be exempt. There are certain varieties of fruits also that seem to be practically free from its attacks, as noted in this report. The Kieffer and Laconte pear, although standing along by the side of badly infested trees, were practically free. There was also another instance of this kind near Still Pond, Kent Co., where the infested trees were entirely surrounded by a block of Kieffer pears. The infested trees were all destroyed when the real character of the insect was discovered, but up to the present time, no scales have been found in the Kieffer orchard. Still another evidence of this character was found in the orchards of John I. Case, near Wheaton, Montgomery County. Here a number of Kieffer pears were planted in between badly infested peach trees, and in no instance, could more than a dozen scales, and these mostly males, be found after diligent searching. Howard and Marlatt cite a peculiar case of this nature in their Bulletin (No. 3, n. s., p. 38), in which they say: " A notable instance is the case of a tree which bore both Lawson and Kieffer grafts. The Lawson branch leaves and fruit were entirely covered, while the Kieffer portion was entirely free from the scale."

Prof. Webster has observed that the Early Richmond cherry was also practically immune. He says (Bul. 81, p. 212): "I have seen a case where the limbs of one of these cherry trees interlocked with those of a pear tree, that had been killed by the scale, yet the cherry was free. In another case, an early Richmond tree had been grafted into Mahaleb stock, and a shoot of the original stock had been thrown from out below the graft. This shoot was thickly populated with scale, while the tree itself was entirely free. I have never yet found it attacking Mulberry, even though trees were standing in the midst of dying trees, killed by this scale."

SUMMARY OF LIFE HISTORY.

The San Jose scale is one of a group of insects known as the armored scales, from the fact that they are protected by a shell or scale-like covering. The insect spends most of its life period under the scale. The only time it is capable of moving about is immediately after birth, and it crawls then only for a few hours. The adult male is also active a short time, as will be explained later.

The partially matured insects pass the winter under the scale. If, during this hibernating period, one of the scales is carefully turned with the point of a knife, a keen eye, without the aid of a magnifying glass, can detect a small, oval, wax-like mass about the size of the diameter of a pin. This is the real insect, although it has not the slightest resemblance to one. With the swelling of the buds, the young insects begin to take food and develop quite rapidly. The male scales begin to be quite prominent the latter part of April, the adult male insects appearing a few days later. The females reach maturity about the first week in June in this state, and begin to produce their young soon afterward.

The production of the young of the San Jose scale is quite different from that of most other insects. Instead of hatching from eggs, as is usually the case, the young are born alive, and the female is about

six weeks producing her progeny. For this reason it has been very difficult to ascertain, with any degree of certainty, the exact number of broods, on account of the intermingling of generations, and, not until the appearance of Howard and Marlatt's Bulletin (No. 3), was the life history of the insect thoroughly and carefully elaborated. The observations were made by Theodore Pergande, an assistant in the Division of Entomology, U. S. Department of Agriculture, on potted plants in the department insectary.

The eggs are fairly well formed within the body of the female, and are enveloped in a very thin, delicate membrane, which is cast off at birth. The newly born insect remains motionless for a few minutes, until its delicate organs harden, so that it can move about. It then forces its way out from under the scale cover and crawls over the plant in search of a suitable place to attach itself.

When first born, the insects are extremely small, and can scarcely be detected by the naked eye. They are lemon yellow in color, with somewhat elongated, oval bodies, and only nine one-thousandths of an inch in length. The general appearance of the young creatures, looking at it from below, is shown in the illustration, figure 9. As indicated, it

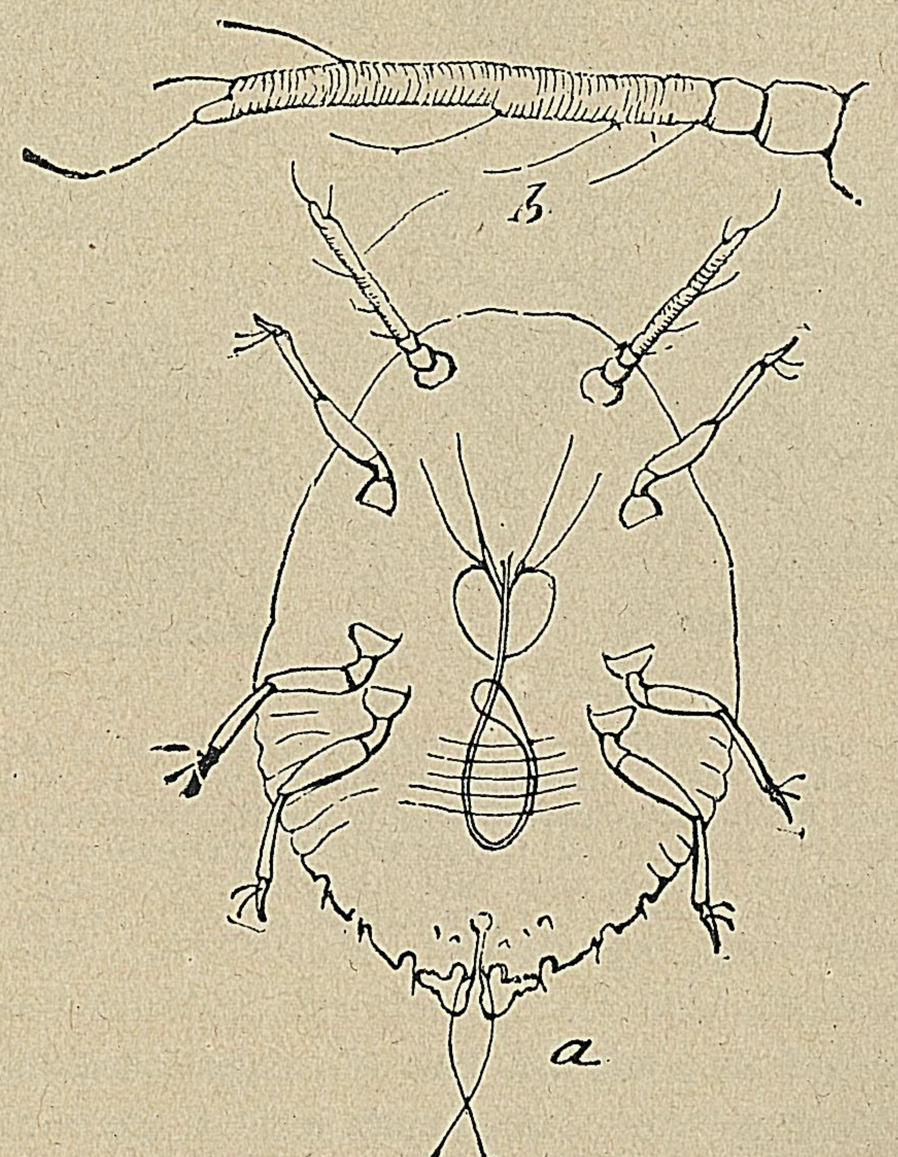

Figure 9. San Jose Scale; *a*, larva, greatly enlarged; *b*, antenna of same, still more enlarged. (After Howard, Circ. 3, New Series, Div. Ent., U. S. Dept. Agr.).

has six well, developed legs, two antennae or feelers, and a very long, thread-like beak or proboscis, through which it sucks the juice of the plant. After crawling a few hours, this lance-like beak is inserted into the plant tissues, and the young creature begins to exude from its back a mass of very fine, white, waxy filaments, and in about two days it is entirely covered with the external covering as shown at figure 10, *c. d.*