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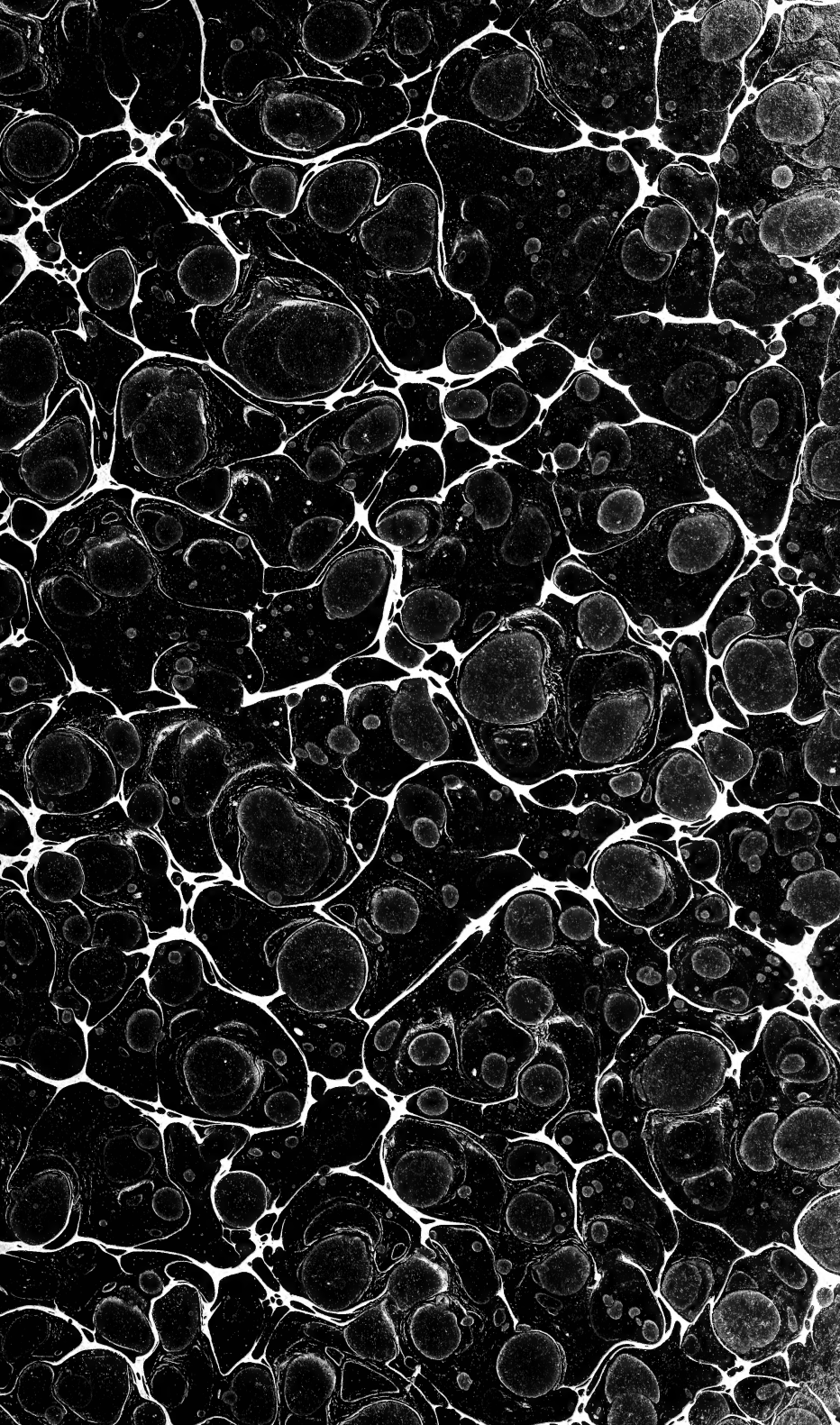
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United States Department of Agriculture,

BUREAU OF ENTOMOLOGY

L. O. HOWARD, Entomologist.

THE CLOVER ROOT-BORER.

(Hylastinus obscurus Marsham.)

By F. M. WEBSTER,

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This insect is not a native of America, but has been introduced from Europe and has established itself in the fields of red clover in some sections of the eastern United States. It frequently commits serious depredations by burrowing in the roots, thereby destroying them. It has long been known in Europe as a clover pest, Eichhoff¹ giving its distribution as Germany, Austria, France, England, and the Canary Islands. Other European entomologists have also written of its occurrence, and, according to Bach, it infested large fields of clover near Odenbach, Germany, in 1803, an occurrence evidently coincident with its description by Marsham in 1802.

