has been recorded as effectively reduc-

ing the numbers of these troublesome insects. Investigations have been made in Australia regarding this phase of control, apparently with some degree of success.

Wild animals sometimes harbor parasites that pass over to domestic species, causing injury and even death. In such cases it may be necessary to control the wild host or remove it entirely until control measures have been established for the injurious insect. A good example of this is the difficulty encountered in controlling the cattle tick in southern Florida. There it was found that the native white-tail deer served as a host for the southern cattle tick, and no matter how thoroughly the domestic animals were treated the wild reservoir continued to furnish sufficient numbers of ticks to prevent complete control. Unless quarantined, animals brought to this country for zoological gardens may easily bring their parasites along with them.

One of the important measures proposed by the Bureau of Entomology and Plant Quarantine for reducing screwworm losses is an improved form of ranch management which recommends timing of the birth of young and performing castration, docking, dehorning, and other surgical operations during the seasons when the screwworm fly is least abundant and least active.

Quarantines of sufficient duration should provide for thorough treatment of animals for such external parasites as lice, fleas, mites, ticks, and tick flies, and such internal parasites as bots, wound-infesting flies, and insect-borne protozoa, bacteria, and viruses. The time element is all-important, as bots, grubs, screwworms, and hoof maggots may spend more or less extended periods within their hosts and are not readily diagnosed from external examination. Certain forms of insects may emerge as adults even after their hosts have been in quarantine for 6 or 8 months. Proper precautions would allow these species to develop and emerge from their hosts while the animals are in quarantine, so that the pests can be destroyed.

Although quarantine regulations have caused many heated arguments and much dissatisfaction and are irksome and often difficult to apply, they are nevertheless exceedingly useful in preventing the spread of parasites as well as diseases.

A rigid and well-enforced inspection of animals entering interstate trade would prevent the transportation of screwworms by common carriers. Severe infestations of this insect have been started in the Central and Northern States by the shipment of infested animals from south Texas late in the spring. The local infestation then increases in size and importance until winter puts a stop to the depredations. An enforced inspection of animals in transit should be supplemented by a thorough cleaning and treatment of the common carrier and holding pens, as scab mites, ticks, fleas, and flies could otherwise be carried to more distant points after their hosts have been unloaded.

At present the United States quarantine laws do not provide against the introduction of animal insect pests in the same thorough manner as against the importation of plant pests; they do, however, prohibit the importation of animals suffering from communicable diseases, some of which are transmitted by insects.