While it did not come to notice in America as a pest until about 1878, when it was found in destructive abundance in central New York, it probably occurred in the country long prior to that date. Dr. Hopkins, who is making a special study of this group of beetles, viz, the Scolytidæ, has shown the writer a specimen, from the collection of the late Dr. Fitch, with a New York label attached to the pin, referring to a note which he has been unable to find. In all probability, however, this specimen antedates the discovery of the insect by Riley in 1878. Besides, owing to the obscure habits of the pest, it is more than likely that it was injurious to clover even prior to this date without, however, having been detected by farmers. Even at present, in the Middle West, where it is most destructive, it has attracted little attention, the effects of its ravages being usually attributed to adverse meteorological conditions. The pest seems to have spread much more rapidly westward, as it probably occurs nearly to the Mississippi River; but it has attracted no attention along the Atlantic coast south of Pennsylvania. In that State, however, the writer recently found it abundant

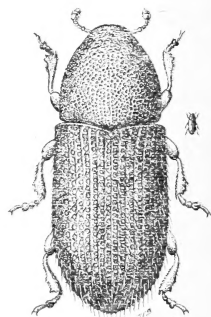


FIG. 1.—*Hylastinus obscurus*: Adult insect—natural size at right (original).

¹Die Europäischen Borkenkäfer, p. 97, 1881.

around Chambersburg, but not disastrously so. It has not been reported at all from the vicinity of Washington, D. C. It is certainly not seriously injurious in the New England States at the present time, and Dr. Fletcher reports a similar state of affairs in Ontario, Canada, while in Ohio, West Virginia, Indiana, and southern Michigan it is becoming more and more destructive.

DESCRIPTION OF THE INSECT.

The fully developed insect is a small, dark-brown, hard-bodied beetle, shown enlarged in figure 1.

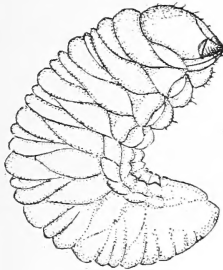


FIG. 2.—*Hylastinus obscurus*: Larva or grub—much enlarged (original).

The larva, or grub, shown enlarged in figure 2, is about an eighth of an inch long, dingy white, with honey-yellow head and brown jaws.

The pupa (fig. 3), is even smaller than the larva, also dingy white, with two minute spinous projections on the top of the head and two somewhat larger ones at the anal extremity.

The eggs are elliptical, white, and minute, yet large enough to be seen with the unaided eye.

LIFE HISTORY.

There is certainly but one generation annually, though this appears to be long drawn out, and scattering individual larvæ and pupæ may be found throughout every month of the year. The finding of eggs as late as September 18 has been reported from Michigan. As a rule, however, the insects pass the winter in the adult stage (fig. 1) within the roots where they developed. During May they abandon the old roots and seek out fresh plants or fields in which to lay their eggs. The eggs are mostly deposited between the middle of May and June 20. The female gouges out a shallow cavity, more often in the crown of the plant, sometimes at the sides of the root even 2 or 3 inches below the crown, and in this places, singly, but not far separated, about half a dozen pale, whitish, elliptical, very minute eggs. These hatch in about a week, and the larvæ (fig. 2) for a time feed in the excavation made by the mother, but soon burrow downward into the root, and before the first of August the majority of them have become fully grown and passed into the pupal stage (fig. 3). By October nearly all have become fully developed beetles, but they make no attempt to leave the plant until the following spring. Bach states that the adults fly at Omegnen in March and April, while Eichhoff has observed them near Mülhausen, swarming during the warm afternoons about the middle of

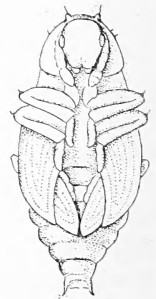


FIG. 3.—*Hylastinus obscurus*: Pupa—much enlarged (original).

June; but these observations were all made in different parts of Europe. In our own country, in Ohio, the adults are abroad and have been swept from clover fields early in May; but no swarming of the beetles has been observed, though it is clear that they may migrate about that time of the year.

FOOD PLANTS.

In Europe, besides red clover and alfalfa, the species is known to attack *Spartinum scopanum* and *Ononis natrix*. In America it has so far been especially destructive to red clover (*Trifolium pratensis*), yet with the recently increasing interest in the growing of alfalfa (*Medicago sativa*) in the Northern States it may be expected to become destructive to that crop also. Besides, it is known to attack mammoth clover (*Trifolium medium*) and alsike (*T. hybridum*). The fact that it also injures the garden pea will be very suggestive to growers of peas for canneries, and indicates the undesirability of sowing peas early in the season on ground that has recently been in these clovers or lying adjacent to the infested clover fields. Late-sown peas, however, would probably not become sufficiently large to invite attack until after the beetles had appeared and gone.

METHOD OF ATTACKING RED CLOVER.

The insect's method of attack is well illustrated by figure 4, showing a clover root split in two, exposing the excavations. In cases of extreme abundance, however, almost the entire main root, except the bark, is eaten out, the substance being displaced by excreta, and the dead top either becomes detached of itself or is easily broken off if one attempts to pull up the plant. It will be observed at once that until the roots have attained sufficient dimensions it will be impossible for the insect to attack them. Over the territory where red clover is grown in this country the seed is sown either during late winter or spring; and during the first year the roots of the plants have not yet attained sufficient size to accommodate the insects at the time the latter are, with the exception, perhaps, of a few belated individuals, abroad and depositing their eggs; and thus the plants are almost, if not, indeed, entirely, exempt from attack the first year. Hence it is not until the summer of the second year that they are destroyed. This has led European entomolo-

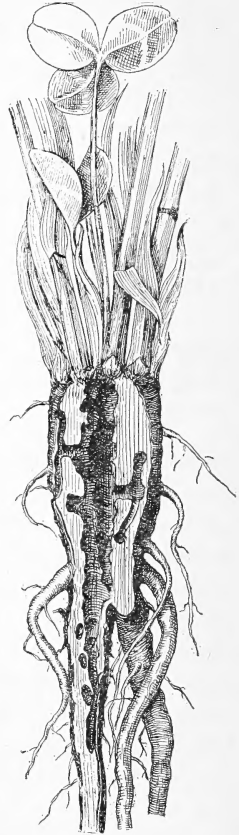


FIG. 4.—Clover root, showing work of *Hylastinus obscurus*—slightly enlarged (original).

gists to believe that, like many others of the Scolytidæ, the insect does not attack the plant until the latter has become weakened by age or is diseased. But, in this country, at least, this can not be true, for the reasons just given. It is not improbable, however, that, as between two plants with roots of the requisite size, an unhealthy one would be preferred by the beetles rather than one in a thoroughly vigorous condition. But, as yet, there have been no observations tending to verify this hypothesis. A diseased clover root, or one that has begun to decline from effects of age, is first affected at the heart; and, as will be observed from figure 4, this is the part first attacked by the root-borer.

EFFECT UPON THE PLANT.

While an infested clover plant sooner or later succumbs to an attack by this insect, life may be lengthened or shortened by meteorological conditions. Thus, if the spring or early summer is very dry, the plants begin to die in patches late in June, as soon as the hay crop is removed; but if there is much rain during this period, the weakened plants may continue to live until winter, dying out before spring. In either case the farmer is likely to be misled and to attribute the loss to the weather. The summer of 1905 was not a dry one. Copious rains fell with sufficient frequency to enable all but the most seriously affected plants to survive. A prominent seedsman of Indiana, who was much among clover fields, thus described the situation in October:

In driving around this year and examining clover fields, we have found that several fields which apparently should have produced an immense amount of seed, or at least, say, 3 or 4 bushels to the acre, * * * did not shake out anything. We pulled up some plants and discovered that the plant broke off at the crown; or if any of the root did come with it, it was small and decayed. On close investigation we discovered a little white worm which seemed to be in abundance and working amongst the roots. We noticed this in a number of fields and have been wondering what it was. We have also had samples of clover plants from other sections of Indiana showing these conditions, and almost invariably the yield of such fields was less than a bushel per acre, and in many instances hulling was abandoned and the huller taken out of the field.

NATURAL ENEMIES.

While Dr. Riley found the larva of one of the common soldier beetles, probably *Telephorus bilineatus*, attacking the larvæ of the borer, and although it probably has other enemies, both among insects and birds, these have so far proven of little economic importance.

PREVENTIVE MEASURES.

The only preventive measure yet tried that gives any promise of success is summer fallowing as soon as the hay crop is removed.

At this time the young are in an immature state and, if deprived of food, must perish. They can not migrate from one clover root to another, and, if the meadow is now broken up, throwing the roots up

to the hot sun and winds, these wither and dry, thus no longer supplying the necessary sustenance, at this time so imperative to the life of the larvæ, and they perish. Thus an invasion of a new field from an old one may be prevented. But if the fallowing be delayed, even for a few weeks, the larvæ will then have for the most part passed into the pupal stage, during which no food is required, and plowing can have little or no effect upon them. This measure, together with the practice of allowing clover fields to stand only two years, would soon reduce the pest to subjugation in any community. No trouble seems to occur in pastures. Once brought under control, it would seem that a system of rotation that involves mowing for hay and seed the first year, pasturing and then breaking up the ground the following year, if generally followed in a community, would suffice to keep the pest in subjection. Extermination is not possible.

Approved:

JAMES WILSON,

Secretary of Agriculture.

WASHINGTON, D. C., *December 28, 1905.*

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